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THE BROKERAGE FIRM EFFECT IN HERDING: EVIDENCE FROM INDONESIA

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Abstract

We examine herding behavior of domestic and foreign investors in the Indonesian stock market. We document that both domestic and foreign investors from a particular brokerage firm tend to herd. The foreign investors exhibit a greater propensity to herd than domestic investors. However, when examining investor trading across brokerage firms, we find only weak evidence of herding by domestic investors and no herding by foreign investors. Our overall findings suggest a strong brokerage firm effect on herding but a weak marketwide effect. Moreover, we find evidence that the strong brokerage effect on herding is likely driven by acting on common information.

JEL Classification: G14, G15

I. Introduction

Several recent studies document that in emerging markets, investors, foreign investors in particular, show a strong tendency of buying and selling stocks together ("herding").[1] For example, Bonser-Neal et al. (2002) and Bowe and Domuta (2004) find that both foreign and domestic investors herd among themselves in trading

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[1] Herding is also reported in developed stock markets, such as the United States and the United Kingdom, even though it is not large in magnitude (Lakonishok, Shleifer, and Vishny 1992; Nofsinger and Sias 1999).

Indonesian stocks, and foreign investors herd more than their local counterparts. Similarly, significant herding behavior is also reported in the Korean stock market (Choe, Kho, and Stulz 1999; Kim and Wei 2002), the Chinese market (Tan et al. 2008), and the Australian dollar market (Carpenter and Wang 2007). After examining herding in the United States, Japan, Hong Kong, South Korea, and Taiwan, Chang, Cheng, and Khorana (2000) find evidence of herding in South Korea and Taiwan but not elsewhere.

Academic researchers have devoted considerable effort to understanding of the herding behavior of market participants and its effect on security prices. Herding can be either rational or irrational. According to Devenow and Welch (1996), the view that herding is irrational focuses on investor psychology where investors ignore their own beliefs and follow others blindly. The view that herding is rational, on the other hand, focuses on the information environment of the underlying investment. Specifically, it is rational and optimal for investors to disregard their own private information and trade with the crowd because of the reputational risk of acting differently from others (Scharfstein and Stein 1990). In addition, it is rational and optimal for investors to herd because they believe that an individual's single piece of private information is not strong enough to reverse the decision of the crowd (Bikhchandani, Hirshleifer, and Welch 1992) or because the herding investors receive correlated private information (Froot, Scharfstein and Stein 1992; Hirshleifer, Subrahmanyam and Titman 1994). It is important to be able to differentiate empirically between these two views on herding: the view that herding is irrational can potentially lead to market inefficiency, whereas the view that herding is rational simply implies an efficient reallocation of assets on the basis of common fundamental information. Unfortunately, it is difficult to directly test these theoretical models of herding because there are no data on the private information available to investors. Therefore, it is difficult to discriminate whether investors have decided to disregard their own information and imitate others. For this reason, the existing literature does not provide compelling empirical evidence to support one view or the other. It is still largely unclear what drives the herding behavior.

In this article, we present an in-depth study of herding behavior of domestic and foreign investors in the Indonesian stock market. To differentiate our work from previous studies, we use a unique data set from the Jakarta Stock Exchange (JSX) that contains all orders and trades handled by individual brokerage firms to investigate the herding behavior of investors from a particular brokerage firm as well as across brokerage firms. There are over 226 brokerage firms registered with the JSX to handle orders and trades for domestic and foreign investors. The majority of brokerage firms, including small local firms, almost exclusively represent domestic investors. Some brokerage firms, particularly those associated with foreign securities firms, handle orders for both domestic and foreign investors, and a few global brokerage firms actually have more foreign clients than domestic clients. This arrangement of brokerages provides an excellent setting to test whether

documented herding is a marketwide phenomenon or is displayed just among a special group of investors. A solution to this question provides new insight into the issues surrounding herding behavior exhibited by foreign and domestic investors in emerging markets.

As in previous studies, we find that both domestic and foreign investors on the JSX exhibit significant herding behavior in trading Indonesian stocks at the stock level and that such behavior is much stronger for foreign investors. After reexamining investors' herding behavior at the brokerage firm level, we document two interesting phenomena. First, domestic investors from a particular brokerage firm tend to buy and sell stocks together, as do foreign investors from a particular brokerage. The foreign investors exhibit a greater propensity to herd than do domestic investors. Second, we find weak evidence of herding by domestic investors and no evidence of herding by foreign investors across brokerage firms. The results suggest that well-documented herding behavior from previous studies is mainly displayed only among investors from a particular brokerage firm, especially for foreign investors. We also find that investors from large-sized brokerages representing both domestic and foreign investors are more likely to herd than those from small local brokerages. Furthermore, the clients of seven global brokerage firms that are active in the Indonesian stock markets exhibit the highest level of herding for both foreign and domestic investors. Moreover, there is evidence of a positive relation between herding among investors and trading profitability. Our findings suggest that the observed strong brokerage firm effect on herding is driven by common information from a particular brokerage firm.

II. Data and Sample Construction

The trading system of the JSX is built on a centralized limit order book. Unlike other well-known limit order markets, such as the Tokyo Stock Exchange and the Toronto Stock Exchange, no market orders are allowed to enter the system. Investors submit a buy (sell) order that matches the lowest (highest) ask (bid) price on the limit order book for execution.

Our study relies on complete order and transaction records on the JSX for the period covering May 1995 through May 2003. A typical order record consists of a unique identification number, stock code, date and time of the order submission, order type (buy or sell), price, and the number of shares. Most important, the order record contains information on whether the trader who submits the order is a domestic or foreign investor and the name of the brokerage the trader uses to submit the order. A transaction record provides the same information for both buyers and sellers. In addition, one of the most appealing features of the data is that the unique identification number assigned to each order appears in the corresponding transaction record if the order is executed. This feature helps us avoid some biases

TABLE 1. Statistics of Samples.

Variable	All	Domestic	Foreign
Number of stocks	378		
Number of brokerage firms	226		
Number of orders	62,786,550	57,228,838	5,557,712
(Average size: shares)	(104,670)	(95,527)	(198,821)
Number of buy orders	27,319,619	24,751,490	2,568,129
(Average size)	(110,665)	(102,642)	(187,995)
Number of sell orders	35,466,931	32,477,348	2,989,583
(Average size)	(100,052)	(90,104)	(208,120)
Number of executed orders	26,422,564	23,934,061	2,488,503
(Average size: shares)	(54,474)	(51,598)	(82,151)
Number of executed buy orders	14,563,607	13,236,610	1,326,997
(Average size)	(51,978)	(49,070)	(80,998)
Number of executed sell orders	11,858,957	10,697,451	1,161,506
(Average size)	(57,539)	(54,725)	(83,468)
Number of trades	25,434,230		
(Average size: shares)	(29,763)		
Act as buyers		22,211,460	3,210,096
(Average size)		(29,229)	(33,483)
Act as sellers		22,178,363	3,242,606
(Average size)		(29,262)	(33,220)

Note: This table presents summary statistics of the sample stocks and trading activities of foreign and domestic investors.

in measuring herding that appear in previous studies.[2] In addition, we can use the information to determine whether a trade is initiated by a buyer or seller, allowing us to measure herding for both initiated and noninitiated orders.

