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Firm headquarters location, ownership structure, and stock return co-movements

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ABSTRACT

This paper investigates the link between firm headquarters location and its stock return co-movements in a full sample of Chinese listed firms from 1999 to 2007. The empirical results show a significant stock return co-movement pattern for firms located in the same province. And both firm-level factors, such as firm size and ownership structure, and provincial-level factors, including GDP per capita and the number of firms in a province, are found to be influential to this pattern. Moreover, results from a subsample of firms listed in the Shenzhen Stock Exchange show a reduction of local co-movement when firms have better information quality.

1. Introduction

Local bias, defined as the preference for investors to hold local companies, has been well documented in many studies.[1] It implies that local investors try to obtain higher stock returns by exploiting local information (Gomez, Priestley and Zapatero, 2012). Current literature tries to explain this phenomenon from different aspects, such as local fundamentals and geographic segmentation (Coval and Moskowitz, 1999; Ivkovic and Weisbenner, 2005; Pirinsky and Wang, 2006; Almazan et al., 2010), information

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[1] For instance, Coval and Moskowitz (1999) and Pirinsky and Wang (2006) for the US; Grinblatt and Keloharju (2001) for Finland; and Massa and Simonov (2006) for Sweden.

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asymmetry (Coval and Moskowitz, 1999; Davis and Henderson, 2004; Ivkovic and Weisbenner, 2005; Malloy, 2005), and investor interaction (Benatzi, 2001; Hong et al., 2003, 2004).[2]

There has not been consensus as to the impact of localism on the price of shares and the covariance structure of stock return. For instance, Seasholes and Zhu (2010) find no evidence to support the role of individual value-relevant information in local stocks, while Ivković and Weisbnner (2005) document a strong preference of household to local investments. In addition, Hong et al. (2008) document empirical findings consistent with the presence of local bias, and Bodnaruk (2009) states that investors sell shares of a firm if they move away from the location of the firm. This paper tries to shed additional light on this issue by investigating the local co-movements of stock return of Chinese listed firms, an important market in the word today and surprisingly be ignored in previous studies. A further elucidation of this issue can facilitate a better understanding of the existence of local factors in asset pricing in emerging markets in addition to developed markets, and it is important for portfolio decisions, capital evaluations and performance assessments (Pirinsky and Wang, 2006).

Examining the stock market in China is important for at least three reasons. Firstly, the existence of specialization and inequality across Chinese regions provides a good opportunity to investigate this issue. The highly segmented Chinese stock market exhibits some unique characteristics comparing to the other more integrated and developed markets, such as stock market in the US. For example, many of the public firms in China localize their product operations in the headquartered provinces, where their information mainly comes from and makes influences to. In addition, government-owned firms are more closely connected to the local government, since their management teams are appointed by local governments, while listed private firms have to make all kinds of efforts to build connections with the local government to facilitate their local operations. Moreover, in China, economic activities are managed and planned at the provincial level, under the guidance of the Chinese central government, so that each province has a relatively independent social and economic integration. Under the current local government official promotion criteria, provincial government tries hard to promote GDP in its jurisdiction and local protectionism is easily promoted. As can be seen from the above arguments, the cross-region social integration level is lower in China than in other developed markets. Young (2000) argues that China is "a fragmented internal market with fiefdoms controlled by local officials" (p1128), and Poncet (2001, 2005) also confirms that China's domestic fragmentation across different provinces is great. Bai et al. (2004, 2008) find that local protectionism is a major factor contributing to China's regional specialization, and Tsui (2007) studies the forces to cause the interprovincial inequality in China. Secondly, stock market in China is in a developing stage, which has lower quality of accounting information disclosure and lower transparency of firm's operations because of the lack of powerful legal regulations and consensus of investor protection. Meanwhile, the corporate governance in China is generally poor (Allen et al., 2005). All of the contributing factors make the study informative to both domestic and international investors who intend to invest in the Chinese market. Thirdly, the ownership structure of Chinese firms is unique. Chinese government owns approximately two-thirds of listed companies and it leads to the majority of outstanding shares to be non-tradable, so that the stock market in China is heavily segmented before the end of 2005. The segmentation of the Chinese stock market is further evidenced by the separation of A-shares (tradable for Chinese domestic investors only) and B-shares (tradable for foreign investors only before February 19, 2001). Foreign investors in China face a quite different investment environment compared with those in other countries, because of the strong policy constrains applied by the Chinese government toward foreign capital.

The empirical results, based on a full sample of all Chinese publicly listed firms from 1999 to 2007, show a strong co-movement pattern of stock returns for firms located in the same province, and foreign ownership influences this local co-movement.[3] This demonstrates the severe segmentation of Chinese markets at provincial level, reflected on localization of operations, information products, and the close connections of local firm

[2] A similar phenomenon called home bias in the international context, is well examined by Aggarwal et al. (2005), Chan, Covrig, and Ng (2005) and Beneish and Yohn (2008). Theoretical study of Nieuwerburgh and Veldkamp (2009) argues that home investors benefit from the information asymmetry.

[3] This paper measures local co-movement as the time series sensitivity of a firm's stock returns to a local index incorporating all firms with headquarters in the same province and excluding the foreign ownership firms. When estimating beta, the overall market and the relevant industry indices are controlled to take into account the joint clustering effect of geography and industries (Glaeser et al., 1992; Pirinsky and Wang, 2006).

management team with local governments, and so on. The similar co-movement pattern of stock return between the US (as documented in Pirinsky and Wang, 2006) and China on this issue suggests that local co-movements are a universal phenomenon in both developed and emerging markets.

