Essays on the Efficiency of Markets

A Dissertation Submitted In Fulfilment of the Requirements for the Degree of Doctor of Philosophy to be Awarded for Published Work at University of Warwick.

Rong Ding (1490951)

Warwick Business School

University of Warwick

Coventry CV4 7AL

U.K

May 2016

Table of Contents

Acknowledgements

I dedicate this dissertation to my wife, Jia Tian, for her enduring patience, encouragement and love. I thank my parents for their mental support. I sincerely thank my adviser, Professor David Marginson, for being extremely supportive. I am very fortunate to have an adviser who is knowledgeable in the field. David always challenged me to raise intriguing questions and explore new ideas. I am grateful to my colleagues at Warwick Business School, Crawford Spence, Georgios Voulgaris, Chendi Zhang who have been very helpful during my PhD study. Finally, I would like to acknowledge the support I received from my friends during my PhD study. My special thanks go to Ming Lei and Ke Zhang. I also want to thank Peng Cheng (XiJiao Liverpool University), Yuping Jia (Frankfurt School of Finance and Management), Wenxuan Hou (University of Edinburgh), Bo Qin and Flora Yu Kuang (University of Melbourne), with whom I had helpful discussions on research and career development. For the sake of brevity, I will refrain from mentioning more names but wish all the best to my friends.

Declaration and collaborative work

I declare that this submission is not substantially the same as any I have previously submitted or am currently submitting in any form for any qualification at another university. No parts of this submission have been previously submitted for a similar qualification. A number of the items included in this submission are joint-authored. Statements from all collaborating authors have been included in Appendix 1.

Chapter 1: Summary and contribution

This chapter provides a summary of the background and key findings of five peer-reviewed publications that constitute the submission for PhD by publication. Two papers (Ding and Jia, 2012; Al-Najjar and Ding, 2014) contribute to research on product market efficiency and the remaining three (Ding and Cheng, 2011; Ding and Hou, 2015; Chen, Ding, Hou and Johan, 2015) contribute to financial market efficiency. Taken together, the underlying theme of these papers has important implications for resources allocation and the aggregate welfare of an economy.

According to a definition in economics, the product market is the marketplace where goods or services are provided for purchase by consumers, businesses, and the public sector. The elements to be considered when defining product market equilibrium include the characteristics of the product or service, the existence of entry barrier, consumer pre-preference, and competition among market participants (i.e., suppliers and consumers). Competition in the product market, which is described by Adam Smith in "the Wealth of Nations (1776)" as allocating productive resources to their most highly valued users *and* encouraging efficiency, enables the movement of resources to where they are most needed, and where they can be most efficiently utilized. It is generally accepted that competition results in lower price as well as greater welfare for consumers, leading to higher efficiency for the economy. However, perfect competition requires no barriers to entry. This implies that in the presence of new firms entering an industry, incumbent firms will lose their existing customers to new entrants and are forced to reduce their price to match the lower price set by new entrants. In real life certain kinds of entry barriers do exist, which makes perfect competition (and perfect product market efficiency) an idealization.

Different from the product market, the influence of the financial market usually goes beyond its geographic boundary, because the development of IT technology enables the integration of various types of financial market (e.g., stock market, bond market and foreign exchange market) and financial market in different locations. Considered as one of the underlying principles of modern financial markets, the (semi-strong form of) efficient market hypothesis (EMH) posits that market price fully reflects all publicly available information, because market participants attempt to profit from their information advantage, and doing so enables the incorporation of their private information into the market price (Fama, 1970). However, this would probably take place in an idealized world of "no market friction", "zero tax" and "zero transaction cost". According to Grossman and Stiglitz (1980), financial market efficiency relies on market participants who actively monitor financial markets and arbitrage away price discrepancies. Nevertheless, a perfectly efficient financial market is almost impossible because if this is the reality, there is no benefit from gathering information. In other words, the degree of financial market efficiency determines the effort investors are willing to expend to collect and trade on information. Therefore, from the viewpoint of Grossman and Stiglitz (1980), EMH is an idealization that is economically unrealizable, but could serve as a useful benchmark for measuring relative market efficiency.

It is an interesting question whether market efficiency theories developed in mature economies such as the US and UK can be applied to other countries with less developed market infrastructures. In an attempt to increase the productivity of state-owned enterprises, the Chinese government began transforming their economy from being centrally planned into market oriented in the late 1970s. As a result, many former state-owned-enterprises (SOEs) were turned into publicly listed firms that successfully raised funds from external investors in

the stock market.[1] However, the government and government agencies continue to be the controlling shareholder of these firms, suggesting that there are two types of agency problem in Chinese SOEs: The agency problem between shareholders and the management (type I agency problem); and the agency problem between controlling shareholders and minority shareholders (type II agency problem). As the majority of publicly listed firms in China are still controlled by the central and local government and effective internal and external governance mechanisms have not been well established yet, the functioning of the Chinese stock market might deviate from what is predicted by the efficient market hypothesis. Another reason that renders the Chinese stock market deviating from an efficient market is that the government still plays a dominant role in managing the economy. For example, SOEs are able to receive preferential treatment from the government in terms of easy access to credit, government subsidiary and favourable regulatory conditions. This indicates that both the financial and product markets play a secondary role in resource allocation, resulting in both markets being less efficient. However, with the development of market infrastructure and financial intermediaries such as financial analysts, the efficiency of the Chinese stock market is likely to improve. For example, Hung (2009) reports that before the announcement by the Chinese government to release the investment restrictions on the B-share market on

[1] There are two stock exchanges in mainland China. Shanghai Stock Exchange was established on 26th November, 1990 and started trading on 19th December, 1990. The Shenzhen Stock Exchange was founded on 1st December, 1990 and started trading on 3rd July, 1991. Two classes of shares are traded on these exchanges. A shares are denominated by Chinese Yuan and traded by domestic investors; B shares are denominated in foreign currencies and traded by foreign investors before February 2001. Additionally, H shares are denominated in Hong Kong Dollar and traded in the Hong Kong stock exchange. By the end of June 2015, there are more than 1,000 and 1,700 firms listed in Shanghai and Shenzhen, respectively. The aggregate market capitalization of two stock exchanges is USD 5.8 trillion by 2015.

19th February 2001 (so domestic investors could trade B-shares), the weak form of efficient market hypothesis was not supported in the B-share market. After the regulatory change in February 2001, the weak form of efficient market hypothesis cannot be rejected, indicating the efficiency of the B-share market has improved.

Recent advancement in psychology and experimental economics has documented a number of departures from the EMH, due to specific behavioural bias that could affect decision-making under uncertainty. These examples include: over-reaction (Debondt and Thaler, 1985), loss aversion (Kahneman and Tversky, 1979; Odean, 1998), overconfidence (Barber and Odean, 2001; Gervais and Odean, 2001) and home bias. In particular, overconfidence is a widely observed psychological bias that generates heterogeneous beliefs (Daniel et al., 2002; Barberis and Thaler, 2003). The difference in investors' beliefs will fluctuate more if there is more difference in investors' level of overconfidence because overconfidence can lead investors to differ in information processing (Scheinkman and Xiong, 2003).

Miller (1977) argues that, if agents have heterogeneous beliefs about an asset's fundamentals and short sales are prohibited, equilibrium prices would, given opinions diverge sufficiently, reflect the opinion of the more optimistic investor. Harrison and Kreps (1978) exploit the dynamic consequences of heterogeneous beliefs. Since an investor knows that, in the future, there may be other investors that value the asset more than he does, the investor is willing to pay more for an asset than if he has to hold the asset forever. This is the theoretical framework used in the first study: Ding and Cheng (2011).

In the Chinese stock market, firms which have issued A shares to domestic investors could also issue B shares in the Shanghai and Shenzhen stock exchanges and H shares in the Hong Kong stock exchange to foreign investors, and such firms are labelled as "cross-listed" firms. Mainland domestic investors are prohibited from investing in H shares in the Hong Kong

market, while Hong Kong investors are only allowed to invest in mainland B shares but not A shares.

In the literature the "foreign share discount" refers to the price difference of cross-listed firms in China. Compared with A shares, the cross-listed B and H shares are always traded at a discount, although shareholders of both shares have equal rights (Fernald and Rogers, 2002). In the first study, we provide fresh evidence to support the view that the speculative trading can potentially explain the share discount of cross-listed stocks by exploiting the "share investment through-train scheme to Hong Kong" announced on 20th August 2007 (but re-assessed in November 2007 and actually suspended thereafter).[2] Because under the "through-train" scheme mainland individual investors were allowed to directly invest in Hong Kong, Hong Kong investors could buy the cross-listed stocks (which are traded at a discount in Hong Kong) with the purpose to sell to incoming mainland investors at a much higher price. We expect such speculative trading to generate market optimism and a price bubble in Hong Kong, as the Hong Kong Hang Seng index rose by 48% after the release of the "through-train scheme" in August 2007. Similarly, after the release of re-assessment announcement in November 2007, the speculative trading motive suddenly dissipated, leading to a dramatic plummet in Hong Kong's stock market. The empirical findings generally support our conjecture. This study contributes to research on market efficiency by identifying speculation as one potential explanation of the "foreign share discount" of cross-listed firms in China.

The second contribution comes from Ding and Hou (2015). In developing the "investor recognition hypothesis", Merton (1987) assumes that investors know only about a subset of

[2] Since 17th November 2014, Mainland and Hong Kong investors can directly invest in the Shanghai and Hong Kong markets through the "Pilot Program of an Interconnection Mechanism for Transactions in the Shanghai and Hong Kong Stock Markets".

the available securities on the market and that these subsets do not overlap among different investors. In equilibrium, investors require a return premium from firms that are not well recognized because investors are less likely to purchase stocks that they are not familiar with, so such stocks tend to have lower liquidity. Merton (1987) proposes that the shareholder base be a reasonable proxy of the extent to which a particular firm is recognized among investors, so a bigger shareholder base indicates that the firm has been better recognized. In other words, potential investors have to be aware of a firm before they can gradually become familiar with it and then eventually decide to invest, suggesting that investor attention is a necessary condition for a firm to be well recognized. Following Da, Engelberg and Gao (2011), in the second study of the submission we use a new measure for investors' active attention, which is the aggregate search volume of a particular stock ticker provided by Google Trends (available from: www.google.com/trends). Then we test the effect of investors' attention paid to listed firms on two aspects: Breadth of ownership; and stock liquidity. We find empirical evidence that investor attention, reflected by Google search volume, is associated with enlarged shareholder base and better stock liquidity. This study contributes to market efficiency research by highlighting that investor information demand is associated with better visibility of the firm among investors as well as reduced information asymmetry between corporate insiders and external investors.

Financial market is where individuals or institutions trade financial securities, commodities, and other tradable assets at a price that reflects the law of supply and demand. The operation of a financial market involves multiple stakeholders including investors, financial intermediaries and regulators. Financial analysts are generally considered as one of the most important financial intermediaries, as they have the expertise to analyse relevant information from financial statements as well as other public sources and, subsequently, disseminate the

information to current and prospective investors (Chung and Jo, 1996). As pointed out by Healy and Palepu (2001), the benefits of analyst coverage result from the analyst's role in information production *and* dissemination which, subsequently, enhances corporate transparency and informational efficiency. According to Jensen and Meckling (1976), "to the extent that security analysis activities reduce the agency costs associated with the separation of ownership and control, they are *indeed socially productive*". Empirical evidence supports the significant role analysts play in the capital market, particularly in developed countries such as the US. For example, Roulstone (2003) shows that more analysts following leads to increased liquidity, suggesting that analysts are able to reduce information asymmetry between investors and managers of the firm. Ayers and Freeman (2003) find that prices of firms with high analyst coverage incorporate future earnings more rapidly than firms with low analyst coverage. Consistent with the view that analysts are important information intermediaries between the firm and the market, Sun (2011) shows that income smoothing enhances earnings informativeness more significantly for firms with high analyst coverage. Overall, analyst coverage is believed to contribute to better corporate transparency and informational efficiency. In Chen, Ding, Hou and Johan (2015), we investigate the monitoring role of financial analysts in the Chinese capital market. As one of the largest emerging economies in the world, the Chinese capital market has experienced remarkable growth since the early 1990s. By the end of 2010, more than 2,000 firms are listed in the Shanghai and Shenzhen stock exchanges, and the total market capitalization exceeds USD 4.76 trillion. As a result of the partial privatization of former state-owned enterprises (SOEs) since the 1990s, the majority of Chinese listed firms are ultimately controlled by the state (e.g., central government, local government or a government agent). Due to political reason SOEs can receive favourable treatment from the government and, thus, have relatively easy access to equity and credit markets, which implies that SOEs are under less pressure to

reduce information asymmetry. In contrast, non-state-owned enterprises (NSOEs) are more dependent on the equity market as the major source of external financing, which implies that they have more incentive to reduce information asymmetry. Therefore, we are able to analyze the effectiveness of analyst coverage and determine whether their monitoring role is potentially reduced (enhanced) depending on ownership structure.

China is also characterized as an earnings-based regulatory regime. For example, in 1998 the China Securities Regulatory Commission (CSRC) required that a listed firm reporting loss for two consecutive years be labelled a special treatment (ST) firm, and its daily stock quotation fluctuation be reduced from 10% to 5%. At the same time, ST firms were subject to intense scrutiny from financial intermediaries such as analysts. Therefore, in this study we explicitly investigate whether the effect of analyst coverage on financial reporting quality is moderated by 1) ownership structure 2) operational performance captured by ST and whether the firm is under-performing its industry peers. Based on the analysis of a large sample of Chinese publicly listed firms between 2003 and 2009, we find that analyst coverage contributes to a higher financial reporting quality in terms of lower incidence of modified audit opinion (MAO), and such effect is more pronounced for non-state-owned enterprises (NSOEs). Furthermore, we show that analyst coverage plays a more significant role in reducing the propensity that firms experiencing financial distress (ST firms) and under-performing firms would receive MAO. The findings of this study contribute to research on market efficiency by highlighting the importance of financial analysts in promoting financial reporting transparency of public firms in China, one of the largest emerging economies in the world.

The fourth study is Ding and Jia (2012). In this study we analyze the economic consequence of the merger of two auditing firms, namely Price Waterhouse and Coopers & Lybrand (PwC) in 1998 in the UK audit market. Consumers often benefit from increased competition

in the product market (Hausman, 1999; Hausman and Leonard, 2002). The UK audit market has been characterized as an oligopoly market. For example, the "Big Four" auditor firms, namely, Deloitte & Touche, Ernst & Young, KPMG and PwC dominate the UK auditing market by auditing 99 of the FTSE 100 companies, 242 of FTSE 250 companies and collecting 99% of auditing fees in the FTSE 350 in 2005. The high degree of concentration becomes more remarkable after the Price Waterhouse and Coopers & Lybrand merger in 1998 and the dissolution of Arthur Anderson in 2002. According to a study commissioned in September 2005 by the Department of Trade and Industry and the Financial Reporting Council (Oxera, 2006), the higher market concentration led to higher audit fees. Between 1995 and 2004, audit fees on average increased by 11.7% in real terms. Although information on operation margins of auditing firms is limited, anecdotal evidence suggests that the fee increase is partially attributed to the collective market power enjoyed by "Big Four" auditors. This is consistent with the theoretical prediction that less competition drives the industry price to a level well above the marginal cost. In the fourth study we investigate the economic consequence of the merger of Price Waterhouse and Coopers & Lybrand in the UK, and focus on the impact of the merger on the change in audit quality and audit fee with a sample of UK publicly listed firms. We find that in the post-merger period (1999-2001) earnings quality improved for clients of top-tier auditors relative to that in the pre-merger period (1995-1997). Consistent with the prediction of economic theory that less competition results in higher fees, we show that there is an increase in audit fee for the top-tier auditor clients after the PwC merger, suggesting the merger leads to a net increase in the price paid by clients to purchase audit services. This study contributes to the market efficiency research because the findings are of interest to regulators who are responsible for assessing the implication of future consolidation of the auditing industry in the UK.

The fifth contribution to this dissertation by publication comes from Al-Najjar and Ding (2014). There are both theoretical and empirical investigations on voluntary disclosure of private information. The theoretical literature identifies conditions under which firms voluntarily disclose their private information (Grossman and Hart, 1980; Grossman, 1981; Milgrom and Roberts, 1986). A manager aiming at maximizing firm value will disclose information only if it is sufficiently favourable (so such disclosure contributes to higher firm value). The empirical literature on voluntary disclosure points to improved liquidity as one of the major benefits. Graham, Harvey and Rajgopal (2005) survey managers from US public firms and report that 44% strongly agreed that "voluntarily communicating information increases the overall stock liquidity (compared with 17% who strongly disagree with the statement)". Higher liquidity attracts both individual and institutional investors, as evidenced by Healy, Hutton and Palepu (1999) who document that firms with sustained improvements in analyst rating of disclosure quality show an increase in stock liquidity, analyst following, institutional ownership and stock performance. On the other hand, firms also incur cost when disclosing private information. Disclosure cost includes the actual cost of making the disclosure and the cost arising from the proprietary nature of the disclosed information. It is relatively difficult to quantify the direct costs associated with disclosure activities. Instead, there is more evidence on the indirect cost of voluntary disclosure. Harris (1998) analyses the association between product market competition and detailed industry segment disclosure, and finds that profitable operations in less competitive industries are less likely to be reported.

In the fifth and last paper included in the submission, we investigate the association between product market competition and disclosure of corporate governance information with a sample of UK public firms. In this study, we suggest that product market competition can potentially have two opposing effects on corporate governance disclosure. On one hand,

firms might have more disclosure due to intense product market competition, since competition serves as disciplinary and monitoring mechanism to pressure managers to commit to better disclosure practice. On the other hand, corporate governance disclosure can be seen as a substitute for product market competition: Managers use more disclosure in less competitive markets to maintain investor confidence in their firms. Following recent literature (i.e. Li, 2010), we employ different measures to describe product market competition at the industry level and examine their influence on corporate governance disclosure. We find evidence that firms in less competitive industries have significantly more disclosure compared with firms in more competitive industries. This study contributes to the research on market efficiency in that empirical findings suggest that different dimensions of competition affect a firm's decision to voluntarily disclose more information. Therefore, regulators might consider harmonizing industry policies with accounting regulations to increase public welfare.

This dissertation is subject to the following limitations. First, both Ding and Cheng (2011) and Ding and Jia (2012) analyze the consequence of individual events in specific countries (the announcement of launching the Hong Kong Through-Train scheme in China and the merger between Price Waterhouse and Coopers & Lybrand in the UK, respectively), and it is not clear whether these findings can be generalized to other countries with different institutional backgrounds. Second, Ding and Hou (2015) is exclusively built on the analysis of S&P 500 stocks, which are large and well-established firms with high visibility. It is expected that smaller and less recognized firms would benefit more from increased investor attention, so adding small and less visible firms to future analysis might strengthen our results. Furthermore, as Google becomes an increasingly important source of information for investors around the world, it might be intriguing to explore the capital market consequences of investors' active demand for information in other markets (e.g., the UK and other

European countries). Third, Chen, Ding, Hou and Johan (2015) is based on the analysis of archival data. We suggest that a combination between an archival study and a field study (e.g., interview with financial analyst and corporate managers) could provide more insights into the role of financial analyst in shaping the financial reporting incentive and practice; and it might be interesting to examine the issue from the perspective of the auditor by exploring how they factor analyst coverage into the risk-assessment framework of auditing. Finally, the product market competition measure used in Al-Najjar and Ding (2014) is an industry-level measure. Recent studies (i.e., Li et al., 2013) develop a firm-level competition measure, based on how managers perceive the firm's competitive environment in the management discussion and analysis section (MD&A) of 10-K filing for US public firms. Future research may use firm-level competition measures to provide in-depth insights into the association between competition and corporate governance disclosure in the UK and other countries.

This rest of the submission is organized as follows: Chapter 2 summarizes the contribution of each paper included in the submission. Chapter 3 outlines the current and future research of the author. Chapter 4 concludes.

Appendix 1 summarizes the contribution split between collaborating authors and provides the written statement by collaborating authors on joint publications. Appendix 2 presents a full bibliography of all publications by the author.

Chapter 2: Description of the five publications

While Chapter 1 outlines the contribution of the submission, Chapter 2 provides a detailed description of the contribution of papers introduced in Chapter 1. In the first study we provide evidence to support the speculative trading-based explanation to the share discount of cross-listed stocks by exploiting the "share investment through-train scheme to Hong Kong" initially announced on 20th August 2007 (but re-assessed in November 2007 and actually suspended thereafter). Dominated by unsophisticated individual investors, the stock market in mainland China is a relative fledgling. China's two stock exchanges in Shanghai and Shenzhen have grown quickly since the early 1990s. In addition, mainland investors are not allowed to invest in the Hong Kong market; while Hong Kong investors are only allowed to invest in the mainland B-class shares market but not A-class shares. Although Hong Kong became part of China in July 1997, it maintains its western-style political ideology and market-oriented economy with a large presence of global institutional investors. Importantly, Hong Kong is one of the primary overseas markets for mainland firms to raise foreign capital, which are also referred to as "H-share" firms. H-share stocks are also regulated by mainland laws, but they are denominated in Hong Kong dollars and traded in the same way as other equities listed on the Hong Kong stock exchange. By the end of July 2008, 152 mainland companies were offering H-share stocks, part of which was cross-listed in both Hong Kong and mainland stock exchanges (CSRC, 2008).

Compared with cross-listed A shares, the cross-listed B and H shares are always traded at a discount. Chan et al. (2008) suggest that information asymmetry is the major reason for this discount. Lee et al. (2001) find that the premium between A and B shares is negatively related to the trading volume, and conclude that the price premiums between cross-listed A and B shares actually are due to the illiquidity of B shares. Furthermore, Fernald and Rogers

(2002) argue that the reason for this discount is that Chinese domestic investors have limited alternative investment opportunities; therefore, they could only invest in A share stocks. In addition, by using the research framework proposed by Scheinkman and Xiong (2003), Mei et al. (2009) find that the price premium exists because there are too many speculators prevailing in the A share market.[3] Therefore, they conclude that the premium between cross-listed shares could be induced by irrational trading behaviour.

Cross-listed stocks are traded at a premium on the mainland stock exchanges (Shanghai and Shenzhen). Because under the "through-train scheme" mainland individual investors were allowed to directly invest in Hong Kong, Hong Kong investors could buy the cross-listed stocks (which are traded at a discount) with the purpose of selling to incoming mainland investors at a much higher price. Such speculative trading behaviour generated market optimism and a price bubble in Hong Kong, as the Hong Kong Hang Seng index rose by 48% after the release of the "through-train scheme" in August 2007. Similarly, after the announcement of re-assessment in November 2007, speculative trading dissipated, leading to a plunge in the Hong Kong market.

We construct a mediation model to clarify the relation between speculative trading, cross-listing price difference and post-announcement return. The underlining rationale is as follows: On one hand, after the August announcement, Hong Kong stockholders are willing to hold their shares and expect to sell their shares to incoming mainland investors at a higher price. Hong Kong speculators are also willing to pay more, as they expect to resell to optimistic mainland investors for a profit. On the other hand, the "through-train scheme"

[3] Mei et al. (2009) use a unique dataset of Chinese firms with dual-class shares of identical rights (A-class and B-class shares, traditionally denoted as shares available to domestic investors and foreign investors until 2001) and find that A shares turnover had a significant and positive correlation with A-B price premium before 2001 and explained 20% of the monthly cross-sectional variation of this premium.

could further generate excess speculative demand for cross-listed stocks in Hong Kong, which pushes stock price higher. Therefore, we hypothesize that the cross-listing price difference causes excess speculative trading which, in turn, generates positive abnormal return. The mediator variable, excess speculative trading volume, serves to clarify the nature of the relationship between cross-listing price difference and post-announcement returns. Similarly we design a mediation model for the November announcement. The empirical results confirm our conjecture.

This research contributes to the literature in multiple ways. First, this study provides new evidence to understand the difference between domestic and overseas market prices of the same underlying assets. Firms cross-listed on mainland markets are traded at a premium relative to those traded in Hong Kong. Previous studies (Chan et al., 2008) suggest that, in a segmented market setting, price difference of assets with identical rights are often associated with limited liquidity and/or information asymmetry. Market liquidity is less likely to explain the cross-listing price difference between the Chinese mainland and Hong Kong, primarily because the Hong Kong market is a more liquid market relative to the mainland market. Information asymmetry between mainland investors and less informed Hong Kong investors may result in this price difference, as investor recognition hypothesis (Merton, 1987) shows that stocks known by less investors should have a lower price. However, empirical findings suggest that this price difference is not necessarily correlated with the Hong Kong shareholder base (a proxy for investor recognition). Consistent with Mei et al. (2009), we argue that the mainland-Hong Kong price difference is more likely to be explained by the speculative price premium in the mainland market.

Second, this study provides supporting evidence for the theoretical prediction that agents pay prices that exceed their own valuation because they believe that in the future they will find a

buyer who is willing to pay even more (e.g., Harrison and Kreps, 1978). Empirically, it is difficult to separate investors with heterogeneous beliefs in asset valuation from each other. The Hong Kong through-train scheme provides a unique opportunity: Hong Kong investors and mainland investors differ in valuing the same stocks, because the price of cross-listed stocks is much higher in the mainland than that in the Hong Kong market. Hong Kong speculators are willing to pay more, expecting to realize capital gains by reselling stock to incoming mainland investors that are more optimistic. In other words, the announcement of through-train scheme generated speculative trading and a price bubble in Hong Kong. In addition, the results are consistent with price pressure hypothesis, as there is a significant association between post-announcement abnormal return and excessive trading, but the association is short-lived (Shleifer, 1986). Furthermore, a mediation model is constructed to analyze the effects of cross-listing price difference (between mainland and Hong Kong markets) on Hong Kong stock returns and decipher an indirect effect of cross-listing price difference on Hong Kong prices, which is mediated by excessive turnover. The findings of this research thus have important implications for both policymakers and regulators.

There is long-standing literature reporting that investors have "home bias" because they tend to favour investment in firms they are familiar with (French and Poterba, 1991; Coval and Moskowitz, 1999; Cao, et al., 2011). In order to become familiar with such firms, investors have to spend time and effort collecting relevant information which suggests that attention from investors might predict the subsequent trading activity. On the theoretical side, studies on asset pricing posit that investor attention is a necessary condition for a stock price to fully reflect public information, as investors need to be aware of the information before they can analyze and react to it (Hirshleifer and Teoh, 2003; Hirshleifer, Lim and Teoh, 2011). However, because of the limits on the information-processing capacity of human beings,

attention is largely concentrated on the stocks that investors are interested in or familiar with which implies that attention paid to stocks by investors could result in subsequent trading of these stocks. The second study aims to provide new insights into the capital market consequences of investors' attention.

Previous empirical studies build on the assumption that the investors passively attend to publicly available information and use measures such as advertising expenditure (Grullon, Kanatas and Weston, 2004) and media coverage (Fang and Peress, 2009) to capture investors' attention. Different from these studies, in the second study we employ a measure recently developed by Da, Engelberg and Gao (2011), namely the aggregate search volume index (SVI) of a stock, and test the impact of investors' active attention on breadth of ownership and liquidity of the firm. After controlling for the passive attention measures documented in the literature, we find that increased investor attention measured by the SVI contributes to a broader shareholder base. This can be interpreted with the "investor recognition hypothesis" (Merton, 1987), which states that the shareholder base measures the recognition of the firm among investors, so that an enlarged shareholder base indicates that the firm has been well recognized. In other words, potential investors have to be aware of a firm before they can gradually become familiar with it and then eventually decide to invest, suggesting that investor attention is a necessary condition for a firm to be recognized. The impact of passive attention measures, however, is not always significant in the results, showing that retail investors do not necessarily invest in firms with more advertising expenditure or media coverage. Furthermore, we find that increased investor attention, as measured by the SVI, results in reduced bid-ask spread, and our results remain consistent after controlling for the passive attention measures, firm characteristics, and year and industry

fixed effects. Our findings remain robust to alternative liquidity measures including effective spread, relative effective spread, and turnover rate.

This study makes several contributions to the literature. First, our study expands the broad literature on the "investor recognition hypothesis" (i.e., Merton, 1987, Grullon et al., 2004; Tetlock, 2010; Fang and Peress, 2009). Merton (1987) posits that "ceteris paribus, an increase in the relative size of the firm's investor base will reduce the firm's cost of capital and increase the market value of the firm." A stock's visibility is associated with its price, publicity and popularity of the core products and social image. However, we suggest that these measures are passive, in that it is implicitly assumed that firms with high visibility will attract more attention from investors, which is difficult to empirically verify. Our study is built on an active measure of *ex post* attention, the Google search volume of a stock. When individual investors actively search for a stock using Google, they acquire useful information relevant to the stock, which mitigates the information asymmetry problem for these stocks. As a result, liquidity improves for stocks with better investor recognition.

Second, our paper adds to the emerging literature on investor attention and asset pricing dynamics, including Barber and Odean (2008) on investor attention and individual investors' trading behaviour, Engelberg and Parsons (2011) on the casual impact of local media coverage on local trading, Da et al. (2011) on the impact of active attention on IPO returns and price changes in subsequent periods, and Aouadi et al. (2013) on the effect of investor attention on stock market liquidity and volatility using Google French data.

Finally, our study extends the literature on the stock market consequence of investors' information demand. For example, Vlastakis and Markellos (2011) use the Google search volume of constituents of Dow Jones Industrial Average Index as a proxy of investors' information demand, and find that such information demand has a significant influence on

stock trading volume and the conditional variance of excess return. Siganos (2013) uses Google search volume of target firms involved in a merger between 2004 and 2010 in the UK as a proxy for investor information demand for the target firms, and finds that such a measure can explain a large percentage of the price increase in target firms prior to the merger. We extend this stream of literature by providing evidence that investors' attention leads to larger shareholder base and improved stock liquidity.

In a seminar paper by Jensen and Meckling (1976), the authors conclude that monitoring activities designed to constrain managerial opportunism should become specialized to those institutions and individuals who possess competitive advantage, and financial analysts are individuals who have the capability and expertise to perform such tasks. Financial analysts are professionals with substantial industry background and knowledge. In addition, they track corporate information on a regular basis and have opportunities to interact directly with managers. Previous studies show that analysts play an important role in disciplining managerial behaviour. For example, Moyer et al. (1989) provide evidence for the monitoring role of analysts as a mechanism to mitigate the agency problem. Analysts also act as whistle-blowers of corporate fraud (Dyck et al. 2010). According to Yu (2008), financial analysts are well trained to go through numerous financial statements and track firms on a regular basis, which enables the improvement of corporate transparency and the identification of financial reporting irregularities. As a result, managers from firms followed by more analysts tend to act more cautiously under the continuous and intense scrutiny, which suggests a positive association between analyst coverage and financial report quality. In the third study we examine the influence of analyst following on the financial reporting quality of Chinese listed firms reflected by modified audit opinions (MAO).

Auditing is essentially a third party certification that can effectively reduce the information asymmetry between managers and investors (Kinney and Martin, 1994). Auditors communicate with financial statement users through their opinion expressed in the auditor's report, as a clean opinion indicates that the financial reports are prepared in accordance with GAAP and do not contain fundamental uncertainties that need future clarification. In this way, auditors help to "certify" the financial statement by increasing its credibility. Assuming a given level of auditor competence and independence, if analysts play an effective role in monitoring managers' self-serving behaviour (i.e., earnings management), the financial statement will faithfully reflect the underlying economic transaction of the firm to a greater extent, leading to higher financial reporting quality and lower incidence of MAO. Therefore, we use whether a firm has received modified audit opinion (MAO) from its auditor as an *ex post* manifestation of (low) financial reporting quality.

We use the Chinese setting to investigate the effect of analyst coverage on financial reporting quality. Since the early 1990s China's capital market and financial intermediation industry have experienced significant growth. Different from the US market that is dominated by institutional investors, the main market force in the Chinese market remains individual investors who are largely reliant on analyst reports when making investment decisions. The analysts' financial and industrial expertise, along with their ability to monitor the firms more regularly and more rigorously, enables them to play a crucial role in mitigating the higher information asymmetries which Chinese investors face.

As a direct result of the partial privatization of former state-owned enterprises (SOEs) since 1990s, a majority of Chinese listed firms are ultimately controlled by the state (e.g., central government, local government or a government agent). Due to political considerations, SOEs receive preferential treatment from the central government and thus have relatively easy

access to equity and credit markets, which implies that SOEs are under less pressure to reduce information asymmetry than non-state owned enterprises (NSOEs). In contrast, NSOEs are more dependent on the capital market to finance their investments, which suggests that they are incentivized to reduce information asymmetry (i.e., responding to the enquiry of analysts or providing high quality/frequent voluntary disclosures) to ensure a lower cost of raising external capital. We are able to analyze the effectiveness of analyst coverage and determine whether their monitoring role is potentially reduced (enhanced) depending on ownership structure. China is also characterized as an earnings-based regulatory regime. For example, in 1998 the China Securities Regulatory Commission (CSRC) required a listed firm reporting loss for two consecutive years to be labelled a special treatment (ST) firm, and its daily stock quotation fluctuation be reduced from 10% to 5%. As soon as the ST firm incurs a third-year loss, its stock trading would be immediately suspended.[4] At the same time, ST firms, as well as firms under-performing their industry peers, are subject to stringent scrutiny from financial intermediaries such as analysts. Therefore, in this study we explicitly investigate whether analyst coverage has an impact on the quality of financial reporting of both SOEs and NSOEs, and also firms under normal versus intense scrutiny from analysts.

Based on our analysis of Chinese listed firms between 2003 and 2009, we find that analyst coverage is negatively associated with the propensity of a MAO being issued, and the relationship is more pronounced for NSOEs. Due to less financial support from the government, Chinese NSOEs rely more on the capital market for external financing. The issuance of a MAO, which undermines the credibility of a firm's financial reporting, indicates

[4] In 2001 CSRC formally introduced a delisting procedure by mandating a firm be compulsorily delisted when it reports four-year consecutive losses.

poor corporate governance and high information asymmetries, thus potentially increasing the firm's cost of raising external capital. This suggests that NSOEs are more likely to respond to issues raised by analysts, leading to improved financial reporting quality. Furthermore, we show that analyst coverage plays a significant role in reducing the propensity for ST firms and under-performing firms to receive MAOs. The findings are robust to alternative specifications of analyst coverage and to the control of endogeneity.

The contribution of this study is three-fold. First, we extend the literature on the effectiveness of external governance mechanism by providing compelling evidence on the monitoring role of financial analysts in an emerging economy, and our findings are complementary to those based on data from developed economies such as the US. Second, our study is related to the growing stream of literature on how economic and institutional development shape the reporting incentive and practice in general and specific determinants of financial reporting quality of Chinese listed firms in particular. Finally, our study is of interest to regulators and policymakers who have continued interest in further promoting corporate transparency in China, and shows that the development of the financial analyst industry has welfare implications for investors and the general public.

The fourth study in the submission analyses the direct consequence of the merger of Price Waterhouse and Coopers & Lybrand in the UK, and investigates the change in the audit quality and audit fee with a large sample of publicly listed UK firms. The PricewaterhouseCoopers (PWC) merger in 1998 created the largest accounting firm in the world, with more than 40,000 employees in 1,100 offices worldwide. Its revenue in 1998 was over USD 13 billion. After the merger, both PwC and other top-tier auditing firms collectively gained more market power. For example, according to McMeeking et al. (2007),

after the merger the audit concentration ratio[5] (CR4) measured by number of clients in the UK rose from 0.69 in 1998 to 0.79 in 1999, and the Herfindahl index from 0.15 in 1998 to 0.21 in 1999. Measured by audit fee, the concentration ratio (CR4) increased from 0.82 in 1998 to 0.88 in 1999, and the Herfindahl Index from 0.21 in 1998 to 0.28 in 1999. On one hand, the merger reduced the level of competition between top-tier auditors. On the other, the merged auditor, PwC, could cut its costs and improve its operating efficiency, which might have an influence on the operation of other top-tier auditors because they need to be more efficient to compete with PwC. The consequence of the merger in terms of audit quality and audit fee is an interesting question that deserves exploration.

In this study we use the earnings quality of clients to reflect audit quality, and construct a six-year sample centred on the event year 1998 (1995-2001, excluding 1998) to address the research question. We use two main tests to compare earnings quality, namely, absolute discretionary accruals and value relevance of earnings. We also examine the change of audit fee from the pre-merger to the post-merger period. In order to show that the change of audit quality and audit fee is not the result of regulatory change, we use the second-tier auditors as a reference group.

We find that in the post-merger period (1999-2001) absolute discretionary accruals of top-tier auditor clients decreased compared with that of non-top-tier auditor clients, indicating less earnings management; in the post-merger period earnings of top-tier auditor clients were more related to stock market returns, indicating that earnings quality improved in this period.

---

[5] The concentration ratio is defined as $CR_n = \sum_{i=1}^{n} X_i$ and the Herfindahl index as $HI = \sum_{1}^{n} X_i^2$ where n is the number of firms and X_i is the size of audit firm i as a percentage of the size of the market.

The results may reflect the enhanced auditor independence and auditors' increasing ability to constrain earnings management of their clients in the post-merger period. Furthermore, we report an increase in audit fee for the top-tier auditor clients after PwC merger, suggesting the merger results in a net increase in the price paid by clients to purchase audit services. This implies that the costs savings from merger (which tends to lower cost of audit service) is dominated by the enhanced market power of auditors (which tends to increase fee). In contrast, the earnings quality of clients of second-tier auditors does not change from the pre-merger to the post-merger period, and there is no evidence of increased audit fee charged by this group of auditors in the post-merger period.

The findings of this study might be of interest to regulators as well as policy-makers. Regulators may cautiously assess the implication of future consolidation of the auditing industry in the UK. The potential consequence is that on one hand, the audit fee is likely to increase if the number of major auditors decreases from "N" to "N-1"; on the other hand, audit quality might improve as a result of enhanced auditor independence. The results of this study may also be of interest to the "big-four" auditors, because if any of them is thinking about a merger, in addition to convincing regulators that the merged firm could provide auditing services of a higher quality, it can alleviate the regulator's concern by promising no fee increase or even sharing some of the merger-induced cost savings with clients in the form of lower audit fees.

The fifth study investigates the association between product market competition and corporate governance disclosure in the UK. Previous theoretical studies provide different predictions. For example, Darrough and Stoughton (1990) predict that firms in more competitive industries will follow a better disclosure practice, because withholding information can be interpreted by potential entrants as good news, which encourages

competitors to enter the market. In contrast, Gertner et al. (1988) suggest that firms in more competitive industries will have less disclosure because information disclosed by one firm can be opportunistically used by industry rivals and it is optimal for firms to have less disclosure. Empirical studies also present mixed results. For example, Harris (1988) finds that a firm's decision to provide separate segment disclosure is positively related to the level of competition. Based on a survey of UK private firms, Dedman and Lennox (2009) suggest that when managers perceive more competition, they are more likely to withhold information on sales and costs. In this study, we argue that product market competition can potentially have two opposing effects on corporate governance disclosure. On one hand, firms might have more disclosure due to intense product market competition, since competition serves as a disciplinary and monitoring mechanism to pressure managers to commit to better disclosure practice. On the other hand, corporate governance disclosure can be seen as a substitute for product market competition: Managers use more disclosure in less competitive markets to maintain investor confidence in their firms. Following a recent study (i.e., Li, 2010), we employ different measures to reflect product market competition at the industry level and examine their impact on the corporate governance disclosure. We report that firms in less competitive industries (where entry cost is high and market size is large) have significantly more disclosure compared to their counterparts in more competitive industries. Furthermore, we find a positive association between corporate governance disclosure and both board independence and audit committee independence. This suggests that firms with better corporate governance disclose more information to external investors. Overall, the findings support the view that managers use more corporate governance disclosure as a substitute for the external disciplinary force of competition. The results of this study have important policy implications, as empirical evidence suggests that different dimensions of competition affect a firm's decision to disclose more information. In addition, firms with strong internal

governance (reflected by more independent directors among the board) are likely to disclose more information. Hence, the results suggest that regulators might harmonize industry policies with accounting regulations to increase the social welfare of the general public. Furthermore, the multiple dimensions of competition imply that policy makers need to consider different aspects of competition before they assess the influence of important merger and acquisition deals that could reshape the level of competition within an industry. Collectively these five studies contribute to our knowledge in product and financial market efficiency.

Chapter 3: Current and future research

3.1 Current research

As a follow up to the study of Ding and Cheng (2011), Ding et al. (2015) explore the well-known A-B share discount puzzle in China by examining how news perception influences the discount of A-share to B-share of the same firm. Since the late 1970s the Chinese government has relaxed its control over domestic and international information flow to facilitate its economic reform. However, in the absence of laws that protect the freedom of press in China, the government has an overwhelming influence on the media. For example, commercialized newspapers remain state-owned and each newspaper must be sponsored by a government unit to obtain its license. Furthermore, the government continues to control the newspaper through the appointment and dismissal of senior editorial staff. This mechanism ensures that the editorial policies and reporting practice of the newspaper remain aligned with the government's preference. Therefore, the Chinese newspaper, which is under tight control by the government, serves the political agenda imposed by the government. One consequence is that negative news is less likely to be reported, because the government has a strong incentive to suppress the release of bad news to maintain social and economic stability. As a result, Chinese media is expected to portray a rosy picture of the firm compared with its English counterpart. However, due to language barriers foreign investors are likely to rely on English media for information. The great divergence between the tone of media reported in Chinese and English media implies more information uncertainty for the cross-listed firms, so foreign investors will demand a return premium for their investment. We, therefore, suggest a greater divergence in the tone of media as reflected by a high ratio of good to bad news reported in Chinese and English media is associated with larger A-B share discount for cross-listed firms, *all others being equal*. The empirical analysis confirms our prediction. We find the ratio of good-to-negative news to be substantially higher for Chinese newspapers relative to that in

English newspapers. Such optimism inflates the price of domestic shares and increases foreign share discounts. We contribute to the literature by constructing a perception-based measure of media optimism and present evidence that the difference in tone of media between Chinese and English media could be an alternative explanation to the "A-B share discount". Our focus on the divergence of the tones between Chinese media and English media distinguishes our study from existing studies, which mainly focus on the divergence of the levels of coverage between Chinese media and English media. Furthermore, our findings suggest that a lack of press freedom in China has implications for the capital market. Because of the tight control imposed by the government, Chinese media are inhibited from reporting bad news related to listed firms, which has an unfavourable influence on the capital allocation decision among foreign investors for cross-listed firms. As far as we are aware, we are the first to document the undesired economic consequences of depressed freedom of press in the context of A-B share discount in China. This paper has been submitted to the Financial Management Association 2016 European Conference. After we present the paper on the conference and receive feedback, we will submit to a reputable journal.

3.2 Future research

The economic consequence of analyst coverage in the Chinese capital market remains an under-explored topic. In an on-going project my collaborator and I explore whether analyst coverage affects the tax-avoidance behaviour of Chinese listed firms. Based on a review of the literature we develop two competing hypotheses: on one hand, the analyst is considered as an important external governance mechanism to discipline managers' opportunistic behaviour including tax avoidance (the monitoring effect). On the other hand, the analyst may set performance targets by issuing an optimistic earnings forecast. To the extent that analysts make forecasted earnings an important performance benchmark, managers are more

likely to use tax avoidance strategies to meet or exceed the consensus of analyst forecast (the pressure effect). Therefore, the effect of analyst coverage on firms' tax avoidance activity is an empirical question that warrants careful investigation. We have collected data on publicly listed firms between 2003 and 2013 in preparation for testing our hypotheses.

As a capital market anomaly that puzzles scholars and practitioners, post-earnings announcement drift (hereafter PEAD) is the tendency of a stock's cumulative abnormal returns to drift in the direction of a recent earnings surprise after an earnings announcement (Ball and Brown, 1968; Bernard and Thomas, 1989, 1990). Although stock prices generally increase (decrease) upon the announcement of positive (negative) earnings surprise, they do not seem to increase (decrease) enough to fully reflect the positive (negative) news, which is reflected by abnormal stock return after the announcement. Bernard and Thomas (1990) show that after a positive (negative) earnings surprise, subsequent earnings surprises tend to be predictably positive (negative) up to three quarters after the initial earnings announcement.

Previous literature has provided two main explanations for PEAD: A failure to adjust abnormal return for risk *and* investors' delayed response to earnings related information (Ball et al., 1993; Bernard and Thomas, 1989; Bartov, et al, 2000). For example, Ball et al. (1993) argue that investment risk increases for firms with high unexpected earnings and decrease for firms with low unexpected earnings. Recent research suggests that delayed response to earnings news due to either under-reaction or high transaction cost is a more plausible explanation for PEAD (Narayanamoorthy, 2006; Ng et al., 2007). The market under-reaction explanation argues that market participants (i.e., investors) fail to fully recognize the implication of current quarterly earnings for future earnings. Alternatively, Soffer and Lys (1999) contend that it is information disseminated between earnings announcements that revise investors' earnings expectation. However, an implicit assumption of the under-reaction

explanation is that investors are instantaneously aware of the earnings related information after it becomes public information. If investors fail to attend to the earnings announcement, they are unlikely to update their future earnings expectation, leading to under-reaction to earnings news. Therefore, the market under-reaction could result from either: 1) Investors do not pay sufficient attention to earnings announcement; or, 2) investors fail to recognize the implication of current earnings for future earnings.

In a new project my collaborator and I are interested in investigating whether PEAD could result from inadequate investor attention to the earnings-related information. A recent study by Chen et al. (2014) analyses articles published on one of the most popular social media platforms for investment community in the US (Seeking Alpha). They find that views expressed in articles and commentaries predict future stock returns.[6] In this study we measure investor attention to earnings announcement with the number of financial analyses of listed firms posted on Seeking Alpha (SA) relative to the number of articles posted in the pre-earnings announcement period, and expect that information from earnings announcement for firms with large increments of SA articles is well impounded into stock prices, which results in a weak PEAD. We aim to contribute to the literature by providing new evidence to explain PEAD.

Chapter 4: Conclusion

[6] Seeking Alpha (SA), which was found in 2004 by David Jackson, is a social media website that provides financial commentary and analysis contributed by registered users. By the end of February 2014, SA had 3 million registered users, and attracted 8 million unique viewers a month.

This dissertation submission presents a series of related publications developed by the author and his collaborators over a five-year period between 2011 and 2015. Taken together, these efforts have enabled the growth of a body a knowledge contributing primarily to financial market efficiency in terms of the following: (1) How apparent departures from the efficient market hypothesis (EMH) can be reconciled by investor speculation motives and information acquisition behaviour; (2) how the financial analyst helps to enhance the corporate transparency and informational efficiency of Chinese listed firms; (3) how competition in the UK audit market impacts the audit quality and audit fee; and (4) how production market competition affects the UK firm's incentive to voluntarily disclose information on corporate governance.

Reference

Al-Najjar, B., and Ding, R. (2014). Product market competition and corporate governance disclosure: evidence from the UK. *Economic Issues*, 19, 73-94

Aouadi, A., Arouri, M., and Teulon, F. (2013). Investor attention and stock market activity: Evidence from France. *Economic Modelling*, 35, 674-681.

Ayers, B.C., and Freeman, R. N. (2003). Evidence that analyst following and institutional ownership accelerate the pricing of future earnings. *Review of Accounting Studies*, 8, 47-67.

Ball, R., Kothari, S., and Watts, R. (1993). Economic determinants of the relation between earnings changes and stock returns. *The Accounting Review*, 63, 622–38.

Barber, B., and Odean, T. (2001). Boys will be boys: gender, overconfidence, and common stock investment. *Quarterly Journal of Economics*, 116, 261-292.

Barber, B., and Odean, T. (2008). All that glitters: The effect of attention and news on the buying behaviour of individual and institutional investors. *Review of Financial Studies*, 21, 785-818.

Barberis, N., and Thaler, R. (2003). A survey of behavioral finance. In Constantinides, M, Harris, M., and Stulz, R. (Eds). *Handbook of the Economics and Finance: Financial Markets and Asset Pricing*. Elsevier/North-Holland, Amsterdam, the Netherlands.

Bartov, E., Krinsky, I., and Radhakrishnan, S. (2000). Investor sophistication and patterns in stock returns after earnings announcements. *The Accounting Review*, 75, 43-63.

Bernard, V., and Thomas, J. (1989). Post-earnings-announcement drift: Delayed price response or risk premium? *Journal of Accounting Research*, 27, 1–36.

Cao, H., Han, B., Hirshleifer, D., and Zhang,H. (2011). Fear of the unknown: Familiarity and economic decisions. *Review of Finance*, 15, 173-206.

Chan, K.A., Menkveld, A.J., and Yang, Z. (2008). Information Asymmetry and asset price: Evidence from the China foreign share discount. *Journal of Finance* 63, 159-196.

Chen, H, De, P., Hu, Y., and Hwang, B. (2014). Wisdom of crowds: the value of stock opinions transmitted through social media. *Review of Financial Studies*, Forthcoming.

Chen, J., Ding, R., Hou, W., and Johan, S. (2015). Do financial analysts perform a monitoring role in China? Evidence from modified audit opinion. *Abacus*, Forthcoming.

CSRC (2008). China Securities Regulatory Committee monthly market statistics online. Available at: http://www.csrc.gov.cn/n575458/n4239016/n7828263/index.html

Coval, J., and Moskowitz, T.J. (1999). Home bias at home: local equity preference in domestic portfolios. *Journal of Finance*, 54, 2045-2073.

Da, Z., Engelberg,J., and Gao, P. (2011). In search of attention. *Journal of Finance*, 66, 1461-1499.

Daniel, K., Hirshleifer, D., and Teoh, S.H. (2002). Investor psychology in capital markets: evidence and policy implications. *Journal of Monetary Economics*, 49, 139-209.

Darrough, M.N., and Stoughton, N.M. (1990). Financial disclosure policy in an entry game. *Journal of Accounting and Economics*, 12, 219-243.

Debondt, W., and Thaler, R. (1985). Does the stock market overreact? *Journal of Finance*, 40, 793-805.

Dedman, E., and Lennox, C. (2009). Perceived competition, profitability and the withholding of information about sales and the cost of sales. *Journal of Accounting and Economics*, 48, 210-230.

Ding, R., and Cheng, P. (2011). Speculative trading, price pressure and overvaluation. *Journal of International Financial Markets, Institutions and Money*, 21, 419-442.

Ding, R., Hou, W., Liu, L., and Zhang, J. (2015). A new resolution of the China foreign share discount puzzle: media control and news perception. *Working Paper*, University of Warwick and University of Edinburgh

Ding, R., and Hou, W. (2015). Retail investor attention and stock liquidity. *Journal of International Financial Markets, Institutions and Money*, 37, 12-26.

Ding, R., and Jia, Y. (2012). Auditor merger, audit quality and audit fee: evidence from the PricewaterhouseCoopers merger in the UK. *Journal of Accounting and Public Policy*, 31, 69-85.

Dyck, A., Morse, A., and Zingales, L. (2010). Who blows the whistle on corporate fraud? *Journal of Finance*, 65, 2015–2444

Engelberg, J., and Parsons, C. (2011). The casual impact of media in financial markets. *Journal of Finance*, 66, 67-97.

Fama, E. (1970). Efficient capital markets: a review of theory and empirical work. *Journal of Finance*, 25, 383-417.

Fang, L. H., and Peress, J.(2009). Media coverage and the cross-section of stock returns. *Journal of Finance*, 64, 2023-2052.