The order and trade records included in our sample are mainly restricted to the Regular Board. Before the Asian financial crisis, the JSX also provided the Foreign Board for trading only among foreign investors on the stocks that had reached the 49% foreign ownership limit. Our sample also includes orders and trades from the Foreign Board, even though their numbers are very small. The orders and trades from other boards for odd-lot trading, cross-trading, block trading, and other nonstandard settlement trading are excluded from the sample.

Our sample includes all stocks listed on the JSX from May 1995 through May 2003. In Table 1, we present summary statistics of the sample stocks. More

[2]For example, two existing studies on herding behavior of domestic and foreign investors in the Indonesian stock market (Bonser-Neal et al. 2002; Bowe and Domuta 2004) compute the herding measure based on trade data. They assume that every trade represents a unique buyer and a unique seller. The studies ignore the fact that a single order could be involved in multiple trades. In our sample, each buy order on average is involved in 1.8 trades, and each sell order on average is involved in 2.2 trades. However, our LSV herding measures still cannot resolve the problem resulting from investors splitting one big order into several small orders over time (Sias 2004). As a result, the Lakonishok, Shelifer, and Vishny measures would be upwardly biased and overstate the herding behavior.

than 62 million orders were placed in this sample of 378 stocks; approximately 26 million orders were executed, resulting in 25 million trades; and 226 brokerage firms were involved in the trading activities of the 378 stocks. Of the 62 million orders in the sample, approximately 5.5 million orders were placed by foreign investors, representing a little less than 10% of the total. The average size of an order from foreign investors, however, was approximately 100% greater than that of domestic investors (198,000 shares per order vs. 95,000 shares per order). The number of sell orders was greater than that of buy orders for both domestic and foreign investors. Of the 25 million trades during the study period, domestic investors acted as buyers in approximately 22 million trades and as sellers in more than 22 million trades. Meanwhile, foreign investors were involved as either buyers or sellers in about 24% of total trades. The average size of trades that involved foreign investors, however, was approximately 15% greater than other trades.

III. Empirical Results

In this section, we report on herding behavior by foreign and domestic investors in the Indonesian stock market. To make our results comparable to earlier studies, we adopt the herding measure of Lakonishok, Shleifer, and Vishny (1992) (LSV).[3] The LSV measure is defined by:

$$|p_{it} - E(p_{it})| - E|p_{it} - E(p_{it})|, \tag{1}$$

where p_{it} is the proportion of a particular group of investors buying (selling) stock i during period t among all investors of the group trading that stock during t. Here, $E(p_{it})$ is the expected value for p_{it}, or the expected proportion of investors from the group buying (selling) stock i during t relative to all investors of the same group trading the stock during t. The adjustment factor, $E|p_{it} - E(p_{it})|$, is the expected value of the absolute value of $(p_{it} - E(p_{it}))$, and it is introduced with the assumption of the number of buyers (sellers) from a particular group of investors follows a binomial distribution with the probability p_{it} of success when herding is not present.

[3]This herding measure has been widely used in several studies to investigate trading behavior of various types of investors, including U.S. mutual funds (Grinblatt, Titman, and Wermers 1995; Wermers 1999), investors of a U.S. discount brokerage (Barber, Odean, and Zhu 2009), UK mutual funds (Wylie 2005), and a German broker's clients (Dorn, Huberman, and Sengmueller 2008).

Foreign and Domestic Herding at the Stock Level

Following equation (1), we compute LSV herding measures of foreign and domestic investors at the stock level:

$$H^s_{ijt} = \left| \frac{B_{ijt}}{B_{ijt} + S_{ijt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| - E \left| \frac{B_{ijt}}{B_{ijt} + S_{ijt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| \Bigg\}, \qquad (2)$$

where B_{ijt} represents the number of buyers from investor type i (domestic or foreign investors) in stock j during period t, and S_{ijt} represents the number of sellers from investor type i in stock j during period t. Similarly, B_{it} (S_{it}) represents the number of buyers (sellers) aggregated across all stocks from investor type i during t.

Our LSV measures are calculated based on daily, weekly, and monthly horizons for the entire study period. We first average herding measures across stocks in each trading period. Then, we compute and report the mean of LSV measures across the 1,972 herding days (417 herding weeks or 97 herding months). Statistical tests (standard errors) are based on the time series of the means of herding measures across stocks, using a Newey–West correction for serial dependence. In computing LSV measures, we restrict our analysis to stocks with at least two trades in the defined trading period. In addition, besides reporting results for all executed orders, we also report the results of the LSV measures based on initiated orders to avoid the estimation bias from some noninitiated limit orders. The noninitiated limit orders pose a problem for measuring herding because the execution of limit orders is related to stock price movement. Specifically, limit buy (sell) orders are more likely to be executed as stock prices fall (rise). As a result, we tend to overstate herding on buying in a downward market and herding on selling in an upward market, even though investors do not actually move in tandem. For this reason, we report two sets of results: one based on all executed orders and another based on initiated orders only.

Table 2 reports the results of LSV herding measure at the stock level. It appears that both foreign and domestic investors show evidence of herding behavior, but foreign investors exhibit stronger herding. At a daily horizon, the average LSV herding measures are 13.26% for foreign investors and 2.22% for domestic investors. Assuming that the average proportion of trading activity is 50% for purchases (sales), 63.26% of foreign investors are on the same side of the market in a typical trading day. In contrast, only 52.22% of domestic investors are the same side of the market. The difference is 11.05%, which is statistically significant. Based on initiation orders only, domestic herding substantially increases to 10.76% compared to the 2.22% from all executed orders. The LSV values of foreign investors increase, too, but in much smaller amounts (from 13.26% to 14.90%). As a result, the difference between foreign and domestic investor herding measures is reduced to 4.14% but is still statistically significant. If we believe that the initiation order

TABLE 2. Herding at Stock Level.

