Agglomeration Economies and Local Comovement of Stock Returns

Fu, Shihe and Shan, Liwei

Wang Yanan Institute for Studies in Economics (WISE), Xiamen University, Southwestern University of Finance and Economics

24 June 2011

Agglomeration Economies and Local Comovement of Stock Returns

Shihe Fu
fushihe@xmu.edu.cn
Wang Yanan Institute for Studies in Economics (WISE)
Xiamen University
Xiamen, 361005, China

Liwei Shan
Lshan@swufe.edu.cn
Research Institute of Economics and Management
Southwestern University of Finance and Economics
Chengdu, 610074, China

June 24, 2011

Abstract: Existing studies in finance have documented the comovement of stock returns of companies headquartered in the same location. The interpretation is that local investors have a "local bias" due to an information advantage on local companies. This paper argues that localized agglomeration economies affect the fundamentals of local companies, resulting in the local comovement of stock returns. Using the data for China A-share listed companies from 1997-2007, we confirm the local comovement of stock returns of companies headquartered in the same city; moreover, the stock returns of a company headquartered in a city with stronger agglomeration economies are also correlated more highly with stock returns of other companies headquartered in the same city. The local comovement of earnings among companies headquartered in the same city is also found, and the local comovement of stock returns is correlated with the local comovement of earnings. We conclude that correlated local fundamentals due to localized agglomeration economies can explain the local comovement of stock returns.

Key Words: Stock returns; Local bias; Agglomeration economies

JEL Classification: G1, R1, R3

Acknowledgements: The authors have benefited from conversations with or comments from Richard Arnott, Jim Davis, Yuming Fu, Li Gan, Shan He, William Kerr, Canlin Li, Debarshi Nandy, Judy Pereira, Stephen L. Ross, V.Brian Viard, and seminar participants at Southwestern University of Finance and Economics, Cheung Kong Graduate School of Business, Hanqing Advanced Institute of Economics and Finance at Renmin University, Zhejiang University, and the China Economist Society 2010 Annual Conference. This research was supported by a grant from the "Project 211 (Phase III)" of the Southwestern University of Finance and Economics.

1 Introduction

Urban agglomeration economies enhance the productivity of firms in cities. For listed companies located in cities, agglomeration economies improve their fundamentals; therefore, agglomeration economies should be closely related to stock markets. Although urban economists have done extensive studies to theorize and empirically test agglomeration economies, surprisingly, few have paid attention to the relationship between agglomeration economies and capital markets. [1]

Interestingly, in finance, increasing attention has been paid to the economic effects of geography on capital markets. One documented anomaly is that, after controlling for risk factors, stock returns of firms headquartered in the same location are significantly correlated (Coval and Moskowitz, 1999, 2001; Pirinsky and Wang, 2006; Anderson and Beracha, 2008). Such a local comovement of stock returns is interpreted as investors' local bias— the phenomenon where investors prefer to invest in stocks of companies that are geographically close to them (Coval and Moskowitz, 1999, 2001; Ivković and Weisbenner, 2004; Zhu, 2008). Empirical evidence has confirmed that local bias exists in the capital markets of many countries, such as in the USA, Germany, and Sweden (Pirinsky and Wang, 2006; Rudorfer, 2007; Mavruk, 2008).[2]

Local bias can result from information asymmetry or investors' behavior. The information asymmetry explanation argues that investors geographically close to the headquarters of a company have better information about that company; therefore, investors are more likely to invest in stocks of such a local company (Coval and Moskowitz, 1999, 2001; Ivković and Weisbenner, 2004; Pirinsky and Wang, 2006; Zhu, 2008). The investors' behavior explanation states that investors' social interactions and activities are usually limited within local regions. Investors within the same local social network are more likely to exchange local information and make similar investment decisions. For example, Hong et al. (2004, 2005, 2008) and Brown et al. (2004, 2008) find that investors are more likely to invest in a stock market when more people in their neighborhood invest in that stock market. It is worth noting that these two explanations of local bias are not mutually exclusive since the behavioral explanation accommodates the plausible situation that investors can have an advantage in obtaining information about local firms via their social interactions with other local investors.

In this paper we apply the urban agglomeration economies theory to stock markets and provide an alternative explanation of the local comovement of stock returns. A large literature in urban economics has provided theoretical explanation and empirical evidence that localization economies—the external economies from the spatial concentration of firms in the same industry in a city—can enhance productivities of firms in the same clustering. In addition, firms of different industries that co-locate in a city can benefit from urbanization economies—the external economies from city size and industrial diversity.[3] If the enhancement of firm

[1] Two exceptions are Helsley and Strange (1991) who study agglomeration economies and credit markets in cities and Ghosh et al. (1995) who test how the relocation of a firm's headquarters affects its stock returns.
[2] Other studies on geography and capital markets focus on a variety of topics. For example, Goetzmann et al. (2004) find that urban agglomeration promotes information spillover, leading to less portfolio diversification of urban investors; Almazan et al. (2007) test how being located in industry clusters affects firms' capital structure.
[3] For a literature review of theories and empirical evidence of agglomeration economies, see Duranton and Puga (2004) and Rosenthal and Strange (2004). For a review of the effect of city size and industrial diversity, see Fu and Hong (2011).

productivity increases firm fundamentals, leading to lower costs or higher earnings, then, the fundamentals of firms located in the same city will be correlated. Translating to stock markets, the correlation of fundamentals will cause the stock returns of firms located in the same city to be correlated. Moreover, firms that are located in a city with a higher degree of industrial diversity and that are in an industry with a higher degree of local concentration tend to have stronger correlation in fundamentals; therefore, their stock return comovement will be stronger. In this paper "concentration" means the spatial clustering of same-industry firms or the specialization of an industry in a city; it does not refer to the concentration of market share in an industry.

In this study we aim to answer two questions: Does there exist significant correlation between stock returns of companies headquartered in the same city in China? And if so, can urban agglomeration economies explain such local correlation of stock returns in Chinese capital markets?

We use the data for China A-share listed firms, drawn from the China Stock Market & Accounting Research (CSMAR) database, and data for Chinese cities from 1997-2007, to conduct the tests.[4] We find that, after controlling for standard risk factors, there exists significant local correlation between stock returns in Chinese capital markets: stock returns of a company are significantly correlated with stock returns of other companies headquartered in the same city. Consistent with the urban agglomeration economies theory, we find that the stock returns of a company headquartered in a city with stronger localization economies and urbanization economies are correlated more highly with the stock returns of other local companies headquartered in the same city. Furthermore, we find that such local correlation between earnings also exists and the local correlation of stock returns can be partially explained by the local correlation between earnings, suggesting that correlated local fundamentals is one of the driving forces of local comovement of stock returns. In contrast, we find mixed and weak evidence for the information-based local bias explanation.

Our study contributes to the literature by narrowing the gap between urban agglomeration economies theory and asset pricing. From the perspective of urban economics, we extend the growing agglomeration economies literature to capital markets, contributing to the understanding of the impact of firm location choice and industrial agglomeration on capital markets. From the perspective of asset pricing theory, we apply the agglomeration economies theory to explain the local comovement of stock returns, offering an alternative interpretation in addition to the local bias theory. Our findings can be informative to investors making portfolio decisions and to firms making location choice.