Fernald, J. and Rogers, J. (2002). Puzzles in the Chinese Stock Market. *Review of Economics and Statistics*, 84, 416-432.

French, K., and Poterba, J. (1991). Investor diversification and international equity markets. *American Economic Review*, 81, 222-226.

Gertner, R., Gibbons, R., and Scharfstein, D. (1988). Simultaneous signalling to the capital and product markets, *Rand Journal of Economics*, 19, 173-190.

Gervais, S., and Odean, T. (2001). Learning to be confident. *Review of Financial Studies*, 14, 1-27.

Graham, J., Harvey, C., and Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of Accounting and Economics*, 40, 3-73.

Grossman, S. (1981). The information role of warranties and private disclosure about product quality. *Journal of Law and Economics*, 24, 461-483.

Grossman, S., and Stiglitz, J. (1980). On the impossibility of informationally efficient markets. *American Economic Review*, 70, 393-480.

Grossman, S., and Hart, O.D. (1980). Disclosure laws and takeover bids. *Journal of Finance*, 35, 323-334.

Grullon, G., Kanatas, G., and Weston, J.P. (2004). Advertising, breadth of ownership, and liquidity. *Review of Financial Studies*, 17, 439-461.

Harris, M.S. (1998). The association between competition and manager's business segment reporting decisions, *Journal of Accounting Research*, 36, 111-128.

Harrison, M., and Kreps, D. (1978). Speculative investor behaviour in a stock market with heterogeneous expectations. *Quarterly Journal of Economics*, 92, 323-336.

Hausman, J. (1999). Cellular telephone, new products and the CPI. *Journal of Business and Economics Statistics*, 17, 188-194.

Hausman, J., and Leonard, G. (2002). The competitive effects of a new product introduction: a case study. *Journal of Industrial Economics*, 50, 237-263.

Healy, P., Hutton, A., and Palepu, K. (1999). Stock performance and intermediation changes surrounding sustained increase in disclosure. *Contemporary Accounting Research*, 16, 485-520.

Healy, P., and Palepu, K. (2001). Information asymmetry, corporate disclosure and the capital markets: a review of the empirical disclosure literature. *Journal of Accounting and Economics*, 31, 405-440.

Hirshleifer

, D., Lim,S., and Teoh, S.H. (2011). Limited investor attention and stock market mis-reactions to accounting information. *Review of Asset Pricing Studies*, 1, 35-73.

Hirshleifer., D, and Teoh, S. H. (2003). Limited attention, information disclosure, and financial reporting. *Journal of Accounting and Economics*, 36, 337-386.

Hung, J.C. (2009). Deregulation and liberalization of the Chinese stock market and the improvement of market efficiency. *The Quarerly Review of Economics and Finance*, 49, 843-857.

Jensen, M., and Meckling, W. (1976). Theory of the firm: managerial behaviour, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.

Kahneman, D., and Tversky, A. (1979). Prospect theory: an analysis of decision under risk. *Econometrica*, 47, 263-292.

Kinney, W.R., and Martin, R.D. (1994). Auditor does auditing reduce bias in financial reporting? A review of audit-related adjustments studies. *Auditing: A Journal of Practice & Theory*, 13,149-156.

Lee, C.F., Chen, G.M., and Rui, O.M. (2001). Stock Return and Volatility on China's Stock Markets. *Journal of Financial Research* 24, 523-543.

Li,

X. (2010). The impacts of product market competition on the quantity and quality of Disclosures. *Review of Accounting Studies* 15, 663-711.

Li, F., Lundholm, R., and Minnis, M. (2013). A measure of competition based on 10-K filings. *Journal of Accounting Research* 51, 399-436.

McMeeking, K., Peasnell, K.V., and Pope, P., (2007). The effect of audit firm mergers on audit pricing in the UK. *Accounting and Business Research*, 37, 301-319.

Mei, J., Scheinkman, J.A., and Xiong, W. (2009), Speculative trading and stock prices: An analysis of Chinese A-B Share premia. *Annals of Economics and Finance,* 10, 225-255

Merton, R. (1987). A simple model of capital market equilibrium with incomplete information. *Journal of Finance*, 42, 483-510.

Milgrom, P., and Roberts, J. (1986). Relying on the information of interested parties. *Rand Journal of Economics*, 17, 18-32.

Miller, E., 1977. Risk, uncertainty and divergence of opinion. *Journal of Finance,* 32, 1151-1168.

Narayanamoorthy, G. (2006), Conservatism and cross-sectional variation in the post-earnings announcement drift. *Journal of Accounting Research*, 44, 763-789.

Ng, J., Rusticus, T., and R. Verdi, R. (2008). Implications of transaction costs for the post-earnings announcement drift. *Journal of Accounting Research*, 46, 661– 696.

Odean, T. (1998). Volume, volatility, price and profit when all traders are above average. *Journal of Finance,* 53, 1887-1034.

Oxera, 2006. Competition and choice in the UK audit market. http://frc.org.uk/FRC-Cocuments/FRC/Competition-and-Choice-in-the-UK-Audit-Market.pdf, accessed on 29th of July, 2015

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

Scheinkman, J., and Xiong, W. (2003). Overconfidence and Speculative Bubbles. *Journal of Political Economy*, 111, 1183-1219.

Shleifer, A. (1986). Do Demand Curves for Stocks Slope Down? *Journal of Finance,* 41, 579-590.

Siganos, A. (2013). Google attention and target price run-ups. *International Review of Financial Analysis*, 29, 219-226.

Soffer, L., and Lys, T. (1999). Post-earnings announcement drift and the dissemination of predictable information. *Contemporary Accounting Research*, 16, 305-331.

Sun, J. (2011). The effect of analyst coverage on the informativeness of income smoothing. *International Journal of Accounting*, 46, 333-349.

Tetlock, P.C. (2010). Does public financial news resolve asymmetric information? *Review of Financial Studies*, 23, 3520-2557.

Vlastakis, N., and Raphael, M., 2012, Information demand and stock market volatility. *Journal of Banking and Finance*, 36, 1808-1821.

Yu, F. 2008. Analyst coverage and earnings management. *Journal of Financial Economics,* 88, 245-271.

Appendix 1: Declaration by contributing authors to joint publication

This appendix contains a declaration from the following contribution authors:

- Basil Al-Najjar
- Jiandong Chen
- Peng Cheng
- Wenxuan Hou
- Yuping Jia
- Sofia Johan

Paper details	Contribution from the authors (%)	
	Rong Ding	Peng Cheng
Speculative trading, price pressure and overvaluation, **Journal of International Financial Markets, Institutions and Money, 21(3), 419-442.**	50%	50%

Signed Rong Ding

Date: 27/04/2015

Print name: Rong Ding

Signed P.P.C

Date: 30/04/2015

Print name: Peng Cheng

Paper details	Contribution from the authors (%)	
	Rong Ding	Yuping Jia
Auditor merger, audit quality and audit fee: evidence from the PricewaterhouseCoopers merger in the UK, **Journal of Accounting and Public Policy, 31(1), 69-85.**	50%	50%

Signed Rong Ding

Date: 05/05/2015

Print name: Rong Ding

Signed Yuping Jia

Date: 11/05/2015

Print name: Yuping Jia

Paper details	Contribution from the authors (%)	
"Retail Investor Attention and Stock Liquidity" **Journal of International Financial Markets, Institutions and Money**, **37, 12-26.**	Rong Ding	Wenxuan Hou
	50%	50%

Signed Rong Ding

Date: 12/06/2015

Print name: Rong Ding

Signed

Date: 12/06/2015

Print name: Wenxuan Hou

Paper details	Contribution from the authors (%)	
"Product Market Competition and Corporate Governance Disclosure: Evidence from the UK." **Economic Issues**, 19, 73-94	Basil Al-Najjar	Rong Ding
	50%	50%

Signed Basil Al-Najjar

Date: 18/06/2015

Print name: Basil Al-Najjar

Signed Rong Ding

Date: 10/06/2015

Print name: Rong Ding

Paper details	Contribution from the authors (%)			
	Jiandong Chen	Rong Ding	Wenxuan Hou	Sofia Johan
Do financial analysts perform a monitoring role in China? Evidence from modified audit opinion. **Abacus, Forthcoming**	25%	25%	25%	25%

Signed Jiandong Chen

Date:

Print name: Jiandong Chen

Signed Rong Ding

Date:

Print name: Rong Ding

Signed

Date:

Print name: Wenxuan Hou

Signed

Date:

Print name: Sofia Johan

Appendix 2: A Full list of publications by Rong Ding

2010
"An exploration of the use of inter-firm cooperation and financial managers' governance role: evidence from Dutch firms" (with Henri Dekker and Tom Groot), *Journal of Accounting and Organizational Change*, 6, 9-26.

2011
"Speculative trading, price pressure and overvaluation" (with Peng Cheng), *Journal of International Financial Markets, Institutions and Money*, 21, 419-442.

2012
"Auditor merger, audit quality and audit fee: evidence from the PricewaterhouseCoopers merger in the UK" (with Yuping Jia), *Journal of Accounting and Public Policy*, 31, 69-85.

2013
"Risk, partner selection and contractual control in interfirm relationships " (with Henri Dekker and Tom Groot), *Management Accounting Research*, 24, 140-155.

"Fund ownership and stock price informativeness of Chinese listed firms" (with Jingming Guo, Wenxuan Hou and Edward Lee), *Journal of Multinational Financial Management*, 23, 166-185.

"Control of International Joint-ventures: A literature review." *Journal of Management Accounting Studies*, 4, 25-68.

"Sovereign wealth fund and financial crisis: a shifting paradigm." (with Yiwen Fei, and Xichi Xu). *China Finance Review International*, 3, 42-60.

2014
"Does mutual fund ownership affect financial reporting quality of Chinese privately-owned enterprises? (with Ann, Chan and Wenxuan, Hou). *International Review of Financial Analysis*, 36, 131-140.

"Product Market Competition and Corporate Governance Disclosure: Evidence from the UK." (with Basil, Al-Najjar), *Economic Issues*, 19, 73-94.

2015
"Retail Investor Attention and Stock Liquidity" (with Wenxuan, Hou), *Journal of International Financial Markets, Institutions and Money*, 37, 12-26.

"Does analyst play a monitoring role in Chinese listed firms? Evidence from modified audit opinion" (with Jiandong Chen, Wenxuan Hou and Sophie Johan). *Abacus*, Forthcoming.

"Determinants and Value Relevance of UK CEO Pay Slice." (with Basil, Al-Najjar and Khaled Hussainey), *International Review of Applied Economic*s, Forthcoming.

Int. Fin. Markets, Inst. and Money 21 (2011) 419–442

Contents lists available at ScienceDirect

Journal of International Financial Markets, Institutions & Money

journal homepage: www.elsevier.com/locate/intfin

Speculative trading, price pressure and overvaluation☆

Rong Ding[a,*], Peng Cheng[b,c]

[a] Middlesex University Business School, The Burroughs, Hendon, London NW4 4BT, United Kingdom
[b] Department of Accounting and Finance, University of Antwerp, 13 Prinsstraat, 2000 Antwerp, Belgium
[c] Department of Business, Management and Economics, Xi'an Jiao'tong-Liverpool University, Suzhou 215123, China

ARTICLE INFO

Article history:
Received 9 June 2010
Accepted 10 January 2011
Available online 17 January 2011

JEL classification:
G12
G15

Keywords:
Speculation
Short-sell constraints
Excess trading
Hong Kong "through-train" scheme

ABSTRACT

Prior theoretical studies (e.g., Harrison and Kreps, 1978) show that investors pay prices over their valuation of assets if potential buyers are willing to pay even more in the future. This study provides supporting evidence by focusing on the Hong Kong "through train" scheme in August 2007, through which mainland Chinese investors were allowed to directly invest in Hong Kong market, but the decision was reassessed (actually suspended) in November 2007. Our findings show that Hong Kong stocks exhibit excess trading volume associated with the two announcements, and stocks are traded higher after the launch-decision day and lower after the reassessment-decision day.

1. Introduction

Prior literature (Miller, 1977; Harrison and Kreps, 1978; Chen et al., 2002; Scheinkman and Xiong, 2003; Hong et al., 2004; Xiong and Yan, 2008) emphasizes the joint effects of heterogeneous beliefs in asset valuation and short-sale constraints on stock prices. When the ability of arbitrageurs to short over-valued shares is limited, valuation discrepancies introduce a speculative motive[1] among

☆ We are grateful to Alan Che from BNP Paribas Shanghai Branch and Dong Wang form HSBC JinTrust Fund Management Co. for their assistance during the data collection process. We also thank participates of seminar at Bradford University and FMA 2009 European conference in Turin for their comments. We are responsible for all remaining errors.

* Corresponding author. Tel.: +44 20 8411 4271; fax: +44 20 8411 6011.
E-mail address: r.ding@mdx.ac.uk (R. Ding).

[1] Speculation may be defined, in Kaldor (1939), "as the purchase (or sale) of goods with a view to resell (repurchase) at a later date."

1042-4431/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.intfin.2011.01.003

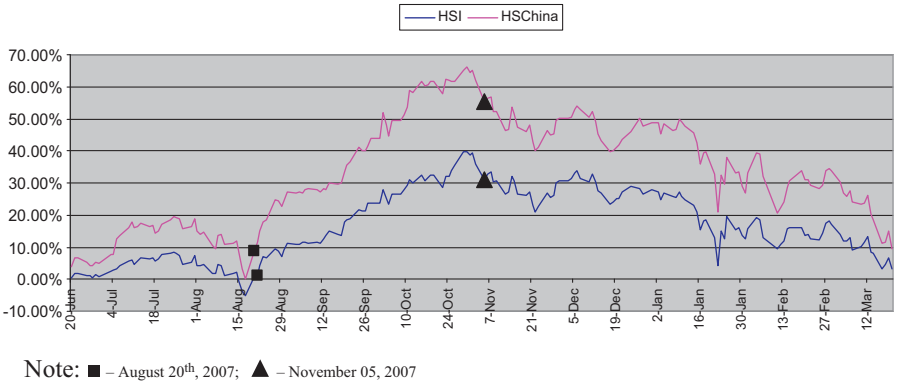

Fig. 1. Hang Seng Index and HS China Enterprise Index Cumulative abnormal returns (06/20/2007–03/20/2008).

investors. Investors have the option to resell their shares to other more optimistic investors in the future for a profit, and equilibrium prices reflect this option. This results in a positive association between speculative trading and stock overvaluation. Although there are a number of theoretical studies present in prior literature, direct empirical evidence is limited, possibly due to the difficulty in testing speculative trading and verifying different beliefs in valuation (Mei et al., 2009).

In this research, we study the price bubble in Hong Kong associated with the mainland China's decision of "Share Investment Through-Train Scheme to Hong Kong" (Forbes, 2007a), which was announced on August 20th, 2007 (hereafter August 20th announcement) but is yet to kick off. Under the Scheme, mainland authority initially allowed individual mainland investors to directly purchase Hong Kong stocks.[2] However, the implementation of this scheme has been plagued by repeated delays. Then, in a speech by Chinese Premier Wen Jiabao on November 3rd, 2007 (Forbes, 2007b), the scheme would have to be re-assessed, as he reiterated the concern that excess fund flows could affect market stability in both China and Hong Kong and he urged the scheme to be rolled out 'cautiously and pragmatically' (Forbes, 2007c). The speech did not explicitly indicate a suspension of the scheme, but in fact the scheme made no progress since then.

Although mainland investors do not officially purchase any Hong Kong shares under the scheme, the scheme is viewed as a catalyst for the dramatic rising share prices in Hong Kong between August and November 2007 (Market Watch, 2008).[3] Hong Kong stocks have rallied to record highs by driving up the Hang Seng Index by 48%, but the Index slid gradually subsequent to the November speech (see Fig. 1). We argue that the scheme generates market optimism and speculative motive in Hong Kong, because Hong Kong investors could take speculative positions against mainland investors as a response to the scheme. Hong Kong speculators purchase Hong Kong shares and they are willing to pay more for the purpose of reselling their shares to more optimistic mainland investors in the future for a profit. The main hypothesis of our empirical analysis is that the announcement to launch this scheme generates price bubble in Hong Kong market, which alleviates after the announcement to reassess the scheme. We find supporting evidence for our conjecture.

This research contributes to the literature in a number of ways. First, our study provides direct empirical evidence to support the heterogeneous beliefs and speculative overvaluation hypothesis (e.g., Harrison and Kreps, 1978). Empirically, it is difficult to verify investors with heterogeneous beliefs in asset valuation, and Hong Kong through-train scheme provides an excellent opportunity: Hong Kong

[2] This outward investment scheme is intended to provide a release valve for some of the money that is piling up in China due to its global trade surplus and robust inward foreign investment, which is stoking inflation and putting upward pressure on the Chinese currency.

[3] Beijing to delay "through-train" scheme by two years (Market Watch Hong Kong, January 15, 2008), may be available online: http://www.marketwatch.com/news/story/beijing-delay-through-train-scheme-two/story.aspx?guid=%7BF5F210B3-38A0-4357-AC76-730AD656C974%7D.

investors and mainland investors differ in valuing the same stocks, because the price of cross-listed stocks with same rights is much higher in mainland than that in Hong Kong market (Appendix A). Hong Kong speculators are willing to pay more, expecting to reap capital gains by reselling the stock to more optimistic mainland investors in the future. In addition, our results are consistent with price pressure hypothesis, as there is a significant association between post-announcement abnormal return and excess trading (buying or selling) but the association is short-lived. Importantly, we identify the mediating effect of excess trading on the association between cross-listing price difference between mainland and Hong Kong and post-announcement abnormal return: on the one hand, Hong Kong stock holders directly adjust their price expectation upwards as s response to the announcement; on the other hand, large cross-listing price difference generates excess demand among Hong Kong investors, which translates into abnormal stock return.

Second, our study contributes to the international finance literature for understanding the difference between domestic market prices and overseas market prices of the same underlying assets. Previous studies suggest that cross-listing price difference is often associated with limited liquidity, information asymmetry and/or investor recognition (Merton, 1987). However, our findings show that mainland-Hong Kong price difference is not correlated with Hong Kong shareholder base (proxy for investor recognition), and market liquidity is not responsible because Hong Kong market is liquid relative to mainland market. In line with Mei et al. (2009),[4] we argue that the mainland-Hong Kong price difference is more likely to be explained by the speculative price premium in mainland market.

Third, our findings could be of interest to policymakers: (1) the introduction of the "through-train" scheme generates speculation in the Hong Kong market. (2) Short sales alleviate price bubbles in the market upturn. However, we do not find robust effects of short sales on bubbles when the market falls, possibly due to the tick rule in Hong Kong.

The remainder of the paper is organized as follows. Section 2 presents a literature review and section 3 discusses China's and Hong Kong's institutional background. Section 4 and 5 introduce the hypotheses and research design. Section 6 analyzes the data and reports the findings. Section 7 discusses and section 8 concludes.

2. Literature review

2.1. Heterogeneous beliefs and speculative trading

Investors often differ in their beliefs about fundamentals of assets. For example, overconfidence is a widely observed behavioral bias in psychological studies that generate heterogeneous beliefs (Daniel et al., 2002; Barberis and Thaler, 2003).[5] Miller (1977) argued that, if agents have heterogeneous beliefs about fundamentals of an asset and short sales are not allowed, equilibrium prices would, if opinions diverge enough, reflect the opinion of the more optimistic investor. Miller (1977) model is static and cannot be used to analyze the dynamics of trading. Harrison and Kreps (1978) exploit the dynamic consequences of heterogeneous beliefs. Since an investor knows that, in the future, there may be other investors that value the asset more than he does, the investor is willing to pay more for an asset than he would pay. The difference between the investor's willingness to pay and his own discounts of expected dividends reflects a speculative motive, which is the willingness to pay more than the intrinsic value of an asset because the owner of the asset has the right to sell it in the future.

Scheinkman and Xiong (2003) present a continuous time equilibrium model to study speculative bubbles and trading volume where overconfidence generates disagreements among agents regarding asset fundamentals. They further characterize properties of the magnitude of the bubble, trading frequency, and asset price volatility, so that they contend this model is potentially capable of explaining

[4] Mei et al. (2009) use a unique dataset of Chinese firms with dual-class shares of identical rights (A-class and B-class shares, traditionally denoted as shares available to domestic investors and foreign investors until 2001) and find that A shares turnover had a significant and positive correlation with A–B price premium before 2001 and explained 20% of the monthly cross-sectional variation of this premium.

[5] Heterogeneous beliefs may also result from private information, and the presence of private information suggests that investors could take advantage of their information to realize a profit.

the observed cross sectional correlation between market/book ratio and turnover for US stocks in the period of 1996–2000 as documented by Cochrane (2003).[6]

2.2. The effect of excess trading on stock prices

Prior empirical studies suggest that demand curve for shares may be downward sloping. For example, although the inclusion in an index does not change the fundamentals of the company, passive index strategists (e.g., index fund) will still purchase the stock and push share price high (Harris and Gurel, 1986; Shleifer, 1986; Lynch and Mendenhall, 1997; Wurgler and Zhuravskaya, 2002; Chakrabarti et al., 2005). Harris and Gurel (1986) and Shleifer (1986) estimate abnormal returns for firms added to the S&P 500 index to be around 3% on the inclusion day. As Shleifer (1986) reports little evidence of price reversal and the abnormal return does not disappear for at least ten days, he supports the hypothesis that demand curves for stocks slope down. However, Harris and Gurel (1986) find nearly completely price reversal after two weeks. The evidence of price reversal following the announcement is consistent with the price pressure hypothesis. Moreover, many other studies examine S&P 500 inclusions and deletions, and generally have found a partial price reversal, but an essentially permanent component as well (Mitchell et al., 2004). Lynch and Mendenhall (1997) examine the post-1989 data, and their evidence indicates a significant temporary stock-price effect prior to the change (i.e., a short-term price reversal). Blouin et al. (2000) find the evidence consistent with price pressure hypothesis that share prices of appreciated firms being temporarily bid up to compensate individual shareholders for any unanticipated capital gains taxes when they sell to index funds.[7] In addition, price pressure hypothesis and downward sloping demand curve for stocks have been tested in different economic settings. For example, returns around the expirations of IPO lock-up provisions provide evidence to support downward sloping hypothesis (Cochrane, 2003; Ofek and Richardson, 2003); Mitchell et al. (2004) support price pressure hypothesis with the evidence around mergers.

3. China's and Hong Kong's institutional background

Classified by the International Finance Corporation as a developed market, Hong Kong stock market is the 7th largest in the world since the 1990s. The market is regulated by its own financial services watchdog, which operates independently from the mainland Chinese authority. Traditionally, mainland investors are not officially allowed to invest in Hong Kong market; while Hong Kong investors are not allowed to invest in mainland A-class shares. Importantly, Hong Kong is one of the primary overseas markets for mainland firms to raise foreign capitals, which are referred to as "H-share" firms. H-share stocks are regulated by mainland laws and Hong Kong listing standards, and they are automatically included in the Hang Seng China Enterprise Index. By the end of July 2008, there are 152 mainland firms offering H-share stocks, part of which are cross-listed in both Hong Kong and mainland stock exchanges (CSRC, 2008).[8]

Mainland stock market is relatively fledgling, and it displayed remarkable booms and crashes since the 1990s. Like the US technology stocks in the 1990s, mainland market had a very high annual turnover rate of 500% (Mei et al., 2009). Moreover, mainland stocks are often over-valued as compared to their international counterparts, For example, the largest price premium of mainland stocks over cross-listed Hong Kong counterparts is 75.2% and the smallest price premium is 22.8% over the period August 20–22, 2007 (see Appendix A for detail).

[6] Several other models have also been proposed to analyze asset trading based on heterogeneous beliefs (Q1Varian, 1989; Harris and Raviv, 1993; Kandel and Pearson, 1995; Chen et al., 2002; Kyle and Lin, 2003; Cao and Ou-Yang, 2009).

[7] Blouin et al. (2000) show that on the first trading day following the S&P 500 inclusion announcement, abnormal stock returns are increasing in the difference between short-term and long-term capital gains tax treatment. In other words, shareholders prefer to hold their stock to qualify for long-term capital gain treatment, so index funds have to offer a higher price to rebalance their portfolio.

[8] China Securities Regulatory Committee (CSRC) monthly market statistics online (July 2008), may be available online at: http://www.csrc.gov.cn/n575458/n4239016/n7828263/index.html.

We argue that the mainland price premium over cross-listed Hong Kong counterparts is not likely to be explained by limited liquidity and the lack of investor recognition in Hong Kong. Hong Kong investors appear to highly value mainland firms with a weighted average P/E ratio of 38 (at Aug 17, 2007); however, Hang Seng composite index firms show a weighted average P/E ratio of below 20. So, we argue that the mainland-Hong Kong price difference is more likely to be explained by the speculative price premium in mainland market (Mei et al., 2009).

4. Hypotheses development

This study investigates the market response to the announcement of launching the "Hong Kong through-train" scheme in August 2007 and the announcement of reassessing the scheme in November 2007, respectively. The main hypothesis is, the announcement to launch the scheme, although did not bring any mainland investors into Hong Kong, would generate speculative motive in Hong Kong market. Consistent with Harrison and Kreps (1978), Hong Kong speculators purchase shares at higher prices as a response to the scheme, and they expect to make a profit through re-selling their shares to prospective mainland buyers, who are more optimistic on stock valuation. Prospective mainland buyers are more optimistic, because shares in mainland market are traded much higher than their Hong Kong counterparts.

Specifically, we hypothesize that the announcement to launch the scheme in August 2007 results in price bubble leading to positive Hong Kong market response. However, the announcement to reassess the scheme in November 2007 could have a negative effect on the price bubble, because of the uncertainty in the implementation of the scheme. In Appendix B, we present these two formal announcements, as well as other three major informal events related to the scheme (e.g., informal interview and journal articles). Expectedly, investors may learn from these informal information sources and modify their price expectations, and those informal events are generally perceived as negative news to the implementation of the scheme. So, we test the following Hong Kong market-level hypothesis:

H1a. The market returns of Hong Kong react positively to the event of August 20th announcement, but negatively to the event of November 5th announcement and the other three negative informal events.

We further examine the firm-level stock price responses to the two announcements, and narrow down the sample to those firms cross-listed in Hong Kong and mainland markets, because for cross-listed firms with identical rights, it is possible to examine stock responses in the two markets, respectively, and compare the results. So, we hypothesize:

H1b. The market-adjusted returns of cross-listed firms in Hong Kong are positively associated with the event of August 20th announcement, but negatively associated with the event of November 5th announcement.

Next, we test whether speculative trading hypothesis can explain price bubble generated in Hong Kong market. Generally speaking, we expect the two announcements to generate excess trading volume, due to "hot" money or rising speculation: for example, the launching announcement in August is likely to generate excess buying, but the reassessing announcement in November is likely to generate excess selling. In order to distinguish between the effect caused by downward sloping stock demand curve hypothesis and the effect caused by price pressure hypothesis, we test whether the association between post-announcement abnormal return and excess trading is temporary or permanent. The evidence of a temporary association between post-announcement abnormal return and excess trading is consistent with the price pressure hypothesis. We then hypothesize:

H2a. In the August event, there is a positive relationship between excess trading (buying) and post-announcement abnormal stock returns.

H2b. In the November event, there is a negative relationship between excess trading (selling) and post-announcement abnormal stock returns.

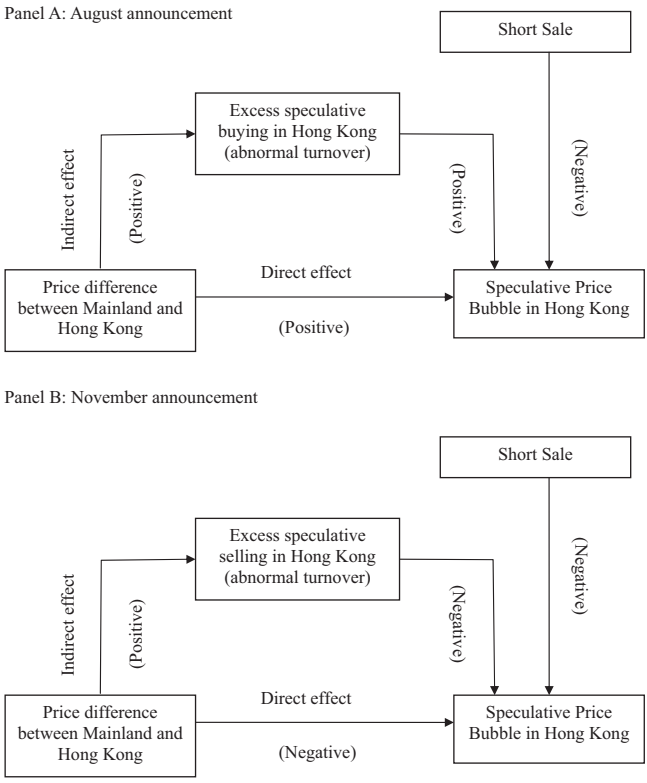

Fig. 2. Hong Kong stock price response to the "through-train" scheme announcements. Panel A: August announcement; Panel B: November announcement.

Then, we further test the effect of cross-listing price difference on abnormal returns. This price difference indicates the extent to which mainland investors are more optimistic in stock valuation than their Hong Kong counterparts. We expect that cross-listing price difference is a key determinant of price bubble, and Hong Kong prices are expectedly re-adjusted towards mainland prices subsequent to the August 20th announcement. On the one hand, Hong Kong stockholders are willing to hold their shares longer, expecting to sell their shares to more optimistic mainland investors at a price comparable to the mainland price. Hong Kong speculators (buyers) are willing to pay more, as they expect to resell to incoming mainland investors for a profit. Hong et al. (2006) label this source of upward bias the resale option effect. On the other hand, the scheme could generate excess speculative demand[9] for Hong Kong stocks, which may further push stock prices higher.

In brief, the total effect of cross-listing price difference on post-announcement price bubble consists of a direct effect and an indirect effect (see Fig. 2). We construct a partial mediation model to explicate the mechanism that underlies the relationship between cross-listing price difference and post-announcement returns via the inclusion of a mediator variable, excess speculative trading (measured as excess turnover). Besides the direct causal relationship between cross-listing price difference and post-announcement returns, we further hypothesize that cross-listing price difference causes excess speculative trading, which in turn causes positive abnormal returns. The mediator variable, excess speculative trading, serves to clarify the nature of the relationship between cross-listing price difference and post-announcement returns.

[9] Consistent with Q1Jones et al. (1990), we distinguish between expected and unexpected turnover to reflect the effects of "fundamental trading" and "excess speculative trading".

H3a. In the August event, there is a positive relationship between cross-listing price difference and post-announcement abnormal stock returns.

H3b. In the August event, there is a positive relationship between cross-listing price difference and excess speculative trading (buying).

H3c. In the August event, excess speculative trading (buying) mediates the relationship between cross-listing price difference and post-announcement abnormal stock returns.

In addition, we examine the effect of short-sale constraints on price bubble. Cross-listing price difference may generate speculative buying and consequently abnormal returns, only when short sale is not allowed or the ability to short over-valued shares is limited. Short sales tend to moderate the tendency for stocks to be bid up to higher prices (Miller, 1977). In Hong Kong stock market, only stocks specified on the "*List of Designated Securities Eligible for Short Selling*" can be sold short (Chang et al., 2007). So, we expect that short sales could to some extent constrain the magnitude of price bubble, because short sales increase the supply of stock by the amount of the outstanding short position. State formally, we test the following hypotheses:

H3d. In the August event, there is a negative relationship between post-announcement abnormal stock returns and stock short-sale eligibility.

For the November 5th announcement, we construct a similar partial mediation model to analyze the relationship between cross-listing price difference and abnormal stock returns with the identical mediator variable (excess speculative trading). However, in the November event, the effect of cross-listing price difference on abnormal stock returns is negative, as the November announcement might signal a significant delay in the implementation of the scheme and Hong Kong shareholders/buyers have to adjust stock valuation downwards. On the other hand, the delay in the scheme could also constrain Hong Kong market speculative motive and reduce speculative demand for Hong Kong stocks, which may in turn drive stock prices down. So, hypothetically, we expect excess speculative trading to partially mediate the relationship between cross-listing price difference and post-announcement returns. Furthermore, Hong Kong speculators may actively short their speculative positions and increase the supply of the stocks, due to the fear that the scheme could be withdrawn. In the November event, short sale is also likely to impose a negative effect on stock returns. So, we hypothesize that:

H4a. In the November event, there is a negative relationship between cross-listing price difference and post-announcement abnormal stock returns.

H4b. In the November event, there is a positive relationship between cross-listing price difference and excess speculative trading (selling).

H4c. In the November event, excess speculative trading (selling) mediates the relationship between cross-listing price difference and post-announcement abnormal stock returns.

H4d. In the November event, there is a negative relationship between post-announcement abnormal stock returns and stock short-sale eligibility.

5. Research design

5.1. Data

We first examine the market-level responses (both Hong Kong and mainland) to the events on August 20th, August 26th, September 2nd, October 16th and November 5th, 2007. Following mainstream event studies we set a 3-day event window centered on the event day ($t = -1$, $t = 0$ and $t = 1$). From Datastream we collect the data of Hang Seng Index, Hang Seng China Enterprises Index (Hong

Kong market benchmarks)[10] and China Securities Index 300 (CSI 300, mainland market benchmark)[11] from August 21, 2006 (one year before the first event day in August, 2007) until August 20th, 2008 (one year after the first event day).

Second, we focus on those stocks cross-listed on both Hong Kong (H-share) and mainland (A-share) market. To qualify for the sample, a firm has to be cross-listed on both Hong Kong and mainland stock market before July 20th, 2007, and the trading should be continuous between August 20th and November 7th, 2007. The final sample consists of 41 firms.[12]

From DataStream we collect stock prices of both A- and H-share stocks of the firm, daily trading volume, market to book ratio and market capitalization; from the website of HKEx (Hong Kong Exchanges and Clearing) we collect data about short-sale eligibility, to test the effects of short-sale eligibility and price difference of cross-listed stocks[13] on the daily abnormal returns of individual Hong Kong shares. A/H difference is computed as the price difference in the prior trading day between the A-share and H-share stocks of the same firm measured as a percentage of the A-share price, as we expect investors to adjust their valuation by reacting to the existing price difference. We collect data over a five-day period starting with the announcement day for the August 20th and November 5th events. Furthermore, we manually collect data of short-sale volume from China Finance Online (www.jrj.com.cn). Finally, to test the investor recognition hypothesis we obtain data of registered shareholders from H-share interim reports ended at June 30th, 2007.

5.2. Research method

5.2.1. Market-level responses to relevant events (Hong Kong and China)

Consistent with previous studies (Ali and Kallapur, 2001; Jain and Rezaee, 2005; Li et al., 2008) we use the following model to estimate the market-level responses associated with the relevant events:

$$MarketRET_t = \alpha_0 + \sum\nolimits_{ALLi} \beta_i D_i + \varepsilon_i \quad (1)$$

where the market return $MarketRET_t$ is calculated using the change in percentage of Hang Seng index and Hang Seng China Enterprises Index on day t relative to day $t-1$, and D_i is a dummy variable equal to 1 during event i, and 0 otherwise; ($i = 1$–5). In order to control for contemporaneous performance changes of major global markets, we bring a control variable into the regression analysis, which is the lagged Dow Jones Industry Average index return at day $t-1$ relative to day $t-2$. In addition, we also control for the possible influence caused by calendar effect. Two dummy variables are introduced and take value of 1 if Monday or Friday of the week; another two dummy variables are used, taking value of 1 if the first and the last trading day of the month.

We use OLS regression to estimate the model over a two-year period between August 21st, 2006 and August 20th, 2008. The coefficient on each dummy variable (β_i) represents an estimate of the average daily return related to the event, namely, the daily market return incremental to the average market return over the non-event days. We expect to find a positive coefficient for the events associated with news favorable to the "through-train scheme", and a negative coefficient for the events associated with news unfavorable to the "through-train scheme". We also run the model for mainland stock market with the China Securities Index 300 as the benchmark.

5.2.2. Firm-level responses to relevant events (Hong Kong and China)

To further investigate the impact of two important announcements on August 20th and November 5th on individual stocks, we run the following regression based on firm-level data for 41 cross-listed

[10] The Hang Seng China Enterprises Index was launched on August 8, 1994 to track the performance of all Hong Kong listed H-shares of Chinese enterprises, hence it is called "H-shares index".

[11] CSI 300 is a diversified index consisting of 300 constituent Mainland A Shares compiled and managed by the China Securities Index Co., Ltd.

[12] A full list of sample firms is provided in Appendix A, as well as short sale eligibility.

[13] To calculate the A/H price difference, we collect data of exchange rate between US dollar/Hong Kong dollar and US dollar/Chinese RMB to convert all stock prices into Chinese RMB on a daily basis.

firms between July 1st and December 19th, 2007 (1 month prior to the announcement on August 20th and 4 months after):

$$AR_{i,t} = \alpha + \gamma_0 Augdummy + \gamma_1 NovDummy + \gamma_2 MTB_{i,t} + \gamma_3 Size_{i,t} + \varepsilon_t \quad (2)$$

where $AR_{i,t}$ is the daily abnormal return for firm i in day t[14]; *AugDummy* is one for August 17th, 20th or 21st, zero otherwise; *NovDummy* is one for November 2nd, 5th or 6th, zero otherwise. $MTB_{i,t}$ is the market to book ratio for firm i in day t. $Size_{i,t}$ is measured as the logarithm of market capitalization for firm i in day t. In addition, we also control for lagged US market return and calendar effect in the regression analysis. We run the regression for Hong Kong and mainland stocks separately. For H-share stocks we expect the coefficient of *AugDummy* to be positive and the coefficient of *NovDummy* to be negative; for A-share stocks, we expect the coefficient of *AugDummy* to be negative and the coefficient of *NovDummy* to be positive.

5.2.3. Effect of excess turnover on Hong Kong post-announcement returns

We hypothesize that excess trading volume (buying) is positively associated with post-announcement abnormal stock returns in the August event; however, in the November event, excess trading volume (selling) is negatively associated with post-announcement abnormal stock returns. So, we use the following model to test the hypothesis:

$$AR_{i,t} = \varphi_0 + \varphi_1 MTB_{i,t} + \varphi_2 Size_{i,t} + \varphi_3 ExcessTurnover_{i,t} + \varepsilon_t \quad (3)$$

where $AR_{i,t}$ is the market-adjusted abnormal return for Hong Kong stock i at post-announcement day t. $MTB_{i,t}$ is the market to book value for stock i at day t. $Size_{i,t}$ is the logarithm form of the market capitalization for stock i at day t. $ExcessTurnover_{i,t}$ is computed as the daily turnover rate for stock i at day t net of the daily average turnover rate in July 2007.

5.2.4. Effect of cross-listing price difference on Hong Kong post-announcement returns

We rely on the following model to test whether excess turnover is mediating the association between price different between cross-listed stocks and post-announcement abnormal returns:

$$AR_{i,t} = \varphi_0 + \varphi_1 A/H\_Difference_{i,t-1} + \varphi_2 MTB_{i,t} + \varphi_3 Size_{i,t} + \varphi_4 Shortselling + \varphi_5 ExcessTurnover + \varepsilon_t \quad (4)$$

where *ExcessTurnover*, the mediating variable, is computed as the difference between daily turnover rate for H-share stocks during the period of interest and the daily average turnover rate in July 2007. *Excess turnover* is considered as a mediating variable to carry out the influence of *A/H_Difference* on post-announcement *abnormal returns* when the four conditions are met: (1) *A/H_Difference* significantly affects *excess turnover*, (2) *A/H_Difference* significantly affects post-announcement *abnormal returns* in the absence of *excess turnover*, (3) *excess turnover* has a significant effect on post-announcement *abnormal returns* and (4) the effect of *A/H_Difference* on *post-announcement abnormal returns* decreases upon the inclusion of *excess turnover* into the model. Statistically, we use the Sobel test to examine the mediating effect of *excess turnover*.

We present results of three regressions. In the first regression, dependent variable (*post-announcement abnormal return*) is regressed on *A/H_Difference* (the price difference between A- and H-share stocks), *shortselling* (short sale eligibility), *market-to-book* and *size* without controlling for the mediating variable *excess turnover*. Then, we regress *excess turnover* on *A/H_Difference*, *shortselling*, *market-to-book* and *size*. Finally, to identify the mediation effect, we regress *abnormal returns* on *A/H_Difference*, *shortselling*, *market-to-book*, *size* and *excess turnover*.

[14] The daily abnormal return is calculated as the difference between the stock return of individual firms and the market return, which is computed based on Hang Seng index in Hong Kong market or China Securities 300 index in mainland Chinese market, respectively.

5.2.5. Test of investor recognition hypothesis

In order to test the investor recognition hypothesis, we follow Grullon et al. (2004) to estimate the relationship between shareholder base and firm-specific characteristics including market to book ratio, market capitalization and share price. Then we name the residual of the regression as "excess shareholder base", and regress A/H price difference on "excess shareholder base". The coefficient being negative and significant provides support for the investor recognition hypothesis.[15]

$$No\_shareholders_i = \gamma_0 + \gamma_1 Size_i + \gamma_2 MTB_i + \gamma_3 H\_Price_i + \varepsilon_i$$

$$Excess\_shareholders = No\_shareholders_i - \hat{\gamma}_0 - \hat{\gamma}_1 Size_i - \hat{\gamma}_2 MTB_i - \hat{\gamma}_3 H\_Price_i$$

where $No\_shareholders_i$ is the logarithm of the number of total H-share shareholders registered on June 30th 2007; $Size_i$, MTB_i and H_Price_i are the logarithm of market capitalization, market-to-book value and H-share stock price, respectively; $\hat{\gamma}_0$ is the estimated intercept; $\hat{\gamma}_1$, $\hat{\gamma}_2$ and $\hat{\gamma}_3$ are the slope coefficients for firm *i*.

Finally, we run the following regressions:

$$A/H\_Difference_i = \gamma_0 + \gamma_1 Excess\_shareholders_i + \varepsilon_i \quad (5)$$

$$AR_i = \rho_0 + \rho_1 Excess\_shareholders_i + \varepsilon_i \quad (6)$$

Investor recognition hypothesis is supported if γ_1 and ρ_1 are negative and significant.

6. Results

6.1. Market-level responses to the relevant events (Hong Kong and China)

Fig. 1 depicts the market returns based on both Hang Seng Index and Hang Seng China Enterprise index between June 20th, 2007 and March 20th, 2008. It can be observed that the market returns computed using both Hong Kong indices are positive after the August 20th announcement, but negative after the November 5th announcement, compatible with the results reported in Table 1 , panel A and B.

As the test period of the November event coincides with the emerging sub-prime crisis in the US, stock price in Hong Kong may be led by the plunging US market due to the concern of troubled financial institutions. Therefore, we control for the lagged US market return based on Dow-Jones Industry Average.[16] Furthermore, we control for the well-documented end-of-week and end-of-month effects by introducing four dummies: Monday dummy, Friday dummy, Month-beginning dummy and Month-end dummy. The results are presented in Table 1.

In model 1 (panel A), the coefficient of August 20th dummy is positive and significant based on one-tailed *t*-test (0.017, $t = 1.62$) when market return is computed on Hang Seng Index, while the coefficient of November 5th dummy is significantly negative (-0.022, $t = -2.17$). The coefficients of other events are insignificant. In model 2, after controlling the lagged US market return, the signs of both August 20th and November 5th dummies remain unchanged, albeit their magnitude and significance levels slightly decline. The coefficient of lagged US market return is significantly positive (0.774, $t = 10.61$), consistent with the observation that Hong Kong market is well integrated with the major markets around the world, as US market return has predictive power of market movements in Hong Kong. In model 3, after controlling end-of-week and end-of-month effects, we find that the estimated coefficients of both August 20th and November 5th dummies remain qualitatively unchanged.

The results based on Hang Seng China Enterprise Index also support our expectation, as the coefficient of August 20th dummy (November 5th dummy) is significant and positive (negative) across regressions, although the coefficients of other events remain insignificant.

[15] We only have the number of registered shareholders on June 30th 2007 for 30 firms, so the sample size for this test is 30.
[16] We thank an anonymous reviewer for pointing out this issue.

Table 1
Univariate market-level analysis. $MarketRET_t = \alpha + \sum_{ALLi} \beta_i D_i + \gamma_1 USRET_{t-1} + \gamma_2 WeekEffect + \gamma_3 MonthEffect + \varepsilon_t$, where $MarketRET_t$ is the market return calculated using the change in percentage of market Index on day t relative to day $t-1$, and D_i is a dummy variable equal to 1 during the three-day event i, and 0 otherwise. $USRET_{t-1}$ is the lagged US market index return (Dow Jones Industry Average) on day $t-1$ relative to day $t-2$. Week effect variables (Monday or Friday dummies) take the value of 1 if Monday or Friday, respectively, 0 otherwise; Monthly effect dummy variables (beginning of the month and end of the month) take the value of 1 for the first trading day or the last trading day of the month, respectively.

Event date	Predicted sign	Hang Seng Index returns			Hang Seng China Enterprise Index returns		
		Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Panel A: Regression of Hong Kong returns on the events (from Aug 21, 2006 to Aug 20, 2008)							
Aug 20, 2007	+	0.017	0.014	0.014 (1.51)	0.027* (1.91)	0.023* (1.70)	0.023* (1.70)
Aug 26, 2007	–	0.005 (0.51)	0.004 (0.39)	0.004 (0.39)	0.021 (1.47)	0.018 (1.33)	0.018 (1.33)
Sept 02, 2007	–	0.005 (0.50)	0.007 (0.57)	0.006 (0.55)	0.009 (0.60)	0.009 (0.53)	0.008 (0.46)
Oct 16, 2007	–	0.005 (0.48)	0.007 (0.74)	0.007 (0.76)	0.007 (0.49)	0.009 (0.68)	0.010 (0.70)
Nov 05, 2007	–	−0.022** (−2.17)	−0.017* (−1.89)	−0.018* (−1.88)	−0.029** (−2.05)	−0.023* (−1.69)	−0.023* (−1.68)
Lagged US market return	NP		0.774*** (10.61)	0.775*** (10.52)		1.036*** (9.59)	1.039*** (9.52)
Monday dummy	NP			−0.000 (−0.24)			−0.001 (−0.27)
Friday dummy	NP			0.001 (0.30)			0.001 (0.37)
Month-beginning dummy	NP			0.000 (0.02)			0.002 (0.29)

Table 1 (*Continued*)

Event date	Predicted sign	Hang Seng Index returns			Hang Seng China Enterprise Index returns		
		Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Month-end dummy	NP			0.000 (0.04)			0.001 (0.10)
Observations		504	498	498	504	498	498

Event date	Predicted sign			China Securities 300 Index returns
	Model 1	Model 2	Model 3	
Panel B: Regression of mainland returns on the events (from Aug 21, 2006 to Aug 20, 2008)				
Aug 20, 2007	–	0.016 (1.13)	0.015 (1.04)	0.015 (1.01)
Aug 26, 2007	+	0.006 (0.41)	0.005 (0.36)	0.005 (0.33)
Sept 02, 2007	+	0.006 (0.42)	0.014 (0.81)	0.016 (0.86)
Oct 16, 2007	+	0.004 (0.24)	0.043 (0.29)	0.003 (0.23)
Nov 05, 2007	+	−0.019 (−1.42)	−0.017 (−1.17)	−0.018 (−1.19)
Lagged US market return	NP		0.300** (2.56)	0.301** (2.55)
Monday dummy	NP			0.003 (1.13)
Friday dummy	NP			−0.001 (−0.47)
Month-beginning dummy	NP			−0.007 (−1.10)
Month-end dummy	NP			0.002 (0.45)
Observations		488	467	467

*** Coefficient is significant at 1% level (2-tailed).
** Coefficient is significant at 5% level (2-tailed).
* Coefficient is significant at 10% level (2-tailed).

Table 1 (panel B) provides the results of mainland market based on China Securities 300 Index. In model 1, the coefficients of August 20th and November 5th dummy, as well as coefficients of other events, are insignificant. After controlling for lagged US market return in model 2 and end-of-week and end-of-month effects in model 3, respectively, the coefficients of all event dummies remain consistently insignificant. The results are consistent with the home bias effect (e.g., French and Poterba, 1991), which suggests that investors hold modest amounts of foreign equities, in spite of substantial benefits from international diversification. That is probably because capital is internationally immobile across countries and investors have superior access to information about local firms or economic conditions. Hence, mainland investors in general are not likely to divert a substantial amount of capital into overseas markets at the early stage of "through-train" scheme. In addition, the coefficient of lagged US market return is positive and significant, which implies that Chinese mainland market is also likely to be integrated into the global financial system in that US market return seems to herald mainland Chinese market movements.

6.2. Firm-level responses to the relevant events (Hong Kong and China)

Table 2 provides the results of association between the abnormal returns of 41 cross-listed stocks and the August 20th and November 5th announcements. We compute abnormal returns for each stock using market-adjusted daily stock returns between July 1st and December 19th, 2007, then pool all H-share (or A-share) stocks together and regress abnormal returns on two event dummies associated with the August 20th and November 5th announcements after controlling for market-to-book and firm size.[17] Consistently, we control for lagged US market return and end-of-week and end-of-month effects in model 2 and 3, respectively. Panel A (Table 2) presents the results for H-share returns. In model 1, the coefficient of August dummy is positive and significant (0.021, $t = 4.56$), suggesting H-share stocks react favorably to the announcement that the "through-train" scheme would kick off. This is consistent with the market level response around August 20th event. In contrast, the coefficient of November dummy is negative and significant (-0.004, $t = -1.86$). Hong Kong investors might interpret the information contained in the re-assessing announcement as a temporary delay or even suspension of the scheme, so they adjusted the stock valuation downwards. In model 2 and model 3, the estimated coefficients of August and November dummy remain qualitatively unchanged. Meanwhile, the coefficient of lagged US market return is positive and significant (0.174, $t = 4.63$). The coefficient of month-end dummy is positive and significant (0.003, $t = 1.90$), compatible with the institutional trading and portfolio pumping literature (e.g., Lakonishok et al., 1991; Sirri and Tufano, 1998; Carhart et al., 2002)[18] that fund managers aggressively buy stocks already held by their funds and pump up prices at calendar-end in order to beat benchmarks and claim decent league-table ranking.

Panel B (Table 2) reports the results of cross-listed stocks in Chinese Mainland market. The coefficient of August dummy is negative and significant across the regressions, which suggests that the "Hong Kong through-train scheme" has a negative effect on cross-listed stocks in Mainland market, possibly due to the concern that mainland investors might divert their investments to Hong Kong market for shares with exactly the same rights at a lower price. The coefficient of November dummy is insignificant across the regressions. Finally, the coefficient of month-beginning dummy is negative and significant (-0.004, $t = -3.12$), consistent with the prediction of portfolio pumping literature that stock returns increase at the close of calendar periods and decrease at the beginning of next periods.

[17] As the abnormal stock return of cross-listed firms might be correlated with each other, we cluster standard error at firm level.

[18] Lakonishok et al. (1991) find that fund managers window dress their portfolios at the end of reporting periods, as a reaction to either implicit or explicit incentive compensation contracts. Sirri and Tufano (1998) show that on the last day of a reference period, fund managers get more benefits from moving performance to that period from the next if their period-to-date performances are near the top of the distribution. Carhart et al. (2002) present evidence that fund managers attempt equity trades at the close of calendar quarters to temporarily inflate calendar quarter returns.