	All Executed Orders			Initiated Orders		
	Foreign LSV	Domestic LSV	F – D	Foreign LSV	Domestic LSV	F – D
Panel A. Daily						
Mean	13.26%	2.22%	11.05%	14.90%	10.76%	4.14%
	(1.50%)	(0.63%)	(1.17%)	(1.14%)	(1.05%)	(1.14%)
Panel B. Weekly						
Mean	14.15%	2.74%	11.42%	15.48%	9.91%	5.57%
	(2.33%)	(1.11%)	(2.30%)	(2.21%)	(2.08%)	(2.21%)
Panel C. Monthly						
Mean	13.94%	2.84%	11.10%	15.24%	8.90%	6.34%
	(4.01%)	(1.18%)	(2.52%)	(4.37%)	(2.15%)	(2.35%)

Note: Panel A reports the results of daily LSV herding measure at the stock level. Panel B (Panel C) reports the results at weekly (monthly) horizon. Besides reporting results for all executed orders, we also report the results of the LSV measures based on initiated orders to avoid the estimation bias from some noninitiated limit orders. The differences between foreign and domestic investor herding measures (F – D) are also reported. The standard errors (reported in parentheses) are based on the time series of the means of herding measures across stocks, using a Newey–West correction for serial dependence. LSV = Lakonishok, Shleifer, and Vishny (1992).

sample presents a more accurate picture in measuring domestic and foreign herding, our results from the daily horizon indicate that both domestic and foreign investors exhibit herding behavior in trading Indonesian stocks, and foreign investors tend to herd more than their local counterparts.

We plot the daily LSV value against time in Figure I, The study period is from May 1995 through May 2003, during which the Asian financial crisis occurred (in 1997–1998). There is some evidence that herding among foreign investors increases during and after the financial crisis. Meanwhile, domestic investor herding does not show any significant qualitative difference during and after the Asian financial crisis period. As a result, the difference in the LSV measure between foreign and domestic investors also increases during and after the Asian financial crisis period.

Almost identical results are reported at both weekly and monthly horizons. At a weekly horizon, for example, considering all executed orders, the LSV values of foreign and domestic investors are 14.15% and 2.74%, respectively. For initiated orders, the value is 15.48% for foreign investors and 9.91% for domestic investors. Foreign investors demonstrate stronger herding behavior than domestic investors at the stock level. These findings are comparable with those in Bonser-Neal et al. (2002) and Bowe and Domuta (2004).

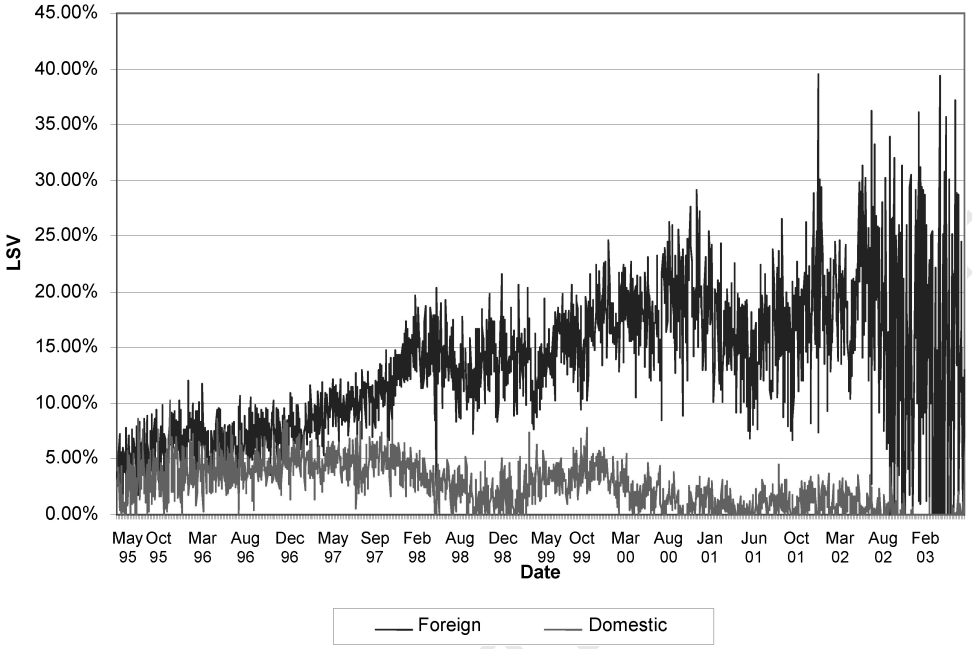

Figure I. Daily LSV Herding Values at Stock Level: May 1995–May 2003. This figure shows the daily LSV herding values at stock level over time for foreign and domestic investors, respectively. LSV herding is defined as:

$$H_{ijt}^{s} = \left| \frac{B_{ijt}}{B_{ijt} + S_{ijt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| - E \left| \frac{B_{ijt}}{B_{ijt} + S_{ijt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| \Bigg\}.$$

Here, B_{ijt} represents the number of buyers from investor type i (domestic or foreign investors) in stock j during period t, and S_{ijt} represents the number of sellers from investor type i in stock j during period t. Similarly, B_{it} (S_{it}) represents the number of buyers (sellers) aggregated across all stocks from investor type i during t. LSV = Lakonishok, Shleifer, and Vishny (1992).

Foreign and Domestic Herding at the Brokerage Level

We are interested in foreign and domestic herding at the brokerage level for several reasons. It is well known that brokerage firms do not merely handle orders and trades for their clients; they also provide investment advice to their clients. Therefore, investors from the same brokerage are more likely to share a similar set of information or follow the same investment recommendations provided by the brokerage firm. In addition, investors from the same brokerages have more opportunities to interact with each other. They may interact more because they are located in the same city, join the same investment club, and visit the same branch office. Those interactions among investors will certainly enhance the information-sharing process and thus influence their investment decision making. Evidence from a few recent studies also suggests that trading activities of investors from a particular

brokerage firm are correlated. Feng and Seasholes (2005) document that individual investors from a Chinese brokerage firm display highly correlated trading behavior, even though they are isolated geographically. Barber, Odean, and Zhu (2009) report that trades of individual investors from a U.S. discount brokerage firm are highly correlated. Dorn, Huberman, and Sengmueller (2008) find that the clients of a German discount broker tend to place trades on the same side of the market in a given stock at a daily frequency (as well as weekly, monthly, and quarterly frequencies).

Given these explanations, it is reasonable to believe that investors who trade through a particular brokerage firm could tend to trade in the same direction. As a result, it is possible that the reported foreign and domestic herding behavior in the previous section is mainly the result in the herding of a particular group of investors at a single brokerage firm. To assess this possibility, we perform two sets of analyses on foreign and domestic herding: herding within the brokerage firm and herding across brokerage firms.

To compute LSV measures of domestic and foreign investors from a particular brokerage firm, we use the following formula:

$$H^{ib}_{isjt} = \left\{ \left| \frac{B_{isjt}}{B_{isjt} + S_{isjt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| - E \left| \frac{B_{isjt}}{B_{isjt} + S_{isjt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| \right\}, \quad (3)$$

where B_{isjt} represents the number of type i buyers from the brokerage firm s in stock j during period t, and S_{isjt} represents the number of type i sellers from brokerage firm s in stock j during period t.