Our findings further show that firms which are smaller, less profitable, with lower dividend yield, lower MTB, and lower proportion of tradable shares, exhibit a stronger local co-movement of stock returns. The impacts of size and profitability are similar to those of the US reported by Pirinsky and Wang (2006), while the impacts of dividend yield and MTB are in contrast to theirs. The different results between the US and the Chinese stocks suggest that the local co-movements influenced by a single factor are caused by different reasons in different markets. Chinese share market investors tend to be highly speculative due to their limited sources for financial investment. They may invest whatever available in the market, by ignoring the location factor. Some differences on this issue are not surprising, which makes this study more informative to worldwide investors. Moreover, higher proportion of tradable shares, which is a unique feature of Chinese firms, are companied with a higher level of co-movement of stock return and indicates that those shares are more likely to incorporate with more market-wide information via trading. So when more information is available to both local and non-local investors, the local co-movements should reduce.

Our findings also show that firms located in provinces with higher GDP per capita and larger number of local firms, exhibit a stronger local co-movement of stock returns. While the higher financial depth, a weaker local factors market, and a better legal system have no impact on local co-movements. This demonstrates that the limited investment opportunity in the market, better economic development at provincial level, and larger numbers of local firms, do influence the local bias. Surprisingly, we find the differences in legal enforcement in different provinces within the same county-level legal system have no impact on stock return local co-movements.

Finally, the empirical result based on a subsample of firms listed in the Shenzhen Stock Exchange shows that better firm-level information quality reduces local co-movements. This demonstrates that the Chinese stock market is more likely to be an information segmented market. Better information disclosure of the listed firms will reduce their local information reliance, thus local co-movements.

This paper is not only a simply Chinese data transformed version of what has been done in previous literature using the US data, but also a complementary to former studies and we contribute to the current literature in several ways:

First, the current literature focuses on the US, the world's largest developed country, while it remains unclear whether the empirical findings in the US can also be applied to the rest of the world, in particular to some emerging countries, like China. The local co-movement issue in the Chinese provinces is important to fill in the gap in the current literature. The similarities and differences between the US (as documented in Pirinsky and Wang, 2006) and China on this issue pose an interesting and important question. It is thus very interesting to examine that the local bias in the largest emerging market, with much less developed financial market and much weaker corporate governance and legal system as well as with a dominating role of state ownership in quite a significant proportion of firms, will behave similar to or different from the largest developed market, the US. We expect that there should be some differences on this issue, thus making this study more informative to worldwide investors.

Second, the availability of Chinese firm-level ownership structure data in recent years makes this study more informative. As an important component of the corporate governance mechanism, ownership structure can influence information transmission and disclosure, and thus influence stock return local co-movements. The Chinese government is the largest shareholder in many firms, thus an important issue arises—what is the effect of the government being both a player and a regulator in the stock market? In this paper, we explicitly employ the detailed ownership structure to investigate this issue, which has been ignored in earlier studies. Ownership structure is a fundamentally important issue, because this information is traded and processed by different owners in the market. It is thus very interesting to know how the potential conflicts of interests among different owners influence the local bias.

Third, an explicit information quality index is employed in this study, which is a direct test of this issue, instead of relying on the inferred information quality from some firm characteristics. Proxies for information quality in former studies are implicit at best, but without employing a direct measure of information quality at firm level, it is hard to deliver convincing evidence regarding the role of information in this local bias issue.

Finally, this is the first study to investigate the impact of the differences in legal enforcement between different provinces within the same county-level legal system on stock return local co-movements, and contributes to the literature on the corporate governance issue. This important issue is not feasible in the US study. An interesting question to ask is that can the differences in provincial corporate governance environments have impacts on local bias, even if they are within the same country level corporate governance and legal system? [4]

Why does firm locality influence stock return co-movements? As is well summarized by Pirinsky and Wang (2006), there are two possible explanations, one is fundamentals while another is geographic segmentation. The former argues that the fundamentals of local firms can be influenced by regional factors, such as local economic conditions, so result in local co-movements in their stock returns. Gomez, Priestley and Zapatero (2009) argue that stock returns can be explained by their co-variances with the local risk factors, in addition to the market portfolio. Gomez, Priestley and Zapatero (2012) document that labor income risk is priced in portfolio returns at the geographical divisional level, including a few states in the US, according to the Census Bureau. However, Pirinsky and Wang (2006) do not find any evidence supporting local co-movements in earning changes for local firms with headquarters located in the same geographical regions, neither do they find any evidence of a large magnitude influence of state economic variables on local co-movements.

The latter explanation claims that physical proximity in the same geographical area promotes social interactions among local members/investors of a community, thus intensifies the exchange of information and sentiment. This can lead to local stock return co-movements, because local investors may follow others blindly (Bikhchandani, Hirshleifer, and Welch, 1992), or they may herd when trading (Hong et al., 2003; Barber, Ordean, and Zhu, 2009). This can be further certificated by a greater participation of the more sociable individuals than others (Hong et al., 2004), and the stronger influence among more financially sophisticated households with similar age and income in their investment decisions (Brown et al., 2008), or in familiarity-driven investment (Benartzi, 2001). DeMarzo, Kaniel and Kremer (2004) provide a theoretical model and show that local factors influence investor portfolio choices. The investor herding behavior in trading local securities leads to an under-diversification problem by creating a community-based systematic risk unrelated to fundamentals. Pirinsky and Wang (2006) document empirical results supporting this geographical segmentation argument. They find that firms with a larger fraction of local investors (proxied by small firms) or less visibility (less profitability) or fewer shareholders exhibit a stronger local co-movement in their stock returns. They also find that the local economic and demographic characteristics, such as financial market participation and financial sophistication of local investors, contribute to local co-movement.