Table 2
The firm-level response to August/November events. $AR_{i,t} = \alpha + \gamma_1 Augdummy + \gamma_2 NovDummy + \gamma_3 MTB_{i,t} + \gamma_4 Size_{i,t} + \gamma_5 USRET_{t-1} + \gamma_6 WeekEffect + \gamma_7 MonthEffect + \varepsilon_t$, where $AR_{i,t}$ is the market-adjusted abnormal return for cross-listed stocks i at day t. August dummy takes value 1 for the three days around the event (August 17,20,21) and 0 otherwise; November dummy takes value 1 for three days around the event (November 2,5,6) and 0 otherwise. $MTB_{i,t}$ is the market to book value for stock i at day t. $Size_{i,t}$ is the logarithm of the market capitalization for stock i at day t. $USRET_{t-1}$ is the lagged US market index return (Dow Jones Industry Average) on day $t-1$ relative to day $t-2$. Week effect variables (Monday or Friday dummies) take the value of 1 if Monday or Friday, respectively, 0 otherwise; Monthly effect dummy variables (beginning of the month and end of the month) take the value of 1 if the first trading day or the last trading day of the month, respectively.

	Predicted sign			Cross-listed stocks in Hong Kong
	Model 1	Model 2	Model 3	
Panel A: Regression of abnormal returns of cross-listed stocks in Hong Kong (July 1 to December 19, 2007)				
August dummy	+	0.021***	0.015***	0.016***
		(4.56)	(4.88)	(5.01)
November Dummy	–	−0.004*	−0.005*	−0.005*
		(−1.86)	(−1.69)	(−1.71)
Market-to-book	NP	0.0004**	0.0004**	0.0004**
		(2.27)	(2.48)	(2.46)
Size	NP	0.0016***	0.0015***	0.0015***
		(2.60)	(2.62)	(2.62)
Lagged US market return	NP		0.174***	0.162***
			(4.63)	(4.28)
Monday dummy	NP			0.0008
				(0.68)
Friday dummy	NP			−0.001
				(−0.97)
Month-beginning dummy	NP			−0.0005
				(−0.33)
Month-end dummy	NP			0.003*
				(1.90)
Observations		5043 (41 firms × 123 days)		

	Predicted sign			Cross-listed stocks in Mainland
	Model 1	Model 2	Model 3	
Panel B: Regression of abnormal returns of cross-listed stocks in Mainland (July 1 to December 19, 2007)				
August dummy		−0.008***	−0.008***	−0.008***
		(−3.26)	(−2.92)	(−3.03)
November Dummy	+	0.003	0.003	0.002
		(1.07)	(0.92)	(0.66)
Market-to-book	NP	0.0002	0.0002	0.0001
		(1.25)	(1.51)	(1.48)
Size	NP	0.001*	0.001*	0.001*
		(1.77)	(1.74)	(1.73)
Lagged US market return	NP		−0.030	−0.027
			(−0.77)	(−0.70)
Monday dummy	NP			0.001
				(0.95)
Friday dummy	NP			−0.001
				(−0.97)
Month-beginning dummy	NP			−0.004***
				(−3.12)
Month-end dummy	NP			0.001
				(0.83)
Observations		5043		

*** Coefficient is significant at 1% level (2-tailed).
** Coefficient is significant at 5% level (2-tailed).
* Coefficient is significant at 10% level (2-tailed).

Table 3
Post-announcement Hong Kong returns and excess trading (August and November events). $AR_{i,t} = \varphi_0 + \varphi_1 MTB_{i,t} + \varphi_2 Size_{i,t} + \varphi_3 ExcessTurnover_{i,t} + \varphi_4 ExcessTurnover_{i,t-1} + \varepsilon_t$, where $AR_{i,t}$ is the market-adjusted abnormal return for Hong Kong stock i at post-announcement day t (August 20–24 and November 5–9, 2007, respectively). $MTB_{i,t}$ is the market to book value for stock i at day t. $Size_{i,t}$ is the logarithm form of the market capitalization for stock i at day t. $ExcessTurnover_{i,t}$ is computed as the daily turnover for stock i at day t net of the daily average turnover in July 2007.

	Predicted sign	Hong Kong post-August abnormal returns (5-day event window)		Robustness check for a longer window	
				Event day 6 to day 10	Event day 6 to day 20
Panel A: Post-announcement abnormal returns during the period August 20–24					
Market-to-book	NP	0.002**	0.002**	−0.0004	0.0003
		(2.03)	(2.04)	(−0.59)	(1.46)
Size	NP	−0.012***	−0.012***	0.012***	0.006***
		(−3.43)	(−3.01)	(4.07)	(3.90)
Excess Turnover	+	0.804***	1.372***	0.494**	0.238
		(5.21)	(5.80)	(2.39)	(1.31)
Lagged Excess Turnover	–		−0.769***		
			(−2.78)		
R-square		0.19	0.27	0.09	0.04
Observations		205 (41 × 5)	164 (41 × 4)	190	570
Panel B: Post-announcement abnormal returns during the period November 5–9					
Market-to-book	NP	0.00012	0.00026	−0.0001	0.0005**
		(0.47)	(0.60)	(−0.24)	(2.12)
Size	NP	0.0008	0.003	−0.00004	−0.0008
		(0.36)	(1.15)	(−0.00)	(−0.87)
Excess Turnover	–	−0.651***	−1.176***	0.091	0.516***
		(−2.98)	(−3.32)	(0.21)	(2.96)
Lagged Excess Turnover	+		0.599*		
			(1.83)		
R-square		0.05	0.07	0.0006	0.03
Observations		205	164	190	570

*** Coefficient is significant at 1% level (2-tailed).
** Coefficient is significant at 5% level (2-tailed).
* Coefficient is significant at 10% level (2-tailed).

6.3. Post-announcement Hong Kong stock returns and excess trading (August and November)

We regress post-announcement stock returns in Hong Kong (August 20–24 and November 5–9, 2007, respectively) on excess turnover rate. Table 3, panel A shows that the coefficient of excess turnover rate is positive and significant (1.372, $t = 5.80$) in the August regression, while the coefficient of lagged excess turnover is negative and significant (−0.769, $t = -2.78$). It implies that the excess turnover is likely to impose a temporary push on stock price, as stock return reverses partly in the next trading day.[19] In contrast, the coefficient of excess turnover rate is negatively significant (−1.176, $t = -3.32$) in the November regression. The positive and significant coefficient of lagged excess

[19] The findings may also be explained by the declining speculative trading, as short-horizon speculative traders reap the profits by closing their long positions once the prices rise to their target level.

turnover (0.599, $t = 1.83$) also signals that abnormal return caused by excess turnover is not likely to be permanent.

In order to formally examine whether the price change is permanent or temporary, we run the same regression to test whether the abnormal returns are significantly associated with excess turnover in a longer post-event window. We run regressions separately with the data from the event period [day 6, day 10] and the event period [day 6, day 20], respectively. The results are reported in Table 3 (panel A and B). Although post-August abnormal returns in Hong Kong from event day 6 to event day 10 are significantly and positively associated with excess turnover, the significance level decreases (from 1% to 5%). Based on a longer event period [day 6, day 20], there is no significant association between post-August abnormal returns and excess turnover. Panel B (Table 3) shows that post-November abnormal returns at event period [day 6, day 10] are no longer significantly associated with excess turnover. For the event period [day 6, day 20], the association tends to be significant but positive. The evidence supports the price pressure hypothesis: the excess demand pushes stock price up or down, but the effect seems to be temporary rather than permanent. Results in Table 3 support H2a and H2b. It confirms that post-announcement Hong Kong returns are associated with excess trading (buying and selling). We argue that price pressure caused by excess trading imposes a temporary effect on Hong Kong returns.[20]

6.4. Post-announcement Hong Kong returns and cross-listing price difference (August)

For the August 20th announcement, we expect the Hong Kong shares with large A/H price difference to react more strongly, because Hong Kong investors would push up the prices of less expensive H-share stocks in more aggressive attempts to re-sell to incoming mainland investors for a larger profit. Furthermore, we expect excess turnover to play a mediating role: on the one hand, consistent with the resale option effect (Hong et al., 2006), Hong Kong stock holders/buyers adjust their price expectations upwards as a response to August 20th announcement, which is the direct effect of A/H price difference on post-announcement stock returns. On the other hand, large A/H price difference could further generate excess demand for H shares, which translates into high abnormal stock returns in Hong Kong. This is the indirect effect of A/H price difference on post-announcement returns. Our conjecture is supported by results reported in Table 4.

First, we run the regression of post-announcement abnormal returns on A/H price difference without controlling for excess turnover, and A/H price difference exhibits a significant positive coefficient (0.14, $t = 6.18$), suggesting that Hong Kong price bubble subsequent to August 20th announcement is associated with A/H price difference between stocks listed on two markets. After excess turnover being controlled for, A/H price difference still has a strong positive impact (0.12, $t = 5.18$), but relatively less significant. It is implied that the effect of A/H price difference on speculative overvaluation is partially mediated by excess turnover. The regression of excess turnover on A/H price difference also confirms that excess turnover is associated with A/H price difference (0.08, $t = 5.09$). Sobel test ($Z = 1.83$, $P < 0.10$) shows that the mediation effect of excess turnover is significant at 10% level, with 11.61% of total effect being mediated as indirect effect.

The results confirm that the total effect of A/H price difference on speculation can be split into two parts: direct effect and indirect effect. The direct effect is dominant, as it accounts for 88.39% of the total effect. It suggests that Hong Kong stock holders/buyers adjust their price expectations upwards directly as a response to August 20th announcement, expecting to re-sell to more optimistic mainland investors for a profit. The results also show that part of the effect of A/H price difference on abnormal returns is going through the mediator variable (excess turnover). The indirect effect is small (11.61%) but still statistically significant. In other words, A/H price difference generates excess demand for H shares after the August 20th announcement, which results in high abnormal stock returns. Overall H3a,b,c are supported.

[20] In addition, recent studies on high-volume return premium (Gervais, 2001; Barber and Odean, 2008) also show that investors draw attention to stocks experiencing high turnover and become net buyers of these attention-grabbing stocks. This could be an alternative plausible explanation for high-volume return premium after the launching announcement in August, but not for high-volume lower return after the re-assessing announcement in November.

Table 4
Post-announcement Hong Kong returns and cross-listing price difference (August event), $AR_{i,t} = \varphi_0 + \varphi_1 A/H\_Difference_{i,t-1} + \varphi_2 MTB_{i,t} + \varphi_3 Size_{i,t} + \varphi_4 Shortselling + \varphi_5 ExcessTurnover_{i,t} + \varepsilon_t$, where $AR_{i,t}$ is the market-adjusted abnormal return for Hong Kong stock i at post-announcement day t (August 20–24, 2007). $MTB_{i,t}$ is the market to book value for stock i at day t. $Size_{i,t}$ is the logarithm form of the market capitalization for stock i at day t. $A/H\_Difference_{i,t-1}$ denotes the price difference between mainland and Hong Kong stocks scaled by mainland prices for stock i at day $t-1$. *Shortselling* takes the value of 1, if eligible for short sales, 0 otherwise. $ExcessTurnover_{i,t}$ is computed as the daily turnover for stock i at day t net of the daily average turnover in July 2007. In the first regression, dependent variable (*abnormal return*) is regressed on *A/H_Difference* without controlling for *excess turnover*, which is the mediating variable. Then, we regress *excess turnover* on *A/H_Difference*. Finally, to detect the mediation effect, we regress *abnormal returns* on *A/H_Difference* with *excess turnover* controlled for.

	Dependent variable Abnormal returns	Dependent variable Excess turnover	Dependent variable Abnormal returns
A/H price difference	0.14***	0.08***	0.12***
	(6.18)	(5.09)	(5.18)
Market-to-book	0.003***	0.0007	0.0003***
	(3.62)	(1.01)	(3.50)
Size	0.000007	−0.0001	0.00003
	(0.00)	(−0.04)	(0.01)
Short sale eligibility	−0.02**	−0.01	−0.02*
	(−2.02)	(−1.64)	(−1.79)
Excess turnover (mediating variable)			0.20**
			(2.00)
R-square	0.25	0.21	0.27
Observations	205	205	205
Sobel mediation test	Coefficient: 0.016	*Z*-statistics: 1.87	*P*-value: 0.062

*** Coefficient is significant at 1% level (2-tailed).
** Coefficient is significant at 5% level (2-tailed).
* Coefficient is significant at 10% level (2-tailed).

6.5. The effect of short sales on Hong Kong returns (August)

In the regression where abnormal return is the dependent variable, the coefficient of short sales eligibility is negative and significant (−0.019, $t = -2.02$), suggesting short sales tend to reduce the magnitude of speculative overvaluation. The results are consistent with the theoretical argument that A/H price difference may generate speculative trading and consequently abnormal returns, only when short sale is not allowed or the ability of short sales is limited (Miller, 1977). In the regression where excess turnover is the dependent variable, the coefficient of short sales eligibility on excess turnover is negative and marginally significant (−0.01, $t = -1.64$).

To further investigate the effect of short sale constraints we replace dummy variable short sales eligibility with the daily short sale volume scaled by turnover on the same trading day for a five-day event window after the August 20th announcement. We also include one-day lagged short sale volume to examine the possible time-lag effect. The results in Table 5 show the coefficient of short sale volume remains negatively significant (-0.167, $t = -2.57$), consistent with early findings. The results

Table 5
Post-announcement Hong Kong returns and short sale volume (August event). $AR_{i,t} = \gamma_0 + \gamma_1 ShortVolume_{i,t-1} + \gamma_2 ShortVolume_{i,t} + \varepsilon_t$. $AR_{i,t}$ is the daily abnormal return for firm i in post-August event day t ($t = 2, 3, 4, 5$; $t = 1$ when August 20th, 2007), and $ShortVolume_{i,t}$ is the daily short selling volume scaled by the share turnover on the same day.

	Predicted sign	Coefficient	*T*-statistics	*P*-value
Lagged shortselling volume	–	−0.087	−1.25	0.214
Shortselling volume	–	−0.167**	−2.57	0.011
R-square		0.07		
Observations		164 (41 × 4)		

Data source: manually collected from www.jrj.com.cn (China Finance Online).
** Coefficient is significant at 5% level (2-tailed).

Table 6
Post-announcement Hong Kong returns and cross-listing price difference (November event). $AR_{i,t} = \varphi_0 + \varphi_1 A/H\_Difference_{i,t-1} + \varphi_2 MTB_{i,t} + \varphi_3 Size_{i,t} + \varphi_4 Shortselling + \varphi_5 ExcessTurnover_{i,t} + \varepsilon_t$, where $AR_{i,t}$ is the market-adjusted abnormal return for Hong Kong stock i at post-announcement day t (November 5–9, 2007). $MTB_{i,t}$ is the market to book value for stock i at day t. $Size_{i,t}$ is the logarithm form of the market capitalization for stock i at day t. $A/H\_Difference_{i,t-1}$ denotes the price difference between mainland and Hong Kong stocks scaled by mainland prices for stock i at day $t-1$. *Shortselling* takes the value of 1, if eligible for short sales, 0 otherwise. $ExcessTurnover_{i,t}$ is computed as the daily turnover for stock i at day t net of the daily average turnover in July 2007. In the first regression, dependent variable (*abnormal return*) is regressed on *A/H_Difference* without controlling for *excess turnover*, which is the mediating variable. Then, we regress *excess turnover* on *A/H_Difference*. Finally, to detect the mediation effect, we regress *abnormal returns* on *A/H_Difference* with *excess turnover* controlled for.

	Dependent variable Abnormal returns	Dependent variable Excess turnover	Dependent variable Abnormal returns
A/H price difference	−0.023*	0.008***	−0.017
	(−1.80)	(2.75)	(−1.35)
Market-to-book	0.00003	0.0001	0.0001
	(0.07)	(1.28)	(0.28)
Size	−0.001	0.002***	0.0002
	(−0.37)	(2.81)	(0.08)
Short sale eligibility	−0.002	0.0004	−0.002
	(−0.35)	(0.25)	(−0.31)
Excess turnover (mediating variable)			−0.65**
			(−2.26)
R-square	0.02	0.09	0.04
Observations	205		205
Sobel mediation test	Coefficient: −0.006	*Z*-statistics: −1.74	*P*-value: 0.08

*** Coefficient is significant at 1% level (2-tailed).
** Coefficient is significant at 5% level (2-tailed).
* Coefficient is significant at 10% level (2-tailed).

corroborate that abnormal stock returns are negatively associated with short sales constraints, in line with the arguments proposed by Miller (1977). Overall H3d is supported.

6.6. Post-announcement Hong Kong returns and cross-listing price difference (November)

Table 6 provides the results related to the hypothesis H4a to H4c that excess turnover is mediating the relationship between A/H price difference and post-announcement abnormal stock returns after the November 5th announcement in Hong Kong market. The negative and significant coefficient of A/H price difference (−0.02, $t = -1.80$) suggests that H-share stocks with larger price difference lost more grounds after the announcement.[21] As the speculative demand for Hong Kong stocks is reduced due to the delay of the scheme, as well as the increased supply of shorting speculative positions in the market, the stock price could be driven down, reflected by negative abnormal returns.

The results in Table 6 confirm our conjecture: the impact of A/H price difference on speculative trading (measured as excess turnover) is positive and significant (0.008, $t = 2.75$), suggesting larger A/H price difference generates larger speculative motive to trade (sell), which could further drive down the share price. Finally, in the regression of abnormal returns on

[21] For each sample firm its H share price is lower than A share price, so larger A/H price difference suggests H share price is lagging behind A share price considerably. Those firms with larger A/H price difference in August remain on top of the list in November, although the magnitude of A/H price difference becomes slightly smaller (details are provided in Appendix A). The only exception is Datang Power, whose average A/H share price difference in August event window (75%) considerably shrank (average 55% in November event window). We re-run the regression after excluding this firm and the results are still robust.

Table 7
Post-announcement mainland returns and cross-listing price difference (August and November) $AR_{i,t} = \varphi_0 + \varphi_1 A/H\_Difference_{i,t-1} + \varphi_2 MTB_{i,t} + \varphi_3 Size_{i,t} + \varepsilon_t$, where $AR_{i,t}$ is the market-adjusted abnormal return for mainland stock i at post-announcement day t (August 20–24 and November 5–9, 2007, respectively). $MTB_{i,t}$ is the market to book value for stock i at day t. $Size_{i,t}$ is the logarithm form of the market capitalization for stock i at day t. $A/H\_Difference_{i,t-1}$ denotes the price difference between mainland and Hong Kong stocks scaled by mainland prices for stock i at day $t-1$.

	Predicted sign	Coefficient	*T*-statistics	*P*-value
Panel A: Post-announcement abnormal returns during the period August 20–24				
A/H price difference	–	−0.04***	−3.17	0.002
Market-to-book	NP	0.0001	0.32	0.749
Size	NP	−0.004*	−1.76	0.083
R-square		0.07		
Observations		205		
	Predicted sign	Coefficient	*T*-statistics	*P*-value
Panel B: Post-announcement abnormal returns during the period November 5–9				
A/H price difference	+	−0.02	−1.94	0.056
Market-to-book	NP	−0.001	−1.92	0.059
Size	NP	−0.004	−1.50	0.137
R-square		0.03		
Observations		205		

*** Coefficient is significant at 1% level (2-tailed).
* Coefficient is significant at 10% level (2-tailed).

A/H price difference with excess turnover being controlled for, the effect of A/H price difference becomes insignificant, indicating a strong mediating effect of excess turnover. Sobel test ($Z = -1.75$, $P < 0.10$) suggests that the mediating effect of excess turnover is significant at 10% level, with 24.31% of total effect being mediated. Overall H4a, H4b and H4c are supported.

6.7. Responses of cross-listed stocks to the August and November events in Chinese mainland market

We also report the response of cross-listed stocks to the August 20th and November 5th announcement in mainland market. Table 7, panel A provides results related to the abnormal returns of 41 A-share stocks after the August 20th announcement. Contrary to what has been found in Hong Kong market, the coefficient of A/H price difference is negative and significant (−0.04, $t = -3.17$), suggesting the "through-train" scheme was not perceived by mainland investors as favorable news for firms with large A- and H-share price difference.[22] One possible explanation is the growing concern that shareholders might divert their investment from A-share to H-share market because they can buy shares with the identical rights at a lower price. This pessimistic sentiment could drive down the share price of cross-listed firms in mainland market. In fact the "through-train scheme" was launched to cool down the over-heated mainland stock market. The announcement of launching the scheme could have direct impact on cross-listed stocks in mainland market as rational investors now have the option to buy stocks with identical rights at a discount in Hong Kong market.

Table 7, panel B provides results related to the abnormal returns of A-share stocks after the November 5th announcement. The coefficient of A/H difference is negative and significant (−0.02, $t = -1.94$), which is inconsistent with our expectation. It is likely that mainland investors did not see through this ambiguous re-assessment message of the scheme, which proves to be the suspension of the scheme. Alternatively, mainland investors may interpret the November announcement as a temporary delay of the scheme, but have the concern that the "through-train" scheme would be re-launched sometime in the future.

[22] Although previous results show the announcement in August has insignificant effect on mainland market as a whole, it could have unequal impacts on different market segments. The effect on the cross-listed firms might be direct and more profound.

Table 8
Evidence on testing investor recognition hypothesis.

	Predicted sign	Coefficient	*T*-statistics	*P*-value
Panel A: Regression of price difference on excess shareholder base $A/H\_Difference_i = \gamma_0 + \gamma_1 Excess\_shareholders_i + \varepsilon_i$, where $A/H\_Difference_i$ denotes the price difference between mainland and Hong Kong stocks scaled by Hong Kong prices; $Excess\_shareholders_i$ is the excess shareholder base, which is the residual of the regression with the number of shareholders as dependent variable and market-to-book, firm size and share price (all in logarithm terms) as independent variables				
Excess shareholder base	–	0.066	1.16	0.257
R-square		0.04		
Observations		30		

	Predicted sign	Coefficient	*T*-statistics	*P*-value
Panel B: Regression of post-announcement (August) returns on excess shareholder base $AR_{i,t} = \rho_0 + \rho_1 Excess\_shareholders_i + \varepsilon_i$ where $AR_{i,t}$ is the daily abnormal return for firm i at post-announcement day t (August 20–24); $Excess\_shareholders_i$ is the excess shareholder base.				
Excess shareholder base	–	0.010	0.64	0.520
R-square		0.01		
Observations		150 (30 × 5)		

7. Further discussions

7.1. Other explanation: investor recognition hypothesis

In this paper we argue that the price bubble is associated with the speculative motive generated by the announcement of "Hong Kong through-train" scheme. Our argument is based on the assumption that the price premium of mainland stocks over their Hong Kong counterparts results from the optimistic valuation of mainland investors (Mei et al., 2009). However, one may argue that the price difference may also be explained by investor recognition hypothesis (Merton, 1987), primarily because of information asymmetry between Hong Kong investors and mainland firms. Hong Kong investors are less informed about mainland firms, which are not well-governed. In this regard, the base of Hong Kong shareholders for mainland firms could be limited. So, the cross-listing price difference between mainland stocks and Hong Kong stocks may be caused by the lack of investor recognition of mainland firms in Hong Kong.

According to Merton (1987), the shareholder base measures the recognition of the firm among investors. A big shareholder base indicates the firm has been well recognized, leading to the reduced magnitude of stock under-valuation. Therefore, we expect a negative association between the shareholder base and price difference between the A- and H-share contexts. Furthermore, more "under-valued" Hong Kong stocks (i.e., less recognized by Hong Kong investors) are likely to respond more favorably to August 20th announcement, because the shareholder base in Hong Kong will increase once mainland investors join in Hong Kong market.

Table 8 displays the results to test the investor recognition hypothesis. We first compute the "excess shareholder base" as the residual of the regression with the number of shareholders as dependent variable and market-to-book, firm size and share price (all in logarithm terms) as independent variables. Then we regress A/H share price difference and abnormal returns on excess shareholder base, respectively. The coefficient being negative and significant would provide support for the investor recognition hypothesis.

In Table 8, panel A, the positive and significant coefficient of excess shareholder base (0.066, $t = 1.16$) suggests that investor recognition hypothesis seems not powerful enough to explain the share price difference between A-share and H-share. In Table 8, panel B, the coefficient of excess shareholder base on abnormal returns is positive and insignificant (0.01, $t = 0.64$). These findings, which fail to support the investor recognition hypothesis, imply the "optimistic valuation

hypothesis" is a more likely interpretation of the share price difference between Hong Kong and mainland
markets.

8. Conclusion

This research provides direct evidence to support the theoretical proposition that agents pay prices that exceed their own valuation of assets if future buyers are willing to pay even more (Harrison and Kreps, 1978). We focus on the Hong Kong "through train" scheme, through which mainland investors are allowed to directly invest in Hong Kong market. We believe it provides a unique research opportunity to distinguish investors with different beliefs in stock valuation, because mainland investors are over-optimistic on stock valuation compared to their international counterparts (Mei et al., 2009), so that mainland investors and Hong Kong investors are easily separated. After the announcement to launch the "through-train" scheme, Hong Kong investors could take speculative positions against perspective mainland investors, expecting to profit from the re-selling to mainland investors. However, the announcement to delay the scheme has a negative effect on Hong Kong price bubble. We find that price difference of cross-listed stocks in Hong Kong is positively associated with post-announcement returns in August, but negatively with post-announcement returns in November.

Our findings also support price pressure hypothesis, since we find that there is an association between excess turnover and post-announcement returns, but the association is temporary rather than permanent. We further conduct a partial mediation analysis, and identify the mediating effect of excess turnover on the association between price difference of cross-listed stocks and post-announcement stock returns. On the one hand, Hong Kong stock holders/buyers directly adjust their price expectation upwards as a response to the announcement in August. On the other hand, large price difference of cross-listed stocks generates excess turnover (buying) in Hong Kong market, which further translates into high stock returns. For the announcement to delay the "through-train" scheme, we also conduct a mediation model to confirm the robustness of the mediating effect of excess turnover. However, our findings do not support investor recognition hypothesis, which suggests speculative bubble is a more likely explanation of the price difference of cross-listed firms between Hong Kong and mainland markets.

Furthermore, we show that Hong Kong stocks respond positively to the announcement that the "through-train" scheme would be launched, but mainland stocks respond negatively. We argue that Hong Kong prices are inflated by speculative motives associated with the announcement to kick off the scheme, but mainland prices drop probably due to the concern that some mainland investors may divert their investment into Hong Kong market.

Finally, this study also provides empirical evidence that short sales might constrain price bubble. We find that Hong Kong stocks ineligible for short sales experience large price bubble after August announcement. Short-sale trading volume is negatively associated with abnormal stock returns. This is consistent with extant literature about the effectiveness of short sales in constraining speculation (Scheinkman and Xiong, 2003; Hong et al., 2004). The implication of the finding is, effective short sales would help asset price not to deviate far from its fundamental value. However, the effectiveness of short sales on stock returns is very limited in Hong Kong when the market falls, possibly due to the re-introduction of tick rule. So, we call for more research to thoroughly clarify the impact of short sales on financial markets.

Appendix A. A list of cross-listed firms and the average price difference as a percentage of mainland price in two event windows

Company name	Average A/H share price difference during the period August 20–22	Average A/H share price difference during period November 5–7	H-share eligible for short selling
Datang Power Co.	75.2%	54.5%	Yes
Sinopec Yizheng Chemical Fibre Co.	72.1%	71.4%	Yes
Sinopec Shanghai Petrochemical Co.	71.5%	70.9%	Yes
Northeast Electric Development Co.	67.4%	62.4%	No
Nanjing Panda Electronic Co.	67.4%	63.5%	No
Aluminum China	67.1%	56.5%	Yes
Shandong Xinhua Pharmaceutical Co.	66.7%	60.9%	No
Beiren Printing	65.8%	62.5%	Yes
Beijing North Star Co.	64.0%	52.4%	No
Jiangxi Copper	63.8%	61.9%	Yes
ZTE	60.5%	45.7%	Yes
China Southern Airline	59.7%	56.0%	Yes
Air China	59.3%	49.9%	Yes
Huadian power International Co.	59.3%	43.5%	Yes
Tianjin Capital Environmental Protection Co.	58.7%	45.6%	No
Chongqing Iron& steel	58.5%	45.6%	Yes
Jingwei Textile Machinery Co	57.2%	53.4%	No
Guangzhou Pharmaceutical Co.	55.3%	49.3%	Yes
CITIC Bank	50.3%	49.6%	Yes
Shenji Group Kunming Machine Tool Co. Ltd.	49.4%	38.0%	No
Huaneng Power International	44.0%	40.6%	Yes
China COSCO Holding	43.7%	40.2%	Yes
Weichai Power	43.1%	22.1%	Yes
Yanzhou coal mining Co	42.9%	32.3%	Yes
Shenzhen Expressway	42.6%	32.6%	Yes
Maanshan Iron	41.5%	38.3%	Yes
Bank of China	38.5%	37.2%	Yes
China Life Insurance	38.4%	31.6%	Yes
Bank of Communications Co.	38.0%	21.1%	Yes
Guangshen Railway	37.3%	32.8%	Yes
China shipping Development Co.	36.8%	32.6%	Yes
Guangzhou Shipyard International Co.	35.4%	34.0%	Yes
ICBC	33.8%	24.8%	Yes
DongFang Electric Corporation	33.1%	9.2%	Yes
Tsingtao Brewery	33.0%	25.6%	Yes
Anhui expressway	32.8%	26.3%	Yes
Angang Steel	31.6%	12.9%	Yes
Ping An insurance	31.2%	23.8%	Yes
Jiangsu Expressway	26.7%	17.3%	Yes
China Merchants Bank	26.0%	18.3%	Yes
Anhui Conch Cement Co.	22.8%	5.8%	Yes

Appendix B. A list of critical events associated with the scheme

No	Date (in 2007)	Type of event	Announced by	Event window	Description
1	Aug 20	Official announcement	Authority of Foreign Exchange	Aug 17–21	Allows individual mainland investors to invest directly in overseas markets, and names Tianjin City to initiate preparation work
2	Aug 26	Informal interview	President of HK Exchange Clearing Limited	Aug 24–28	Advises investors to carefully guard against investment risks in Hong Kong market
3	Sept 02	Top journal article	Prior national monetary committee member	Aug 31–Sept 04	Advises to learn a lesson from the past, and slow down the process of "through-train" scheme
4	Oct 16	Informal interview	President of Bank of China	Oct 15–17	The scheme is still under planning, and no time table is set to formally launch the scheme
5	Nov 05	Press conference	Prime minister	Nov 02–06	Urges the scheme to be rolled out "cautiously and pragmatically", and it has to be regulated

Source: http://focus.jrj.com.cn/special/home/grzt.html, China Finance Online.

References

Ali, A., Kallapur, S., 2001. Security price consequences of the private securities Litigation Reform Act of 1995 and related events. The Accounting Review 76, 431–460.

Barber, B.M., Odean, T., 2008. All that glitters: the effect of attention and news on the buying behavior of individual and institutional investors. Review of Financial Studies 21, 785–818.

Barberis, N., Thaler, R., 2003. A survey of behavioral finance. In: Constantinides, G., Harris, M., Stulz, R. (Eds.), Handbook of the Economics of Finance. North-Holland.

Blouin, J., Raedy, L., Shackelford, D., 2000. The impact of capital gains taxes on stock price reactions to S&P 500 inclusion. NBER Working Paper 8011.

Cao, H., Ou-Yang, H., 2009. Differences of opinion of public information and speculative trading in stocks and options. Review of Financial Studies 22, 299–335.

Carhart, M., Kaniel, R., Musto, D.K., Reen, A.V., 2002. Learning for the tape: evidence of gaming behavior in equity mutual funds. Journal of Finance 57, 661–692.

Cochrane, J., 2003. Stocks as money: convenience yield and the tech-stock bubble. In: Hunter, W.C., Kaufman, G., Pomerleano, M. (Eds.), Asset Price Bubbles. MIT Press, Cambridge, MA.

Chakrabarti, R., Huang, W., Jayaraman, N., Lee, J., 2005. Price and volume effects of changes in MSCI indices—nature and causes. Journal of Banking and Finance 29, 1237–1264.

Chang, E.C., Cheng, J.W., Yu, Y., 2007. Short-sales constraints and price discovery: evidence from the Hong Kong market. Journal of Finance 62, 2097–2121.

Chen, J., Hong, H., Stein, J., 2002. Breadth of ownership and stock returns. Journal of Financial Economics 66, 171–205.

Daniel, K., Hirshleifer, D., Teoh, S.H., 2002. Investor psychology in capital markets: evidence and policy implications. Journal of Monetary Economics 49, 139–209.

Forbes, 2007a. China's New Wall Street (Faces In The News: August 22, 2007), may be available online: http://www.forbes.com/facesinthenews/2007/08/22/tianjin-finance-center-face-markets-x_jc_0822autofacescan01.html.

Forbes, 2007b. Hong Kong Spooked Over China Investment. may be available at: http://www.forbes.com/markets/2007/11/05/hong-kong-investment-markets-equity-cx_vk_1105markets01.html (accessed 24 January 2011).

Forbes, 2007c. China prime minister reiterates Hong Kong "through-train" to proceed cautiously (November 24, 2007). may be available online: http://www.forbes.com/markets/feeds/afx/2007/11/25/afx4370522.html (accessed 24 January 2011).

French, K., Poterba, J., 1991. Investor diversification and international equity markets. Papers and Proceedings. American Economic Review, 222–226.

Gervais, S., 2001. The high-volume return premium. Journal of Finance 56, 877–919.

Grullon, G., Kanatas, G., Weston, J., 2004. Advertising, breadth of ownership, and liquidity. Review of Financial Studies 17, 439–461.

Harris, L, Gurel, E., 1986. Price and volume effects associated with changes in the S&P 500 new evidence for the existence of price pressures. Journal of Finance 41, 815–829.

Harris, M., Raviv, A., 1993. Differences of opinion make a horse race. Review of Financial Studies 6, 473–506.

Harrison, M., Kreps, D., 1978. Speculative investor behavior in a stock market with heterogeneous expectations. Quarterly Journal of Economics 92, 323–336.

Hong, H., Kubik, J.D., Stein, J.C., 2004. Social interaction and stock-market participation. Journal of Finance 59, 137–163.

Hong, H., Scheinkman, J., Xiong, W., 2006. Asset float and speculative bubbles. Journal of Finance 61, 1073–1117.

Jain, P.K., Rezaee, Z., 2005. The Sarbanes-Oxley Act of 2002 and security market behavior: early evidence. Contemporary Accounting Research 23, 629–654.

Kaldor, N., 1939. Speculation and economic stability. Review of Economic Studies 7, 1–27.
Kandel, E., Pearson, N., 1995. Differential interpretation of public signals and trade in speculative markets. Journal of Political Economy 103, 831–872.
Kyle, A., Lin, T., 2003. Continuous Trading with Heterogeneous Beliefs and No Noise Trading. Duke University Working Paper.
Lakonishok, J., Shleifer, A., Thaler, R., Visny, R., 1991. Window dressing by pension fund managers. American Economic Review 81, 227–231.
Li, H., Pincus, M., Rego, S.O., 2008. Market reaction to events surrounding the Sarbanes-Oxley Act of 2002 and earnings management. Journal of law and Economics 51, 111–134.
Lynch, A., Mendenhall, R., 1997. New evidence on stock price effects associated with changes in the S&P 500 index. Journal of Business 70, 351–383.
Mei, J., Scheinkman, J., Xiong, W., 2009. Speculative trading and stock prices: evidence from Chinese A-B share premia. Annals of Economics and Finance 10, 225–255.
Merton, R., 1987. A simple model of capital market equilibrium with incomplete information. Journal of Finance 42, 483–510.
Miller, E., 1977. Risk, uncertainty and divergence of opinion. Journal of Finance 32, 1151–1168.
Mitchell, M., Pulvino, T., Stafford, E., 2004. Price pressure around mergers. Journal of Finance 59, 31–63.
Ofek, E., Richardson, M., 2003. Dotcom mania: the rise and fall of internet stock prices. Journal of Finance 58, 1113–1137.
Scheinkman, J., Xiong, W., 2003. Overconfidence and speculative bubbles. Journal of Political Economy 111, 1183–1219.
Shleifer, A., 1986. Do demand curves for stocks slope down? Journal of Finance 41, 579–590.
Sirri, E., Tufano, P., 1998. Costly search and mutual fund flows. Journal of Finance 53, 1589–1622.
Wurgler, J., Zhuravskaya, E., 2002. Does arbitrage flatten demand curves for stocks? Journal of Business 75, 583–608.
Xiong, W., Yan, H., 2008. Heterogeneous Expectations and Bond Markets. Princeton University Working Paper.

Int. Fin. Markets, Inst. and Money 37 (2015) 12–26

Contents lists available at ScienceDirect

Journal of International Financial Markets, Institutions & Money

journal homepage: www.elsevier.com/locate/intfin

Retail investor attention and stock liquidity☆

Rong Ding[a], Wenxuan Hou[b,*]

[a] Warwick Business School, University of Warwick, Coventry, England, UK
[b] University of Edinburgh Business School, 29 Buccleuch Place, Edinburgh, Scotland EH8 9JS, UK

ARTICLE INFO

Article history:
Received 8 May 2013
Accepted 7 April 2015
Available online 16 April 2015

Keywords:
Investors' attention
Breadth of ownership
Liquidity
Bid-ask spread
SVI
Media coverage
Google
Retail investor

ABSTRACT

We use the search volume index (SVI) of the stock ticker provided by Google Trends to capture the active attention that retail investors pay to stocks. Based on the analysis of S&P 500 stocks from 2004 to 2009, we show that the majority of the variation in SVI cannot be explained by passive attention measures, including Google News coverage and advertising expenditure. We find that retail investor attention, reflected by the level and change in SVI, significantly enlarges the shareholder base and improves stock liquidity. The results are robust to the control of endogeneity issues.

1. Introduction

The "under-diversification puzzle" documented in the literature shows that investors have "home bias" because they tend to favor investment in firms they are familiar with (French Poterba, 1991; Tesar and Werner, 1995; Cao et al., 2011). In order to get familiar with such firms, investors have to spend time and effort collecting relevant information, which suggests that attention from investors might predict the subsequent trading activity. On the theoretical side, studies on asset pricing posit that investor attention is a necessary condition for a stock price to fully reflect public information, as investors need to be aware of the information before they can analyze and react to it (Hirshleifer and Teoh, 2003; Hou et al., 2009; Hirshleifer et al., 2011). However, because of the limits on the information-processing capacity of human beings, attention is largely concentrated on the stocks that investors are interested in or familiar with, which implies that attention paid to stocks by investors could result in subsequent trading of these stocks. Our study aims to provide fresh insights into the capital market consequences of investors' attention.

Building on the assumption that the investors passively attend to publicly available information, previous studies have used advertising expenditure (Grullon et al., 2004) and media coverage (Fang and Peress, 2009) to capture investors' attention and examine its implications for stock liquidity and stock returns. In this paper, we employ a measure of active attention

☆ The authors are grateful for valuable comments from an anonymous reviewer, John Doukas, Angelica Gonzalez, Michela Verardo and the participants in the EFA (European Finance Association) 2011 meeting in Stockholm for helpful comments. We are grateful to Lei Zhang for his assistance with the collection of the SVI data.

* Corresponding author. Tel.: +44 0 131 651 5319; fax: +44 0 131 651 4389.
E-mail address: wenxuan.hou@ed.ac.uk (W. Hou).

http://dx.doi.org/10.1016/j.intfin.2015.04.001
1042-4431/

from investors, recently developed by Da et al. (2011), namely the aggregate search volume index (SVI) provided by Google Trends (available from: www.google.com/trends), and test the impact of investors' attention paid to listed firms on two aspects of listed firms: breadth of ownership and liquidity. After controlling for the passive attention measures documented in the literature, we find that increased investors' attention measured by the SVI contributes to a broader shareholder base. This is in line with the argument of Barber and Odean (2008) that retail investors tend to search for information about the firm's history, product, environment and strategies when selecting stocks, and can be interpreted with the "investor recognition hypothesis" (Merton, 1987), which states that the shareholder base measures the recognition of the firm among investors, so that an enlarged shareholder base indicates that the firm has been well recognized. In other words, potential investors have to be aware of a firm before they can gradually become familiar with it and then eventually decide to invest, suggesting that investor attention is a necessary condition for a firm to be recognized. The impact of passive attention measures, however, is not always significant in the results, showing that retail investors do not necessarily invest in firms with more advertising expenditure or media coverage[1]. Furthermore, we find that increased investors' attention, as measured by the SVI, results in reduced bid-ask spread, and our results remain consistent after controlling for the passive attention measures, firm characteristics, and year and industry fixed effects. Our findings remain robust to alternative liquidity measures, including effective spread, relative effective spread, and turnover rate (trading volume divided by shares outstanding).

This paper makes three important contributions to the literature. First, our study contributes to the broad literature on the "investor recognition hypothesis" (i.e., Merton, 1987; Grullon et al., 2004; Tetlock, 2010; Fang and Peress, 2009)[2]. Merton (1987) asserts that "ceteris paribus, an increase in the relative size of the firm's investor base will reduce the firm's cost of capital and increase the market value of the firm." A stock's visibility is associated with its price, publicity and popularity of the core products and social image. However, we suggest that these measures are passive, in that it is implicitly assumed that firms with high visibility will attract more attention from investors which is difficult to empirically verify. Our study is built on an active measure of ex post attention, as Google search is a confirmed measure of attention: if an individual intentionally searches for information about a stock, it is evident that one is paying attention to it (Da et al., 2011)[3]. Furthermore, Google search index captures investors' attention in a more timely way than passive measures of attention. When individual investors actively search for a stock using Google, they acquire useful information relevant to the stock, which mitigates the information asymmetry problem for these stocks. As a result, liquidity improves for stocks with better investor recognition.

Second, our paper adds to the emerging literature on investor attention and asset pricing dynamics, including Barber and Odean (2008) on investor attention and individual investors' trading behavior, Engelberg and Parsons (2011) on the casual impact of local media coverage on local trading, Da et al. (2011) on the impact of active attention on IPO returns and price changes in subsequent periods and Aouadi et al. (2013) on the effect of investor attention on stock market liquidity and volatility use Google French data.

Finally, our study extends the literature on the stock market consequence of investors' information demand. For example, Vlastakis and Markellos (2012) use the Google search volume of constituents of Dow Jones Industrial Average Index as a proxy of investors' information demand, and find that such information demand has significant impact on stock trading volume and the conditional variance of excess return. Siganos (2013) use Google search volume of target firms involved in a merger between 2004 and 2010 in the UK as a proxy for investor's information demand for the target firms, and find that such measure can explain a large percentage of the price increase in target firms prior to the merger. Vozlyublennaia (2014) use Google search to proxy for investor attention (investors' information demand) and reports that attention has a short-lived influence on performance of index of stocks, bonds and commodities. In addition, attention weakens the predictability of index return because more revealed information due to increasing attention improves market efficiency. We contribute to this stream of literature by showing investors' attention leads to larger shareholder base and improved stock liquidity.

The remainder of the paper is organized as follows. Section 2 describes the research design and the data. Sections 3 and 4 present the empirical results. Section 5 describes the robustness checks. Section 4 concludes by providing suggestions for future research.

[1] We argue that the SVI captures investor attention in a more timely and accurate manner than passive attention measures for the following reasons: (1) media coverage of a firm is sporadic, while the SVI is continuous; (2) media coverage does not necessarily guarantee attention unless investors attend to it, and the same news coverage could generate different levels of investor attention for different stocks (Da et al., 2011).

[2] Empirical evidences largely support the investor's recognition hypothesis. Chen et al. (2004) report an increased investor's awareness after a firm is added to the S&P 500 index, which leads to a reduction in both the information asymmetry component of the bid-ask spread and the Merton (1987)'s cost of under-diversification. By the same token, Lehavy and Sloan (2008) contend that an exchange listing increases investor's recognition of a firm. Furthermore, a positive association between investor's recognition and contemporaneous stock return id documented. Bushee and Miller (2012) find that small and mid-cap firms can enhance their visibility among investors and analysts by hiring an investor relation firm, which contributes to improved market valuation.

[3] Our study is related to, but different from, Grullon et al. (2004) because our paper focuses on the relation between investors' active attention (to a stock) and the firm's shareholder base as well as its liquidity, while Grullon et al. (2004) investigate firms' advertising expenditure, as a (passive) approach used to reach a broad audience, and its impact on breadth of ownership and liquidity.

2. Research design and data

2.1. Active attention measures

Since the beginning of 2004, Google Trends has provided data on the search frequencies of terms on a weekly basis (http://www.google.com/trends)[4]. It shows how many searches have been made for a specific keyword relative to the total number of searches over time[5]. Following Da et al. (2011) and Drake et al. (2012), we proxy investor attention by the search volume index (SVI) provided by Google Trends. Specifically, we measure investor attention for a company based on the SVI for the stock ticker rather than the company name, since searching for a stock using its ticker is less ambiguous (Da et al., 2011) and searches using ticker symbols as the search term are more likely to reflect searches for financial information than searches for non-financial information (Drake et al., 2012). We download the weekly SVI for the ticker symbols of S&P500 stocks, which provides time-series variations in the information searches for each firm. If a ticker is rarely searched for, Google Trends will return a zero value. In addition, we exclude two types of noisy tickers. First, we remove 12 companies whose tickers are single or double alphabets (e.g., "C" for Citi group, "M" for Macy's and "AA" for Alcoa). Second, we exclude 23 companies whose tickers have generic meanings (e.g., "DO" for Diamond Offshore Drilling, "GAS" for AGL resources, "LEG" for Legget & Platt and "FAST" for Fastenal)[6].

We download weekly SVIs for all constituents of the S&P 500 index over a six-year period from January 2004 to December 2009. A retail investor can easily obtain a firm's ticker from financial news, where tickers are often reported in parentheses. Following Da et al. (2011), we exclude SVIs with value of zero, and compute the change in SVI as follows:

$$\Delta \mathrm{SVI}_t = \mathrm{Ln}(\mathrm{SVI}_t) - \mathrm{Ln}\left[\mathrm{Med}(\mathrm{SVI}_{t-1}, \ldots, \mathrm{SVI}_{t-8})\right] \quad (1)$$

where SVI_t is the search volume index during week t obtained from Google Trends, and [Med (SVI_{t-1}, …, SVI_{t-8})] is the median value of the SVI during the previous eight weeks. As a positive ΔSVI would indicate a surge in investor attention, a positive ΔSVI is more likely to lead to subsequent trading behavior. Another benefit of using ΔSVI is that time trends and low-frequency seasonality are removed (Da et al., 2011).

2.2. Passive attention measures

A commonly used passive attention measure is media coverage in newspapers. For example, Fang and Peress (2009) focus on four daily newspapers with nationwide circulation in the US: the *New York Times*, *USA Today*, the *Wall Street Journal*, and the *Washington Post*. We argue, however, that the average retail investor is unlikely to subscribe to more than two to three newspapers at the same time. A more convenient and inexpensive way for them to obtain news is through the Internet, and every piece of news on the Internet has "global circulation and access".

The advanced "news search" section in Google News enables us to obtain a figure for the total number of relevant news items per year, for each company in our sample, from 2004 to 2009[7]. To obtain the number of news items, we use the company name instead of the ticker, because tickers are only reported in financial newspapers but retail investors do not necessarily get their information from financial newspapers only. The multiple meanings of the names of some companies may add noise to our data (e.g., Apple). However, due to the large number of news items, it would be unfeasible for us to read every article in order to exclude the irrelevant ones. Nevertheless, this noise is expected to introduce some bias against obtaining consistent results. A feature of the Google News is that it counts multiple newspaper distribution of the same article. Thus, it also reflects the dissemination of news, which is closely related to the passive attention of individuals.

Prior research also suggests that advertising expenditure is a measure of passive attention because intensive advertisement is able to promote the awareness of the product of the company among consumers and the stock of the company among investors (Grullon et al., 2004). In our study, we control for both Google News and firm's advertising expenditure so that the incremental effect of active attention reflected by SVI can be disentangled.

---

[4] http://www.google.com/intl/en/trends/about.html. The data are scaled to the average traffic for the term in question over a fixed time period (usually January 2004).

[5] In this study, search is defined as the activity of submitting an enquiry regarding a particular term using Google. Consequently, the search volume is the number of enquiries submitted within a certain period.

[6] To confirm that the search of the tickers reflects retail investors' attention on the stocks, we employ a new application "Goolge Correlate" (http://www.google.com/trends/correlate), which identifies the most correlated SVIs. For example, the SVI of the ticker "APPL" is highly correlated with SVIs of "apple stocks" (correlation as 0.894), "apple quotes" (0.867) and "apple stock price"; while the SVI of "apple" is highly correlated with SVIs of with "apple store" (0.862), "iphone" (0.852) and "apple online store" (0.827). This indicates that investors tend to use tickers to search for stock-related information whereas consumers tend to search company's name for product and retail information, which justifies our strategy to use SVI for stock ticker instead of company name as a proxy for investors' attention.

[7] The number of news items related to a particular search term over a given period of time is available from Google News (http://news.google.com) database, which aggregates news from 4500 English-language news sources worldwide. The stories are sorted without any consideration of political viewpoint or ideology.

2.3. Research design and data

To investigate how investor attention affects the breadth of ownership and stock liquidity, we incorporate the attention measures to the models of Grullon et al. (2004) as follows:

$$\begin{aligned}\text{LnNumS} &= \lambda_0 + \lambda_1 \text{SVI} + \lambda_2 \text{LnNews} + \lambda_3 \text{LnAdv} \\ &+ \lambda_4 \text{LnAge} + \lambda_5 \text{RET} + \lambda_6 \text{ROA} + \lambda_7 \text{LnMC} + \lambda_8 \left(\frac{1}{P_t}\right) \\ &+ \lambda_9 \text{LnTurnover} + \lambda_{10} \text{LnVolatility} + \lambda_{11} \text{NASDAQ} + \varepsilon\end{aligned} \tag{2}$$

$$\begin{aligned}\text{RBAS} &= \gamma_0 + \gamma_1 \text{SVI} + \gamma_2 \text{LnNews} + \gamma_3 \text{LnAdv} \\ &+ \gamma_4 \text{LnAge} + \gamma_5 \text{ROA} + \gamma_6 \text{LnMC} + \lambda_7 \left(\frac{1}{P_t}\right) \\ &+ \gamma_8 \text{LnTurnover} + \gamma_9 \text{LnVolatility} + \gamma_{10} \text{NASDAQ} + \varepsilon\end{aligned} \tag{3}$$

where the number of shareholders (lnNumS) and the relative bid-ask spread (RBAS) are regressed against the search volume index (SVI), the number of news items available online (LnNews), and the advertising expenses (lnAdv). To confirm our predictions, we expect to find a significantly positive λ_1 in Eq. (2) and a significantly negative γ_1 in Eq. (3). We also use the change in SVI (ΔSVI) instead of the level of the SVI for robustness checks. The change in SVI defined in Eq. (1) reflects an abnormal "jump" in the SVI relative to the "normal" level over a longer time period (the previous eight weeks). As explained earlier, it can also remove time trends and low-frequency seasonality (Da et al., 2011). The annual observations of the number of shareholders, advertising expenses and other accounting data are obtained from Compustat. A large proportion of firms do not report their advertising expenses. Replacing missing advertising expenditure with zero is an approach commonly used in previous studies to maintain sample size (e.g., Grullon et al., 2004; Banker et al., 2011). In this study, because we use the natural logarithm of advertising expenditure in our analysis, we replace any missing values with \$0.01 rather than zero. As a robustness check, we also replicate the analysis based on the smaller sample excluding those firms with missing advertising expenditure and the results are consistent.

