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Can media exposure improve stock price efficiency in China and why?

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ABSTRACT

The media in China has undergone extensive commercialization to become more market-driven over the last 35 years. Based on a sample of over two million newspaper articles, this study investigates whether the media in China has an incremental impact on stock price efficiency. We find that: as media coverage of a firm increases, (1) its stock price synchronicity decreases; (2) the probability of informed trading of its stock increases; and (3) the extent to which its stock price deviates from random walk decreases. Our inter-regional analysis over thirty-one provinces/regions within China reveals that the effects of the media on decreasing stock price synchronicity, increasing the probability of informed trading, and reducing stock price deviation from random walk are stronger in regions of weaker institutional development. Our findings suggest that a market-driven media can play the role of compensating for the underdeveloped governance institutions in transitional economies such as China.

1. Introduction

In transitional economies such as China or Russia, agency problems are severe but the standard governance institutions to protect investors and maintain transparency are limited and weak (e.g., Allen et al., 2005). With investor protection weakened and transparency reduced, stock prices are likely to become less informative because they are less able to incorporate firm-specific information (Jin and Myers, 2006). The resulting

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equilibrium is that stock prices are less efficient because they are less able to channel scarce capital into best investments (Tobin, 1982).

In such an institutional environment, can the media play the role of compensating for the weak standard institutions to improve stock price efficiency? Our study investigates this hitherto unexplored question in the context of listed Chinese firms. Our analysis focuses on the impact of firm-level media coverage on three dimensions of stock price efficiency: (1) the ability of stock price to incorporate firm-specific information; (2) the collection of private firm-specific information in stock trading (i.e., the extent of informed trading); and (3) the extent to which stock prices deviate from random walk (i.e., pricing error).[1] In an inter-regional analysis across 31 regional/provincial jurisdictions within China, we also directly test our compensating hypothesis that the effect of media coverage in increasing stock price efficiency is stronger in regions (or countries) with weaker standard governance institutions.

We are motivated to study the effect of firm-level media coverage in China on stock pricing efficiency for at least two reasons. First, La Porta et al. (1998) suggest that in countries where standard institutions are weak, substitutive or compensating mechanisms (such as concentrated ownership) may develop to sustain financial activities.[2] As the largest transitional economy in which standard institutions for investor protection and disclosure transparency are either underdeveloped or still in the developing stage, China provides arguably the best laboratory setting in which to identify compensating mechanisms.[3] Our investigation in effect assesses whether the media can act as a compensating mechanism to increase stock price efficiency.

Second, Morck et al. (2000) find that Chinese stock prices are less able to incorporate firm-specific information than most other stocks in a 40-country sample.[4] Jin and Myers (2006) as well as Hutton et al. (2009) show that the ability of stock prices to incorporate firm-specific information is lower in countries with poor investor protection and low firm-level transparency. In the case of China and other transitional economies, these two related factors stem from the underdevelopment of standard governance institutions. This institutional underdevelopment results in weak legal enforcement, lax financial regulations, poor disclosure quality, insufficient information intermediation, poor external monitoring by financial analysts, independent auditors, institutional investors, or credit rating agencies. Since the development of standard governance institutions is necessarily a gradual process, the potential compensating role of the well-established and increasingly market-driven institution of the Chinese media warrants research attention.[5]

Our empirical strategy involves developing two measures of firm-specific media coverage based on over two millions newspaper articles written about all listed firms in China and published in 14 national financial newspapers and the 10 largest comprehensive newspapers in China in the period of 2000–2009 and identifying three empirical proxies for stock price efficiency, which are the inverse of stock price synchronicity, the probability of informed trading (PIN), and stock pricing error. Our results reveal the following.

First, we find that as the media coverage of a firm increases, the ability of the firm's stock to incorporate firm-specific information improves. Second, we find that as the media coverage of a firm increases, both the probability of informed trading and the probability that a private information event occurs in its stock increase. Third, we find that as the media coverage of a firm increases, the extent to which the firm's stock

[1] To the best of our knowledge, this study is the first to examine the relation between firm-level media coverage (in China or elsewhere) and stock price efficiency. There is, however, a growing literature which looks at the relation between non-media institutions and stock price efficiency (e.g., Kim and Shi, 2012; Haw et al., 2012; Ferreira et al., 2011; Gul et al., 2010; Boehmer and Kelley, 2009; Fernandes and Ferreira, 2009; Ferreira and Laux, 2007; Jin and Myers, 2006; Chan and Hameed, 2006; Morck et al., 2000).

[2] La Porta et al. (1998) use both the words "substitute" (p. 1116) and "compensate" (p. 1140) to describe these mechanisms relative to "complement" mechanisms. We prefer the word "compensate" because these mechanisms cannot *completely* substitute for legal institutions, but they can "compensate, at least in part" (p. 1140).

[3] China ranks poorly in the ranking of countries in terms of rule of law, corruption, and the protection of property rights (La Porta et al., 2004; Pistor and Xu, 2005; Allen et al., 2005; Jiang et al., 2010).

[4] Given that China is the second-largest and fastest-growing economy and that it attracts the largest amount of foreign capital, the *inability* of Chinese stocks to incorporate firm-specific information into their prices is an important concern, particularly from the perspective of foreign equity investors. For example, the fraction of U.S. pension money invested in emerging markets with underdeveloped legal systems such as China is growing rapidly (Dyck et al., 2008, p. 1094).

[5] See next section and Appendix C for detailed arguments.

price deviates from random walk (i.e., stock pricing error) decreases. These findings, taken together, suggest that firm-level media coverage can increase stock price efficiency.

Fourth, to alleviate concerns about potential endogeneity, we apply the *propensity score matching* (PSM) procedure (Rosenbaum and Rubin, 1984). We find that our results from the PSM analysis remain qualitatively identical with our main results using the full sample. Fifth, to alleviate concerns about the potential impact of liquidity on our results, we conduct a further sub-sample analysis by dividing the main sample into sub-samples of liquid and illiquid firms. We find no evidence that variations in liquidity drive our results.

Finally, we test our compensating hypothesis directly by investigating whether the observed effect of media coverage on stock price efficiency differs systematically across 31 different provincial/regional jurisdictions of differing institutional development within China. Our results show that: (1) stocks of firms located in regions of weaker institutional development are less price efficient as expected; and (2) the effect of media coverage in increasing stock price efficiency is stronger (weaker) in regions within China with weaker (stronger) institutions. These results are in support of the hypothesis that institution of the media is able to play the role of compensating (or substituting) for the underdeveloped standard institutions normally expected to provide investor protection, maintain transparency, and thus increase stock price efficiency.

Our study adds to the extant literature in two ways. First, this paper contributes to the stock price efficiency literature by identifying the effect of a hitherto unexamined factor, namely firm-level media coverage, on the efficiency of stock prices. In so doing, we provide useful insights into the channels through which the media can impact the efficiency of stock markets. Second, our paper contributes to the investor protection literature by showing that the media can play the compensating role of protecting investors and maintaining transparency in transitional economies such as China where standard institutions normally expected to perform these functions are relatively weak and underdeveloped.

The remainder of this paper is organized as follows. The next section provides a background discussion of the media in China. Section 2 develops our empirical predictions. Section 3 describes the data and measurement of key variables. Section 4 presents the empirical analysis and results. Section 5 sets forth our conclusions.

2. Empirical predictions

2.1. Does media coverage enhance stock price efficiency?

Research on the role of media coverage in financial economics is relatively recent. There are two strands of the literature relevant to this paper. The first deals with how media coverage affects stock prices. Klibanoff et al. (1998) find that country-specific news reported on the front page of *The New York Times* makes the price of closed-end country funds moving to fundamentals more closely and quickly. Tetlock et al. (2008) show that firm-specific qualitative information in news articles can help predict earnings and stock prices. Fang and Peress (2009) find that investors demand a premium in stocks with no media coverage: They attribute this finding to a lower level of "investor recognition" (Merton, 1987) of stocks with low media coverage due to their lower level of relative information completeness.[6] Hillert et al. (2012) find that firms with media coverage exhibit stronger momentum.

The second strand of the literature deals with the watchdog function of the media. The question typically asked is whether more "sunshine," resulting from more media coverage translates into more investor protection. In a sample of U.S. firms whose accounting practices were challenged and sanctioned by the Securities and Exchange Commission (SEC), Miller (2006) finds that media coverage played a role in the early identification of accounting fraud. Dyck et al. (2008) show that coverage in the Anglo-American press increases the probability that a corporate governance violation is reversed in Russian firms. Dyck et al. (2010) show that the media was responsible for "blowing the whistle" on between 17% and 24% of corporate frauds in the U.S. between 1996 and 2004. Two important and related implications arise from these studies. First, more firm-specific "sunshine" resulting from more firm-level media coverage can improve investor protection

[6] In other words, media coverage of a firm increases the relative "investor recognition" of its stock because it increases the stock's relative information completeness.

through facilitating law/regulatory enforcements (the enforcement effect) and/or creating public pressure on the firms covered (the reputation effect). Second, better investor protection improves the information environment of the firm by improving governance. With better governance, firms become more transparent because they have less to hide (Leuz et al., 2003).

Combining these two strands of research and extending them, we conjecture that stocks of firms with more media coverage are more price efficient because there is more firm-specific information available in the market about these stocks. The underlining rationale is that these firms are more transparent and investors of these firms enjoy better investor protection (Jin and Myers, 2006). First, firm-level media coverage generates more firm-relevant *public* information. The resultant enforcement and reputation effects improve firm-level governance and thus firm-level transparency accordingly (Leuz et al., 2003). Second, media coverage provides more investor protection through the watchdog function of the media. Better investor protection is critically responsible for encouraging investors to collect more firm-specific *private* information before they trade on a stock. With more information and higher transparency available, any deviation of a transaction stock price from the efficient price (i.e. stock pricing error) would become smaller and disappears more quickly.

2.2. The media in China as a watchdog?

Because of its ability to monitor and expose corporate wrongdoing, the media in the U.S. have been viewed as a watchdog for small investors (e.g., Miller, 2006; Dyck et al., 2010). That is, the watchdog function, if carried out effectively, should increase firm-level transparency and improve investor protection, resulting in improvements in the firm-level information environment and stock price efficiency. Moreover, the watchdog effect of the media is expected to be comparatively greater when other standard investor-protecting institutions (such as the courts) are underdeveloped (e.g., La Porta et al., 1998).

In the Chinese context, standard investor-protecting institutions are weak (La Porta et al., 2004; Allen et al., 2005; Jiang et al., 2010) and the media institution is much better developed (Liebman, 2005; Lin, 2008). Thus, it is of interest to find out whether, and to what extent, the media in China can perform the watchdog function. At the outset, it is not apparent whether the state-controlled (i.e., non-independent) Chinese media can ever be a watchdog for small investors. However, the discussion in Appendix C about the media reform in China over the last 35 years suggests that the situation is more nuanced and reveals that a strict dichotomy between media independence and non-independence is not informative of the evolving Chinese media. Specifically, two factors are worth noting.

First, there has been a change in the media information paradigm as the media model in China changed from a propagandist model to a commercialized model, resulting in not only more information, but also more diversified information, conveyed to the public by the media.[7] The change in the media model reflects the fact that the legitimacy basis of the ruling Party has changed from one of communist ideology to one of economic performance; it also explains the Party's permanent retreat since the early 1990s on news reporting in the lifestyle-related *white zone* (see Appendix C, Footnote 21).

Second, the near-complete financial autonomy, the demand for credible and reliable information from the public, and competition among news media force most newspapers in China to become responsive to the information demands of the subscribing public. In particular, strong market competition and the increasing dissonance with a dying ideology have caused Chinese journalists to focus more on the battleground of *gray zone* news reporting, covering wrong-doing, fraud, corruption, and other unfair actions at the regional and corporate levels (see Appendix C, Footnote 22).