We also compute LSV measures of domestic and foreign investors across brokerage firms. To do so, we first classify a brokerage firm into a buyer or a seller for a type of investor. Specifically, a brokerage firm is a buyer if $B_{isjt} > S_{isjt}$ and a seller if $S_{isjt} > B_{isjt}$.

Then, we apply equation (2) to compute the LSV measures as follows:

$$H^{cb}_{ijt} = \left| \frac{FB_{ijt}}{FB_{ijt} + FS_{ijt}} - \frac{FB_{it}}{FB_{it} + FS_{it}} \right| - E \left| \frac{FB_{ijt}}{FB_{ijt} + FS_{ijt}} - \frac{FB_{it}}{FB_{it} + FS_{it}} \right|, \quad (4)$$

where FB_{ijt} represents the number of brokerage buyers from investor type i in stock j during period t, and FS_{ijt} represents the number of brokerage sellers from investor type i in stock j during period t. Note that FB_{it} (FS_{it}) represents the number of brokerage buyers (sellers) aggregated across all stocks from investor type i during t.

Table 3 reports the results for herding within a brokerage firm (within-brokerage herding) and herding across brokerage firms (cross-brokerage herding), respectively. First, we discuss the results for within-brokerage herding. As in the previous section, we report LSV herding measures at daily, weekly, and monthly

TABLE 3. Herding at Brokerage Firm Level.

	All Executed Orders			Initiated Orders		
	Foreign LSV	Domestic LSV	F – D	Foreign LSV	Domestic LSV	F – D
Panel A. Daily						
Within brokerage	23.67%	8.46%	15.20%	22.90%	9.90%	13.00%
	(2.14%)	(1.06%)	(2.15%)	(2.15%)	(1.06%)	(2.17%)
Across brokerages	0.49%	1.81%	−1.33%	1.35%	7.95%	−6.60%
	(0.32%)	(0.46%)	(0.24%)	(0.52%)	(1.05%)	(1.12%)
W – C	23.18%	6.65%		21.55%	1.95%	
	(3.15%)	(1.88%)		(2.89%)	(2.12%)	
Panel B. Weekly						
Within brokerage	22.03%	7.01%	15.02%	21.80%	8.56%	13.24%
	(5.17%)	(2.10%)	(2.18%)	(4.18%)	(2.10%)	(2.21%)
Across brokerages	1.23%	4.02%	−2.80%	2.66%	7.77%	−5.12%
	(0.78%)	(0.82%)	(0.31%)	(1.21%)	(2.07%)	(1.21%)
W – C	20.8%	2.99%		19.14%	0.79%	
	(5.33%)	(2.77%)		(5.21%)	(1.34%)	
Panel C. Monthly						
Within brokerage	19.51%	5.53%	13.98%	19.90%	7.34%	12.56%
	(4.23%)	(2.15%)	(3.25%)	(5.25%)	(3.17%)	(3.28%)
Across brokerages	2.54%	6.00%	−3.46%	3.79%	8.19%	−4.40%
	(1.32%)	(1.21%)	(0.82%)	(1.30%)	(1.13%)	(1.32%)
W – C	16.97%	−0.47%		16.11%	−0.85%	
	(5.77%)	(1.67%)		(6.56%)	(2.01%)	

Note: This table reports the results for herding within a brokerage firm (within-brokerage herding) and herding across brokerage firms (cross-brokerage herding), respectively. Panel A reports the results of daily LSV herding measure. Panel B (Panel C) reports the results at weekly (monthly) horizon. Besides reporting the differences between foreign and domestic investor herding measures (F – D), we also report the differences between within-brokerage herding and cross-brokerage herding measures (W – C). The standard errors are reported in parentheses. LSV = Lakonishok, Shleifer, and Vishny (1992).

frequencies for all executed orders, as well as initiated orders. Not surprisingly, strong herding is detected among both foreign and domestic investors in Table 3. Comparing the results in Tables 2 and 3, at a daily frequency, the average LSV measure on within-brokerage herding for foreign investors in Table 3 is 23.67%, about 10% more than the corresponding LSV measure of 13.26% reported in Table 2. To domestic investors, the LSV measure on within-brokerage herding is 8.46%, nearly three times as large as the figure reported in Table 2. The difference in values of the LSV measure on within-brokerage herding between foreign and domestic investors is still large at 15.20%, even though both foreign and domestic within-brokerage herding substantially increases. For the sample of initiated orders, however, an increase in the LSV measure on within-brokerage herding is only reported by foreign investors, which increases to 22.90% from 14.90%. Yet, there

is no significant change to domestic investors. Similar results are also reported at a weekly or monthly frequency. Overall results in Table 3 indicate that both foreign and domestic herding is more pronounced when they are measured within a single brokerage firm. These results confirm our expectation that the clients of a particular brokerage firm are more likely to exhibit herding behavior. Even within a single brokerage firm, foreign investors herd more than domestic investors.

We now focus on the results for herding across brokerage firms. Keep in mind that we use a single investor representing all investor trading from a specific brokerage firm to measure the herding across brokerages. In our study, then, a buyer to a brokerage firm indicates that there are more investors buying than investors selling the stock at the brokerage firm. Similarly, a seller to a brokerage firm indicates that there are more investors selling than investors buying the stock at the brokerage firm. To compute this LSV measure, equation (4) is applied.

Evidence of cross-brokerage herding is substantially weak compared to the findings either for herding at the stock level or for within-brokerage herding. More surprising, foreign investors show marginal or no herding behavior, especially at a daily or weekly frequency for the sample of all executed orders. For instance, the LSV measure of foreign investors at a daily frequency is merely 0.49%, which is statistically insignificant. Based solely on the initiated orders, its value increases to 1.35%, a much smaller number compared to previous results for foreign investor herding. In contrast, the values of the LSV measure for domestic investors at various horizons are statistically significant. Moreover, they all are significantly greater than the values of the LSV measure for foreign investors.

Figures II and III plot within-brokerage herding and cross-brokerage herding over the study period, respectively. Within-brokerage herding among foreign investors is consistently much stronger than that for domestic investors. Meanwhile, on cross-brokerage herding, domestic investors clearly show more herding than foreign investors before the Asian financial crisis.

Robustness Checks

The results summarized in Tables 2 and 3 provide strong evidence that both domestic and foreign investors exhibit significant herding in trading Indonesian stocks, and such behavior is more prominent for foreign investors, particularly among those from the same brokerage firm. In this section, we conduct several tests to verify the robustness of the preceding results.