We calculate the relative bid-ask spread as the monthly average of the ratio of the daily inside spread to the midpoint of the daily inside spread from CRSP (Centre for Research in Security Prices). Chung and Zhang (2009) suggest the daily CRSP-based spread as a good substitute for the TAQ-based spread in that the former represents at least 91% (78%) of the cross-sectional variation in the latter from NASDAQ (NYSE/AMEX) stocks. We drop any observations of relative spread that are greater than 50% of the midpoint in order to filter the data for errors. We remove 26,732 daily observations with relative spreads larger than 50%, from the original 10,238,830 daily observations (accounting for 0.26%), by following Chung and Zhang (2009). We then transform the daily data into monthly data to perform the analysis. For robustness checks, we replicate the analysis using alternative liquidity measures, including the effective spread and the relative effective spread. The change in relative spread is defined as the monthly change in relative spread in percentage terms. The effective spread is constructed as twice the difference between the transaction price and the spread midpoint. The relative effective spread is the effective spread scaled by the midpoint of the spread.

In order to perform the empirical analysis, we transform the daily liquidity spread measures and the weekly attention measures of SVI and ΔSVI to monthly observations by taking the average in each calendar month. Then, we merge the annual observations of the advertisement expense into the firm-month panel data.

Following Grullon et al. (2004), we control for other factors that may have an impact on stock liquidity. The market microstructure model (Ho and Stoll, 1980) suggests that a high trading volume reduces the inventory cost per trade and therefore leads to a smaller bid-ask spread. Hence, stocks with a high trading volume are expected to have smaller spreads. We control for share turnover (LnTurnover), which is constructed as the monthly average of the share volume divided by shares outstanding from CRSP. Large firms tend to have high trading volumes and thus smaller spreads, and therefore we also control for firm market capitalization (lnMC) from CRSP. Investors may have a preference for stocks within a certain price range, so we also include the inverse of the closing price from CRSP ($1/P$) in our analysis. Return volatility and firm age are included to proxy for risks. Return volatility is the monthly average of the standard deviation of daily returns, obtained from CRSP. Firm age is the number of years for which the firm has been included in CRSP. Average monthly return (RET) and return on assets (ROA) are used to control for market performance and profitability. Average monthly return is the average of the daily stock returns from CRSP. Return on assets is constructed from Compustat as the annual operating income before depreciation, scaled by total assets. Finally, an exchange dummy (NASDAQ is assigned the value 1 for firms listed on the NASDAQ, and 0 otherwise) is included to account for systematic differences in the market microstructure. Following Grullon et al. (2004), for some variables we take their natural logarithm as shown in Eqs. (2) and (3), and we include industry and

Table 1
Summary statistics.

	Mean	Std. Dev	25%	Median	75%	Obs.
Investor attention						
SVI	1.1752	1.3412	0.8000	0.9800	1.2200	14,690
SVI change (ΔSVI)	0.0079	0.1200	−0.0400	0.0013	0.0470	14,690
Number of news	9914	49,515	313	1200	3320	14,690
Advertising(million)	511	729	50	212	629	6742
Advertising' (million)	235	556	0.01	0.01	163	14,690
Breadth of ownership						
Number of shareholders (thousand)	74	199	4	15	51	14,690
Liquidity measures						
Relative spread	0.0297	0.0186	0.0181	0.0241	0.0347	14,690
Firm characteristics						
Firm age	35	24	15	34	47	14,690
Stock return	0.0098	0.1000	−0.0400	0.0100	0.0600	14,690
ROA	0.5700	0.5000	0.3000	0.4400	0.6600	14,690
Firm size	9.3300	1.1500	8.5100	9.1700	10.0800	14,690
1/Share price	0.0400	0.0400	0.0200	0.0300	0.0400	14,690
Log (return volatility)	−4.0200	0.5600	−4.4200	−4.0800	−3.6800	14,690
NASDAQ	0.1500	0.3600	0	0	0	14,690

This table reports the summary statistics of our sample. The sample includes the constituents of the S&P 500 over a period of six years from January 2004 to December 2009. The SVI is the search frequency of a stock ticker, from Google Trends. The change in the SVI is the difference between the SVI during week *t* and the median value of the SVI during the previous eight weeks. Number of news is the online media coverage from Google News. Advertising expenses and number of shareholders are obtained from Compustat. Note that not all firms disclose their advertising expenditure, and the number of firm-year observations is only 6742. In order to keep as many observations as possible in our analysis, we replace the missing observations with 0.01, assuming these firms spend roughly zero on advertising, following Grullon et al. (2004), and this is expressed as *Advertising*'. The relative bid-ask spread is the monthly average of the ratio of the daily inside spread to the midpoint of the daily inside spread from CRSP. Firm age is the number of years for which the firm has been included in CRSP. The average monthly return is the average of the daily stock returns from CRSP. Return on assets is constructed from Compustat as the annual operating income before depreciation, scaled by total assets. Firm size is the market capitalization, calculated as the product of the total number of outstanding shares and the annual closing price. Share turnover is constructed from CRSP as the monthly average share volume divided by the shares outstanding. Return volatility is the monthly average of the standard deviation of daily returns, obtained from CRSP. NASDAQ equals 1 for firms listed on the NASDAQ, and 0 otherwise.

year fixed effects in the analysis[8]. The final sample consists of 14,690 firm-month observations over the period from 2004 to 2009. The top and bottom 0.5% of the variables are winsorized to reduce the possible effects of spurious outliers.

2.4. Summary statistics

Panel A of Table 1 presents the descriptive statistics of the variables. Both the mean and median of the SVI change (ΔSVI) are positive, showing an upward trend in the attention paid to the tickers of S&P 500 firms. The media coverage of the firms, according to Google News, varies from 313 (25%) to 3320 (75%), with a mean (median) of 9914 (1200). This is substantially larger than the amount of newspaper coverage documented in Fang and Peress (2009), where the mean (median) was 12 (5). The difference indicates that firms are better covered by online media than by traditional media such as national newspapers. The mean (median) advertising expenditure is $449 ($144) million, which is much larger than the figures documented in Grullon et al. (2004) based on an earlier sample from 1993 to 1998. This shows that firms are spending much more on advertising nowadays. The number of shareholders ranges from 4000 to 51,000, with a mean (median) of 74,000 (14,000). The mean (median) of the relative spread is 0.029 (0.0241). The average firm in our sample is older and larger than that in Grullon et al. (2004), presumably for two reasons. First, we only include the constituents of the S&P 500, in which newly listed firms are less likely to be included. Second, there is a threshold of search volume for Google Trends to report the SVIs, therefore SVIs are not available for some fledgling firms.

2.5. The active and passive attention measures

In Table 2, we explore how the SVI and ΔSVI, the newly proposed direct measures of active attention, are related to the traditional passive attention measures, and to firm-specific characteristics. Table 2 shows that news coverage and advertising expenditure are positively associated with the SVI, which suggests that investors pay more attention to firms with greater visibility in terms of news coverage and expenditure on advertising. The coefficients of turnover, return on assets, firm size and return volatility are significantly positive, showing that firms with good operating performance, actively traded stocks, high market value, and higher risk grab more attention from retail investors. This is in line with the finding of Seasholes and

[8] By following Grullon et al. (2004), the average monthly return (*RET*) is only incorporated in Eq. (2), that is, when the dependent variable is the number of shareholders (*lnNumS*).

Table 2
Active and passive attention measures.

	Dependent variables	
	Model I: SVI	Model II: change in SVI
Ln (number of news)	0.013*** (6.29)	−0.0004 (−0.42)
Ln (advertising)	0.008*** (7.64)	0.0002 (1.16)
Ln (turnover)	0.08*** (9.13)	0.0004** (2.2)
Ln (firm age)	−0.03*** (−4.24)	−0.0004 (−0.35)
ROA	0.07*** (6.71)	−0.0001 (−0.06)
Ln (Firm size)	0.08*** (14.5)	0.005*** (5.02)
Ln (return volatility)	0.03*** (2.65)	0.007*** (2.75)
Obs.	14,690	14,690
Adj. R^2	0.05	0.003

This table shows to what extent the active attention (measured by SVI and the change in SVI) can be explained by the passive attention (measured by online media coverage and advertising expenditure), and firm characteristics. The SVI is the search frequency of the stock ticker, according to Google Trends. The change in the SVI is the difference between the SVI during week t and the median value of the SVI during the previous eight weeks. The "number of news" is the online media coverage, according to Google News. Advertising expenditure is obtained from Compustat. Firm age is the number of years for which the firm has been included in CRSP. Return on assets is constructed from Compustat as the annual operating income before depreciation, scaled by total assets. Firm size is the market capitalization, calculated as the product of the total number of outstanding shares and the annual closing price. Return volatility is the monthly average of the standard deviation of daily returns, taken from CRSP.
*, ** and *** represent significance at the 10%, 5% and 1% levels. Standard errors are adjusted for heteroscedasticity.

Wu (2007) that stocks with higher returns or higher risk receive more news coverage and therefore attract more attention among investors. The coefficient of firm age is significantly negative, and this might be due to the impact of newly founded Information Technology glamour companies[9]. Despite the significance of the explanatory variables, the explanatory power of the model is low, and 95% of the variation in the active attention measures remains unexplained. In model II, we regress the change in SVI against the same set of explanatory variables. The only significant variable here is turnover, and more than 99% of the variation is unexplained. This shows the distinction in the aspects of attention captured by the active and passive measures.

3. Active attention measure and breadth of ownership

We perform the regression analysis as shown in Eq. (2) to test the effect of investor attention on the shareholder base[10]. We regress the natural logarithm of the number of shareholders against the active attention measures, passive attention measures including online news coverage and advertising expenditure, and a set of control variables suggested in Grullon et al. (2004) to explain cross-sectional variations in the breadth of ownership. The results are reported in Panel A of Table 3. In model I we include only the SVI and the control variables. Here, the coefficient of SVI is significantly positive, which suggests that active attention is positively associated with the size of the shareholder base. The coefficients of firm age, firm size and return on assets are significantly positive, showing that profitable firms, large firms and long-standing firms enjoy a larger shareholder base. The coefficient of $1/P$ is positive and significant, in line with the explanation that individual investors are likely to buy stocks within a certain price range (i.e., higher $1/P$).

We incorporate online news coverage in model II, and advertising expenditure in model III. The effect of the SVI remains significant after controlling for the passive attention measures. The coefficient of online news coverage is significantly positive, suggesting that firms that are widely covered by news stories on the Internet are associated with a larger shareholder base. The impact of advertising expenditure is positive, but marginally insignificant. All active and passive measures are incorporated in model III, and the positive effect of the SVI on the shareholder base remains significant after controlling for the passive attention measures. The results are also economically significant. According to model I, a one standard deviation (1.34) increase in the SVI leads to an increase of 1000 shareholders, which is 6% of the median number of shareholders (15,000) for our sample firms.

Because S&P 500 firms are observed multiple times in the firm-month panel data, we correct for standard errors using clustering in model IV by applying a bootstrapping regression as a robustness check. Standard errors are clustered by firm

[9] We partition the sample according to the median of firm age, and run the regressions again on the two subsamples. We find that the coefficient of firm age is significantly positive ($p < 0.01$) in the subsample of older firms, and significantly negative ($p < 0.01$) in the subsample of younger firms. Since there are more Information Technology firms in the young subsample, we conjecture that the negative coefficient of firm age obtained for the full sample is attributed to their impact.

[10] As shown in Panel A of the appendix, we first conduct a univariate test in the following way: we classify the firms into low-attention and high-attention subsamples based on the median value of the SVI. The former group of firms is associated with 47,310 fewer shareholders on average, and this difference is significant at the 1% level. We further classify the two subsamples into small and large firms, based on the median value of market capitalization. The difference between the number of shareholders for the low-attention and high-attention sub-samples is 2270 and 74,380 for the small and large subsamples, respectively, and the differences are statistically significant. The results support our prediction that firms with a higher amount of active attention paid to them will be associated with a larger shareholder base, no matter how large the firm is. The results of these tests are available from the authors upon request.

Table 3
Active attention and breadth of ownership: multivariate analysis.

Panel A. SVI and breadth of ownership

	Dependent variable				
	Ln (number of shareholders in thousand)				
	Model I	Model II	Model III	Model IV	Model V
SVI	0.02** (2.36)	0.02** (2.39)	0.02** (2.33)	0.19** (7.92)	0.21** (4.66)
Ln (number of News)		0.04*** (5.51)	0.04** (5.42)	0.02** (2.41)	0.04*** (5.51)
Ln (advertising)			0.01 (1.57)	−0.01 (−0.74)	0.26*** (14.69)
Ln (firm age)	0.27*** (12.2)	0.27*** (12.25)	0.27*** (12.25)	0.12*** (8.07)	0.34*** (7.1)
Return	−0.2 (−1.59)	−0.2 (−1.58)	−0.2 (−1.56)	−0.14 (−1.09)	0.14 (0.86)
ROA	0.31*** (8.66)	0.31*** (8.77)	0.31*** (8.8)	0.03 (0.54)	0.83*** (7.56)
Ln (firm size)	0.90*** (73.06)	0.88*** (66.07)	0.87*** (64.4)	0.97*** (41.41)	0.78*** (17.64)
1/share price	8.28*** (13.09)	8.18*** (12.97)	8.16*** (12.96)	11.53*** (13.22)	14.15*** (12.08)
Ln (turnover)	−0.07** (−2.47)	−0.08** (−2.56)	−0.08** (−2.62)	−0.26*** (−5.89)	−0.22** (−2.69)
Ln (return volatility)	−0.13*** (−3.74)	−0.14*** (−3.80)	−0.13*** (−3.72)	−0.10*** (−2.63)	0.03 (0.61)
NASDAQ	−0.67*** (−13.93)	−0.65*** (−13.55)	−0.65*** (−13.53)	−0.77*** (−10.30)	−0.46*** (−5.79)
Year	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Adjust clustered errors	N	N	N	Y	Y
Exclude missing advertising	N	N	N	N	Y
Obs.	14690	14690	14690	14690	6742
Adj. R^2	0.397	0.398	0.398	0.28	0.34

Panel B. Change in SVI and breadth of ownership

	Dependent variable				
	Ln (number of shareholders in thousand)				
	Model I	Model II	Model III	Model IV	Model V
Change in SVI	0.21** (1.93)	0.21** (1.96)	0.21** (1.96)	0.37** (2.53)	0.22** (1.88)
Ln (number of News)		0.04*** (5.52)	0.04** (5.42)	0.03*** (2.94)	−0.01 (−0.69)
Ln (advertising)			0.01 (1.64)	−0.01 (−0.32)	0.30*** (17.83)
Ln (firm age)	0.27*** (12.15)	0.27*** (12.2)	0.27*** (12.2)	0.13*** (6.49)	0.31*** (6.63)
Return	−0.21 (−1.64)	−0.21 (−1.63)	−0.2 (−1.60)	−0.14 (−1.53)	0.1 (0.79)
ROA	0.31*** (8.59)	0.31*** (8.7)	0.31*** (8.73)	−0.02 (−0.35)	0.80*** (8.19)
Ln (Firm size)	0.90*** (72.68)	0.88*** (66.7)	0.88*** (64.1)	0.97*** (51.57)	0.80*** (25.95)
1/Share price	8.24*** (13.13)	8.14*** (13)	8.12*** (13)	11.02*** (20.76)	14.83*** (20.61)
Ln (turnover)	−0.07** (−2.47)	−0.08** (−2.57)	−0.08** (−2.64)	−0.26*** (−6.92)	−0.13** (−1.82)
Ln (return volatility)	−0.14*** (−3.83)	−0.14*** (−3.90)	−0.14*** (−3.81)	−0.10** (−2.53)	0.02 (0.4)
NASDAQ	−0.67*** (−13.95)	−0.65*** (−13.56)	−0.65*** (−13.55)	−0.76*** (−11.23)	−0.52*** (−8.42)
Year	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Adjust cluster errors	N	N	N	Y	Y
Exclude missing advertising	N	N	N	N	Y
Observation	14,690	14,690	14,690	14,690	6742
Adj. R^2	0.397	0.398	0.398	0.28	0.34

This table reports the estimates from the panel regressions relating the number of shareholders to the active investor attention (SVI). The sample includes the constituents of the S&P 500 over a period of six years from January 2004 to December 2009. The SVI is the search frequency of a stock ticker, obtained from Google Trends. The change in the SVI is the difference between the SVI in week t and the median value of the SVI during the previous eight weeks. The "number of news" is the online media coverage obtained from Google News. Advertising expenses and the number of shareholders are taken from Compustat. Firm age is the number of years for which the firm has been included in CRSP. Average monthly return is the average of the daily stock returns from CRSP. Return on assets is constructed from Compustat as the annual operating income before depreciation, scaled by total assets. Firm size is the market capitalization, calculated as the product of the total number of outstanding shares and the annual closing price. Share turnover is constructed from CRSP as the monthly average of the share volume divided by the shares outstanding. Return volatility is the monthly average of the standard deviation of daily returns, drawn from CRSP. NASDAQ equals 1 for firms listed on the NASDAQ, and 0 otherwise.
*, ** and *** represent significance at the 10%, 5% and 1% levels. Standard errors are adjusted for heteroscedasticity.

to account for heteroskedasticity. The coefficient of the SVI remains significantly positive. In model V, we replicate the test based on a smaller sample of 6742 observations by excluding firms with missing advertising expenditure. The result shows that our main result hold for a subsample of firms with positive advertising expenditures[11]. When firm fixed effects are applied to control static firm-level effects in untabulated test, the results remain consistent. Overall, the results reported

[11] We use the full sample to perform the main test in that the subsample might be subject to selection bias. We thank the anonymous referee for this point.

in Panel A show that the positive impact of active attention on the shareholder base is robust to the control of the passive attention measures, firm characteristics, and year and industry fixed effects.

In Panel B, we replicate the test by replacing the SVI with the change in SVI, and examine its impact on the shareholder base. Consistent with our prediction, the coefficient of the change in SVI is significantly positive in model I, showing that an increase in active attention leads to a larger number of shareholders. A one standard deviation (0.12) increase in the change of SVI leads to an increase of about 1000 in the shareholder base, which is about 6% of the corresponding figure (15,000) for a median firm. The positive impact, again, is robust to the control of the passive attention measures, firm characteristics, and year and industry fixed effects, as shown in models II and III. The signs of the coefficients for online news and advertising expenditure and the other control variables are consistent with those reported in Panel A. Finally, we adjust for standard errors and apply the bootstrapping regression in model IV as a robustness check, and replicate the test based on a smaller sample of 6742 firm-month observations excluding observations with missing advertising expenditure in model V. The findings remain consistent. To sum up, the results reported in Table 3 show that retail investors tend to become shareholders of the listed firms to which they pay attention through Internet searches. The results suggest that the Internet has become an important tool for retail investors to gather information and make investment decisions.

4. Active attention and stock liquidity

Table 4 reports the results of the impact of investor attention on the stock liquidity. As shown in Eq. (3), we regress the relative bid-ask spread on the SVI, online media coverage, advertising expenditure and a set of control variables[12]. In model I, we include only the SVI and the control variables. Capturing the impact of active attention, the coefficient of the SVI is significantly negative, which suggests that higher level of investor attention reflected by search frequency leads to a reduced bid-ask spread and therefore improved stock liquidity. Models II and III incorporate passive attention measures including Google online news coverage and advertising expenditure, while model IV adjusts the clustered standard error by applying the bootstrapping regression. Model V is based on the reduced sample of 6742 observations with non-missing advertising expenditure. The coefficients of the SVI remain negative and significant across the models, suggesting that investors' active attention helps to improve stock liquidity. Consistent with Grullon et al. (2004), the coefficient of advertising expenditure is significantly negative in model V.

We also replicate the analysis by replacing the SVI with the change in SVI, and present the results in Panel B of Table 4. In model I, the coefficient of the SVI change is significantly negative, suggesting that an increase in investor attention improves liquidity. The results remain robust after controlling for the passive attention measures in models II and III, after applying the bootstrapping regression model to adjust the clustered standard error in model IV and after dropping the observations with no advertisement expenditure in model V. In untabulated test, we also apply firm fixed effects or replace the level of liquidity with the change in liquidity[13] as the dependent variable. The results remain consistent in that the significantly negative coefficients of the change in SVI support our prediction that increased investor attention helps to promote stock liquidity[14].

There are several aspects of liquidity, and bid-ask spread reflects the inventory aspect. Stoll (1978) and Ho and Stoll (1981) argue that liquidity depends on factors that influence the risk of holding inventory and extreme events that provoke order imbalance and thereby cause inventory overload. To compensate the inventory holding cost, dealers will purchase shares at the bid price below the "true" price and sell shares at the ask price above the "true" price, generating the bid-ask spread.

Bid-ask spread, however, may fail to capture other aspects. For example, Grossman and Miller (1988) show that liquidity is also determined by the demand and supply of immediacy, and bid-ask spread does not reflect the cost of supplying immediacy to the market. Kyle (1985) notes the informed speculation aspect of liquidity when market makers cannot distinguish between order flow generated by informed traders or liquidity traders, they set the price as an increasing function of the imbalance in the order flow, which may indicate informed trading. This suggests a positive relation between the transaction volume and price change, known as price impact. It can be considered as the first derivative of the effective spread with respect to the order size and reflects the cost of demanding additional instantaneous liquidity. Amihud (2002) measures it as the daily price response associated with one dollar of trading volume, calculated as the daily ratio of absolute stock return to dollar trading volume averaged over all positive volume days.

[12] As shown in the Panel B of the Appendix, we divide our sample firms into low-attention and high-attention subsamples based on the median level of the SVI and test the difference in the means of the relative bid-ask spread. The results show that the relative bid-ask spread is significantly smaller in the high-attention subsample. When we further divide the sub-samples according to market capitalization, into small and large firms, the difference in the bid-ask spread still exists in both types of firm. The difference is more pronounced for smaller firms because they are, in general, less recognized by investors, and therefore more likely to benefit from increased active attention from investors. The results are available upon request.

[13] The change in liquidity is measured by the relative spread in month t minus the average relative spread between month $t-1$ and month $t-3$.

[14] The panel C in appendix also reports the results by applying the firm fixed effects. The results of three out of four regression models are broadly in line with our main results. Petersen (2009) gives possible explanations for the minor inconsistency: the standard errors clustered by firm are unbiased and produce correctly sized confidence intervals whether the firm effect is permanent or temporary while the fixed effect and random effects model only produces unbiased standard errors when the firm effect is permanent.

Table 4
Active attention and stock liquidity.

Panel A. SVI and relative bid-ask spread

	Dependent variable relative spread in %				
	Model I	Model II	Model III	Model IV	Model V
SVI	−0.01** (−2.18)	−0.01** (−2.17)	−0.01*** (−2.11)	−0.01* (−1.73)	−0.01** (−1.87)
Ln (number of news)		0.01* (1.71)	0.01* (1.8)	0.01 (1)	0.01 (0.15)
Ln (advertising)			−0.003 (−1.42)	−0.01 (−0.34)	−0.02*** (−2.56)
Ln (firm age)	−0.01 (−0.73)	−0.01 (−0.69)	−0.01 (−0.70)	−0.02*** (−2.44)	−0.04*** (−3.72)
ROA	−0.01 (−0.46)	−0.01 (−0.41)	−0.01 (−0.44)	−0.03*** (−2.72)	−0.12*** (−5.88)
Ln (firm size)	0.003 (0.39)	−0.001 (−0.17)	0.001 (0.16)	0.01 (0.43)	0.03*** (4.22)
1/share price	2.95*** (8.04)	2.93*** (7.99)	2.94*** (7.99)	3.17*** (11.58)	3.64*** (9.77)
Ln (turnover)	0.12*** (7.68)	0.12*** (7.64)	0.12*** (7.69)	0.15*** (13.24)	0.16*** (8.32)
Ln (return volatility)	2.47*** (84.99)	2.47*** (84.95)	2.47*** (84.86)	1.93*** (87.23)	1.82*** (38.39)
NASDAQ	−0.03 (−1.28)	−0.03 (−1.14)	−0.03 (−1.14)	0.02 (1.43)	0.01 (0.11)
Year	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Adjust cluster errors	N	N	N	Y	Y
Exclude missing advertising	N	N	N	N	Y
Observation	14,690	14,690	14,690	14,690	6742
Adj. R^2	0.793	0.793	0.793	0.56	0.55

Panel B. Change in SVI and relative bid-ask spread

	Dependent variable relative spread in %				
	Model I	Model II	Model III	Model IV	Model V
Change in SVI	−0.24*** (−4.30)	−0.24*** (−4.30)	−0.24*** (−4.30)	−0.19*** (−4.58)	−0.27*** (−6.45)
Ln (number of news)		0.01* (1.7)	0.01* (1.79)	0.01 (0.88)	0.01 (0.12)
Ln (advertising)			−0.003 (−1.42)	−0.01 (−0.16)	−0.01** (−2.47)
Ln (firm age)	−0.01 (−0.67)	−0.01 (−0.63)	−0.01 (−0.64)	−0.02*** (−3.23)	−0.04*** (−4.05)
ROA	−0.01 (−0.39)	−0.01 (−0.35)	−0.01 (−0.39)	−0.03*** (−3.85)	−0.11*** (−6.11)
Ln (firm size)	0.003 (0.38)	−0.001 (−0.19)	0.001 (0.16)	0.01 (0.32)	0.03*** (3.56)
1/share price	2.97*** (8.11)	2.95*** (8.05)	2.96*** (8.06)	3.25*** (10.31)	3.74*** (10.54)
Ln (turnover)	0.12*** (7.76)	0.12*** (7.71)	0.13*** (7.77)	0.15*** (17.47)	0.16*** (8.3)
Log(return volatility)	2.48*** (85.28)	2.47*** (85.24)	2.47*** (85.16)	1.93*** (89.67)	1.83*** (43.63)
NASDAQ	−0.03 (−1.24)	−0.02 (−1.11)	−0.02 (−1.11)	0.01 (0.94)	0.01 (0.2)
Year	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Adjust cluster errors	N	N	N	Y	Y
Exclude missing advertising	N	N	N	N	Y
Observation	14,690	14,690	14,690	14,690	6742
Adj. R^2	0.794	0.794	0.794	0.56	0.55

Panel C. Active attention and amihud illiquidity measures

	Dependent variable		
	ILLIQ	*ILLIQMA*	*SD(ILLIQ)*
	Model I	Model II	Model III
Change in SVI	0.02 (1.01)	0.01 (1.4)	0.01 (0.22)
Ln (number of news)	0 (0.81)	0 (0.81)	0 (0.79)
Ln (advertising)	0 (1.37)	0 (1.38)	0 (1.36)
Ln (firm age)	−0.01 (−1.16)	−0.01 (−1.19)	−0.01 (−1.12)
ROA	−0.02 (−1.33)	−0.02 (−1.32)	−0.02 (−1.34)
Ln (firm size)	−0.02 (−1.48)	−0.02 (−1.51)	−0.02 (−1.47)
1/share price	−0.08 (−1.17)	−0.1 (−1.17)	−0.1 (−1.24)
Ln (turnover)	−0.14 (−1.52)	−0.16 (−1.51)	−0.16 (−1.52)
Ln (return volatility)	0.1 (1.53)	0.11 (1.47)	0.11 (1.53)
NASDAQ	0.04 (1.44)	0.04 (1.43)	0.04 (1.53)
Year	Y	Y	Y
Industry	Y	Y	Y
Observation	14690	14690	14690
Adj R^2	0.2423	0.1561	0.2311

Panel A and B of this table reports the estimates from panel regressions relating the relative bid-ask spread to active investor attention (SVI). The sample includes the constituents of the S&P 500 over a period of six years from January 2004 to December 2009. The SVI is the search frequency of the stock ticker, obtained from Google Trends. The change in the SVI is the difference between the SVI in week t and the median value of the SVI during the previous eight weeks. The "number of news" is the online media coverage from Google News. Advertising expenses are obtained from Compustat. The relative bid-ask spread is the monthly average of the ratio of the daily inside spread to the midpoint of the daily inside spread, obtained from CRSP. Firm age is the number of years for which the firm has been included in CRSP. Return on assets is constructed from Compustat as the annual operating income before depreciation, scaled by total assets. Firm size is the market capitalization, calculated as the product of the total number of outstanding shares and the annual closing price. Share turnover is constructed from CRSP as the monthly average of the share volume, divided by shares outstanding. Return volatility is the monthly average of the standard deviation of daily returns, from CRSP. NASDAQ equals 1 for firms listed on the NASDAQ, and 0 otherwise.
Panel C presents the results based on the Amihud (2002) liquidity measures. *ILLIQ* is the monthly average for the daily ratio of absolute return to the dollar volume of the stock. *ILLIQMA* is the ratio of the variable *ILLIQ* to its monthly mean across all stocks. *SD(ILLIQ)* is the monthly standard deviation of *ILLIQ* (Lang and Maffett, 2011). We correct for standard errors using clustering.
*, ** and *** represent significance at the 10%, 5% and 1% levels. Standard errors are adjusted for heteroscedasticity.

To explore whether the active attention of retail investors also affects other aspects of liquidity, we replace the dependent variable with the Amihud (2002) liquidity measure (*ILLIQ*) and the results are reported in Panel C. The coefficient of Change in SVI is insignificant. When we incorporate *ILLIQMA*, estimated as the ratio of the *ILLIQ* to the average *ILLIQ* of all stocks in the market, or incorporate the standard deviation of *ILLIQ* (Lang and Maffett, 2011), the coefficients of attention measures remain insignificant. The results suggest that the active attention could significantly mitigate the adverse-selection type of illiquidity, but not the price-impact type of illiquidity. Amihud (2002) also indicates that although bid-ask spread is a finer and better measure, there is no one single measure that captures all its aspects. As suggested by Da et al. (2011), SVI largely reflects the attention of retail investors because institutional investors have access to professional information vendors. In general the trading volume (in dollar term) of an average retail investor is less likely to be large, which suggests that their trading behavior might have diminished effect on the stock price reaction to trading.

5. Robustness checks

5.1. Alternative bid-ask spread measures

To confirm that our finding is robust to other liquidity measures, we replicate the regressions by replacing the relative bid-ask spread with the effective spread and the relative effective spread as the dependent variables. Following Grullon et al. (2004), the effective spread is defined as twice the difference between the transaction price and the spread midpoint, and the relative effective spread is defined as the effective spread divided by the midpoint of the spread. Table 5 provides the results of the analysis. The change in the SVI is significantly negative in both models I and II of Panel A. This is consistent with our main finding that active attention helps to improve stock liquidity. Both online news coverage and advertising expenditure are found to reduce the bid-ask spread as well. Next, we use the turnover rate as an alternative liquidity measure and repeat the analysis (see Datar et al., 1998)[15]. In Panel B, we show that both the active and passive attention measures are positively associated with the share turnover. This confirms that our results are robust to various specifications of liquidity.

5.2. Propensity score matching

Our research design may be subject to endogeneity concern. The concern stems from possible reverses causality or selection effects in that retail investor attention is not randomly assigned to firms. For example, liquidity shocks may affect retail investor attention. In addition, corporate announcements, events or firm characteristics may affect both liquidity level and retail investor attention. To control for the endogeneity issue and to draw causal inferences, and to explore attributors of substantial increase in retail investor attention, we apply propensity score matching (PSM) (Rosenbaum and Rubin, 1983) to replicate our main tests. To implement the approach, we first define substantial increase in SVI (SIn_SVI) is equal to 1 if the change in SVI is above the 10% percentile and 0 otherwise. We then estimate a logit regression to the incidence of substantial increase in SVI (SIn_SVI) based on traditional attention measures and firm characteristics as shown in Table 5D. Then, we construct a one-to-one nearest-neighbor matched sample based on the closest predicted value (propensity scores) from the logit regression. In this way, each firm with substantial increase in attention (SIn_SVI = 1) is matched with another counterpart firm with similar characteristics, but without substantial increase in attention (SIn_SVI = 0). It is worth to note that the results of model I that firms with more advertising costs, larger size, higher operating performance, higher turnover, and higher volatility, and firms listed in NASDAQ are more likely to experience substantial increase in SVI, whereas firms which also attract high media coverage are less likely to experience such change. Such randomized experiment sample with 3002 observations is less subject to the endogeneity issue. As shown in Table 5C, we replicate the main tests by using the matching sample to get the more reliable and rigorous results. The results remain consistent in that substantial increase in SVI improves breadth of ownership and stock liquidity.

To control for possible confounding effects of corporate events, we replicate the PSM test by incorporating dummy variables capturing index inclusion, corporate splits or dividend payments. It is also worth to note that these corporate events do not significantly affect the change in attention as documented in the first step of the PSM approach. The results from the second step remain consistent.

5.3. Test for causality

To further strengthen the causal inferences of the results, we also employ the Granger test as additional robustness checks by following the studies of the determinants of stock liquidity (e.g., Roulstone, 2003; Chordia et al., 2005; Goyenko and Ukhov, 2009)[16]. The Granger causality test is used to determine whether one time series is useful in forecasting another. The logic is as follows: suppose that we have three time series: the change in investor attention (ΔSVI), the liquidity (RBAS)

[15] Trading activity reflected by turnover rate is a weak measure of liquidity because trading volume could be high when liquidity is low (Pastor and Stambaugh, 2003). Grullon et al. (2004) find the turnover rate to be weakly correlated with advertising expenditure.

[16] For example, Roulstone (2003) uses Granger causality test to identify the causal relationship between analyst following and market liquidity. His results show that analyst following causes stock liquidity to improve, because post levels of analyst following are related to future liquidity levels.

Table 5
Robustness checks.

Panel A. SVI change and relative spread

	Dependent variables Effective spread	Relative effective spread
	Model I	Model II
Change in SVI	−0.11** (−2.02)	−0.01*** (−2.47)
Ln (number of News)	−0.01*** (−3.07)	−0.001*** (−3.87)
Ln (advertising)	−0.02*** (−4.97)	−0.001*** (−5.46)
Ln (firm age)	0.05*** (3.87)	0.001*** (4.74)
ROA	0.11*** (4.75)	0.01*** (5.22)
Ln (firm size)	0.13*** (5.28)	0.01*** (5.67)
1/share price	0.62*** (3.19)	0.03*** (3.91)
Ln (turnover)	1.00*** (5.32)	0.05*** (5.8)
Ln (return volatility)	−0.68*** (−5.39)	−0.03*** (−5.79)
NASDAQ	−0.25*** (−5.21)	−0.01*** (−5.66)
Year	Y	Y
Industry	Y	Y
Observation	14,690	14,690
Adj. R^2	0.79	0.79

Panel B. SVI change and turnover

[1,0]	Dependent variable: turnover		
	Model I	Model II	Model III
Change in SVI	0.12*** (3.8)	0.12*** (3.8)	0.12*** (3.8)
Ln (number of news)	0.01***	0.01*** (3.59)	(2.99)
Ln (advertising)		0.01***	(10.44)
Ln (firm age)	−0.06*** (−9.47)	−0.05*** (−9.41)	−0.05*** (−9.37)
ROA	−0.06*** (−6.71)	−0.06*** (−6.60)	−0.06*** (−6.31)
Ln (firm size)	−0.08*** (−16.87)	−0.08*** (−15.79)	−0.09*** (−17.37)
1/share price	−0.65*** (−5.87)	−0.68*** (−6.00)	−0.71*** (−6.21)
Ln (return volatility)	0.65*** (62.04)	0.65*** (62.01)	0.65*** (62.25)
NASDAQ	0.27*** (20.62)	0.28*** (21.13)	0.27*** (21.03)
Year	Y	Y	Y
Industry	Y	Y	Y
Observation	14,690	14,690	14,690
Adj. R^2	0.483	0.484	0.487

Panel C. Substantial increase in SVI and propensity score matching

	Dependent variable		
	Substantial increase in SVI	Ln (number of shareholders in thousand)	Relative spread in %
	Model I	Model II	Model III
SIn_SVI		0.14*** (2.59)	−0.08** (−2.52)
Ln (number of news)	−0.02*** (−2.79)	0.04*** (2.64)	0 (−0.25)
Ln (advertising)	0.01* (1.87)	0.02*** (2.76)	−0.01* (−1.92)
Ln (firm age)	0.03* (1.7)	0.36*** (7.51)	−0.03* (−1.66)
ROA	0.06** (2.06)	0.60*** (9.71)	−0.01 (−0.16)
Ln (Firm size)	0.11*** (7.13)	0.92*** (31.16)	−0.03 (−1.54)
1/share price	−0.87** (−2.01)	15.30*** (10.70)	5.09*** (5.96)
Ln (turnover)	0.06** (2.05)	−0.12 (−1.56)	0.08** (2.2)
Ln (return volatility)	0.15*** (4.21)	−0.36*** (−4.53)	2.47*** (38.33)
NASDAQ	0.30*** (7.63)	−0.71*** (−7.96)	−0.13*** (−2.65)
Year	Y	Y	Y
Industry	Y	Y	Y
Observation	14690	3002	3002
Adj R^2	0.0214	0.4739	0.7873

Table 5 (*Continued*)

Panel D. Corporate events and transparency					
	Dependent variable				
	Ln(number of shareholders in thousand)		Relative spread in %		
	Model I	Model II	Model III	Model IV	Model V
Change in SVI	0.21* (1.7)	0.27** (2.07)	−0.24*** (−3.43)	−0.23*** (−3.01)	−0.23*** (−3.28)
Ln (number of news)	0.04 (0.88)	0.03 (0.78)	0.01 (1.02)	0.01 (1.02)	0 (0.27)
Ln (advertising)	0.01 (0.24)	0 (0.04)	0 (−0.74)	0 (−0.94)	0 (−0.65)
Ln (firm age)	0.27** (2.01)	0.25* (1.96)	−0.01 (−0.44)	0 (−0.21)	0 (−0.04)
Return	−0.20* (−1.75)	−0.27** (−2.31)			
ROA	0.31 (1.52)	0.35* (1.75)	−0.01 (−0.21)	0 (−0.12)	0 (0.01)
Ln (firm size)	0.87*** (10.4)	0.88*** (10.28)	0 (0.04)	0 (−0.04)	0.01 (0.45)
1/share price	8.13*** (3.35)	8.28*** (3.42)	2.97*** (4.76)	2.87*** (4.62)	2.92*** (4.6)
Ln (turnover)	−0.08 (−0.47)	−0.11 (−0.64)	0.12*** (2.78)	0.13*** (2.77)	0.14*** (3.2)
Ln (return volatility)	−0.13 (−1.09)	−0.15 (−1.11)	2.48*** (36.71)	2.50*** (35.36)	2.44*** (34.07)
NASDAQ	−0.64** (−2.11)	−0.64** (−2.05)	−0.02 (−0.55)	−0.02 (−0.54)	−0.02 (−0.4)
Event_dividend	0.08 (0.77)		0.04* (1.89)		
Event_split	−0.17 (−0.59)		−0.14 (−1.4)		
Big4					−0.24 (−1.3)
Year	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Adjust cluster errors	Y	Y	Y	Y	Y
Exclude event months	N	Y	N	Y	N
Obs	14690	12591	14690	12591	14690
Adj. R^2	0.3981	0.3906	0.7937	0.7918	0.7923

Panel A and B of this table report the estimates from panel regressions relating the alternative liquidity measures to active investor attention (SVI). The sample includes the constituents of the S&P 500 over a period of six years from January 2004 to December 2009. The effective spread is defined as twice the difference between the transaction price and the spread midpoint. The relative effective spread is defined as the effective spread divided by the midpoint of the spread. Share turnover is constructed from CRSP as the monthly average of the share volume divided by the shares outstanding. The SVI is the search frequency of a stock ticker, obtained from Google Trends. The change in SVI is the difference between the SVI in week *t* and the median value of the SVI during the previous eight weeks. The "number of news" is the online media coverage from Google News. Advertising expenditure is obtained from Compustat. The relative bid-ask spread is the monthly average of the ratio of the daily inside spread to the midpoint of the daily inside spread, obtained from CRSP. Firm age is the number of years for which the firm has been included in CRSP. Return on assets is constructed from Compustat as the annual operating income before depreciation, scaled by total assets. Firm size is the market capitalization, calculated as the product of the total number of outstanding shares and the annual closing price. Return volatility is the monthly average of the standard deviation of daily returns, obtained from CRSP. NASDAQ equals 1 for firms listed on the NASDAQ, and 0 otherwise.

Panel B presents the results based on the propensity score matching. Substantial increase in SVI (SIn_SVI) is set to 1 if the change in SVI is above the top 10 percentile and 0 otherwise. Matching sample of 3002 observation is constructed by Model 1, with 1501 firms as treatment group (SIn_SVI = 1) and 1501 firms as control group (SIn_SVI = 0).

Panel C presents the results after controlling for corporate events or financial reporting transparency. *Event_split* that equals 1 if share splits happened in the month and 0 otherwise; similarly, *Event_dividend* equals 1 if the dividend distribution was announced in the month and 0 otherwise.

*, ** and *** represent significance at the 10%, 5% and 1% levels. Standard errors are adjusted for heteroscedasticity.

and a vector of control variables that have predictive power for liquidity (Control). We first use past values of RBAS (up to previous 10 weeks), ΔSVI and Control to forecast RBAS (Eq. (4)). Then, we use past values of ΔSVI, RBAS and Control to predict ΔSVI. If the results reject the hypothesis that past values of RBAS can predict ΔSVI (Eq. (5)) but fail to reject the hypothesis that past values of ΔSVI can predict RBAS (Eq. (4)), this indicates that the past values of ΔSVI provide statistically significant information about RBAS. That is, ΔSVI is able to Granger-cause RBAS.

First, in order to check whether changes in the SVI lead to changes in liquidity, we use a standard *F* test to test the joint hypothesis that $\delta_1 = \delta_2 = \ldots \delta_{10} = 0$ for the following regression:

$$\mathrm{RBAS}_{i,t} = \alpha + \sum_{j=1}^{10} \beta_j \mathrm{RBAS}_{i,t-j} + \sum_{k=1}^{10} \delta_k \Delta\mathrm{SVI}_{i,t-k} + \sum \mathrm{Control} \tag{4}$$

Then, we test the joint hypothesis that $\kappa_1 = \kappa_2 = \ldots \kappa_{10} = 0$ for the following regression:

$$\Delta\mathrm{SVI}_{i,t} = \sigma + \sum_{j=1}^{10} \kappa_j \mathrm{RBAS}_{i,t-j} + \sum_{k=1}^{10} \gamma_k \Delta\mathrm{SVI}_{i,t-k} + \sum \mathrm{Control} \tag{5}$$

The untabulated results show the hypothesis that a change in the SVI does not cause a change in liquidity is rejected at the 10% confidence level. However, we fail to reject the hypothesis that liquidity does not cause a change in the SVI at a conventional level. The findings stay robust to the inclusion of higher-order lags of liquidity. Therefore, our inference is that an increase in investors' attention paid to a stock (reflected by a change in the SVI) causes liquidity to improve.

5.4. Other confounding factors

To show that our results are not driven by confounding corporate events such as stock split and dividends, we incorporate them as additional control variables in our tests. The first dummy variable is *Event_split* that equals 1 if share splits happened in the month and 0 otherwise; similarly, *Event_dividend* equals 1 if the dividend distribution was announced in the month and 0 otherwise. Alternatively, we also replicate the tests by excluding the firm-month observations with these corporate events, and the results are robust. The results reported in the columns I to IV in Panel D of Table 5 remain consistent in that investor attention measured by Change in SVI increases shareholder base and improve stock liquidity. The results also hold when we incorporate other events such as *Index*, which equals 1 if the firm is newly included in S&P500 index in the month and 0 otherwise.

As previous literature shows that financial reporting transparency is associated with stock liquidity (i.e., Lang and Maffett, 2011), we create a dummy variable to proxy for financial reporting transparency. Specifically, *Big4* is set to 1 for firms audited by Big four auditing firms (namely KPMG, Ernst & Young, Deloitte Touche Tohmatsu, and PricewaterhouseCoopers), and 0 otherwise. We add them as additional control variables in the analysis as reported in column V of Panel D, and find that the results remain consistent. We also consider alternative measures for financial reporting transparency such as going on concern audit opinions from auditing firm but find that S&P500 firms in our sample do not receive going on concern audit opinions.

6. Conclusion

The "home bias" literature suggests that investors are inclined to invest in firms that they are familiar with. In order to get familiar with a firm, investors need to acquire relevant information. Individual investors, who are generally unable to access professional information vendors such as Reuters or Bloomberg, may increasingly rely on Google, the dominant Internet search engine, to search for relevant information before making investment decisions. In this paper, we use search frequency data on S&P 500 stocks between January 2004 and December 2009, provided by Google Trends, as a direct measure of active investor attention, and examine the impact of this active attention from retail investors on the shareholder base and stock liquidity. We find this active attention measure to be distinct from passive measures such as the number of news items available on the Internet (based on Google News; news.google.com)[17] and advertising expenditure. Despite the positive correlation between the active and passive attention measures, almost 95% of the cross-sectional variation in the former cannot be explained by the latter. We further show that the increased investor attention indicated by the search volume index (SVI) and Google News contributes to a broader shareholder base. Furthermore, increased investor attention leads to a reduced relative bid-ask spread and a higher turnover rate. Our findings are robust to the control of firm characteristics suggested in Grullon et al. (2004), and to alternative measures of stock liquidity.

Our study contributes to the burgeoning literature on the role of investor attention in the dynamics of asset pricing. Studies in this stream of literature include Barber and Odean (2008) on investor attention and individual investors' trading behavior, Yuan (2009) on recording-breaking events related to the Dow index and front-page coverage in newspapers as proxies for investor attention, and its impact on trading behavior and market returns, and Da et al. (2011) on investor attention measured by Google search frequency, and its effect on IPO returns and the price pressure hypothesis proposed by Barber and Odean (2008). This study also extends the literature on the "investor recognition hypothesis" (e.g., Grullon et al., 2004; Fang and Peress, 2009). In markets with information asymmetry, investors are less likely to possess the required information. Consequently, securities with lower investor recognition become less liquid and have to offer a higher return to compensate for their "illiquidity". The fact that a security is attracting more attention from investors can enable it to be "better recognized". As a result, stocks with increased investor attention become more liquid. Our results generally lend credence to the "investor recognition" hypothesis.

The findings of our study have implications for companies that wish to promote investor recognition. Companies may intentionally make themselves more visible on the Internet and especially in the Google search engine in order to attract the attention of potential investors. Our results might be of interest to participants in the financial markets (e.g., liquidity traders), in that they may benefit from sophisticated models that incorporate individuals' information acquisition behavior into predictions of stock liquidity. Finally, our findings may incentivize Google and other search engine companies to further improve their service in terms of providing more timely and accurate data on public search behavior, and to profit by selling such services.

Our study is subject to the following limitations. First, although we apply propensity score matching and Granger test to address the concern of endogeneity problem, future research may attempt to identity some exogenous shift in investor's attention and further explore the casual relation between investors' attention and stock liquidity. We notice that corporate events could not trigger substantial change in retail investors' attention in that non-professional investors do not tend to

[17] Yuan (2009), Tetlock (2010) and Fang and Peress (2009) use either the LexisNexis database or the Dow Jones news archive to determine the number of newspaper articles related to a stock. The Google news channel includes news from the most popular English-language news sites, such The New York Times, Bloomberg, Reuters, the Guardian, CBS News, BBC News, Times Online, and CNN, and thus offers broader news coverage. We argue that online media coverage is more accessible than newspaper coverage for retail investors, who are more likely to search for information on the Internet.

closely follow corporate announcements. We conjecture that retail investor attention could be affected by proxies related to coverage on social media. Second, our analysis is exclusively built on the sample of S&P 500 stocks, which are large and well-established firms with high visibility. It is expected that smaller and less recognized firms would benefit more from increased investor attention, therefore adding small firms to future studies might strengthen the analysis. Note that if the tickers of some small firms are rarely searched for, Google will return a value of zero. Third, as suggested by Da et al. (2011), SVI largely reflects the attention of retail investors because institutional investors have access to professional information vendors such as the Bloomberg or Reuters. In general the trading behavior of an average retail investor is less likely to have a remarkable effect on the stock price, which might plausibly explain why active attention measure of retail investors is insignificantly related to the Amihud (2002) illiquidity measure. Further research may examine a wide range of liquidity measures. Finally, the majority of research in this area is based on US data[18]. As Google becomes an increasingly important source of information for investors around the world, it might be interesting to explore the capital market consequences of investors' active demand for information in other markets (e.g., the UK, other European countries and Asia). We leave this for future research.

Appendix A.

Panel A. Active attention and breadth of ownership: univariate analysis

	SVI		Difference	*t*-statistics
	Low	High		
All	46.96	94.27	47.31***	14.38
Small	22.45	24.72	2.27**	2.06
Large	78.86	153.24	74.38***	11.54

Panel B. Active attention and stock liquidity: univariate analysis

	SVI		Difference	*t*-statistics
	Low	high		
All stock	3.08	2.89	−0.19***	6.38
Small	3.44	3.27	−0.17***	3.43
Large	2.62	2.56	−0.06*	1.72

Panel C. Firm fixed effects

	Dependent variable			
	Ln(number of shareholders in thousand)		Relative spread in %	
	Model I	Model II	Model III	Model IV
Change in SVI	0.01** (2.11)	0.02 (0.64)	−0.03*** (−3.57)	−0.24*** (−4.44)
Ln (number of News)	0.01 (0.83)	0.01 (0.74)	0.04** (2.36)	0.04** (2.53)
Ln (advertising)	−0.06*** (−12.28)	−0.06*** (−12.2)	−0.01 (−0.96)	−0.01 (−1.13)
Ln (firm age)	−0.01 (−0.22)	−0.01 (−0.27)	0.27*** (4.17)	0.27*** (4.24)
Return	0.05 (1.49)	0.05 (1.47)		
ROA	0.08*** (4.45)	0.08*** (4.4)	0.03 (0.74)	0.03 (0.8)
Ln (Firm size)	0.02 (1.15)	0.02 (1.2)	−0.14*** (−4.88)	−0.14*** (−4.89)
1/Share price	0.95*** (6.57)	0.94*** (6.53)	2.08*** (7.53)	2.11*** (7.65)
Ln (turnover)	0.10*** (7.73)	0.10*** (7.75)	0.14*** (5.74)	0.14*** (5.87)
Ln (return volatility)	−0.04*** (−3.91)	−0.04*** (−3.9)	2.48*** (121.89)	2.48*** (121.97)
NASDAQ	Omitted	Omitted	Omitted	Omitted
Year	Y	Y	Y	Y
Industry	Y	Y	Y	Y
Firm fixed effects	Y	Y	Y	Y
Obs.	14690	14690	14690	14690
Overall R^2	0.0198	0.0209	0.7674	0.7673

Panel A reports the number of shareholders (in thousand) for stocks with low and high attention. The sample includes the constituents of S&P 500 over a period of 6 years from January 2004 to December 2009. The attention is measured by SVI, the search frequency of stock ticker from Google Trends. The firms are further classified into small and large ones based on the mean of market capitalization. *, ** and *** represent significance at the 10%, 5% and 1% level.

Panel B reports presets the relative bid-ask spread (in %) for stocks with low and high attention. The sample includes the constituents of S&P 500 over a period of 6 years from January 2004 to December 2009. The attention is measured by SVI, the search frequency of stock ticker from Google Trends. The firms are further classified into small and large ones based on the mean of market capitalization. *, ** and *** represent significance at the 10%, 5% and 1% level.