Based on the discussions above and in Appendix C, we conjecture that the media in China are able to perform a limited watchdog role at the regional and corporate levels for two main reasons. The first (arising from *market* logic) has to do with the strong market incentives unleashed by commercialization that motivate the media to push the limits of what is allowed. The second reason (arising from "*Party*" logic) is related to the congruence between the Party-state's overall interests in sustaining economic development as well as maintaining social stability at the national level and curbing corruption as well as fraud at the regional and corporate levels.

[7] By a "commercialized" media, it is meant that the media receives little or no state subsidies and must rely on private subscription and advertising revenue to survive in the marketplace. In short, a commercialized media needs to be market-driven.

In sum, we predict that stocks of firms with more media coverage in China are more price-efficient because these firms are more transparent and there is more informed trading of these firms' stocks. As a result, there is: (1) more firm-specific information being incorporated into stock prices; (2) more private information being transmitted to the public through informed trading; and (3) the deviation of a transaction stock price from the efficient price being reduced. We therefore hypothesize in alternative form:

H1a. Media coverage of a firm is positively associated with the amount of firm-specific information incorporated into its stock price, measured by the inverse of stock price synchronicity, all else being equal.

H1b. Media coverage of a firm is positively associated with the amount of firm-specific private information available, measured by the probability of informed trading in the stock market, all else being equal.

H1c. Media coverage of a firm is negatively associated with the deviation of a stock price from the efficient price, measured by stock pricing error, all else being equal.

2.3. Does institutional development matter?

Because investors normally rely on legal and other governance institutions for protection, these institutions are important to both the development and efficiency of the stock market (La Porta et al., 2000).[8] Evidence from Morck et al. (2000) suggests that poor investor protection increases the cost and risk of collecting firm-specific private information on the part of investors, and thus makes stock prices less informative. La Porta et al. (1998) present evidence to suggest that in countries with a weak legal system, compensating institutions (such as concentrated ownership) may develop to sustain financial activities.

Similar to La Porta et al. (1998), we argue that the incremental impact of the media as a compensating institution in providing investor protection is likely to be greater in countries (or regions within a country) where extant institutions that are normally expected to perform such functions are less developed. For example, the incremental effects of media coverage on investor protection and transparency are likely to be weaker in the U. S., the most developed market economy with mature institutional infrastructures, than in China, where institutional infrastructures are much less mature. Similarly, the incremental impact of media coverage is likely to vary in accordance with the extent of institutional development across 31 provincial/regional jurisdictions within China itself. Thus, the regional variation in institutional development within China provides an opportunity to test our hypothesis directly by examining the interplay between the role of the media and that of non-media institutions in influencing stock price efficiency. The compensating hypothesis on the role of the media suggests that the association between media coverage and stock price efficiency is likely to be stronger in regions of relatively weaker institutional development. We hypothesize in alternative form:

H2. The associations of media coverage with (a) stock price synchronicity, (b) firm-specific private information available, and (c) deviation of a transaction stock price from the efficient price, are more pronounced in regions (or provinces) with relatively weaker institutional development, all else being equal.

3. Data and variables

3.1. Empirical measures of media coverage

To test hypotheses H1 through H2, we need to construct empirical measures of firm-level media coverage in the Chinese language setting. This poses challenges, particularly because no previous research has addressed

[8] Acemoglu and Johnson (2005), for example, distinguish "contracting institutions" (which support economic activities among firms and/or individuals) and "property rights institutions" (which protect individuals and investors from expropriation by corporate insiders and politically powerful persons or organizations). However, these authors find that both sets of institutions are required to support the development of stock markets.

this issue in the Chinese language setting.[9] Unlike U.S.-based studies, where linguistic classification dictionaries (e.g., the commonly used General Inquirer's Harvard-IV-4 classification dictionary) are available to measure different types of media coverage in English (e.g., Tetlock et al., 2008; Fang and Peress, 2009), in this study we must develop our own for the Chinese language media.

To avoid subjective interpretations and to include as large a coverage range as possible, we choose to focus on *general* media coverage based on newspaper articles written about every listed firm (excluding financial firms) in China and published in all 14 national financial newspapers and the 10 largest comprehensive newspapers by circulation in China from 2000 to 2009.[10] To minimize measurement errors, we use a task-specific computer search program to download these articles. This approach has several advantages. By focusing on general media coverage, we need not decide subjectively whether coverage is positive or negative and how positive or negative it is. In addition, the ability to include a wide range of media coverage enables us to capture both the information enlargement effect and the information dissemination effect (Engelberg and Parsons, 2011), both of which support the watchdog/oversight function of the media. Moreover, this approach is justified because we are interested in how the watchdog function of media coverage (as opposed to how a specific type of coverage) facilitates firm-specific information flow or improves information-based trading in the stock market.

Specifically, we take the following three steps to construct a data set containing media coverage of listed firms using the WiseNews database.[11] First, for each firm in our sample, we download articles that mention the name of the firm for each firm-year after filtering out articles generated by the firm in question (e.g., various firm-generated announcements and reports). Here, our objective is to exclude self-generated media coverage.

Second, for each firm-year, we count the number of articles that mention the name of the firm and denote this total as *MediaCov1*. Although articles that mention the name of a particular firm in question may or may not be about the firm, the number does capture the publicity dimension of media coverage of the firm and enhances its "investor recognition." To ensure that an article is about the firm, researchers in U.S.-based studies normally rely on a "relevance score" provided by a classification dictionary in English. Fang and Peress (2009), for example, retain an article containing a firm's name if the article's "relevance score" is 90% or above. Since there is no classification dictionary in Chinese to rely on, we use a different empirical strategy in the next step.

Third, in each article, we count the number of times the name of the firm in question is mentioned and the number of times that the name of each of *all* listed firms in China is mentioned in the same article (if any).[12] For example, for given firm in a given year, we may find that the name of the firm in question (Firm A) in an article is mentioned 3 times, but the name of another firm (Firm B) is mentioned 5 times in the article, and the name of yet another firm (Firm C) is mentioned 6 times in the same article. We keep an article only if the name of the firm in question is mentioned more times than any other names on the assumption that this article is therefore likely to be about this firm. In other words, we would drop the article about Firm A in our example even though the name of Firm A is mentioned 3 times, because Firm B (Firm C) is mentioned 5 (6) times. We then re-count the number of articles in each firm-year and denote this total as *MediaCov2*.

By construction, *MediaCov1* measures media coverage of a firm by all articles that mention the name of the firm in question, whereas *MediaCov2* measures media coverage of a firm by articles in which the name of the firm is mentioned most often. While the *MediaCov1* captures the publicity or "investor recognition" dimension of media coverage, it is very likely that not all these articles are written about the firm. In comparison, *MediaCov2* is more likely to capture articles actually written about the firm, though this measure may still contain measurement errors. To the extent that both measures are likely to contain articles not actually written about the firm, they are biased against researchers finding significant results.[13]

[9] To the best of our knowledge, our study is the first attempt to empirically measure firm-level media coverage in China.

[10] Miller (2006) finds that, as far as financial frauds, the financial press tends to produce more original information, whereas the non-financial press tends to repeat information already reported elsewhere.

[11] WiseNews is a Hong Kong-based electronic news clipping service that provides access to news from about 550 newspapers and magazines published in Mainland China, Hong Kong, Taiwan, and Macau.

[12] In our sample of 2,144,850 articles, the average number of listed firms mentioned by name in an article is 6.

[13] Manually reading through the 2,114,850 articles in our sample is not feasible and would be subject to the uncertainty of subjective and inconsistent interpretations.

3.2. Empirical measures of stock price efficiency

To enhance the validity of our finding on the impact of media coverage on stock price efficiency, we assess stock price efficiency from three different but inter-related dimensions using three measures: (1) the ability of a stock price to incorporate firm-specific information as measured by the inverse of stock price synchronicity developed by Morck et al. (2000), (2) the amount of private firm-specific information about a stock available in the stock market as measured by the probability of informed trading (PIN) developed by Easley et al. (1996), and (3) the deviation of a transaction stock price from the efficient price as measured stock pricing error developed by Hasbrouck (1993).

Stock price synchronicity, denoted by *SYNCH*, reflects the amount of firm-specific information incorporated into stock prices through informed trading. High synchronicity of a stock indicates that its price reflects more common information relative to firm-specific information, or a less informative stock price.[14] The probability of informed trading denoted by *PIN*, is used to capture the amount of firm-specific *private* information available in the stock market. Previous empirical work generally supports the use of *PIN* as a valid measure of the probability of informed trading (Vega, 2006; Chen et al., 2007; Ferreira and Laux, 2007; Ferreira et al., 2011).[15] Following Hasbrouck (1993) and Boehmer and Kelley (2009), we measure a stock pricing error ($V(s)/V(p)$) as the dispersion or standard deviation of the extent to which a stock price deviates from random walk ($V(s)$), scaled by the standard deviation of the stock price itself ($V(p)$). Appendix B provides detailed explanations on procedures used to compute all measures mentioned above.

3.3. Empirical measures of institutional development

H2 concerns whether and how non-media institutional development across regions affects the impact of media coverage on stock price informativeness. To test H2, we need to obtain empirical proxies for the strength of institutional development across the economically fragmented 31 regions/provinces within China.[16] Given that administrative regions or provinces in China typically exhibit large variations in economic and institutional development, Fan et al. (2009) construct institutional development indices for each province to capture the efficacy or strength of institutions at the provincial level within China.[17] These indices, ranging from small (bad) to large (good), include: (1) overall market-institution development (denoted *Inst_General*); (2) government intervention in markets (denoted *Inst_Gov*); (3) private enterprise development (denoted *Inst_Private*); (4) regional protectionism (denoted *Inst_Protectionism*); (5) financial market development (*Inst_Financial*); and (6) legal environment (denoted *Inst_Law*). Since the above indices capture different aspects of the strength of regional institutions, we use them all, one by one, to test H2.

3.4. Other variables

Exact definitions and sources of the key variables above and other control variables used in the paper are provided in Appendix A. Financial information needed to construct non-media and non-institutional variables is collected from the China Stock Market and Accounting Research (CSMAR) database.

[14] This measure has been used in a large number of studies to measure firm-specific information, including Piotroski and Roulstone (2004), Chan and Hameed (2006), Ferreira and Laux (2007), Fernandes and Ferreira (2009), Gul et al. (2010), and Ferreira et al. (2011).

[15] To avoid the effects of order flows, we also discompose *PIN* into the probability of a private information event occurring (*ALPHA*) and order flows and focus on *ALPHA* alone (see Appendix B for details).

[16] The problem of regional economic fragmentation within China has been described as "one country, thirty-one economies" (Huang, 2003, p. 141).

[17] Periodic reports based on these indices have been compiled by the National Economic Research Institute of the China Reform Foundation since 2001. These indices are used to gauge the varying degree of "marketization" across regions within China. Academics are beginning to use these indices to conduct China-based research (e.g., Srinidhi et al., 2012).

4. Empirical analysis

4.1. Descriptive statistics

Panels A and B of Table 1 show the extent of media coverage about our sample firms by year and industry, respectively. Overall, there are a total of 2,114,860 (499,876) articles when media coverage is measured as *MediaCov1* (*MediaCov2*) written about our sample of 9613 firm-years over the period 2000–2009. On average, there are 220 (52) articles per firm in a year when media coverage is measured as *MediaCov1* (*MediaCov2*). Given that there are, on average, 220 articles per firm in a year, a listed firm on average gets its name mentioned in an article at least once in a few days in any given year. Because all firms in our sample are listed and the range of our media coverage is quite extensive, there is no firm in the sample that received no media coverage in any given year. As shown in Panel A, the extent of media coverage per year (*MediaCov1*) appears to increase over time, with a low of 108 per firm in 2000 and a high of 307 per firm in 2008, though there is no clear trend. As shown in Panel B, more than half the firms in our sample are in the manufacturing industry. Firms in the mining industry tend to have the greatest media coverage, though there appears to be no significant difference in the distribution of coverage per firm by industry, irrespective of whether the coverage is measured by *MediaCov1* or *MediaCov2*.