Buy- versus Sell-Herding. To adopt the methodology of Wermers (1999), we recalculate our LSV measures conditioned on $p_{it} > E(p_{it})$ or on $p_{it} < E(p_{it})$ for buy-herding and sell-herding, respectively. The segregation is useful in analyzing herding by domestic and foreign investors into stocks separately from herding by them out of stocks. Table 4 presents the results for the LSV measure at a daily frequency for both domestic and foreign investors conditional on buying and

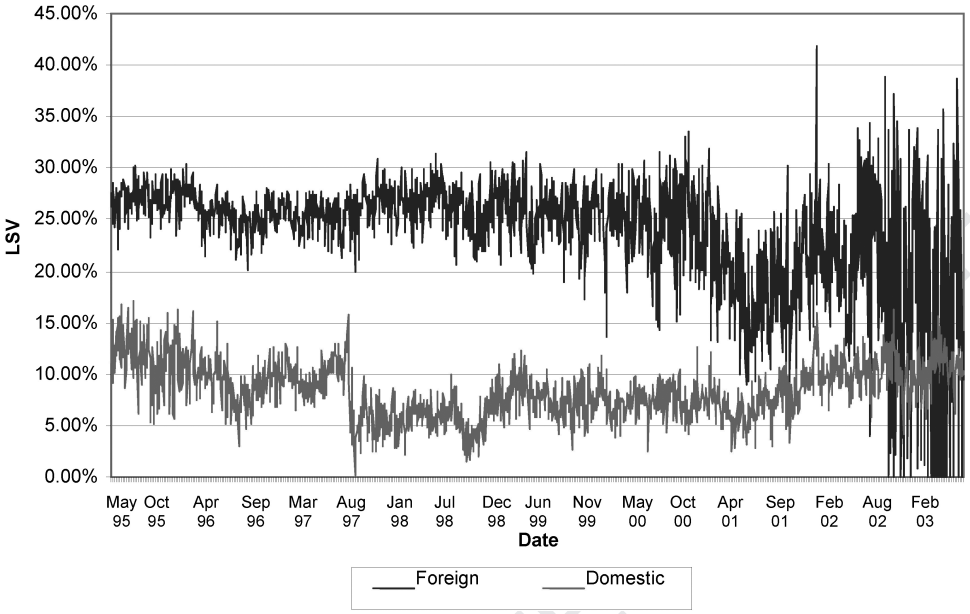

Figure II. Daily Within-Brokerage LSV Herding Values: May 1995–May 2003. This figure shows the daily within-brokerage LSV herding values at stock level over time for foreign and domestic investors, respectively. Within-brokerage LSV herding is defined as:

$$H_{isjt}^{ib} = \left| \frac{B_{isjt}}{B_{isjt} + S_{isjt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| - E \left| \frac{B_{isjt}}{B_{isjt} + S_{isjt}} - \frac{B_{it}}{B_{it} + S_{it}} \right| \Bigg\}.$$

Here, B_{isjt} represents the number of type i buyers from brokerage firm s in stock j during period t, and S_{isjt} represents the number of type i sellers from brokerage firm s in stock j during period t. Similarly, B_{it} (S_{it}) represents the number of buyers (sellers) aggregated across all stocks from investor type i during t. LSV = Lakonishok, Shleifer, and Vishny (1992).

selling.[4] The evidence suggests that investors in the Indonesian stock market engage in herding at the stock level or within brokerage for both buying and selling stocks. According to the results from the initiation order sample, foreign investors show a stronger tendency of selling together. This is not displayed among domestic investors. Once again, results confirm that foreign investors herd more than domestic investors. Figure IV also plots the within-brokerage buy- and sell-herding for foreign investors against time, which shows evidence of more sell-herding than buy-herding after the Asian financial crisis.

The Effect of Firm Size on Herding Behavior. Firm size is a good proxy for both liquidity of trading and information asymmetry among different investor

[4]Results are similar based on weekly and monthly horizons. We are happy to provide the results upon request.

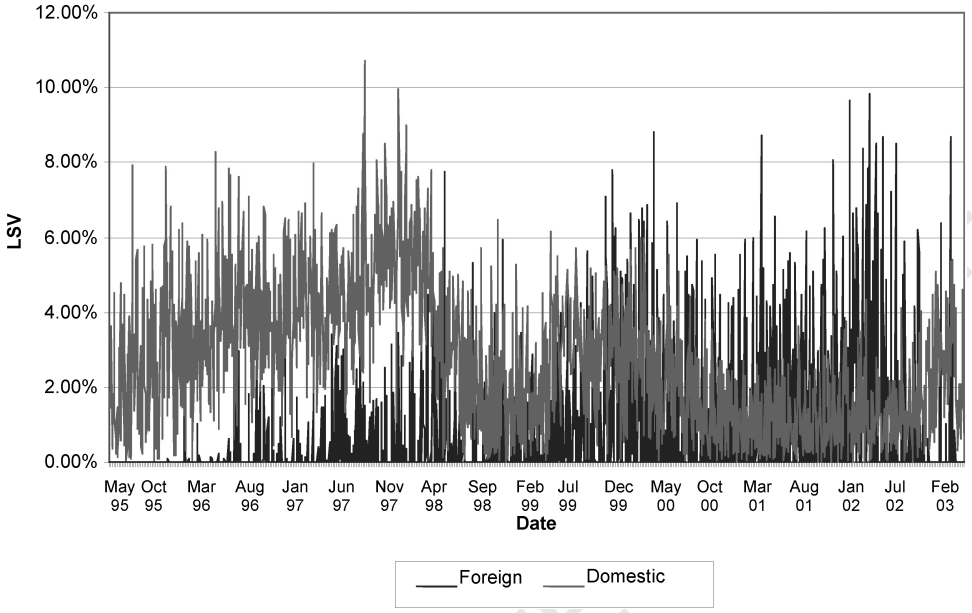

Figure III. Daily Cross-Brokerage LSV Herding Values: May 1995–May 2003. This figure shows the daily cross-brokerage LSV herding values at stock level over time for foreign and domestic investors, respectively. Cross-brokerage LSV herding is defined as:

$$H_{ijt}^{cb} = \left| \frac{FB_{ijt}}{FB_{ijt} + FS_{ijt}} - \frac{FB_{it}}{FB_{it} + FS_{it}} \right| - E\left| \frac{FB_{ijt}}{FB_{ijt} + FS_{ijt}} - \frac{FB_{it}}{FB_{it} + FS_{it}} \right|.$$

Here, FB_{ijt} represents the number of brokerage buyers from investor type i in stock j during period t, and FS_{ijt} represents the number of brokerage sellers from investor type i in stock j during period t. FB_{it} (FS_{it}) represents the number of brokerage buyers (sellers) aggregated across all stocks from investor type i during t. LSV = Lakonishok, Shleifer, and Vishny (1992).

types. In addition, a majority of transactions in which foreign investors are involved, acting as either buyers or sellers, are concentrated in a handful of large, liquid stocks. It would be interesting to know whether foreign and domestic herding is related to the characteristics of individual stocks. No clear relation emerges between herding behavior and firm size. However, we observe that domestic investors tend to exhibit more herding when trading large stocks than small stocks. Overall, firm size, or liquidity, plays a very limited role in explaining why foreign investors are more likely to herd than domestic investors.[5]

Order Data. We perform a robustness check by using all orders, including both executed and nonexecuted orders. This robustness test is motivated by two concerns. First, using trades or executed orders to measure herding cannot reflect

[5] We are happy to provide the results upon request.

