The Geography of Borsa Istanbul Stock Returns

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ABSTRACT

This paper examines the relationship between firm location and monthly return correlations of Borsa Istanbul's stocks during the period between January 2005 and September 2011. These firms are also included in Borsa Istanbul (BIST) City Indices. Following Pirinsky and Wang (2006) model, we find similar results which show that stock returns of firms show a strong degree of co-movement with stock returns of other firms located in the same city. In our analysis, we also try to explain local comovement with financial sophistication and foreign investors. As the ratio of equity investors to population for city increases, local comovement also increases. Similarly, as the ratio of institutional equity investors to total equity investors for city increases, local comovement also increases. Although insignificant, when the ratio of foreign equity investors to total equity investors for each stock increases local comovement decreases. Our results are consistent with prior literature. Location is an important determinant of stock returns for BIST and this information is important for portfolio diversification.

Keywords: *Borsa Istanbul, geography, financial sophistication, foreign investors, stock market, composite leading indicators.*

Jel Classification*: G02, G10, G11.*

Borsa İstanbul Hisse Senedi Getirilerinin Coğrafyası

ÖZET

Bu çalışma Borsa İstanbul hisse senedi piyasasında (BIST) işlem gören şirketlerin aylık getirileri ile bu şirketlerin coğrafi konumları arasındaki ilişkiyi analiz eder. İncelenen dönem Ocak 2005 ile Eylül 2011 tarihleri arasındaki dönemdir. İncelenen şirketler aynı zamanda BIST şehir endeksleri içerisinde yer alan şirketlerdir. Pirinsky ve Wang (2006) tarafından kullanılan yöntem analiz yöntemi olarak seçilmiştir ve benzer sonuçlar bulunmuştur. Aynı coğrafi bölgede yer alan şirketlerin getirileri arasında ortak yönlü bir hareket söz konusudur. Hisse senetlerinin getirileri arasındaki bu ortak yönlü hareket finansal uzmanlık ve yabancı yatırımcılar ile açıklanmaya çalışılmıştır. Analizlere dahil şehirler için, ilgili şehirdeki hisse senedi yatırımcısının şehir nüfusuna oranı arttıkça ortak hareket artmıştır. Benzer şekilde hisse senedi kurumsal yatırımcı sayısının şehir nüfusuna oranı arttıkça da artış izlenmiştir. İstatistiksel olarak anlamlı sonuçlar bulunmamış olmasına rağmen, ilgili hisse senedinde yabancı yatırımcı sayısının toplam yatırımcı sayısına oranı arttıkça getiriler arasındaki ortak hareket azalmıştır. Analiz sonuçları literatür ile tutarlıdır. İMKB için şirketlerin coğrafi konumları hisse senedi getirilerini belirleyen bir etkendir.

Anahtar Kelimeler: *Borsa İstanbul, coğrafya, finansal uzmanlık, yabancı yatırımcılar, hisse senedi piyasası, bileşik öncü göstergeler endeksi.*

JEL Sınıflandırması: *G02, G10, G11.*

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1. INTRODUCTION

All the investors in the stock market may not have access to the information they need for their investment decisions. This type of information asymmetry is widely studied in finance literature (Kang and Stulz , 1997, Brennan and Cao, 1997, Choe, Kho and Stulz, 2001, Hau, 2001, Seasholes, 2000, Grinblatt and Keloharju, 2000). The geographic location of firms and investors plays an important role in financial decision making (French and Poterba, 1991, Tesar and Werner, 1995). Geographic distance or boundaries are important sources of information asymmetry. Closer investors have better information than distant ones.

Geographical distance is also an important factor in determining stock market correlation due to information asymmetry and home bias effect. Asymmetric information problem between firms and outside investors is very likely to increase with distance (Coval and Moskowitz, 1999; Ivković and Weisbenner, 2005). Pirinsky and Wang (2006) and Barker and Loughran (2007) test this assumption and find that the correlation of stock returns increases with decreasing distance.

Recently researchers have applied the gravity model to analyze stock market correlations to evaluate the impacts of information asymmetries on the geographical distribution of international stock markets. The results imply that geography matters, in stock market correlations as the geographical variables like distance, border, time zone. Especially the distance between markets may cause some information costs for investors.

Based on the research background and motivation, the research purpose is to investigate whether geography matters for correlation of stock returns for Borsa Istanbul (BIST):

(1) by applying gravity model approach and

(2) by calculating beta (β) to see how stock returns co-move with the returns of an index of stocks located in the same city (following Pirinsky and Wang (2006) model)

We can classify the theories in two groups that might explain why stock returns are correlated with distance; industry clustering and local investor bias (Barker and Loughran, 2007). Firms in the same industry prefer to stay close. In order to distinguish between these two theories, we use different control variables such as sector and sub-sector index, firm characteristics, regional characteristics and country-level economic fundamentals.

The relationship between geography and the correlation of stock returns has attracted a considerable amount of research attention in the US and other countries. In contrast, there is very limited evidence for the Turkish market. In order to fill this void, this paper examines the relationship between firm location and monthly return correlations of Borsa Istanbul's (BIST) stocks during the period between January 2005 and September 2011. While classifying firm's headquarters according to geographical locations, we use BIST City Indices' classifications.