Remaining parts of this paper are organized as follows. In Section 2, we present the data and the summary statistics. Section 3 demonstrates the links between local co-movements and headquarters location. And relationships between local co-movements and operating earnings are illustrated in Section 4. In Section 5, the firm-level and provincial-level determinants of local co-movements are investigated. And Section 6 is the conclusion of this paper.

2. Data and summary statistics

All Chinese stocks traded in the SSE (Shanghai Stock Exchange) and SZSE (Shenzhen Stock Exchange) are included in this study, and the time period is from 1999 to 2007. Data of stock prices and firms' headquarters come from the WIND database. A firm's location is the location of its headquarters, consistent with that of Coval and Moskowitz (1999) and Ivkovic and Weisbenner (2005).[5] There are 30 provinces, plus four municipalities (Beijing, Tianjin, Shanghai and Chongqing) in China. To be included in the sample, each province must have at least five publicly traded firms in at least two different industry groups.

[4] The impact of the difference of the provincial corporate governance on different aspects of the provincial financial markets in China has been increasingly noticed by current literature, including Hasan et al.(2009), Chen et al.(2006, 2009), Lo et al.(2010), Chen et al.(2011) and Lin et al.(2012).

[5] In the US study, Pirinsky and Wang (2006) define the firm's location as the Metropolitan Statistical Area (MSA) of its headquarters, which is not applicable in the Chinese market.

Table 1
Summary Statistics. All firms in the Chinese stock market are included in the sample over the period from 1999 to 2007. This table provides the total number of firms as well as the number of provinces and industries they are in. The sample includes domestic A-share stocks traded in Shanghai and Shenzhen. We define the industries according to the Chinese Securities Regulatory Commission (CSRC). To be included in this sample, a firm has to be entirely traded over the period from 1999 to 2007 and a province or an industry has more than 5 stocks.

			Number of firms per province or industry			
	No. of firms	No. of province or industry	Mean	Median	Min.	Max.
1999–2001	752	30 provinces	25.07	16.5	6	115
	752	21 industries	35.81	24	5	109
2002–2004	1013	30 provinces	33.77	23.5	9	123
	1013	21 industries	48.24	39	10	146
2005–2007	1230	30 provinces	41	27	9	137
	1230	21 industries	58.57	49	10	181

As can be seen from Table 1, the sample firms span 21 major industries and 30 provinces. For instance, in the period of 2005–2007, there are 1230 firms traded, and each province has 41 firms on average, with a median of 27 firms. Guangdong has the largest number of publicly traded firms (137 firms), while Qinghai has the smallest number (6 firms). Other provinces with a large number of firms are Shanghai (135), Beijing (82), Zhejiang (82), Jiangsu (81) and Shandong (66).

We define the industries according to the Industry Classification Standard published by the Chinese Securities Regulatory Commission (CSRC). For example, for the period of 2005–2007, each industry has on average 33 firms, with a median of 22 firms. Machinery has the largest number of publicly traded firms (181 firms), while Media has the smallest number (10 firms). Other industries with large numbers of firms are petroleum (129), pharmaceutical and medicine (90), wholesale and retails (85), and real estate (83).

3. Local co-movements of stock returns and headquarters location

Following Pirinsky and Wang (2006), the co-movements of a stock with other stocks in the same region are measured by firstly constructing a local index, and then by estimating the following time-series regression for each stock:

$$R_t = \alpha + \beta_1 R_{tl} + \beta_2 R_{tm} + \varepsilon_{i,t} \quad (1)$$

where, R_t is a stock's monthly return, and R_{tl} is the relevant local index return, which is calculated as the equal weighted average returns of all stocks in the firm's province and excluding the stock itself. R_{tm} is the monthly value weighted market return which is calculated by all stocks traded in Shanghai and Shenzhen exchanges. Firms from the same province may benefit from geographical clustering by being in the same or related industries (Ellison and Glaeser, 1997; Pirinsky and Wang, 2006). This is particularly the case in the Chinese market, given each provincial government's efforts to promote GDP at the provincial level, thus we control for the impact of industry geography. An equal weighted industry index is introduced in Eq. (2):

$$R_t = \alpha + \beta_1 R_{tl} + \beta_2 R_{tm} + \beta_3 R_{ti} + \varepsilon_{i,t}. \quad (2)$$

where, R_{ti} is a stock's corresponding industry return. It excludes the stock itself and average returns of other stocks in the industry. To better completely control the influence from industries, we introduce the spillover effects from other industries and possible co-movement with related industries, following Pirinsky and Wang (2006), we introduce two more industry geography variables into the following Eq. (2):

$$R_t = \alpha + \beta_1 R_{tl} + \beta_2 R_{tm} + \beta_3 R_{ti} + \sum_{j=1}^{2} \gamma_j R_{tij} + \varepsilon_{i,t} \quad (3)$$

where, R_{tl}, $R_{tm,}$ and R_{ti} are defined as before. R_{ti1} is the return of the associated industry which makes the regression model below gets the highest R^2:

$$R_t = \alpha + \beta_1 R_{ti1} + \varepsilon_{i,t} \quad (4)$$

R_{ti2} is the return of the associated industry which makes the regression model below gets the highest R^2:

$$R_t = \alpha + \beta_1 R_{ti1} + \beta_2 R_{ti2} + \varepsilon_{i,t}. \quad (5)$$