Table 2 presents descriptive statistics. The mean and median of the R^2 for the market model specified in Appendix B are 0.4082 and 0.4027, respectively, with a standard deviation of 0.1635, suggesting that the R^2 is reasonably distributed. The R^2 for our Chinese sample is relatively high, reflecting that Chinese stocks tend to co-move more closely with common factors rather than firm-specific factors.[18] Consistent with the R^2 statistics, the mean and median of $SYNCH$ are -0.4193 and -0.3939 with a standard deviation of 0.7035, much higher than for the U.S. sample of Piotroski and Roulstone (2004), who report a mean and median synchronicity of -1.742 and -1.754, respectively. This again suggests that Chinese stocks are more synchronous than U.S. stocks. The mean and median of *PIN* (*ALPHA*) in our sample are 0.1383 (0.3304) and 0.1398 (0.3340), respectively, with a standard deviation of 0.0600 (0.1259), suggesting *PIN* (*ALPHA*) is reasonably distributed. The mean (median) of $V(s)/V(p)$ in the sample is 0.1156 (0.1079), with a standard deviation of 0.0531, similarly suggesting a reasonable distribution.

With respect to descriptive statistics on other variables, the following are noteworthy: First, the mean for *Private Firm* of 0.317 indicates that about 32% of our sample firms are non-state-controlled listed firms, while the rest are state-controlled firms. Second, about 8% of our sample firms issue both A-shares for domestic investors and B-shares for foreign investors. Third, about 2% of our sample firms issue both A-shares and H-shares traded on the Hong Kong stock market. Finally, on average, each of our sample firms is followed by about one analyst.

Fig. 1a–d is graphic illustrations of the relations between *MediaCov1* in deciles and the corresponding $SYNCH$, *PIN*, *ALPHA*, and $V(s)/V(p)$ averages. The illustrations generally suggest negative relations of media coverage with $SYNCH$ and $V(s)/V(p)$ and positive relations of media coverage with *PIN* and *ALPHA*. We obtain similar patterns when using *MediaCov2* to measure media coverage. These results are generally consistent with H1a that media coverage reduces stock price synchronicity, H1b that media coverage increases the probability of informed trading, and H1c that the media coverage reduces the deviation of a stock price from random walk. Taken together, they are consistent with the view that more intensive media coverage is associated with higher price efficiency for Chinese stocks.

4.2. The impact of media coverage on stock price efficiency

H1a concerns the impact of media coverage on the ability of stock prices to incorporate firm-specific information, measured by stock price synchronicity ($SYNCH$), while H1b and H1c re-examine H1a, focusing on the impact of media coverage on the amount of private firm-specific available, measured by the probability

[18] For example, Gul et al. (2010) report that the mean R^2 for their Chinese sample is about 45%, whereas Piotroski and Roulstone (2004) report a much lower mean R^2 of 19.3% for their U.S. sample.

Table 1
Media sample characteristics.

Year	No. of firms	No. of articles as measured by *MediaCov1*	No. of articles as measured by *MediaCov2*	Average media coverage	
				MediaCov1 per firm	*MediaCov2* per firm
Panel A: by year					
2000	285	30,780	5700	108	20
2001	707	108,171	21,917	153	31
2002	804	106,128	27,336	132	34
2003	893	175,921	40,185	197	45
2004	1019	106,995	23,437	105	23
2005	1086	280,188	65,160	258	60
2006	1144	323,752	85,800	283	75
2007	1158	279,078	68,322	241	59
2008	1256	385,592	79,128	307	63
2009	1261	254,722	63,050	202	50
Total	9613	2,114,860	499,876	220	52

Industry	No. of firms	Average media coverage	
		MediaCov1 per firm	*MediaCov2* per firm
Panel B: by industry			
Agriculture, Forestry, and Fishing	192	181	40
Mining	144	312	66
Manufacturing	5168	213	50
Electric, Gas, and Sanitary Services	439	202	47
Construction	167	215	60
Transportation	364	265	65
Communication	571	238	63
Wholesale and Retail Trade	729	219	53
Real Estate	705	242	55
Public Utility	335	218	66
Culture, Sport and Entertainment	88	255	43
Conglomerate	711	214	47
Total	9613	220	52

This table presents average media coverage distributions as measured by number of newspaper articles.

of informed trading (*PIN*) and the extent to which stock price deviates from random walk, measured by stock pricing error ($V(s)/V(p)$). To test H1a, H1b, and H1c, we specify the following regression:

$$StockPriceEfficiency = a_0 + a_1 MediaCoverage + \sum_k a_k Control_k + (error) \quad (1)$$

where the dependent variable, *StockPriceEfficiency*, refers to the pricing efficiency of stocks. When testing H1a, *StockPriceEfficiency* is proxied by *SYNCH*, which is inversely related to the ability of stock price to incorporate firm-specific information. When testing H1b, *StockPriceEfficiency* is proxied by *PIN*, which has a direct relation with the probability of informed trading in a stock. When testing H1c, *StockPriceEfficiency* is proxied by $V(s)/V(p)$, which is positively related to the extent to which a stock price deviates from random walk. In Eq. (1), we measure the extent of media coverage about a firm using two alternative proxies: *Ln*(*MediaCov1*) and *Ln*(*MediaCov2*). Given the positive relation between *Media Coverage* and *StockPriceEfficiency*, H1a translates as $a_1 < 0$ when Eq. (1) is estimated with $StockPriceEfficiency = SYNCH$. H1b translates as $a_1 > 0$ when Eq. (1) is estimated with $StockPriceEfficiency = PIN$. H1c translates as $a_1 < 0$ when Eq. (1) is estimated with $StockPriceEfficiency = V(s)/V(p)$.

Following previous related research (Chan and Hameed, 2006; Ferreira and Laux, 2007; Boehmer and Kelley, 2009; Gul et al., 2010; Ferreira et al., 2011), we include a set of control variables in our regressions. These variables are firm size (*SIZE*), leverage (*LEV*), earnings volatility (*STDROA*), market-to-book ratio (*M/B*), the number of firms in the industry to which the firm belongs (*INDNUM*), the size of the industry

Table 2
Descriptive statistics.

	Q1	Mean	Median	Q3	Std dev.	*N*
Panel A: PIN and synchronicity						
PIN	0.1085	0.1383	0.1398	0.1734	0.0600	9613
ALPHA	0.2710	0.3304	0.3340	0.4038	0.1259	9613
SYNCH	−0.8812	−0.4193	−0.3939	0.0789	0.7035	9316
R^2	0.2929	0.4082	0.4027	0.5197	0.1635	9316
V(s)/V(p)	0.0705	0.1156	0.1070	0.1486	0.0531	9316
Panel B: Variables of interest used in the main regression						
MediaCov1	95	220	156	276	182.77	9613
MediaCov2	15	52	32	62	56.71	9613
Ln(MediaCov1)	0.0913	0.1013	0.1011	0.1125	0.0181	9613
Ln(MediaCov2)	0.0555	0.0693	0.0699	0.0829	0.0213	9613
Inst_General	6.11	7.78	7.66	9.55	2.163	9613
Inst_Gov	7.52	8.49	8.64	9.80	1.498	9613
Inst_Private	6.39	8.49	8.93	10.29	2.823	9613
Inst_Protectionism	8.90	9.50	10.29	10.77	1.831	9613
Inst_Financial	6.33	7.90	8.07	10.01	2.156	9613
Inst_Law	4.32	7.09	5.96	9.42	3.443	9613
Panel C: Other explanatory variables						
PrivateFirm	0	0.317	0	1	0.465	9613
B_SHARE	0	0.081	0	0	0.272	9613
H_SHARE	0	0.024	0	0	0.153	9613
Big_4	0	0.063	0	0	0.245	9613
ANALYST	0	1.075	0.693	2.079	1.217	9613
AD	0.017	0.059	0.037	0.072	0.051	9613
Panel D: Control variables						
SIZE	20.628	21.323	21.271	21.978	0.9546	9613
LEV	0.3861	0.5213	0.5281	0.6583	0.1851	9613
M/B	1.0467	1.5076	1.2677	1.7522	0.6328	9613
INDNUM	4.2341	4.5641	4.5218	4.9698	0.5567	9613
INDSIZE	25.887	26.477	26.453	27.088	0.8489	9613
STDROA	0.0133	0.0458	0.0261	0.0568	0.0489	9613
VOL	0.0448	0.1113	0.0875	0.1563	0.0787	9613

All variables are defined in Appendix A.

to which the firm belongs (*INDSIZE*), and trade volume (*VOL*). Year and industry dummies are also included to account for year and industry fixed effects.

Table 3 presents the results on the impact of media coverage on the amount of firm-specific information incorporated into stock prices. As shown, where *SYNCH* is used as the dependent variable, we find that the coefficients on both media coverage measures are highly significant with an expected negative sign at less than the 1% level. This is consistent with H1a, suggesting that a greater amount of firm-specific information is incorporated into the stock prices of firms with high media coverage than those with low coverage.

Panel A of Table 4 reports the results using *PIN* as the dependent variable. As shown in Panel A, we find that the coefficients on both media coverage measures are also highly significant with an expected positive sign at less than the 1% level. This is consistent with H1b. One concern with using PIN as a proxy of private firm-specific information is that it reflects both the probability of a private information event occurring (*ALPHA*) and trade order flows. To alleviate this concern, we discompose *PIN* into *ALPHA* and trade order flows. Panel B of Table 4 reports the results using *ALPHA* as the proxy for the amount of private firm-specific information available in the market. As shown in Panel B, we find that the coefficients of both media coverage measures are highly significant with an expected positive sign at less than the 1% level. These findings support the following view: Media coverage encourages information arbitrageurs to process more public information into value-relevant private information, and/or to collect and produce more private information.