The next section introduces the data sets and tests whether there exists local correlation of stock returns in Chinese capital markets. Section 3 reviews both the information-based local bias theory and agglomeration economies theory and tests which theory can explain the local comovement of stock returns. Section 4 provides more evidence supporting the agglomeration economies explanation of local correlation, including testing the local comovement of earnings

[4] A-share refers to shares traded in mainland China, denominated in Chinese currency RMB. Only a small number of firms issue shares traded in foreign currencies, i.e., B-share (in US dollars) and H-share (in Hong Kong dollars).

and the relationship between local correlation of stock returns and local correlation of earnings. Section 5 concludes.

2. Local correlation of stock returns in Chinese stock markets

2.1 The comovement of stock returns of firms headquartered in the same city

Does there exist local correlation of stock returns in Chinese capital markets? Related studies are quite few. Feng and Seasholes (2004) use brokerage data from five cities in China and find that investors hold higher proportions of stocks of companies headquartered in locations near them. Wongchoti and Wu (2008) identify comovement of stock returns for companies headquartered in the same province in China. A province consists of many cities and rural areas, so it is not appropriate to apply the agglomeration economies concept at the province level. In this paper we directly test if stock returns of companies headquartered in the same city in China move together. At this point, we must clarify exactly what "city" or "firm location" refers to in this paper since a company may have multiple operating units across different cities. We use the headquarters city as the location of a company. Using the location of headquarters as the location of a company is standard in the related literature (Coval and Moskowitz, 1999, 2001; Ivković and Weisbenner, 2004; Hong, et al., 2004, 2005; Pirinsky and Wang, 2006; Zhu, 2008) and we do so to be consistent with the existing literature. In addition, the headquarters of a multi-unit firm is the center for information collection and processing, communication with consumers and investors, and decision making, and the analysis of agglomeration economies applies to headquarters as well as to establishments (Davis and Henderson, 2008).

We first test whether there exists comovement of stock returns of companies headquartered in the same city. According to the asset pricing theory, only market risk matters to stock returns. After market risk factors are controlled for, other factors should have no significant impact on stock returns. Therefore, we use the capital asset pricing model (CAPM) as the baseline model and test whether a stock's returns are correlated with the returns of other stocks in the same city, conditioning on market risk factors. Our methodology of testing the local correlation of stock returns is mainly based on Pirinsky and Wang (2006), and the model is specified as follows:

$$R_{it} - R_t^f = \alpha_i + \beta^{City}(R_t^{City} - R_t^f) + \beta^{MKT}(R_t^{MKT} - R_t^f) + \varepsilon_{it}, \qquad (1)$$

where R_{it} is the monthly return of stock i (Mretwd).[5] R_t^f is the risk-free interest rate, calculated as China's annual deposit interest rate divided by 12.[6] R_t^{City} is the equally-weighted average monthly returns of all stocks of companies headquartered in the same city, excluding the stock in question, to avoid spurious correlations. R_t^{MKT} is the monthly market return, calculated as the equally-weighted average monthly returns of all the A-share stocks (Cmretwdeq).[7] The coefficient of interest is β^{City}, measuring the magnitude of local correlation of stock returns.

[5] CSMAR variable names are inside the parentheses.
[6] For a robustness check, we also drop R^f in model (1), but obtain similar results.
[7] For a robustness check, we also calculate R_t^{MKT} as the average returns weighted by the value of tradable shares, and the results are similar.

Since empirical results suggest that the single-factor CAPM does not perform well in asset pricing tests, we also estimate an extended CAPM by including industry average returns:

$$R_{it} - R_t^f = \alpha_i + \beta^{City}(R_t^{City} - R_t^f) + \beta^{MKT}(R_t^{MKT} - R_t^f) + \beta^{IND}(R_t^{IND} - R_t^f) + \varepsilon_{it}, \quad (2)$$

where R_t^{IND} is the equally-weighted average monthly returns of the industry to which the firm in question belongs, excluding the stock returns of the firm in question. [8]

For an additional robustness check, we also consider factors used by Fama and French (1993) and Carhart (1997): *HML*, *SMB*, and *MOM* (*Momentum*), and specify the third model as

$$\begin{aligned} R_{it} - R_t^f &= \alpha_i + \beta^{City}(R_t^{City} - R_t^f) + \beta^{MKT}(R_t^{MKT} - R_t^f) + \beta^{IND}(R_t^{IND} - R_t^f) \\ &\quad + \beta^{HML} HML_t + \beta^{SMB} SMB_t + \beta^{MOM} MOM_t + \varepsilon_{it}, \end{aligned} \quad (3)$$

where *HML*, *SMB*, and *MOM* are constructed following the same methodology specified in Fama and French (1993) and Carhart (1997). Specifically, *HML* is the value factor, defined as the difference between the returns on a portfolio of high book-to-market ratio firms and the returns on a portfolio of low book-to-market ratio firms; *SMB* is the size factor, calculated as the difference between the returns on a small-stock portfolio and the returns on a big-stock portfolio; and *MOM* is the momentum factor, defined as the difference between the returns on a portfolio of stocks whose prices are increasing recently and the returns on a portfolio of stocks whose prices are decreasing recently. [9] In finance it is well established that these three factors, *HML*, *SMB*, and *MOM*, together with the market risk premium ($R^{MKT} - R^f$), should capture all the risk associated with a stock (Fama and French, 1993; Carhart, 1997).

We obtain data from two sources. Stock returns, financial variables, ownership information, and other firm attributes information are extracted from the CSMAR database.[10] The city attributes data are drawn from the *China Urban Statistic Yearbook*s from 1998 to 2008, published by the China Statistics Press. The industry classifications follow the China Securities Regulatory Commission's (CSRC) standard; C category (manufacturing) is divided into C0-C9 industries, and the rest of the industries are grouped by each capital letter. Industry classifications in the *Yearbook*s differ from CSRC codes; to construct urban agglomeration variables, we recode the CSRC classifications to match the *Yearbook* categories. There are 22 CSRC industries in total and the detailed codes are listed in Table A.1 in the Appendix. We select the stock return data of all the A-share listed companies from January 1997 to December 2007 whose industries are consistent with the available classifications in the *Yearbook*s. We use a company's registration location to locate the city of its headquarters. Following Pirinsky and Wang (2006), we select a city only if it hosts at least five listed companies' headquarters.

[8] The industry classification in model (3) follows the China Securities Regulatory Commission's standards (see Table A.1 in the Appendix).
[9] For a detailed description of how these factors are calculated, please see French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.
[10] The CSMAR database in China is equivalent to the COMPUSTAT and CRSP data in the USA.

Table 1 reports the distribution of A-share listed companies and their industries across cities in our sample. From 1997 to 2007, Shanghai is the city with the largest number of listed companies and industries. By 2007, Shanghai hosts 20 of the 22 industries in the sample. The number of cities in the sample increases from 33 in 1997 to 58 in 2007, and 95% of cities are large cities with population size above 500,000 persons.