We separate our sample into 3 subsamples according to time periods: 1999–2001, 2002–2004, and 2005–2007, and regress Eqs. (1)–(3) separately. Table 2 presents the averages of the estimation of betas and their t-statistics. The empirical results in the first panel (Eq. (1)) clearly show the existence of the local co-movement between stocks within the same province: local β_1 is positive and significant at the 1% level in all three equations, even after controlling for the market returns. The averages of local betas range from 0.63 to 0.87 over various sub-periods. The empirical results also reveal that local sensitivity is much stronger in the later period (0.82 in 2005–2007 vs. 0.63 in 1999–2001).

The empirical results in the second panel (Eq. (2)) also clearly show strong existence of local co-movement between stocks within the same province: local β_1 is positive and significant at the 1% level in all three equations, even after controlling for market returns and industry returns. The significance of industry betas (β_3) justifies the inclusion of the industry index in the regression equation, and as a result, the significance of local betas (β_1) is reduced. However, local betas remain significant in terms of economics and statistics: they are still significant at the 1% level and range from 0.34 to 0.39 over various time periods. When there is an industry index, the market index exhibits a much weaker sensitivity: the market betas (β_2) range from 0.11 to 0.27 in Eq. (1) vs. −0.01 to 0.06 in Eq. (2). Market betas (β_2) have a weaker significance in later periods after introducing the industry factor, and become insignificant in the latest period, 2005–2007.

The empirical results in the third panel (Eq. (3)) also clearly show strong existence of local co-movement between stocks within the same province: local β_1 is positive and significant at the 1% level in all equations, even after controlling for market returns and industry returns. The significance of industry

Table 2
Local co-movement. The time-series regression Eqs. (1)–(3) are run for the following three periods: 1999–2001, 2002–2004, and 2005–2007. Note that γ_1 and γ_2 are not available for all stocks in the sub-period 1999–2001.

	β_1	β_2	β_3	γ_1	γ_2
Equation 1					
1999–2001	0.6286***	0.2694***			
t-Stat	30.46	13.22			
2002–2004	0.8717***	0.1077***			
t-Stat	62.02	7.94			
2005–2007	0.8227***	0.1607***			
t-Stat	41.26	8.41			
Equation 2					
1999–2001	0.3856***	0.0573***	0.4921***		
t-Stat	14.01	2.90	18.47		
2002–2004	0.3634***	0.0327**	0.6058***		
t-Stat	16.18	2.23	26.66		
2005–2007	0.3403***	−0.0080	0.6389***		
t-Stat	12.12	0.42	27.30		
Equation 3					
1999–2001	NA	NA	NA	NA	NA
t-Stat	NA	NA	NA	NA	NA
2002–2004	0.3104***	−0.0226*	0.5316***	0.1517***	0.0469*
t-Stat	9.79	−1.84	17.22	5.10	1.69
2005–2007	0.2465***	−0.0280	0.5383***	0.1933***	0.0516*
t-Stat	7.06	0.23	17.21	6.69	−1.93

t-Statistics in parentheses. *** $p < 0.01$, ** $p < 0.5$, * $p < 0.1$.

betas (β_3 and γ_1) justifies the inclusion of industry index in the regression equation, and as a result, the significance of local betas is further reduced. However, local betas remain significant in terms of economics and statistics: they are still significant at the 1% level, ranging from 0.25 to 0.31 over various time periods. Market betas (β_2) become insignificant in the latest period (2005–2007).

Overall, the above evidence demonstrates the existence of local co-movement in stock returns for firms in the same province, even after controlling for industry and market factors.

4. Local co-movements and operating earnings

The local co-movements in stock returns observed in Section 3 could be due to local co-movements in firm cash flows, if local economic conditions influence local firm operations, in particular for those regionally operated small firms. This subsection will investigate this hypothesis by examining whether there are local co-movements in earnings, as a proxy for firm cash flows. If that is the case, then we can state that local economic conditions do influence local co-movements in stock returns.

For each firm, we denote EG_1 by the change between current and previous quarter earning (ΔE) divided by book value (B) of the firms, that is $EG_1 = \Delta E / B_1$. As an alternative, we calculate the change in its current-quarter earnings vs. the same-quarter earnings in the previous year (ΔE), to control for seasonality of the earnings. The second method also is scaled by the firm's book value of equity (B). This is denoted as EG_4 ($=\Delta E / B_4$). Based on EG_1 and EG_4, we calculate the market earnings index (EG_{mk}) and local earnings index (EG_{lk}) by both equal weighted and value-weighted earnings ratios of the firms, where $k = (1, 4)$. The weight is based on each firm's book values of equity, excluding this firm's earnings ratio from the local index.