Using monthly returns, we first construct a set of local stock return indices for each city by equally weighting the returns of all stocks within each city (following Pirinsky and Wang, 2006). Second, we construct a gravity model which consists of explanatory variables of the distance between city centers and a dummy variable for common border between cities while the dependent variable is the mutual correlation between local stock return indices. The results of gravity model show that correlations tend to vary inversely with distance between city centers and directly with the border between cities.

We continue our analysis by examining the degree of comovement of a stock by calculating betas for local stock indices (β^{CITY}), market portfolio (β^{MKT}), sector (β^{SEC}) and sub-sector (β^{SUBSEC}) indices. Our analysis shows that, average of local stock betas is higher than the average of stock market betas ($\beta^{CITY} > \beta^{MKT}$). Since the stock prices may be affected by information specific to a sector or a subsector, in addition to market portfolio we also calculate sector and sub-sector betas for stocks. We use the industry classification of BIST sector and BIST sub-sector indices. The results show that the average of sub-sector betas is higher than the local stock betas. And the average of local stock betas is higher than the sector and market betas ($\beta^{SUBSEC} > \beta^{CITY} > \beta^{SEC} > \beta^{MKT}$). When we exclude city Istanbul from our calculations, we find the same results but with lower betas both for city, market, sector and sub-sector ($\beta^{SEC} > \beta^{SUBSEC} > \beta^{CITY} > \beta^{MKT}$) indices.

In order to analyze whether the local comovement of stock returns is affected by country-level economic fundamentals, we use composite leading indicators (CLI) indices as independent variable and calculate stock betas for CLI (β^{CLI}). When we include the returns of local stock index and the market portfolio index (BIST National 100), the magnitude of both market portfolio betas and CLI betas decreases ($\beta^{CITY} > \beta^{MKT} > \beta^{CLI}$).

The findings of this study until now shows that stock returns contain a strong local component consistent with the literature. In order to study the cross-sectional determinants of local comovement, we also analyse some firm and regional characteristics. Our results show that firm size, net income and market to book ratio have not any explanatory power over the local comovements.

We continue our analysis by defining four regional characteristics; InstitutionalRatio as the number of institutional equity investors divided by the total equity investors for each stock, ForeignRatio, as the number of foreign equity investors divided by the total equity investors for each stock, CitySophisticationRatio as the number of equity investors divided by the population for each city and InvestorSophisticationRatio as the number of institutional equity investors divided by the total equity investors for each city. When we regress the estimated city beta on InstitutionalRatio and ForeignRatio, we find that the coefficients of InstitutionalRatio and ForeignRatio are negative but insignificant in regression equation. Although insignificant, we can say that there is negative relation, as the number of institutional and foreign investors increase in each stock, local beta decreases. When we regress the estimated city beta on CitySophisticationRatio and InvestorSophisticationRatio we find that, the coefficient of CitySophisticationRatio is positive but insignificant and the coefficient of InvestorSophisticationRatio is positive and significant in regression equation. When we include firm characteristics as control variables in the regression equation, the coefficients of CitySophisticationRatio, InvestorSophisticationRatio and market to book ratio are significant and positive.

We find that stock returns of companies headquartered in the same city exhibit a strong degree of comovement. To the best of our knowledge, there have not been any studies on the geography of BIST stock returns for Turkey. Turkey is an emerging country. Our findings add to the growing literature on the importance of geography in portfolio diversification in an emerging country.

The paper is organized as follows. We discuss relevant literature in Section 2. Section 3 discusses the data. Section 4 analyzes the application of gravity model to local stock return indices. Section 5 explains the comovement of stock returns. Section 6 studies the relation between local comovement of stock returns and national economic fundamentals. Section 7 analyzes the impact of firm characteristics on the local comovement of stock returns. Section 8 explores the determinants of local comovement in terms of various regional characteristics. And we finish by summarizing our main findings.

2. LITERATURE REVIEW

Individual investors and institutions in most countries prefer to hold domestic stocks instead of holding large amounts of foreign stocks. Such behaviour is known as home bias. Since this behaviour appears to be inefficient from a diversification perfective, researchers have offered a variety of explanations for this phenomenon. Recent studies suggest that home bias is widespread and investors show a preference for familiar companies and companies located in close distance (see Tesar and Werner, 1995; Kang and Stulz, 1997; Coval and Moskowitz, 1999).

In the literature French and Poterba (1991) and Tesar and Werner (1995) were the first researchers studied the home bias in equities. Coval and Moskowitz (1999) extended these studies showing that home bias is also valid for domestic portfolios. Specifically, they showed that U.S. investment managers prefer locally headquartered firms, particularly small, highly leveraged firms that produce nontradable goods.