Panel C reports the estimates from panel regressions with firm fixed effects applied.

[18] One exception is Aouadi et al. (2013), which construct attention measure with French investor's online search behavior, provided by Google, and show that investor attention is a determinant of the stock market liquidity and volatility.

References

Amihud, Y., 2002. Illiquidity and stock returns: cross-section and time-series effects. J. Financ. Mark. 5, 31–56.
Aouadi, A., Arouri, M., Teulon, F., 2013. Investor attention and stock market activity: evidence from France. Econ. Model. 35, 674–681.
Banker, R.D., Huang, R., Natarajan, R., 2011. Equity incentives and long-term value created by SG&A expenditure. Contemp. Account. Res. 28, 794–830.
Barber, B., Odean, T., 2008. All that glitters: the effect of attention and news on the buying behaviour of individual and institutional investors. Rev. Financ. Stud. 21, 785–818.
Bushee, B., Miller, G., 2012. Investor relations, firm visibility and investor following. Account. Rev. 87, 867–897.
Cao, H., Han, B., Hirshleifer, D., Zhang, H., 2011. Fear of the unknown: familiarity and economic decisions. Rev. Finance 15, 173–206.
Chen, H., Noronha, G., Singal, V., 2004. The price response to S&P 500 index additions and deletions: evidence of asymmetry and a new explanation. J. Finance 59, 1901–1930.
Chordia, T., Sarkar, A., Subrahmanyam, A., 2005. An empirical analysis of stock and bond market liquidity. Rev. Financ. Stud. 18, 85–129.
Chung, K.H., Zhang, H., 2009. A simple approximation of intraday spreads using daily data. In: Working paper. State University of New York at Buffalo, Buffalo, NY, Available at ⟨http://ssrn.com/abstract=1346363⟩.
Da, Z., Engelberg, J., Gao, P., 2011. In search of attention. J. Finance 66, 1461–1499.
Datar, V., Naik, N., Radcliffe, R., 1998. Liquidity and stock return: an alternative test. J. Financ. Mark. 1, 203–229.
Drake, M., Roulstone, D., Thornock, J., 2012. Investor information demand: evidence from Google searches around earnings announcement. J. Account. Res. 50, 1001–1040.
Engelberg, J., Parsons, C., 2011. The casual impact of media in financial markets. J. Finance 66, 67–97.
Fang, L.H., Peress, J., 2009. Media coverage and the cross-section of stock returns. J. Finance 64, 2023–2052.
French. Poterba, J., 1991. Investor diversification and international equity markets. Am. Econ. Rev. 81, 222–226.
Grossman, S., Miller, M., 1988. Liquidity and market structure. J. Finance 43, 617–633.
Grullon, G., Kanatas, G., Weston, J.P., 2004. Advertising, breadth of ownership, and liquidity. Rev. Financ. Stud. 17, 439–461.
Goyenko, R.Y., Ukhov, A.D., 2009. Stock and bond market liquidity: a long-run empirical analysis. J. Financ. Quant. Anal. 44, 189–212.
Hirshleifer, D., Teoh, S.H., 2003. Limited attention, information disclosure, and financial reporting. J. Account. Econ. 36, 337–386.
Hirshleifer, D., Lim, S., Teoh, S.H., 2011. Limited investor attention and stock market mis-reactions to accounting information. Rev. Asset Pricing Stud. 1, 35–73.
Ho, T., Stoll, H.R., 1980. On dealer markets under competition. J. Finance 35, 259–267.
Ho, T., Stoll, H.R., 1981. Optimal dealer pricing under transaction and return uncertainty. J. Financ. Econ. 9, 47–73.
Hou, K., Xiong, W., Peng, L., 2009. A Tale of Two Anomalies: The Implications of Investor Attention for Price and Earnings Momentum, Available at SSRN: http://ssrn.com/abstract=976394
Kyle, A., 1985. Continuous auction and inside trading. Econometrica 53, 1315–1336.
Lang, M., Maffett, M., 2011. Transparency and liquidity uncertainty in crisis period. J. Account. Econ. 52, 101–125.
Lehavy, R., Sloan, R., 2008. Investor recognition and stock returns. Rev. Account. Stud. 13, 327–362.
Merton, R., 1987. A simple model of capital market equilibrium with incomplete information. J. Finance 42, 483–510.
Pastor, L., Stambaugh, R.F., 2003. Liquidity risk and expected stock returns. J. Pol. Econ. 111, 642–685.
Petersen, M.A., 2009. Estimating standard errors in finance panel data sets: comparing approaches. Rev. Financ. Stud. 22 (1), 435–480.
Rosenbaum, P., Rubin, D., 1983. The central role of the propensity score in observational studies for causal effects. Biometrika 70, 41–55.
Roulstone, D., 2003. Analyst following and market liquidity. Contemp. Account. Res. 20, 551–578.
Seasholes, M., Wu, G., 2007. Predictable behavior, profits, and attention. J. Empirical Finance 14, 590–610.
Siganos, A., 2013. Google attention and target price run ups. Int. Rev. Financ. Anal. 29, 219–226.
Stoll, H.R., 1978. The pricing of security dealer service: an empirical study of Nasdaq stocks. J. Finance 33, 1153–1172.
Tesar, L., Werner, I., 1995. Home bias and high turnover. J. Int. Money Finance 14, 467–492.
Tetlock, P.C., 2010. Does public financial news resolve asymmetric information? Rev. Financ. Stud. 23, 2557–3520.
Vlastakis, N., Markellos, R., 2012. Information demand and stock market volatility. J. Bank. Finance 36, 1808–1821.
Vozlyublennaia, N., 2014. Investor attention, index performance and return predictability. J. Bank. Finance 41, 17–35.
Yuan, Y., 2009. Attention and trading. In: Working paper. University of Iowa, Iowa.

On Monday, 8 June 2015, FIRTH Michael Arthur <mafirth@ln.edu.hk> wrote:

Dear Wen

I am pleased to accept the paper "Do financial analysts perform a monitoring role in China? Evidence from modified audit opinions". 'Accept' means that the paper will be forwarded to Abacus with the recommendation that the paper be accepted for the special issue. Congratulations on your achievement.

Best regards

Michael

Do financial analysts perform a monitoring role in China?

Evidence from modified audit opinions*

Jiandong Chen[a], Rong Ding[b], Wenxuan Hou[c,†] and Sofia Johan[d]

[a] School of Public Finance and Taxation,Collaborative Innovation Center for Financial Security, Southwestern University of Finance and Economics, China

[b] Warwick Business School, University of Warwick, United Kingdom.

[c] University of Edinburgh Business School, University of Edinburgh, United Kingdom.

[d] Schulich School of Business, York University, Toronto, Canada

* The authors are grateful to two anynous referees, Shujun Ding (discussant), Michael Firth, Stewart Jones (Editor), Edward Lee and participants of the Abacus Special Issue conference "Accounting in China" in Chengdu, China for their helpful comments.

† Corresponding Author. Email: Wenxuan.hou@ed.ac.uk;
Tel: +44 (0) 131 651 5319

Do financial analysts perform a monitoring role in China?

Evidence from modified audit opinions

Abstract

This paper examines the impact of analyst coverage on the financial reporting quality of firms as reflected by modified audit opinions (MAOs). Using a sample of Chinese listed firms between 2003 and 2009, we find that analyst coverage, which serves as an external governance mechanism, has a positive influence on the financial reporting quality of Chinese listed firms. More significantly, such effect is more pronounced for non-state-owned enterprises (i.e. private firms), in that they are more dependent on external equity capital and therefore under greater pressure from analysts to provide high-quality accounting information. Furthermore, we show that analyst coverage plays a more positive role for firms reporting consecutive losses (ST firms). Our findings are robust to various specifications of analyst coverage and to the control of endogeneity with instrumental variable approach.

Keywords: Modified Audit Opinion (MAO), Analyst Coverage, Analyst Following, State-owned enterprises, China

1. Introduction

The accounting literature has paid considerable attention to the determinants of financial reporting quality. Prior studies provide evidence on the roles institutional environments and accounting regulations have in determining the quality of financial reporting (Ali and Hwang, 2000; Ball, Kothari and Robin, 2000; Leuz, Nanda and Wysocki, 2003). [1] Furthermore, firms' operating characteristics (e.g., financial performance, leverage, growth), as well as internal governance structures (e.g., independence and financial expertise of board/ audit committee), have been found to be associated with various proxies of financial reporting quality (Beatty and Harris, 1995; Keating and Zimmerman, 1999; Penman and Zhang, 2002; Ball and Shivakumar, 2005). However, there is limited research exploring the governance or monitoring role of financial analysts in enhancing financial reporting quality, especially in emerging markets. Our study aims to fill this gap.

We are analyzing the financial analysts because they are considered to be one of the most important financial intermediaries between corporate insiders and external investors. They collect firm-specific information from corporate insiders (e.g., managers) and subsequently disseminate the information to current and prospective users such as investors (Chung and Jo, 1996). Managers themselves are cognizant of the influence analysts have on investor sentiment as reflected by share prices (Graham, Harvey and Rajgopal, 2005) and extant research thus far concentrates on analyzing the monitoring effects of analyst on managerial decisions (Jensen and Meckling, 1976; Chung and Jo, 1996; Lin and McNichols, 1998; Degeorge, Patel and Zeckauser, 1999; Irvine, 2003; Chang, Dasgupta and Hilary, 2006).

[1] Ball, Kothari and Robin (2000) report that earnings are less timely in recognizing economic loss in code law countries than in common law countries. Based on the analysis of over 8,000 firms from 31 countries, Leuz, Nanda and Wysocki(2003) find less earnings management in countries with strong investor protection and legal enforcement, developed stock market and dispersed ownership.

According to Jensen and Meckling (1976), monitoring activities designed to constrain managerial opportunism should become specialized to those institutions and individuals who possess competitive advantage, and financial analysts are individuals who have the capability and expertise to perform such tasks. Financial analysts are professionals with substantial industry background and knowledge. In addition, they track corporate information on a regular basis and have opportunity to interact directly with managers. Previous studies show that analysts play an important role in disciplining managerial behavior. For example, analysts act as whistle blowers of corporate fraud (Dyck, Morse and Zingales, 2010), and corporate governance deteriorates after a reduction in analyst coverage due to brokerage merger and closure (Chen, Harford and Lin, 2013). Moyer et al (1989) provide supporting evidence for the monitoring role of analysts as a device to mitigate the agency problem. As a result, managers from the firms followed by a large number of analysts tend to act more cautiously under the continuous and intense scrutiny.

Prior research shows that analysts are an important information intermediary in China that helps to improve market efficiency. For example, Chen et al. (2014) analyze a large sample of Chinese listed firms between 2003 and 2008, and report a negative association between analyst coverage and the incidence of corporate fraud. Their findings suggest that in China analyst plays a monitoring role in disciplining manger's opportunistic behavior that is detrimental to shareholders' welfare. Following this logic, we suggest that analyst coverage effectively reduces manager's opportunistic behavior in financial reporting, leading to higher financial reporting quality reflected by a lower incidence of the issuance of modified audit opinions (MAOs). However, we note that there is a large body of literature suggesting that analysts issue biased forecasts or recommendations to attract investment banking business

and curry favor with management (Lim, 2001; Irvine, 2004; Agrawal and Chen, 2008). The self-serving incentives of analysts might therefore attenuate their monitoring role in promoting the quality of accounting information of those firms under their coverage. To summarize, we consider the relation between analyst following and firm's financial reporting quality reflected by MAOs as an empirical question that deserves investigation.

We believe that our use of the issuance of MAOs as a proxy for (lower) financial reporting quality is appropriate in our research setting. It is well established that firm audits, which serve as an external monitoring mechanism to constrain managers' opportunistic behavior that results from the separation of ownership and control, can reduce information asymmetry between managers and investors (Kinney and Martin, 1994). An auditor, when exercising his independent role in certifying financial reporting quality, would be unable to provide an *unmodified* audit opinion if he finds that the financial statements as a whole are not free from material misstatements; or he has been unable to obtain enough evidence to conclude that the financial statements as a whole are in full compliance of GAAP. Once the auditor determines that the statements have been qualified, he will classify his qualification as an explanatory paragraph, disclaimer or adverse opinion. The issuance of MAOs therefore is an appropriate proxy for financial reporting quality, or financial statements not meeting acceptable standards at the outset.[2] Prior research has identified the negative signaling effect of MAO. For example, using data on Chinese listed firms, Chen et al. (2000) show that MAOs are associated with negative abnormal stock return over a three-day window centered on the announcement of MAO, suggesting that firms receiving MAO have an increased cost of capital. By employing the issuance of MAOs as an *ex post* signal of (lower) financial

[2] We suggest that high quality auditors to consider not only whether the client's accounting choice are in compliance with GAAP, but also how faithfully the financial statements reflect the firm's underlying economic transaction. In this sense, auditors help improve financial reporting quality by increasing the credibility of the financial reports.

reporting quality, we are able to investigate the role of analyst coverage in affecting the financial reporting quality.[3]

We use the Chinese setting to investigate the effect of analyst coverage on financial reporting quality for various reasons. China has become one of the largest emerging economies since the inception of its economic reform in 1978. Since early 1990's China's capital market and in turn, financial intermediation, have experienced significant growth. Unlike the U.S therefore, China is a fast-developing, but nevertheless *still* developing, private equities market therefore investors are more reliant on analyst coverage in making decisions. The analysts' financial and industrial expertise, along with their ability to monitor the firms not only more regularly but also more rigorously, serve an important role in mitigating the arguably higher information asymmetries and agency problems Chinese investors face (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1998, 1999). Furthermore, prior studies explore the role of analyst coverage as a determinant of financial reporting quality by using only one single measure: the number of analysts following a firm. By using Chinese data, we are able to differ significantly in our research as we use three different but related measures of analyst coverage: 1) the number of analyst reports issued for a firm (monitoring frequency) 2) the number of analysts following a firm (monitoring intensity) and 3) the number of brokerage houses that issue analyst reports for a firm (monitoring scope). As a result our study is expected to provide an enhanced understanding of the role analyst coverage plays in the financial reporting process.

[3] We acknowledge that the issuance of MAOs reflects both auditor's competence (auditor's ability to detect problematic issues in the financial reporting process) and auditor's independence (auditor's willingness to publicly disclose such problems). Assuming at a given level of auditor competence and independence, if analysts effectively serve as whistle blowers in monitoring manager's self-serving behavior, the financial statement will faithfully reflect the underlying economic transaction of the firm to a greater extent, leading to higher financial reporting quality and lower incidence of MAO. In this study we do not explore the impact of analyst coverage on firm's auditor choice, although we believe this can be an interesting question for future research.

As the direct result of the partial privatization of former state-owned enterprises (SOEs) since 1990's, a majority of Chinese listed firms are ultimately controlled by the state (e.g., central government, local government or a government agent).[4] Due to political connections, SOEs receive preferential treatment from the central government and thus have easy access to equity and credit markets (e.g. Chen et al., 2011), which implies that SOEs are under less pressure to reduce information asymmetry than non-state owned enterprises (NSOEs). In contrast, NSOEs are more dependent on the capital market to finance their investments, which suggests that they are incentivized to reduce information asymmetry (i.e., responding to the enquiry of analysts or providing high quality/frequent voluntary disclosures) to ensure a lower cost of raising capital. We are able to analyze the effectiveness of analyst coverage and determine whether their monitoring role is potentially reduced (enhanced) depending on ownership structure. In addition to taking into account ownership structure, we also analyze the effect more intense scrutiny by analysts would have on firms. China is also characterized as an earnings-based regulatory regime. For example, in 1998 the China Securities Regulatory Commission (CSRC) required a listed firm reporting losses for two consecutive years to be labeled a special treatment (ST) firm, and its daily stock quotation fluctuation be reduced from 10% to 5%. As soon as the ST firm incurs a third-year loss, its stock trading would be immediately suspended.[5] At the same time, ST firms are subject to stringent scrutiny from financial intermediaries such as analysts. Therefore, in this study we explicitly investigate whether analyst coverage has an impact on the quality of financial reporting carried out by both SOEs and NSOEs, and also firms under normal versus intense

[4] In this study state-owned enterprises (SOEs) are defined as enterprises with the government as the largest controlling shareholder. In contrast, non state-owned enterprises (NSOEs) are controlled by individuals, families or investment fund. In this sense NSOEs can be considered as private firms. However, throughout the paper we use SOEs and NSOEs to indicate that they are two exclusive groups.

[5] In 2001 CSRC formally introduced a delisting procedure by mandating a firm be compulsorily delisted when it reports four-year consecutive losses.

scrutiny.

Based on our analysis of Chinese listed firms between 2003 and 2009, we find that analyst coverage is negatively associated with the propensity of a MAO being issued, and the relationship is more pronounced for NSOEs. The results are robust to different measures of analyst coverage and to the inclusion of firm-specific characteristics documented by prior studies. Due to less financial and political backing from the government, Chinese NSOEs are relatively more reliant on the capital market for external financing (e.g. Chen et al. 2011). The issuance of a MAO undermines the credibility of a firm's financial reporting, indicating poor corporate governance and high information asymmetries thus potentially increasing the firm's cost of raising capital. This suggests that NSOEs are more likely to respond to issues raised by analysts, leading to improved financial reporting quality. Furthermore, we show that analyst coverage plays a significant role in reducing the propensity for ST firms to receive MAOs. This finding suggests that more intense analyst coverage subsequently leads to enhanced financial reporting quality and a lower likelihood of a firm being issued a MAO.

Our paper makes a number of contributions to the literature. First, we extend the literature on the effectiveness of external governance mechanism by providing original evidence on the role of financial analysts in enhancing financial reporting quality. Second, our study is linked to the growing stream of literature on how economic and institutional development shape the reporting incentive and practice in China. Finally, our results are of interest to regulators and policymakers with a continued interest in further reform to promote corporate transparency in China, and shows that the development of financial analysts in China has an important implication on investor protection.

The rest of our paper is organized as follows. Section 2 explains the institutional background, reviews the literature, and develops our hypotheses. Section 3 describes our research design. Section 4 and 5 presents our empirical results. Section 6 concludes.

2. Literature and development of hypotheses

2.1 Institutional Background

The financial analyst industry has experienced substantial growth in parallel with the fast development of Chinese stock market since 1990s. In August 1991, the Securities Association of China, which serves as the nationwide self-regulatory body of the Chinese capital market, was officially launched. Securities Analysts Association of China (SAAC), which is under the supervision of the Securities Association of China, was formally established in July 2000. On December 13th, 2002, SAAC held its first meeting in Beijing, announcing the establishment of the securities analysts and investment advisors committee. The "Code of conduct for Chinese security analysts", which provides guidance on the responsibility of analysts, was first released in 2000 and later amended in 2005.[6] By the end of 2013, there are 115 security companies in China. 84 consultancy firms have been approved by China Securities Regulatory Commission (CSRC) to provide investment consultancy service, with more than 2,500 qualified financial analysts being employed by both security firms and consultancy firms.

2.2 Related literature

Numerous studies have examined the role of financial analysts as information intermediaries

[6] Based on a careful check of the law/regulations that governs the Chinese financial analyst industry issued between 2000 and 2013, we conclude that there is still no Chinese version of the Regulation Fair Disclosure, which prohibits the selective disclosure of non-public information, unless such information is simultaneously released to the public.

between firms and external investors. Because analysts collect information from public and private sources, continuously evaluate the performance of the firm, make forecasts about its future prospects and issue buy, hold or sell recommendation to investors, analyst coverage is likely to improve the transparency and reduce the information asymmetry of the firm under scrutiny. Empirical evidence largely supports this prediction. Hong et al. (2000) report a negative association between analyst coverage and the profitability of the momentum strategy. Roulstone (2003) shows that increased analyst following leads to increased liquidity because analysts are able to reduce information asymmetry between investors and managers of the firm. Ayers and Freeman (2003) find that prices of firms with high analyst coverage incorporate future earnings more rapidly than firms with low analyst coverage. Consistent with the view that analysts are key information intermediaries between the firm and market, Sun (2011) shows that income smoothing enhances earnings informativeness more significantly for firms with high analyst coverage. Finally, Sun and Liu (2011) find that firms with high analyst coverage adopt more conservative accounting practices and conclude that analyst coverage has an important effect on the financial reporting process.

As analysts have the relevant experience and industry-wide knowledge to scrutinize the financial statements of listed firms, an emerging literature explores the association between financial reporting quality and analyst coverage. For example, Yu (2008) employs discretionary accruals as the proxy of earnings management and reports that firms with more analyst coverage have higher financial reporting quality (lower level of earnings management). Focusing on the mergers between U.S. brokerage firms which result in the reduction of analysts following a particular stock, Irani and Oesch (2013) show that the quality of financial reporting decreases after a decline in analyst following. Furthermore, the reduction in financial reporting quality is concentrated among firms with low initial coverage

and poor internal governance.

2.3 Development of hypotheses

According to Jensen and Meckling (1976), "to the extent that security analysis activities reduce the agency costs associated with the separation of ownership and control, they are indeed socially productive". One such benefit is that financial analysts are effective in constraining earnings management practices, because they are well trained to go through numerous financial statements and track firms on a regular basis, which enables the improvement of corporate transparency and the identification of financial reporting irregularities (Yu, 2008). Analysts are also reported to monitor managerial behavior and make it difficult for managers to expropriate company wealth (Lang, Lins and Miller, 2004; Dyke, Morse and Zingales, 2010). This leads to our first hypothesis:

H1a: *Analyst coverage improves the financial reporting quality of Chinese listed firms as reflected by the reduced propensity to receive MAOs.*

Prior studies show that investment banking incentives and other self-interests to access private information from management motivate analysts to provide biased earnings forecasts and stock recommendations (i.e., Michaely and Womack, 1999; Lim, 2001; Irvine, 2004; Agrawal and Chen, 2008). Empirically, Irvine (2004) finds that forecasts that deviate more from the consensus (''bold'' forecasts) are associated with increase in the analyst's employers' share of the trading in the covered stock shortly after the release of the forecast. Agrawal and Chen (2008) show that more favorable recommendations (relative to the consensus recommendation) are associated with a larger share of the securities firm's revenue obtained from investment banking and brokerage business.[7] The claim that analysts

[7] Although there is a substantial body of literature suggesting that analysts issue biased forecasts or

face incentives to be optimistic implicitly relies on the assumption that managers provide private information to analysts who issue biased forecasts and recommendation. Given that analysts have preferential access to information provided by management in China, we argue that analysts' incentive to curry favor with management attenuates their monitoring function in enhancing financial reporting quality of those firms under their coverage, suggesting that there is a negative association between analyst following and financial reporting quality reflected by the higher propensity of MAO.

H1b: *Analyst coverage reduces the financial reporting quality of Chinese listed firms as reflected by the higher propensity to receive MAOs.*

Taking into consideration of the institutional or ownership characteristics of Chinese listed firms, we suggest that the monitoring effects of analyst tend to be more pronounced in NSOEs. Because SOEs have easy access to equity and credit markets due to political reason (e.g. Chen, Lobo and Wang, 2011), they generally have weaker incentives to reduce information asymmetry and are under less pressure from analysts to provide high-quality accounting information. Compared with the SOEs that receive preferential treatment from the government, NSOEs have to rely on the capital market for external financing. In order to lower the cost of raising capital, NSOEs have to provide high quality financial statements. Furthermore, when NSOEs are approached by financial analysts, they are incentivized to respond to analyst enquiries or any other clarifications sought from analysts, which results in the enhanced quality of accounting information. Hypothesis 2 thus follows:

H2: *The effect of analyst coverage in reducing the incidence of MAOs is more pronounced in*

---

recommendations to attract investment banking business, other studies report contradictory results. For example, based on a sample of 16,625 U.S. debt and equity offerings Ljungqvist et al. (2006) find little evidence that analysts employed by investment banks bias their research to earn investment banking deals. In a similar vein, Jacob et al. (2008) document that more accurate earnings forecasts are issued by analysts employed by firms that offer investment banking.

NSOEs.

Extant literature shows that earnings-based regulation induces earnings management to meet the regulatory requirements (DeFond and Jiambalvo, 1994; Burgstahler and Dichev, 1997; Liu and Lu, 2007).[8] For example, Jiang and Wang (2008) show that Chinese listed firms experiencing consecutive losses (ST firms) use earnings management to avoid compulsory delisting, as the ratio of small-profit to small-loss firms have increased significantly since 1998. These practices are likely to result in a higher probability of receiving MAOs.[9] However, prior studies suggest that analysts are effective in detecting serious financial reporting irregularities (i.e. fraud). For example, examining the alleged corporate frauds in U.S. between 1996 and 2004, Dyke, Morse and Zingales, (2010) conclude that analysts played a central role in detecting corporate frauds, in that auditors and analysts collectively account for 24% of whistleblowers. Although analysts do not receive monetary compensation from disclosing fraudulent behavior of the firms they cover, they do benefit from improved reputation and better career prospects (Hong, Kubik and ùsoloman, 2003) due to their obvious diligence. Building on the premise that analysts are able to use their experience and industry-specific expertise to identify financial reporting problems that arise from earnings management, we expect to find support for the following hypothesis:

H3: *The effect of analyst coverage in reducing the incidence of MAOs is more pronounced for firms under more intense scrutiny (i.e. ST firms facing potential delisting risk)*

[8] Anecdotal evidence shows that Chinese firms use financial packaging in the pre-IPO period to inflate earnings (Aharony, Lee and Wong, 2000) and manage earnings with non-operating items to meet regulatory requirement for seasonal offering (Chen and Yuan, 2004).

[9] Previous literature (e.g., Chen and Yuan, 2004; Liu and Lu, 2007) suggests that Chinese listed firms manage earnings to qualify for seasonal offerings (issuing additional shares to existing shareholders). According to CSRC, publicly listed firms are only allowed to make seasonal offerings if they have not received Modified Audit Opinions (MAO) for 3 consecutive years before the seasonal offering. Therefore, such regulation may deter firms interested in seasonal offerings from engaging in earnings management (which leads to high propensity of MAO), suggesting a negative association between seasonal offerings and Chinese listed firms receiving MAO. However, firms may use real earnings management (i.e. transaction with related party) to meet the regulatory requirement of seasonal offerings.

3. Research design

3.1 Various measures of analyst coverage

In this study we use three different measures of analyst coverage: 1) *Report* is the number of analyst reports issued for firm *i* in a given calendar year, which reflects the monitoring frequency; 2) *Analyst* is the number of analysts following firm *i* in a given calendar year, which reflects the monitoring intensity; 3) *Broker* is the number of brokerage houses that issue analyst reports for firm *i* in a given calendar year, which reflects the monitoring scope. An important reason to take into account the number of brokerage houses covering a firm is that prior research has found evidence of potential distortions in analyst recommendations, particularly if the brokerage is associated with an investment bank that has an underwriting relationship with the covered firm (Lin and McNichols, 1998; Michaely and Womack, 1999, Hong and Kubik., 2003a). However, if the firm is followed by more brokerage firms, analysts from other brokerage firms are expected to issue *less biased* reports and therefore play a more objective monitoring role.

3.2 Research model

We rely on the following Logit model to test hypothesis 1. In order to mitigate the concern of endogeneity, we take the lead-lag approach by regressing MAO for firm *i* in year *t* on analyst coverage measures in year *t-1*. We suggest that using the lagged analyst coverage measure effectively reduces concerns that the relation is running from MAO to analyst coverage (i.e. less analysts are following firms receiving MAOs), because analysts make their coverage decisions before they learn about MAOs issued. This approach has been used in recent studies in accounting (e.g., Degeorge, Jeanjean and Stolowy, 2013).

$$MAO_{i,t} = a_0 + a_1 \text{Coverage}_{i,t-1} + \sum_{k=1}^{k} a_{k+2} Control_k + e \quad (1)$$

MAOs, which are *ex post* manifestations of inferior financial reporting quality, have received considerable attention from regulators, investors and the public (Firth, Mo and Wong, 2012). Following Firth, Rui and Wu (2012), we classify audit opinions that are qualified with an explanatory paragraph, disclaimer and adverse opinion as MAO. The dependent variable $MAO_{i,t}$ takes a value of one if the auditor issues a MAO for firm *i* in year *t*, and zero otherwise. The main explanatory variable is *Coverage*, which represents the following three measures of analyst coverage: 1) *Report* is the number of analyst report issued for firm *i* in year *t-1*; 2) *Analyst* is the number of financial analyst following firm *i* in year *t-1*; 3) *Broker* is the number of brokerage house that issue analyst reports for firm *i* in year *t-1*; hypothesis 1 is supported if the coefficient of *Coverage* (a_1) is negative and significant.

To test hypothesis 2 we introduce a binary variable *NSOE* (one for non state-controlled firms, zero otherwise) into the model. We further include an interaction term between *NSOE* and *Coverage*. Hypothesis 2 is supported if the coefficient of the interaction term (b_3) is negative and significant.

$$MAO_{i,t} = \beta_0 + \beta_1 Coverage_{i,t-1} + \beta_2 NSOE_{i,t-1} + \beta_3 \text{Coverage}_{i,t-1} \times NSOE_{i,t-1} + \sum_{k=1}^{k} \beta_{k+3} Control_k + \varepsilon \quad (2)$$

Finally, we introduce a dummy variable ST (one if a listed firm has experienced losses for two consecutive years, zero otherwise) and use the following model to test hypothesis 3. A negative and significant coefficient of interaction term between ST and Coverage lends support to the hypothesis that analyst coverage plays a more significant role in reducing the propensity for ST firms to receive MAOs.

$$MAO_{i,t} = \gamma_0 + \gamma_1 Coverage + \gamma_2 STPT_{i,t-1} + \gamma_3 Coverage_{i,t-1} \times STPT_{i,t-1} + \sum_{k=1}^{k} \gamma_{k+3} Control_k + \varepsilon \quad (3)$$

3.3 Control variable

We employ three sets of control variables in our analyses. Our first set of control variables are related to firm-specific characteristics. We use the natural logarithm of market capitalization of firm *i* in year *t-1* as a measure of Size, and the price to book ratio as a proxy for Growth. SEOF is a dummy variable that takes the value 1 if a listed firm announced proposals for seasonal offerings and zero otherwise. Foreign is the percentage of total shares owned by foreign investors. RSR is the ratio of restricted shared to total shares. Fund represents the percentage of shares owned by mutual funds. OwnCon, which measures the ownership concentration, is the Herfindahl index of the top 10 block-holders. Big4 is a dummy variable that equals one if the firm is audited by one of the Big 4 auditors (Ernst & Young, KPMG, PriceWaterhouseCoopers and Deloitte), zero otherwise.[10] Finally, IFRS is a dummy variable that takes 1 for observations after 2007 when CGAAP (Chinese Generally Accepted Accounting principles) converged towards IFRS (International Financial Reporting Standards), zero otherwise.[11]

Previous studies suggest that boards characterized by a high percentage of independent directors that hold more frequent meetings can effectively safeguard the interests of shareholders (Beasley, 1996). Therefore we include the following governance variables as the second set of control variables. First, we include a dummy variable Duality, which takes

[10] In China, Big 4 auditing firms are legally required to launch a joint venture with a local firm to provide auditing service. We therefore regard an auditor as Big 4 if one of its partners is a Big 4.

[11] Because all Chinese listed firms have their fiscal year ending in December, we expect that the convergence of CGAAP towards IFRS would only affect financial statements issued in 2008 and 2009.

the value of one if the CEO of the firm also holds the position of chairman of the board, zero otherwise. Bmeet is the annual board meetings frequency, and Bsize is the number of board member. Indr is the percentage of independent directors on the board and Supsize is a dummy variable that equals one if the number of supervisory board member is above the median of all the observations in a sample year, and zero otherwise. Smeet is annual supervisory boarding meeting frequency.

Finally, we include *Year, Industry* and *Region* fixed effects. The year fixed effect captures the potential changing regulatory environment during our sample period (2003-2009), and the industry fixed effect captures the industry-specific impact on our analyses. We define industry according to the first two digits of the Global Industry Classification Standards (GICS). We include the region fixed effect to control for the effect of differentiated levels of market and institutional development across China.[12] Following Firth, Fung and Rui (2006), we classify firms into four different regions based on their level of economic and institutional development. We summarize the definition of variables in Appendix 1.

<< Insert Appendix 1 about here >>

3.4 Data

The data used in this study are collected from CCER (China Center for Economic Research) and CSMAR (China Stock Market and Accounting Research) database. Our sample period begins in 2003, the first year when data on firm ownership structure is made available. All the data except NSOE (ownership status) and ST (profit status) are extracted from CSMAR. We include all firms listed on the Shenzhen and Shanghai Stock Exchanges from 2003 to 2009.

[12] For example, the market development level is eastern area is more advanced than that in central and western provinces (Fan and Wang, 2005). It is recognized that institutional and market development has a significant impact on financial reporting quality (Firth, Mo and Wong, 2012; Firth, Rui and Wu, 2012).

Our final sample consists of 9,844 firm-year observations, in which 791 MAOs are identified over the sample period.

4 Results

4.1 Descriptive statistics

Figure 1 provides the change of analyst coverage for Chinese listed firms from 2003 to 2009. For an average firm in our sample, the number of reports issued (number of analysts following) has increased from 1 (1) in 2003 to 12 (7) in 2009. The number of brokerage house that issue reports also show a comparable increase. The evidence reflects the substantial growth of the financial analyst profession in China over the period under consideration.

<< Insert Figure 1 about here >>

Table 1 provides the descriptive statistics of the variables and compares the mean and median of the variables across the sub-samples partitioned based on whether a firm received a MAO from its auditor. As shown in Table 1, Panel A, firms that receive MAOs are covered by fewer analyst reports, followed by less analysts and brokerage houses, and the difference (median) is significant at the 1% level. Consistent with findings documented by prior studies (Chen et al., 2000), firms receiving MAOs are generally small in terms of market capitalization. Furthermore, firms with MAOs have less mutual fund ownership and are less likely to be audited by Big 4 auditors. NSOEs (non state-owned enterprise) and ST firms are more likely to receive MAOs. Finally, firms that receive MAOs tend to have less board members and smaller supervisory boards.

We further divide the sample into NSOEs (Panel B) and SOEs (Panel C) sub-samples

and compare characteristics of firms that receive and don't receive MAOs in each sub-sample. For both NSOEs and SOEs, we find that firms receiving MAOs are covered by fewer analyst reports, followed by less analysts and brokerage houses, which provides initial evidence supporting hypothesis 1. Firms that receive MAOs are smaller in terms of market capitalization. For both NSOEs and SOEs, firms that receive MAOs have less mutual fund ownership, suggesting that mutual fund ownership may have a positive effect on the financial reporting quality.

<< Insert Table 1 about here >>

4.2 Correlation

Table 2 presents the non-parametric Spearman correlation among the variables. The correlation between three measures of coverage (Report, Analyst and Broker) is positive and highly significant, consistent with the expectation that they reflect inter-related dimensions of external monitoring mechanisms. MAOs are negatively correlated with three measures of coverage, suggesting that external monitoring by analysts reduce the propensity that a firm would receive a MAO. MAOs are positively correlated with NSOEs, which implies that NSOEs are more likely to receive MAOs. The correlation between MAOs and ST firms is positive, suggesting that firms experiencing consecutive losses have incentives to manipulate earnings to avoid being delisted, which results in higher propensity for the issuance of MAOs. The correlation between MAOs and SEOF is negative, indicating that firms proposing seasonal offerings are less likely to receive MAOs. This is consistent with the regulation that listed firms would only be allowed to make seasonal offerings if they haven't received MAOs for three consecutive years prior to the offering. Size, fund ownership and Big 4 are negatively correlated with MAOs, which suggest that large firms, firms with high fund ownership and a Big 4 as auditors are less likely to receive MAOs. Analyst (Broker) is positively correlated with size and growth, which suggests that large firms and firms with

high growth potential are followed by more analysts (brokerage houses). NSOE is negatively correlated with size and fund ownership, indicating that NSOEs are firms with smaller market capitalization attracting less investment from funds. The correlation between NSOE and growth is positive, which implies that NSOEs have high growth potential. Among the control variables, size is positively correlated with fund ownership and Big 4, and the correlation between size and ST is negative. The correlation between growth (ST) and fund ownership is positive (negative), suggesting that mutual funds have higher ownership in growing firms but are less likely to invest in firms that experience consecutive losses.

<< Insert Table 2 about here >>

4.3 Empirical results

4.3.1 Test of hypothesis 1

Table 3 presents results consistent with our prediction that analyst coverage is negatively associated with the propensity for firms to receive MAOs from their auditors. First we use Report (the number of analyst reports issued for firm *i* in year *t-1*) as a proxy for analyst coverage and regress MAO in year *t* on Report and the control variables. The coefficient of Report is negative and significant (-0.0793, t= -2.62), suggesting that firms are less likely to receive MAOs when more analyst reports were issued in the previous year. When we compute the marginal effect, a one standard deviation increase in Report (12.218) leads to 3.15% decrease in the incidence of MAO, implying the economic significance of our finding. Next we replace Report with Analyst (number of analyst following firm *i* in year *t-1*) and repeat the analysis. The negative and significant coefficient of Analyst (-0.1527, t= -3.76) indicates that firms are less likely to experience MAOs if they are followed by more analysts in the previous year. Finally we substitute Analyst with Broker (number of brokerage house that issue report for firm *i* in year *t-1*) and repeat the regression. We find the coefficient of Broker is negative and significant (-0.1765, t= -4.12), confirming that more brokerage houses

following a firm reduces the propensity that MAOs would be issued.

Among the control variables, the coefficient of *ST* is positive and significant across the models, consistent with the conjecture that firms reporting consecutive losses are more likely to manipulate earnings to avoid being delisted, which results in the issuance of a MAO. The coefficient of size is negative and significant, suggesting that large firms are less likely to receive MAOs. The coefficient of SEOF is significantly negative, indicating that firms proposing seasonal offerings are less likely to receive MAOs. The coefficients of Fund and OwnCon are negative and significant across the models, indicating that firms with high ownership by mutual funds and high ownership concentration are less likely to receive MAO. It is worth noting that the IFRS dummy variable is positively significant, which suggests more MAOs after accounting standards in China converge toward IFRS. This may be attributed to the increase of managerial discretionary influence in financial reporting under principles-based accounting standards such as IFRS (Agoglia et al., 2011; Ahmed et al., 2013). Regarding the governance variables, the coefficients of *Indr* are negative (although marginally significant) across the models, which implies that an independent board is more effective in constraining earnings management and therefore contributes to high financial reporting quality. The findings are consistent with the view that independent directors have incentives to be effective monitors to maintain their reputation (Fama and Jensen, 1983). Overall we find supporting evidence for hypothesis 1.

<< Insert Table 3 about here >>

4.3.2 Test of hypothesis 2

To test hypothesis 2 we first regress MAO on NSOE and other control variables (excluding analyst coverage) in regression I. Then we add Coverage and interaction between Coverage and NSOE. We use Report, Analyst and Broker as proxies for analyst coverage in regression

II, III and IV. The results are presented in Table 4. In regression I the positive and significant coefficient of NSOE (0.36, t= 3.95) indicates that NSOEs are more likely to receive MAOs. This is consistent with the findings documented in Wang et al. (2008) that state-controlled firms are economically protected by central or local government, so auditors are less likely to issue MAOs for these firms. In regression II the coefficient of the interaction term between NSOE and analyst coverage is negative and significant (-0.1225, t= -1.93), which suggests that analyst monitoring of NSOEs (in terms of number of analyst reports issued) plays a more significant effect in decreasing the propensity that these firm would receive MAO.[13] When we compute the marginal effect, a one standard deviation increase in Report (12.218) reduces the incidence of MAOs among NSOEs by 4.73%, confirming the economic significance of our results. It is plausible that NSOEs are more susceptible to the external monitoring of analysts, because they have to maintain their good reputations to access the capital market at a lower cost. Consequently they are more likely to react to the issues raised in the analyst reports, leading to improved financial reporting quality and reduced propensity of receiving a MAO. In contrast, SOEs are under less pressure from analyst monitoring because they can enjoy the preferential treatment from the central and local government. The results in regression III are consistent with those in regression II, as the coefficient of the interaction is negative and significant (-0.1837, t= -2.22). In regression IV we use Broker as the proxy for analyst coverage and repeat the analysis. In line with results based on Report and Analyst, we find that the coefficient of NSOE (interaction) is significant and positive (negative). Our results thus support hypothesis 2.

<< Insert Table 4 about here >>

4.3.3 Results on the test of hypothesis 3

[13] The net effect of Report on the propensity that NSOEs would receive MAO is -0.16, the sum of b_1 and b_3.

To test hypothesis 3 we first regress MAO on ST and other control variables (excluding analyst coverage) in regression I. The positive and significant coefficient of ST is consistent with the conjecture that firms with consecutive losses are more likely to engage in earnings management to avoid compulsory delisting, which in turn results in high propensity of receiving MAOs. Next we include analyst coverage and an interaction term between ST and analyst coverage in the regression. In regression II we use Report as the first proxy for analyst coverage. The coefficients of Report and interaction are negative and significant (-0.08, t=-2.70; -0.3674, t=-2.18), suggesting that analyst coverage reduces the propensity that firms would receive MAO, and the effect is more pronounced for firms experiencing consecutive losses. The result of the marginal effect shows that a one standard deviation increase in Report (12.218) reduces the incidence of MAOs among ST firms by 14.46%, indicating the economic significance of our result. It is plausible that due to their sensitive and rather urgent status on the market ST firms attract more intense attention from analysts, who are able to utilize their expertise to identify and disclose the earnings management practice of ST firms. Consequently, ST firms have to take corrective action, which results in improved reporting quality and reduced propensity of receiving MAOs. Consistent with prior findings that analysts are more effective in detecting corporate fraud (Dyck et al., 2010), our results suggest that analysts play a disciplinary role in monitoring the financial reporting practice of ST firms. Next, we replace Report with Analyst (Broker) in regression III (IV), and get qualitatively consistent results. Taken together, our empirical evidence support hypothesis 3 that analyst coverage plays a more significant role in reducing the propensity that ST firms would receive MAOs from their auditors.

<< Insert Table 5 about here >>

5 Robustness checks

We perform a battery of sensitivity tests to check the robustness of our main findings.

5.1 Endogeneity Issue

A common concern with the studies of financial analysts is the potential endogeneity problem stemming from the fact that they do not follow listed firms randomly. We employ the lead-lag approach to alleviate the concern in the baseline tests. To further strengthen the rigor of the study, we also carry out additional robustness test. He and Tian (2013) summarize two strategies to address the issue. The first approach is to rely on quasi-natural experiments, namely brokerage closures (Kelly and Ljungqvist, 2011, 2012) and brokerage mergers (Hong and Kacperczyk, 2010), which directly affect firms' analyst coverage but are exogenous to firms' outcome. The second approach is to reply on instrumental variables and the two-stage least squares (2SLS) analysis. For example, Yu (2008) uses the index inclusion to capture exogenous variations in analyst coverage. Because the constructed quasi-natural experiments in the literature are based on the US samples and we failed to find the complete list of brokerage closures and mergers in China, we follow the strategy of Yu (2008) by using the index inclusion as the instrumental variable. Specifically, we use the Shanghai Shenzhen CSI 300 index (CSI 300) inclusion as instrumental variables, and estimate the predicted level of analyst coverage with whether a firm is included in the CSI 300 and firm-specific attributes. Firm as index constituents tends to attract more following analysts than a similar firm that is not included in the index. In addition, Yu (2008) note that the criteria for being added to the index are based on the industry conditions to which the firm belongs as well as on how representative a firm is of its industry.

We test the association between *predicted analyst coverage* and the incidence of

MAO. As the CSI 300 is compiled by the China Securities Index Company since April 8, 2005, this robustness check is based on a subsample from 2005 to 2009. The results, which are reported in Table 6 are consistent with our main finding. The predicted number of analyst reports help to reduce the incidence of MAOs in NSOEs, but not in SOEs.

<< Insert Table 6 about here >>

The literature has also recognized that analyst coverage is associated with firm factors such as firm size and institutional ownership. This is also reflected in the correlation matrix in Table 2 that the correlations of *Report* with both *Size* and *Fund* are greater than 0.5, indicating the strong size and fund effects. We control for these factors by following the approach of Yu (2008). We first run the regression model as follows:

$$Coverage_{i,t} = \alpha_0 + \alpha_1 Size_{i,t-1} + \alpha_1 Fund_{i,t-1} + \varepsilon_i \quad (4)$$

where *Coverage* is the number of reports issued on the firm; *Size* is the natural logarithm of market capitalization, and *Fund* is the number of shares held by mutual fund relative to the total number of shares. The residual of this regression is defined as the residual coverage and we incorporate it in Model (2) to perform the tests. The variation of the residual coverage is not attributed to firm size or fund ownership.

The results are reported in Table 7. The results of Regression I show that both firm size and fund ownership are significantly associated with analyst coverage and they explain as much as 39.28% of the variation. The results of Regression II show that the coefficient of residual coverage is negative but insignificant. However, the coefficient of the interaction term of residual coverage and NSOE is significantly negative, showing that analyst coverage

reduces the incidence of MAOs in NSOEs. The findings are consistent with the main results of Table 4 and further support our hypotheses, suggesting that our results are not driven by the size or fund effects.

<< Insert Table 7 about here >>

5.2 Controlling for firm performance

We use return on assets (ROA) as a proxy for firm performance and introduce a dummy variable "Under" which takes 1 for firms whose ROA is below the industry median in a given year, zero otherwise. It is likely that firms underperforming their industry peers would engage in earnings management, resulting in a high propensity of receiving MAO. Analyst coverage is expected to have a more significant effect in decreasing the propensity that underperforming firms would receive MAO. Therefore we include in the regression an interaction between Coverage and Under. Consistent with our prediction, the coefficient of Under is positive and significant, suggesting that underperforming firms are more likely to receive MAO. The coefficient of interaction is significantly negative, indicating that analyst coverage plays a more important role in reducing the propensity that underperforming firms would receive MAO. The results are presented in Table 8.

<< Insert Table 8 about here >>

5.3 Audit Shopping

In addition, the literature suggests that firms' audit choice decision is affected by their governance quality. For example, Archambeault and DeZoort (2001) find that governance

quality is associated with suspicious auditor switching. Previous research on auditing suggests that small and local auditors in China are more likely to issue clean audit opinions under pressure from their clients. If firms with lower analyst coverage tend to switch to local auditors that are less likely to detect problems in financial statement, there will be a positive association between analyst coverage and the incidence of Modified Audit Opinions (MAOs), because firms with lower analyst coverage are less likely to receive MAOs. This would bias us against finding the results. Taking this into account, we narrow down our sample to firms audited by Big 4 auditors, and repeat the analysis within the reduced sample. Our results again remain consistent.

5.4 Other tests

Given that various analyst coverage measures (Report, Analysts and Broker) are positively correlated (cf. Table 2), we repeat the analysis using Report and Broker conditional on Analyst being non-zero. That is, after removing all observations with zero analyst following, we conduct regression analysis with Report and Broker as proxies for analyst coverage. Our results (unreported) are qualitatively consistent.

To control for potentially omitted variables, we follow prior studies (Firth et al., 2011) by including additional control variables: LagMAO (dummy variable that equals one if the firm received MAO in the previous year, zero otherwise), ROE (return on equity), Current (current assets divided by current liabilities), Inventory (inventory divided by total assets), AR (accounts receivable divided by total assets), and re-run the analyses. Our main findings remain qualitatively unchanged (un-tabulated).

To take into consideration the effect of the split share structure reform in 2005,[14] we repeat our analysis in two sub-sample periods 2003-2004 and 2006-2009, and find consistent results in both periods. Finally we repeat our analysis for each of the sample year (2003 to 2009), and find our results stay robust for each year from the sample period. This mitigates concerns that our results are driven by observations from any particular year from the sample period.

5.5 Additional test on analyst recommendations

In addition to our main results based on the three measures of analyst coverage, we also examine whether the content the analyst reports is related to MAOs. Analysts often make their recommendation to the investors based on their analysis in the report. The standard recommendation is classified in the following five categories: strong buy (Grade 1), buy (Grade 2), hold (Grade 3), sell (Grade 4) and strong sell (Grade 5). It is worth noting that analysts do not explicitly give standard recommendation in some reports, and we denote them as Grade 0. We collect the analyst recommendation data from CSMAR and present the descriptive statistics in Panel A of Table 9. The total number of reports received by each firm ever year is 11.14 and 11.08 of them come with standard recommendations. It shows the average numbers (ratio) of reports with recommendation of strong buy, buy and hold (i.e. Grade 1-3) received by each firm in each year are respectively 2.64, 5.86 and 2.41 (17.82%, 40.94% and 37.53%), while the average numbers (ratio) of sell and strong sell (Grade 4-5) are as small as 0.05 and 0.11 (1.41% and 2.30%). This shows that financial analysts in China are reluctant to give negative recommendations presumably because of their concern of the relationship withlisted firms: recommendation of sell or strong sell could make it more

[14] Since this reform promotes the gradual elimination of the trading restriction of non-tradable shares, which are largely held by state shareholders, it is more likely to affect SOE listed firms than NSOE listed firms (Hou et al., 2012).

difficult for the analysts to get access to the listed firms in future[15].

Panel B of Table 9 shows the relation between analyst recommendation and MAOs in the subsequent year. Regression I shows that the coefficients of Grade 2 and Grade 4 are -0.3934 and 1.0081 respectively and significant at 1% level, indicating that recommendation of buy is significantly related to lower incidence of MAOs, while the recommendation of sell is related to higher incidence. When we classify the recommendation into three categories, we still obtain consistent results[16]. These findings are in line with our results in Table 7 that firms with better performance or prospects are more likely to provide high quality accounting information. In untabulated tests, we also replace the number of each type of recommendations with their ratio, as shown in regression II, the results are broadly consistent.

<< Insert Table 9 about here >>

6. Conclusion

In this study we find that analyst coverage is negatively associated with the propensity that Chinese listed firms would receive MAOs, and the negative association is more pronounced for non state-owned enterprises (NSOEs). Our results are robust after controlling firm-specific characteristics documented by previous research to affect the propensity of issuing MAOs. Furthermore, we show that analyst coverage plays a more significant role in reducing the propensity that firms confronting high delisting risk (ST firms) receive MAOs. In other words, ST firms may have strong incentives to manipulate earnings to avoid compulsory delisting. At the same time, due to their sensitive status ST firms are likely to attract increasing attention from analysts, who may use their experience and expertise to identify the financial reporting irregularities. This subsequently leads to a lower propensity of

[15] http://finance.sina.com.cn/stock/qsth/20091211/01237087405.shtml (in Chinese)
[16] We thank one anonymous reviewer for the suggestion.

issuing MAOs for ST firms.

Our study opens a broad avenue for ongoing research in this arena, so we provide some suggestion for future research. First, Xu et al. (2013) differentiate between "star" analyst (analyst selected by business magazine as one of the best analysts based on performance) and non-star analyst, and find that firms followed by "star" analyst show decreased return synchronicity, while this doesn't hold for firms followed by non-star analysts. Future research might examine whether star analyst coverage plays a more significant role in reducing the incidence of MAO, as "star" analysts in general have superior skills in producing firm-specific information and have greater influence on the market. Second, a combination between an archival study and a field study (e.g., interview with financial analyst and corporate managers) could provide more insights into the role of analyst in shaping the financial reporting incentive and practice. Third, it would be promising to conduct cross-country analysis to investigate how different cultural and institutional contexts can affect the relationship between analyst coverage and the quality of financial reporting. Fourth, given that financial analysts play a crucial governance role, it will be interesting to explore whether analyst coverage has any impact on firms' audit choice, as audit is considered as an important external governance mechanism that safeguards the interests of financial statement users. Finally, it might be interesting to examine the issue from the perspective of auditor by factoring analyst coverage into the risk-assessment framework of the external auditing. We encourage more research in these directions.

