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Foreign versus domestic institutional investors in emerging markets: Who contributes more to firm-specific information flow?

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ABSTRACT

Using a large sample of firms listed on the Korea Stock Exchange over 1998–2007, this study investigates whether and how trading by foreign and domestic institutional investors improves the extent to which firm-specific information is incorporated into stock prices, captured by stock price synchronicity. We find, first, that stock price synchronicity decreases significantly with the intensity of trading by foreign investors and domestic institutional investors. Second, trading by foreign investors facilitates the incorporation of firm-specific information into stock prices to a greater extent than trading by aggregate domestic institutions. Third, among domestic institutions with differing investment horizons, short-term investing institutions, such as securities and investment trust companies, play a more important role in incorporating firm-specific information into stock prices via their trading activities, compared with long-term investing institutions, such as banks and insurance companies. Finally, we provide evidence suggesting that trading by foreign and domestic short-term institutions reduces the extent of accrual mispricing. Our results are robust to a variety of sensitivity checks.

1. Introduction

The past 25 years have witnessed a growing trend in which many emerging countries have liberalized their stock markets, allowing foreign investors to invest directly in the equity securities of local firms. Foreign access

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to domestic equity markets has raised a number of interesting questions related to foreign investors' portfolio choice and performance. An important stream of research in the "home bias" literature investigates firm-specific factors that influence shareholdings by foreign investors. Although barriers to international investment in emerging markets have significantly reduced since market liberalizations, foreign investors may still face indirect barriers (Karolyi and Stulz, 2003). The home bias literature typically posits the information disadvantage of foreign investors, which influences their asset holdings and performance. For example, Kang and Stulz (1997) and Dahlquist and Robertsson (2001), using Japanese and Swedish data, respectively, find that foreign investors hold disproportionately more shares of large firms and firms with greater recognition or visibility in international markets. Bradshaw et al. (2004) find that U.S. investors prefer foreign firms that exhibit higher levels of conformity with U.S. Generally Accepted Accounting Principles. Covrig et al. (2006) find that foreign managers of mutual funds tend to overweight stocks that are globally well known, while domestic managers prefer stocks with large dividend payouts, low financial distress and high growth potential. Similarly, Leuz et al. (2009) provide evidence that U.S. investors are reluctant to invest in foreign firms with aggressive earnings management, especially those from countries with poor disclosure regimes. Overall, these studies suggest that foreigners prefer to invest in stocks with less information uncertainty to overcome their information disadvantages.

Another stream of research focuses on the investment performance of foreign investors vis-à-vis domestic investors and provides mixed evidence. For example, Shukla and Inwegen (1995), Brennan and Cao (1997) and Hau (2001) find evidence that local investors outperform foreign investors. In contrast, Seasholes (2004), Grinblatt and Keloharju (2000), Karolyi (2002) and Froot and Ramadorai (2008) provide evidence suggesting that foreign investors are more informed and outperform their domestic counterparts. In reconciling the mixed evidence on investor performance, Albuquerque et al. (2009) show the presence of global private information that gives an information advantage to international investors who are not as informed as local investors about local private information.

Since the aforementioned studies focus mainly on foreign investors' asset holdings and investment performance, little is known about the role of foreign and domestic institutional investors in influencing the information environment, particularly in emerging markets with less developed institutional infrastructures. To fill this gap, our study aims to provide systematic evidence on the following under-researched questions:

(1) Does trading by foreign and domestic institutional investors improve the flow of firm-specific information to the market?
(2) Do foreign investors play a more significant role in enhancing firm-specific information flow via their trading than domestic institutional investors?
(3) Does the informational role of domestic institutions differ according to their investment horizons?

To address these questions, we first investigate whether the trading of a firm's shares by foreign and local institutional investors improves firm-specific information flow to the market, particularly the extent to which firm-specific information is incorporated into stock prices relative to common (market-wide and/or industry-wide) information. In so doing, we measure the relative amount of firm-specific versus common information incorporated into stock prices, using stock price synchronicity, or co-movement. Lower stock price synchronicity means that stock prices covary with firm-specific factors to a greater extent than with common factors, leading to less synchronous or more informative stock prices (Durnev et al., 2003; Jin and Myers, 2006). To the extent that institutional investors, whether foreign or local, actively collect, process and trade on firm-specific information, we expect that their trading activities facilitate the incorporation of firm-specific information into stock prices, thereby reducing synchronicity.

Second, we examine whether and how foreign investors differ from domestic institutional investors in their roles of influencing the flow of firm-specific information to the market. Given that foreign investors in emerging markets are typically more sophisticated and have an information advantage of global information, it is interesting to examine whether or not our results on the informational effect of trading by foreign investors are driven by the fact that foreign investors are institutional investors. We evaluate this unexplored question by comparing the informational role of foreign trading with that of domestic institutional trading, using the latter as a benchmark.

Finally, we investigate whether domestic institutions with relatively short investment horizons are better able to facilitate firm-specific information flow, compared with domestic institutions with relatively long investment horizons. Previous research finds that the influence of institutional trading on managerial behavior and stock returns differs significantly, according to whether institutional investors are dedicated or transient institutions (Bushee, 1998, 2001) and whether they are short-term investors—who trade more actively—or long-term investors—who trade less actively (Yan and Zhang, 2009). To date, however, little is known about whether institutions with differing investment horizons play different roles in influencing the incorporation of firm-specific information into stock prices. To provide systematic evidence on this issue, we compare the informational role of domestic short-term institutions, such as securities and investment trust companies, with that of domestic long-term institutions, such as banks and insurance companies.