Pirinsky and Wang (2006) and Barker and Loughran (2007) find that the correlation of monthly stock returns for US companies increases with decreasing distance. Pirinsky and Wang (2006) group firms by Metropolitan Statistical Areas (MSA). They use stock returns as dependent variable and index of other firms in the MSA, the market return and industry indices as independent variables in their regression equations. Pirinsky and Wang (2006) find that stocks in the same geographical area move together. This behaviour is not fully explained by fundamentals because the stocks do not have local comovement for their earnings. This behaviour is also not explained by local economic activity. When firms change headquarters location, return comovement with the old headquarters-location portfolio decreases and comovement with the new headquarters-location portfolio increases. Pirinsky and Wang (2006) conclude that comovement can only be explained by the geographic-segmentation view. Local investors' correlated trading patterns should be taken into account by portfolio managers.

Barker and Loughran (2007) have chosen a different approach by taking into account other factors that might affect correlations. They regress pair wise correlations of raw stock returns on distance as well as a set of control variables. They find that local events affect the buy/sell decisions of investors, and trading activity in all nearby firms is affected by these events, causing return correlations.

Although there is a consensus on that the correlation of stock returns increases when the geographical distance decreases, researchers are still discussing the methodological issues. The findings of Eckel *et al.* (2011) differ from the ones reported by Pirinsky and Wang (2006) and Barker and Loughran (2007) showing that the choice of a research methodology is important for analyzing the effects of distance on cross–correlation. Barker and Loughran (2007) criticize the methodology by Pirinsky and Wang (2006) and obtain contradicting results for large firms. Eckel *et al.* (2011) further modifies the regression approach by Barker and Loughran (2007) and gets results which are broadly consistent but differ in some aspects. For the stocks contained in the S&P 500 that they examine, both approaches lead to similar results. Contrary to previous studies they find that beyond 50 miles geographical proximity is irrelevant for stock return correlations. For distances below 50 miles, they show that the magnitude of local correlations varies with investor sentiment.

Home preference reflects an informational advantage of local investors. The models that try to explain home bias is in line with the gravity model if we state that near regions have correlated information also across borders. Gravity modeling approach has been frequently used to explain the trade patterns among countries. Recent studies also suggest that gravity models can be used to explain cross-country stock market correlations adequately. Huang *et al.* (2006) and Flavin *et al.* (2001) used gravity modeling approach to explain the stock market correlations and find that physical distance has significant effects on stock market correlations.

3. DATA AND DESCRIPTIVE STATISTICS

In literature, Coval and Moskowitz (1999), Ivkovic and Weisbenner (2005), Loughran and Schultz (2004, 2005), Seasholes and Zhu (2010) use the headquarters' location as the firms' location. In this study, BIST city indices serves as the source of the corporate headquarter addresses.

BIST indices are used to calculate price and return performances of all shares traded in BIST. The BIST 100 Index is used as the main indicator of the National Market and also as market portfolio in our study. There are sector and sub-sector indices calculated in BIST. The BIST classification of sectors and sub-sectors are given in Table 1.

Table 1: Sector and subsector indices

Sector	*Sub-sector*
BIST Industrials	• BIST Food, Beverage
	• BIST Textile, Leather
	• BIST Wood, Paper, Printing
	• BIST Chemical, Petroleum, Plastic
	• BIST Non-Metal Mineral Products
	• BIST Basic Metal
	• BIST Metal Products, Machinery
BIST Services	• BIST Electricity
	• BIST Transportation
	• BIST Tourism
	• BIST Wholesale and Retail Trade
	• BIST Telecommunication
	• BIST Sports
BIST Financials	• BIST Banks
	• BIST Insurance
	• BIST Leasing, Factoring
	• BIST Holding and Investment
	• BIST Real Estate Investment Trusts
BIST Technology	• BIST Information Technology

Since the year 2009, BIST started to compute City Indices in order to monitor the price and return performances of those companies which have their main production units or registered offices in the same city. City Indices are calculated for cities with minimum 5 companies whose stocks are traded on the BIST. The cities that city indices currently being calculated for are Adana, Ankara, Antalya, Balıkesir, Bursa, Denizli, Istanbul, Izmir, Kayseri, Kocaeli, Tekirdag. In production companies, the city where minimum 50% of the production takes place is included. In service companies with the exception of communication and construction companies and holdings, the city where minimum 50% of the operating income is obtained is included. If there is no city where minimum 50% of the production or operating income is obtained, then the city where the registered office is located is included. For communication companies, construction companies and holdings, the city where the registered office is located is included. Companies that operate in the financial sector with the exception of holdings and companies that operate in the retail sector are not included. For the stocks of a company to be included in the city indices, the scope of the city indices should cover the activities of the company and there should be an index being calculated for the city in which the company is covered (http://borsaistanbul.com/en/products-and-markets/indices/stock-indices/city-indices, accesses 29 July 2013).

The monthly data for stocks traded on BIST, BIST Sectoral Indices and BIST 100 Index used in this study was obtained from BIST. The actual time period under study ranges from January 2005 to September 2011. Table 2 lists the total number of firms and the cities in the sample. The sample includes domestic common stocks traded on BIST from January 2005 to September 2011. Some firms are removed from the sample because they did not have a complete series of 81 monthly stock returns according to BIST. In all of our analysis, the 163 firms in our sample are equally weighted to calculate local stock return indices.