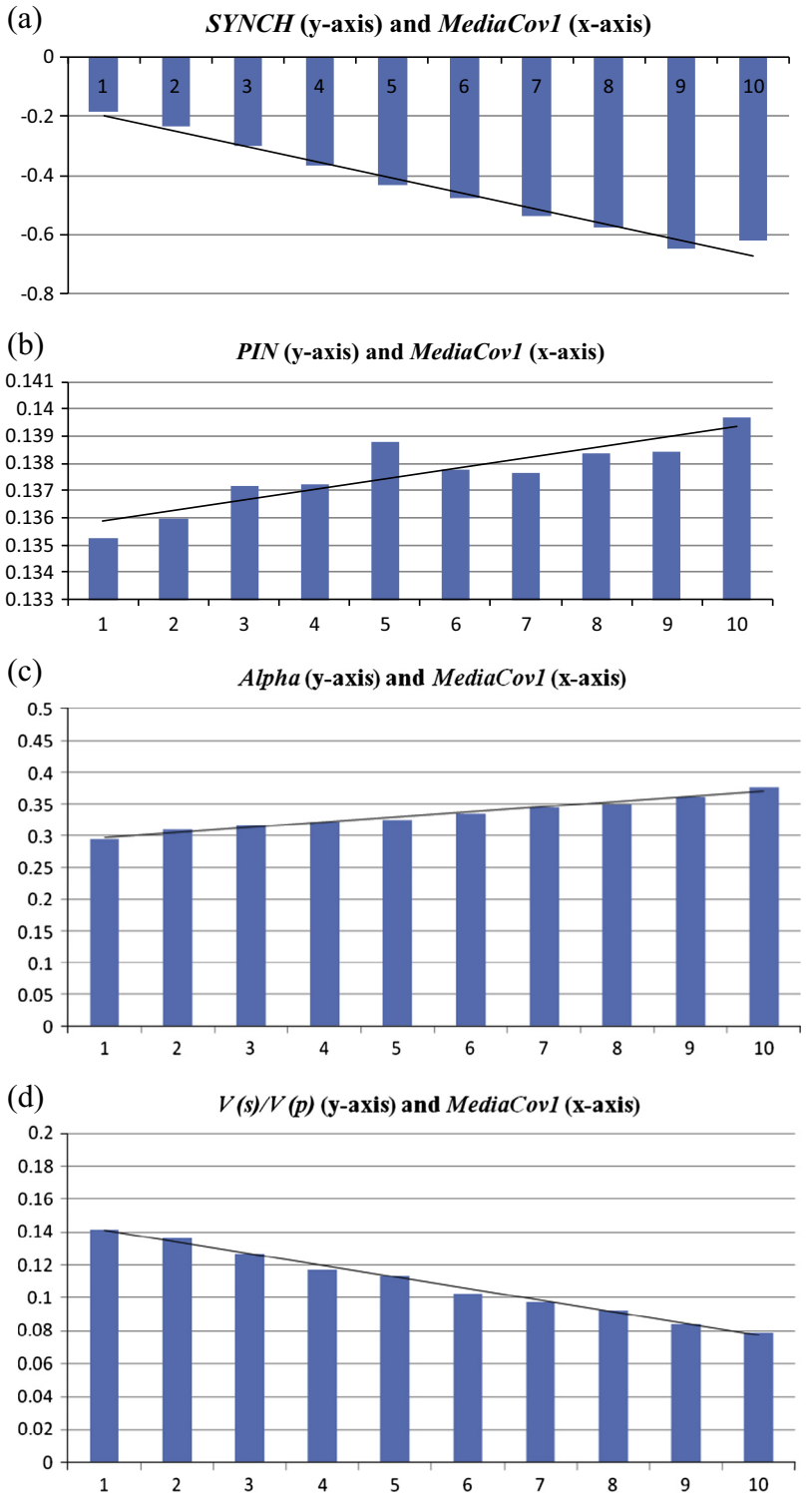

Figure 1. The figures illustrate the relation between media coverage in deciles and the corresponding synchronicity averages, the relation between media coverage in deciles and the corresponding *PIN* (*ALPHA*) averages, and the relation between media coverage in deciles and the corresponding $V(s)/V(p)$. All variables are defined in Appendix A.

Table 3
Media coverage and synchronicity.

Dependent variable = *SYNCH*	(1)	(2)
Constant	−2.8220	-3.1383
	(4.82)***	(5.32)***
Ln(MediaCov1)	−6.479	
	(9.32)***	
Ln(MediaCov2)		−3.432
		(6.79)***
SIZE	0.1833	0.1719
	(13.54)***	(12.51)***
LEV	0.0101	0.0122
	(1.80)*	(2.32)***
M/B	−0.0087	−0.0091
	(1.36)	(1.39)
INDNUM	0.0350	−0.0252
	(0.86)	(0.61)
INDSIZE	−0.0200	−0.0135
	(0.69)	(0.46)
STDROA	−0.2541	−0.2727
	(3.25)***	(3.34)***
VOL	−1.4290	−1.440
	(9.41)***	(9.38)***
Industry & year dummies	Yes	Yes
Observations	9316	9316
Adjusted R^2	0.398	0.389

This table presents regression results of the effects of media coverage on stock price efficiency as measured by synchronicity. The variables are as defined in Appendix A. Absolute values of z are reported in parentheses. Standard error is clustered by firm.
* Statistical significance level at 10%.
** Statistical significance level at 5%.
*** Statistical significance level at 1%.

Table 5 presents the results on the impact of media coverage on stock pricing error. As shown, where $V(s)/V(p)$ is used as the dependent variable, we find that the coefficients on both media coverage measures are highly significant with an expected negative sign at less than the 1% level. This is consistent with H1c, suggesting a smaller deviation from random walk for stock prices of firms with high media coverage than those with low coverage.

In short, the results from Tables 3–5 suggest the media coverage is able to increase stock price efficiency by increasing the ability of stock price to incorporate firm-specific information and the probability of having private firm-specific information available as well as reducing the deviation of a stock price from the efficient price.

4.3. Endogeneity

In the regressions specified above, we implicitly assume that stock price synchronicity, the probability of informed trading, and stock pricing error are influenced by media coverage. Intuitively, it seems unlikely that a stock (or the firm behind it) is able to affect media coverage by newspapers across the entire country. The firm behind a stock cannot decide the amount of media coverage it receives at any point in time. For example, there is no compelling reason to believe that firms with low stock price synchronicity are more or less able to attract media attention. Therefore, the results reported in Tables 3–5 are unlikely to be driven by reverse causality.[19]

[19] Engelberg and Parsons (2011), for example, find that media coverage strongly predicts financial market activities rather than the reverse.

Table 4
Media coverage, *PIN*, and *ALPHA*.

Dependent variable = *PIN*	(1)	(2)
Panel A.: Media coverage and PIN		
Constant	0.3665	0.3787
	(8.08)***	(8.35)***
Ln(*MediaCov1*)	0.4850	
	(5.25)***	
Ln(*MediaCov2*)		0.1492
		(4.26)***
Size	−0.0118	−0.0116
	(16.10)***	(15.58)***
LEV	−0.00030	−0.0002
	(0.51)	(0.48)
M/B	−0.0021	−0.0001
	(1.70)*	(1.67)*
INDNUM	0.0022	0.0025
	(0.85)	(0.93)
INDSIZE	−0.0002	−0.0010
	(16.10)***	(0.12)
STDROA	0.0002	0.0021
	(1.88)*	(1.87)*
VOL	−0.1687	−0.168
	(10.50)***	(10.45)***
Industry & year dummies	Yes	Yes
Observations	9613	9613
Adjusted R^2	0.156	0.155
Dependent variable = *ALPHA*	(1)	(2)
Panel B: Media coverage and ALPHA		
Constant	−0.4542***	−0.5149***
	(−4.19)	(−4.71)
Ln(*MediaCov1*)	0.0110***	
	(4.85)	
Ln(*MediaCov2*)		0.0073***
		(4.19)
SIZE	0.0238***	0.0247***
	(10.41)	(11.08)
LEV	−0.0099	−0.0110
	(−1.24)	(−1.38)
M/B	0.0220***	0.0234***
	(5.73)	(6.28)
INDNUM	−0.0033	−0.0032
	(−0.57)	(−0.55)
INDSIZE	0.0098**	0.0100**
	(2.10)	(2.13)
STDROA	0.1522***	0.1573***
	(4.65)	(4.80)
VOL	0.1209***	0.1404***
	(3.39)	(4.00)
Industry & year dummies	Yes	Yes
N	9613	9613
Adjusted R^2	0.131	0.131

Panel A presents regression results of the effects of media coverage on stock price efficiency as measured by *PIN*. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm. Panel B presents regression results of the effects of media coverage on stock price efficiency as measured by *ALPHA*. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm.

* Statistical significance level at 10%.
** Statistical significance level at 5%.
*** Statistical significance level at 1%.

Table 5
Media coverage and stock pricing error.

Dependent variable = $V(s)/V(p)$	(1)	(2)
Constant	0.5116***	0.5003***
	(17.31)	(16.68)
Ln(MediaCov1)	−0.0033***	
	(−4.06)	
Ln(MediaCov2)		−0.0032***
		(−5.04)
SIZE	−0.0151***	−0.0147***
	(−21.48)	(−20.93)
LEV	0.0198***	0.0199***
	(6.77)	(6.89)
M/B	−0.0024*	−0.0026**
	(−1.93)	(−2.07)
INDNUM	0.0024	0.0025
	(1.27)	(1.33)
INDSIZE	−0.0027**	−0.0028**
	(−2.16)	(−2.24)
STDROA	−0.0179	−0.0129
	(−1.44)	(−1.03)
VOL	−0.1754***	−0.1778***
	(−21.15)	(−21.73)
Industry & year dummies	Yes	Yes
N	9316	9316
Adjusted R^2	0.672	0.675

This table presents regression results of the effects of media coverage on stock price efficiency as measured by stock pricing error. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm.

* Statistical significance level at 10%.
** Statistical significance level at 5%.
*** Statistical significance level at 1%.

Nonetheless, one cannot completely rule out the possibility of reverse causality or endogeneity. To alleviate this concern, we address the possible endogeneity problem using a *propensity score matching* (PSM) analysis (Rosenbaum and Rubin, 1984). To conduct a PSM analysis, we construct a reduced sample that consists of the sub-group of stocks with the highest 20% media coverage (high media coverage stocks, coded as 1) and a sub-group of stocks with the lowest 50% media coverage (low media coverage stocks, coded as 0). Using this reduced sample, we first estimate a probit model in which the likelihood of a stock getting high media coverage is linked to firm-specific variables that are deemed to affect the media coverage. Dyck et al. (2008) suggest that the level of media interest in a firm is determined by firm-specific attributes. Since these attributes are likely to correlate with dimensional characteristics that distinguish one firm from another, we include the following variables in the probit model: size (*SIZE*), risk (*Lev*), growth prospects (*M/B*), earnings volatility (*STDROA*), trading volume of its stock (*VOL*), the number of firms in the industry to which the firm belongs (*INDNUM*), and the size of the industry to which the firm belongs (*INDSIZE*). Year and industry dummies are also included to account for year and industry fixed effects.

Using this probit model, we obtain the *predicted* likelihood of a stock getting high media coverage, i.e., the propensity score, for each stock. Based on this score and using the one-to-one nearest neighbor matching method, we match stocks in the high media coverage group with stocks from the low media coverage group. When media coverage is measured as *MediaCov1* (*MediaCov2*), the mean allowable range of likelihood between a high media coverage stock and its PSM low media coverage match is 0.13% (0.15%), with the maximum at 3.2% (8.8%). By construction, in our PSM sample, a high media coverage stock and its PSM-matched, low media coverage stock are identical with respect to the predicted likelihood of media coverage, and thus, are equally likely ex ante to receive the same amount of media coverage (although they

Table 6
Propensity Score Method (PSM) analysis.

	(1) $\Delta SYNCH$	(2) ΔPIN	(3) $\Delta ALPHA$	(4) $\Delta V(s)/V(p)$
Panel A: Media coverage = MediaCov1				
Constant	0.1026	−0.0224***	0.0583**	0.0029
	(1.26)	(2.75)	(2.22)	(0.66)
Δ *Ln*(*MediaCov1*)	−0.0546*	0.0050**	0.0142**	−0.0081***
	(1.88)	(2.37)	(2.21)	(4.62)
$\Delta SIZE$	0.1570***	−0.0237***	−0.0034	−0.0249***
	(4.43)	(7.92)	(0.40)	(13.81)
ΔLEV	−0.5523***	0.0135***	0.0082	0.0196***
	(6.67)	(2.67)	(0.63)	(6.87)
$\Delta M/B$	−0.2346***	−0.0072***	0.0077	−0.0105***
	(8.63)	(3.51)	(1.35)	(8.36)
$\Delta INDNUM$	−0.0868***	0.0070**	−0.0185**	0.0106***
	(2.59)	(2.01)	(2.14)	(4.55)
$\Delta INDSIZE$	0.0943***	−0.0049*	0.0162**	−0.0115***
	(4.26)	(1.91)	(2.50)	(7.88)
$\Delta STDROA$	0.2070	−0.0272***	−0.0473**	−0.0428***
	(0.54)	(3.33)	(2.25)	(8.39)
ΔVOL	−0.8805***	−0.1954***	0.0921*	−−0.2820***
	(5.04)	(11.00)	(1.84)	(25.56)
Industry & year dummies	Yes	Yes	Yes	Yes
Observations	1863	1922	1922	1863
Adjusted R^2	0.391	0.216	0.038	0.550
Panel B: Media coverage = MediaCov2				
Constant	0.0477	−0.0376***	0.0221	−0.0089**
	(0.52)	(4.45)	(0.82)	(2.45)
Δ *Ln*(*MediaCov2*)	−0.0618***	0.0064***	0.0109**	−0.0036**
	(2.71)	(3.27)	(1.98)	(2.06)
$\Delta SIZE$	0.1536***	−0.0231***	0.0181*	−0.0243***
	(4.51)	(6.11)	(1.76)	(11.18)
ΔLEV	−0.4052***	0.0066	−0.0272*	0.0034
	(6.79)	(1.14)	(1.79)	(1.10)
$\Delta M/B$	−0.1334***	−0.0095***	0.0253***	−0.0108***
	(6.09)	(4.25)	(3.93)	(8.92)
$\Delta INDNUM$	−0.1227***	0.0006	0.0014	0.0064***
	(3.68)	(0.20)	(0.14)	(2.77)
$\Delta INDSIZE$	0.1525***	0.0012	0.0091	−0.0081***
	(5.68)	(0.49)	(1.12)	(4.56)
$\Delta STDROA$	0.1880	−0.0169	0.0126	−0.0186**
	(1.47)	(1.51)	(0.41)	(2.51)
ΔVOL	−1.7743***	−0.2003***	0.3070***	−0.3565***
	(8.42)	(9.68)	(5.45)	(27.84)
Industry & year dummies	Yes	Yes	Yes	Yes
Observations	1863	1922	1922	1863
Adjusted R^2	0.400	0.183	0.075	0.490