To assess the *firm-level* relation between the amount of firm-specific information incorporated into stock prices and the trading activities of foreign versus domestic institutional investors, we need to obtain firm-level data on trading by foreign and domestic institutional investors in a specific market. This paper takes advantage of the availability of such data in Korea. To our knowledge, Korea is one of few countries, if not the only one, in which detailed data on the shareholdings and trading of equity shares by foreigners and different types of domestic institutions are publicly available for listed companies. Foreigners investing in equity shares listed on the Korea Stock Exchange (KSE) are required to register with the Financial Supervisory Service (FSS). Since 1992, the FSS has kept track of the number of equity shares held by foreign investors and different types of domestic institutions for each stock listed on the KSE.[1] This data availability provides us with a unique setting in which to compare the informational role of foreign investors with that of domestic institutions and allows us to further evaluate any differences between the informational roles of domestic institutions with different investment horizons. In this regard, the Korean equity market is well suited to address our research questions. The Korean regulatory authority completely abolished limits on foreign equity ownership in 1998 (a year after the Korean financial crisis started). We analyze the informational role of foreign and domestic institutional investors in the Korean stock markets for the period 1998–2007, during which foreign ownership constraints were not binding. By limiting our sample to the post-crisis period, we effectively control for the potential effect of foreign ownership constraints, or "investability," on our results.[2]

Briefly, our results reveal the following: First, we document evidence that both foreign and domestic institutional investors play a significant role in facilitating the incorporation of firm-specific information into stock prices. Our regression results show that both types of investors contribute to reducing stock price synchronicity, or co-movement, via their trading activities. Second, we find that the informativeness-enhancing effect of foreign trading is significantly greater than the same effect associated with aggregate domestic institutional trading. This suggests that foreign investors are more actively involved in information-based trading and their trading activities accelerate the flow of firm-specific information into the market.

Third, we find that, among domestic institutions, securities and investment trust companies play a more significant role in facilitating the flow of firm-specific information to the market via their trading, compared with banks and insurance companies. Given that these securities and investment trust companies engage more actively in informed trading for short-term profits than banks and insurance companies, our results are

[1] Foreigners can hold Korean stocks by directly trading them or via indirect trades through foreign institutions. Therefore, there are two types of foreign investors in Korea: (i) foreign individuals who reside in and outside of Korea and (ii) branches/subsidiaries of foreign institutions domiciled in Korea and foreign institutions domiciled outside Korea. While the database we use, KIS-DATA of the Korea Investment Service (KIS), provides information about the aggregate numbers of shares held by "foreign investors" and different types of domestic institutions (i.e., securities companies, investment trust companies, banks, and insurance companies), it does not provide information about the decomposition of shareholdings by different types of foreign investors. However, our discussions with several FSS and KIS officials indicate, without exception, that foreign investors in Korea consist predominantly of foreign institutions. The percentage of shares traded by foreign individual investors participating directly in the Korean equity market is trivial during our sample period and thus the term *foreign investors* in the KIS database can be interpreted as foreign *institutional* investors. In this paper, the terms *foreigners*, *foreign institutional investors* and *foreign institutions* are therefore used interchangeably to refer to foreign investors.

[2] As is common in emerging markets, the foreign ownership limit differs across stocks within a country and across countries. Using an international sample of firms from 33 emerging market countries, Bae et al. (2004) show that the degree to which a stock can be owned by foreigners (or investability) is positively associated with return volatility. Further, Bae et al. (2012) find that greater investability is associated with the more efficient transmission of global market information into stock prices in emerging markets.

consistent with the view that institutional investors with relatively short investment horizons facilitate firm-specific information flow to the market to a greater extent than those with relatively long investment horizons. Finally, we provide evidence that accrual mispricing is mitigated for firms whose shares are actively traded by foreign investors and domestic short-term institutions, suggesting that foreign and domestic short-term institutional trading enhances the information environment of local firms. Overall, our results support the view that foreign investors and domestic short-term institutions engage more actively in information-based trading and thus play a more important role in facilitating the incorporation of firm-specific information into stock prices, compared with domestic long-term institutions.

This paper adds to the existing literature in the following ways. First, while many studies in the home bias literature examine foreign investors' preferences over stock characteristics and their trading patterns (e.g., Kang and Stulz, 1997; Choe et al., 1999; Ahearne et al., 2004; Covrig et al., 2006), they pay little attention to the impact of trading on the information environment in emerging markets. To our knowledge, our study is the first to investigate the impact of foreign trading on the information environment and compare it with that of domestic institutional trading.

Second, prior research suggests that institutional trading is an important channel through which firm-specific information is incorporated into stock prices (e.g., Chakravarty, 2001; Hartzell and Starks, 2003; Piotroski and Roulstone, 2004; Aslan et al., 2007; Ferreira and Laux, 2007). Piotroski and Roulstone (2004) show that firm-specific return variation (an inverse measure of synchronicity) is positively associated with trading by institutional investors. Ferreira and Laux (2007) provide evidence that institutional trading contributes more to the incorporation of private information into the stock prices of firms with greater openness to takeovers. Our study extends the results of Piotroski and Roulstone (2004) and Ferreira and Laux (2007) by offering a finer decomposition of institutional investors. We decompose institutional investors into foreign and domestic institutions and further classify domestic institutions into short-term and long-term investors based on the type of institution. Our analysis contributes to the related literature by adding new evidence that trading by foreign investors and domestic short-term institutions decreases stock price synchronicity or increases the amount of firm-specific information incorporated into stock prices, but trading by domestic long-term institutions does not.

This paper proceeds as follows. Section 2 develops our hypotheses. Section 3 explains the measurement of our research variables and specifies our main regression model. Section 4 describes the sample and data sources. Section 5 presents empirical results, including descriptive statistics and our main regression results. Section 6 presents empirical results using an alternative measure of firm-specific information flows. Section 7 conducts further analysis to examine the informational role of foreign and domestic institutional trading in the context of accrual pricing. The final section presents our conclusions.