Table 2: Total number of firms and the distribution of industries in each city

City	*Number of Firms*	*Number of Sectors*	*Number of Sub-sectors*
ADANA	6	1	3
ANKARA	7	2	3
ANTALYA	5	1	2
BALIKESIR	4	1	2
BURSA	19	2	7
DENIZLI	4	1	4
ISTANBUL	67	4	15
IZMIR	21	4	7
KAYSERI	6	2	3
KOCAELI	19	2	7
TEKIRDAG	5	1	3
Total	***163***		

Monthly return is calculated as the percentage logarithmic change in the value of stock compared to previous month’s closing value as follows:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) * 100 \qquad (1)$$

Using monthly returns, we first construct a set of local stock return indices for each city by equally weighting the returns of all stocks within each city. Equal weighting allows us to analyze better the question of how a particular stock comoves with other stocks within the same region. For example, some cities may have many stocks (Istanbul) while others may have few (Pirinsky and Wang, 2006, pp. 1996-1997).

Summary statistics for calculated local stock return indices for each city are outlined in Table 3. Excess (negative) skewness and kurtosis are exhibited for each series. Normality is formally rejected for all series using the Jarque–Bera test except Adana (*p* 0.692), Antalya (*p* 0.088), Denizli (*p* 0.217) and Tekirdag (*p* 0.099).

Table 3: Summary statistics for calculated local stock return indices

	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**	**Jarque-Bera**	**Probability**	**Observations**
ADANA	-0.114	35.303	-26.252	10.816	-0.020	3.466	0.738	0.692	81
ANKARA	0.775	19.716	-40.666	12.907	-1.106	4.119	20.753	0.000	81
ANTALYA	-0.524	31.179	-50.346	15.135	-0.450	3.792	4.851	0.088	81
BALIKESIR	0.074	39.611	-42.317	12.953	-0.231	4.704	10.523	0.005	81
BURSA	0.071	19.693	-30.819	10.027	-0.802	3.712	10.398	0.006	81
DENIZLI	0.881	29.088	-35.118	11.716	-0.408	3.488	3.052	0.217	81
ISTANBUL	-0.089	16.962	-34.324	9.261	-0.945	4.451	19.172	0.000	81
IZMIR	0.366	19.934	-32.429	9.779	-0.942	4.567	20.267	0.000	81
KAYSERI	-0.031	30.683	-32.209	11.065	-0.500	4.013	6.833	0.033	81
KOCAELI	0.010	16.192	-27.853	9.202	-0.699	3.092	6.633	0.036	81
TEKIRDAG	0.739	21.470	-25.772	9.577	-0.545	3.427	4.628	0.099	81

4. GRAVITY MODEL

Gravity model approach can be used to explain the effects of cross-sectional properties on the index correlation among city indices. For this purpose, we conducted a gravity model which consists of explanatory variables of the distance between cities, and a dummy variable for common border while the dependent variable is the mutual correlation between local city indices that we construct by equally weighting the returns of all stocks within each city.

$$Corr_{ijt} = \beta_0 + \beta_1(Distance)_{ij} + \beta_2(Border)_{ij} + \varepsilon_{ij} \quad (2)$$

In regression equation (2), $Corr_{ijt}$ are mutual local stock return indices correlations between city indices in year t. It is transformed into z'=[ln(1+r) - ln(1-r)], proposed by Fisher (1915) to overcome the non-normal distribution of Pearson's correlation. $(Distance)_{ij}$ is the geographical distance between the cities where the city centers are located. $(Border)_{ij}$ is the dummy variable represents the neighborhood effect arising from sharing a common border. It takes the value of one if two cities have a common border. ε_{ij} is a stochastic error term.

Considering the individual effects of included explanatory variables on stock market index correlations, it is expected that common border have positive effects which strengthen the correlation while distance has negative effects.

We employed the panel data to estimate the gravity model. First, we estimated the unweighted model using Ordinary Least Squares (OLS) estimator and checked the assumptions for the validity of the model. The results are presented on Table 4. The coefficient for distance is significant and negative. Although the coefficient for border is insignificant, it is positive. When we estimate the model with cross-section weights, we observe that both the distance and the border are significant and the signs of the coefficients are as expected with the gravity literature.

Table 4: Gravity Model

$$Corr_{ijt} = \beta_0 + \beta_1(Distance)_{ij} + \beta_2(Border)_{ij} + \varepsilon_{ij} \quad (2)$$

Periods included: 7 Cross-sections included: 100 Adjusted R^2 : 0.013061 Method: Panel Least Squares	Coefficients (t-statistics)	Prob.
α_i	2.818335 (6.131821)	0.0000
β_1	-0.164308 (-2.131676)	0.0334
β_2	0.105391 (0.739811)	0.4597
Periods included: 7 Cross-sections included: 100 Adjusted R^2 : 0.031312 Method: Panel EGLS (Cross-section weights)		
α_i	2.592416 (5.908173)	0.0000
β_1	-0.126393 (-1.716700)	0.0865
β_2	0.265899 (2.014848)	0.0443

Specifically, Barker and Loughran (2007) find that correlations in monthly returns among pairs of S&P 500 stocks tend to vary inversely with distance between the firms' headquarters cities. Following the results of Barker and Loughran (2007), in these analyses we first construct a set of local stock return indices for each city by equally weighting the returns of all stock within each city. Second, we find the distance between the city centers from a sample firm's headquarters city. Third, we find the correlations between the local stock return indices for city pairs. Fourth, we apply gravity model. The results of gravity model show that correlations tend to vary inversely with distance between city centers and directly with the border between cities. We find evidence for the hypothesis of Barker and Loughran (2007) that "a firm's return comovement with portfolios of stocks headquartered in other cities diminishes with distance from a firm's own headquarters city".