Table 1. Distribution of listed companies and industries across cities

		Number of companies in a city		Number of industries in a city		
Year	Number of cities	Mean	Max	Mean	Max	Min
1997	33	15	109	7	19	4
1998	38	15	115	7	19	1
1999	40	16	117	8	19	1
2000	45	16	119	8	19	1
2001	47	17	126	8	20	1
2002	51	17	128	8	20	1
2003	53	17	131	8	20	2
2004	58	17	134	8	20	2
2005	58	17	133	8	20	2
2006	58	17	133	8	20	2
2007	58	17	133	8	20	2

Following Pirinsky and Wang (2006), we require that each stock have at least 24 monthly returns during the sample period. For each model, we run time-series regressions and obtain estimated coefficients for each stock. Then, we average the coefficients and compute the *t* statistics by dividing the mean of the coefficients by the standard deviation of the coefficients. This procedure is similar to the two-step regression in Fama and MacBeth (1973).[11]

Panel 1 of Table 2 reports the results of testing the local correlation of stock returns for the whole sample period. The coefficient of the average stock returns of all other companies headquartered in a city, β^{City}, is significantly positive in all models, showing that, after controlling for risk factors, stock returns of a firm are positively correlated with the average stock returns of other firms headquartered in the same city. Specifically, the value of β^{City} is 0.613 in the model controlling only for market portfolio return, 0.281 for the model controlling for both market and industry portfolio returns, and 0.259 for the model controlling for additional pricing factors. This diminishing pattern is consistent with the findings based on the US data (Anderson and Beracha, 2008).

We also estimate models (1) to (3) for two sub-periods: 1997-2002 and 2003-2007. [12] We also require that each stock have at least 24 months returns data during each sub-period. In order to ensure that in each city a sufficient number of stocks exist for estimation, we also require that

[11] In Fama and MacBeth (1973), the first step is to estimate a set of coefficients (e.g., β^{City}, β^{MKT}, and such) for each stock; then, the mean and standard deviation of these coefficients are computed. *t* statistics are computed using the mean coefficient divided by the standard deviation of those coefficients.

[12] Later in the paper, we will use quarterly earnings data, which are available only from 2003; therefore, we use 2003 as the breakpoint for sub-periods.

each city have at least five stocks. The results are presented in panels 2 and 3 of Table 2 and are consistent with panel 1.[13]

Table 2. Testing local correlation of stock returns

1997-2007	Model (1)		Model (2)		Model (3)	
	Coefficient	*t* statistic	Coefficient	*t* statistic	Coefficient	*t* statistic
$\boldsymbol{\beta}^{City}$	**0.613**	**29.46**	**0.281**	**14.06**	**0.259**	**12.75**
β^{MKT}	0.421	19.17	0.043	1.69	0.20	4.06
β^{IND}			0.686	30.73	0.546	13.24
β^{HML}					0.016	0.66
β^{SMB}					0.160	4.19
β^{MOM}					0.043	2.41
Adj. R^2	0.469		0.504		0.534	
Sample size	1047		1047		1047	
1997-2002						
$\boldsymbol{\beta}^{City}$	**0.440**	**16.56**	**0.315**	**12.31**	**0.318**	**11.72**
β^{MKT}	0.549	18.44	0.109	2.78	0.230	4.65
β^{IND}			0.569	18.35	0.444	10.60
β^{HML}					-0.025	-0.91
β^{SMB}					0.085	2.74
β^{MOM}					-0.028	-1.37
Adj. R^2	0.471		0.496		0.526	
Sample size	765		765		765	
2003-2007						
$\boldsymbol{\beta}^{City}$	**0.677**	**22.82**	**0.262**	**8.85**	**0.204**	**4.90**
β^{MKT}	0.377	12.23	0.051	1.58	0.276	3.48
β^{IND}			0.706	28.33	0.531	10.19
β^{HML}					0.048	1.12
β^{SMB}					0.196	4.34
β^{MOM}					0.023	0.70
Adj. R^2	0.486		0.526		0.561	
Sample size	1026		1026		1026	

Note: Following Pirinsky and Wang (2006), for each model, we run a time-series regression to obtain estimated coefficients for each stock. Then, the coefficients are averaged and the *t* statistics are calculated by dividing the mean of the coefficients by the standard deviation of the coefficients.

2.2 How "local" is the local correlation of stock returns?

The previous results show that the stock returns of a firm are correlated with the returns of other local companies, as well as with the market return. A natural question arises: Are the stock returns of a firm also correlated with firms located in other cities nearby? Or put in another way, is the local comovement really "local"? We address this question by detecting the relationship

[13] We will not discuss further the coefficients of other risk factors since those variables just serve as controls and their coefficients can be time-varying.

between local correlation and geographic distance, following the ideas of Grinblatt and Keloharju (2001) and Barker and Loughran (2009). However, because longitude and latitude data for each firm's street address are not available in China, we employ the methodology used in Fu (2007), Rosenthal and Strange (2008), and Anderson and Beracha (2008). We locate the longitude and latitude of the centroid of each city and compute the circular distance between any two centroids as the distance between the two cities, using the following formula:

$$D_{12} = \frac{2\pi R}{360} \times \arccos[\sin(lat1)\sin(lat2) + \cos(lat1)\cos(lat2)\cos(long1 - long2)],$$

where R=6378 Kilometers (KMs) and *lat* and *long* refer to latitudes and longitudes of two points on the earth, respectively. If long1=long 2, then, the distance is

$$D_{12} = \frac{2\pi R}{360} \times (lat1 - lat2).$$

We assume that all firms are located in the centroid of each city and draw buffers (rings) of different radii around each city centroid: (0, 500), (500-1,000), (1,000-1,500), and over 1,500 KMs. We treat the city where a firm is located as the first ring, and cities within a radius of 500 KMs (excluding the city in question) as the second ring, and cities within a radius of between 500 KMs and 1,000 KMs as the third ring, and so forth. We use R^{D2}, R^{D3}, R^{D4}, and R^{D5} to denote the equally-weighted returns of all firms within the second, third, fourth, and fifth ring, respectively, and add them to models (1) to (3) but dropping the market return variable. For example, model (1) now becomes model (4):

$$\begin{aligned} R_t - R_t^f &= \alpha_i + \beta^{City}(R_t^{City} - R_t^f) + \beta^{D2}(R_t^{D2} - R_t^f) + \beta^{D3}(R_t^{D3} - R_t^f) \\ &\quad + \beta^{D4}(R_t^{D4} - R_t^f) + \beta^{D5}(R_t^{D5} - R_t^f)_t + \varepsilon_{i,t}. \end{aligned} \tag{4}$$

If the local correlation of stock returns is indeed local, then, the coefficients β^{City}, β^{D2}, β^{D3}, β^{D4}, and β^{D5} should attenuate and possibly become less significant with distance. Table 3 shows that there indeed exists a clear spatial decay pattern of those coefficients. For example, in column 1 of panel 1, or model (4), the coefficients for β^{City}, β^{D2}, β^{D3}, β^{D4}, and β^{D5} are 0.301, 0.269, 0.149, 0.160, 0.124, respectively, and all are significant at the 1% level.[14] The same pattern of attenuation holds for two sub-periods and, to save space, only the results for sub-period 2003-2007 are presented in panel 2. Since there is no a priori theory on how many rings we should draw, we also try a series of experiments. For example, we draw two buffers by assigning all firms either in a city or outside a city; three buffers by assigning all firms in a city, outside a city but within a province, outside a province. All the results are similar (results are not reported here, but are available upon request). Taking all evidence together, we conclude that there exists local correlation of stock returns at the city level in Chinese stock markets.

[14] Our finding is a bit different from Eckel et al. (2011) who use a mark correlation function of residual stock returns and find that in the USA the spatial correlation of stock returns disappears after 50 miles.