2. Hypothesis development

Stock market liberalization in emerging markets facilitates the flow of investment funds from capital-abundant, developed countries to capital-scarce, developing countries. Using aggregate country-level data, several studies in the international finance literature show that this enhanced flow of foreign funds to domestic equity markets contributes to increasing domestic equity market values (Bekaert and Harvey, 2000), reducing the cost of raising equity capital (Stulz, 1999), boosting domestic investments (Henry, 2000) and enhancing financial market development and liquidity (Bekaert et al., 2005). This study argues that a country's stock market liberalization leads to an improvement in the information environment. Increased foreign access to domestic equity markets stimulates more research and information production by local and foreign analysts, brokerages and other market participants. It also spurs local firms to disclose more and better information. For example, local firms are prompted to set up an investor relations department to effectively cope with the ever-increasing demand for detailed information from foreign investors and to provide detailed financial information in foreign languages.[3]

[3] Since LG Electronics first established its investor relations department in 1994, many firms followed suit. Firms increasingly use voluntary disclosure to improve investor relations by communicating directly with investors. In 2007, Korean publicly traded firms, on average, made 1.82 times the number of voluntary disclosures annually (Korea Listed Companies Association).

Stock market liberalization also puts more pressure on securities market regulators to adopt accounting standards, disclosure rules and corporate governance practices that are comparable to international standards. Since opening its equity markets to foreign investors in 1992, the Korean government has made steady efforts to improve corporate transparency. Specifically, after the 1997 Asian financial crisis, the Korea Financial Supervisory Commission made substantial amendments to the Korean financial accounting standards to be more compatible with International Financial Reporting Standards, enhanced auditor independence with the introduction of class action lawsuits and improved corporate governance practices by strengthening minority shareholder rights and external monitoring mechanisms.[4]

In addition to its impact on a country's overall information environment, foreigner access to local equity markets also influences the information environment at the firm level. Foreign investors in emerging markets are typically sophisticated institutional investors, such as mutual funds and pension funds. In general, institutional investors, whether foreign or domestic, have more resources and expertise than individual investors. Institutional investors enjoy economies of scale in information acquisition and processing due to relatively low per-unit costs of acquiring and analyzing information, and are better at gleaning insights from public information such as published annual reports. Such investors can thus be considered what Kim and Verrecchia (1994) call "elite information processors." Their superior information is ultimately incorporated into stock prices via trading. In a related vein, Kim and Verrecchia (1994, 1997) present a scenario under which the low-frequency public release of information, such as earnings announcements, triggers agents with diverse information processing skills to generate new idiosyncratic insights from the public disclosure.[5] Consistent with these arguments, several studies show that institutional investors are better informed, on average, and trade actively to exploit their information advantage (e.g., Chakravarty, 2001; Hartzell and Starks, 2003; Piotroski and Roulstone, 2004; Aslan et al., 2007; Ferreira and Laux, 2007). Thus, to the extent that institutions' buying and selling decisions are guided by the firm-specific information they gather and analyze, we expect that the trading activities of institutional investors, whether foreign or domestic, facilitate the price formation process by promoting the incorporation of firm-specific information into stock prices, which in turn reduces stock price synchronicity. To provide direct evidence on the issue, we test the following hypothesis in alternative form:

H1. Stock price synchronicity decreases with the intensity of trading by foreign and domestic institutional investors.

When it comes to the relative information advantage of foreign versus domestic institutional investors, the empirical evidence to date is mixed. Shukla and Inwegen (1995) and Hau (2001) find that domestic investors have an information advantage over foreign investors. In contrast, Grinblatt and Keloharju (2000) and Karolyi (2002) show that foreign investors outperform domestic institutional investors in Finland and Japan, respectively. Seasholes (2004) provides evidence suggesting that foreign investors in Taiwan are better informed than domestic institutions.

On one hand, foreign investors may have a disadvantage in gaining access to private information that corporate insiders have, relative to domestic institutional investors, for the following reasons. Foreign investors investing in Korean stocks may have an information disadvantage due to distance, language and culture. In Korea, corporate governance is relatively weak, corporate ownership is highly concentrated in the hands of a few controlling shareholders or founding family members, firms' affiliations with large business groups are prevalent, internal transactions among related parties are common and value-relevant (inside) information is often shared exclusively within the closely held network of related parties, including corporate insiders, affiliated or subsidiary firms within the same business group, substantial shareholders, main creditors, major customers and input suppliers (Jacobson and Aaker, 1993; Jiang and Kim, 2004; Joh, 2003; Kim and Yi, 2006). In this environment, domestic institutional investors are more likely to have informal channels through which they can communicate with insiders (e.g., CEO, board members and controlling shareholders), compared with foreign investors. As a result, foreign investors are likely to be informationally disadvantaged in local markets,

[4] For example, as part of post-crisis governance reforms, Korean listed companies are now required to have independent, non-executive directors on the board and to establish an audit committee under the board.

[5] Barron et al. (2002) find that public accounting disclosures trigger the production of significant idiosyncratic information.

compared with domestic institutions. Foreign investors may have to bear relatively high information costs to overcome this disadvantage. This information problem may discourage informed trading by foreign investors and potentially impede the incorporation of firm-specific information into stock prices (e.g., Grossman and Stiglitz, 1980; Roll, 1988; Morck et al., 2000), which in turn leads to less informative stock prices.

On the other hand, foreign investors may be better informed. Foreign investors in emerging markets are part of global investment companies who hold foreign stocks from multiple countries in their portfolios and rebalance their portfolios when new information arrives. Some of them are also located in world financial centers such as New York and London, which enables them quick access to better information and provides them with better learning opportunities through the transfer of information, skills and ideas. For example, Christoffersen and Sarkissian (2009) provide evidence that U.S. mutual funds located in financial centers perform better than other funds located elsewhere because managers of funds in financial centers can have better learning opportunities, which leads to performance improvements. These investors with global portfolios of equity shares are more likely to have a better understanding of, and the superior ability to collect and analyze, global business and investment factors (e.g., oil price trends and foreign currency fluctuations) that simultaneously influence the stock prices of multiple firms in many countries around the world. In particular, the Korean economy has a relatively high exposure to global business factors as its dependence on overseas demand for Korean products and overseas supply of non-labor inputs has been growing year after year.[6] As a result, the Korean economy is susceptible to external global shocks, such as oil price changes or currency movements. In fact, foreign investors may not only have better access to global information, they may also process global data and convert it into private information. To the extent that foreign investors have information about these business factors influencing the future prospects of Korean companies, we expect that foreign investors may have a relative information advantage over local institutions in Korea.