We then run the following time-series regression for each firm using earning growth ratios, with $k = 1$ or 4:

$$EG_{tk} = \alpha + \beta_1 EG_{ltk} + \beta_2 EG_{mtk} + \varepsilon_{i,t}. \quad (6)$$

Table 3 reports the estimations of Eq. (6) over the sample period of 1999–2007. The significance of the means of local earnings betas and market earnings betas are also reported. As can be seen, the results suggest that the co-movements between firm's earnings and the local earnings index (β_1) are negative and insignificant, which indicate that the local co-movements in stock returns are unlikely due to local co-movements in earnings. The market-wide co-movements in corporate earnings are significant and positive. These results seem to suggest that the information contained in Chinese firms' earnings is

Table 3
Local co-movement of earnings. This table is based on the following regression equation:

$$EG_{tk} = \alpha + \beta_1 EG_{ltk} + \beta_2 EG_{mtk} + \varepsilon_{i,t}.$$

For each firm we calculate the change of its current-quarter earnings vs. the previous-quarter earnings (ΔE), scaled by the firm's book value of equity (B). This is denoted as EG_1 ($=\Delta E / B_1$). As an alternative, we calculate the change of its current-quarter earnings vs. the same-quarter earnings in the previous year (ΔE), which is to control for the earnings seasonality. The second method also is scaled by the firm's book value of equity (B). This is denoted as EG_4 ($=\Delta E / B_4$). Based on EG_1 and EG_4, we calculate the market earnings index (EG_{mk}) and local earning index (EG_{lk}) by both equally weighting and value-weighting the firms' earnings ratios, where $k = (1, 4)$. The weight is based on each firm's book values of equity, excluding this firm's earnings ratio from the local index. The sample includes 1032 stocks as previous which own at least 24 quarter observations over 1999–2007.

	Equally weighted		Value weighted	
	β_1	β_2	β_1	β_2
EG_1				
Mean	−0.1321	1.2199	−0.0851	0.7494
t-Stat	−0.85	2.53	−0.44	2.02
EG_4				
Mean	−0.0050	0.9595	−0.1353	0.5758
t-Stat	−0.04	2.71	−0.66	1.68

influenced by the overall market, not by local market. Even if there is information unrelated to earnings which could drive local co-movements of stock returns, we think that this information will be eventually incorporated in earnings in the future. Thus such information is unlikely to impact on our results, given our long-run approach towards earnings. In addition, some may argue that many firms obtain earnings from other provinces, thus our result does not take into account the significant local co-movement in earnings. This is unlikely in China, due to Chinese provincial governments' heavy involvements in protecting local markets. Furthermore, given that our results also control for industry effects, it is unlikely that the local competition can affect earnings.

5. What determines the local co-movements of stock returns?

5.1. Firm characteristics

As in previous literature (Coval and Moswitz, 2001; Pirinsky and Wang, 2006), the following independent variables are considered: Size (the natural logarithm of the end of last year's market capitalization); leverage (total debts / total assets); dividend yield (the annual dividend payout/the market capitalization); MTB (market-to-book ratio: equity market value/equity book value); ROA (return on assets); NOS (the natural logarithm of number of shareholders); the largest shareholder ownership; institutional ownership; Tradeprop, the ratio of tradable shares compared to total shares; Bdummy, a dummy equal to 1 if there is B-share for this particular firm, and zero otherwise. Hdummy, a dummy equal to 1 if there is H-share for this particular firm, and zero otherwise. Three-year averages are calculated for all independent variables for the three sub-periods.

We distinguish between two groups of characteristics. The first group includes size, leverage, dividend yield, market-to-book, and ROA; the second group is related to the firm's ownership structure and includes NOS, the largest ownership, state ownership (StateOwn), institutional ownership (institution), and the proportion of tradable shares (Tradeprop), the existence of B-shares (Bdummy) and H-shares (Hdummy). We run two specific of regressions, one with variables only from the first group and the other with variables from both groups. The dependent variable here is local betas from Eq. (2).

Table 4 presents the results. Size is always negative and significant in the latter two periods (2002–2004 and 2005–2007), implying that small companies have stronger local co-movements. A possible reason is that larger firms are more visible in the market thus a greater number of investors in other provinces are more likely to invest in it. This demonstrates the “size effect”, as documented by Coval and Moswitz (2001) and Pirinsky and Wang (2006). These results seem to be inconsistent with Roll (1988), who finds that large stocks' covariance with the market is larger than that of small stocks, while our measurement of local co-movement has taken into account the market index (local betas are estimated over Eq. (2), which contains the market index). Our results seem to suggest that after considering the market influences, smaller firms are more likely to covary with the local index.

Leverage does not have a significant impact on local co-movements in the three subsamples, indicating that creditors do not play significant role in corporate governance, especially in promoting corporate transparency.

Dividend yield is negative and significant, which shows that high dividend yield firms with high visibility tend to attract more non-local investors and to reduce local co-movements. This demonstrates that, given the low dividend payment tendency in the Chinese firms, non-local investors choose those with high dividend payment to invest. This is in contrast to the US insignificant evidence in Pirinsky and Wang (2006).

MTB is negative and significant, which shows that high MTB firms showing high valuations tend to attract more non-local investors and thus reduce local co-movements. This is in contrast to the US insignificant evidence in Pirinsky and Wang (2006).

ROA, the measure of a firm's profitability, is negative and significant in the latter period of 2005–2007. This demonstrates that a local firm which is more profitable to investors may attract investors outside the region of the firm. This result is consistent with the US evidence in Pirinsky and Wang (2006).