The matches for the sub-group of stocks with the highest 20% media coverage (high media coverage stocks, coded as 1) are selected from the sub-group of stocks with the lowest 50% media coverage (low media coverage stocks, coded as 0) using PSM. The panels below present the regression results of the impact of the ex post difference between matching pairs in actual media coverage on the difference in *SYNCH*, *PIN*, *ALPHA*, and $V(s)/V(p)$. Note that a high media coverage stock and its low media coverage match are PSM identical and thus *equally* likely ex ante to receive the same media coverage. The variables are as defined in Appendix A. Absolute values of z are reported in parentheses.

* Statistical significance level at 10%.
** Statistical significance level at 5%.
*** Statistical significance level at 1%.

in fact did not, ex post). Therefore, for the firms in this PSM sample, the difference in actual ex post media coverage, if any, is likely to be exogenous.

Using this reduced PSM sample of matching pairs, we repeat our regression analyses reported in Tables 3–5 by regressing the differences between pairs in *SYNCH*, *PIN*, *ALPHA*, and $V(s)/V(p)$, respectively on the differences between pairs in actual ex post media coverage (both measures) and in the controls. The results are reported in Panels A (for *MediaCov1*) and B (for *MediaCov2*) of Table 6. As shown in Panels A and B, the PSM-estimated coefficients of both media coverage variables are significant for the four dependent variables and with the expected signs. This is consistent with our full sample results reported in Tables 3–5. Our PSM results reported in Panels A and B of Table 6, taken together, suggest that our main results in Tables 3–5 are unlikely to be driven by potential endogeneity bias. The PSM results lend further support to H1a, H1b, and H1c that media coverage improves the pricing efficiency of stocks.

4.4. Variations in liquidity

Although all our regressions have been adjusted for trade volume (*VOL*), we carry out additional analysis to assess whether variations in liquidity drive our results. We do this by dividing the sample into liquid and illiquid sub-samples. The lack of liquidity or illiquidity is measured by the ratio of the daily absolute return to the RMB trade volume, averaged for each year. This illiquidity ratio gives the absolute (percentage) price change per RMB of daily trading volume, or the daily price impact of the order flow. A stock is classified as liquid (illiquid) if its illiquidity ratio is below (above) the median ratio in the whole sample. We then re-estimate the regressions of Tables 3–5 in these two sub-samples. The estimated coefficients of media coverage (both measures) with *SYNCH*, *PIN*, *ALPHA*, and $V(s)/V(p)$, respectively, as dependent variables for liquid and illiquid sub-samples are reported in Table 7. As shown, the media coverage coefficients of all four dependent variables remain significant and of the correct signs. In other words, out results are unlikely to be driven by variations in liquidity.

4.5. Robustness

Our regression analyses thus far include a set of seven control variables (*SIZE*, *LEV*, *M/B*, *INDNUM*, *INDSIZE*, *STDROA*, and *VOL*). We now include six additional control variables to alleviate concern about omitted correlated variables. Using a sample of Chinese listed firms, Gul et al. (2010) find that stock price syn-

Table 7
High liquidity versus low liquidity.

Dependent variables	Low liquidity		High liquidity	
	Ln(*MediaCov1*)	*Ln*(*MediaCov2*)	*Ln*(*MediaCov1*)	*Ln*(*MediaCov2*)
SYNCH	−0.1479***	−0.0717***	−0.1646***	−0.0630***
	(6.24)	(3.95)	(5.78)	(3.32)
PIN	0.0054***	0.0028*	0.0078***	0.0030**
	(2.81)	(1.90)	(3.89)	(2.00)
ALPHA	0.0164***	0.0082*	0.0144***	0.0068**
	(2.67)	(1.86)	(3.35)	(2.36)
$V(s)/V(p)$	−0.0060***	−0.0047***	−0.0061***	−0.0043***
	(3.33)	(3.46)	(4.47)	(3.54)

This table presents the estimated coefficients of media coverage from regressions using *SYNCH*, *PIN*, *ALPHA*, and $V(s)/V(p)$, respectively, as dependent variables in sub-samples divided according to illiquidity. The lack of liquidity or illiquidity of a stock is measured by the ratio of the daily absolute return to the RMB trade volume, averaged for each year. This illiquidity ratio gives the absolute (percentage) price change per RMB of daily trading volume, or the daily price impact of the order flow. A stock is classified as a high liquidity (low liquidity) stock if its illiquidity ratio is below (above) the median ratio in the whole sample. The variables are as defined in Appendix A. Absolute values of z are reported in parentheses.

* Statistical significance level at 10%.

** Statistical significance level at 5%.

*** Statistical significance level at 1%.

Table 8
Media coverage, synchronicity, PIN, stock price error and other explanatory variables.

Dependent variable = *SYNCH*	(1)	(2)
Panel A: Synchronicity		
Constant	−2.2851	−2.5945
	(3.79)***	(4.29)***
Ln(*MediaCov1*)	−6.0599	
	(8.74)***	
Ln(*MediaCov2*)		−2.9879
		(5.95)***
PrivateFirm	−0.0439	−0.0481
	(1.73)*	(1.87)*
B_SHARE	−0.0468	−0.0389
	(1.30)	(1.05)
H_SHARE	−0.1167	−0.1287
	(2.04)**	(2.14)**
Big_4	−0.02153	−0.0331
	(0.65)	(0.97)
Ln (*ANALYST*)	−0.0046	−0.0119
	(0.39)	(0.98)
AD	−0.5792	−0.6056
	(3.70)***	(3.87)***
SIZE	0.1808	0.1721
	(11.64)***	(10.88)***
LEV	0.0091	0.0106
	(01.56)	(1.93)*
M/B	−0.0082	−0.0084
	(1.29)	(1.30)
INDNUM	0.0494	0.0413
	(1.22)	(1.01)
INDSIZE	−0.0393	−0.0343
	(1.36)	(1.19)
STDROA	−0.2445	−0.2608
	(3.20)*	(3.27)*
VOL	−1.456	−1.484
	(9.80)***	(9.89)***
Industry & year dummies	Yes	Yes
Observations	9316	9316
Adjusted R^2	0.402	0.392

Dependent variable = *PIN*	(1)	(2)
Panel B: PIN		
Constant	0.3326	0.3473
	(7.05)***	(7.37)***
Ln(*MediaCov1*)	0.2622	
	(5.42)***	
Ln(*MediaCov2*)		0.1538
		(4.20)***
PrivateFirm	0.0027	0.0028
	(1.58)	(1.67)*
B_SHARE	0.0070	0.0070
	(2.92)***	(2.86)***
H_SHARE	0.001	0.0013
	(0.15)	(0.31)
Big_4	−0.000	−0.000
	(−.0.17)	(0.10)
Ln (*ANALYST*)	−0.0051	−0.0048
	(5.00)***	(4.73)***

(*continued on next page*)

Table 8 (*continued*)

Dependent variable = *PIN*	(1)	(2)
AD	−0.0028	−0.0031
	(0.28)	(0.29)
SIZE	−0.0093	−0.0091
	(10.63)***	(10.33)***
LEV	−0.0000	−0.0000
	(0.25)	(0.26)
M/B	−0.0002	−0.0001
	(1.66)*	(1.66)*
INDNUM	0.0031	0.0033
	(1.17)	(1.26)
INDSIZE	−0.0006	−0.0007
	(0.31)	(0.36)
STDROA	0.0002	0.0002
	(1.88)*	(1.87)*
VOL	−0.1776	−0.168
	(10.92)***	(10.45)***
Industry & year dummies	Yes	Yes
Observations	9613	9613
Adjusted R^2	0.161	0.159

Dependent variable = *ALPHA*	(1)	(2)
Panel C: ALPHA		
Constant	−0.4199***	−0.3273***
	(−3.69)	(−2.84)
Ln(MediaCov1)	0.0079***	
	(3.40)	
Ln(MediaCov2)		0.0058***
		(3.28)
PrivateFirm	0.0021	0.0016
	(0.57)	(0.43)
B_SHARE	−0.0014	−0.0017
	(−0.89)	(−0.83)
H_SHARE	−0.0105	−0.0103
	(−0.80)	(−0.90)
Big_4	0.0028	0.0027
	(0.42)	(0.40)
Ln (ANALYST)	−0.0102***	−0.0093***
	(−4.09)	(−3.76)
AD	−0.0001***	−0.0001***
	(−8.96)	(−8.32)
SIZE	0.0274***	0.0267***
	(10.02)	(9.66)
LEV	−0.0121	−0.0107
	(−1.33)	(−1.17)
M/B	0.0167***	0.0175***
	(3.57)	(3.72)
INDNUM	0.0078	0.0081
	(1.58)	(1.62)
INDSIZE	0.0039	0.0045
	(0.84)	(0.97)
STDROA	0.1423***	0.1412***
	(3.80)	(3.72)
VOL	−0.0604	−0.0483
	(−1.38)	(−1.11)
Industry & year dummies	Yes	Yes
Observations	9613	9613
Adjusted R^2	0.128	0.128

Table 8 (*continued*)

Dependent variable = $V(s)/V(p)$	(1)	(2)
Panel D: V(s)/V(p)		
Constant	0.5819***	0.5756***
	(16.67)	(16.42)
Ln(MediaCov1)	−0.0020***	
	(2.61)	
Ln(MediaCov2)		−0.0021***
		(3.40)
PrivateFirm	0.0001	0.0001
	(0.04)	(0.12)
B_SHARE	0.0056	0.0058
	(1.27)	(1.30)
H_SHARE	0.0057	0.0055
	(1.44)	(1.41)
Big_4	0.0012	0.0013
	(0.53)	(0.58)
Ln (ANALYST)	0.0028***	0.0028***
	(4.56)	(4.55)
AD	0.0001	0.0001
	(0.71)	(0.11)
SIZE	−0.0163***	−0.0161***
	(17.89)	(17.59)
LEV	0.0216***	0.0216***
	(6.95)	(6.92)
M/B	−0.0052***	−0.0052***
	(3.68)	(3.73)
INDNUM	0.0029	0.0029
	(1.40)	(1.44)
INDSIZE	−0.0028*	−0.0029**
	(1.94)	(1.99)
STDROA	0.0035	0.0044
	(0.49)	(0.62)
VOL	−0.0770***	−0.0779***
	(8.48)	(8.63)
Industry & year dummies	Yes	Yes
Observations	9316	9316
Adjusted R^2	0.663	0.663

Panel A presents regression results of the effects of media coverage on stock price efficiency as measured by *SYNCH* with the inclusion of other explanatory variables. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm.