Given the two opposing perspectives on the relative information advantage of foreign investors vis-à-vis domestic institutional investors, it is an empirical question whether there are any differences in the informational roles that foreign and domestic institutional investors play in emerging markets. To provide direct evidence on this under-researched issue, we test the following hypothesis in alternative form.

H2. Trading by foreign investors decreases stock price synchronicity to a greater extent than trading by domestic institutions.

There are three different types of domestic institutional investors in Korea: (1) securities (or investment brokerage) and investment trust companies, including investment advisory companies; (2) insurance companies; and (3) banks, including short-term and long-term lending institutions. In general, institutions act as agents for other investors. They are thus constrained by various legal restrictions, such as the prudent-man laws, that purport to protect small individual investors. Among institutions, banks and insurance companies are subject to more stringent prudence standards, affecting their investment patterns and horizons (Del Guercio, 1996). In addition, when it comes to investing in equity shares, Korean banks and insurance companies are subject to the investment limits imposed under the Banking Act and Insurance Business Act, respectively, whereas no such regulations restrict securities and investment trust companies. Further, banks and insurance companies are more likely to have business relations with the local companies in which they invest, compared with securities and investment trust companies (Gillian and Starks, 2003; Aggarwal et al., 2011).[7] As a result, domestic banks and insurance companies hold shares of other companies primarily for the purposes of maintaining business relations and/or long-term investment purposes, and thus are less likely to trade shares for short-term profits,[8] while domestic securities and investment trust companies are more likely to engage actively in infor-

[6] According to the Bank of Korea, exports accounted for 55% of the nation's gross national income in 2008, which is well above Japan's 22% and the U.S.'s 18.5%.

[7] As an example, Samsung Life Insurance can manage the pension funds of many Korean listed companies and provide them with a company-wide group life insurance policy.

[8] In Korea, banks and insurance companies hold a large proportion of the voting rights of a firm to maintain their relationships or affiliations with the firm as a client or business partner. As such, their equity stakes can be viewed, in large part, as the holding of debt (Baek et al., 2004). Del Guercio (1996) provides evidence that institutional investors governed by prudent-man laws (e.g., pension funds and insurance companies) tend to hold stocks with certain characteristics for longer,

mation-based trading for short-term profits. One can therefore expect that, among the different types of domestic institutions, securities and investment trust companies play a more important role in facilitating the incorporation of firm-specific information into stock prices via their trading activities.

Given the scarcity of evidence on this issue, particularly in the context of an emerging market, we aim to provide systematic evidence on whether the informational roles of different domestic institutions differ according to their investment horizons. For this purpose, we hypothesize the following in alternative form:

H3. Trading by domestic institutions with short investment horizons decreases stock price synchronicity to a greater extent than trading by domestic institutions with long investment horizons.

3. Measurement of variables and model specification

3.1. Stock price synchronicity

A key dependent variable in our study is stock price synchronicity, which captures the extent to which individual stock returns co-move with common factors. The total variation of a firm's stock return can be decomposed into two components: (1) common return variation, that is, the return volatility associated with common (market-wide and industry-wide) factors, and (2) firm-specific return variation, that is the return volatility associated with firm-specific factors. Similar to other studies (e.g., Morck et al., 2000; Jin and Myers, 2006; Gul et al., 2010), we measure stock price synchronicity using the R^2 statistics from an augmented market model. Specifically, we estimate the following model using weekly return data for each stock:

$$r_{j,k,t} = \alpha_j + \beta_{j1} r_{m,t} + \beta_{j2}(r_{us,t} + e_{j,t}) + \beta_{j3,} r_{k,t} + \varepsilon_{jt} \tag{1}$$

where $r_{j,k,t}$ is the return on firm j in industry k at week t; $r_{m,t}$ is the Korea market index return at week t; $r_{us,t}$ is the U.S. market index return at week t; $e_{j,t}$ is the change in the exchange rate per U.S. dollar at week t; and $r_{k,t}$ is the value-weighted weekly return of industry k at week t, which is computed using all firms with the same two-digit code of the Korean Standard Industry Classification (KSIC), with firm j's weekly return excluded. Stocks are included in our sample if more than 40 weeks of data are available during a particular year. Eq. (1) includes U.S. stock market returns to control for the global market factor.[9]

Let σ_j^2 and $\sigma_{j\varepsilon}^2$ denote the total return variation and firm-specific return variation, respectively, of Eq. (1). Common return variation is then measured by $\sigma_j^2 - \sigma_{j\varepsilon}^2$. For each firm in the sample, we compute the *relative* common return variation for each stock using the ratio of common return variation to total return variation, that is, $(\sigma_j^2 - \sigma_{j\varepsilon}^2)/\sigma_j^2$. Note here that R_j^2 of Eq. (1) is equal to this ratio, while $1 - R_j^2$ of Eq. (1) is equal to $\sigma_{j\varepsilon}^2/\sigma_j^2$. We then obtain our measure of stock price synchronicity, denoted by *Synch*, for firm j in each year as

$$Synch_j = \log\left(\frac{\sigma_j - \sigma_{j\varepsilon}}{\sigma_{j\varepsilon}}\right) = \log\left(\frac{R_j^2}{1 - R_j^2}\right) \tag{2}$$

The logarithmic transformation is applied to circumvent the bounded nature of R_j^2 within $[0, 1]$. By construction, high values of *Synch* mean a higher level of common return variation relative to firm-specific return variation.