TABLE 4. Buy-Herding versus Sell-Herding.

	All Executed Orders			Initiated Orders		
	Foreign LSV	Domestic LSV	F – D	Foreign LSV	Domestic LSV	F – D
Panel A. Stock Level						
Buying	11.93%	4.01%	7.91%	13.13%	9.14%	3.99%
	(1.71%)	(0.83%)	(1.92%)	(1.69%)	(0.63%)	(1.77%)
Selling	15.63%	1.61%	14.02%	18.23%	11.78%	6.44%
	(2.21%)	(0.91%)	(2.59%)	(2.43%)	(0.78%)	(2.36%)
Panel B. Within Brokerage						
Buying	22.58%	10.94%	11.64%	20.68%	11.34%	9.33%
	(1.92%)	(1.09%)	(2.21%)	(2.23%)	(1.05%)	(2.36%)
Selling	26.74%	7.35%	19.39%	28.43%	9.26%	19.18%
	(2.02%)	(1.25%)	(2.33%)	(2.45%)	(1.15%)	(2.64%)
Panel C. Across Brokerages						
Buying	0.88%	2.79%	−1.91%	3.31%	7.36%	−4.05%
	(1.70%)	(1.04%)	(2.02%)	(1.57%)	(0.77%)	(1.69%)
Selling	−0.11%	2.26%	−2.37%	1.02%	8.71%	−7.69%
	(1.65%)	(1.00%)	(1.87%)	(1.78%)	(0.73%)	(1.88%)

Note: This table reports the results for herding at a daily frequency for both domestic and foreign investors conditional on buying and selling. We adopt the methodology of Wermers (1999) to recalculate LSV measures conditioned on $p_{it} > E(p_{it})$ or on $p_{it} < E(p_{it})$ for buy-herding and sell-herding, respectively. Here, p_{it} is the proportion of foreign (domestic) investors buying stock i during period t among all foreign (domestic) investors trading that stock during t. $E(p_{it})$ is the expected value for p_{it}. Panel A reports the results of LSV herding measured at stock level. Panel B (Panel C) reports the results for herding within a brokerage firm (across brokerage firms). The differences between foreign and domestic investor herding measures (F – D) are also reported. The standard errors are reported in parentheses. LSV = Lakonishok, Shleifer, and Vishny (1992).

trading behavior of all investors who show a desire to buy and sell stocks. Investors whose orders are not being filled are not included in our analyses of previous sections. Second, according to Agarwal et al. (2009), domestic and foreign investors on the JSX show different behavior when submitting limit orders. For instance, foreign investors tend to submit more initiation orders, and they like to submit limit orders with more competitive prices. As a result, orders submitted by foreign investors are more likely to be executed than those submitted by their local counterparts. Computing LSV herding measures based on all orders mitigates the two concerns. Our results from the order sample are consistent with the findings in the previous sections.[6]

[6] Again, we are happy to provide the results upon request.

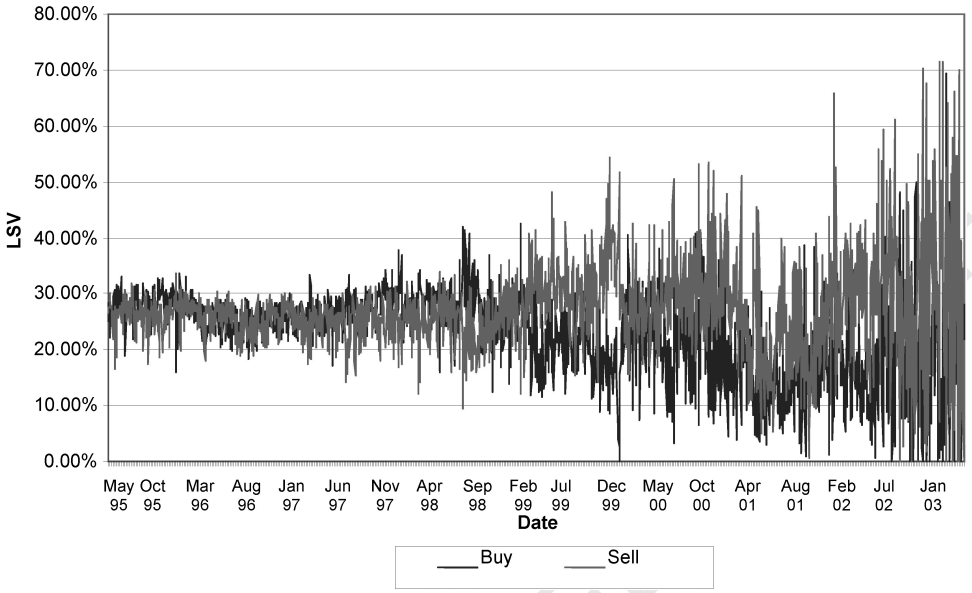

Figure IV. Buy- versus Sell-LSV Herding Values of Foreign Investors: May 1995–May 2003. This figure shows the daily within-brokerage LSV herding values of foreign investors over time. We adopt the methodology of Wermers (1999) to recalculate within-brokerage LSV measures conditioned on $p_{it} > E(p_{it})$ or on $p_{it} < E(p_{it})$ for buy-herding and sell-herding, respectively. Here, p_{it} is the proportion of foreign investors buying stock i during time period t among all foreign investors trading that stock during t. $E(p_{it})$ is the expected value for p_{it}. LSV = Lakonishok, Shleifer, and Vishny (1992).

Determinants of the Brokerage Effect on Herding

One of the most striking results from previous sections is that both foreign and domestic investors within a particular brokerage firm exhibit a strong tendency to herd, but their herding diminishes across brokerage firms, especially among foreign investors. Results from Table 3 appear to suggest a strong brokerage effect on the herding of domestic and foreign investors in the Indonesian stock market but a weak marketwide effect. These findings have important implications for understanding why investors herd in trading, an important unresolved issue.

If herding is driven by market sentiment, fads, informational cascades, and positive-feedback trading (Bikhchandani, Hirshleifer, and Welch 1992; Nofsinger and Sias 1999), it moves prices away from fundamentals and generates excess volatility. With this view, herding is a trading phenomenon displayed more at the marketwide level. However, if investors herd because they receive correlated private information (Froot, Scharfstein and Stein 1992; Hirshleifer, Subrahmanyam and Titman 1994), herding is rational and moves prices toward fundamentals. Given that investors from the same brokerage are more likely to share a similar set of

information or follow the same investment recommendations supplied by the brokerage firm, it is more likely to find herding within brokerage firms. Therefore, we are able to differentiate empirically between these views by comparing the relative importance of the brokerage effect and the marketwide effect on herding. The documented strong brokerage effect on herding by both domestic and foreign investors seems to be consistent with the view that herding is rational. To verify the assessment, we perform additional analyses to examine whether the within-brokerage herding is largely driven by acting on common information rather than following other investors blindly.