Panel B presents regression results of the effects of media coverage on stock price efficiency as measured by *PIN* with the inclusion of other explanatory variables. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm.

Panel C presents regression results of the effects of media coverage on stock price efficiency as measured by *ALPHA* with the inclusion of other explanatory variables. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm.

Panel D presents regression results of the effects of media coverage on stock price efficiency as measured by $V(s)/V(p)$ with the inclusion of other explanatory variables. The variables are as defined in Appendix A. Absolute values of *z* are reported in parentheses. Standard error is clustered by firm.

* Statistical significance level at 10%.

** Statistical significance level at 5%.

*** Statistical significance level at 1%.

Table 9
Media coverage, stock price synchronicity, and institutional development.

Dependent variable = *SYNCH*	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Synchronicity and MediaCov1						
Constant	−3.3563 (5.40)***	−3.0673 (4.62)***	−3.4235 (5.64)***	−3.0975 (4.85)***	−3.3246 (5.43)***	−3.4911 (5.83)***
Ln(MediaCov1)	−5.6136 (3.20)***	−9.9233 (3.61)***	−5.7884 (3.78)***	−8.7713 (3.18)***	−6.3348 (3.72)***	−3.6719 (3.31)***
Inst_General	−0.0483 (2.15)***					
*Inst_General * Ln(MediaCov1)*	0.4717 (2.25)***					
Inst_Gov		−0.0833 (2.50)***				
*Inst_Gov * Ln(MediaCov1)*		0.9497 (3.01)***				
Inst_Private			−0.0412 (2.37)***			
*Inst_Private * Ln(MediaCov1)*			0.4548 (2.74)***			
Inst_Protectionism				−0.0594 (2.13)**		
*Inst_Protectionism * Ln(MediaCov1)*				0.7647 (2.68)***		
Inst_Financial					−0.0529 (2.54)***	
*Inst_Financial * Ln(MediaCov1)*					0.5632 (2.75)***	
Inst_Law						−0.0289 (2.08)**
*Inst_Law * Ln(MediaCov1)*						0.2433 (1.90)*
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year and industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7972	7972	7972	7972	7972	7972
Adjusted R^2	0.503	0.505	0.502		0.505	
Panel B: Synchronicity and MediaCov2						
Constant	−3.3238 (5.50)***	−3.1998 (5.32)***	−3.2969 (5.64)***	−3.2775 (5.59)***	−3.2825 (5.62)***	−3.2943 (5.67)***
Ln(MediaCov2)	−2.4322 (1.89)*	−5.6343 (2.94)***	−2.7662 (2.48)***	−4.2813 (2.36)***	−2.8758 (2.31)***	−0.9435 (1.16)
Inst_General	−0.0253 (2.09)**					
*Inst_General * Ln(MediaCov2)*	0.3463 (2.19)**					
Inst_Gov		−0.0356 (2.08)**				
*Inst_Gov * Ln(MediaCov2)*		0.6970 (3.12)***				
Inst_Private			−0.0206 (2.20)**			
*Inst_Private * Ln(MediaCov2)*			0.3590 (2.87)***			
Inst_Protectionism				−0.0156 (1.16)		
*Inst_Protectionism * Ln(MediaCov2)*				0.4988 (2.63)***		

Table 9 (*continued*)

Dependent variable = *SYNCH*	(1)	(2)	(3)	(4)	(5)	(6)
Inst_Financial					−0.0239	
					(2.19)***	
Inst_Financial * *Ln*(*MediaCov2*)					0.3977	
					(2.61)***	
Inst_Law						−0.0160
						(2.10)**
Inst_Law * *Ln*(*MediaCov2*)						0.1653
						(1.70)*
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year and industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7972	7972	7972	7972	7972	7972
Adjusted R^2	0.502	0.501	0.503	0.506	0.503	0.505

Panel A presents regression results of the effect of *MediaCov1* (lagged one period) on *SYNCH* across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.

Panel B presents regression results of the effect of *MediaCov2* (lagged one period) on *SYNCH* across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.

* Statistical significance level at 10%.

** Statistical significance level at 5%.

*** Statistical significance level at 1%.

chronicity is higher for government controlled firms, while it is lower for A-share firms that simultaneously issue B-shares for foreign investors (traded on the Shanghai and Shenzhen stock exchanges) and H-shares traded on the Hong Kong stock exchange. Their study also finds that synchronicity is lower for Big 4-audited firms. Following their study, we now additionally include in Eq. (1) four indicator variables: (1) *Private Firm* equal to 1 for non-government controlled firms and 0 for government controlled firms; (2) *B-SHARE* equal to 1 for firms with both A- and B-shares; (3) *H-SHARE* equal to 1 for firms with both A- and H-shares; and (4) *Big 4* equal to 1 for firms with Big 4 auditors and 0 otherwise.

Chan and Hameed (2006) show that analyst following is positively associated with synchronicity in emerging markets. To further check the sensitivity of our results, we also control for the intensity of analyst coverage of a firm by including *Ln* (*ANALYST*). One may argue that a firm's exposure to media (as well as the ability to attract analyst attention) could be positively associated with the intensity of a firm's advertising activities. In an attempt to isolate the media coverage effects on firm-specific information flow from advertising (and analyst coverage), we also include the *AD* variable, which is measured by the ratio of a firm's selling expenses to sales. Panels of A, B, C, and D of Table 8 present the regression results after including the six additional control variables mentioned above.

As shown in Panel A of Table 8, when *SYNCH* is used as the dependent variable, the coefficients on both media coverage variables are highly significant at less than the 1% level with an expected negative sign. This suggests that our main results are robust to the inclusion of these additional control variables. The synchronicity-reducing impact of media coverage holds even after the additional control variables are accounted for. The following is noteworthy with respect to the additional control variables: First, we find that the coefficient on *Private Firm* is negative and marginally significant at less than the 10% level. This suggests that synchronicity is lower for non-government controlled firms than for government controlled firms, a finding consistent with Gul et al. (2010). Second, we find that synchronicity is significantly lower for A-share firms that also issue H-shares for investors in the Hong Kong stock market. This is consistent with the finding of Gul et al. (2010). Third, consistent with our previous findings, we find that synchronicity is lower for firms with higher advertising expenditures. Finally, the coefficients on other control variables are, overall, qualitatively identical with those reported in Panel A of Table 3.

Table 10
Media coverage, PIN, and institutional development.

Dependent variable = *PIN*	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: *PIN* and *MediaCov1*						
Constant	0.2355	0.1973	0.2429	0.1868	0.2442	0.2696
	(4.71)***	(3.73)***	(4.95)***	(3.57)***	(4.92)***	(5.36)***
Ln(MediaCov1)	0.4023	0.6493	0.2717	0.7939	0.3247	0.2350
	(2.76)***	(3.01)***	(2.25)***	(4.06)***	(2.35)***	(2.49)***
Inst_General	0.0048					
	(2.59)***					
Inst_General * *Ln(MediaCov1)*	−0.0422					
	(2.31)***					
Inst_Gov		0.0083				
		(3.14)***				
Inst_Gov * *Ln(MediaCov1)*		−0.0687				
		(2.68)***				
Inst_Private			0.0033			
			(2.31)***			
Inst_Private * *Ln(MediaCov1)*			−0.0235			
			(1.70)*			
Inst_Protectionism				0.0092		
				(4.20)***		
Inst_Protectionism * *Ln(MediaCov1)*				−0.0780		
				(3.64)***		
Inst_Financial					0.0038	
					(2.16)***	
Inst_Financial * *Ln(MediaCov1)*					−0.0318	
					(1.80)*	
Inst_Law						0.0023
						(1.84)*
Inst_Law * *Ln(MediaCov1)*						−0.0215
						(1.83)*
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year and industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8514	8514	8514	8514	8514	8514
Adjusted R^2	0.239	0.250	0.251	0.252	0.249	0.250
Panel B: *PIN* and *MediaCov2*						
Constant	0.2463	0.2176	0.2470	0.2223	0.2504	0.2646
	(5.07)***	(4.38)***	(5.11)***	(4.50)***	(5.17)***	(5.50)***
Ln(MediaCov2)	0.3449	0.5816	0.2405	0.5798	0.3213	0.1985
	(2.86)***	(3.32)***	(2,38)***	(4.02)***	(2.81)***	(2.65)***
Inst_General	0.0033					
	(3.01)***					
Inst_General * *Ln(MediaCov2)*	−0.0389					
	(2.57)***					
Inst_Gov		0.0059				
		(3.32)***				
Inst_Gov * *Ln(MediaCov2)*		−0.0646				
		(3.12)***				
Inst_Private			0.0025			
			(3.08)***			
Inst_Private * *Ln(MediaCov2)*			−0.0242			
			(2.10)***			
Inst_Protectionism				0.0053		
				(4.54)***		
Inst_Protectionism * *Ln(MediaCov2)*				−0.0597		
				(3.76)***		

Table 10 (*continued*)

Dependent variable = *PIN*	(1)	(2)	(3)	(4)	(5)	(6)
Inst_Financial					0.0031	
					(3.03)***	
Inst_Financial * *Ln*(*MediaCov2*)					−0.0355	
					(2.48)***	
Inst_Law						0.0016
						(2.24)***
Inst_Law * *Ln*(*MediaCov2*)						−0.0209
						(2.21)***
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year and industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8514	8514	8514	8514	8514	8514
Adjusted R^2	0.253	0.252	0.253	0.251	0.252	0.251

Panel A presents regression results of the effect of *MediaCov1* (lagged one period) on *PIN* across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.

Panel B presents regression results of the effect of *MediaCov2* (lagged one period) on *PIN* across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.

** Statistical significance level at 5%.

* Statistical significance level at 10%.

*** Statistical significance level at 1%.

As shown in Panel B of Table 8, when *PIN* is used as the dependent variable, we find that the coefficients on both media coverage variables are significantly positive at less than the 1% level. This suggests that our results reported in Panel B of Table 3 are robust to the inclusion of the additional control variables. The *PIN*-increasing effect of media coverage holds even after controlling for additional determinants of the probability of informed trading. With respect to the estimated coefficients on the newly included control variables, the following are apparent: First, the amount and availability of private information is greater for Chinese A-share firms that simultaneously issue B-shares for foreign investors than for A-share only firms. Second, consistent with the finding of Chan and Hameed (2006), the coefficient on $ANALYST$ is significantly negative, suggesting that the flow of private information about a firm is lower for firms with higher analyst as follows. This is in line with the view that analysts engage more in the acquisition and dissemination of common information than firm-specific information, thereby facilitating the flow of common information in emerging markets such as China. Finally, the coefficients on other control variables are, overall, qualitatively identical with those reported in Panel B of Table 3.

As shown in Panel C (D), the results of the $ALPHA$ ($V(s)/V(p)$) regression against the same set of test and control variables are, overall, similar to those reported in Panel B (A) where *PIN* ($SYNCH$) is used as the dependent variable. We therefore do not repeat a full explanation of the regression results again, but we note the following: these results lend further support to H1a, H1b, and H1c, that is, the notion that firm-level media coverage can improve stock price efficiency in Chinese firms.

4.6. Media coverage and non-media institutional development

Consistent with H1a, H1b, and H1c our results provide strong and robust evidence that media coverage generally increases stock price efficiency. However, it is not clear whether the media substitutes/compensates for or complements other non-media institutions, which are underdeveloped in China (Allen et al., 2005). Building on the law and finance literature (La Porta et al., 1998), we examine whether the media in China can play the role of compensating for the relatively underdeveloped non-media investor protection institutions. Specifically, we expect the effect of media coverage on stock price efficiency to be stronger in countries or regions of relatively weaker institutional infrastructures (H2).

Table 11
Media coverage, ALPHA, and institutional development.