3.2. Empirical model

To examine the effect of trading by foreign versus domestic institutional investors on stock price synchronicity, we estimate the following regression model:

[9] In Eq. (1), the expression $r_{us,t} + e_{j,t}$ translates U.S. market returns into local currency units.

$$Synch_{jt} = \beta_0 + \beta_1 FORV_{jt} + \beta_2 DOMV_{jt} + \beta_3 \log(1 + \#ANAL)_{jt} + \beta_4 \log MVE_{jt} + \beta_5 LEV_{jt} + \beta_6 MB_{jt} + \beta_7 SROA_{jt} + \beta_8 HERFIN_{jt} + \beta_9 CHAEBOL_{jt} + \beta_{10} GDR_{jt} + \beta_{11} BIG4_{jt} + \beta_{12} AveVol_{jt} + (IndustryDummies) + (YearDummies) + error \quad (3)$$

where empirical definitions of all variables are provided in the Appendix and the dependent variable, *Synch*, for firm *j* and year *t*, is as defined in Eq. (2). Our proxy for the intensity of foreign trading, *FORV*, is the total number of shares purchased and sold by foreign investors as a fraction of the annual trading volume. Our proxy for the intensity of trading by domestic institutional investors, *DOMV*, is the total number of shares purchased and sold by different domestic investing institutions (i.e., securities and investment trust companies, banks, and insurance companies) as a fraction of the annual trading volume.

As control variables, we include firm-level variables that are deemed to influence *Synch*. Previous research shows that stock price synchronicity is positively related to the intensity of analyst activity in the U.S. market (Piotroski and Roulstone, 2004; Hameed et al., 2010), in emerging markets (Chan and Hameed, 2006) and around the world (Kim and Shi, 2010). We include the log-transformed measure of the number of analysts issuing earnings forecasts, that is, $\log(1 + \#ANAL)$, to control for this effect of analyst activity on *Synch*.[10] We include market capitalization ($\log MVE$), leverage (*LEV*) and the market-to-book ratio (*MB*) to control for the potential impacts of firm size, financial risk and growth potential, respectively, on *Synch*. Evidence shows that synchronicity is also inversely related to earnings volatility (e.g., Piotroski and Roulstone, 2004; Kim and Shi, 2010). We include earnings volatility, *SROA*, to control for the effect of this negative relation on our results, where *SROA* is measured by the standard deviation of return on assets (ROA) over the past five years using 10 half-year earnings observations. It is likely that firm performance is more interdependent among firms within a concentrated industry. In such a case, information that is specific to a firm is more likely to have valuation implications to other firms in the same industry. This can result in a higher level of intra-industry information transfer, which can lead to more synchronous stock prices (Piotroski and Roulstone, 2004). To control for this possibility, we include industry concentration (*HERFIN*), which is measured by the sales revenue-based Herfindahl index of industry-level concentration, where the industry is defined by its two-digit KSIC code.

Chaebols (large business groups or conglomerates) play a dominant role in the Korean economy. Prior to the Korean financial crisis in 1997, a top-30 chaebol controlled, on average, 26 firms in a variety of industries (Kim and Yi, 2006). Like other business groups in emerging markets, Korean chaebols can be viewed as a collection of diverse business enterprises in a wide range of industries, typically controlled by members of a founding family. Similar to *keiretsu* in Japan, the top-30 chaebols are highly diversified business groups with a nexus of explicit and implicit contracts that closely tie affiliated firms to one another, and often share value-relevant inside information exclusively with affiliated firms. Compared with independent firms, firms affiliated with large business groups in emerging markets may afford their controlling shareholders more opportunities for internal transactions through intra-group trading and internal financial markets for their private gains (Hubbard and Palia, 1999; Khanna and Palepu, 2000; Joh, 2003). This would provide chaebol-affiliated firms with more opportunities and means for managerial opportunism relative to independent firms. Consistent with the above argument, Kim and Yi (2006) find that chaebol-affiliated firms in Korea engage more aggressively in opportunistic earnings management compared with standalone firms. We include an indicator variable, *CHAEBOL*, to control for the potential effect of chaebol membership on the flow of firm-specific information to the market.

Fernandes and Ferreira (2008) document that cross-listing leads to a decrease in stock price synchronicity, particularly for firms in developed markets. We include an indicator variable representing the presence of cross-listing in overseas stock markets, denoted by *GDR*, to control for the effect of cross-listing on our results.

[10] To further examine whether foreign analysts' activities influence stock price synchronicity similar to foreign institutional trading activities, we define domestic analysts as ones forecasting earnings only for Korean firms in the Institutional Brokers' Estimate System (IBES) database. Using this definition, in lieu of $\log(1 + \#ANAL)$, we separate analyst coverage into foreign coverage ($\log(1 + \#ForeignANAL)$) and domestic coverage ($\log(1 + \#DomesticANAL)$) and estimate Eq. (4). We find that domestic coverage is positively related to stock price synchronicity, while foreign coverage is insignificantly related.

Extant evidence suggests that the quality of accounting disclosure is positively associated with audit quality in the U.S. (e.g., Reed et al., 2000), in East Asian countries (e.g., Mitton, 2002; Fan and Wong, 2005) and around the world (Choi and Wong, 2007; Choi et al., 2008). Large auditors, such as international Big 4 audit firms, are more likely to limit managerial discretion over opportunistic earnings management and thus help improve the credibility of published financial statements, which may, in turn, facilitate the flow of more credible, firm-specific information to the market. However, in Korea, their effect on synchronicity may be limited, because Big 4-affiliated auditors in Korea only have a member firm relationship with large local audit firms, and are not allowed to run their own operations in Korea. We include an indicator variable, *BIG4*, to control for audit quality differentiation between Big 4-affiliated and non-Big 4-affiliated auditors. We also include the average daily trading volume (*AveVol*) to control for the effect of liquidity. Industry dummies are included to control for industry fixed effects.