Table 3. The spatial decay of local correlation of stock returns

1997-2007	(1)		(2)		(3)	
Variable	Coefficient	*t* statistic	Coefficient	*t* statistic	Coefficient	*t* statistic
β^{City}	0.301	14.14	0.255	12.75	0.243	12.08
β^{D2}	0.269	5.94	0.185	4.03	0.159	3.76
β^{D3}	0.149	2.75	-0.03	-0.59	-0.082	-1.41
β^{D4}	0.160	3.28	0.043	0.84	0.113	1.97
β^{D5}	0.124	2.88	-0.037	-0.86	-0.004	-0.08
β^{IND}			0.594	17.79	0.569	15.18
β^{HML}					-0.003	-0.13
β^{SMB}					0.034	1.56
β^{MOM}					0.037	1.79
Adj. R^2	0.498		0.520		0.550	
Sample size	1024		1024		1024	
2003-2007						
β^{City}	0.274	6.70	0.225	6.01	0.210	5.85
β^{D2}	0.263	3.81	0.163	2.43	0.135	1.85
β^{D3}	0.145	1.25	-0.049	-0.43	-0.045	-0.47
β^{D4}	0.192	1.64	0.091	0.73	0.164	1.63
β^{D5}	0.131	2.09	-0.011	-0.17	-0.031	-0.51
β^{IND}			0.588	13.70	0.563	12.25
β^{HML}					0.034	0.84
β^{SMB}					0.027	0.86
β^{MOM}					0.024	0.78
Adj. R^2	0.524		0.549		0.583	
Sample size	1003		1003		1003	

Note: Following Pirinsky and Wang (2006), for each model, we run a time-series regression to obtain estimated coefficients for each stock. Then, the coefficients are averaged and the *t* statistics are calculated by dividing the mean of the coefficients by the standard deviation of the coefficients.

3 What causes the local comovement of stock returns?

In this section we test whether local bias or agglomeration economies can explain the local correlation of stock returns. As mentioned in the introduction, local bias can result from information asymmetry or investors behavior. Testing the investor behavior explanation requires micro-data at the small geographic level (such as census block) or household level (Hong et al., 2004, 2005). Currently, such data are not available in China. Therefore, this paper does not test the investor behavior explanation.

3.1 Local bias and the local correlation of stock returns

Since the headquarters of a multi-unit firm is its information and communication center, proximity to a headquarters gives local investors an information advantage. The more asymmetric the information is, the more information advantage local investors will gain. In general, local firms with smaller sizes, poorer performance, and higher leverages tend to have more severe information asymmetry problems; therefore, local investors can have greater information advantages with regard to these local firms (Coval and Moskowitz, 1999, 2001; Pirinsky and Wang, 2006). Such firms are usually not well known and have higher uncertainty. They are generally neglected by investors and analysts; therefore, it is more difficult for distant investors to obtain information about such firms. Pirinsky and Wang (2006) provide supportive evidence that the local comovement of stock returns is associated with the above firm characteristics.

We are also interested in testing whether the local bias theory applies to Chinese capital markets. Specifically, we test whether the local correlation of stock returns is stronger for Chinese firms with smaller sizes, poorer performance, and higher leverages. We construct a set of firm characteristics variables as follows:

Log(*MV*): the logarithm of the market value of a listed firm at the end of December of each year, calculated as the year-end stock price multiplied by the number of total shares. This variable controls for firm size.

ROA: return of asset, calculated as net income divided by total assets (CSMAR variable *B002000000* divided by *A001000000*), used to measure firm performance.

According to Coval and Moskowitz (1999) and Pirinsky and Wang (2006), larger firms and better-performing firms are more likely to be known by distant investors and less affected by local bias. Therefore, for larger firms and better-performing firms, the correlation of stock returns with other local firms should be weaker.

Leverage: the ratio of debt to total assets (CSMAR variable *A002000000* divided by *A001000000*). Coval and Moskowitz (1999) argue that firms with higher leverages have more uncertainty in future performance. Local investors generally have greater information advantage with regard to local firms with higher leverages. The correlations with local stock returns are expected to be stronger for firms with higher leverages.

Log(M/B): logarithm of the ratio of market value of equity to book value of equity (CSMAR variable *A003000000*), measuring the growth potential of a firm. Investors closer to a company tend to have better information about the growth potential of the company; therefore, the correlations with local stock returns are expected to be higher for firms with higher growth potential.

Following the finance literature, market value of equity, *ROA*， *M/B*, and *Leverage* are all Winsorized at the 1% and 99% levels.

3.2 Localization economies and the local correlation of stock returns

The concentration of firms of the same industry within a location can generate scale economies that are external to a firm but internal in that industry. Such external economies are called localization economies, or Marshallian externalities, in the dynamic context (Henderson, 2003). The clustering of same-industry firms not only generates cost savings, through shared inputs and labor markets, but also facilitates knowledge spillovers and information flows among firms. Therefore, the fundamentals of firms in the same industry clustering in a city tend to move together, holding all else constant.

The spatial concentration of firms in one particular industry can also affect firms in other related industries in the same location, through backward and forward linkages. For instance, if information technology (IT) firms concentrate highly in a city, then, industries closely related to IT, such as computer training and education, sales, maintenance, as well as industries loosely related to IT, such as service industries for IT employees, will also tend to concentrate in the city. Therefore, when an external random shock occurs, all other industries in the same city, as well as the IT industry, will be affected through the rippling effect. Translating to the capital markets, stock returns of firms in the same city will fluctuate together.

In summary, the concentration of same-industry firms in a city can generate correlation of fundamentals among firms in the same city. A random shock common to all the firms in that particular industry will also affect the rest of the firms in the same city. When the shock transmits to the capital markets, the stock returns of all firms in the same city will be correlated, and the correlation will be higher if the degree of spatial concentration of that particular industry is higher.

To test whether the local correlation of stock returns is stronger for firms in a city with stronger localization economies, we construct a location quotient index, in terms of employment to measure industrial concentration (or specialization) using data from the *China Urban Statistic Yearbook*s:

$$\textit{Industrial Concentration} = \frac{e_{ij} / e_i}{e_j / \sum_i e_i}, \tag{5}$$

where e_{ij} is the total employment of industry j in city i; e_i is the total employment in city i; e_j is total employment of industry j in the nation; $\sum_i e_i$ is the national employment.[15]

3.3 Urbanization economies and the local correlation of stock returns

The concentration of firms of different industries in a city, as well as city size, can generate scale economies external to firms and industries but internal within a city. Such external economies are called urbanization economies, or Jacobs externalities, in a dynamic context (Glaeser et al., 1992). Extensive empirical studies in urban economics have confirmed that urbanization

[15] In this paper "employment" refers to the "unit employment", which excludes private sector employment. Private sector employment data by industry at the city level are not available in China. Since, in most of the cities, private sector employment is much smaller than unit employment and distributes across all industries, we believe the industrial concentration index (and the diversity index used in the next subsection) using only unit employment is a reasonable approximation.

economies enhance firm productivity (Fu and Hong, 2011). Holding all else constant, firm fundamentals are also affected by urbanization economies, and the financial performance of firms in the same city will change in the same direction.[16] Consequently, stock returns of firms in the same city will move together.

City size and urban diversity may also affect information spillovers across firms of different industries and promote cross-industry innovation. In general, a larger, denser city implies more frequent, unexpected social interactions. A higher degree of urban diversity may result in more connections between firms of different industries; therefore, a random shock common to a city will generate correlated information change and correlated fluctuation in stock returns.