Dependent variable = *ALPHA*	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: *ALPHA* and *MediaCov1*						
Constant	−0.7125***	−0.7818***	−0.7075***	−0.8542***	−0.0718	−0.2003**
	(−6.87)	(−7.05)	(−6.99)	(−8.03)	(−0.95)	(−2.05)
Ln (MediaCov1)	0.0244***	0.0349***	0.0214***	0.0483***	0.0282***	0.0231***
	(3.80)	(3.61)	(4.05)	(5.93)	(6.36)	(5.49)
*Inst_General * Ln(MediaCov1)*	−0.0016*					
	(−1.91)					
Inst_General	0.0083**					
	(1.96)					
*Inst_Gov * Ln(MediaCov1)*		−0.0027**				
		(−2.33)				
Inst_Gov		0.0150**				
		(2.55)				
*Inst_Private * Ln(MediaCov1)*			−0.0011*			
			(−1.80)			
Inst_Private			0.0065**			
			(2.10)			
*Inst_Protectionism * Ln(MediaCov1)*				−0.0040***		
				(−4.40)		
Inst_Protectionism				0.0209***		
				(4.68)		
*Inst_Financial * Ln(MediaCov1)*					−0.0011*	
					(−1.79)	
Inst_Financial					0.0047	
					(1.39)	
*Inst_Law * Ln(MediaCov1)*						−0.0009*
						(−1.67)
Inst_Law						0.0036
						(1.25)
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry and year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8514	8514	8514	8514	8514	8514
Adjusted R^2	0.135	0.135	0.135	0.137	0.092	0.092
Panel B: ALPHA and MediaCov2						
Constant	−0.5295***	−0.5810***	−0.5276***	−0.5921***	−0.0544	−0.5020***
	(−5.62)	(−6.00)	(−5.65)	(−6.15)	(−0.82)	(−5.38)
Ln (MediaCov2)	0.0218***	0.0335***	0.0190***	0.0337***	0.0227***	0.0145***
	(3.86)	(3.96)	(4.05)	(4.84)	(6.08)	(4.09)
*Inst_General * Ln(MediaCov2)*	−0.0019***					
	(−2.65)					
Inst_General	0.0059**					
	(2.38)					
*Inst_Gov * Ln(MediaCov2)*		−0.0031***				
		(−3.16)				
Inst_Gov		0.0108***				
		(3.11)				
*Inst_Private * Ln(MediaCov2)*			−0.0014***			
			(−2.71)			
Inst_Private			0.0052***			
			(2.89)			
*Inst_Protectionism * Ln(MediaCov2)*				−0.0030***		
				(−3.94)		
Inst_Protectionism				0.0106***		
				(4.12)		

Table 11 (*continued*)

Dependent variable = *ALPHA*	(1)	(2)	(3)	(4)	(5)	(6)
Inst_Financial * *Ln*(*MediaCov2*)					−0.0009*	
					(−1.78)	
Inst_Financial					0.0022	
					(1.13)	
Inst_Law * *Ln*(*MediaCov2*)						−0.0010**
						(−2.21)
Inst_Law						0.0028*
						(1.69)
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry and year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8464	8464	8464	8464	7899	8464
Adjusted R^2	0.132	0.132	0.132	0.133	0.087	0.132

Panel A presents regression results of the effect of *MediaCov1* (lagged one period) on *ALPHA* across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.

Panel B presents regression results of the effect of *MediaCov2* (lagged one period) on *ALPHA* across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.

* Statistical significance level at 10%.

** Statistical significance level at 5%.

*** Statistical significance level at 1%.

We test H2 by evaluating the interaction effect of media coverage and the level of institutional development across different provinces in China. For this purpose, we estimate the following regressions:

$$StockPriceEfficiency = b_0 + b_1 Media\,Coverage + b_2 Institutional\,Development + b_3 Media\,Coverage * Institutional\,Development + \sum_k b_k Control_k + (error) \quad (2)$$

where the dependent variable, *StockPriceEfficiency*, refers to the pricing efficiency of stocks as in Eq. (1). When testing H2a, *StockPriceEfficiency* is proxied by *SYNCH*. When testing H2b, *StockPriceEfficiency* is proxied by *PIN*. When testing H2c, *StockPriceEfficiency* is proxied by $V(s)/V(p)$. We measure the extent of media coverage about a firm using two alternative proxies: *Ln*(*MediaCov1*) and *Ln*(*MediaCov2*). In Eqs. (2), H2a and H2c are supported if $b_1 < 0$ and $b_3 > 0$ when the dependent variable is *SYNCH* or $V(s)/V(p)$. H2b is supported if $b_1 > 0$ and $b_3 < 0$ when the dependent variable is *PIN* or *ALPHA*.

Table 9 presents the regression results for Eq. (2), where *SYNCH* is used as the proxy for stock price efficiency. In Panel A, media coverage is measured by *Ln*(*MediaCov1*), while in Panel B, it is measured by *Ln* (*MediaCov2*). We use six different measures of institutional development constructed by Fan et al. (2009) and described in Section IV C to proxy for the relative non-media institutional development in a region. Results from both Panels A and B of Table 9 show that the effect of media coverage on mitigating synchronicity remains negative and statistically significant (with one exception, in model 6 of Panel B) even after controlling for the strength of regional institutional infrastructures and their interaction with media coverage. This result lends further support for our earlier finding that media coverage facilitates incorporation of firm-specific information into stock prices, thus mitigating synchronicity. In addition, the coefficients on each of six non-media institutional development proxies are all negative and significant for all cases except one (column 4 in Panel B) in both panels. This finding suggests that stocks of firms in regions with more developed non-institutions are less synchronous. This cross-regional evidence within China is consistent with the cross-country evidence reported in Morck et al. (2000) and Kim and Shi (2012).

Table 12
Media coverage, $V(s)/V(p)$, and institutional development.

Dependent variable = $V(s)/V(p)$	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: V(s)/V(p) and MediaCov1						
Constant	0.5318***	0.5392***	0.5544***	0.5764***	0.5465***	0.5472***
	(19.82)	(18.70)	(21.07)	(20.37)	(20.66)	(20.79)
Ln(MediaCov1)	−0.0073***	−0.0102***	−0.0109***	−0.0153***	−0.0084***	−0.0091***
	(−3.26)	(−3.18)	(−6.86)	(−4.51)	(−6.36)	(−7.44)
*Inst_General * Ln(MediaCov1)*	0.0005**					
	(2.04)					
Inst_General	−0.0027*					
	(−1.95)					
*Inst_Gov * Ln(MediaCov1)*		0.0008**				
		(2.34)				
Inst_Gov		−0.0034*				
		(−1.79)				
*Inst_Private * Ln(MediaCov1)*			0.0007***			
			(4.12)			
Inst_Private			−0.0038***			
			(−4.16)			
*Inst_Protectionism * Ln(MediaCov1)*				0.0013***		
				(3.94)		
Inst_Protectionism				−0.0072***		
				(−4.53)		
*Inst_Financial * Ln(MediaCov1)*					0.0005***	
					(2.90)	
Inst_Financial					−0.0031***	
					(−3.04)	
*Inst_Law * Ln(MediaCov1)*						0.0006***
						(3.93)
Inst_Law						−0.0034***
						(−4.10)
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry and Year Effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8720	8720	8720	8720	8720	8720
Adjusted R^2	0.675	0.675	0.672	0.676	0.672	0.672
Panel B: V(s)/V(p) and MediaCov2						
Constant	0.5157***	0.5199***	0.5104***	0.5369***	0.5085***	0.5079***
	(19.49)	(19.20)	(19.48)	(20.11)	(19.35)	(19.36)
Ln(MediaCov2)	−0.0085***	−0.0120***	−0.0073***	−0.0128***	−0.0057***	−0.0059***
	(−4.61)	(−4.34)	(−4.45)	(−4.27)	(−4.72)	(−5.00)
*Inst_General * Ln(MediaCov2)*	0.0007***					
	(3.14)					
Inst_General	−0.0023***					
	(−2.79)					
*Inst_Gov * Ln(MediaCov2)*		0.0010***				
		(3.40)				
Inst_Gov		−0.0027**				
		(−2.33)				
*Inst_Private * Ln(MediaCov2)*			0.0005***			
			(2.76)			
Inst_Private			−0.0014**			
			(−2.23)			
*Inst_Protectionism * Ln(MediaCov2)*				0.0011***		
				(3.54)		
Inst_Protectionism				−0.0041***		
				(−4.07)		

Table 12 (*continued*)

Dependent variable = $V(s)/V(p)$	(1)	(2)	(3)	(4)	(5)	(6)
Inst_Financial * *Ln*(*MediaCov2*)					0.0004**	
					(2.34)	
Inst_Financial					−0.0014**	
					(−2.23)	
Inst_Law * *Ln*(*MediaCov2*)						0.0003***
						(2.61)
Inst_Law						−0.0013**
						(−2.47)
Other explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry and year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8720	8720	8720	8720	8720	8720
Adjusted R^2	0.675	0.676	0.675	0.676	0.675	0.675

Panel A presents regression results of the effect of *MediaCov1* (lagged one period) on $V(s)/V(p)$ across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.
Panel B presents regression results of the effect of *MediaCov2* (lagged one period) on $V(s)/V(p)$ across regions of varying institutional development. The variables are as defined in Appendix A. Other explanatory variables and controls refer to those used in Table 8. Absolute values of z are reported in parentheses. Standard error is clustered by firm.
* Statistical significance level at 10%.
** Statistical significance level at 5%.
*** Statistical significance level at 1%.

More importantly, the coefficients on the interaction of media coverage and each of six non-media institutional development proxies are all positive and significant across six columns in both panels. This finding is consistent with H2, suggesting that the effect of media coverage on mitigating stock price synchronicity is significantly stronger (weaker) in regions of relatively weaker (stronger) institutional development.

Table 10 presents the regression results for Eq. (3), where *PIN* is used as the proxy for stock price efficiency. In Panel A, media coverage is measured by *Ln*(*MediaCov1*), while in Panel B, it is measured by *Ln* (*MediaCov2*). As shown in Panels A and B of Table 10, the coefficient on the media coverage variable is significant with an expected positive sign across all six columns in both panels. This finding lends further support for our earlier finding: the main effect of media coverage on increasing the probability of informed trading remains positive and statistically significant even after controlling for the strength of regional institutional infrastructures and their interaction with media coverage. Moreover, the coefficients on each of six regional non-media institutional development proxies are all significantly positive across all six columns in both panels. This finding suggests that stocks of firms located in regions with more developed non-media institutions have significantly higher PIN, and this result is robust to alternative measures of non-media institutions in each region. Stated another way, we provide evidence suggesting that more firm-specific private information is available for stocks of firms located in regions where non-media institutions are better developed.

More importantly, coefficients on the interaction between media coverage and each of six non-media institutional development proxies are significantly negative across six columns in both Panels A and B. This finding is consistent with H2, suggesting that the effect of media coverage on increasing *PIN* is significantly stronger (weaker) pronounced in regions of stronger (weaker) institutional development. In summary, the results in Tables 8 and 9, taken together, suggest that the media contributes incrementally more to making stock prices more informative in China, where non-media institutions are still less developed. One implication is that the media in China is able to compensate for other less developed non-media investor protection institutions.

Tables 11 and 12 show regression results for Eq. (3), where $ALPHA$ and $V(s)/V(p)$ are used, respectively, as proxies for stock price efficiency. Since results related to $ALPHA$ ($V(s)/V(p)$) are consistent with those related to PIN in Table 9 (with those related to $SYNCH$ in Table 8), we will not repeat the same exposition here. Suffice to say that the results from Tables 9–12, taken together, support our main hypothesis (H2) that the impact of media coverage on stock price efficiency is greater in regions of weaker institutional development within the 31 jurisdictions inside China.