References

Archambeault, D., and DeZoort, F. T. (2001). Auditor opinion shopping and the audit committee: An analysis of suspicious auditor switches. *International Journal of Auditing*, 5, 33-52.

Agoglia, C., Doupnik, T., and Tsakumis, G. 2011. Principles-based versus rules-based accounting standards: The influence of standard precision and audit committee strength on financial reporting decisions. *The Accounting Review* 86, 747–767.

Agrawal, A., and Chen, M. 2008. Do analyst conflicts matter? Evidence from stock recommendations. *Journal of Law and Economics* 51, 503-537.

Aharony, J., Lee, C.W.J., and Wong, T.J. 2000. Financial packaging of IPO firms in China. *Journal of Accounting and Research* 38, 103-126.

Ahmed, A., Neel, S., and Wang, E. 2013. Does mandatory adoption of IFRS improve accounting quality? Preliminary evidence. *Contemporary Accounting Research* 30, 1344-1372. .

Ali, A., and Hwang, L. 2000. Country-specific factors related to the value relevance of accounting data earnings. *Journal of Accounting Research* 38, 1-21.

Ayers, B.C., and Freeman, R. N. 2003. Evidence that analyst following and institutional ownership accelerate the pricing of future earnings. *Review of Accounting Studies* 8, 47-67.

Ball, R., and Shivakumar, L. 2005. Earnings quality in UK private firms: Comparative loss recognition timeliness. *Journal of Accounting and Economics* 39, 83-128.

Ball, R., Kothari, S.P., and Robin, A. 2000. The effect of international institutional factors on accounting earnings. *Journal of Accounting and Economics* 29, 1-51.

Beasley, M.S. 1996. An empirical analysis of the relation between the board of director composition and financial statement fraud. *The Accounting Review* 71, 443-466.

Beatty, A., and Harris, D. 1998. The effects of tax, agency costs and information asymmetry on earnings management: A comparison of public and private firms. *Review of Accounting*

Studies 3, 299-326.

Burgstahler, D., and Dichev, I. 1997. Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics* 24, 99-126.

Chang, X., Dasgupta, S., and Hilary, G. 2006, Analyst coverage and financing decisions, *Journal of Finance* 61, 3009–3048.

Chen, H., Chen, J.Z., Lobo, G.J., and Wang, Y. 2011. Effects of audit quality on earnings management and cost of equity capital: Evidence from China. *Contemporary Accounting Research* 28, 892–925.

Chen, C., Su, X., and Zhao, R. 2000. An emerging market's reaction to initial modified audit opinions: Evidence from the Shanghai Stock Exchange. *Contemporary Accounting Research* 17, 429- 455.

Chen, G., Firth, M., Xin, Y., and Xu, L. 2008. Control transfers, privatization, and corporate performance: Efficiency gains in China's listed companies. *Journal of Financial and Quantitative Analysis* 43, 161-190

Chen, K., and Yuan, H. 2004. Earnings management and capital resource allocation: evidence form China's accounting-based regulation of right issues. *The Accounting Review* 79, 645-665.

Chen, J., Cumming, D., Hou, W., and E, Lee. 2014. Does the external monitoring effect of financial analysts deter corporate fraud in China? *Journal of Business Ethics*, Forthcoming.

Chung, K.H., and Jo, H. 1996. The impact of security analysts' monitoring role and market functions of the market value of firms. *Journal of Financial and Quantitative Analysis* 31, 493-512

CSRC, 2001. Rules for stock trading suspension and exchange delisting of companies reporting losses. December 5th, 2001.

Degeorge, F., Ding, Y., Jeanjean, T., and Stolowy, H. 2013. Analyst coverage, earnings management and financial development: An international study. *Journal of Accounting and Pubic Policy* 32, 1-25.

Degeorge, F., Patel, J., and Zeckhauser, R. 1999. Earnings management to exceed thresholds, *The Journal of Business* 72, 1-33.DeFond, M.L., and Jiambalvo, J. 1994. Debt covenant violation and manipulation of accruals. *Journal of Accounting and Economics* 17, 145-176.

DeFond, M.L., Erkens, D.H., and Zhang, J, 2014. Do client characteristics really drive the Big N audit quality effect? University of Southern California Working Paper No. ACC 02.14.

Dyck, A., Morse, A., and Zingales, L. 2010. Who blows the whistle on corporate fraud? *Journal of Finance* 65, 2015–2444

Fama, E.F., and Jensen, M.C. 1983. Separation of ownership and control. *Journal of Law and Economics* 26, 301-325.

Fan, J.P.H., and Wong, T.J. 2005. Do external auditors perform a corporate governance role in emerging markets? Evidence from East Asia, *Journal of Accounting Research* 43, 35-72.

Firth, M., Fung, P., and Rui, O.M. 2006. Corporate governance and CEO compensation in China. *Journal of Corporate Finance*, 12, 693–714.

Firth, M., Mo, P., and Wong, R. 2012. Auditors' organizational form, legal liability, and reporting conservatism: Evidence from China. *Contemporary Accounting Research* 29, 57-93

Firth, M., Rui, O.M., and Wu, X. 2012. How do various forms of auditor rotation affect audit quality? Evidence from China. *The International Journal of Accounting* 47, 109-138.

Graham, J., Harvey, C., and Rajgopal, S. 2005. The economic implications of corporate financial reporting, J*ournal of Accounting and Economics* 40, 3-73.

He, J. J., and Tian, X. (2013). The dark side of analyst coverage: The case of innovation. *Journal of Financial Economics* 109, 856-878.

Healy, P., and Palepu, K. 2001. Information asymmetry, corporate disclosure and the capital

markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31, 405-440.

Hong, H., and Kacperczyk, M., 2010. Competition and bias. *Quarterly Journal of Economics* 125, 1683–1725

Hong, H., and Kubik, J. 2003. Analyzing the analyst: career concerns and biased earnings forecast. *Journal of Finance* 58, 313-351.

Hong, H., Kubik, J., and Solomon, A. 2000. Security analyst's career concerns and herding of earning s forecast. *Rand Journal of Economics* 31, 121-144.

Hong, H., Lim, T., and Stein, J. 2000. Bad news travels slowly: size, analyst coverage and the profitability of momentum strategies. *Journal of Finance* 55, 265-295.

Hou, W., Kuo, J., and Lee, E., 2012. The impact of state ownership on share price informativeness: The case of the Split Share Structure Reform in China. *British Accounting Review* 44, 248–261.

Irani, R., and Oesch, D. 2013. Financial reporting and the information environment: Evidence from natural experiment. *Journal of Financial Economics* 109, 398-418.

Irvine, P. 2004. Analysts' forecast and brokerage-firm trading. *The Accounting Review* 79, 125-149.

Jacob, J., Rock, S., and Weber, D. 2008. Do non-investment bank analysts make better earnings forecasts? *Journal of Accounting, Auditing and Finance* 23, 23-61.

Jiang, G., and Wang, H. 2008. Should earnings thresholds be used as delisting criteria in stock market? *Journal of Accounting and Public Policy* 27, 409-419.

Keating, A., and Zimmerman, J. 1999. Depreciation-policy changes: tax, earnings management and investment opportunity incentives. *Journal of Accounting and Economics* 28, 359-389.

Kelly, B., Ljungqvist, A., 2011. The value of research. Unpublished working paper

Kelly, B., Ljungqvist, A., 2012. Testing asymmetric-information asset pricing models. *Review of Financial Studies* 25, 1366–1413.

Kinney, W.R., Matrtin, R.D, and Martin, R.D. 1994. Auditor does auditing reduce bias in financial reporting? A review of audit-related adjustments studies. *Auditing: A Journal of Practice & Theory* 13,149-156.

Leuz, C., Nanda, D., and Wysocki, P. 2003. Earnings management and institutional factors: an international comparison. *Journal of Financial Economics* 69, 505-527.

Lang, M.H., Lins, K.V., and Miller, D.P. 2004. Concentrated control, analyst following, and valuation: Do analyst matter most when investors are protected least? *Journal of Accounting Research* 42, 589-623.

La Porta, R., Lopez de Silanes, F., Shleifer, A., and Vishny, R.W., 1998. Law and Finance. J*ournal of Political Economy* 106, 1113-1155.

La Porta, R., Lopez de Silanes, F., Shleifer, A., and Vishny, R.W., 1999. Corporate ownership around the world. *Journal of Finance* 54, 471-517.

Lim, T. 2001. Rationality and analysts' forecast bias. *Journal of Finance* 56, 369-385.

Liu, Q., and Lu, Z. 2007. Corporate governance and earnings management in the Chinese listed companies: a tunneling perspective. *Journal of Corporate Finance* 13, 881-906.

Ljungqvist, A., Marston, F., Wilhelm, W. 2006. Competing for security underwriting mandates: banking relationships and analyst recommendations. *Journal of Finance* 61, 301-340.

Peasnell, K., Pope, P., and Young, S. 2005. Board monitoring and earnings management: Do outside directors influence abnormal accruals? *Journal of Business, Finance and Accounting* 32, 1311-1346.

Penman, S., and Zhang, X. 2002. Accounting conservatism, the quality of earnings, and stock returns. *The Accounting Review* 77, 237-264.

Roulstone, D.T. (2003).Analyst following and market liquidity. *Contemporary Accounting Research* 20, 552-578.

Sun, J. 2011. The effect of analyst coverage on the informativeness of income smoothing. *International Journal of Accounting* 46, 333-349.

Sun, J., and Liu, G. 2011. The effect of analyst coverage on accounting conservatism. *Managerial Finance* 37, 5-20.

Xu, N., Chan, K., Jiang, X., and Z, Yi. 2013. Do star analysts know more firm-specific information? evidence from China. *Journal of Banking and Finance* 37, 89-102.

Yu, F. 2008. Analyst coverage and earnings management. *Journal of Financial Economics* 88, 245-271.

Appendix 1. Definition of Variables

Main test variables:

MAO	A dummy variable that takes the value of 1 if modified audit opinion has been issued for firm *i* in year *t*, zero otherwise.
Report	The number of analyst reports issued for firm *i* in year *t*-1.
Analyst	The number of financial analysts following firm *i* in year *t*-1.
Broker	The of brokerage house that issue analyst reports for firm *i* in year *t*-1.
NSOE	A dummy variable that equals 1 if the controlling shareholder of the firm is not the central or local government; 0 otherwise.

Control Variables:

Size	The natural logarithm of market capitalization
Growth	Price-to-book ratio
ST	A dummy variable assigned to 1 if a listed firm experiences consecutive two-year or longer loss; 0 otherwise
SEOF	A dummy variable assigned to 1 if a listed firm announce a proposal of seasonal offering in the year; 0 otherwise.
Foreign	The number of foreign shares relative to the total number of shares
RSR	The number of restricted shares relative to the total number of shares
Fund	The number of shares held by mutual fund relative to the total number of shares
OwnCon	The Herfindahl index of the top 10 largest blockholders of the firm
Big4	A dummy variable assigned to 1 if the audit firm is one of the big 4 (i.e. PwC, Deloittee, Ernst & Young, and KPMG); 0 otherwise
IFRS	A dummy variable assigned to 1 for observations after 2007 onwards when Chinese Generally Accepted Accounting Principles (CGAAP) converged with the International Financial Reporting Standard(IFRS); 0 otherwise
Duality	A dummy variable equal to 1 if the CEO also holds the position of board chair; 0 otherwise
BMeet	Annual board meeting frequency
Bsize	The number of board members
Inder	The ratio of independent directors in the board
Supsize	A dummy variable equal to 1 if the number of supervisory board members is above the median value of the yearly observations, and 0 otherwise
Smeet	Annual supervisory board meeting frequency

Industry and region dummies are defined in our empirical analysis are defined as follow:

The industry dummies are constructed based on the first two digits of the GICS (Global Industry Classification Standard) codes. The region dummies are constructed by following Frith et al. (2006), in which the firms are grouped into four different regions by the levels of economic development: 1. Shanghai and Shenzhen; 2. The more developed areas including the eastern and coastal provinces; 3. The inland provinces; and 4. The least developed provinces in the north-western part of the country.

Figure 1. Analyst Coverage in China

Figure 1 presents the average analyst coverage of the Chinese listed firms from 2003 to 2009. Report denotes the number of analyst reports issued for the firm. Analyst denotes the number of financial analysts following the firm; Broker is the number of brokerage house that issue analyst reports on the firms.

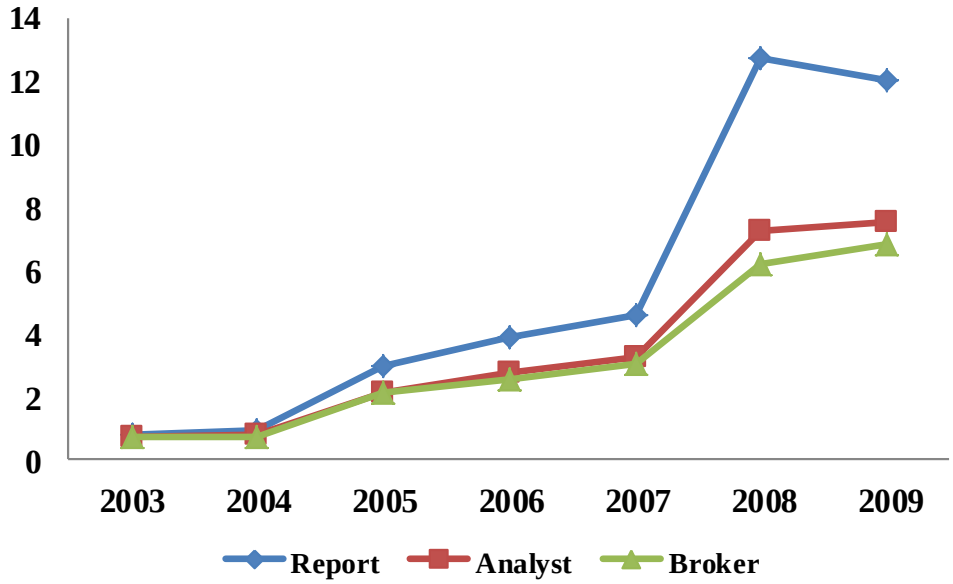

Table 1. Descriptive Statistics

This table presents the descriptive statistics of the variables and the partitioned samples based on the audit opinion, as well as the difference of median test. *MAO* equals 1 if modified (non-standard option) audit opinion is issued by the auditors and 0 otherwise. *Coverage* denotes the following three measures of analyst coverage. *Report* denotes the number of analyst reports issued for the firm. *Analyst* denotes the number of financial analysts following the firm; *Broker* is the number of brokerage house that issue analyst reports on the firms. *NSOE* equals 1 if the firm is non-state-owned enterprise and 0 otherwise. Other variables are defined in Appendix 1. *, **, *** indicate 10%, 5%, and 1% level significance respectively. Panel A is based on the whole sample, whereas Panel B and C are based on NSOE samples and SOE samples respectively. The median values in Panel A are compared by using the Mann-Whitney U-test (i.e. Wilcoxon rank-sum test). It is worth to note that the Z-value is significant when the median values of two samples are same because the test also detects difference in shape and spread.

Panel A

	Total			MAO=1			MAO=0			Difference					
	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median	Mean	t-value		Median	z-value	
MAO	0.0858	0.2801	0												
Report	5.8107	12.2180	1	0.6030	2.7681	0	6.2658	12.6127	1	5.6627	12.6002	***	1	22.653	***
Analyst	3.7266	6.6934	1	0.4336	1.7597	0	4.0144	6.8860	1	3.5807	14.5828	***	1	22.69	***
Broker	3.3782	5.8022	1	0.4096	1.6286	0	3.6376	5.9615	1	3.2280	15.1787	***	1	22.707	***
NOSE	0.3533	0.4780	0	0.4766	0.4998	0	0.3425	0.4746	0	-0.1341	-7.5864	***	0	-7.565	***
Size	13.8878	1.2121	13.7434	13.0302	1.0428	12.9185	13.9627	1.1970	13.8067	0.9326	21.2191	***	0.8882	20.268	***
Growth	3.7306	4.1802	2.6442	3.7418	8.5167	2.0751	3.7296	3.5596	2.6774	-0.0122	-0.0785		0.6023	7.971	***
ST	0.0883	0.2837	0	0.5145	0.5001	1	0.0510	0.2201	0	-0.4635	-49.1773	***	-1	-44.063	***
SEOF	0.0489	0.2156	0	0.0063	0.0793	0	0.0526	0.2232	0	0.0463	5.7966	***	0	5.787	***
Foreign	0.0140	0.0643	0	0.0115	0.0524	0	0.0142	0.0652	0	0.0028	1.1562		0	0.657	
RSR	0.4863	0.2113	0.5284	0.4892	0.1897	0.5225	0.4861	0.2130	0.5293	-0.0031	-0.4016		0.0068	0.578	
Fund	0.0346	0.0697	0.0015	0.0037	0.0215	0	0.0373	0.0718	0.0027	0.0336	13.1259	***	0.0027	24.955	***
OwnCon	0.1911	0.1288	0.1585	0.1426	0.1118	0.1095	0.1958	0.1310	0.1636	0.0531	11.0785	***	0.0542	12.316	***
Big4	0.0718	0.2582	0	0.0278	0.1645	0	0.0757	0.2645	0	0.0479	5.0046	***	0	4.999	***
IFRS	0.4675	0.4990	0	0.3552	0.4789	0	0.4773	0.4995	0	0.1221	6.6118	***	0	6.597	***
Duality	0.1399	0.3469	0	0.1745	0.3797	0	0.1369	0.3437	0	-0.0376	-2.9248	***	0	-2.924	***
Bsize	9.4708	2.1067	9	8.9760	2.0260	9	9.5141	2.1082	9	0.5381	6.9053	***	0	6.728	***
Bmeet	8.3770	3.4757	8	8.3666	3.2820	8	8.3779	3.4923	8	0.0113	0.0874		0	-0.784	
Indr	0.3517	0.0529	0.3333	0.3498	0.0690	0.3333	0.3519	0.0512	0.3333	0.0021	1.051		0	-0.203	
Supsize	4.0977	1.4277	3	3.9229	1.3818	3	4.1130	1.4307	3	0.1901	3.5937	***	0	3.676	***
Smeet	4.0623	1.7809	4	3.8053	1.6801	4	4.0847	1.7877	4	0.2794	4.2353	***	0	4.468	***
Obs.		9844			791			9053							

Panel B

Sample: NSOE	MAO=1			MAO=0			Difference		
	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median	Mean	t-value	
Report	0.4508	2.4632	0	5.6144	11.3179	1	5.1636	8.6976	***
Analyst	0.3060	1.4653	0	3.5155	6.0769	1	3.2095	10.0607	***
Broker	0.2869	1.3436	0	3.1543	5.2532	1	2.8674	10.3924	***
Size	12.8922	1.0381	12.7987	13.8349	1.0901	13.7723	0.9427	15.5615	***
Growth	3.4917	8.7477	1.9305	4.3590	4.3095	3.1530	0.8673	3.0521	***
ST	0.5847	0.4934	1	0.0707	0.2563	0	-0.5140	-30.9986	***
SEOF	0.0055	0.0738	0	0.0699	0.2550	0	0.0644	4.8036	***
Foreign	0.0162	0.0616	0	0.0239	0.0875	0	0.0078	1.6388	
RSR	0.4819	0.1954	0.5186	0.4497	0.2153	0.4871	-0.0322	-2.7085	***
Fund	0.0024	0.0131	0	0.0365	0.0700	0.0012	0.0341	9.3047	***
OwnCon	0.1085	0.0787	0.0874	0.1449	0.1011	0.1189	0.0364	6.6263	***
Big4	0.0137	0.1162	0	0.0353	0.1847	0	0.0217	2.184	**
IFRS	0.3825	0.4867	0	0.5720	0.4949	1	0.1895	6.8654	***
Duality	0.2077	0.4062	0	0.1998	0.4000	0	-0.0078	-0.3485	
Bsize	8.6284	2.1399	9	8.8602	1.7786	9	0.2318	2.2687	**
Bmeet	8.5355	3.2066	8	8.9183	3.6833	8	0.3828	1.8881	*
Indr	0.3577	0.0770	0.3333	0.3600	0.0505	0.3333	0.0023	0.7642	
Supsize	3.6148	1.1356	3	3.5826	1.0174	3	-0.0321	-0.5561	
Smeet	3.7623	1.6505	4	4.3404	1.8411	4	0.5781	5.6876	***
Obs.		366			2547				

Panel C

Sample: SOE	MAO=1			MAO=0			Difference		
	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median	Mean	t-value	
Report	0.7415	3.0394	0	6.1391	12.8617	1	5.3976	8.5217	***
Analyst	0.5459	1.9955	0	3.8538	6.9294	1	3.3079	9.6847	***
Broker	0.5169	1.8539	0	3.4844	5.9612	1	2.9675	10.0941	***
Size	13.1431	1.0402	13.0262	14.0402	1.2183	13.8807	0.8971	14.6161	***
Growth	4.0910	8.3629	2.2224	3.4188	3.2202	2.4757	-0.6722	-3.5049	***
ST	0.4493	0.4980	0	0.0472	0.2121	0	-0.4021	-32.7989	***
SEOF	0.0072	0.0849	0	0.0489	0.2157	0	0.0416	3.9079	***
Foreign	0.0076	0.0431	0	0.0078	0.0438	0	0.0002	0.0692	
RSR	0.5022	0.1770	0.5278	0.4817	0.2068	0.5269	-0.0205	-1.9664	**
Fund	0.0050	0.0270	0	0.0387	0.0748	0.0024	0.0337	9.1284	***
OwnCon	0.1741	0.1267	0.1323	0.2167	0.1373	0.1922	0.0426	6.1329	***
Big4	0.0411	0.1987	0	0.0885	0.2841	0	0.0475	3.3438	***
IFRS	0.3285	0.4702	0	0.4326	0.4955	0	0.1041	4.1479	***
Duality	0.1498	0.3573	0	0.1000	0.3000	0	-0.0498	-3.2222	***
Bsize	9.2923	1.8761	9	9.7564	2.1140	9	0.4641	4.3494	***
Bmeet	8.2536	3.3585	8	8.2834	3.3931	8	0.0298	0.173	
Indr	0.3435	0.0596	0.3333	0.3479	0.0510	0.3333	0.0044	1.6818	*
Supsize	4.1981	1.5165	4	4.3384	1.4889	5	0.1403	1.8517	*
Smeet	3.8357	1.7037	4	4.0492	1.7621	4	0.2135	2.3885	**
Obs.		414			5952				

Table 2. Correlation Matrix

This table presents the nonparametric spearman rank correlation matrix of the variables used in our analyses. *MAO* equals 1 if modified (non-standard option) audit opinion is issued by the auditors and 0 otherwise. *Coverage* denotes the following three measures of analyst coverage. *Report* denotes the number of analyst reports issued for the firm. *Analyst* denotes the number of financial analysts following the firm; *Broker* is the number of brokerage house that issue analyst reports on the firms. *NSOE* equals 1 if the firm is non-state-owned enterprise and 0 otherwise. Other variables are defined in Appendix 1.

	[1]	*[2]*	*[3]*	*[4]*	*[5]*	*[6]*	*[7]*	*[8]*	*[9]*	*[10]*	*[11]*	*[12]*	*[13]*	*[14]*	*[15]*	*[16]*	*[17]*	*[18]*	*[19]*	*[20]*	*[21]*
[1]MAO	1.00																				
[2]Report	-0.23*	1.00																			
[3]Analyst	-0.23*	1.00*	1.00																		
[4]Broker	-0.23*	1.00*	1.00*	1.00																	
[5]NOSE	0.08*	0.03*	0.04*	0.04*	1.00																
[6]Size	-0.20*	0.57*	0.57*	0.56*	-0.10*	1.00															
[7]Growth	-0.07*	0.20*	0.20*	0.20*	0.12*	0.36*	1.00														
[8]ST	0.36*	-0.26*	-0.26*	-0.26*	0.07*	-0.22*	0.01	1.00													
[9]SEOF	-0.06*	0.16*	0.16*	0.15*	0.02	0.19*	0.10*	-0.03*	1.00												
[10]Foreign	-0.01	0.08*	0.08*	0.08*	0.11*	0.01	0.01	-0.02	0.02	1.00											
[11]RSR	0.00	-0.10*	-0.09*	-0.08*	0.03*	-0.44*	-0.07*	-0.01	-0.02	0.12*	1.00										
[12]Fund	-0.24*	0.69*	0.69*	0.69*	-0.04*	0.54*	0.15*	-0.35*	0.17*	0.05*	-0.06*	1.00									
[13]OwnCon	-0.12*	0.11*	0.11*	0.11*	-0.23*	-0.05*	-0.05*	-0.12*	0.00	-0.02	0.54*	0.10*	1.00								
[14]Big4	-0.05*	0.21*	0.21*	0.21*	-0.07*	0.20*	-0.02	-0.07*	0.02	0.09*	0.04*	0.15*	0.13*	1.00							
[15]IFRS	-0.08*	0.35*	0.35*	0.34*	0.11*	0.55*	0.39*	-0.01	0.15*	0.02	-0.43*	0.14*	-0.14*	-0.01	1.00						
[16]Duality	0.02	0.00	0.00	0.00	0.14*	-0.03*	0.07*	0.06*	-0.01	0.05*	0.01	-0.02	-0.06*	-0.04*	0.06*	1.00					
[17]Bsize	-0.05*	0.14*	0.14*	0.14*	-0.18*	0.12*	-0.06*	-0.12*	0.02	0.06*	0.06*	0.14*	0.04*	0.15*	-0.09*	-0.11*	1.00				
[18]Bmeet	0.01	0.09*	0.08*	0.08*	0.04*	0.20*	0.14*	0.03*	0.15*	0.01	-0.16*	0.05*	-0.09*	0.04*	0.28*	-0.01	-0.06*	1.00			
[19]Indr	-0.02	0.08*	0.08*	0.08*	0.09*	0.09*	0.06*	0.01	0.04*	0.00	-0.08*	0.04*	-0.04*	0.02	0.16*	0.05*	-0.21*	0.08*	1.00		
[20]Supsize	-0.03*	0.05*	0.06*	0.06*	-0.24*	0.11*	-0.08*	-0.07*	-0.01	-0.01	0.02	0.08*	0.07*	0.09*	-0.07*	-0.10*	0.34*	-0.05*	-0.10*	1.00	
[21]Smeet	-0.05*	0.18*	0.18*	0.17*	0.02	0.28*	0.17*	0.00	0.11*	-0.01	-0.23*	0.08*	-0.06*	0.03*	0.39*	0.01	-0.04*	0.38*	0.09*	0.01	1.00

Table 3. Analyst Coverage and Modified Audit Opinions

This table presents the results of the Logit regression model:

$$MAO_{i,t} = \alpha_0 + \alpha_1 Cover_{i,t-1} + \sum_{k=2}^{k} \alpha_k Control_k + \varepsilon$$

The dependent variable *MAO* equals 1 if modified audit opinion is issued by the auditor, and 0 otherwise. *Report* denotes the number of analyst reports issued for the firm. *Analyst* denotes the number of financial analysts following the firm. *Broker* is the number of brokers house that issue analyst reports on the firms. Other variables are defined in the Appendix. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Regression I			Regression II			Regression III		
Report	-0.0793	-2.62	***						
Analyst				-0.1527	-3.76	***			
Broker							-0.1765	-4.12	***
Size	-0.4560	-5.75	***	-0.4376	-5.55	***	-0.4316	-5.47	***
Growth	-0.0102	-1.19		-0.0104	-1.22		-0.0104	-1.23	
ST	1.8429	18.57	***	1.8200	18.39	***	1.8145	18.36	***
SEOF	-1.8620	-3.3	***	-1.8750	-3.32	***	-1.8708	-3.32	***
Foreign	0.0197	0.03		0.0798	0.13		0.0958	0.15	
RSR	-0.7501	-2.29	**	-0.6389	-1.94	*	-0.6120	-1.85	*
Fund	-6.6057	-2.5	**	-5.5024	-2.2	**	-5.1865	-2.12	**
OwnCon	-2.8091	-5.83	***	-2.8212	-5.85	***	-2.8253	-5.86	***
Big4	0.1313	0.6		0.1653	0.75		0.1763	0.8	
IFRS	0.4234	2.32	**	0.4704	2.56	**	0.4816	2.62	***
Duality	-0.0293	-0.26		-0.0224	-0.2		-0.0226	-0.2	
Bsize	-0.0173	-0.73		-0.0155	-0.65		-0.0147	-0.62	
Bmeet	0.0344	3	***	0.0341	2.96	***	0.0339	2.94	***
Indr	-1.3417	-1.57		-1.3126	-1.53		-1.3049	-1.53	
Supsize	0.0535	1.54		0.0530	1.52		0.0527	1.51	
Smeet	-0.0249	-0.99		-0.0260	-1.03		-0.0263	-1.04	
Constant	4.3028	3.56	***	4.0126	3.33	***	3.9217	3.26	***
Region effect		Yes			Yes			Yes	
Industry effect		Yes			Yes			Yes	
Year effect		Yes			Yes			Yes	
Pseudo R^2		0.229			0.2313			0.232	
N		9844			9844			9844	

Table 4. Non-State-Owned Enterprises, Analyst Coverage and Modified Audit Opinion

This table presents the results of the Logit model:

$$MAO_{i,t} = \alpha_0 + \alpha_1 Cover_{i,t-1} + \alpha_2 NSOE_{i,t-1} + \alpha_3 Cover_{i,t-1} \times NSOE_{i,t-1} + \sum_{k=1}^{k} \alpha_{k+3} Control_k + \varepsilon$$

The dependent variable *MAO* equals 1 if modified audit opinion is issued by the auditor, 0 otherwise. *Coverage* denotes the following three measures of analyst coverage. *Report* denotes the number of analyst reports issued for the firm. *Analyst* denotes the number of financial analysts following the firm; *Broker* is the number of brokerage house that issue analyst reports on the firms. *NSOE* equals 1 if the firm is non-state-owned enterprise and 0 otherwise. Other control variables are defined in Appendix 1. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Regression I			Regression II *Cover=Report*			Regression III *Cover=Analyst*			Regression IV *Cover=Broker*		
Cover				-0.0401	-1.45		-0.0871	-2.05	**	-0.0324	-1.37	
NSOE	0.3600	3.95	***	0.4851	4.82	***	0.5063	5.07	***	0.5342	5.43	***
Cover×NSOE				-0.1225	-1.93	*	-0.1837	-2.22	**	-0.2417	-3.12	***
Size	-0.4933	-6.46	***	-0.4321	-5.44	***	-0.4152	-5.24	***	-0.4310	-5.42	***
Growth	-0.0102	-1.14		-0.0106	-1.23		-0.0109	-1.27		-0.0107	-1.25	
ST	1.8991	19.14	***	1.8280	18.24	***	1.8068	18.14	***	1.8092	18.14	***
SEOF	-1.9009	-3.34	***	-1.8812	-3.31	***	-1.8914	-3.33	***	-1.8871	-3.32	***
Foreign	-0.3295	-0.53		-0.1333	-0.21		-0.0889	-0.14		-0.0949	-0.15	
RSR	-1.2195	-3.93	***	-0.7864	-2.31	**	-0.6904	-2.03	**	-0.7104	-2.09	**
Fund	-11.7532	-3.97	***	-7.0973	-2.65	***	-6.1124	-2.38	**	-7.0725	-2.67	***
OwnCon	-2.2993	-4.67	***	-2.3396	-4.73	***	-2.3367	-4.72	***	-2.3615	-4.77	***
Big4	0.0291	0.13		0.1225	0.56		0.1541	0.7		0.1212	0.55	
IFRS	0.2196	1.21		0.3760	2.02	**	0.4186	2.24	**	0.4149	2.23	**
Duality	-0.0717	-0.63		-0.0433	-0.38		-0.0380	-0.33		-0.0379	-0.33	
Bsize	-0.0185	-0.78		-0.0136	-0.57		-0.0115	-0.48		-0.0133	-0.56	
Bmeet	0.0328	2.83	***	0.0315	2.69	***	0.0310	2.62	***	0.0304	2.58	***
Indr	-1.6269	-1.89	*	-1.6445	-1.92	*	-1.6279	-1.9	*	-1.6633	-1.94	*
Supsize	0.0707	2.02	**	0.0679	1.92	*	0.0681	1.93	*	0.0672	1.91	*
Smeet	-0.0233	-0.92		-0.0242	-0.95		-0.0252	-0.99		-0.0247	-0.97	
Constant	4.9229	4.24	***	3.8706	3.19	***	3.5950	2.97	***	3.8268	3.15	***
Region effect		Yes			Yes			Yes			Yes	
Industry effect		Yes			Yes			Yes			Yes	
Year effect		Yes			Yes			Yes			Yes	
Pseudo R^2		0.2278			0.2343			0.2368			0.2363	
N		9844			9844			9844			9844	

Table 5. Delisting Risks, Analyst Coverage and Modified Audit Opinion

This table presents the results of the Logit model:

$$MAO_{i,t} = \alpha_0 + \alpha_1 Cover_{i,t-1} + \alpha_2 ST_{i,t-1} + \alpha_3 Cover_{i,t-1} \times ST_{i,t-1} + \sum_{k=1}^{k} \alpha_{k+3} Control_k + \varepsilon$$

The dependent variable *MAO* equals 1 if modified audit opinion is issued by the auditor, 0 otherwise. *Coverage* denotes the following three measures of analyst coverage. *Report* denotes the number of analyst reports issued for the firm. *Analyst* denotes the number of financial analysts following the firm; *Broker* is the number of brokerage house that issue analyst reports on the firms. *ST* is a dummy variable assigned to 1 if a listed firm experiences consecutive two-year or longer loss and labelled as "special treatment" by the regulatory commission to indicate the delisting risk; and 0 otherwise. Other control variables are defined in Appendix 1. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Regression I			Regression II *Cover=Report*			Regression III *Cover=Analyst*			Regression IV *Cover=Broker*		
Cover				-0.0808	-2.7	***	-0.1550	-3.87	***	-0.1782	-4.24	***
ST	1.8991	19.14	***	1.9211	18.15	***	1.8924	17.81	***	1.8934	17.84	***
Cover × ST				-0.3674	-2.18	**	-0.3930	-1.9	*	-0.4588	-2.18	**
Size	-0.4933	-6.46	***	-0.4071	-5.09	***	-0.3894	-4.89	***	-0.3818	-4.79	***
Growth	-0.0102	-1.14		-0.0112	-1.29		-0.0113	-1.32		-0.0114	-1.32	
NSOE	0.3600	3.95	***	0.3846	4.21	***	0.3977	4.36	***	0.4005	4.4	***
SEOF	-1.9009	-3.34	***	-1.8345	-3.24	***	-1.8493	-3.27	***	-1.8459	-3.27	***
Foreign	-0.3295	-0.53		-0.1620	-0.26		-0.1167	-0.18		-0.1017	-0.16	
RSR	-1.2195	-3.93	***	-0.9007	-2.73	***	-0.7863	-2.37	**	-0.7576	-2.28	**
Fund	-11.7532	-3.97	***	-6.9846	-2.57	***	-5.8760	-2.27	**	-5.5824	-2.2	**
OwnCon	-2.2993	-4.67	***	-2.2725	-4.61	***	-2.2712	-4.6	***	-2.2708	-4.59	***
Big4	0.0291	0.13		0.1485	0.68		0.1816	0.83		0.1921	0.88	
IFRS	0.2196	1.21		0.3381	1.83	*	0.3897	2.09	**	0.4036	2.17	**
Duality	-0.0717	-0.63		-0.0548	-0.48		-0.0485	-0.42		-0.0483	-0.42	
Bsize	-0.0185	-0.78		-0.0104	-0.44		-0.0085	-0.36		-0.0074	-0.31	
Bmeet	0.0328	2.83	***	0.0348	2.95	***	0.0343	2.88	***	0.0339	2.86	***
Indr	-1.6269	-1.89	*	-1.5841	-1.84	*	-1.5531	-1.81	*	-1.5516	-1.81	*
Supsize	0.0707	2.02	**	0.0677	1.92	*	0.0681	1.93	*	0.0678	1.92	*
Smeet	-0.0233	-0.92		-0.0254	-1		-0.0265	-1.05		-0.0269	-1.06	
Constant	4.9229	4.24	***	3.5478	2.9	***	3.2556	2.67	***	3.1418	2.57	***
Region effect		Yes			Yes			Yes			Yes	
Industry effect		Yes			Yes			Yes			Yes	
Year effect		Yes			Yes			Yes			Yes	
Pseudo R^2		0.2278			0.2332			0.2355			0.2364	
N		9844			9844			9844			9844	

Table 6. Exogenous variations from index inclusion.

The table repots the results of two-stage least squares regressions with Shanghai Shenzhen CSI 300 index inclusion dummy as the instrumental variable. The index is compiled by the China Securities Index Company since April 8, 2005, and therefore the sample period is from 2005 to 2009. *Index Inclusion* is set to one if a firm is included in the index and zero otherwise. *Predicted Report* is the estimated number of analyst reports in the first stage. Other control variables are defined in Appendix 1. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Dependent Variable								
	Report			Modified Audit Opinion					
	First Stage			Second Stage					
	All Firms			NSOE=1			NSOE=0		
Index Inclusion	4.5727	9.09	***						
Predicted Report				-0.1651	-2.47	**	0.0298	0.98	
Size	4.9311	23.43	***	0.3611	1.11		-0.5139	-2.74	***
Growth	-0.1579	-6.95	***	-0.0299	-2.66	***	0.0175	2.12	**
NSOE	0.2880	1.05		1.1605	9.58	***	1.1850	12.15	***
SEOF	-0.5496	-0.9		-0.7918	-2.63	***	-0.2020	-1.13	
Foreign	2.2506	1.37		-1.2890	-1.69	*	-0.5338	-0.65	
RSR	12.7612	17.31	***	1.3184	1.23		-0.3546	-0.98	
Fund	60.1739	23.18	***	7.9210	1.56		-3.2066	-1.73	*
OwnCon	-0.0423	-0.03		-1.8543	-3.13	***	-1.3561	-3.58	***
Big4	8.2820	10.07	***	0.9209	1.2		-0.1479	-0.51	
IFRS	-5.2769	-14.76	***	0.6961	1.74	*	0.2187	1.15	
Duality	0.9001	3.32	***	-0.0358	-0.32		0.0891	0.89	
Bsize	0.6087	7.72	***	0.1294	2.18	**	-0.0055	-0.21	
Bmeet	-0.0921	-2.23	**	-0.0131	-0.68		0.0046	0.44	
Indr	6.4419	2.49	**	2.1792	1.86	*	1.0485	1.48	
Supsize	0.0612	0.59		0.0657	1.31		0.0130	0.52	
Smeet	0.2382	3.14	***	0.0660	1.6		-0.0077	-0.34	
Constant	-69.7042	-10.93	***	-9.3779	-1.56		4.9658	1.65	*
Region effect		Yes			Yes			Yes	
Industry effect		Yes			Yes			Yes	
Year effect		Yes			Yes			Yes	
Obs.		9282			3796			5445	

Table 7. Robustness checks: residual analyst coverage

The table repots the results of the ordinary least squares regression that generates residual analyst coverage in Regression I and the results of the impact of residual analyst coverage on the incidence of modified audit opinions in Regression II. Residual coverage is the residuals from a regression of the number of analyst reports on firm size and fund ownership ratio. Other control variables are defined in Appendix 1. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Regression I Dependent Variable: *Report*			Regression II Dependent Variable: *MAO*		
Resi_Report				-0.0401	-1.45	
NSOE				0.4851	4.82	***
Resi_Report×NSOE				-0.1225	-1.93	**
Size	3.75	41.39	***	-0.5826	-4.94	***
Growth				-0.0106	-1.23	
ST				1.8280	18.24	***
SEOF				-1.8812	-3.31	***
Foreign				-0.1333	-0.21	
RSR				-0.7864	-2.31	**
Fund	62.21	39.47	***	-9.5935	-3.49	***
OwnCon				-2.3396	-4.73	***
Big4				0.1225	0.56	
IFRS				0.3760	2.02	**
Duality				-0.0433	-0.38	
Bsize				-0.0136	-0.57	
Bmeet				0.0315	2.69	***
Indr				-1.6445	-1.92	*
Supsize				0.0679	1.92	*
Smeet				-0.0242	-0.95	
Constant				5.8141	3.58	***
Region effect		Yes			Yes	
Industry effect		Yes			Yes	
Year effect		Yes			Yes	
R^2 *(I) & Pseudo* R^2*(II)*		0.3928			0.2343	
Obs.		9844			9844	

Table 8. Firm Performance, Analyst Coverage and Modified Audit Opinion

This table presents the results of the Logit model:

$$MAO_{i,t} = \alpha_0 + \alpha_1 Cover_{i,t-1} + \alpha_2 Undep_{i,t-1} + \alpha_3 Cover_{i,t-1} \times Undep_{i,t-1} + \sum_{k=1}^{k} \alpha_{k+3} Control_k + \varepsilon$$

The dependent variable *MAO* equals 1 if modified audit opinion is issued by the auditor, 0 otherwise. *Coverage* denotes the following three measures of analyst coverage. *Report* denotes the number of analyst reports issued for the firm. *Analyst* denotes the number of financial analysts following the firm; *Broker* is the number of brokerage house that issue analyst reports on the firms. *Undep* is a dummy variable of underperformance assigned to 1 if the ROA (return on asset) of a listed firm is below the median value of the the firms in the same industry in the same year, and 0therwise. The industry are classified by using the first two digits of the GICS code. Other control variables are defined in Appendix 1. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Regression I			Regression II *Cover=Report*			Regression III *Cover=Analyst*			Regression IV *Cover=Broker*		
Cover				-0.0460	-2.2	**	-0.1054	-3.16	***	-0.1269	-3.42	***
Undpe	1.2905	12.83	***	1.3289	12.43	***	1.3014	12.05	***	1.2902	11.92	***
Cover × Undpe				-0.0970	-2.6	***	-0.1317	-2.44	**	-0.1341	-2.3	**
Size	-0.8064	-10.19	***	-0.7276	-10.28	***	-0.7064	-9.97	***	-0.7008	-9.89	***
Growth	-0.0013	-0.12		-0.0030	-0.38		-0.0034	-0.44		-0.0034	-0.44	
NSOE	0.4782	5.33	***	0.4880	5.58	***	0.4966	5.67	***	0.4985	5.7	***
SEOF	-1.6521	-2.82	***	-1.6538	-2.8	***	-1.6642	-2.82	***	-1.6657	-2.82	***
Foreign	-0.5680	-0.95		-0.5211	-0.73		-0.4928	-0.69		-0.4882	-0.68	
RSR	-1.1139	-3.47	***	-0.7565	-2.31	**	-0.6184	-1.87	*	-0.5867	-1.77	*
Fund	-8.7368	-2.92	***	-4.5204	-2.02	**	-3.5183	-1.61		-3.2556	-1.5	
OwnCon	-2.4972	-5.07	***	-2.5675	-5.64	***	-2.5939	-5.68	***	-2.6049	-5.71	***
Big4	0.1009	0.42		0.2037	0.89		0.2337	1.02		0.2424	1.06	
IFRS	0.5817	3.1	***	0.7428	4	***	0.8080	4.32	***	0.8224	4.39	***
Duality	0.1032	0.97		0.1104	1.03		0.1178	1.1		0.1181	1.1	
Bsize	-0.0327	-1.44		-0.0251	-1.11		-0.0231	-1.02		-0.0224	-0.98	
Bmeet	0.0267	2.24	**	0.0279	2.31	**	0.0277	2.28	**	0.0275	2.27	**
Indr	-1.4053	-1.81	*	-1.3334	-1.81	*	-1.3082	-1.78	*	-1.3057	-1.77	*
Supsize	0.0646	1.88	*	0.0653	2	**	0.0653	1.99	**	0.0651	1.99	**
Smeet	-0.0191	-0.76		-0.0204	-0.79		-0.0218	-0.84		-0.0221	-0.85	
Constant	8.5433	7.18	***	7.2270	6.56	***	6.8965	6.25	***	6.8163	6.18	***
Region effect		Yes			Yes			Yes			Yes	
Industry effect		Yes			Yes			Yes			Yes	
Year effect		Yes			Yes			Yes			Yes	
Pseudo R^2		0.1987			0.2037			0.2062			0.2069	
N		9844			9844			9844			9844	

Table 9. Analyst Recommendation and Modified Audit Opinion

Panel A

This panel shows the descriptive statistics of the grade of the analyst recommendation. *Grade* 1-5 represent the number of analyst reports received by each firm recommending strong buy (1), buy (2), hold (3), sell (4) and strong sell (5). Grade 0 denotes the number of reports without standard recommendation. *R_Grade* 0-5 denote the ratio of recommendation in each grade relative to the total number of reports received by each firm.

	Mean	Std.	25%	Median	75%	Obs
Grade1	2.6446	5.4162	0	1	3	4935
Grade2	5.8640	10.0021	0	2	7	4935
Grade3	2.4148	3.6879	0	1	3	4935
Grade4	0.0501	0.2711	0	0	0	4935
Grade5	0.1086	0.4785	0	0	0	4935
Grade0	0.0582	0.6759	0	0	0	4935
Grade 1-5	11.0821	16.4562	2	5	13	4935
Grade 0-5	11.1402	16.5138	2	5	14	4935
R_Grade1	0.1782	0.2460	0	0.0357	0.3022	4926
R_Grade2	0.4094	0.3385	0	0.4409	0.6667	4926
R_Grade3	0.3753	0.3775	0	0.2500	0.6667	4926
R_Grade4	0.0141	0.0977	0	0	0	4926
R_Grade5	0.0230	0.1266	0	0	0	4926

Panel B.

This panel shows the relation between analyst recommendation and the incidence of MAOs. The dependent variable *MAO* equals 1 if modified audit opinion is issued by the auditor, 0 otherwise. *Grade* 1-5 represent the number of analyst reports received by each firm recommending strong buy (1), buy (2), hold (3), sell (4) and strong sell (5). Grade 0 denotes the number of reports with no standard recommendation. *R_Grade* 1-5 denote the ratio of recommendation in each grade relative to the total number of reports received by each firm. The industry is classified by using the first two digits of the GICS code. Other control variables are defined in Appendix 1. The sample period covers 2003 to 2009. *, **, *** indicate 10%, 5%, and 1% level significance respectively.

	Regression I			Regression II		
Grade1	-0.0112	-0.06				
Grade2	-0.3934	-2.8	***			
Grade3	-0.2552	-1.55		-0.2819	-1.69	*
Grade4	1.0081	2.79	***			
Grade5	-0.1377	-0.31				
Grade0	-0.2137	-0.38				
Grade1+2				-0.3825	-3.02	***
Grade4+5				0.4697	1.65	*
Size	-0.3151	-2.12	**	-0.2969	-2.01	**
Growth	-0.0010	-0.04		-0.0014	-0.05	
NSOE	0.2505	1.21		0.2484	1.2	
ST	1.7561	7.17	***	1.7664	7.24	***
SEOF	-2.1652	-2.08	**	-2.1594	-2.09	**
Foreign	-6.2651	-2.12	**	-6.0292	-2.04	**
RSR	-0.5901	-0.97		-0.5780	-0.96	
Fund	-2.4787	-1.06		-2.0238	-0.92	
OwnCon	-1.6890	-1.72	*	-1.6954	-1.74	*
Big4	-0.9070	-1.63		-0.9564	-1.72	*
IFRS	0.0967	0.32		0.0845	0.27	
Duality	-0.0398	-0.17		-0.0282	-0.12	
Bsize	0.0684	1.47		0.0679	1.46	
Bmeet	0.0466	2.4	**	0.0482	2.44	**
Indr	-0.9807	-0.48		-0.8294	-0.41	
Supsize	-0.0369	-0.53		-0.0336	-0.48	
Smeet	-0.0206	-0.4		-0.0209	-0.41	
Constant	1.7245	0.74		1.4659	0.63	
Region effect		Yes			Yes	
Industry effect		Yes			Yes	
Year effect		Yes			Yes	
Psedo R2		0.1826			0.1807	
N		4935			4935	

J. Account. Public Policy 31 (2012) 69–85

Contents lists available at SciVerse ScienceDirect

J. Account. Public Policy

journal homepage: www.elsevier.com/locate/jaccpubpol

Auditor mergers, audit quality and audit fees: Evidence from the PricewaterhouseCoopers merger in the UK

Rong Ding [a], Yuping Jia [b,*]

[a] Middlesex University Business School, The Burroughs, Hendon, London NW4 4BT, UK
[b] Frankfurt School of Finance and Management, Sonnemannstraße 9-11, 60314 Frankfurt am Main, Germany

A B S T R A C T

Focusing on the merger of Price Waterhouse and Coopers & Lybrand in 1998, we document increased audit quality (measured by earnings quality of the clients) for the merged firm and other big-X auditors (The big-X auditors are Ernst & Young, Deloitte, KPMG and Arthur Anderson.) during the post-merger period because: (1) controlling for economic conditions, clients of big-X auditors have lower levels of absolute discretionary accruals and (2) the value relevance of earnings has significantly increased. Furthermore, we find evidence that in the post-merger period, there is a significant increase in audit fees for PricewaterhouseCoopers and other big-X client firms, which suggests that the effect of collectively enhanced market power of big-X auditors (which tends to increase audit fees) dominates the effect of cost savings from the merger (which tends to lower audit fees). The results have implications for regulators and policy makers.

1. Introduction

The accounting literature has paid considerable attention to the consequences of the mergers between former "big-eight" auditors over the past three decades (Wootton et al., 1994; Pong, 1999; Wolk et al., 2001), addressing their direct impacts on industry concentration. Prior literature has been less salient on the association between auditor mergers and audit quality, however. On the one hand, after merging, big-X auditors[1] have collectively gained market power. According to the ***Financial Times*** (September 19, 1997, p. 13): "Not only is this (merger) undesirable on competitive grounds; it will also

* Corresponding author. Tel.: +49 69 154008839.
E-mail address: y.jia@fs.de (Y. Jia).

[1] "Big-X" auditors refer to the "top-tier" auditors. In particular, Big-8 (1985–1989), Big-6 (1990–1997), Big-5 (1998–2002) and Big-4 (after 2002).

0278-4254/$ - see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.jaccpubpol.2011.08.002

allow the merged firm to exercise an unhealthy degree of influence over the standards and practices of the profession as a whole." On the other hand, when two auditors merge, they can cut down their costs by combining their specialists and complementary locations (Sullivan, 2002), leading to higher operating efficiency and lower costs in providing auditing services, which might help to improve audit quality. It is an intriguing question to examine whether mergers between auditors positively or negatively affect audit quality. Because it is difficult to measure audit quality directly (e.g., through the evaluation of going concern opinion), instead, we indirectly test audit quality in terms of the earnings quality of auditees (e.g., Becker et al., 1998; Callaway Dee et al., 2006; Bryan et al., 2004; Jenkins et al., 2006). Following prior literature (Becker et al., 1998; Reynolds and Francis, 2000; Francis et al., 2004; Ball and Shivakumar, 2005; Jenkins et al., 2006), absolute discretionary accruals and value relevance are used as measures of earnings quality in our paper.