To test whether the local correlation of stock returns is stronger for firms located in a city with a higher degree of urbanization economies, we construct an urban industrial diversity index measured by one minus the Herfindal index, in terms of industry employment:

$$Urban\ diversity_i = 1 - \sum_j e_{ij}^2 , \qquad (6)$$

where e_{ij} is the ratio of total employment in industry j in city i to the total employment in city i. The advantage of using this diversity index is that its value is between 0 and 1. If a city hosts many different industries, and each industry's employment share is very small, then, the diversity index will be close to 1. This index also takes into account both the distribution of employment across industries and the number of industries in a city. The computation of industrial concentration and industrial diversity uses one-digit industry classification from the *China Urban Statistic Yearbooks.* There are 15 industries from 1997 to 2002 and 19 industries since 2003.[17]

In addition, local business cycles affect stock returns (Korniotis and Kumar, 2008). To test the effect of agglomeration economies on the local correlation of stock returns, it is necessary to control for some important local macroeconomic variables. We also add a logarithm of city population size to control the city scale effect (Fu and Hong, 2011) and GDP per capita to control for the effect of urban income on investment (Pirinsky and Wang, 2006). GDP per capita may also capture the effect of local business cycles on capital markets. To control for heterogeneity in investment and in the legal environment of different cities, we also add city fixed effects (in this case we have to drop all the city level variables, such as industrial diversity, GDP per capita, and city size, but still keep the industrial concentration index).

3.4 Results

[16] Jennen and Verwijmeren (2010) find that agglomeration economies have a negative effect on the financial performance of single-unit Dutch firms. However, as they admit, their results cannot be extended to multi-unit firms or to firms in other countries.

[17] The industry classification in the *Yearbooks* is different from that of the CSRC. When merging the city industry data with the CSMAR data, we re-classify the CSMAR industries according to the *Yearbook* standard (see Table A.1 in the Appendix). About 76% of companies can be matched by the same industry classifications. The unmatched companies are excluded, which is why the sample size in the following analysis is a bit smaller.

We regress β^{City} on agglomeration economies variables and firm attributes for two sub-periods, as well as for the whole sample period. Agglomeration economies variables and firm attributes are the average of each sub-period (1997-2002 and 2003-2007) or the average of the whole period. The results are presented in Table 4, where β_{T2-1}^{City} is β^{City} of column (1) in Table 2 and β_{T3-1}^{City} is β^{City} of column (1) in Table 3.

Table 4. Agglomeration economies, firm attributes, and local correlation of stock returns

	1997-2007				2003-2007			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	β_{T2-1}^{City}	β_{T2-1}^{City}	β_{T3-1}^{City}	β_{T3-1}^{City}	β_{T2-1}^{City}	β_{T2-1}^{City}	β_{T3-1}^{City}	β_{T3-1}^{City}
Industrial concentration	0.091***	0.100***	0.182***	0.184***	0.040	0.029	0.281***	0.276***
	(3.17)	(3.25)	(3.26)	(3.30)	(0.97)	(0.64)	(3.66)	(3.62)
Urban diversity	0.629**		0.862**		0.875**		0.201	
	(2.16)		(2.28)		(2.21)		(0.37)	
Log(Population)	0.207***		0.168***		0.194***		0.188***	
	(11.22)		(6.42)		(8.63)		(4.54)	
GDP per capita	5.176***		5.868***		10.677***		2.856	
	(5.28)		(4.82)		(5.56)		(1.07)	
Log(MV)	-0.382***	-0.377***	0.006	-0.013	-0.398***	-0.409***	0.004	-0.026
	(-13.15)	(-11.68)	(0.18)	(-0.354)	(-15.51)	(-13.41)	(0.10)	(-0.63)
ROA	-3.823***	-4.127***	-0.598	-0.413	-3.325***	-3.478***	-0.481	-0.109
	(-8.20)	(-8.53)	(-0.99)	(-0.63)	(-6.97)	(-6.89)	(-0.71)	(-0.15)
Log(M/B)	0.011	0.007	0.044	0.037	0.002	-0.015	-0.006	-0.019
	(0.27)	(0.18)	(0.87)	(0.68)	(0.05)	(-0.35)	(-0.10)	(-0.27)
Leverage	-0.334***	-0.367***	0.390**	0.411**	-0.296**	-0.322**	0.178	0.214
	(-2.77)	(-2.96)	(2.36)	(2.44)	(-2.41)	(-2.58)	(0.96)	(1.11)
City fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Sample size	976	976	954	954	951	951	929	929
Adj. R^2	0.431	0.459	0.120	0.138	0.443	0.466	0.061	0.072

Note: The dependent variable in columns 1, 2, 5, and 6, β_{T2-1}^{City}, is β^{City} in column (1) of Table 2; the dependent variable in columns 3, 4, 7, and 8, β_{T3-1}^{City}, is β^{City} in column (1) of Table 3. *t* statistics are corrected for heteroskedasticity and are reported in the parentheses below the coefficients. Superscripts "***", "**", and "*" indicate significance at the 1%, 5%, and 10% levels, respectively.

Columns 1-4 of Table 4 indicate that the coefficients of industrial concentration are significantly positive in all model specifications, suggesting that the correlation with local stock returns is stronger for firms in a city with stronger localization economies. The coefficients of industrial diversity and city size are also positive and significant, providing evidence that the local correlation of stock returns is stronger in cities with stronger urbanization economies.

Columns 1-2 of Table 4 show that the coefficients of market value of equity (*Log(MV)*) and return of assets (*ROA*) are negative and significant, consistent with the information-based local bias explanation. But the coefficient of growth potential (*Log(M/B)*) is not significant, and the coefficient of *Leverage* is significantly negative, contrary to the local bias explanation, possibly because China has a much larger number of small investors than in the USA. Zhu (2008) finds that unlike institutional investors, small investors' local bias is based not on advantageous information but on non-fundamental familiarity with local firms, such as familiarity caused by advertising. The coefficients of firm attributes in columns 3-4 either are not significant or reverse sign, implying little robustness of the information-based local bias theory.

The coefficients of GDP per capita in columns 1 and 3 are significantly positive, possibly because small investors in high-income cities have more funds to invest in stocks, creating stronger local bias. The positive, significant coefficients of city size (Log(Population)) in columns 1 and 3 probably can be interpreted in two ways: scale economies derived from city size may result in correlation of fundamentals among firms in the same city, or larger cities have more small investors creating stronger local bias. [18]

Columns 5-8 present the results of estimating the same models for the 2003-2007 sub-period and exhibit qualitatively similar patterns, although in some models the coefficients of agglomeration variables lose some significance.

In summary, Table 4 demonstrates that evidence for the information-based local bias theory is rather mixed, weak, and not robust. However, consistent with the agglomeration economies theory, a firm's stock returns are positively correlated with the average stock returns of other firms headquartered in the same city. Particularly, if a firm is in a city with stronger localization economies or stronger urbanization economies, its stock returns are correlated more highly with the average stock returns of other local firms.