5. THE LOCAL COMOVEMENT OF STOCK RETURNS

Following Pirinsky and Wang (2006) model, we examine the degree of comovement of a stock with other stocks from the same city. We use local stock return indices for each city constructed by equally weighting the returns of all stocks within each city. Following Pirinsky and Wang (2006), stock-level time-series regression below is estimated:

$$R_t = \alpha_i + \beta^{CITY} R_t^{CITY} + \beta^{MKT} R_t^{MKT} + \varepsilon_{i,t} \quad (3)$$

In regression equation, R_t is the monthly return of a particular stock, R_t^{CITY} is the monthly return of the stock's corresponding city index, and R_t^{MKT} is the monthly return of the market portfolio. We use BIST 100 Index as market portfolio. To avoid spurious correlations, when calculating the return on the city index, R_t^{CITY}, the return of the corresponding stock is excluded (see Pirinsky and Wang, 2006, pg.1997).

In order to control for industry effects, we modify equation (3) by introducing sector and subsector indices of the stock's corresponding industry group, that is,

$$R_t = \alpha_i + \beta^{CITY} R_t^{CITY} + \beta^{MKT} R_t^{MKT} + \beta^{SEC} R_t^{SEC} + \beta^{SUBSEC} R_t^{SUBSEC} + \varepsilon_{i,t} \quad (4)$$

1. *Where R_t^{SEC}, R_t^{SUBSEC} are the return of the stock's corresponding sector and sub-sector indices. The data for sector, sub-sector indices and sector classifications for stocks are taken from BIST[1].*

We estimate equations (3) and (4) as time-series regressions over the period January 2005 to September 2011, which requires at least 81 nonmissing monthly return observations. Averages of the estimated coefficients (betas) for equation (3) are presented in Table 5 and for equation (4) are presented in Table 6.

Table 5. Local comovement

$$R_t = \alpha_i + \beta^{CITY} R_t^{CITY} + \beta^{MKT} R_t^{MKT} + \varepsilon_{i,t} \quad (3)$$

	Mean		Mean (Istanbul is excluded)	
	β^{CITY}	β^{MKT}	β^{CITY}	β^{MKT}
	0.9031	0.6595	0.7248	0.5830
t-stat	3.2049	2.8951	3.2708	3.0621

[1] Constituent Companies Of BIST Equity Indices (Current) are taken from http://www.imkb.gov.tr/Data/StocksData.aspx . Index information and companies included in BIST Indices is also taken from http://www.kap.gov.tr/yay/English/ek/index.aspx (accessed 6 December 2012).

Table 6: Local comovement and sectors

$$R_t = \alpha_i + \beta^{CITY} R_t^{CITY} + \beta^{MKT} R_t^{MKT} + \beta^{SEC} R_t^{SEC} + \beta^{SUBSEC} R_t^{SUBSEC} + \varepsilon_{i,t} \quad (4)$$

	Mean				Mean (Istanbul is excluded)			
	β^{CITY}	β^{MKT}	β^{SEC}	β^{SUBSEC}	β^{CITY}	β^{MKT}	β^{SEC}	β^{SUBSEC}
	0.7780	0.0514	0.7076	0.8503	0.6377	0.0402	0.8157	0.7734
t-stat	2.3982	0.6215	0.8862	3.6589	2.5638	0.8683	1.0120	3.2995

We observe that stock local betas, β^{CITY}, are significantly positive in two specifications (equation (3) and (4)). Average beta with respect to the local index for equation (3) is 0.9031. Average market beta is 0.6595. When we look at the Table 6, for the equation (4), it shows that industry betas especially sub-sector appears stronger. Although the introduction of industry indices reduces the magnitude and significance of local betas, local betas still remain highly economically and statistically significant. Average local beta for equation (4) is 0.7780.

As an additional robustness test of local comovement, we estimate Table 5 and Table 6 excluding Istanbul-the largest city in the sample. Istanbul's becoming a regional and global financial center will make considerable contribution to increased employment and increased inflow of international funds into Turkey, and to economic growth[2]. This test is conducted by the fact that trading location matters for stock returns (Pirinsky and Wang, 2006; Froot and Dabora, 1999; Chan and Hameed and Lau, 2003) and Istanbul is natural financial center for Turkey. The test results are very similar to those reported in Table 5 and Table 6 with Istanbul is included. When the city Istanbul is excluded, the average local beta for equation (3) is 0.7248 and for equation (4) is 0.6377.