In this study, we focus on the merger between Price Waterhouse and Coopers & Lybrand in 1998 because this was the most recent merger between top-tier auditors in recent decades. We believe that the folding of Arthur Anderson into Deloitte & Touche in 2002 is different from any previous merger, as it is unlikely that Arthur Anderson could have remained as a stand-alone firm after the Enron scandal. After the dissolution of Arthur Anderson in 2002, the majority of its clients in the UK were subsumed into Deloitte & Touche, while the big-4 (PricewaterhouseCoopers, Ernst & Young, Deloitte and KPMG) have remained as the dominant auditors worldwide since then. Therefore, in this paper, we narrow our attention to the impact of the merger between Price Waterhouse and Coopers & Lybrand on the audit-service market by comparing (1) the earnings quality of auditees in the UK and (2) audit fees paid by clients during the three-year periods before and after the merger in 1998. The evidence may have implications for regulators facing the possibility of a future scenario in which the current "big-4" merge into a "big-3," as the PricewaterhouseCoopers merger provides an event through which the consequences of auditor mergers on audit pricing and audit quality can be scrutinized.

Our sample consists of publicly listed firms audited by big-X and non-big-X audit firms in the UK between 1995 and 2001, except for the event year 1998. The primary reason to use UK data is that UK public companies have long been required by the Companies Act 1967 to disclose audit-fee information. We conduct two main tests to compare earnings quality, namely, absolute discretionary accruals and the value relevance of earnings. We also examine audit-fee changes from the pre-merger to the post-merger period. Furthermore, to show that the changes to audit quality and audit fees are not the result of regulatory changes, we use the non-big-X auditors as a reference group. The final sample consists of 3677 observations for absolute discretionary accrual tests and value relevance tests and 5820 observations for audit fee tests.

Compared with previous studies that examine the effects of auditor mergers on audit pricing (e.g., McMeeking, 2007), our contribution is twofold. First, to the best of our knowledge, we provide the first empirical evidence on the association between auditor mergers and audit quality (measured by earnings quality of clients): in the post-merger period, absolute discretionary accruals of big-X client firms decreased compared with non-big-X client firms, indicating less earnings management; in the post-merger period, earnings of big-X clients are more related to stock-market returns, indicating that earnings quality has improved in this period. The results may reflect enhanced auditor independence and auditors' increasing ability to constrain the earnings management of their clients. Second, we use the non-big-X auditors (second tier auditors) as a control group, which mitigates the concern that our findings are driven by secular trends or changes to regulatory provisions during the period under consideration. In particular, we show an increase in audit fees for the big-X clients after their auditors merged, suggesting that the merger results in a net increase in the price paid by clients to purchase audit services. This implies that the cost savings from a merger (which tends to lower costs of audit services) is dominated by enhanced market power of auditors (which tends to increase fees). In contrast, the earnings quality of the clients of non-big-X auditors does not change from the pre-merger to the post-merger period, and there is no evidence of increased audit fees charged by this group of auditors in the post-merger period.

Our results are of interest to regulators and policy makers. Regulators may cautiously assess the implication of future consolidation of the auditing industry in the UK. The potential consequence is that, on the one hand, the audit fee is likely to increase if the number of major auditors decreases from "N" to "N − 1"; on the other hand, audit quality might improve as a result of enhanced auditor inde-

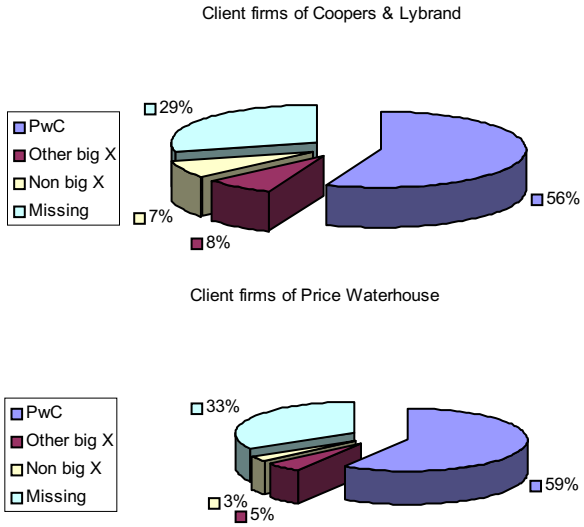

Fig. 1. The distribution of client firms of Coopers & Lybrand and Price Waterhouse after the 1998 merger.

pendence. Our findings have implications for auditors (especially the current "big-four") because if any one of them is contemplating a merger, in addition to convincing regulators that the merged firm can provide service of higher quality, it can choose to share some of the merger-induced cost savings with clients in the form of lower audit fees to alleviate the regulatory concerns.

The rest of the paper is organized as follows. Section 2 provides the background to the study. Section 3 discusses the research methodology and sample selection while Section 4 presents the results. Section 5 concludes.

2. Background

2.1. The PricewaterhouseCoopers merger

In 1997, the potential mergers between Ernst & Young and KPMG and Price Waterhouse and Coopers & Lybrand attracted the attention of competition authorities across the Atlantic: the European Commission and the US Department of Justice. However, on February 13, 1998, Ernst &Young and KPMG withdrew their intention to merge, partly because the combined firm would dominate the auditing industry worldwide. This cleared the road for the proposed merger between Price Waterhouse and Coopers & Lybrand: both the US Department of Justice and European Commission approved the merger because there was "no conclusive proof that the merger would create or strengthen a position of collective dominance" and "five vigorous competitors would remain in the marketplace" (*Accountancy*, June 1998). The PricewaterhouseCoopers merger created the largest accounting firm in history, with more than 40,000 employees in 1100 offices worldwide. Its revenue in 1998 was over USD 13 billion. Fig. 1 shows the influence of the merger on the distribution of their clients. The merged firm retains approximately 56% of the clients of Coopers & Lybrand and approximately 59% of the clients of Price Waterhouse. According to McMeeking et al. (2007), after the merger, the audit concentration ratio (CR4), measured by the number of clients in the UK, had risen from 0.69 in 1998 to 0.79 in 1999, and the Herfindahl index increased from 0.15 in 1998 to 0.21 in 1999. Measured by audit fees, the concentration ratio (CR4) increased from 0.82 in 1998 to 0.88 in 1999, and the Herfindahl Index rose from 0.21 in 1998 to 0.28 in 1999.[2]

[2] The concentration ratio is defined as $CR_n = \sum_{i=1}^{n} X_i$ and the Herfindahl index as $HI = \sum_{1}^{n} X_i^2$ where n is the number of firms and X_i is the size of audit firm i as a percentage of the size of the market.

Table 1
The influence of the PWC merger on audit fees and client size for PWC, non-PWC big-X, and non-big-X clients. *Logfee* is the audit fee in logarithmic terms; *client_size* is measured by the log of the total assets; l*ogfee_diff* is the *logfee* difference before and after the merger; *client_size_diff* is the *client_size* difference before and after the merger. The *P*-values for the significant difference (*p*-value < 10%) are highlighted in **bold**.

PWC client firms							
Variable	Minimum	25th	Mean	Median	75th	Maximum	Obs
Panel A: Before the merger							
Logfee	−2.000	−1.046	−0.647	−0.699	−0.314	1.093	860
client_size	0.097	1.572	2.158	2.060	2.711	4.710	956
Panel B: After the merger							
logfee	−1.824	−0.896	−0.459	−0.523	−0.097	1.104	777
client_size	0.467	1.665	2.262	2.138	2.802	4.346	799
			Mean	Std Dev	Std Error	*t*-Value	*p*-Value
Panel C: t-Test on client-size and audit-fee differences							
logfee_diff	(before − after)	Pooled	−0.188	−0.245	−0.132	−6.560	**<.0001**
client_size_diff	(before − after)	Pooled	−0.104	−0.182	−0.027	−2.650	**0.0082**
Non-PWC big-X client firms							
Variable	Minimum	25th	Mean	Median	75th	Maximum	Obs
Panel A: Before the merger							
logfee	−2.000	−1.046	−0.699	−0.721	−0.398	0.973	1453
client_size	−0.268	1.504	2.037	1.931	2.514	4.710	1581
Panel B after the merger							
logfee	−1.886	−0.939	−0.536	−0.598	−0.215	1.107	2326
client_size	−1.000	1.596	2.168	2.077	2.688	5.186	2405
			Mean	Std Dev	Std Error	*t*-Value	*p*-Value
Panel C: t-Test on client-size and audit-fee differences							
logfee_diff	(before − after)	Pooled	−0.125	−0.165	−0.086	−6.200	**<.0001**
client_size_diff	(before − after)	Pooled	−0.084	−0.1389	−0.0298	−3.03	**0.0025**
Non-big-X client firms							
Variable	Minimum	25th	Mean	Median	75th	Maximum	Obs
Panel A: Before the merger							
logfee	−2.000	−1.398	−1.075	−1.097	−0.824	0.591	619
client_size	−0.252	1.127	1.540	1.520	1.904	3.916	660
Panel B: After the merger							
logfee	−2.000	−1.347	−1.048	−1.086	−0.796	0.799	562
client_size	−0.721	1.142	1.565	1.553	1.967	4.249	592
			Mean	Std Dev	Std Error	*t*-Value	*p*-Value
Panel C: t-Test on client-size and audit-fee differences							
logfee_diff	(before − after)	Pooled	−0.027	−0.079	0.026	−0.990	0.321
client_size_diff	(before − after)	Pooled	−0.0256	−0.0962	0.045	−0.71	0.4771

We provide some descriptive statistics on audit fees and client size (measured by the logarithm of assets) for PriceWaterhouseCoopers (hereafter PWC), non-PWC big-X auditors and non-big-X auditors. Furthermore, we compare the mean of the audit fees and client sizes for these three groups of auditors between the pre-merger and post-merger periods. The results are presented in Table 1.

First, for PWC clients, the mean of the audit fees increased from the pre-merger period to the post-merger period, and the difference is significant at the 1% level ($p < 0.0001$). The mean client size also increased from the pre-merger to the post-merger period, and the difference is significant at the 1% level ($p = 0.0082$). Overall, the results indicate that after the merger, PWC gained increasing market power over their clients, and thus, they retained large clients and charged a higher fee to these clients.

We also observe a similar change for non-PWC big-X clients. For example, they charged a higher fee to their clients in the post-merger period, and the average client size increased in the post-merger period (both differences are significant at the 1% level). Furthermore, the number of clients of non-

PWC big-X auditors increased in the post-merger period. Considering the fact that the collective market share of big-X and non-big-X auditors remained stable over the period 1995–2001, it is likely that some of the former clients of Price Waterhouse and Coopers & Lybrand switched to non-PWC big-X auditors after the merger. Finally, we compare the audit fees and client size of non-big-X auditors between the pre-merger and post-merger periods. The differences in both audit fees and client size are insignificant at the conventional level. The results suggest that the impact of the PWC merger extended beyond the merged auditor because after the merger, PWC as well as other big-X auditors gained more market power, which enabled them to charge higher fees to their clients. However, the impact of the PWC merger on non-big-X auditors seems to be insignificant.

2.2. Audit size and audit quality

As an important monitoring and insurance mechanism to mitigate the agency problem of public corporations, external auditing is expected to reduce noise and bias in financial statements (Kinney and Martin, 1994). Therefore, auditing plays a central role in constraining opportunistic earnings management in publicly listed companies. Audit quality is defined as the joint probability that an auditor will (1) discover a breach in the client's accounting system and (2) report the breach (DeAngelo, 1981). The former refers to the auditor's capability, and the latter refers to the auditor's independence. While the technical capability of the auditor is usually assumed to be constant across different auditors regardless of their size, audit quality is a function of the auditor's independence. We propose that audit quality is expected to increase after an auditing firm merger, as larger auditors are more likely to be independent. We elaborate our proposition according to the following dimensions.

2.2.1. Client-specific quasi-rents

Although audit technology is characterized by significant client-specific start-up costs, DeAngelo (1981) argues that larger auditors (measured by the number of clients) have reduced the incentive to "cheat" to retain any individual client because auditors lose quasi-rents from all other clients when lower-than-promised audit quality is detected and disclosed. Apparently, large auditors have more to lose than their smaller competitors under such circumstances. It follows logically that the merged firm (PWC) with an enlarged client base has more incentive to supply audit services of higher quality.

2.2.2. Auditor's liability

Dye (1993) shows that the value of an audit consists of two components: an "informational" component, which refers to the value of an audit to improving resource-allocation decisions, and a "liability" component, which represents the option value of the claim financial statement users have on the auditor in the event of an "audit failure." For auditors, their largest liability derives from clients who subsequently experience financial distress because investors of financially distressed firms regard the auditor as an associated party that has "deeper pockets" to compensate for their loss.[3] For instance, Jones and Raghunandan (1998) show that top-tier auditors were less likely to serve as independent auditors for financially distressed firms and high-tech firms in 1994 relative to 1987 because these auditors tried to reduce their exposure to litigation by avoiding more risky clients. Due to the fact that large auditors have more exposure to litigation risk, merged (large) auditors are better motivated to deliver audit services of higher quality to prevent potentially substantial losses arising from "audit failure."

2.2.3. The influence of important clients

Unlike their smaller rivals, who sometimes heavily depend on a dozen "important clients,"[4] large auditors with a more diversified customer base are less likely to compromise when facing pressure from

[3] Focusing on the "Private Securities Litigation Act of 1995" in the US, Geiger et al. (2006) conclude that the Reform Act largely provided litigation relief to the Big-6 auditing firms in the US, which is consistent with the argument that the larger auditing firms have more litigation exposure than their smaller competitors.

[4] "When one or a few large clients supply a significant portion of the total fees of a public accounting firm, the firm will have great difficulty maintaining independence," *Improving the Accountability of Publicly Owned Corporations and Their Auditors* (Subcommittee on Reports, Accounting and Management of the Committee on Government Affairs: United States Senate, 1977).

individual clients, partly because large auditors have enhanced negotiation power over their clients. Furthermore, a merger, which substantially increases the size of an auditor, creates synergies by effectively combining the resources of different firms, thus enabling the merged firm to supply even more comprehensive service to clients. Thus, resource reallocation is less likely to be a problem for large auditors in the event of client switching. Overall, the influence of individual clients is perceived to be a decreasing function of auditor size, indicating that large auditors are less likely to sacrifice audit quality when under pressure from clients.

2.2.4. Auditor wealth

It is expected that an auditor's wealth is positively associated with its reputation. This wealth will lose value in the case of audit failure. Dye (1993) posits that wealthier auditors suffer more from "scandal" and litigation risk and thus have greater incentive to supply high-quality service to protect their reputations and wealth. Furthermore, wealthy auditors are more capable of attracting the best professionals in the industry and committing more resources to training and research, enabling them to provide service at a higher level.

Using client earnings quality to reflect audit quality, empirical studies have provided supporting evidence for DeAngelo's theoretical premise that audit quality is positively correlated with auditor size. Teoh and Wong (1993) report that earnings response coefficients (ERC) of the big-6 auditors are higher than those of non-big-6 auditors. Similarly, Becker et al. (1998) examine the discretionary accruals and confirm that earnings quality is negatively related to the presence of non-big-5 auditors.

Following the extant literature, we use the earnings quality of clients to reflect audit quality. It is expected that the merger that created PWC led to increased audit quality because the merged firm (with strengthened auditor independence) is more capable of constraining its clients from opportunistic earnings management. Furthermore, the results in Table 1 indicate that the effects of the PWC merger spread to other big-X auditors: all of them are able to charge higher fees, and the average client size for each firm increased in the post-merger period. This suggests that PWC and other big-X auditors gained more market power, which enables them to become more independent and thus more effective in constraining their clients from earnings management. We therefore hypothesize the following:

H1. The audit quality (measured by earnings quality of clients) of PricewaterhouseCoopers as well as other big-X auditors improved after the PWC merger.

To disentangle the effect of the PricewaterhouseCoopers merger, we use non-big-X auditors as a reference group to rule out the possibility that the change in audit quality is the result of an institutional change during this period. Non-big-X auditors, also referred to as "second-tier auditors," have long been reported to focus on different market segments from the big-X: big-X audits all FTSE 100 companies in the UK, and 97% of FTSE 250 companies and most other listed companies employ a big-X auditor (Beattie et al., 2003); by contrast, non-big-X auditors specialize in small and fledgling companies. The client distribution in Fig. 2 shows that the markets for big-X and non-big-X auditors are quite segmented because the market shares of the two groups are largely stable over the sample period (big-X auditors have 80% of the market share, and non-big-X auditors have 20%). Assuming there were no "exogenous" shocks (e.g., the introduction of new financial reporting standards) with a positive impact on the average audit quality of publicly listed firms, the PWC merger would have had little influence on the market segments controlled by non-big-X auditors.

2.3. Audit size and audit fees

Dopuch and Simunic (1980) contend that merged auditors might achieve economies of scale and scope through increased labor productivity. A merged auditor with an enlarged client base can support more areas of specialized knowledge (e.g., in-depth knowledge of the client's industry and better understanding of different tax laws and accounting standards) and redeploy strategic assets for more productive uses, leading to decreased marginal costs. Furthermore, a merger of two auditors with complementary geographic locations might also reduce the marginal cost of auditing, especially for

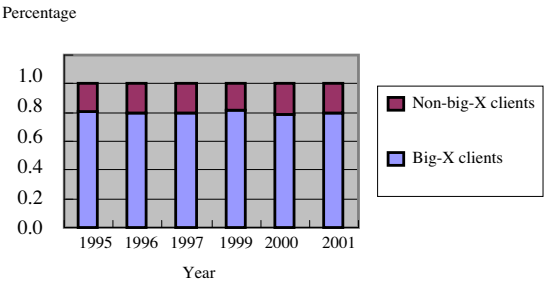

Fig. 2. The market share of big-X and non-big-X auditors in the UK.

geographically diverse clients, such as multinational companies (Sullivan, 2002). Marginal cost reductions are likely to be more significant for large clients because specialists will be more efficiently utilized if they can spend all of their time on a limited number of clients. Reasonably, increased geographic coverage of an auditor would benefit large clients more than small clients. A merger-induced cost reduction is expected to result in lower audit fees if the auditors are willing to partially pass along the benefits of cost savings to their clients. However, because the market for audit services has long been characterized as oligopolistic (Hermanson et al., 1987; Beattie and Fearnley, 1994), merged top-tier auditors, together with their direct rivals, might boost their profits by charging more to their clients because they enjoy enhanced market power. If a merger between auditors generates both cost savings and increased market power, the net change in audit fees paid by clients will indicate which effect dominates. Prior literature has provided conflicting results: Ivancevich and Zardkoohi (2000) investigate the effect of mergers among four US accounting firms in 1989/1990 on audit fees and conclude that both the market share and audit fees of the merged firms fell relative to those auditors not involved in the merger. In contrast, Menon and Williams (2001) document a significant increase in audit fees paid to international audit firms in the US for the three-year period following the merger (1991–1993). To address the issue of audit fees, we compare the level of audit fees charged by PWC and other big-X auditors in the pre-merger and post-merger periods. Consistently, we use non-big-X auditors as a reference group.

3. Research design

3.1. Methodology

3.1.1. Measurement of earnings quality

Prior research (Dechow et al., 1995; Becker et al., 1998; Jenkins et al., 2006) suggests that discretionary accruals are often used as an effective proxy for earnings management because they reflect the magnitude by which managers are allowed to manipulate earnings with accruals. Thus, we measure companies' earnings quality with discretionary accruals, which are computed using the cross-sectional industry variation of a performance-adjusted modified Jones model (Reynolds and Francis, 2000; Kothari et al., 2005). It is expected that non-discretionary accruals are influenced by changes in firms' economic conditions: differences in revenues and trade receivables, the level of property, plants and equipment, and firm performance. To control for industry and time effects, separate calculations were performed for each group of firms with the same two-digit SIC codes and fiscal years. Discretionary accruals are measured as the difference between total accruals and non-discretionary accruals. In particular, discretionary accruals are residuals of the following regression model:

$$TA_{ij,t}/A_{ij,t-1} = a_{1jt}\left(\frac{1}{A_{ij,t-1}}\right) + a_{2jt}\left(\frac{\Delta SALES_{ij,t} - \Delta TR_{ij,t}}{A_{ij,t-1}}\right) + a_{3jt}\frac{PPE_{ij,t}}{A_{ij,t-1}} + a_{4jt}ROA_{ij,t} + \varepsilon_{ij,t} \quad (1)$$

where TA_{ijt} is the total accruals (net income from continuing operations minus operating cash flows) for company i in industry j for year t; $A_{ij,t-1}$ is the total assets for company i in industry j for year $t-1$;

$\Delta SALES_{ijt}$ is the change in revenue from the prior year for company i in industry j for year t; ΔTR_{ijt} is the change in trade receivables; PPE_{ijt} is the gross PP&E for company i in industry j for year t; and e_{ijt} is the error term for company i in industry j for year t. α_1, α_2, α_3, and α_4 are firm-specific parameters.

Consistent with prior literature (Balsam et al., 2003; Jenkins et al., 2006), we use the absolute value of discretionary accruals to emphasize the magnitude of the accruals rather than the direction. Smaller absolute values of discretionary accruals indicate less earnings management and suggest that earnings will be more valuable to investors. Prior research identifies several firm-specific factors that may influence the magnitude of discretionary accruals. These factors include firm size, operating cash flows, total accruals, and leverage (Becker et al., 1998; Reynolds and Francis, 2001; Jenkins et al., 2006). We include them as control variables in the following regression analysis to test our hypothesis:

$$DA_{it} = \beta_0 + \beta_1 big\_x_{it} + \beta_2 after_{it} + \beta_3 bigx\_after_{it} + \beta_4 size_{it} + \beta_5 OCF_{it} + \beta_6 TA_{it} + \beta_7 leverage_{it} + \mu_{it} \quad (2)$$

where *DA* is estimated discretionary accruals from Eq. (1); *big_x* equals one if the firm is audited by a big-X firm; *after* equals one if the observation is from the post-merger period (1999, 2000, and 2001); *bigx_after* is the interaction term of *big_x* and *after*, which accounts for the big-x firm effect after the merger; *size* is the log of sales; *OCF* is cash flows from operations scaled by lagged total assets; *TA* is total accruals (net income from continuing operations minus operating cash flows); and *leverage* is the ratio of total long-term debt to total assets.

In this study, we narrow our attention to the impact of the merger between Price Waterhouse and Coopers & Lybrand. As the merger was effectively completed on July 1, 1998, we define the three-year period from 1995 to 1997 as the pre-merger period and 1999 to 2001 as the post-merger period. Because fewer absolute discretionary accruals indicate less earnings management, a negative and significant coefficient of the interaction term between *big_x* and *after* ($\beta 3$) in Eq. (2) would support our hypothesis that earnings management has decreased in the post-merger period, which implies that the audit quality of big-X auditors has improved.

Subsequently, we analyze whether investors also perceive earnings quality to be influenced by the merger. We build on the value-relevance model of Easton and Harris (1991), which employs both the current earnings level and the change in earnings to explain annualized stock returns. Following Ghosh and Moon (2005), we also control for factors that influence the returns-earnings relationship. The regression is specified as follows:

$$\begin{aligned} RET_{it} = {} & \delta + \delta_1 EARN_{it} + \delta_2 \Delta EARN + \delta_3 EARN_{it} * big\_x_{it} * after_{it} + \delta_4 \Delta EARN_{it} * big\_x_{it} * after_{it} \\ & + \delta_5 after_{it} + \delta_6 big\_x_{it} + \delta_7 big\_x_{it} * after_{it} + \sum_{j=1}^{6} \delta_8 + 2(j-1) EARN_{it} * Controls_{it} \\ & + \sum_{j=1}^{6} \delta_9 + 2(j-1) \Delta EARN_{it} * Controls_{it} + \sum_{j=1}^{6} \delta_{10} + 2(j-1) Controls_{it} + \upsilon_{it} \end{aligned} \quad (3)$$

where *RET* is the stock return calculated over a 12-month period ending three months after the fiscal year-end for firm i; *EARN* is net income before extraordinary items and discontinued operations per share of the firm over the period $t-1$ to t; and $\Delta EARN$ is the change in *EARN*. Both *EARN* and $\Delta EARN$ are deflated by the beginning-year price; *after* equals one if the observation is from the post-merger period (1999, 2000 and 2001); the interaction term $big\_x * after$ accounts for the value relevance of earnings for the big-X clients after the merger. We include the following control variables in the regression: *age*, computed using the beginning and end dates, as reported in CRSP, measures the number of years that the firm has been publicly traded as of the fiscal year-end; *growth* is the market-to-book value of the firm (market value of the firm plus the book value of debt scaled by the book value of total assets); *persistence* is the first-order autocorrelation of income before extraordinary items per share; *beta* is systematic risk computed using the past 60 monthly stock returns; *size* is measured as a log of sales; *leverage* is the ratio of total long-term debt to total assets. The coefficients of $\delta 3$ and/or $\delta 4$ being positive and significant would support our expectation that investors perceive the earnings level ($\delta 3$) and/or earnings change ($\delta 4$) of big-X clients to become more value-relevant after the merger.

3.1.2. Audit fees

Following previous literature (Francis and Simon, 1987), we use the logarithmic model that has robust explanatory power to investigate the change in audit fees before and after the PWC merger, for both big-X and non-big-X auditors.

$$Logfee_{i,t} = \lambda_{0t} + \lambda_1 after_{i,t} + \lambda_i control_{i,t} + \varsigma_{i,t} \quad (4)$$

The dependent variable is the natural log of the audit fees, and the time dummy *"after"* is assigned one for observations in the post-merger period (1999, 2000 and 2001). We expect the cost of audit services to decrease for the merged auditor due to economies of scale, but it is unclear whether the auditor will retain the benefits of cost savings within the firm, partially pass them along to their clients by charging less, or increase audit fees to maximize profit. Therefore, it is an empirical question to examine the sign and magnitude of the coefficient for *after* in the model.

Consistent with prior literature (Francis and Simon, 1987), control variables include the following:

Client size: natural log of total assets.
Leverage: ratio of debt to total assets.
Current ratio: total current assets divided by total current liabilities.
Risk: quick assets divided by total current liabilities.
Performance: net income divided by total assets.

3.2. Sample selection

We collected our data from COMPUSTAT Global. Consistent with previous studies, we exclude financial institutions (SICs between 6000 and 6999) and utility companies (SICs between 4000 and 4999). For discretionary accrual tests, to ensure the reliable estimation of parameters, we require a minimum of 20 observations for each two-digit SIC codes and fiscal year. We delete the top and bottom 1% of outliers based on all continuous variables used.[5] We use the same sample base for value-relevance tests. The final sample consists of 2816 big-X client firms and 861 non-big-X client firms.

For audit-fee tests, we delete the top and bottom 1% of outliers based on the log audit fees, leverage, current ratios and quick ratios. The final sample consists of 4639 observations for big-X auditor client firms and 1181 observations for non-big-X client firms.

4. Results

Table 2 illustrates the industry distribution of both big-X and non-big-X client firms in the sample. The sample firms are from 21 industry categories. Within the sample, both primary metal industry and auto dealer and gas stations industry have the smallest numbers of observations (20), whereas the business-services industry has the largest number of observations (697). The number of big-X firms (2816) is approximately three times larger than that of non-big-X firms (861), while the business-services industry contributes the largest percentage of observations to both the big-X sample (17.2%) and non-big-X sample (24.7%).

4.1. Earnings quality

4.1.1. Results of absolute discretionary accruals

Table 3 provides summary statistics on the firm characteristics of big-X and non-big-X clients before and after the merger. Panels A and B show that, on average, big-X client firms have a higher level of absolute discretionary accruals (0.056 (after) vs. 0.048 (before)) in the post-merger period but less operating cash flows (71.365 (after) vs. 81.509 (before)). Another notable difference is that the performance of big-X client firms became worse (ROA = 0.012 (after) vs. ROA = 0.046 (before)) and the oper-

[5] The results remain consistent when we exclude the observations where the absolute value of discretionary accruals scaled by assets is greater than one or where the discretionary accruals scaled by assets exceed their means by three standard deviations.

Table 2
Distribution of sample firms by industry. This table presents the distribution of big-X and non-big-X client firms by two-digit SIC industry codes.

SIC	Industry description	Big-X	Non-big X	Total
13	Oil and Gas Extraction	37	6	43
15	Bldg Cnstr-Gen Contr, Op Bldr	206	35	241
20	Food and Kindred Products	192	73	265
22	Textile Mill Products	20	2	22
27	Printing, Publishing and Allied	144	35	179
28	Chemicals and Allied Products	317	53	370
30	Rubber and Misc Plastics Prods	43	4	47
32	Stone, Clay, Glass, Concrete Pd	131	32	163
33	Primary metal	14	6	20
34	Fabr Metal, Ex Machy, Trans Eq	48	15	63
35	Indl, Comml Machy, Computer Eq	164	51	215
36	Electr, Oth Elec Eq, Ex Cmp	179	87	266
37	Transportation Equipment	138	18	156
38	Meas Instr, Photo Gds, Watches	126	24	150
50	Durable Goods-Wholesale	196	49	245
55	Auto Dealers, Gas Stations	15	5	20
58	Eating and Drinking Places	97	54	151
59	Miscellaneous Retail	13	9	22
73	Business Services	484	213	697
79	Amusement and Recreation Svcs	83	43	126
87	Engr, Acc, Resh, Mgmt, Rel Svcs	169	47	216
Total		2816	861	3677

Big-X firms are the clients of big-X auditors.
Non-big-X firms are the clients of non-big-X auditors.

ating risk increased in the post-merger period (beta = 0.689 (after) vs. beta = 0.525 (before)). For non-big-X client firms, the trend is very similar. Panels C and D show that after the merger, non-big-X client firms had a higher level of absolute discretionary accruals (0.069 (after) vs. 0.053 (before)) but less operating cash flows (6.826 (after) vs. 12.907 (before)). On average, the performance of non-big-X client firms deteriorated after the merger (ROA = −0.036 (after) vs. ROA = 0.034 (before)), but the risk decreased (beta = 0.533 (after) vs. beta = 0.568 (before)). On average, non-big-X client firms are smaller compared to big-X client firms (log assets = 3.530 vs. log assets = 4.867 for the pre-merger period; log assets = 3.346 vs. log assets = 4.967 for the post-merger period). Non-big-X client firms are also younger (5.670 (before) and 6.509 (after) vs. 6.523 (before) and 8.437 (after)), which implies that non-big-X auditors specialize in small and young firms.

Table 4.1 presents the results of the regression analysis. As discussed in Section 3.1, the level of discretionary accruals is influenced by firms' economic conditions. After controlling for firm characteristics, a significant and negative coefficient on the interaction term of *big_x* and *after* indicates less earnings management of big-X client firms in the post-merger period. Table 4.1, Panel A shows the regression results without controlling for firm-specific characteristics, while Panel B reports the regression results after controlling for firm-specific characteristics. Consistently, both results show that the coefficients of the interaction term on *big_x* and *after* are significantly negative (-0.021, $p = 0.017$ and -0.016, $p = 0.025$), which suggests that compared with the non-big-X auditors, big-X auditors constrain their clients from earnings management to a lager extent in the post-merger period.

4.1.2. Results of value relevance

Table 4.2 provides the results of the value-relevance test. Following Ghosh and Moon (2005), the explanatory variables include earnings and changes in earnings as well as the interaction between earnings (change of earnings) and firm-specific variables (age, growth, size, leverage and persistence). Furthermore, we interact earnings (change of earnings) with *BA*(Bigx_after), the interaction term of *Big_x* and *after*, which accounts for the big-X effect in the post-merger period. The coefficient of interaction between earnings (change of earnings) and BA (*EPS_BA*/Δ*EPS_BA*) being positive and significant

Table 3
Summary statistics on the firm characters of big-X and non-big-X firms before and after the merger. This table presents the distribution of firm characteristics for big-X client firms before the merger (Panel A), big-X firms after the merger (Panel B), non-big-X firms before the merger (Panel C), and non-big-X firms after the merger (Panel D). *Abs_DA is the* absolute value of discretionary accruals calculated from the performance-adjusted modified Jones model; *client_size* is measured by the log of the total assets; *OCF* is cash flows from the operations scaled by lagged total assets; *TA* is the total accruals (net income from continuing operations minus operating cash flows); *leverage is* the ratio of total long-term debt to total assets; *age* is the number of years that the firm has been publicly traded as of the fiscal year-end; *growth* is the market-to-book value of the firm (market value of the firm plus the book value of debt scaled by the book value of the total assets); *ROA* is the return on assets; and *beta* is the systematic risk computed using the past 60 monthly stock returns.

Variable	Minimum	25th	Mean	Median	75th	Maximum	Obs
Panel A: Big-X client firms_before the merger							
Abs_DA	0.000	0.016	0.048	0.034	0.063	0.619	1292
client_size	1.338	3.673	4.867	4.623	5.862	9.319	1292
OCF	−22.300	3.238	81.509	11.612	38.412	2761.000	1292
TA	−1.117	−0.099	−0.069	−0.058	−0.020	0.226	1292
leverage	0.000	0.012	0.102	0.082	0.161	0.529	1292
age	1.000	6.000	6.523	7.000	8.000	9.000	1292
growth	0.016	0.633	1.548	1.084	1.794	19.871	1292
ROA	−0.729	0.033	0.046	0.064	0.095	0.266	1292
beta	−7.794	0.152	0.525	0.557	0.976	5.539	1187
Panel B: Big-X client firms_after the merger							
Abs_DA	0.000	0.018	0.056	0.039	0.071	0.845	1404
client_size	1.439	3.729	4.967	4.843	6.011	9.766	1404
OCF	−22.658	2.356	71.365	11.393	44.399	2606.000	1404
TA	−1.103	−0.114	−0.084	−0.060	−0.021	0.224	1404
leverage	0.000	0.008	0.126	0.096	0.205	0.560	1404
age	1.000	5.000	8.437	10.000	11.000	13.000	1404
growth	0.013	0.588	1.743	0.982	1.896	19.975	1404
ROA	−0.826	0.001	0.012	0.046	0.084	0.261	1404
beta	−4.693	0.212	0.689	0.638	1.131	6.197	1161
Panel C: Non-big-X client firms_before the merger							
Abs_DA	0.000	0.019	0.053	0.037	0.071	0.909	378
client_size	−0.070	2.585	3.530	3.504	4.408	7.424	378
OCF	−5.132	1.030	12.907	3.804	10.533	264.700	378
TA	−3.096	−0.101	−0.077	−0.054	−0.017	0.255	378
leverage	0.000	0.000	0.080	0.041	0.131	0.493	378
age	1.000	4.000	5.670	6.000	7.000	9.000	378
growth	0.050	0.524	1.335	1.026	1.615	13.933	378
ROA	−1.673	0.036	0.034	0.062	0.097	0.206	378
beta	−5.185	0.192	0.568	0.579	0.997	3.307	352
Panel D: Non-big-X client firms_after the merger							
Abs_DA	0.000	0.020	0.069	0.044	0.083	1.257	447
client_size	−0.039	2.312	3.346	3.258	4.322	6.640	447
OCF	−8.046	0.020	6.826	1.849	6.924	127.700	447
TA	−2.153	−0.119	−0.095	−0.059	−0.011	0.240	447
leverage	0.000	0.001	0.085	0.036	0.150	0.424	447
age	1.000	3.000	6.509	6.000	10.000	13.000	447
growth	0.026	0.504	1.374	0.888	1.684	14.136	447
ROA	−1.853	−0.041	−0.036	0.037	0.070	0.230	447
beta	−13.341	0.133	0.533	0.593	1.029	5.832	385

would support our conjecture that earnings (change of earnings) of big-X clients became more value-relevant in the post-merger period. Consistent with our expectation, the coefficient of *EPS_BA* is positive and significant (0.086, $p = 0.003$). However, the coefficient of Δ*EPS_BA* is negative but insignificant (-0.05, $p = 0.431$). Furthermore, the coefficient of *EPS_growth* is positive and significant (0.50, $p < 0.001$), suggesting that earnings of firms with higher growth are perceived to be more value-relevant by investors. Finally, the coefficients of *EPS_age*, *EPS_leverage* and Δ*EPS_beta* are significantly negative. Overall, we find supportive evidence for H1.

Table 4.1
Absolute discretionary accrual test. The table presents OLS regressions of absolute discretionary accruals on big-X firms and the merger status with and without controlling for firm-specific factors. The *p*-values for the significant coefficients (*p*-value < 10%) are highlighted in **bold**. The sample consists of firms with data available on all variables needed to compute the discretionary accruals. We delete the top and bottom 1% of observations to control for outliers. The dependent variable is *DA*, the discretionary accruals calculated from the performance-adjusted modified Jones model; *big_x* equals one if the auditor is large X and is zero otherwise; *after* equals one if the firm is in a post-merger period (1999, 2000, and 2001) and is zero otherwise; *bigx_after* is the interaction term of *big_x* and *after*, which accounts for the big-firm effect after the merger; *size* is measured by the log of total assets; *OCF* is cash flows from operations scaled by lagged total assets; *TA* is the total accruals (net income from continuing operations minus operating cash flows); and *leverage is* the ratio of total long-term debt to total assets.

$$DA_{it} = \beta_0 + \beta_1 big\_x_{it} + \beta_2 after_{it} + \beta_3 bigx\_after_{it} + \beta_4 size_{it} + \beta_5 OCF_{it} + \beta_6 TA_{it} + \beta_7 leverage_{it} + \mu_{it}$$

	Coefficient	Std. Error	*t*-Statistic	Sig. (2-tailed)	Adj_R2
Panel A: Regressions of absolute discretionary accruals on big-X firm status					
intercept	0.061	0.006	10.480	**<.0001**	0.016
Big_x	−0.008	0.007	−1.280	0.201	
after	0.039	0.008	4.940	**<.0001**	
bigx_after	−0.021	0.009	−2.380	**0.017**	
Panel B: Regressions of absolute discretionary accruals on big-X firm status and controls					
intercept	0.067	0.006	11.300	**<.0001**	0.358
big_x	0.007	0.005	1.370	0.171	
after	0.026	0.006	4.080	**<.0001**	
bigx_after	−0.016	0.007	−2.250	**0.025**	
size	−0.008	0.001	−7.450	**<.0001**	
OCF	0.000	0.000	0.830	0.404	
TA	−0.307	0.007	−42.920	**<.0001**	
leverage	−0.051	0.013	−4.100	**<.0001**	

4.2. Audit fees

Table 5.1, Panel A (B) presents the descriptive statistics for big-X clients in the pre-merger (post-merger) period. In the pre-merger period, big-X client firms have a mean audit fee (in log term) of −0.680 (in millions), client size (in log asset) of 2.083 (in millions), current ratio of 1.664, risk (quick ratio) of 0.964 and performance (net income divided by total assets) of 0.041. In the post-merger period, the mean of the audit fees (in log terms) is −0.536 (in millions), client size (in log assets) is 2.168 (in millions), the current ratio is 1.840, risk (quick ratio) is 1.140 and performance (net income divided by total assets) is −0.005.

Table 5.1, Panel C provides the regression results for big-X client firms. The results show that all of the coefficients are significant at the 1% level: the coefficient of *client_size* is positive, indicating that large firms pay more for audit services; the coefficients of *current* and *performance* are negative, suggesting that firms with lower financial risk and better performance are charged less by auditors; the coefficient of *risk* is positive, which suggests that firms with higher risk have to pay a higher audit fee. Finally, the coefficient of central interest, *after*, is positive (0.064, $p < 0.0001$), which indicates that big-X client firms pay more audit fees in the post-merger period than in the pre-merger period. It can be inferred that instead of sharing with the clients the cost savings from a merger, by lowering audit fees, big-X auditors chose to charge more to their clients to raise profits. Consistent with the theoretical prediction implied by Chaney et al. (2003),[6] when the audit market becomes less competitive, auditors may charge the clients higher fees, possibly as a result of the growing market power of big-X auditors after a merger.

Table 5.2 presents the results for non-big-X client firms. Compared with big-X client firms, non-big-X auditors have a lower mean of audit fees and client size in both pre-merger and post-merger periods. The regression results show that the coefficient of *after* is insignificant at the conventional level

[6] The theoretical model in Chaney et al. (2003) suggests that the auditor fees would be lower when the audit market becomes more competitive, which implies that when the level of competition decreases, the audit fees might increase.

Table 4.2
Value relevance test. The table presents OLS regressions of returns on earnings and earnings change interacting with big-X firms and the merger status. *p*-Values for significant coefficients (*p*-value < 10%) are highlighted in **bold**. We delete the top and bottom 1% of observations to control for outliers. The dependent variable is annualized stock returns, *EPS* is net income before extraordinary items and discontinued operations per share of the firm over the period $t-1$ to t; ΔEPS is the change in EPS. Both *EPS* and ΔEPS are deflated by the beginning-year price; *BA* (*big_x_after*) is the interaction term of *big_x* and *after*, which accounts for the big-X auditor effect after the merger; *age* is the number of years that the firm has been publicly traded as of the fiscal year-end; *growth* is the market-to-book value of the firm (market value of the firm plus the book value of debt scaled by the book value of the total assets); *size* is the log of sales; *leverage is* the ratio of total long-term debt to total assets; *persistence* is the first-order autocorrelation of income before extraordinary items per share; *beta* is the systematic risk computed using the past 60 monthly stock returns; and *big_x* equals one if the auditor is big-X auditor and is zero otherwise.

$$RET = \delta + \delta_1 EARN + \delta_2 \Delta EARN + \delta_3 EARN * after * big\_x + \delta_4 \Delta EARN * after * big\_x + \delta_5 after + \delta_6 big\_x + \delta_7 after * big\_x + \sum_{j=1}^{6} \delta_8 + 2(j-1) EARN * Controls + \sum_{j=1}^{6} \delta_9 + 2(j-1) \Delta EARN * Controls + \sum_{j=1}^{6} \delta_{10} + 2(j-1) Controls + \upsilon \quad (3)$$

	Coefficient	Std. Error	*t*-Statistic	Sig. (2-tailed)	Adj_R2
Intercept	−0.136	0.037	−3.720	**0.000**	0.207
EPS	0.136	0.060	2.260	**0.024**	
ΔEPS	0.311	0.118	2.630	**0.009**	
EPS_BA	0.086	0.029	2.940	**0.003**	
ΔEPS_BA	−0.050	0.064	−0.790	0.431	
EPS_age	−0.008	0.005	−1.780	**0.076**	
ΔEPS_age	−0.014	0.013	−1.130	0.257	
EPS_growth	0.500	0.050	10.000	**<.0001**	
ΔEPS_growth	−0.003	0.022	−0.150	0.878	
EPS_size	−0.010	0.010	−0.980	0.328	
ΔEPS_size	0.032	0.021	1.550	0.121	
EPS_leverage	−0.775	0.150	−5.160	**<.0001**	
ΔEPS_leverage	−1.042	0.258	−4.030	**<.0001**	
EPS_persistence	0.010	0.027	0.360	0.719	
ΔEPS_persistence	0.018	0.030	0.610	0.540	
EPS_beta	0.000	0.005	0.060	0.951	
ΔEPS_beta	−0.043	0.025	−1.720	**0.086**	
big_x	−0.011	0.030	−0.380	0.708	
after	−0.062	0.035	−1.770	**0.077**	
big_x_after	−0.027	0.040	−0.670	0.504	
age	0.012	0.003	3.740	**0.000**	
growth	0.129	0.005	26.210	**<.0001**	
size	0.004	0.005	0.670	0.506	
leverage	−0.070	0.076	−0.920	0.360	

(−0.013, $p = 0.443$), which suggests that the audit fees charged by "second-tier" auditors in the post-merger period do not differ from those in the pre-merger period.

4.3. Sensitivity check

A series of sensitivity checks are conducted to test the robustness of our results. For discretionary accrual tests, first, we follow Kothari et al. (2005) and re-calculate the discretionary accruals from the Jones model and modified Jones model with or without an intercept, and we find that the results remain consistent. Second, we run separate regressions for PWC clients and non-PWC big-X clients. The results are similar for PWC clients and non-PWC big-X clients: both PWC and other big-X auditors are more effective in constraining their clients from earnings management in the post-merger period than non-big-X auditors. Third, we run regressions for positive discretionary accruals and negative

Table 5.1
PWC merger influence on audit fees: big-X client firms. The dependent variable is the *Logfee* (log of the audit fee), *after* is a time dummy that takes the value of 1 for observations from the post-merger period (1999, 2000 and 2001) and is zero otherwise; *client_size* is measured by the log of the total assets; *current* is the total current assets divided by the total current liabilities; *risk* is the quick assets divided by the total current liabilities; and *performance* is the net income divided by the total assets. The *p*-values for the significant coefficient (*p*-value < 10%) are highlighted in **bold**.

$$Logfee = \lambda_0 + \lambda_1 after + \lambda_2 client\_size + \lambda_3 current + \lambda_4 risk + \lambda_5 performance + \zeta$$

Variable	Minimum	25th	Mean	Median	75th	Maximum	Obs
Panel A: Big-X client firms_before the merger							
Logfee	−2.000	−1.046	−0.680	−0.721	0.357	1.093	2313
client_size	−0.268	1.521	2.083	1.965	2.582	4.710	2537
current	0.255	1.067	1.664	1.381	1.812	14.568	2537
risk	0.059	0.529	0.964	0.809	1.084	12.182	2524
performance	−1.162	0.028	0.041	0.062	0.098	0.274	2537
Panel B: Big-X client firms_after the merger							
Logfee	−1.886	−0.939	−0.536	−0.598	0.215	1.107	2326
client_size	−1.000	1.596	2.168	2.077	2.688	5.186	2405
current	0.247	1.002	1.840	1.352	1.965	17.604	2405
risk	0.059	0.531	1.140	0.822	1.182	12.206	2387
performance	−1.182	−0.020	−0.005	0.038	0.079	0.272	2404

	Coefficient	Std. Error	*t*-Statistic	Sig. (2-tailed)	Adj_R2
Panel C: Big-X client firms_regression results					
intercept	−1.860	0.017	110.770	**<.0001**	0.667
after	0.064	0.010	6.540	**<.0001**	
client_size	0.596	0.007	91.730	**<.0001**	
current	−0.032	0.005	−6.910	**<.0001**	
risk	0.032	0.006	5.110	**<.0001**	
performance	−0.351	0.032	−10.930	**<.0001**	

discretionary accruals separately. The results show that constraints on earnings management by big-X auditors are mainly reflected by positive discretionary accruals: big-X auditors significantly reduced the positive discretionary accruals of their clients, whereas there is no significant difference between big-X and non-big-X auditors regarding negative discretionary accruals. The results suggest that income-increasing discretionary accruals (positive discretionary accruals) may be the main focus of auditors.

For value-relevance tests, we run regressions separately for PWC clients and non-PWC big-X clients to assess whether our choice of grouping all big-X client firms is justified. The results show that the market perceives earnings in the post-merger period to be more value-relevant for both PWC clients and non-PWC big-X clients, while there is no significant difference for non-big-X client firms.

Furthermore, we follow Easton and Harris (1991) and run a value-relevance regression (in which returns are regressed on earnings and change of earnings only) for big-X clients and non-big-X clients separately and compare the adjusted R-squared of the regressions from pre-merger and post-merger periods with a Cramer (1987) test. We find that for big-X client firms, the adjusted R-squared in the post-merger period is significantly higher than that in the pre-merger period, which implies that earnings and earnings changes do provide more explanatory power for returns for big-X clients after the merger. In contrast, for non-big-X clients, the difference between adjusted R-squared for regressions from pre-merger and post-merger periods is not statistically significant from which we conclude that the value relevance of earnings for non-big-X clients does not change from the pre-merger to the post-merger period. The results are consistent with our findings reported in Section 4.1.2.

We test the robustness of findings regarding audit fees by running alternative regressions with additional control variables (the ratio of debt to equity and the return on equity). With regard to the direction and significance level, unreported results show that the coefficient of our main variable of interest, the time dummy *"after,"* remains robust.

Table 5.2
PwC merger influence on audit fees for non-big-X client firms. The *p*-values for the significant coefficient (*p*-value < 10%) are highlighted in **bold**.

$$Logfee = \lambda_0 + \lambda_1 after + \lambda_2 client\_size + \lambda_3 current + \lambda_4 risk + \lambda_5 performance + v$$

Variable	Minimum	25th	Mean	Median	75th	Maximum	Obs
Panel A: Non-big-X client firms_before the merger							
Logfee	−2.000	−1.398	−1.075	−1.097	0.824	0.591	619
client_size	−0.252	1.127	1.540	1.520	1.904	3.916	660
current	0.251	1.099	1.715	1.483	1.955	16.652	660
risk	0.061	0.575	1.059	0.863	1.207	12.303	659
performance	−1.048	0.030	0.045	0.062	0.100	0.244	660
Panel B: Non-big-X client firms_after the merger							
Logfee	−2.000	−1.347	−1.048	−1.086	0.796	0.799	562
client_size	−0.721	1.142	1.565	1.553	1.967	4.249	592
current	0.249	1.018	1.990	1.451	2.228	15.125	591
risk	0.072	0.561	1.286	0.884	1.436	9.500	573
performance	−1.228	−0.037	−0.024	0.037	0.071	0.274	592

	Coefficient	Std. Error	*T*-Statistic	Sig. (2-tailed)	Adj_R2
Panel C: Non-big-X client firms_regression results					
intercept	−1.956	0.028	−69.830	**<.0001**	0.617
after	−0.013	0.017	−0.770	0.443	
client_size	0.598	0.014	41.660	**<.0001**	
current	−0.029	0.008	−3.580	**0.000**	
risk	0.028	0.011	2.580	**0.010**	
performance	−0.365	0.052	−6.950	**<.0001**	

5. Conclusions

Using data from UK publicly listed companies audited by big-X auditors and non-big-X auditors before and after the PricewaterhouseCoopers merger in 1998, we conclude that the audit quality (measured by the earnings quality of auditees) improved in the post-merger period because, compared with non-big-X client firms, absolute discretionary accruals of big-X clients decreased in the post-merger period, indicating less earnings management; in the post-merger period, earnings of big-X clients are more related to stock-market returns, implying that investors perceive earnings to be more value-relevant. In contrast, we do not find such changes for non-big-X client firms. We also find evidence that there is a significant increase in audit fees for big-X clients in the post-merger period. However, we find no significant difference between the audit fees charged by non-big-X auditors in pre-merger and post-merger periods. The results suggest that cost savings from a merger (which tends to lower audit fees) are dominated by collectively enhanced market power of "top-tier" auditors (which tends to increase audit fees).

Our findings have implications for regulators and policy makers, as authorities are required to cautiously assess the consequences of future consolidation in the auditing industry, which is characterized as a "tight oligopoly." Further consolidation might reduce consumer welfare, as auditors may use their increased market power to charge high audit fees, but larger auditors with strengthened independence are able to provide higher-quality audit service. Further, a merger between "top-tier" auditors might also help the position of "second-tier" auditors, as they might use competitive pricing to challenge their large rivals. Our results are of interest to accounting firms considering a merger in the auditing industry. To mitigate regulatory scrutiny, they might choose to share with clients the cost savings from the merger by reducing audit fees.