The first analysis is to investigate the relations between within-brokerage herding and brokerage characteristics. Our hypothesis is that if within-brokerage herding is driven by correlated information, brokerage firms with a greater research culture and larger research capacity should display more herding among their investors. An attempt to explicitly measure research culture and capacity for all brokerage firms is difficult. However, we can estimate a regression of within-brokerage LSV measures on a wide range of brokerage characteristics. Brokerage characteristics include the logarithm of the brokerage's total assets, the logarithm of the brokerage's total operating revenues, the brokerage's trading activity measured by the average ratio of the brokerage turnover to marketwide turnover on the stock day, and two variables that indicate whether the brokerage firm belongs to one of the three categories based on its client base.[7] One category includes brokerage firms that almost exclusively represent domestic investors, and another category includes those that represent both domestic and foreign investors. Among the 226 brokerage firms, we identify 55 firms representing a significant number of foreign and domestic clients. Furthermore, among these 55 brokerages, we pay special attention to seven global brokerage firms: ABN AMRO, HSBC, Nikko, Nomura, JPMorgan, Merrill Lynch, and UBS Warburg. They represent more foreign investors than domestic investors.

The results—reported separately for within-brokerage LSV measures based on all investors, domestic investors, and foreign investors (see Table 5)—suggest that those seven large-sized brokerages representing both domestic and foreign investors are associated with greater herding compared to other brokerages. The brokerage's trading activity is also positively correlated with within-brokerage herding. Furthermore, the seven global brokerage firms exhibit the highest level of herding. These results support the notion that a specific brokerage firm does play a role in an investor's decision-making process for stock trades.

Moreover, if strong within-brokerage herding is associated with common information, a testable hypothesis is whether it is also positively correlated with

[7]We collected the total assets and operating revenues data for all brokerage firms between 2000 and 2002. The results are based on information from 2000. Conclusions do not change when 2001 and 2002 data are used for the estimations.

TABLE 5. Regression of Within-Brokerage Herding.

	(1) LSV Measure All Investors	(2) LSV Measure Foreign Investors	(3) LSV Measure Domestic Investors
Constant	0.1388***	0.0684	0.0969
	(0.0432)	(0.0141)	(0.0684)
ln(Brokerage's total assets)	0.0070***	0.0110*	0.0054**
	(0.0033)	(0.0061)	(0.0025)
ln(Brokerage's operating revenues)	0.0088	0.0003	0.0002
	(0.0329)	(0.0006)	(0.0003)
Brokerage trading activity	2.4172***	1.1960***	2.3470***
	(0.1802)	(0.3410)	(0.1682)
Indicator for 55 brokerages	0.0286***	0.0755***	0.0118*
	(0.0077)	(0.0151)	(0.0062)
Indicator for 7 global brokerages	0.0734***	0.1314***	0.0433***
	(0.0162)	(0.0340)	(0.0151)
No. of observations	218	215	218
F-value	114.32	18.19	99.75
R^2	0.64	0.29	0.58

Note: The table reports the results of regressing of within-brokerage LSV herding measures on a wide range of brokerage characteristics. Results are reported separately for within-brokerage LSV herding measures based on all investors, foreign investors, and domestic investors. Brokerage characteristics include the logarithm of the brokerage's total assets, the logarithm of the brokerage's total operating revenues, the brokerage's trading activity measured by the average ratio of the brokerage turnover to marketwide turnover on the stock day, and two variables that indicate whether the brokerage firm belongs to one of the three categories based on its client base. The standard errors are reported in parentheses. LSV = Lakonishok, Shleifer, and Vishny (1992).

***Significant at the 1% level.
**Significant at the 5% level.
*Significant at the 10% level.

trading profitability. Dvorak (2005) finds that investors represented by global brokerage firms earn relatively higher profits in trading Indonesian stocks. Here, we conduct a test with an approach similar to Wermers (1999) and Wylie (2005). Specifically, on each trading day, all within-brokerage LSV herding measures are first categorized as buy-herding LSV or sell-herding LSV. Next, we compute the means of buy-herding LSV and sell-herding LSV, respectively, for each stock. Then, stocks are divided into quintiles of stocks based on the level of buy-herding LSV or sell-herding LSV on the herding day. Finally, the averages of one-day returns for the herding day, before and after the herding day for all stocks in each quintile, are calculated.

Table 6 reports the average of returns across the 1,972 herding days. The overall results suggest that the quintile of heavy (light) buy-herding is associated with relative higher (lower) returns one day after the herding period. In contrast, the quintile of heavy (light) sell-herding experiences relatively lower (higher) returns.

TABLE 6. Returns of Within-Brokerage Herding Quintiles Before and After Herding Day.

	All Investors			Foreign Investors			Domestic Investors		
Quintile	Day –1	Day 0	Day +1	Day –1	Day 0	Day +1	Day –1	Day 0	Day +1
Panel A. Buy-Herding									
BH1 (Light buying)	0.48% (6.29)	1.04% (12.82)	−0.09% (−1.29)	0.29% (3.11)	0.68% (6.69)	−0.05% (−0.45)	0.48% (6.61)	1.12% (14.33)	−0.19% (−2.84)
BH2	0.00% (0.01)	0.00% (0.02)	0.08% (1.27)	0.12% (1.35)	0.31% (3.08)	−0.04% (−0.54)	0.05% (0.69)	0.10% (1.28)	0.13% (1.90)
BH3	−0.29% (−4.53)	−0.46% (−7.29)	0.18% (2.75)	0.07% (0.90)	0.26% (3.19)	−0.04% (−0.48)	−0.29% (−4.29)	−0.55% (−8.06)	0.14% (3.58)
BH4	−0.35% (−6.16)	−0.66% (−11.06)	0.19% (2.92)	0.11% (1.43)	0.39% (5.09)	0.01% (0.07)	−0.48% (−7.61)	−0.75% (−13.09)	0.23% (3.39)
BH5 (Heavy buying)	−0.18% (−3.29)	0.17% (1.97)	0.29% (4.89)	0.18% (2.68)	0.47% (6.73)	0.22% (3.15)	−0.29% (−4.77)	−0.11% (−1.93)	0.25% (3.79)
Panel B. Sell-Herding									
SH1 (Light selling)	0.04% (0.52)	−0.23% (−3.13)	0.18% (2.63)	0.51% (5.62)	0.68% (5.98)	0.12% (0.28)	−0.21% (−2.97)	−0.60% (−8.07)	0.23% (3.37)
SH2	0.14% (1.87)	0.24% (3.26)	0.12% (1.80)	0.12% (1.22)	0.25% (2.76)	0.13% (0.43)	0.20% (2.68)	0.27% (3.59)	0.12% (1.73)
SH3	0.00% (0.05)	0.31% (4.77)	−0.10% (−1.64)	0.01% (0.10)	−0.17% (−2.00)	−0.04% (−0.76)	0.18% (2.69)	0.64% (9.27)	−0.14% (−2.00)
SH4	−0.10% (−1.73)	0.04% (0.62)	−0.05% (−0.75)	−0.37% (−5.17)	−0.31% (−3.26)	−0.01% (−0.61)	0.06% (0.94)	0.47% (7.42)	−0.09% (−1.36)
SH5 (Heavy selling)	−0.50% (−8.84)	−0.43% (−13.90)	−0.08% (−0.82)	−0.44% (−6.21)	−0.54% (−7.22)	−0.05% (−0.30)	−0.26% (−4.36)	0.38% (6.09)	−0.10% (−0.32)
BH5 – SH5	0.32% (2.32)	0.60% (3.22)	0.37% (2.98)	0.62% (4.35)	1.01% (5.33)	0.27% (1.86)	−0.03% (0.36)	−0.49% (2.35)	0.35% (2.23)