NOS (the number of shareholders) is insignificant. This does not show the strong local bias of individual shareholders (Hong et al., 2004), in contrast to the US evidence in Pirinsky and Wang (2006).

Table 4

Determinants of local co-movements: firm characteristics. For each stock in the sample, we estimate time-series regressions of monthly stock returns on the returns of a local index and the market portfolio for the all 3-year periods: 1999–2001,2002–2004, and 2005–2007. We then regress the estimated local beta on the following firm characteristics: Size, the natural logarithm of the market capitalization of the firm; leverage, the total debt over assets ratio; dividend yield, the dividend payout divided by the market value of equity; MTB (market-to-book ratio), the market to book ratio; ROA, return on assets; NOS, the natural logarithm of the number of shareholders; StateOwn, state ownership; largest ownership, the fraction of the number of shares held by the biggest shareholders over the total number of shares; institution, institutional ownership; Tradeprop, the ratio of tradable shares compared to total shares; Bprop, the ratio of B shares compared to total shares; and Hprop, the ratio of H shares compared to total shares. All independent variables are 3-year annual averages for the three periods. Estimated coefficients and their t-statistics are presented in the table.

VARIABLES	1999–2001			2002–2004			2005–2007		
Int 99–01	1.1876 (0.87)	0.6414 (0.47)	2.8167*** (1.90)						
Int 02–04				2.6086** (2.60)	2.4308*** (2.32)	3.5979** (3.38)			
Int 05–07							6.0494** (5.72)	3.1897** (2.77)	6.5500** (5.90)
Size	−0.0304 (−0.45)	0.0018 (0.03)	−0.0923 (−1.33)	−0.0991*** (−2.02)	−0.0890* (−1.75)	−0.1359** (−2.71)	−0.2676** (−4.97)	−0.1197*** (−2.08)	−0.2726** (−5.07)
Leverage	0.1580 (1.27)	0.1405 (1.13)	0.1632 (1.32)	0.0877 (1.14)	0.0265 (0.29)	0.0976 (1.28)	−0.0121 (−0.70)	−0.0120 (−0.69)	−0.0112 (−0.65)
Dividend yield	−9.5797** (−3.27)	−9.0968** (−3.11)	−9.1946** (−3.16)	−6.1823** (−2.74)	−5.0174*** (−2.15)	−6.3993** (−2.87)	−3.4001*** (−2.03)	−2.0651 (−1.25)	−3.1529* (−1.90)
MTB	−0.0209*** (−2.49)	−0.0230** (−2.74)	−0.0214** (−2.58)	−0.0112 (−1.42)	−0.0102 (−1.27)	−0.0121 (−1.53)	−0.0282** (−2.71)	−0.0128 (−1.17)	−0.0274** (−2.64)
ROA	−0.0004 (−0.07)	−0.0005 (−0.10)	0.0016 (0.30)	−0.0021 (−0.50)	−0.0037 (−0.74)	−0.0014 (−0.33)	−0.0105*** (−2.13)	−0.0131*** (−2.57)	−0.0097*** (−1.96)
NOS	−0.0057 (−0.91)	−0.0082 (−1.32)	0.0015 (0.22)	−0.0007 (−0.13)	−0.0001 (−0.02)	0.0047 (0.76)	0.0044 (0.59)	−0.0081 (−1.08)	0.0074 (0.96)
Bdummy	0.6568** (6.82)	0.6343** (6.59)	0.5260** (5.04)	0.1754*** (2.02)	0.1474* (1.67)	0.0833 (0.90)	0.3061** (2.76)	0.2726*** (2.46)	0.1632 (1.34)
Hdummy	−0.1923 (−1.02)	−0.1979 (−1.05)	−0.3458* (−1.77)	−0.1776 (−1.11)	−0.1760 (−1.12)	−0.2938* (−1.77)	0.0931 (0.50)	0.0618 (0.33)	−0.0574 (−0.29)
Largest ownership	0.0015 (0.91)			0.0002 (0.12)			0.0039*** (1.99)		
StateOwn		−0.0011 (−0.94)			−0.0007 (−0.74)			−0.0010 (−0.42)	
Institution					−0.0005 (−0.17)			−0.0097** (−3.93)	
Tadeaprop			−0.0072** (−2.86)			−0.0054*** (−2.57)			−0.0056*** (−2.41)
Observations	750	750	747	1011	979	1008	1229	1222	1225
Adjusted R-squared	0.292	0.292	0.298	0.236	0.225	0.241	0.204	0.210	0.203

t-Statistics in parentheses.*** $p < 0.01$.** $p < 0.05$.* $p < 0.1$.

The largest ownership exhibits a positive and significant impact on local co-movements in 2005–2007, which indicates that bigger shareholder, the more opaque, the more information superiority investors in the firms' headquarters would own. Meanwhile, the existence of government ownership (StateOwn) does not seem to exhibit a significant impact, documents that government owners have not significant impact on firms' information disclosure.

Institutional ownership data is unavailable for period 1999–2001 due to fact that institutional investors were not yet developed in this period in China. The results in the latter period of 2005–2007 show a negative impact, indicating that they tend to convince more non-local investors to invest and to reduce local co-movement.

The proportion of tradable shares in a firm, as proxied by Tradeprop, exhibits a significantly negative impact on local co-movements. The higher proportion of tradable shares means that those firms are more likely to incorporate more market-wide information via trading. Local co-movements are reduced, given that more information is available to both local and non-local investors.