6. THE LOCAL COMOVEMENT OF STOCK RETURNS AND NATIONAL ECONOMIC FUNDAMENTALS

The relationship between stock prices and macroeconomic variables has been widely investigated assuming that macroeconomic fluctuations are influential on stock prices. A number of macroeconomic variables have been used such as industrial production, inflation, interest rates and oil prices (Hamao, 1988; Stock and Watson, 1989; Stock and Watson, 2003).

[2] "Strategy and Action Plan For Istanbul International Financial Center", October 2009, www.dpt.gov.tr (accessed 6 December 2012)

Studies of the dynamic relationship between economic growth and stock market returns have examined both directions of causality, since the former series may have predictive power for stock returns and the latter may be considered as a leading business cycle indicator. There is evidence that the stock market returns are related to turning points in the business cycle (Fama and French, 1989; Schwert, 1989; Fama, 1990).

Leading indicators are a useful tool for predicting future economic conditions[3]. There is a vast literature that deals with the different aspects of the leading indicators, ranging from the choice and evaluation of the best indicators, possibly combined in composite indexes. Compared to a single indicator variable, composite indicators have the advantage that they eliminate the noise of individual variables and reduce the risk of false signals. OECD composite leading indicator is one of the best-known composite indicators worldwide.[4] The OECD leading indicators were developed by a working party composed of Secretariat staff and national experts and were based on work by the National Bureau of Economic Research (NBER) of the United States.

With the cooperation of OECD, the Central Bank of the Republic of Turkey has constructed a composite leading indicator (CLI) for the Turkish economy with the aim of foreseeing the contraction and the expansion periods of the economic activity. The monthly data for CLI used in this study was obtained from electronic data distribution system of Central Bank of the Republic of Turkey (CBRT)[5]. The actual time period under study ranges from January 2005 to September 2011.

$$R_t = \alpha_i + \beta^{CLI} CLI_t + \varepsilon_{i,t} \qquad (5)$$

$$R_t = \alpha_i + \beta^{MKT} R_t^{MKT} + \beta^{CLI} CLI_t + \varepsilon_{i,t} \qquad (6)$$

$$R_t = \alpha_i + \beta^{CITY} R_t^{CITY} + \beta^{MKT} R_t^{MKT} + \beta^{CLI} CLI_t + \varepsilon_{i,t} \qquad (7)$$

In regression equation, R_t is the monthly return of a particular stock, R_t^{CITY} is the monthly return of the stock's corresponding city index, and R_t^{MKT} is the monthly return of the market portfolio. CLI_t is the monthly changes of CLI which will be used as the changes of

[3] Pirinsky and Wang (2006) use local economic conditions in their analysis. Because of the difficulties of obtaining local data (at the city level) in Turkey, we do not use it in our analysis.

[4] See http://www.tcmb.gov.tr/Yayınlar/Kitaplar/Çalışmalar/ 'A Composite Leading Indicator For The Turkish Economic Activity', also European Central Bank Working Paper Series, “Leading Indicators in a Globalised World” (accessed 6 December 2012).

[5] www.tcmb.gov.tr (accessed 6 December 2012) .

national economic fundamentals.

Table 7: Local comovement and Composite Leading Indicator (CLI)

$$R_t = \alpha_i + \beta^{CLI} CLI_t + \varepsilon_{i,t} \qquad (5)$$

$$R_t = \alpha_i + \beta^{MKT} R_t^{MKT} + \beta^{CLI} CLI_t + \varepsilon_{i,t} \qquad (6)$$

$$R_t = \alpha_i + \beta^{CITY} R_t^{CITY} + \beta^{MKT} R_t^{MKT} + \beta^{CLI} CLI_t + \varepsilon_{i,t} \qquad (7)$$

	Mean Equation (5)	Mean Equation (6)		Mean Equation (7)		
	β^{CLI}	β^{MKT}	β^{CLI}	β^{CITY}	β^{MKT}	β^{CLI}
	2.4802	0.8718	1.3430	0.8892	0.6165	0.4990
t-stat	3.0622	4.9933	1.6213	3.0564	2.6924	0.5514

Table 7 reports the results from equations (5), (6) and (7). In the equation (5) we regress the monthly return of the stock on changes of CLI, while in the equation (6) we regress the monthly return of stock on both changes of CLI and the return of the market portfolio. In equation (7), we include the returns of the local city index on the right-hand side. The introduction of local city indices in equation (7) reduces the magnitude of both market portfolio betas (0.6165) and CLI betas (0.4990).

7. THE LOCAL COMOVEMENT OF STOCK RETURNS AND FIRM CHARACTERISTICS

We choose a set of firm characteristics that have been shown to be correlated with the local bias of various groups of investors.

$$\beta_i^{CITY} = \alpha_i + \beta_1 Size + \beta_2 NetIncome + \beta_3 MarketToBook + \varepsilon_i \qquad (8)$$

$$\beta_i^{SUBSEC} = \alpha_i + \beta_1 Size + \beta_2 NetIncome + \beta_3 MarketToBook + \varepsilon_i \qquad (9)$$

2. Specifically we consider the following firm characteristics as independent variables in regressions (8) and (9) from the BIST Equity Market Data Basic Ratios annual files[6].