4. Sample and data

4.1. Foreign equity ownership in Korea

In 1992, foreigners were allowed for the first time to own equity shares of Korean firms. As summarized in Table 1, the ownership limit for foreign investors has increased since 1992, reflecting the Korean government's policy of gradually liberalizing Korean stock markets to the global investment community. The ownership limits for each individual foreign investor were 3% of a firm's shares outstanding in 1992, 4% in April 1996, 5% in October 1996, 6% in May 1997, 7% in November 1997, and 50% in December 1997—the starting month of the Korean financial crisis—and were completely lifted in May 1998. In addition to an individual ownership limit, the FSS imposed a limit for foreign investors as a group. In 1992, this aggregate ownership limit was 10%, meaning that foreigners as a group could own only up to 10% of the equity shares outstanding of a Korean firm listed on the KSE. The aggregate limit was increased to 12% in December 1994 and then gradually increased to 26% by November 1997. During the starting month of the Korean financial crisis, the aggregate limit increased to 55% and was completely lifted in May 1998.

Table 2 presents summary statistics of foreign equity ownership in Korea by year for the period 1992–2007. The second column of Table 2 provides the total number of shares (in millions of shares) owned by foreign investors. The numbers in parentheses represent the percentage of shares owned by foreign investors relative to total shares outstanding. This equally weighted measure of foreign ownership increased gradually from 4.1% in 1992 to 11.5% in 1996. It then decreased to 9.1% in 1997, reflecting an outflow of foreign equity investment during the Korean financial crisis. The post-crisis period, during which the foreign ownership limit was completely lifted, witnessed a stable increase in foreign ownership, from 10.5% in 1998 to a peak of 22.9% in 2005. The last column of Table 2 reports the market value (in billions of Korean won) of shares owned by

Table 1
Changes in shareholding limits for each foreign individual and foreigners as a group (as a percentage of the total number of shares outstanding). *Source*: FSS.

	Individual limit (%)	Aggregate limit (%)
January 1992	3	10
December 1994	3	12
July 1995	3	15
April 1996	4	18
October 1996	5	20
May 1997	6	23
November 1997	7	26
December 1997	50	55
May 1998	No ceiling	No ceiling

The individual limit represents the percentage of equity shares each individual foreigner is allowed to hold. The aggregate limit represents the percentage of equity shares that foreigners as a group are allowed to hold.

Table 2
Number and market value of shares held by foreign investors in each sample year. *Source*: FSS.

Year	Number of shares held by foreign investors (millions of shares), as a percentage relative to the total number of shares	Market value of shares held by foreigners (billions of Korean won), as a percentage relative to total market capitalization
1992	220.2	n/a
	(4.1%)	
1993	503.0	n/a
	(8.7%)	
1994	634.8	15,402
	(9.2%)	(10.2%)
1995	762.3	16,723
	(10%)	(11.9%)
1996	989.2	15,222
	(11.5%)	(13%)
1997	819.8	10,358
	(9.1%)	(14.6%)
1998	1204.1	25,633
	(10.5%)	(18.6%)
1999	2136.8	76,590
	(12.3%)	(21.9%)
2000	2731.1	56,558
	(13.9%)	(30.1%)
2001	2869.2	93,698
	(14.7%)	(36.6%)
2002	3054.5	93,160
	(11.5%)	(36.0%)
2003	4259.1	142,534
	(18%)	(40.1%)
2004	5514.1	173,158
	(22%)	(41.9%)
2005	5334.9	260,262
	(22.9%)	(39.7%)
2006	5563.1	262,533
	(22.2%)	(37.2%)
2007	5347.9	308,180
	(18.9%)	(32.3%)

foreign investors. The numbers in parentheses represent this market value's percentage of the total market capitalization of all firms listed on the KSE. This value-weighted measure of foreign ownership is greater than the equally weighted measure across all years and the difference between the two measures has increased over years since the 1997 crisis. This difference indicates that foreign investors hold disproportionately more shares of large firms in their portfolios, a characteristic that became increasingly pronounced during the post-crisis period of 1998–2007.

4.2. Sample construction

Our sample construction begins with the list of non-financial firms included in the 2007 *KIS-DATA* file compiled by the Korea Investment Service, a subsidiary of Moody's Investment Service.[11] The KIS-DATA file includes financial statement data and ownership-related data, including the number of shares held by foreign investors, domestic institutions by type (i.e., securities and investment trust companies, banks, and insurance companies) and the largest shareholder for all firms listed on the KSE. All stock return data are gathered from Data stream and trading volume data are obtained directly from the KSE. The number of analysts following a firm is obtained from the IBES International Summary. We exclude firms in regulated

[11] Kang and Stulz (1997) exclude firms in the financial service industry from their Japanese sample.

Table 3
Distribution of sample firms by year.

Year	Number of firms	Percentage
1998	434	9.63
1999	437	9.69
2000	399	8.85
2001	427	9.47
2002	405	8.98
2003	512	11.36
2004	443	9.83
2005	442	9.80
2006	489	10.85
2007	520	11.54
Total	4508	100

industries (e.g., utilities and telecommunications) and firms with negative sales or negative total assets in a particular year.[12]

Our final sample consists of 4508 firm–year observations for the 10-year post-crisis period of 1998–2007, during which the foreign ownership limit was completely lifted. Restricting our sample to the post-crisis observations allows us to effectively control for the potential effect of the foreign ownership constraint on our results. We winsorize all continuous variables at the 1st and 99th percentiles to mitigate the effects of extreme observations. Table 3 provides the number of firms included in our sample and their percentage relative to total firm–year observations by year.

5. Empirical results

5.1. Descriptive statistics

Table 4 presents the distributional properties of our research variables. The R^2 statistics refer to the coefficient of determination for Eq. (1), while *Synch* is our log-transformed measure of stock price synchronicity in Eq. (2). As shown in Panel A of Table 4, the mean and median R^2 are 0.266 and 0.245, respectively. The mean R^2 of 0.266 is greater than the reported mean R^2 of 0.193 for the U.S. sample of Piotroski and Roulstone (2004), though it is lower than the reported mean R^2 of 0.454 for the Chinese sample of Gul et al. (2010), suggesting that the stock prices of Korean firms are more (less) synchronous than those of U.S. (Chinese) firms. Panel B of Table 4 provides descriptive statistics for the *PIN* measures that are inversely related to *Synch*. The *PIN* measure appears to be reasonably distributed, with a mean (median) of 0.215 (0.213) and a standard deviation of 1.175.