The existence of B-shares, as proxied by Bdummy in a firm promotes local co-movements. This might be because local investors are more likely to invest in those firms with B-shares, since they may feel that foreign participation in these firms will make them better off in terms of accounting information transparency and firm corporate governance.

The existence of H-shares, as proxied Hdummy in a firm, does not have a consistently significant impact on local co-movement except for a weak negative significance in the first two periods.

Table 5
Determinants of local co-movements: information. We obtain the information disclosure evaluation for 414 firms listed in Shenzhen from 2001–2007. We then regress the local betas (from 2001–2007) on the information disclosure level variables defined as: 1) Info_Dummy: if a firm gets evaluation above "Good" more than 4 times then it's 1, otherwise 0; and 2) evaluation: we give scores for different levels of evaluation, Non-pass = 0, Pass = 1, Good = 2, Excellent = 3. The variable evaluation is defined as the average of scores over 7 years. In additional, we control some key firm characteristics in regressions: Size, the natural logarithm of the market capitalization of the firm; leverage, the total debt over assets ratio; dividend yield, the dividend payout divided by the market value of equity; MTB (market-to-book ratio), the market to book ratio; and ROA, return on assets.

Variables	Evaluation			Info_Dummy		
Constant	1.0067***	3.3924***	4.5748	0.4039***	3.3673***	4.2603**
	(5.86)	(2.89)	(0.78)	(8.28)	(2.87)	(2.13)
Disclosure	−0.2614***	−0.0401	−0.5177	−0.1382**	0.0372	−1.2458
	(−4.09)	(−0.51)	(−0.24)	(−2.28)	(0.55)	(−0.51)
Size		−0.1298**	−0.2067		−0.1342**	−0.1769*
		(−2.32)	(−0.75)		(−2.41)	(−1.87)
Leverage		0.0002	0.0070		0.0002	0.0003
		(0.71)	(0.99)		(0.56)	(0.93)
Dividend yield		−4.6936	−3.2020		−5.1827*	−4.6159
		(−1.49)	(−0.95)		(−1.67)	(−1.37)
MTB		−0.0188*	−0.0165		−0.0188*	−0.0176
		(−1.76)	(−1.49)		(−1.76)	(−1.61)
ROA		−0.0073	0.0571		−0.0100	−0.0040
		(−0.88)	(1.35)		(−1.21)	(−0.37)
Disclosure*Size			0.0314			0.0647
			(0.31)			(0.56)
Disclosure*leverage			−0.0029			−0.0015
			(−0.96)			(−0.63)
Disclosure*ROA			−0.0264			−0.0147
			(−1.57)			(−0.94)
Observations	414	413	413	414	413	413
Adjusted R-squared	0.037	0.090	0.089	0.010	0.090	0.086

t-Statistics in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Table 6
Determinants of local co-movements: provincial and firm characteristics. For each stock in the sample, we estimate time-series regressions of monthly stock returns on the returns of a local index and the market portfolio for three 3-year periods: 1999–2001, 2002–2004, and 2005–2007. We then regress the estimated local beta on the following provincial characteristics: GDP (provincial GDP per capita); NOF (the number of firms in a province); financial depth (M2/GDP); local factors market; and local law system; and the following firm characteristics: Size, the natural logarithm of the market capitalization of the firm; leverage, the total debt over assets ratio; dividend yield, the dividend payout divided by the market value of equity; MTB (market-to-book ratio), the market to book ratio; ROA, return on assets; NOS, the natural logarithm of the number of shareholders; StateOwn, state ownership; largest ownership, the fraction of the number of shares held by the biggest shareholders over the total number of shares; institution, institutional ownership; Tradeprop, the ratio of tradable shares compared to total shares; Bprop, the ratio of B shares compared to total shares; and Hprop, the ratio of H shares compared to total shares. All independent variables are 3-year annual averages for the three periods. Estimated coefficients and their t-statistics are presented in the table.

VARIABLES	1999–2001			2002–2004			2005–2007		
Int99–01	0.1450***	0.1386	3.4870**						
	(3.24)	(1.20)	(2.3937)						
Int 02–04				0.2376***	0.1726**	4.2460***			
				(6.12)	(2.04)	(3.70)			
Int 05–07							0.1755***	0.0730	4.6657***
							(3.25)	(0.70)	(3.73)
GDP	0.0000***	0.0000	0.0000	0.0000***	−0.0000	0.0000 (0.93)	0.0000***	0.0000	0.0000
	(6.70)	(0.92)	(0.5929)	(3.95)	(−0.09)		(3.56)	(0.21)	(1.51)
NOF		0.0057***	0.0042***		0.0028**	0.0027*		−0.0020	−0.0014
		(4.33)	(3.2345)		(1.96)	(1.92)		(−1.25)	(−0.94)
Financial Depth		0.0003	0.0000		0.0002	−0.0002		−0.0006	−0.0017
		(0.63)	(0.0498)		(0.29)	(−0.30)		(−0.51)	(−1.45)
Local Factor		0.0233	0.0163		−0.0044	−0.0068		0.0209	0.0247
Market		(0.85)	(0.6121)		(−0.21)	(−0.33)		(0.78)	(0.97)
Local Law System		−0.0502	−0.0252		0.0103	−0.0060		0.0324	0.0142
		(−0.93)	(−0.4812)		(0.26)	(−0.15)		(1.30)	(0.61)