However, our study is subject to the following caveats: the findings are entirely based on UK data, and thus, we are cautious in generalizing the results to other countries because of differences in market structures and institutional environments. Additionally, our study only examines the auditing function of accounting firms, which usually perform multiple functions. Furthermore, we might

underestimate the extent of audit-fee increases because of well-documented practices by auditors to non-audit service contracts (such as consulting) from clients by lowering the price for audit services. Finally, the results are specific to the PWC merger in 1998 and may not be generalized to previous and later mergers.

Our study opens a rich avenue for future research in this domain: it can be extended to include the previous merger in 1989/1990 and subsequent merger in 2002 to make comparisons along a time horizon; it can also be broadened to make international comparisons between countries with dissimilar accounting standards and different levels of investor protection. Leuz et al. (2003) report a negative association between earnings management and the level of investor protection based on evidence across 31 countries. It would be interesting to examine whether external institutional factors can mitigate the association between auditor mergers and audit quality to different extents.

Acknowledgements

We are grateful to Sofie van der Meulen, Chris Ittner, Laurence van Lent, and Philomena Leung for helpful comments. This paper has benefited from seminar participants at the Netherlands Network of Economics (NAKE), Tilburg University, Free University Amsterdam, the EAA annual conference (2006) in Dublin and the AFAANZ annual conference (2006) in Wellington. Yuping Jia also gratefully acknowledges financial support from the Netherlands Organization for Scientific Research (Project Number 017.001.101).

References

Ball, R., Shivakumar, L., 2005. Earnings quality in UK private firms: comparative loss recognition timeliness. Journal of Accounting and Economics 39, 83–128.
Balsam, S., Krishnan, J., Yang, J.S., 2003. Auditor industry specialization and earnings Quality. Auditing: A Journal of Practice and Theory 22, 71–97.
Beattie, V., Fearnley, S., 1994. The changing structure of the market for audit services in the UK – a descriptive study. British Accounting Review 26, 301–322.
Beattie, V., Goodacre, A., Fearnley, S., 2003. And then there were four: a study of UK audit market concentration-causes, consequences and the scope for market adjustment. Journal of Financial Regulation and Compliance 11, 250–265.
Becker, C.L., Defond, M., Jiambalvo, J., Subramanyam, K., 1998. The effect of audit quality on earnings management. Contemporary Accounting Research 15, 1–24.
Bryan, D.M., Liu, C., Tiras, S.L., 2004. The influence of independent and effective audit committees on earnings quality. Working Paper. <http://ssrn.com/abstract=488082>.
Callaway Dee, C., Lulseged, A., Nowlin, T.S., 2006. Earnings quality and auditor independence: an examination using non-audit fee data. Advances in Accounting 22, 123–148.
Chaney, P.K., Jeter, D.C., Shaw, P.E., 2003. The impact on the market for audit services of aggressive competition by auditors. Journal of Accounting and Public Policy 22, 487–516.
Cramer, J.S., 1987. Mean and variance of R^2 in small and moderate samples. Journal of Econometrics 35, 253–266.
DeAngelo, L.E., 1981. Audit size and audit quality. Journal of Accounting and Economics 3, 183–199.
Dechow, P., Sloan, R., Sweeney, A., 1995. Detecting earnings management. The Accounting Review 70, 193–225.
Dopuch, N., Simunic, D., 1980. The Nature of competition in the auditing profession: a descriptive and normative view. In: Buckley, J.W., Weston, J.F. (Eds.), Regulation and Accounting Profession. Lifetime learning Publication, Belmont, CA, pp. 77–94.
Dye, R.A., 1993. Auditing standards, legal liability and auditor wealth. Journal of Political Economy 101, 887–914.
Easton, P., Harris, T., 1991. Earnings as an explanatory variable for returns. Journal of Accounting Research 29 (1), 19–36.
Francis, J., Simon, D., 1987. A test of audit pricing in the small-company segment of the US audit market. The Accounting Review 62, 145–157.
Francis, J., LaFond, R., Olsson, P.M., Schipper, K., 2004. Costs of equity and earnings attributes. The Accounting Review 79, 967–1010.
Geiger, M., Raghunandan, K., Rama, D., 2006. Auditor decision-making in different litigation environments: the Private Securities Litigation Reform Act, audit reports and audit firm size. Journal of Accounting and Public Policy 25 (3), 332–353.
Ghosh, A., Moon, D., 2005. Auditor tenure and perceptions of audit quality. The Accounting Review 80, 585–612.
Hermanson, R., Dykes, L., Turner, D., 1987. Enforced competition in the accounting profession – does it make sense? Accounting Horizons 1, 13–19.
Ivancevich, S.H., Zardkoohi, A., 2000. An explanatory analysis of the 1989 accounting firm megamergers. Accounting Horizons 14, 389–401.
Jenkins, D.S., Kane, G.D., Velury, U., 2006. Earnings quality decline and the effect of industry specialist auditors: an analysis of the late 1990s. Journal of Accounting and Public Policy 25, 71–90.
Jones, F., Raghunandan, K., 1998. Client risk and recent changes in the market for audit services. Journal of Accounting and Public Policy 17, 169–181.
Kinney, W.R., Martin, R.D., 1994. Does auditing reduce bias in financial reporting? A review of audit-related adjustment studies. Auditing: A Journal of Practice and Theory 13, 149–156.

Kothari, S., Leone, A., Wasley, C., 2005. Performance matched discretionary accrual measures. Journal of Accounting and Economics 39, 163–197.
Leuz, C., Nanda, D., Wysocki, P.D., 2003. Earnings management and investor protection: an international comparison. Journal of Financial Economics 69, 505–527.
McMeeking, K., Peasnell, K.V., Pope, P., 2007. The effect of larse audit firm mergers on audit pricing in the UK. Accounting and Business Research 37, 301–319.
McMeeking, K., Pope, P., Peasnell, K., 2007. The effect of large audit firm mergers on audit pricing in the UK. Accounting and Business Research 37, 301–319.
Menon, K., Williams, D.D., 2001. Long term trends in audit fees. Auditing: A Journal of Practice and Theory 20, 115–136.
Pong, C., 1999. Auditor concentration: a replication and extension for the UK audit market 1991–1995. Journal of Business, Finance and Accounting 26, 451–475.
Reynolds, J.K., Francis, J., 2000. Does size matter? The influence of large clients on office-level auditor reporting decisions. Journal of Accounting and Economics 30, 375–400.
Reynolds, J., Francis, J., 2001. Client size and auditor reporting decisions: An office-level analysis. Journal of Accounting and Economics 30, 375–400.
Sullivan, M.W., 2002. The effect of Big Eight accounting firm mergers on the market for audit services. Journal of Law and Economics 45, 375–399.
Subcommittee on Reports, Accounting and Management of the Committee on Government Affairs, 1977. Improving the Accountability of Publicly Owned Corporations and Their Auditors. United States Senate, 95th Congress, 1st Session, Committee Print. Washington D.C.
Teoh, S., Wong, T.J., 1993. Perceived audit quality and earnings response coefficient. The Accounting Review 68, 346–366.
Wolk, C.M., Michelson, S.E., Wootton, C.W., 2001. Auditor concentration and market share in the US: 1988–1999 a descriptive note. British Accounting Review 33, 157–174.
Wootton, C.W., Tonge, S.D., Wolk, C.M., 1994. Pre and post big-eight mergers: comparison of auditor concentration. Accounting Horizons 8, 58–74.

Product market competition and corporate governance disclosure: Evidence from the UK

Basil Al-Najjar[1] and Rong Ding

ABSTRACT

In this study we measure multiple dimensions of product market competition and examine their impacts on corporate governance disclosure, based on a sample of UK public firms over the period 2001 to 2009. We use factor analysis to explore the different dimensions of product market competition; and regression models to analyse the association between multiple dimensions of product market competition and corporate governance disclosure. We find that firms in less competitive industries have significantly more corporate governance disclosure. Furthermore, we detect a positive association between corporate governance disclosure and board independence, as well as audit committee independence. This suggests that firms with better corporate governance tend to disclose more information to external investors. Overall the findings support the view that managers use more corporate governance disclosure as a substitute for the external disciplinary force of product market competition.

1. INTRODUCTION

WE INVESTIGATE the association between product market competition and corporate governance disclosure. Our research question is motivated by the different predictions in the theoretical literature. On the one hand, Darrough and Stoughton (1990) investigate competition in the context of an entry game, and predict that firms in more competitive industries will adopt better disclosure practice. This is because withholding information can be interpreted by potential entrants as good news, thus encouraging competitors to enter the market. On the other hand, Gertner et al (1988) detect that firms in more competitive industries will have less disclosure. Here, the logic is that information disclosed by one firm can be used opportunistically by industry rivals, and hence it is optimal for firms to have less information disclosure. In a similar vein, Wagenhofer (1990) suggests that greater product market competition inhibits disclosure in markets with mature competitors.

Empirical studies in this area also present mixed results. For example, Harris (1998) finds that a firm's decision to provide separate segment disclosure is positively related to the level of competition. In contrast, Verrecchia and Weber (2006) report that the probability of a firm providing proprietary information is negatively related to product market competition, measured by industry concentration. Based on a survey of UK private firms, Dedman and Lennox (2009) suggest that when managers perceive more competition, they are more likely to withhold information on sales and costs. Healy and Palepu (2001) conclude that the empirical studies provide little evidence on how product market competition is related to disclosure. To summarise, disagreements over the association between product market competition and disclosure remain unresolved and we aim to investigate this issue within corporate governance disclosure in a sample of UK public firms.

In the current study, we suggest that product market competition can potentially have two opposing effects on corporate governance disclosure. One reason for this is that firms might have more disclosure as a result of intense product market competition, since competition serves as a disciplinary and monitoring mechanism, to pressure managers to commit to better disclosure practice. Alternatively, corporate governance disclosure can be seen as a substitute for product market competition: managers use more disclosure in less competitive markets to maintain investors' confidence in their firms.

Under the Companies Act 1967, UK public firms are mandated to disclose audited financial statements to shareholders. In 1993, the Accounting Standard Board (ASB) introduced voluntary 'Operating and Financial Review''(OFR) for public firms. OFR recommends public firms in the UK provide a formalised narrative explanation of their financial performance, containing information on corporate social responsibility and internal governance, as such information is useful for investors to interpret firms' financial performance. Furthermore, UK public firms have low entry barriers for most industries (except for those under tight government regulation). Therefore, we exploit the UK setting to analyse the relationship between product market competition and corporate governance disclosure.

In previous empirical studies, competition is constructed typically as an industry level measure. For example, the level of concentration is used to measure competition (see for example, Marciukaityte and Park 2009; Balakrishnan and Cohen 2009). However, other studies suggest that product market competition has different dimensions (see for example, Raith 2003). Following the approach of Li (2010), we employ different measures, to reflect product market competition at the industry level, and examine their impact on the corporate governance disclosure. We report that firms in less competitive industries (where entry cost is high and market size is large) have significantly more disclosure compared with their counterparts in more competitive industries.

Our results are robust after controlling for those firm-specific characteristics and corporate governance factors that have been documented to

affect disclosure, in previous studies. Furthermore, we find a positive association between corporate governance disclosure and both board independence and audit committee independence. This suggests that firms with better corporate governance disclose more information to external investors. Overall, the findings support the argument that managers use more corporate governance disclosure as a substitute for the external disciplinary force of competition.

Accordingly, this paper contributes to the literature in a number of ways. To the best of our knowledge, this is the first study to measure multiple dimensions of product market competition, and to investigate the relationship between corporate governance disclosure and competition in the UK context. We add to the previous literature by identifying competition as an important economic determinant of a firm's decision to disclose more information. Second, we provide evidence on the positive association between corporate governance factors and disclosure. Finally, we extend earlier studies (e.g., Marciukaityte and Park 2009), that use industry concentration to measure competition, and find that different dimensions of competition can have different impacts on disclosure.

The rest of the paper is organised as follows. Section 2 reviews the literature and develops hypotheses. Section 3 describes the data and research method. Section 4 presents the empirical results, and Section 5 concludes.

2. Corporate governance. disclosure and product market competition: Theoretical framework and hypotheses development

In this Section we start with a discussion of corporate governance disclosure, then we develop our hypotheses.

2.1 Corporate governance disclosure and product market competition in the UK context

Historically, the Companies Act of 1900 (UK) required companies to disclose a limited amount of audited balance sheet information to their shareholders. A revised version in 1907 made it mandatory for public firms to file balance sheets with a central registry at Companies House (Flower 2004). In 1918, the Wrenbury Committee considered potential reforms of the Companies Act and recommended that the policy of limited public disclosure should continue. In 1925, the Institute of Chartered Accountants in England and Wales took a similar stance. In 1967, private companies were required to start filing their accounts with Companies House (Flower 2004).

In 1993, the Accounting Standard Board issued the statement of 'Operating and Financial Review' (OFR). The OFR enabled UK public firms to provide a structured narrative explanation of their financial performance, which has been voluntary (mandatory) for all listed firms before (after) April 1, 2005. However, on November 28, 2005 the UK government announced that the OFR would no longer be mandatory. In 2006, the Accounting Standard

Board recommended a revised version of the OFR, which can be seen as an extended version. According to the Accounting Standard Board, the revised OFR should be 'addressed to members, setting out their analysis of business with a forward-looking orientation in order to assist members to assess the strategies adopted by the entity and the potential for those strategies to succeed; the OFR should focus on matters that are relevant to the interest of members' (the Accounting Standard Board, 2006: principle 6). The OFR, which is qualitative in nature, contains information on corporate social responsibility and internal governance, as such information is valuable for investors to interpret the financial performance of public firms.

Furthermore, public firms in the UK, similar to their US counterparts, have a diverse corporate ownership structure and high quality disclosure. Apart from those tightly regulated industries (such as utilities), entry barriers are generally low for other industries in the UK. This indicates that there is a sufficient variation in the level of competition from industry to industry. Consequently, we take advantage of this interesting institutional setting in the UK to explore the relationship between product market competition and corporate governance disclosure.

2.2 Theoretical framework

The classical agency problem arises from the information asymmetry and the conflict of interests between principles (shareholders) and agents (managers). The separation between ownership and control provides managers with the opportunity to make decisions that maximise their benefits, at the expense of shareholders (Jensen and Meckling 1976; Fama and Jensen 1983). Information asymmetry between managers and shareholders leads to inefficient resource allocation, which subsequently increases the cost of raising capital because shareholders demand a risk premium for their investments. Prior literature suggests that product market competition is an efficient monitoring and disciplining mechanism to alleviate agency problems, as Shleifer and Vishny (1997, p. 738) assert: 'Product market competition is probably the most powerful force towards economic efficiency in the world'.

Previous studies show that product market competition provides incentives for managers to better align their interests with those of shareholders. It is well established in the literature that firms with strong governance have on average better performance (see for example, Gompers *et al* 2003; Anderson *et al* 2004). However, Giroud and Mueller (2011) find that firms with good corporate governance have higher firm value and better operating performance, in non-competitive industries, suggesting that firms in non-competitive industries will benefit more from strong governance practices. This implies that competition serves as an effective mechanism to discipline managers and thus partially substitutes internal governance tools.

Another theoretical perspective that is pertinent to the relationship between competition and disclosure is a manager's career concern (Narayanan

1985). Narayanan observes that top executives have an incentive to take actions that boost short-term performance at the expense of long-run shareholders' interests, if they are concerned with their reputation on the labour market, and that such concerns could become more serious when product market competition is high. Other studies show that CEO turnover is higher in more competitive industries (see for example, DeFond and Park 1999), and poorly performing firms in competitive industries are more likely to become takeover targets (Kruse and Rennie 2006). In contrast, managers in less competitive industries tend to suffer less from such career concern problems. However, information asymmetry still exists in the presence of intensive competition (albeit to a less extent), and disclosure can be used partially to solve the information asymmetry problem.

2.3 Hypotheses development

Product market competition plays an instrumental role in determining firms' disclosure practice. On the one hand, firms can strengthen disclosure to enhance corporate transparency and improve their reputation among investors. On the other hand, if the information disclosed is opportunistically exploited by current or potential competitors, such disclosure could put firms at risk. This suggests that firms tend to adopt a low level of disclosure (Verrecchia 1983). Thus, firms have to balance the benefits and costs of disclosure to decide the optimal level of such disclosure. We further elaborate two potential channels through which product market competition can affect a manager's incentives on corporate governance disclosure.

First, managers in less competitive industries are more likely to suffer from agency conflicts, as they are operating in an environment where the disciplinary force of competition is largely absent. In order to substitute the weak monitoring function of competition and signal to the market that their interests are aligned with those of shareholders, managers in less competitive industries can volunteer to make more disclosure, to build a good reputation and occupy advantageous positions in the labour market. This 'substitution argument' is based on the assumption that firms in less competitive industries have access to more free cash flows from operations, as a result of dominant market power. Hence, managers are likely to benefit themselves with corporate resources in the absence of a strong monitoring environment. To alleviate the concerns of shareholders and maintain investors' confidence in their firms, managers in less competitive industries are motivated to disclose more information on corporate governance. As such, managers can use disclosure as a substitute for the disciplinary force of competition.

Although theoretical work (see for example, Clarke 1983) predicts that it could be sub-optimal for firms in less competitive industries to increase disclosure on sales and investment strategies, we suggest that corporate governance disclosure can bring more benefits than costs, for the following reasons. First, corporate governance disclosure does not involve specific information on

a product or investment decision, so competitors are less likely to benefit from such information. Second, a high level of disclosure on corporate governance signals that firms are committed to high transparency, which is generally appreciated by investors. Based on the above discussion we expect to find support for the following hypothesis:

H1: Firms operating in less competitive industries disclose more information on corporate governance.

However, Guadalupe and Peres-Gonzalez (2005) find evidence that the private benefits of managerial control, as a measure of the magnitude of conflict between managers and shareholders, decrease with the intensity of product market competition. Relating product market competition to quality of financial reporting, Marciukaityte and Park (2009) detect that firms in more competitive industries are less likely to engage in earnings management. In a similar vein, Balakrishnan and Cohen (2009) find that competition disciplines managers because the frequencies of earnings re-statement are significantly lower in more competitive industries. Focusing on the relationship between product market competition and a firm's social performance, Fernandez-Kranz and Santalo (2010) report that firms in more competitive industries have better social ratings. These results indicate that shareholders of firms in more competitive industries are more likely to have fewer agency conflicts.

Previous literature also suggests that more disclosure is able to reduce information asymmetry and alleviate agency problems (see for example, Easley and O'Hara 2004; Lambert *et al* 2007). Furthermore, La Porta *et al* (2006) find that an increase in mandatory disclosure is associated with a substantially lower level of private benefits of control. Therefore, managers in more competitive industries might voluntarily commit to better corporate governance disclosure. Here, competition can be seen as a powerful disciplinary mechanism for managers, since competition effectively removes incapable managers and managers who do not act in the best interest of shareholders. Furthermore, firms operating in highly competitive industries are more likely to rely on external financing for growth, *ceteris paribus*, because competition (in general) will lower the profit margin at the industry level. Previous literature suggests that a major benefit of increased disclosure to reduce information asymmetry and lower cost of capital (see for example, Easley and O'Hara 2004; Lambert *et al* 2007). Consequently, as firms in competitive industries also compete for funds in the financial market, they have strong incentives to disclose more information on corporate governance to raise capital at lower costs. Hence we posit that:

H2: Firms operating in more competitive industries disclose more information on corporate governance.

Prior studies suggest that internal corporate governance can be of great significance in monitoring firms' performance and minimising managers' oppor-

tunistic behaviours. For example, Bujaki and McConomy (2002) report that firms with more 'unrelated directors on the board' voluntarily provide more information related to corporate governance. Ben-Amar and Boujenoui (2010) also find that 'the percentage of unrelated directors on the board' impacts governance disclosure. Wang and Hussainey (2013) show that corporate governance features (board size and composition, CEO duality, directors' ownership) influence companies' decision to disclose forward-looking statements voluntarily in the narrative section of annual reports, from a sample of UK public firms.

The findings of these studies suggest that board independence (measured by the percentage of independent directors on the board) plays an important role in increasing board strength and monitoring of managers. This is because insider directors are more likely to have a close relationship with the management, which lowers their incentive and effectiveness in monitoring the top executives (see for example, Pincus *et al* 1989). Accordingly, we hypothesise that there is a positive relationship between independent directors and corporate governance disclosure. In addition, audit committee independence can enhance the quality of disclosure, as they are more able to question the financial reports and to provide better links with external auditors. Accordingly, we predict a positive association between audit committee independence and the disclosure of information related to corporate governance. Thus we hypothesise that:

H3: Firms with more independent board and audit committee disclose more information on corporate governance.

3. Research design

In this section we first discuss the data used in the current study. Then we provide more details on the source of data and research method adopted in the study.

3.1. Data on product market competition

Raith (2003) suggests that product market competition has multiple dimensions, so drawing a conclusion based on one dimension of competition could be misleading. Following the literature (such as, Karuna 2007; Li 2010), in this study we construct variables to measure three dimensions of competition: potential entry cost to an industry, industry profitability and industry concentration. Specifically, we use industry capital expenditure (the average capital expenditure for all firms in one industry) and industry market size (logarithm of aggregate industry sales) to reflect entry cost. This is because industry capital expenditure reflects the necessary investment for potential rivals to compete with existing players in an industry, so it is positively correlated with entry costs. As large sales is normally associated with high initial investment, the correlation between industry market size and entry costs should also be positive.

Next, we use industry price-cost margin and industry return on assets (ROA) to measure industry profitability, as large profits can motivate firms to enter an industry. It is necessary to control for industry profitability in the analysis. High industry profitability might imply more competition from potential entrants, or less competition from existing players in the industry (because existing players can achieve high profit, so they have less incentives to increase competition), and hence the interrelationship between industry profitability and competition is ambiguous. Finally, we use the four firm concentration ratio and Herfindahl index to capture industry concentration, as highly concentrated industries are assumed to have less competition.

We further employ principal component analysis with Oblimin rotation, to generate three factors with eigenvalue larger than one: Entry cost is a factor obtained from the factor analysis on industry capital expenditure and industry market size; industry profitability is a factor obtained from the factor analysis on industry price-cost margin and industry ROA; whilst industry concentration is a factor obtained from the factor analysis on the four firm concentration ratio and Herfindahl index. All the data used to calculate competition measures are collected from DataStream for all the firms listed in each industry. In the analysis we first use each individual measure for competition and then use three factors simultaneously in the regression, to generate a complete overview of the association between the dimensions of competition and corporate governance disclosure. It is worth mentioning that for industry classification, we employ the 4 digit SIC codes available in DataStream. Finally, consistent with previous studies, we exclude financial firms.

3.2 Data on corporate governance disclosure and firm-specific characteristics

Our initial sample is based on FTSE 250 companies over the period 2001 to 2009. After excluding financial and utilities firms, the final sample consists of 162 firms. We use the corporate governance rating score of the Corporate Governance Quotient database developed by Institutional Shareholder Services (ISS), that rates publicly traded companies in terms of the quality of their corporate governance. The information is voluntarily disclosed by the firm, which reflects their disclosure levels of internal governance information. The information about corporate governance variables such as board independence and audit independence, is hand-collected from firms' annual reports. Firm level financial information is obtained from DataStream.

3.3 Research method

In order to investigate the effect of competition and internal corporate governance on governance disclosure, we employ panel data analysis. Our main interest is to examine the relationship between competition and corporate governance disclosure. Previous studies show that firm size is important in explaining the level of disclosure (Zarzeski 1996; Chen and Jaggi 2000; Cheng and Courtenay 2006), so we control for firm size (natural logarithm of total

assets) in our analysis. Both theoretical and empirical studies in industry organisations suggest that leverage reduces the intensity of competition (Fudenburg and Tirole 1986; Chevalier 1995), so we include leverage (long-term debt to total assets) as another control variable. Firms with a high growth rate and greater risk are less likely to disclose information (Rogers and Stocken 2005; Waymire 1985), so we include market-to-book ratio, cash flow (ratio of cash flow to total assets) and the firm's historical beta (a measure of a firm's systematic risk, obtained from DataStream) in our models. We also control for institutional ownership, since these investors can obtain more information directly from their meetings with managers and hence there is less need for disclosure (Schadewitz and Blevins 1998; Celik *et al* 2006).

We first estimate the determinants of firms' corporate governance disclosure (INDEXCGQ) without controlling for the industry effect. Next, following Fernandez-Kranz and Santalo (2010), we re-estimate the model by adding industry effects. It is worth noting that we have examined issues related to endogeneity in our models. According to the Hausman Test there is no strong significant evidence of an endogeneity problem among the industry variables we are employing. We also used lagged variables to double check the robustness of our results. Those findings are not significantly different from what is reported in this paper. Our random effects model is as follows:

$$INDEXCGQ_{it} = \beta 0 + \beta 1 X_{it} + \beta 2 Control + \varepsilon_{it} \quad (1)$$

Where $INDEXCGQ_{it}$ is our corporate governance disclosure for firm i at year t, with α as an intercept term; X_{it} is a vector of product market competition measures and Control is a vector of control variables. ε_{it} is the error term. Variable definitions are provided in Table 1.

Table 1: Variable Definition

AUDIND is the percentage of independent directors in the audit committee

BETA is historical beta of firms

BOARDIND is board independence, which is measured as the ratio of independent directors to total number of directors on board

CASHFLOW is defined as ratio of cash flow to total assets

ICAPEXP is measured as the weighted average of capital expenditures for firms in each industry per year

INDCON4 is the four firm concentration ratio, which is measured as the sum of the market share of four biggest firms in each industry each year

INDEXCGQ is corporate governance disclosure measure

INDHHI is defined as the Herfindahl index, which is measured as the sum squared of market share of firms in each industry each year *cont...*

...cont

INDMGN is the price-cost margin measured as industry sales to industry operating costs

INDMKTS is assessed as the product market size which is the natural logarithm of industry sales in each industry yearly

INDROA is defined as industry Earnings Before Interest, Taxes and Depreciation (EBITDA) to industry total assets

INSIDEROWN is the percentage of shares owned by insiders

INSTITUTIONOWN is the percentage of shares owned by institutions

LEV is leverage which is measured as the ratio of long term debt to total assets

MKBV is market to book ratio

SIZE is measured as the natural logarithm of total assets

4. Results

This section is divided into two sub-sections. Firstly, we discuss the descriptive statistics and report findings from the correlation analysis of the investigated variables. Secondly, we discuss the results of the regression analysis on the relationship between competition and corporate governance on corporate governance disclosure.

4.1. Descriptive statistics and correlation

Table 2 presents the descriptive statistics of the variables. The mean of the corporate governance disclosure score is 86.79, indicating that the average firms in the sample have a relatively good ranking of disclosure. The mean of the four firm concentration ratio is 0.625 which suggests that, on average, firms operate in a relatively concentrated industry (the largest four firms in the industrial control 62.5 per cent of market share). The mean of firm size (logarithm of total assets) is 13.36, as our sample is populated with large firms included in the FTSE250 index. The mean of board independence (audit committee independence) is 0.48 (0.96), indicating that 48 per cent (96 per cent) of board members (audit committee directors) are independent. Finally, on average 17.49 per cent of shares are owned by institutions.

Table 3 shows the correlations between variables. Corporate governance disclosure is positively correlated with firm size, board independence and audit committee independence, suggesting that large firms, and firms with independent boards and independent audit committees, are more likely to disclose more information on corporate governance. The industry-average of capital expenditure is positively related to price-cost margin at the industry level and the industry return on assets, indicating that profitable industries tend to have high entry costs in terms of capital investment. The industry-

Table 2: Descriptive statistics

Variables	*Mean*	*Minimum*	*Maximum*
INDEXCGQ	86.788	0	100
ICAPEXP	385155.5	46894	986944.2
INDMKTS	18.253	16.730	19.951
INDMGN	0.015	1.93e-06	0.065
INDROA	0.963	-0.711	7.690
INDCON4	0.625	0.239	1
INDHHI	0.178	0.049	1
SIZE	13.364	9.919	18.212
MKBV	2.847	-99.6	21.25
LEV	0.171	0	0.647
BOARDIND	0.480	0.1	0.818
CASHFLOW	0.188	-6.676	0.980
AUDIND	0.959	0.286	1
BETA	1.058	-0.54	5.35
INSIDEROWN (%)	17.485	0.01	73.4

average of capital expenditure is also positively correlated with the four firm concentration ratio, indicating that relatively concentrated industries have high entry costs.

Industry market size is positively correlated with price-cost margin and industry return on assets, which implies that industries with large market size are more profitable. Price-cost margin at the industry level (industry return on assets) is positively correlated with the four firm concentration ratio and Herfindahl index, indicating that highly concentrated industries are more profitable. This is consistent with findings in the economics literature (see for example, Rivera-Batiz 1988), as powerful firms in less competitive industries are price makers instead of price takers, so they can charge high prices to increase their profits. The four firm concentration ratio is highly correlated with the Herfindahl index, as they both measure the level of industry concentration.

Industry return on assets is positively related to insider ownership, suggesting that insiders are more likely to invest in firms operating in profitable industries. The correlation between board independence (audit committee independence) and firm size is positive, as large firms are likely to have more independent boards (audit committee). Leverage is negatively related to

cash flow, which indicates that firms with less cash flow use higher gearing to finance their operations. Finally, board independence is negatively correlated with institutional ownership, hence institutions invest less in firms with independent boards, possibly due to concerns of the board that firms become less transparent when institutions hold a significant percentage of shares. According to Table 2, the correlations between variables are low to moderate, which implies that multicollinearity is not of a concern in our specification.

4.2. Results on the association between competition and corporate governance disclosure

Table 4 presents our main results on the association between product market competition and corporate governance disclosure, without controlling for the industry effects. In Models 1 to 6, the dependent variable is the corporate governance disclosure index, while the independent variable of central interest is each individual measure of competition. In Model 7 the dependent variable is still the corporate governance disclosure index, while the independent variables are three factors resulting from the principal component analysis (entry cost, industry profitability and industry concentration, respectively). In each model we control for firm-specific characteristics and corporate governance variables. The coefficients of industry average capital expenditure (ICAPEXP, Model 1), industry market size (INDMKTS, Model 2) and industry price-cost margin (INDMGN, Model 3) are positive and significant, which suggest that firms operating in industries with higher entry costs (higher capital expenditure and large market size) tend to disclose more information on corporate governance. Furthermore, firms in more profitable industries tend to have more corporate governance disclosure.

In Model 7 the coefficient of entry cost (which is the factor score obtained from the principal component analysis on industry capital expenditure and industry market size) is positive and significant, which confirms our earlier result that firms disclose more governance information in less competitive industries where there is higher entry cost. Our findings are consistent with Li (2010), who shows that competition from potential rivals increases management earnings forecasts and management investment forecasts.[4] Overall, our findings support the argument that firms use more corporate governance disclosure as a substitute for the external disciplinary force of product market competition, as managers in these firms aim to gain a reputation for the good treatment of their shareholders and the maintenance of investors' confidence in their firms. *H1* is thus supported.

Our results also suggest that the association between competition and corporate governance disclosure is sensitive to the multi-dimensional characterisation of competition, as we find a positive and significant association between entry cost (industry profitability) and disclosure, but an insignificant association between industry concentration and disclosure. Therefore, we caution against the use of a concentration ratio as the only measure of

Table 3: Correlation

	INDEXCGQ	*ICAPEXP*	*INDMKTS*	*INDMGN*	*INDROA*	*INDCON4*	*INDHHI*	*SIZE*	*MKBV*	*LEV*
INDEXCGQ	1.000									
ICAPEXP	0.027	1.000								
	(0.497)									
INDMKTS	0.011	0.390***	1.000							
	(0.772)	(0.000)								
INDMGN	0.005	0.289***	0.912***	1.000						
	(0.905)	(0.000)	(0.000)							
INDROA	-0.012	0.154***	0.445***	0.621***	1.000					
	(0.766)	(0.000)	(0.000)	(0.000)						
INDCON4	0.010	0.205***	0.127***	0.313***	0.677***	1.000				
	(0.805)	(0.000)	(0.000)	(0.000)	(0.000)					
INDHHI	-0.002	0.032	0.044*	0.318	0.695***	0.868***	1.000			
	(0.951)	(0.230)	(0.096)	(0.000)	(0.000)	(0.000)				
SIZE	0.203***	0.078*	-0.020	-0.027	-0.083**	-0.010	0.002	1.000		
	(0.000)	(0.007)	(0.480)	(0.343)	(0.004)	(0.733)	(0.947)			
MKBV	-0.019	-0.011	0.034	0.039	0.049*	0.015	0.030	-0.168***	1.000	
	(0.638)	(0.719)	(0.259)	(0.196)	(0.101)	(0.607)	(0.311)	(0.000)		
LEV	0.042	0.151***	-0.019	-0.040	-0.039	0.048*	0.008	0.437***	-0.162***	1.000
	(0.293)	(0.000)	(0.519)	(0.178)	(0.184)	(0.105)	(0.785)	(0.000)	(0.000)	
BOARDIND	0.193***	-0.017	-0.026	-0.013	-0.075**	0.015	0.034	0.232***	0.009	0.009
	(0.000)	(0.584)	(0.397)	(0.661)	(0.014)	(0.632)	(0.266)	(0.000)	(0.771)	(0.765)
CASHFLOW	-0.199***	0.008	-0.008	-0.007	-0.083**	0.015	0.013	-0.250***	0.104**	-0.066*
	(0.000)	(0.823)	(0.812)	(0.833)	(0.013)	(0.660)	(0.701)	(0.000)	(0.003)	(0.052)
AUDIND	0.129**	-0.025	0.036	0.027	0.009	-0.032	-0.011	0.023	0.158***	0.003
	(0.002)	(0.447)	(0.269)	(0.406)	(0.772)	(0.326)	(0.738)	(0.482)	(0.000)	(0.940)
BETA	0.118**	0.112***	0.146***	0.088**	0.131***	0.047*	-0.012	0.100**	0.046	0.130***
	(0.003)	(0.000)	(0.000)	(0.002)	(0.000)	(0.106)	(0.685)	(0.001)	(0.126)	(0.000)
INSIDEROWN	-0.006	0.105***	0.026	0.001	-0.028	-0.008	-0.031	-0.238***	0.042	-0.163***
	(0.891)	(0.000)	(0.374)	(0.972)	(0.350)	(0.789)	(0.296)	(0.000)	(0.175)	(0.000)

***,**,* significant at 1 %, 5 % and 10 % levels respectively.

Table 4: The association between product market competition and corporate governance disclosure without controlling for industry effects (for the 162 firms (clusters))

Dependent variable: Indexcgq	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Independent Variables:							
ICAPEXP	0.001**						
	(0.033)						
INDMKTS		2.775**					
		(0.030)					
INDMGN			109.972*				
			(0.094)				
INDROA				-0.005			
				(0.993)			
INDCON4					-0.751		
					(0.821)		
INDHHI						-0.736	
						(0.910)	
Entry cost							2.144**
							(0.026)
Industry profitability							-0.453
							(0.691)
Ind'y concentration							-0.283
							(0.792)
BOARDIND	14.142**	11.985*	12.117*	11.819*	11.593*	11.745*	13.103*
	(0.038)	(0.077)	(0.075)	(0.088)	(0.093)	(0.087)	(0.056)
AUDIND	11.341*	11.058*	10.884*	11.350*	11.420*	11.386*	11.301*
	(0.072)	(0.080)	(0.085)	(0.074)	(0.073)	(0.073)	(0.074)
INSIDEROWN (%)	0.011	0.012	0.019	0.0226	0.0229	0.0227	0.006
	(0.796)	(0.777)	(0.668)	(0.601)	(0.597)	(0.600)	(0.884)
SIZE	2.276**	2.679**	2.631**	2.466**	2.487**	2.474**	2.438**
	(0.012)	(0.003)	(0.004)	(0.007)	(0.007)	(0.007)	(0.008)
MKBV	0.827**	0.793**	0.766**	0.734**	0.736**	0.735**	0.856**
	(0.003)	(0.004)	(0.006)	(0.008)	(0.008)	(0.008)	(0.002)
LEV	0.552	1.117	1.208	1.268	1.356	1.293	0.549
	(0.909)	(0.818)	(0.804)	(0.795)	(0.782)	(0.791)	(0.911)
CASHFLOW	-5.938**	-5.278*	-5.349*	-5.264*	-5.136*	-5.213*	-5.662*
	(0.045)	(0.074)	(0.071)	(0.077)	(0.090)	(0.083)	(0.063)
BETA	0.626	0.549	0.694	0.729	0.759	0.735	0.636
	(0.486)	(0.543)	(0.442)	(0.436)	(0.408)	(0.419)	(0.484)
Constant	31.367**	-20.792	29.117**	33.060**	33.162**	33.031**	32.163**
	(0.023)	(0.464)	(0.039)	(0.018)	(0.018)	(0.018)	(0.023)
Observation	353	353	353	353	353	353	353
Wald Chi^2	38.06***	37.87***	35.78***	32.66***	32.66***	32.65***	40.02***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R2	0.131	0.129	0.126	0.119	0.119	0.119	0.136

***, **,* significant at 1 %, 5 %, 10 % levels respectively.

Table 5: The association between product market competition and corporate governance disclosure after controlling for industry effects (for the 162 firms (clusters))

Dependent Variable: Indexcgq	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Independent variables:							
ICAPEXP	0.001** (0.038)1						
INDMKTS		4.141* (0.062)					
INDMGN			204.105 (0.132)				
INDROA				-0.485 (0.582)			
INDCON4					-35.288 (0.178)		
INDHHI						6.549 (0.857)	
Entry cost							3.018** (0.033)
Industry profitability							-0.845 (0.640)
Ind'y concentration							1.707 (0.800)
BOARDIND	1.864* (0.102)	11.751* (0.108)	11.800* (0.107)	12.995* (0.074)	13.526* (0.064)	13.084* (0.071)	11.629 (0.111)
AUDIND	11.180* (0.081)	11.335* (0.077)	11.156* (0.083)	11.860* (0.066)	11.078* (0.086)	12.321* (0.056)	11.482* (0.074)
INSTITUTIONOWN (%)	0.013 (0.760)	0.010 (0.828)	0.017 (0.701)	0.024 (0.584)	0.021 (0.639)	0.026 (0.550)	0.008 (0.849)
SIZE	2.481** (0.009)	2.576** (0.007)	2.606** (0.007)	2.624** (0.006)	2.586** (0.007)	2.606** (0.006)	2.443** (0.010)
MKBV	0.896** (0.002)	0.863** (0.003)	0.828** (0.005)	0.720** (0.011)	0.758** (0.008)	0.714** (0.012)	0.921** (0.002)
LEV	0.431 (0.932)	0.231 (0.964)	0.125 (0.980)	0.161 (0.975)	0.439 (0.931)	0.383 (0.939)	0.181 (0.971)
CASHFLOW	-6.010* (0.059)	-5.860* (0.067)	-5.734* (0.073)	-5.091* (0.107)	-5.210* (0.100)	-5.050* (0.107)	-6.237* (0.049)
BETA	0.981 (0.321)	0.764 (0.441)	0.952 (0.339)	0.929 (0.355)	0.901 (0.365)	0.844 (0.393)	0.917 (0.354)
Constant	23.240 (0.126)	-46.776 (0.283)	25.931* (0.088)	31.483** (0.040)	62.357** (0.029)	28.398* (0.091)	27.751* (0.082)
Wald Chi^2	40.01** (0.001)	38.63** (0.001)	37.34** (0.002)	35.66** (0.003)	36.92** (0.002)	36.35** (0.003)	41.43** (0.001)
R2	0.141	0.134	0.134	0.132	0.134	0.131	0.140

***, **,* significant at 1 %, 5 %, 10 % levels respectively.

competition (see for example, Marciukaityte and Park 2009), because the subsequent inference could be misleading.

The coefficients on board independence and audit committee independence are positive and significant across all the regressions, which indicate that firms with independent boards and independent audit committees have better corporate governance disclosure. This is consistent with previous findings of a positive relationship between governance and disclosure (see for example, Anderson *et al* 2004). Accordingly, the empirical evidence supports *H3*. Regarding the firm-specific variables, we show that there is a positive relationship between corporate governance disclosure and both firm size and market to book ratio. In addition, cash flow is negatively associated with corporate governance disclosure.

We re-estimate the regressions after controlling for industry effects, and report the findings in Table 5. The results are qualitatively consistent, as the coefficients of ICAPEXP (Model 1), INDMKTS (Model 2), INDMGN (Model 3) and entry costs (Model 7) remain positive and significant, which suggests that our results stay robust after controlling for the industry effects.

Finally, we estimate the models using the lagged corporate governance factors to control for any possible endogeneity. The results (not reported) were not substantially different from the results reported in this paper.[5]

Our results have important implications for regulators and policy makers, as government policies to regulate product market competition may have unintended consequences on firms' disclosure practices. For example, the multiple dimensions of competition imply that regulators need to consider both *current* level of competition in terms of industry concentration and the *potential* level of competition in terms of entry barriers, to assess appropriately the overall level of competition across different industries.

5. Conclusions

In this study we test the association between product market competition and corporate governance disclosure, using a sample of UK firms. What distinguishes the current study from previous studies on competition and corporate disclosure is that we use multiple measures (entry cost, industry concentration and industry profitability), to reflect the different dimensions of competition, and analyse the association between each competition dimension and corporate governance disclosure. We find that firms in less competitive industries (where entry cost is high and market size is large) have significantly more disclosure. The results remain robust after controlling for the firm-specific factors and corporate governance variables that have been documented to affect disclosure. Furthermore, we report a positive association between disclosure and board independence, as well as audit committee independence, which suggests that firms with better corporate governance tend to disclose more information to external investors. Overall, the findings support the argument

that managers use more disclosure as a substitute for the external disciplinary force of product market competition.

We contribute to the literature by identifying competition as an important determinant of corporate governance disclosure. As far as we are aware of, this is the first study to measure multiple dimensions of product market competition, and investigate the relationship between corporate governance disclosure and competition in the UK context. Second, we provide new evidence on the positive association between corporate governance factors and disclosure. Finally, our findings confirm that the association between competition and corporate governance disclosure is sensitive to the multi-dimensional characterisation of competition. Therefore, we suggest that in future studies, product market competition needs to be measured by more than merely industry concentration to avoid reaching misleading inferences.

Our findings may have implications for both academics and policy makers, as we provide empirical evidence that different dimensions of competition affect a firm's decision to disclose more information. In addition, firms with strong internal governance (such as having more independent directors on the board) are likely to disclose more information. Hence, our results suggest that regulators might harmonise industry policies and accounting regulations to increase social welfare of the general public. Furthermore, the multiple dimensions of competition imply that policy makers may consider different aspects of competition before they assess the impact of important merger and acquisition deals that could re-shape the level of competition within an industry.
Our study is subject to the following limitations. First, we adopt an industry level competition measure based on data from publicly listed firms in the UK. As we do not have access to data on UK private firms, our measure is likely to underestimate the actual level of competition. Second, our competition measure is compiled based on UK domestic firms. As the result of economic integration within the European Union (EU), companies from other EU countries may compete directly with domestic UK firms, so our competition measure is likely to be downward biased. Finally, by construction, our competition measure is at an industry level, however firms operating in the same industry may confront different levels of competition. Unfortunately this is not captured by our competition measure.

We suggest three directions for future research. First, researchers may go beyond a single country to investigate the association between competition and corporate governance disclosure from economically integrated regions, such as the EU, in particular countries that use a common currency, such as the euro. Within the EU, firms from different countries compete directly with each other, which suggests that competition at the EU level may have an impact on firms' disclosure practices.

Second, recent studies (e.g. Li *et al* 2013) develop a firm-level competition measure, based on how managers perceive the firm's competitive environment in the management discussion and analysis section (MD&A) of 10-K

filing for US public firms.[6] Future research may use firm level competition measures to provide in-depth insights on the association between competition and corporate governance disclosure.

Finally, although competition at the industry level is considered stable in the short to medium term, longitudinal studies may take the advantage of studying external shocks to an industry, to explore how an increased or decreased level of competition shapes firms' disclosure practice over time.

Accepted for publication: 5 January 2014

ENDNOTES

1. Basil Al-Najjar; Department of Management; School of Business, Economics and Informatics; Birkbeck, University of London Email: b.al-najjar@bbk.ac.uk; Rong Ding, Accounting and Finance, Southampton University, Email: R.Ding@soton.ac.uk.

2. We employ a corporate governance rating score from the Corporate Governance Quotient database developed by Institutional Shareholder Services, that rates publicly traded companies in terms of the quality of their corporate governance. Each public company is assigned a rating based on a number of factors including board structure and composition, the executive and director compensation charter, and bylaw provisions. The information is disclosed voluntarily by each firm, which reflects their level of disclosure of internal governance information.

3. It is essential to note that firms from regulated industries (i.e., financial and utilities firms) are excluded because they have different statutory requirements compared with firms in other industries.

4. Based on a large sample of US firms, Li (2010) uses principal component analysis to construct competition from potential rivals with industry average of plant and equipment, industry average R&D, industry average capital expenditure and industry market size.

5. These results are available upon request.

6.Li *et al* (2013) use the number of occurrences of competition-related words (such as competition, competitor, competitive and competing) per 1,000 total words in the 10-K to capture competition at firm level, and find that firms' rates of diminishing marginal return on new and existing investment vary significantly with this measure.

REFERENCES

Anderson R C, Mansi S and Reeb D (2004) 'Board characteristics, accounting report integrity and the cost of debt', *Journal of Accounting and Economics,* 37, 315-342.

Balakrishnan K and Cohen D (2009) 'Product market competition, financial accounting misreporting and corporate governance: Evidence from accounting re-statements', New York University Stern, Working Paper no. ACC-09-08.

Ben-Amar W and Boujenoui A (2010) 'Factors Explaining Corporate Governance Disclosure Quality: Canadian Evidence', University of Ottawa, Working Paper.

Bujaki M and McConomy B (2002) 'Corporate governance: Factors influencing disclosure by publicly traded Canadian firms', *Canadian Accounting Perspectives*, 29, 105-139.

Celik O, Ecer A and Karabacak H. (2006) 'Disclosure of forward looking information: evidence from listed companies on Istanbul stock exchange (ISE)', *Investment Management and Financial Innovations*, 3, 197-216.

Chen C J P and Jaggi B (2000) 'Association between independent non-executive directors, family control and financial disclosure in Hong Kong', *Journal of Accounting and Public Policy*, 19, 285-310.

Cheng E C M and Courtenay S M (2006) 'Board composition, regulatory regime and disclosure', *The International Journal of Accounting*, 41, 262-289.

Chevalier A (1995) 'Capital structure and product market competition: empirical evidence from the supermarket industry', *American Economic Review*, 85, 415-435.

Clarke R (1983) 'Collusion and the incentives for information sharing', *Bell Journal of Economics*, 14, 383-394.

Darrough M N and Stoughton N M (1990) 'Financial disclosure policy in an entry game', *Journal of Accounting and Economics*, 12, 219-243.

Dedman E and Lennox C (2009) 'Perceived competition, profitability and the withholding of information about sales and the cost of sales', *Journal of Accounting and Economics*, 48, 210-230.

DeFond M and Park C (1999) 'The effect of competition on CEO turnover', *Journal of Accounting and Economics*, 27, 35-56.

Easley D and O'Hara M (2004) 'Information and the cost of capital', *Journal of Finance*, 47, 577-605.

Fama E and Jensen M (1983) 'Separation of ownership and control', *Journal of Law and Economics*, 26, 301-325.

Fernandez-Kranz K and Santalo J (2010) 'When necessity becomes a virtue: the effect of product market competition on corporate social responsibility', *Journal of Economics and Management Strategy*, 19, 453-487.

Flower J (2004) *European financial reporting: adapting to a changing world*, Basingstoke: Palgrave Macmillan.

Fudenburg D and Tirole J (1986) 'A signal Jamming theory of predation', *Rand Journal of Economics*, 17, 366-376.

Gertner R, Gibbons R and Scharfstein D (1988) 'Simultaneous signalling to the capital and product markets', *Rand Journal of Economics*, 19, 173-190.

Giroud X and Mueller H M (2011) 'Corporate governance, product market competition and equity prices', *Journal of Finance*, 66, 563-600.

Gompers P, Ishii J and Metrick A (2003) 'Corporate governance and equity price', *Quarterly Journal of Economics*, 118, 107-155.

Guadalupe, M., and Perez-Gonzalez, F. (2005) 'The impact of product market competition on private benefits of control', Columbia University, Working Paper.

Harris M S (1998) 'The association between competition and managers' business segment reporting decisions', *Journal of Accounting Research*, 36, 111-128.

Healy P M and Palepu K G (2001) 'Information asymmetry, corporate disclosure and capital markets: A review of the empirical disclosure literature', *Journal of Accounting and Economics*, 31, 405-440.

Jensen M and Meckling W (1976) 'Theory of firm: managerial behaviour, agency costs and ownership structure', *Journal of Financial Economics*, 4, 305-360.

Karuna C (2007) 'Industry product market competition and managerial incentives', *Journal of Accounting and Economics*, 43, 275-297.

Kruse T and Rennie C (2006) 'Product market competition, excess free cash flows and CEO discipline: evidence from the US retail industry', University of Arkansas, Working Paper.

La Porta R, Lopez de Silanes F and Shleifer A (2006) What Works in Securities Laws? *Journal of Finance*, 61, 1-32.

Li F, Lundholm R and Minnis M (2013) 'A measure of competition based on 10-K filings', *Journal of Accounting Research,* 51, 399-436.

Li X (2010) 'The Impacts of Product Market Competition on the Quantity and Quality of Disclosures', *Review of Accounting Studies*, 15, 663-711.

Lambert R, Leuz C and Verrecchia R E (2007) 'Accounting information, disclosure and the cost of capital', *Journal of Accounting Research*, 45, 385-420.

Marciukaityte D and Park J C (2009) 'Market competition and earnings management', Working paper, Drexel University, Available at http://ssrn.com/abstract=1361905

Narayanan N P (1985) 'Managerial incentives for short term incentives', *Journal of Finance*, 40, 1469-1484.

Pincus K, Rusbarsky M and Wong J (1989) 'Voluntary formation of corporate audit committees among NASDAQ firms', *Journal of Accounting and Public Policy*, 8, 239-265.

Raith M (2003) 'Competition risk and managerial incentives', *American Economics Review*, 93, 1425-1436.

Rivera-Batiz L F (1988) 'Increasing returns, monopolistic competition and agglomeration economies in consumption and production', *Regional Science and Urban Economics*, 18, 125-153.

Rogers J and Stocken P C (2005) 'Credibility of management forecast', *The Accounting Review* 80, 1233-1260.

Schadewitz H and Blevins D (1998) 'Major determinants of interim disclosures in an emerging market', *American Business Review*, 16, 41-55.

Shleifer A and Vishny R (1997) 'A survey of corporate governance', *Journal of Finance*, 52, 737-783.

Verrecchia R E (1983) 'Discretionary disclosure', *Journal of Accounting and Economics*, 5, 179-194.

Verrecchia R E and Weber J (2006) 'Redacted disclosure', *Journal of Accounting Research,* 44, 791-814.

Wagenhofer A (1990) 'Disclosure with a strategic opponent', *Journal of Accounting and Economics*, 12, 341-363.

Wang M and Hussainey K (2013) 'Voluntary forward-looking statements driven by corporate governance and their value relevance', *Journal of Accounting and Public Policy*, 32, 26-49.

Waymire G (1985) 'Earnings volatility and voluntary management forecast disclosure', *Journal of Accounting Research*, 23, 268-295.

Zarzeski M (1996) 'Spontaneous harmonization effects of cultural and market forces on accounting disclosure practices', *Accounting Horizon,* 10, 18-37.