4 Robustness checks

4.1 Local correlation of earnings

Our previous analysis indicates that there exists local correlation of stock returns in Chinese capital markets and such local correlation can be partially explained by local agglomeration economies. If capital markets are relatively efficient, then, stock returns should capture firm fundamentals, implying that earnings of firms headquartered in the same city would be highly correlated too. Following Pirinsky and Wang (2006), we specify the following models to test whether earnings of local firms are correlated:

$$dE/BE_t = \alpha_i + \beta^{City}(dE/BE)_t^{City} + \beta^{MKT}(dE/BE)_t^{MKT} + \beta^{IND}(dE/BE)_t^{IND} + \varepsilon_{i,t}, \quad (7)$$

where dE is the earnings of a firm in quarter t minus earnings in the same quarter of the previous year (quarter t-4). This approach removes the seasonal fluctuations.[19] BE_t is the book value of equity in quarter t. For each firm, we calculate the equally-weighted average of the earnings

[18] To better control for the effect of local business cycles, we also add city level unemployment rate to the models in Table 4, and replace GDP per capita by average city wage. The results are almost the same.

[19] Data regarding the first quarter of each year is obtained directly from each firm's financial statement; data for other quarters of each year are computed based on the first quarter, mid-year, and annual financial statements. The purpose of using quarterly data is to obtain a longer time series data. We also obtain similar results using annual data (not reported here).

growth rates of all companies in a city, $(dE/BE)^{City}$, excluding the corresponding firm. We also add two additional control variables to model (7): the equally-weighted average of the earnings growth rates of all firms in the market, $(dE/BE)^{MKT}$, and the equally-weighted average of the earnings growth rate in each industry , $(dE/BE)^{IND}$.

Quarterly earnings data are available only since 2003; therefore, we estimate model (7) for only the 2003-2007 period. Similar to Table 3, for each stock we run a time series regression of model (7), and then compute the mean and standard deviation of the coefficients and the t statistics accordingly. The left panel of Table 5 presents the results and shows that a firm's earnings growth is significantly, positively correlated with the earnings growth of local firms headquartered in the same city.

To further check whether the local correlation of earnings is indeed local, following the model (4) specification, we add to model (7) the equally-weighted average of the earnings growth rate in each ring, a certain distance away from a firm's location:

$$\begin{aligned} dE/BE_t &= \alpha_i + \beta^{City}(dE/BE)_t^{City} + \beta^{IND}(dE/BE)_t^{IND} + \beta^{D2}(dE/BE)_t^{D2} \\ &\quad + \beta^{D3}(dE/BE)_t^{D3} + \beta^{D4}(dE/BE)_t^{D4} + \beta^{D5}(dE/BE)_t^{D5} + \varepsilon_{i,t}, \end{aligned} \tag{8}$$

where $(dE/BE)^{Di}$ denotes the equally-weighted average of the earnings growth rate of all firms located within the ith ring. The right panel of Table 5 shows that the local correlation of earnings growth rate, β^{City}, is still statistically significant and is much larger than those correlations with firms located outside of the city. It is worth noting that the local correlation coefficients of earnings do not show a consistent decay pattern, possibly because a firm's earnings come from the earnings of all its subsidiaries, which are spread across different cities and are affected by the agglomeration economies in each city where those subsidiaries are located.

Table 5. Local correlation of earnings

	1		2		3		4	
	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic	Coefficient	t statistic
β^{City}	0.266	2.20	0.304	2.00	0.306	2.95	0.307	2.40
β^{MKT}	0.840	4.35	0.632	3.03				
β^{IND}			0.176	1.38			0.295	2.10
β^{D2}					0.168	1.56	-0.007	-0.05
β^{D3}					0.209	1.46	0.079	0.54
β^{D4}					0.175	0.99	0.198	1.20
β^{D5}					0.156	1.62	0.048	0.41
Adj. R^2	0.158		0.206		0.294		0.334	

Note: Columns 1 and 2 are obtained from estimating model (7); columns 3 and 4, from model (8), all using the Fama-MacBeth regression method. Sample size: 838.

4.2 Correlation between $\beta^{city-return}$ and $\beta^{city-earnings}$

Thus far we have found local correlation of stock returns and local correlation of earnings. If local correlation of stock returns is driven by correlated fundamentals, then, we expect the local correlation of stock returns should capture, to some degree, the local correlation of earnings. We therefore estimate the following model:

$$\beta_i^{City-return} = f(\beta_i^{City-earnings}, \text{firm attributes, city attributes}) + \varepsilon_i . \qquad (9)$$

Table 6 presents the results, where the dependent variable $\beta_{T2-1}^{City-return}$ refers to the return β^{City} from column 1 of panel 3 in Table 2 and $\beta_{T3-1}^{City-return}$ refers to the return β^{City} from column 1 of panel 2 in Table 3; $\beta_{T2-2}^{City-return}$ refers to the return β^{City} from column 2 of panel 3 in Table 2 and $\beta_{T3-2}^{City-return}$ refers to the return β^{City} from column 2 of panel 2 in Table 3. In each model the value of the key regressor, $\beta^{City-earnings}$, corresponds to the earnings β^{City} in Table 5, conditional on the same set of control variables as each dependent variable is. All models show that the coefficients of $\beta^{City-earnings}$ are positive and statistically significant at least at the 10% level, suggesting that correlated fundamentals of local companies can partially explain the correlated stock returns of local companies.

Table 6. Correlation between local correlation of returns and local correlation of earnings

	Dependent variable							
	1	2	3	4	5	6	7	8
	$\beta_{T2-1}^{City-return}$	$\beta_{T2-1}^{City-return}$	$\beta_{T3-1}^{City-return}$	$\beta_{T3-1}^{City-return}$	$\beta_{T2-2}^{City-return}$	$\beta_{T2-2}^{City-return}$	$\beta_{T3-2}^{City-return}$	$\beta_{T3-2}^{City-return}$
$\beta^{City-earnings}$	0.014*	0.013*	0.032**	0.033**	0.032***	0.032***	0.035**	0.036**
	(1.82)	(1.77)	(2.12)	(2.14)	(3.28)	(3.11)	(2.38)	(2.36)
Log(MV)	-0.386***	-0.406***	-0.004	-0.061	-0.287***	-0.314***	-0.007	-0.052
	(-13.36)	(-12.86)	(-0.10)	(-1.31)	(-8.83)	(-8.56)	(-0.18)	(-1.18)
ROA	-3.949***	-4.170***	-0.180	0.523	-1.943***	-1.864***	-0.245	0.325
	(-7.51)	(-7.77)	(-0.22)	(0.62)	(-2.87)	(-2.56)	(-0.32)	(0.41)
Log(M/B)	0.009	-0.007	-0.011	-0.064	0.047	0.037	0.032	0.002
	(0.20)	(-0.15)	(-0.15)	(-0.77)	(0.769)	(0.53)	(0.15)	(0.02)
Leverage	-0.478***	-0.540***	-0.034	0.003	-0.423**	-0.462**	-0.186	-0.141
	(-3.69)	(-4.09)	(-0.16)	(0.15)	(-2.34)	(-2.36)	(-0.95)	(-0.68)
GDP per capita	8.797***		6.490***		2.947		4.232***	
	(5.59)		(2.60)		(1.23)		(1.87)	
Log(Population)	0.234***		0.194***		0.186***		0.180***	
	(10.09)		(4.83)		(5.48)		(4.92)	
City fixed effects	No	yes	No	Yes	No	yes	No	Yes
Adj. R^2	0.487	0.503	0.067	0.088	0.201	0.183	0.071	0.078

Note: The dependent variable $\beta_{T2-1}^{City-return}$ refers to the return β^{City} from column 1 of panel 3 in Table 2; $\beta_{T3-1}^{City-return}$, the return β^{City} from column 1 of panel 2 in Table 3; $\beta_{T2-2}^{City-return}$, the return β^{City} from column 2 of panel 3 in Table 2; $\beta_{T3-2}^{City-return}$, the return β^{City} from column 2 of panel 2 in Table 3. In each column the value of the key regressor, $\beta^{City-earnings}$, corresponds to the earnings β^{City} in Table 5 conditional on the same set of control variables as each dependent variable is. *t* statistics are corrected for heteroskedasticity and are presented in parentheses. Sample size: 787.