- *Size* – the natural logarithm of the market capitalization of the stock measured at the end of the previous year.
- *Net Income* - net income of the firm.
- *MarketToBook* - the market value of equity over the book value of equity.

[6] http://www.ise.org (accessed 6 December 2012)

All of the above independent variables are averaged over the seven years. Table 8 shows the results from the regressions of local comovement on firm characteristics. We use as a dependent variable the estimated city betas based on equation (3) (Table 8). We also use as a dependent variable sub-sector betas from equation (4) (Table 9). We then regress the estimated city beta and sub-sector beta on the firm characteristics listed above.

Table 8: Local comovement and firm characteristics (City Beta)

$$\beta_i^{CITY} = \alpha_i + \beta_1 Size + \beta_2 NetIncome + \beta_3 MarketToBook + \varepsilon_i \quad (8)$$

Number of Observations : 92 Adjusted R^2 : -0.007983	Coefficients (t-statistics)	Prob.
α_i	1.333949 (2.451265)	0.0162
β_1	-0.094716 (-0.866270)	0.3887
β_2	5.38E-07 (0.449001)	0.6545
β_3	0.015282 (1.323461)	0.1891

Table 9: Local comovement and firm characteristics (Sub-sector Beta)

$$\beta_i^{SUBSEC} = \alpha_i + \beta_1 Size + \beta_2 NetIncome + \beta_3 MarketToBook + \varepsilon_i \quad (9)$$

Number of Observations : 60 Adjusted R^2 : 0.032142	Coefficients (t-statistics)	Prob.
α_i	-0.395597 (-0.655711)	0.5147
β_1	0.255786 (2.066087)	0.0435
β_2	-0.053804 (-1.277590)	0.2067
β_3	0.023004 (0.484173)	0.6302

We observe that firm characteristics in equation (8) do not exhibit significant explanatory power over local stock return. On the other hand, only the size in regression equation (9) has explanatory power over sub-sector betas.

8. THE LOCAL COMOVEMENT OF STOCK RETURNS AND REGIONAL CHARACTERISTICS

We classify the investors in two groups. Some market participants are sophisticated investors who are experts in gathering and processing public information. Conversely other investors are unsophisticated. Following prior literature Hand (1990), Walther (1997), Ali *et al.* (2000), Bartov *et al.* (2000), we consider institutional investors as sophisticated investors and construct our variable *InstitutionalRatio* for investor sophistication. We construct another variable *ForeignRatio* to examine the impact of foreign investors on local comovement of stock returns.

The yearly data used in this study was obtained from The Association of Capital Market Intermediary Institutions of Turkey[7]. *InstitutionalRatio* and *ForeignRatio* is averaged over the seven years (2005 and 2011). We define the regression equation (10).

$$\beta_i^{CITY} = \alpha_i + \beta_1 InstitutionalRatio + \beta_2 ForeignRatio + \varepsilon_i \quad (10)$$

- *InstitutionalRatio* – the number of institutional equity investors divided by the total equity investors for each stock
- *ForeignRatio* – the number of foreign equity investors divided by the total equity investors for each stock

Home bias, which observes that investors show a preference for investing in their home countries, is a well documented phenomenon in finance. There are also studies about home bias, within country, at a regional level. We use as a dependent variable the estimated city betas based on equation (3). We then regress the estimated city beta on the variables *InstitutionalRatio* and *ForeignRatio,* in order to examine an institutional investor bias or a foreign investor bias. Table 10 presents the results from the regression equation (10).

Table 10: Local comovement and regional characteristics (Institutional and Foreign Holdings of Stocks)

$$\beta_i^{CITY} = \alpha_i + \beta_1 InstitutionalRatio + \beta_2 ForeignRatio + \varepsilon_i \quad (10)$$

Number of Observations :92 Adjusted R^2 : 0.001013	Coefficients (t-statistics)	Prob.
α_i	0.998354 (10.92049)	0.0000
β_1	-0.036850 (-0.695791)	0.4883
β_2	-0.056489 (-0.628938)	0.5309

When we look at the estimated coefficients in the Table 10 we can see that they are insignificant. Although the coefficients are insignificant, interestingly, local comovement is negatively related to the *InstitutionalRatio* and *ForeignRatio*. Foreign investors are mostly institutional investors. The results from the regression equation (10) show that institutional investors and foreign investors show the same bias. On the other hand, the individual investors correlated trading for local stocks might be caused by easy access to locally generated information or, alternatively, by rumors or noise trading among local traders who share social networks (Hong and Kubik and Stein, 2004, 2005).