5. Concluding remarks

Based on a sample of over two million newspaper articles and using a large sample of firms listed in China's emerging stock markets, where "investor protection is weak and agency problems are severe" (Allen et al., 2005, p. 90), this study investigates whether the commercialized state-owned media in China has an incremental impact on stock price efficiency. Our main findings can be summarized as follows. First, we find that as media coverage of a firm increases, its stock price synchronicity decreases. Second, we find that as media coverage of a firm increases, both the probability of informed trading and the probability of a private information event occurring in its stock increase. Third, we find that as media coverage of a firm increases, the extent to which its stock price deviates from random walk decreases. These findings, taken together, suggest media coverage improves the efficiency of stock prices. The above results are robust to potential endogeneity and reverse causality as well as to variations in liquidity. Finally, we examine the relative impact of the media across 31 provinces/regions within China. We find that the impact of the media on decreasing stock price synchronicity, increasing the probability of informed trading, and reducing stock pricing error is stronger (weaker) in regions of weaker (stronger) institutional development within China. This finding suggests that media coverage plays a significant role of compensating for the relatively underdeveloped governance institutions in transitional economies such as China.

Overall, our results suggest that a commercialized and increasingly market-driven Chinese media can increase stock price efficiency in China where standard governance institutions to protect investors and maintain corporate transparency are weak. As the first attempt to study the impact of the Chinese media on stock prices, our results are preliminary. As such, they contain one caveat and raise two questions. The caveat is that despite the market-driven commercialization, the watchdog effect of the media would soon cease should the Chinese government (or the Chinese Communist Party) consider curbing corruption and corporate fraud no longer a well-grounded state policy objective (a political survival strategy), although such scenario is luckily unlikely. The first question raised by our results is whether the impact of this type of media (or a more independent media) on stock price efficiency will remain significant in a context when standard governance institutions are developed and strong.[20] The second question is whether the compensating role of the media relative to non-media institutions (where they are less developed) is general or specific only to the pricing efficiency of stocks. We leave these questions to future research.

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[20] Note the inter-regional analysis controls for the difference in institutional development between regions within China but not for the difference in institutional development between China and, say, the US.

Appendix A. Variable definitions

Dependent variables

SYNCH: natural logarithmic transformation of the world market model, computed as Log $[R^2/(1 - R^2)]$, where R^2 is the R^2 of the model defined in Appendix B.

PIN: probability of informed trading, computed based on the model defined in Appendix B.

ALPHA: probability of a private information event occurring based on the model defined in Appendix B.

V(s)/V(p): pricing error based on the model defined Appendix B scaled by the standard deviation of intraday (log) transaction prices.

Explanatory variables of interest

MediaCov1: the number of newspaper articles that mention the name of the firm.

MediaCov2: the number of newspaper articles in which the name of the firm in question is mentioned most often (i.e., the number of times the name of the firm is mentioned is highest in an article relative to the names of all other listed firms mentioned in the article).

Ln(MediaCov1): natural logarithmic transformation of *MediaCov1* plus one scaled by two hundred.

Ln(MediaCov2): natural logarithmic transformation of *MediaCov2* plus one scaled by two hundred.

Inst_General: score for overall development of market institutions in the region where the firm is headquartered; a higher score indicates better development.

Inst_Gov: score for government intervention in markets in the region where the firm is headquartered; a higher score indicates lower government intervention.

Inst_Private: score of private enterprise development in the region where the firm is headquartered; a higher score indicates better private enterprise development.

Inst_Protectionism: score of regional protectionism in the region where the firm is headquartered; a higher score indicates lower regional protectionism.

Inst_Financial: score for financial market development in the region where the firm is headquartered; a higher score indicates better financial market development.

Inst_Law: score for legal environment in the region where the firm is headquartered; a higher score indicates better legal environment.

Other explanatory variables

Private Firm: an indicator variable equal to one if the firm is a private sector (rather than government-owned or controlled) firm; zero otherwise.

B_SHARE: indicator variable equal to one if the firm also issues B-shares (denominated in US dollars and set up for foreign investors), zero otherwise.

H_SHARE: indicator variable equal to one if the firm also lists on the Hong Kong stock exchange, zero otherwise.

BIG_4: an indicator variable equal to one if the firm uses a Big 4 international auditor, zero otherwise.

Ln(ANALYST): natural logarithmic transformation of one plus the number of analysts following the firm, zero otherwise.

AD: ratio of selling expense over sales, a proxy for advertising expense.

Control variables

SIZE: natural logarithmic transformation of the book value of a firm's total assets.

LEV: ratio of total liability over total assets.

M/B: market-to-book equity ratio.

INDNUM: natural logarithmic transformation of the number of firms in the industry to which a firm belongs.

INDSIZE: natural logarithmic transformation of year-end total assets of all sample firms in the industry to which a firm belongs.

STDROA: standard deviation of Return-on-assets over the preceding five-year period, including the current year.

VOL: trading volume computed as the total value of daily shares traded scaled by total value of shares outstanding in a day.

Appendix B. Estimation of *SYNCH, PIN*, and *V*(*s*) variables

$SYNCH = \text{Ln}\,(R^2/(1-R^2))$, where R^2 is the R^2 of a firm-year obtained from the following regression models during that firm-year:

$$RET_{it} = a + \beta_1 MKRET_t + \beta_2 WRDRET_t + \varepsilon_{it}$$

(Firms with A-shares only)

$$RET_{it} = a + \beta_1 MKRET_t + \beta_2 MKRET^B + \beta_3 WRDRET_t + \varepsilon_{it}$$

(Firms with A- and B-shares)

$$RET_{it} = a + \beta_1 MKRET_t + \beta_2 MKRET^H + \beta_3 WRDRET_t + \varepsilon_{it}$$

(Firms with A and H-shares)

where, for firm *i* at day *t*, RET_{it} is daily return of firm i trading in either Shanghai or Shenzhen exchange on day *t*; *MKRET* is the value weighted market return, based on the domestic composite value weighted index of shares (A-shares). WRDRET is the world market return computed using MSCI World Index. $MKRET^B$ is the composite value weighted market index of B-shares (denominated in US dollars and set up for foreign investors). $MKRET^H$ is the value weighted Hong Kong market return using the value weighted Hang Seng index.

$$PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon_b + \varepsilon_s}$$

where α (*ALPHA*) is the probability of a private information event occurring; μ is the arrival rate of informed traders when an information event occurs; ε_b is the arrival rate of buy orders, and ε_s is the arrival rate of sell orders. Following Easley et al. (1996), these parameters are estimated using a maximum likelihood estimation procedure, assuming a Poisson arrival process for informed and uninformed traders, and based on actual information about daily buy and sell orders provided by CSMAR for the period 2000–2009. Note that using actual buy and sell orders rather than algorithms to determine these orders increases the precision of our estimates.

V(*s*) = the lower bound for the standard deviation of dispersion of pricing error, s, based on the model proposed by Hasbrouck (1993) and used by Boehmer and Kelley (2009), where the (log) transaction stock price at transaction time *t*, p_t, is defined to be the sum of a random component, m_t, and a pricing error, s_t:

$$p_t = m_t + s_t$$

whereas *m*, the random walk component represents the efficient price, the pricing error, *s*, captures the extent to which a transaction stock price deviates from its efficient price. *V*(*s*) is estimated using a VAR system with five lags over the first difference in *p* and three trade variables: (1) a trade sign indicator, (2) signed trading volume, and (3) the signed square root of trading volume. Following Boehmer and Kelley (2009), we sign a trade by assuming that a trade is buyer initiated if the price is above the prevailing quote midpoint (and seller initiated for the converse). *V*(*s*) is estimated for each stock in the sample for each year based on average weekly trade orders of the stock in the year provided by CSMAR for the period 2000–2009.

Appendix C. From propaganda to commercialization: a discussion of the Chinese media

The media in China is an integral part of the government or of the Chinese Communist Party (CCP). The Propaganda Department of the CCP Central Committee (Central Propaganda Department, or CPD) has been responsible for the overall management of culture, including the mass media, in China since the early 1950s. Most newspapers are administratively linked to the CCP. The CCP Central Committee, for example, publishes *People's Daily*. The model is replicated at local levels (e.g., *Southern Daily* is linked to Guangdong Provincial

Communist Party Committee). For many years prior to the economic reform in 1978, central and local newspaper articles in China were no more than official propaganda documents from the Party-state.

The commercialization of the Chinese media started in the late 1970s in tandem with economic reform for two reasons. First, as the basis of legitimacy for CCP rule changed from one of communist ideology to one of economic performance, the propaganda model of the media no longer suited the Party needs. Second, the financial burden of a nationwide propagandist media also proved too onerous for the government. Thus, media commercialization had the dual aim of reducing state subsidies for the media and yet expanding the media to further Party-state interests in economic development and social stability (Huang, 2001, 2007; Liebman, 2005; Lin, 2006). As the state reduced subsidies, many newspapers had to find other means toward financial self-sufficiency. Continued state ownership, combined with the emphasis on profitability, led to the so-called "marketization" of the media. For example, the state-controlled Southern Daily Group, whose flagship *Southern Daily* remains the official mouthpiece of the Guangdong Provincial Communist Party Committee, also publishes *Southern Metropolitan Daily*, a successful mass market tabloid with a high circulation, and *Southern Weekend*, a weekly paper regarded as one of the most outspoken papers in China. With the exception of the official *Southern Daily*, which receives state support, other papers in the group are *commercial* newspapers in that they must rely entirely on income generated from advertising and private subscription. A portion of profits from the commercially successful *Southern Weekend* and other commercial papers in the Group is used to partly underwrite the cost of publishing the unprofitable mouthpiece *Southern Daily*.

Media commercialization represents a change in the media information paradigm. The number of newspapers in China grew from 186 in 1978 to near 2000 in 2005, and most of them now operate without state subsidies (Esarey, 2005; Lin, 2006). Competition is often fierce between commercial newspapers within and across regions, forcing newspapers to provide more and increasingly diversified information content to readers. The near-complete financial autonomy, the demand for credible and reliable information from the public, and competition among news media force most newspapers in China to become responsive to the information demands of the subscribing public. A newspaper with exclusively old-style *propaganda* reporting typically does not have strong demand from the public. Because readership has become a crucial factor determining profitability (or even survival), the market logic dictates that all commercial newspapers must now carry at least some critical and investigative reporting to maintain and expand market share.

Notwithstanding the extensive commercialization, the media in China remains state-controlled and is subject to a range of extensive formal and informal regulations (Liebman, 2005). As a rule, any direct criticism of the national CCP leadership, the central government, or the military is strictly off-limits. Any reporting that frames these parties as the center of grievance is simply not allowed.[21] Journalists could, however, get away with criticizing regional government officials and corporations if the central government and the CCP leadership are framed to be on the right side. Subject to formal and informal norms in China, a commercialized newspaper caters to the demands of its reading public, on whom it relies for revenue. Although the media avoids ideologically sensitive topics (e.g., democratic reform), it does enjoy a freer hand in exposing wrongdoing at the regional or corporate level (Keatley, 2003). The commercialized financial press (e.g., *Caijing Magazine*) has been instrumental in exposing much corruption/fraud and numerous corporate scandals in firms and financial markets (Lin, 2006).[22]

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[21] Lin (2008) divides the current news reporting in China into three zones: black, gray, and white. *Black zone* reporting covers news reporting that poses direct challenges to the CCP rule and is, without exception, censored by coercive political power. *White zone* reporting covers apolitical soft news and has posed no problems since the early 1990s when the Party retreated from its ideological stand against the *bourgeois life style*. The battleground now is in the *gray zone*, where news reporting covers wrong-doing, fraud, corruption, and other unfair actions at the regional and corporate levels.

[22] See, for example, "Zhengjian Hui Shouxi Guwen Cheng Yulun Jiandu Hen Zhongyao" [Chief Advisor to the Securities Commission States That Popular Opinion Supervision is Very Important], Renmin Wang [People's Daily Online], July 14, 2001.

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