4.3 Agglomeration economies and local correlation of earnings

The next natural question is whether agglomeration economies can explain the local correlation of earnings? We proceed to regress the local correlation of earnings on urban agglomeration economies variables and a firm's growth potential variable, dropping other variables that are not related to firm fundamentals, similar to Table 4 models.[20] The results are presented in Table 7. Although both industry concentration and urban diversity variables are not significant and in some cases reverse signs, the coefficient of city size is still positive and statistically significant at the 5% level. If we consider that city size captures the scale economies of large cities that are external to individual firms, then, the Table 7 results still provide evidence, albeit weak, that agglomeration economies can partially explain the local correlation of earnings, consistent with our overall research idea. However, we are aware that for firms with operating units in different cities, earnings come from different cities; therefore, the agglomeration economies in the headquarters cities might not be influential.

Table 7. Agglomeration economies and local correlation of earnings

	$\beta_{T5-3}^{City-earnings}$			$\beta_{T5-4}^{City-earnings}$		
	1	2	3	4	5	6
Industrial concentration	-0.035	-0.016	0.063	0.291	0.306	0.375*
	(-0.19)	(-0.09)	(0.36)	(1.35)	(1.43)	(1.73)
Urban diversity	-3.024*	-2.995*	-1.082	-1.374	-1.351	0.320
	(-1.75)	(-1.75)	(-0.84)	(-0.81)	(-0.81)	(0.22)
Log(Population)	0.422**	0.363**		0.363**	0.318**	
	(2.01)	(2.02)		(2.25)	(2.26)	
Log(M/B)		1.162*	1.234*		0.899*	0.962*
		(1.80)	(1.82)		(1.84)	(1.87)
Adj. R^2	0.007	0.027	0.020	0.010	0.026	0.019

Note: The dependent variable, $\beta_{T5-3}^{City-earnings}$, is the earnings β^{City} in column 3 of table 5; $\beta_{T5-4}^{City-earnings}$, the earnings β^{City} in column 4 of table 5. Sample period: 2003-2007. *t* statistics are corrected for heteroskedasticity and are presented in parentheses. Sample size: 765.

4.4 Single- versus multiple-location firms

If a firm has only one operating location, then, there is little discrepancy in using headquarters city as a measure of firm location; but discrepancy arises for firms with multiple units spreading across different cities. As an additional robustness check, we distinguish single-location firms from multiple-location firms. We check the annual reports of sample firms each year to determine whether firms have more than one operating location. Those annual reports usually do not specifically state how many operating locations a firm has; therefore, we have to infer whether a firm has operating units located in different cities, based on textual clues in the annual reports, such as sales breakdown and description of business activities. Table 8 presents the summary statistics of single and multi-location firms.

[20] Using other values of earnings β^{City} as dependent variables or adding more firm attributes variables or city fixed effects generates similar patterns of results.

Table 8. Single- versus multiple-location firms

	Single-location firms		Multi-location firms		Changing-location firms	
Year	Number	Proportion	Number	Proportion	Number	Proportion
1997-2007	145	15%	525	54%	306	31%
2003-2007	149	16%	706	74%	98	10%

Note: Single-location firm refers to a firm located in only one city; multi-location firm refers to a firm with units located in more than one city. Changing location refers to a firm that changed its location status (i.e., from a single city to multiple cities or vice versa) during the sample time period.

We create a *Single* dummy set to 1 if a firm is located in only one city during the sample period and a *Change* dummy set to 1 if a firm has changed its location status from a single city to multiple cities or vice versa. When adding these two dummies to all the models in Table 4, we find that our previous results still hold and the coefficients of these two dummies are not significant in most cases (results are presented in Table 9). We also add these two dummy variables to the models in Table 6 and Table 7, and the results are very similar (results are not reported here but are available upon request). We conclude that although using headquarters city as firm location may generate measurement errors and estimation bias, the issue is not serious.

Table 9. Models with single-location and changing-location variables

	1997－2007				2003－2007			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	β^{City}_{T2-1}	β^{City}_{T2-1}	β^{City}_{T3-1}	β^{City}_{T3-1}	β^{City}_{T2-1}	β^{City}_{T2-1}	β^{City}_{T3-1}	β^{City}_{T3-1}
Industrial concentration	0.091***	0.100***	0.182***	0.183***	0.036	0.024	0.275***	0.271***
	(3.15)	(3.25)	(3.28)	(3.32)	(0.85)	(0.52)	(3.58)	(3.55)
Urban diversity	0.602**		0.860**		0.805**		0.185	
	(2.06)		(2.28)		(2.04)		(0.34)	
Log(Population)	0.210***		0.167***		0.198***		0.188***	
	(11.32)		(6.34)		(8.73)		(4.48)	
GDP per capita	5.140***		5.843***		10.635***		2.901	
	(5.21)		(4.84)		(5.56)		(1.09)	
Log(MV)	-0.386***	-0.379***	0.008	-0.009	-0.400***	-0.409***	0.006	-0.023
	(-13.17)	(-11.70)	(0.239)	(-0.26)	(-14.58)	(-13.46)	(0.16)	(-0.55)
ROA	-3.807***	-4.117***	-0.612	-0.431	-3.368***	-3.545***	-0.545	-0.162
	(-8.21)	(-8.55)	(-1.02)	(-0.66)	(-7.12)	(-7.07)	(-0.80)	(-0.23)
Log(M/B)	0.012	0.009	0.041	0.034	0.005	-0.012	-0.005	-0.019
	(0.30)	(0.213)	(0.81)	(0.62)	(0.12)	(-0.28)	(-0.07)	(-0.26)
Leverage	-0.339***	-0.372***	0.391**	0.418**	-0.315***	-0.339**	0.170	0.214
	(-2.81)	(-3.00)	(2.37)	(2.48)	(-2.58)	(-2.72)	(0.91)	(1.11)
Single	-0.055	-0.044	0.017	0.051	-0.095**	-0.065	-0.006	0.029
	(-1.29)	(-1.00)	(0.30)	(0.81)	(-1.99)	(-1.33)	(-0.08)	(0.36)
Change	-0.033	-0.026	0.047	0.054	0.093	0.097	0.100	0.064
	(-0.96)	(-0.74)	(1.05)	(1.11)	(1.47)	(1.51)	(1.00)	(0.63)
City fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Sample size	976	976	954	954	951	951	929	929
Adj. R^2	0.431	0.459	0.119	0.137	0.446	0.468	0.061	0.071

Note: The dependent variable in columns 1, 2, 5, and 6, β^{City}_{T2-1}, is β^{City} in column 1 of Table 2; the dependent variable in columns 3, 4, 7, and 8, β^{City}_{T3-1}, is β^{City} in column 1 of Table 3. *t* statistics are corrected for heteroskedasticity and are reported in the parentheses below the coefficients. Superscripts "***", "**", and "*" indicate significance at the 1%, 5%, and 10% levels, respectively.