Note: On each trading day, all within-brokerage LSV herding measures are first categorized as buy-herding LSV or sell-herding LSV. Next, we compute the means of buy-herding LSV and sell-herding LSV, respectively, for each stock. Stocks are divided into quintiles of stocks based on the level of buy-herding LSV or sell-herding LSV on the herding day. The averages of one-day returns for the herding day, before and after the herding day for all stocks in each quintile, are calculated. The *t*-values are reported in parentheses. LSV = Lakonishok, Shleifer, and Vishny (1992).

The results are consistent with Dvorak (2005) given that the global brokerage firms exhibit the highest level of herding. They support the view that the brokerage effect on herding is more likely driven by correlated private information. It is interesting to note some differences in herding-day returns between foreign-investor-herding stocks and domestic-investor-herding stocks. Excluding the heaviest buying quintiles (BH5 in Table 6), stocks associated with buy-herding by foreign investors are more likely to have positive or higher returns on the herding days. In contrast, the returns are more likely to be negative or lower for stocks associated with buy-herding by domestic investors. The similar but opposite results are for sell-herding stocks: stocks associated with sell-herding by foreign investors are more likely to have negative or lower returns on herding days, whereas the returns are more likely to be positive or higher for stocks associated with sell-herding by domestic investors. A similar pattern is observed for returns one day before the herding day. This raises the question of whether the brokerage firm provides the same information

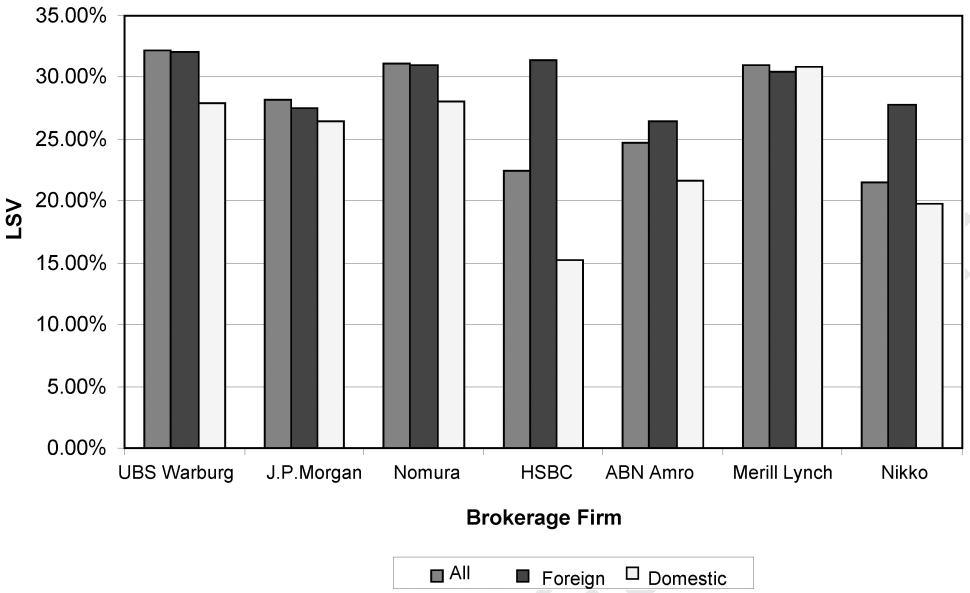

Figure V. LSV Values of All Investors, Domestic Investors, and Foreign Investors. This figure shows the means of daily within-brokerage LSV herding values separately for all investors, foreign investors, and domestic investors from each of seven global brokerage firms. LSV = Lakonishok, Shleifer, and Vishny (1992).

or recommends the same stocks to its domestic and foreign clients. To address the question, we compute LSV herding measures separately for all investors, domestic investors, and foreign investors from a particular brokerage firm. If both domestic and foreign clients receive the same recommendations and react accordingly, the LSV value for all investors should not decline dramatically compared to that for domestic or foreign investors. We graph the results for seven global brokerage firms in Figure V.[8] Both domestic and foreign investors associated with the seven global brokerage firms exhibit high level of herding. More important, LSV values for all investors are large and comparable to the values for foreign or domestic investors, which suggests that both foreign and domestic investors from brokerage firms with heavy trading activity present are more likely trade in the same direction. These results confirm our expectation that strong within-brokerage herding is primarily driven by common information from a particular brokerage firm.

[8] We also perform the same analysis by picking the 10 largest domestic brokerage firms. Results are similar.

IV. Concluding Remarks

We find that both domestic and foreign investors on the JSX exhibit significant herding behavior at the stock level, and such behavior is much stronger for foreign investors. After reexamining the investors' herding behavior at the brokerage firm level, we document two interesting phenomena. First, both domestic and foreign investors from a particular brokerage firm tend to buy and sell stocks together. The foreign investors exhibit more of a propensity to herd than domestic investors. Second, we find weak evidence of herding by domestic investors and no evidence of herding by foreign investors across brokerage firms. The results suggest that documented herding behavior is mainly displayed only among investors from a particular brokerage firm, especially with respect to foreign investors. We also find that investors from those large brokerages representing both domestic and foreign investors are more likely to herd than those from other brokerages. The clients of global brokerage firms exhibit the highest level of herding for both foreign and domestic investors. Furthermore, there is evidence of a positive relation between herding and trading profitability. Our results are consistent with the view that the strong brokerage firm effect on the herding of domestic and foreign investors is likely driven by common information from a particular brokerage firm. As a result, the herding is more a trading phenomenon displayed at the brokerage firm level than one displayed across the market.

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