Panel C of Table 4 presents the distributional properties of *FORV*, *DOMV* and two components of *DOMV*, that is, *STDV* and *LTDV*, where $DOMV = STDV + LTDV$. These four trading intensity measures represent the total number of shares traded (i.e., purchased and sold) per year by foreign investors, domestic institutions, domestic short-term institutions (i.e., securities and investment trust companies) and domestic long-term institutions (i.e., bank and insurance companies), respectively, as a fraction of the annual trading volume.[13] As shown in Panel C of Table 4, the distributions of these trading measures appear to be skewed, and foreign investors and domestic institutions, on average, traded about 10% and nearly 19%, respectively, of total shares outstanding. Consistent with our expectations, both the mean and median values of *STDV* are greater than those of *LTDV*, suggesting that domestic short-term institutions trade more intensely than domestic long-term institutions.

[12] Several firms in regulated industries (e.g., utilities and telecommunications) are subject to other types of regulatory limits of foreign ownership, even after 1998. These companies are excluded from our sample.

[13] We also run our analyses using the log-transformed measures of *FORV*, *DOMV*, *STDV* and *LTDV*. The results (unreported) are qualitatively similar.

Table 4
Descriptive statistics.

	Q1	Mean	Median	Q3	Std. dev.	*N*
Panel A: Stock price synchronicity						
R^2	0.129	0.266	0.245	0.386	0.170	4508
Synch	−1.904	−1.297	−1.124	−0.463	1.175	4508
Panel B: Probability of informed trading measure						
PIN	0.185	0.215	0.213	0.246	0.054	2933
Panel C: Variables of interest used in main regressions						
FORV	0.003	0.103	0.020	0.101	0.191	4508
DOMV	0.015	0.188	0.092	0.308	0.220	4508
STDV	0.007	0.126	0.050	0.201	0.163	4508
LTDV	0.006	0.061	0.031	0.097	0.073	4508
Panel D: Control variables						
log(1 + #*ANAL*)	0.000	0.656	0.000	1.100	0.779	4508
log *MVE*	16.940	18.089	17.786	18.956	1.643	4508
LEV	0.348	0.492	0.493	0.634	0.195	4508
MB	0.346	0.898	0.594	1.060	0.949	4508
SROA	0.022	0.048	0.035	0.055	0.048	4508
HERFIN	0.017	0.064	0.023	0.096	0.069	4508
CHAEBOL	0.000	0.221	0.000	0.000	0.415	4508
GDR	0.000	0.036	0.000	0.000	0.187	4508
BIG4	0.000	0.479	0.000	1.000	0.499	4508
AveVol	0.004	0.012	0.009	0.020	0.063	4508

All variables are defined in Appendix B.

Panel D of Table 4 reports descriptive statistics for the control variables included in Eq. (3), together with other control variables used in simultaneous estimations. In general, our sample firms display considerable cross-sectional variation in log(1 + #*ANAL*), *LEV*, *MB*, *SROA* and *HERFIN* as reflected in the large standard deviations relative to their mean values. Descriptive statistics for our size variable (log *MVE*) suggest that it is reasonably distributed, though its cross-sectional variation is not large relative to other variables. On average, about 22% of our sample firms are affiliated with chaebols, while 3.6% of our sample firms are cross-listed on overseas stock markets via Global Depository Receipts (GDRs). On average, only about 48% of our sample firms have their financial statements audited by Big 4-affiliated audit firms. Given that about 85% of U.S. firms are audited by Big 4 auditors (e.g., Kim et al., 2003), the evidence in Table 4 indicates that Big 4-affiliated auditors in Korea have a much smaller market share in the Korean audit market than in the U.S. market.

5.2. Results of main regressions

Table 5 presents the results of our main regression in Eq. (3). Throughout the paper, all reported *t*-values for the estimated coefficients are on an adjusted basis using standard errors corrected for firm and year clustering.[14] As shown in column 1 of Table 5, we find that the coefficient of the intensity of foreign trading, *FORV*, is significantly negative at the 1% level, suggesting that stock price synchronicity decreases significantly with the intensity of foreign trading. As shown in column 2 of Table 5, when we add the intensity of domestic institutional trading to that of foreign trading, we find that both the coefficients of *FORV* and *DOMV* are significantly negative at the 1% and 10% levels, respectively (−0.513 with $t = -2.94$ and −0.225 with $t = -1.94$, respectively). This is consistent with H1, suggesting that institutional trading, whether foreign or domestic, accelerates the incorporation of firm-specific information into stock prices, thereby reducing stock price synchronicity.

[14] See Petersen (2009) for a detailed discussion about the use of clustered standard errors as a means to correct residual correlations in panel data.

Table 5
Effect of foreign and domestic institutional trading on stock price synchronicity.

Variable	Dependent variable = *Synch*					
	(1)		(2)		(3)	
	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
FORV	−0.559	−3.14[a]	−0.513	−2.94[a]	−0.558	−2.95[a]
DOMV			−0.225	−1.94[c]		
STDV					−0.836	−2.17[b]
LTDV					−0.159	−0.26
log(1 + #*ANAL*)	0.135	2.40[b]	0.142	2.48[b]	0.144	2.48[b]
log *MVE*	0.170	3.87[a]	0.184	4.25[a]	0.181	4.23[a]
LEV	0.014	0.12	−0.010	−0.35	−0.009	−0.35
MB	0.000	0.06	0.000	0.02	0.000	0.01
SROA	−0.916	−2.80[a]	−0.931	−2.85[a]	−0.927	−2.82[a]
HERFIN	−0.006	−0.10	−0.024	−0.17	−0.016	−0.16
CHAEBOL	0.263	4.77[a]	0.265	4.81[a]	0.261	4.78[a]
GDR	0.158	1.67[c]	0.138	1.56	0.153	1.62
BIG4	0.079	2.38[b]	0.079	2.40[b]	0.080	2.39[b]
AveVol	−0.753	−1.15	−1.098	−1.32	−1.073	−1.29
Intercept	−4.667	−5.94[a]	−4.868	−6.26[a]	−4.833	−6.22[a]
Industry dummy	Yes		Yes		Yes	
Adjusted R^2	0.248		0.249		0.249	
N	4508		4508		4508	

The superscripts a, b and c denote the 1%, 5% and 10% levels of significance, respectively, using a two-tailed test. All variables are defined in Appendix B. Reported *t*-values are on an adjusted basis using standard errors corrected for clustering by firm and by year.