5 Conclusion

Both local bias theory based on information advantage and urban agglomeration economies theory predict that the stock returns of companies headquartered in the same location will be correlated. This paper tests how urban agglomeration economies and company attributes affect the A-share stock returns in China capital markets. We find that after controlling for standard risk factors, the stock returns of companies headquartered in the same city are significantly correlated. Different from the US capital markets (Pirinsky and Wang, 2006), we find mixed, weak evidence for the information-based local bias theory, possibly because there are more small investors in the China capital markets. However, consistent with urban agglomeration economies theory, we find that the stock returns of companies headquartered in a city with stronger localization economies or urbanization economies are also correlated more highly with other local companies headquartered in the same city. We also find that earnings of local companies are correlated and can be partially explained by urban agglomeration economies. The local correlation of stock returns are also correlated with the local correlation of earnings, further suggesting that complementary to the local bias theory, localized agglomeration economies translating to capital markets provides another interpretation of the local comovement of stock returns.

Our study is the one of the few to narrow the gap between urban agglomeration economies and capital markets through the premise that agglomeration economies improve firm fundamentals. Our findings can help understand the spatial factors that affect asset pricing in the Chinese capital markets. Our findings can also be useful for investors to make portfolio choices and companies to make location choice decisions. For example, since in addition to risk factors, agglomeration economies can also affect returns, investors might need to consider the local industrial environment in order to make informed portfolio choices.

References

Almazan, A., Motta, A., Titman, S., Uysal, V., 2007. Financial structure, liquidity, and firm locations, NBER Working Paper 13660.

Anderson, C., Beracha, E., 2008. Robustness of the headquarters-city effect on stock returns, Journal of Financial Research 31, 271-300.

Barker, D., Loughran, T., 2009. The geography of S&P 500 stock returns, Journal of Behavioral Finance 8, 177-190.

Brown, J., Ivković, Z., Smith, P., Weisbenner, S., 2004. The geography of stock market participation: The influence of communities and local firms, NBER Working Paper 10235.

Brown, J., Ivković, Z., Smith, P., Weisbenner, S., 2008. Neighbors matter: Causal community effects and stock market participation, Journal of Finance 63, 1509-1531.

Carhart, M., 1997. On persistence in mutual fund performance, Journal of Finance 52, 57-82.

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

Coval, J., Moskowitz, T., 2001. The geography of investment: Informed trading and asset prices, Journal of Political Economy 109, 811-841.

Davis, J., Henderson, V., 2008. The agglomeration of headquarters, Regional Science and Urban Economics 38, 445-460.

Duranton, G., Puga, D., 2004. Micro-foundations of urban agglomeration economies, in Henderson, V., Thisse, J.F. (eds.), Handbook of Regional and Urban Economics IV, Amsterdam: North Holland, pp. 2063-2118.

Eckel, S., Löffler, G., Maurer, A., Schmidt, V., 2011. Measuring the effects of geographical distance on stock market correlation, Journal of Empirical Finance 18, 237-247.

Fama, E., French, K., 1993. Common risk factors in the returns on stocks and bonds, Journal of Financial Economics 33, 3-56.

Fama, E., MacBeth, J., 1973. Risk, return, and equilibrium: Empirical tests, Journal of Political Economy 81, 607-636.

Feng, L., Seasholes, M., 2004. Correlated trading and location, Journal of Finance 59, 2117-2144.

Fu, S., 2007. Smart café cities: Testing human capital externalities in the Boston metropolitan area, Journal of Urban Economics 61, 86-111.

Fu, S., Hong, J., 2011. Testing urbanization economies in manufacturing industry: Urban diversity or urban size? Journal of Regional Science, forthcoming.

Ghosh, C., Rodriguez, M., Sirmans, C., 1995. Gains from corporate headquarters relocations: Evidence from the stock market, Journal of Urban Economics 38, 291-311.

Glaeser, E., Kallal, H., Scheinkman, J., Shleifer, A., 1992. Growth in cities, Journal of Political Economy 100, 1126-1152.

Goetzmann, W., Massa, M., Simonov, A., 2004, Portfolio diversification and city agglomeration, NBER Working Paper 10343.

Grinblatt, M., Keloharju, M., 2001. How distance, language, and culture influence stockholdings and trades, Journal of Finance 56, 1053-1073.

Helsley, R., and Strange, W., 1991. Agglomeration economies and urban capital markets, Journal of Urban Economics 29, 96-112.

Henderson, V., 2003. Marshall's scale economies, Journal of Urban Economics 53, 1-28.

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

Hong, H., Kubik, J., Stein, J., 2005. Thy neighbor's portfolio: Word-of-mouth effects in the holdings and trades of money managers, Journal of Finance 60, 2801-2824.

Hong, H., Kubik, J., Stein, J., 2008. The only game in town: Stock-price consequences of local bias, Journal of Financial Economics 90, 20-37.

Ivković, Z., Weisbenner, S., 2004. Local does as local is: Information content of the geography of individual investors' common stock investments, Journal of Finance 60, 267– 306.

Jennen, M., Verwijmeren, P., 2010. Does agglomeration affect financial performance? Urban Studies 47, 2683-2703.

Korniotis, G., Kumar, A., 2008. Long Georgia, short Colorado? The geography of return predictability, McCombs School of Business Working Paper, University of Texas at Austin.

Mavruk, T., 2008. Local bias of investors in Sweden, International Research Journal of Finance and Economics 22, 7-25.

Pirinsky, C., Wang, Q., 2006. Does corporate headquarters location matter for stock returns? Journal of Finance 61, 1991-2015.

Rosenthal, S., Strange, W., 2004. Evidence on the nature and sources of agglomeration economies, in Henderson, V., Thisse, J.F. (eds.), Handbook of Regional and Urban Economics IV, Amsterdam: North Holland, pp. 2119-2171.

Rosenthal, S., Strange, W., 2008. The attenuation of human capital spillovers, Journal of Urban Economics 64, 373-389.

Rudorfer, M., 2007. The impact of headquarters location on stock returns, Diploma Thesis. European Business School - International University Schloss Reichartshausen Oestrich-Winkel.

Wongchoti, U., Wu, F., 2008. Provincial co-movement in Chinese stock returns, Applied Financial Economics Letters 4, 171-176.

Zhu, N., 2008. The local bias of individual investors, Yale School of Management Working Paper.

Appendix:

Table A.1. Industry classifications

China Urban Statistic Yearbook industry classifications	CSRC industry code	CSRC industry classifications
Agriculture, forestry, livestock farming, fishery	A	Agriculture, forestry, livestock farming, fishery
Mining	B	Mining
Manufacturing	C	Manufacturing
	C0	Food & beverage
	C1	Textiles & apparel
	C2	Timber & furniture
	C3	Paper & printing
	C4	Petrochemicals
	C5	Electronics
	C6	Metals & non-metals
	C7	Machinery
	C8	Pharmaceuticals
	C99	Miscellaneous
Utilities	D	Utilities
Construction	E	Construction
Transportation, warehouse, and postal	F	Transportation and warehouse
Information technology	G	Information technology
Wholesale and retail trade	H	Wholesale and retail trade
Finance and insurance	I	Finance and insurance
Real estate	J	Real estate
Rental and business services; scientific research; technology services; geology; public utility management	K	Social services
Culture, sports, and entertainment	L	Communication and cultural industry
	M	Comprehensive

Note. CSRC refers to the China Security Regulatory Commission.