Size			−0.1278* (−1.8539)			−0.1708*** (−3.16)			−0.2014*** (−3.30)
Leverage			0.0949 (0.7798)			−0.0215 (−0.24)			−0.0137 (−0.80)
Dividend Yield			−7.8846*** (−2.7516)			−4.6376** (−1.98)			−1.6558 (−1.00)
MTB			−0.0272*** (−3.3207)			−0.0131 (−1.63)			−0.0122 (−1.12)
ROA			0.0032 (0.6246)			−0.0063 (−1.25)			−0.0134*** (−2.65)
NOS			−0.0014 (−0.2075)			0.0036 (0.58)			−0.0029 (−0.36)
Largest Ownership			0.0018 (0.7710)			−0.0001 (−0.04)			0.0012 (0.52)
Stateown			−0.0021 (−1.3947)			−0.0008 (−0.61)			−0.0012 (−0.48)
institution						0.0018 (0.66)			−0.0086*** (−3.47)
Tradeaprop			−0.0071** (−2.5490)			−0.0045* (−1.88)			−0.0027 (−0.96)
Bdummy			0.3242*** (2.9095)			−0.0556 (−0.55)			0.1311 (1.00)
Hdummy			−0.3388* (−1.7548)			−0.2867* (−1.73)			0.0076 (0.04)
Observations	752	752	747	1013	1013	976	1231	1231	1218
Adjusted R-squared	0.250	0.273	0.334	0.216	0.224	0.246	0.114	0.114	0.231

t-Statistics in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

5.2. Firm-level information disclosure quality in the Shenzhen Stock Exchange

The Shenzhen Stock Exchange (SZSE) provides information disclosure evaluation for stocks with grades of information disclosure level: "Non-pass", "Pass", "Good" and "Excellent". The data is only available for 355 firms in our sample from 2001 to 2007. In this section we examine the role of firm-level information disclosure quality in determining local co-movements.

Based on the grading, we construct two information variables, (1) Info_Dummy: if a firm receives evaluation above "Good" more than four times out of seven years, then it is 1, otherwise 0; (2) evaluation: we give scores for different levels of evaluation, Non-pass = 1, Pass = 2, Good = 3, Excellent = 4. The variable evaluation is defined as the sum of scores over 7 years.

We first regress Eq. (2) for 414 firms from 2001 to 2007 in the new sample and obtain their local betas, and then regress local betas on information variables as well as all firm characteristic variables in the last sub-section. All firm characteristics are 7-year annual averages for the period from 2001 to 2007. Table 5 reports the results.

Our finding is that local co-movements are negatively influenced by information disclosure quality. This implies that better information disclosure quality reduces local co-movements, due to a more willing involvement of non-local investors. The higher information disclosure quality, the lower level of local co-movements for this firm. This is because higher information quality would reduce non-local investors' information asymmetry and attract more non-local investors.

In addition, we add several interactions between firm-level information disclosure quality and firm characteristics: size, leverage, and return on assets (ROA). The results show that the interactions between firm-level information disclosure quality and size, leverage and ROA are insignificant. The empirical results do not find any significance of the interaction terms.

5.3. Provincial characteristics

In addition to firm variables, the following variables at provincial-level are included: NOF (the number of firms in a province); GDP (provincial GDP per capita); financial depth (M2/GDP); local factors market; and local law system. If these variables help increase the visibility of local firms to non-local investors, we hypothesize that local co-movements should be reduced. Otherwise, it will be increased.

Table 6 reports the result of these provincial variables. As can be seen from this table, GDP per se is significant in columns (1), (4) and (7), while not significant in the other columns. This implies that wealthy local investors intend to trade local stocks, and this tendency will be subsumed by other factors if they are also included in the regressions, such as local financial depth, local factors market, and so on.

NOF (the number of firms in a province) is positive and significant in the period of 1999–2001 and 2002–2004. This shows the availability of local firms, thus the supply of available local shares, will induce local investors to invest more. This is in contrast with the US evidence in Pirinsky and Wang (2006).

Financial depth (M2/GDP) is insignificant in all regressions, which implies that the development of the financial system in this region does not influence local investors to invest in non-local stocks, or non-local investors to invest in local stocks.

The local factors market is insignificant, implying that the availability of local factors, such as financial funding and labor income, cannot facilitate the investors to have more financial freedom to invest in the financial market.

Local law system has an insignificant impact, which implies that a more restrictive regulatory system in a particular province does not change the information quality of all firms in that province. Or this implies that the role of the regulatory system may be incorporated in the firm factors.

6. Conclusion

This paper tries to shed additional light on local bias issue by investigating the link between firm headquarters location and firm stock return co-movements in a full sample of Chinese firms from 1999 to 2007.

The empirical results show a strong co-movements pattern of stock returns for firms located in the same province. Moreover, both firm-level and provincial-level factors are found to influence this co-movement, for instance, firm size and ownership structure at firm level, GDP per capita and the number of firms at provincial level. The result from a subsample of firms listed in the Shenzhen Stock Exchange shows that better firm-level information quality reduces local co-movement.

There are policy implications arising from this study. Information quality should be improved both at firm level and at provincial level to reduce the local co-movement, thus improving investors' welfares.

This paper can be extended to international studies by examining firstly, whether there is local bias worldwide, and secondly what country-level factors contribute to the differences in this issue across the world.

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