In addition to the above regression we construct two more variables; investor sophistication ratio and city sophistication ratio. We define city sophistication ratio and

[7] http://www.tspakb.org.tr (accessed 6 December 2012) Data is extracted from equity investor profile file for each year. The number of investment funds, corporate investors, investment trusts and other institutions are classified as the number of institutional investors.

investor sophistication ratio as regional characteristics and construct our variable *CitySophisticationRatio* as the number of equity investors divided by the population for each city and *InvestorSophisticationRatio* as the number of institutional equity investors divided by the total equity investors for each city[8]. We include this parameter and three control variables, market to book ratio, size and net income in the regression equation (12).

$$\beta_i^{CITY} = \alpha_i + \beta_1 CitySophisticationRatio + \beta_2 InvestorSophisticationRatio + \varepsilon_i \quad (11)$$

$$\beta_i^{CITY} = \alpha_i + \beta_1 CitySophisticationRatio + \beta_2 InvestorSophisticationRatio + \beta_3 MarketToBook + \beta_4 Size + \beta_5 NetIncome + \varepsilon_i \quad (12)$$

- *CitySophisticationRatio* – the number of equity investors divided by the population for each city
- *InvestorSophisticationRatio* – the number of institutional equity investors divided by the total equity investors for each city
- *MarketToBook* - the market value of equity over the book value of equity.
- *Size* – the natural logarithm of the market capitalization of the stock measured at the end of the previous year.
- *Net Income* - net income of the firm.

CitySophisticationRatio and *InvestorSophisticationRatio* is averaged over the five years (2007,2011). Control variables are averaged over the seven years (2005, 2011). Table 11 presents the results from the regression of local comovement on regional characteristics. We use as a dependent variable the estimated city betas based on equation (3). We then regress the estimated city beta on the regional characteristics listed above.

Table 11: Local comovement and regional characteristics

$$\beta_i^{CITY} = \alpha_i + \beta_1 CitySophisticationRatio + \beta_2 InvestorSophisticationRatio + \varepsilon_i \quad (11)$$

Number of Observations : 92 Adjusted R^2 : 0.304612	Coefficients (t-statistics)	Prob.
α_i	0.253838 (1.844895)	0.0684
β_1	0.109593 (1.382515)	0.1703
β_2	1.278753 (4.301212)	0.0000

Kimball and Shumway (2006) and Van Rooij, Lusardi and Alessie (2011) find that

[8] Population data used in this study was obtained from Turkish Statistical Institute.

financially sophisticated households are more likely to participate in the stock market. Investment in complex assets, such as stocks, is also found to be affected by word of mouth, the advice of neighbours (Hong and Kubik and Stein, 2004; Brown and Ivkovich and Smith and Weisbenner, 2008). When we look at the regression results for equation (11) in Table 11, although the coefficient for *CitySophisticationRatio* is insignificant we find that local comovement is positively related to *CitySophisticationRatio* and *InvestorSophisticationRatio.* As the number of institutional equity investors divided by the total equity investors in a city increases, the local comovement of stock returns also increases. This is consistent with the finding of Coval and Moskowitz (2001) which documents the preference of U.S. mutual fund managers for local companies.

When we look at the regression results for equation (12), we can see that local stock beta is positively related to *CitySophisticationRatio*, *InvestorSophisticationRatio* and *MarketToBook.* Interestingly, the coefficient for the *CitySophisticationRatio* becomes significant and the significance of the *InvestorSophisticationRatio* increases once we control for *MarketToBook, Size* and *Net Income.*

Table 12: Local comovement, regional and firm characteristics

$$\beta_i^{CITY} = \alpha_i + \beta_1 CitySophisticationRatio + \beta_2 InvestorSophisticationRatio + \beta_3 MarketToBook + \beta_4 Size + \beta_5 NetIncome + \varepsilon_i \quad (12)$$

Number of Observations : 92 Adjusted R^2 : 0.349817	Coefficients (t-statistics)	Prob.
α_i	0.801886 (1.919583)	0.0582
β_1	0.129062 (1.674899)	0.0976
β_2	1.355938 (4.687760)	0.0000
β_3	0.022247 (2.313173)	0.0231
β_4	-0.127300 (-1.432024)	0.1558
β_5	-0.002461 (-0.100098)	0.9205

9. CONCLUSION

We find that stock returns of companies headquartered in the same city exhibit a strong degree of comovement for BIST. According to our results, firm level characteristics and general economic fundamentals cannot explain local comovements. In our analysis, we also try to explain local comovement with financial sophistication. Financial sophistication leads to better risk-sharing. More sophisticated investors also appear more likely to participate in the stock market. It is likely that there will be variations in financial sophistication in population according to the geographic regions. As the ratio of equity investors to population for city increases, local comovement also increases. In a similar way, as the ratio of institutional equity investors to total equity investors for city increases, local comovement also increases. On the other hand, although insignificant, when the ratio of foreign equity investors to total equity investors for each stock increases local comovement decreases.

Local investors have a correlated trading pattern for BIST stocks. Local comovement is positively related to the stock market participation of local residents and negatively related to stock market participation of foreign investors. This result is consistent with the existence of a home bias. The correlated trading for local stocks might be caused by easy access to locally generated information or, alternatively, by rumors or noise trading among local traders who share social networks.

Our results strengthen the case that local investor bias is a widespread and important world-wide phenomenon. And the geography might be an important consideration in achieving efficient portfolio diversification for BIST stocks. Further research should first investigate the reasons for correlated trading patterns of local investors. Second, it should be investigated both the level and the cross-sectional variation in foreign ownership in BIST stocks.

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