In column 3 of Table 5, we decompose domestic institutional trading, namely, *DOMV*, into (i) trading by short-term institutions such as securities and investment trust companies that have a relatively short investment horizon, *STDV*, and (ii) trading by long-term institutions such as banks and insurance companies that have a relatively long investment horizon, *LTDV*. We then include these two proxies in lieu of *DOMV* in our regression. This decomposition allows us to evaluate whether investment horizons differentially influence the informational role of domestic institutions. We find that the coefficient of *STDV* is significant at the 5% level with an expected negative sign, while the coefficient of *LTDV* is negative but insignificant at any conventional level. The above results are consistent with H2, suggesting that domestic short-term institutions play a more important role in facilitating the incorporation of firm-specific information into prices via their trading activities, compared with domestic long-term institutions. The above finding is consistent with that of Yan and Zhang (2009), who find that in the U.S. market, short-term institutions are better informed than long-term institutions.

Turning back to the results in column 2 of Table 5, we find that, while the coefficients for both *FORV* and *DOMV* are significantly negative, the coefficient of *FORV* is significantly greater in its absolute magnitude than the coefficient of *DOMV* ($p = 0.05$, one-tailed test). This finding is consistent with H3, suggesting that the *Synch*-reducing effect of foreign trading observed is not driven by the fact that foreign investors are institutional investors. Rather, the results are consistent with the view that foreign investors are better informed and more actively involved in informed trading than domestic institutions. Stated another way, foreign investors have superior ability to collect and process firm-specific information than domestic institutions, and tend to trade more intensely on it. As a result, trading by foreign investors accelerates firm-specific information capitalization into stock prices in a more accurate and timely manner, compared with trading by domestic institutions.

As shown in column 3 of Table 5, however, when we decompose domestic investing institutions into securities and investment trust companies (with a relatively short investment horizon) and non-securities companies such as banks and insurance companies (with a relatively long investment horizon), we find that the coefficients of both *FORV* and *STDV* are significant with an expected negative sign at the 1% and 5% levels, respectively, while the coefficient of *LTDV* is insignificant at any conventional level. This result suggests that

the synchronicity-reducing effect of domestic institutional trading observed in column 2 of Table 5 is driven, in large part, by trading by domestic short-term institutions, and not by domestic long-term institutions. We also find that the coefficient of $STDV$ is not significantly different in magnitude from that of $FORV$ ($p = 0.18$, one-tailed test), suggesting that both foreign investors and domestic short-term institutions facilitate firm-specific information flow to the market to a similar degree. In short, the results reported in Table 5, taken together, indicate that both foreign investors and domestic short-term institutions contribute more to the incorporation of firm-specific information into stock prices via their trading activities than domestic long-term institutions.

With respect to the estimated coefficients of control variables, the following is apparent. First, the coefficient of $\log(1 + \#ANAL)$ is significantly positive at the 5% level across all columns of Table 5, indicating that synchronicity increases with analyst following. This is in line with the finding of previous research, that stock prices become more synchronous as analyst activities become more intense in the U.S. market (Piotroski and Roulstone, 2004; Hameed et al., 2010), in emerging markets (Chan and Hameed, 2006) and around the world (Fernandes and Ferreira, 2008; Kim and Shi, 2010), because analysts engage primarily in the production and dissemination of common (industry-wide and/or market-wide) information, as opposed to firm-specific information. Second, we find that the coefficient of $\log MVE$ is significantly positive across all columns, reflecting that large firms have more synchronous prices. Third, we find that synchronicity decreases significantly with earnings volatility ($SROA$). Fourth, we find a significantly positive coefficient for $CHAEBOL$, suggesting that stock prices are more synchronous for chaebol-affiliated firms. Finally, contrary to our expectations, we find that synchronicity is higher for firms who appoint Big 4-affiliated auditors than for those with non-Big 4-affiliated auditors.

5.3. Does the level of institutional holdings matter?

Previous research uses the level of institutional holdings as a proxy for institutions' information advantage when examining the informational role of institutions (e.g., Jiambalvo et al., 2002; Yan and Zhang, 2009). On one hand, higher shareholdings may enable institutional investors to gain access to firm-specific private information. This suggests that the level of institutional holdings is inversely related to synchronicity. On the other hand, institutions that follow index investment strategies or section-based strategies are more likely to have an information advantage with respect to industry- or market-level information, which contributes to improving intra-industry information transfers. This view suggests a positive relation between institutional holdings and synchronicity. To see whether our results reported in Table 5 are driven by the omission of the institutional holding variables, we re-estimate our main regression in Eq. (3) after adding the *levels* of foreign and domestic institutional holdings at the end of year $t - 1$ to the trading intensity measures.[15]

Though not reported here for brevity, our re-estimated results show that the inclusion of the level-of-holding (as opposed to trading) variables does not alter our main inferences on the test variables, $FORV$, $DOMV$, $STDV$ and $LTDV$. That is, (i) trading by both foreign and domestic institutions facilitates the incorporation of firm-specific information into stock prices, thereby reducing stock price synchronicity or co-movement; (2) trading by foreign investors decreases synchronicity to a greater extent than trading by domestic institutions; and (3) trading by domestic short-term institutions decreases synchronicity, but trading by domestic long-term institutions does not. We also find that the levels of shareholdings of foreign and domestic institutional investors are insignificant in influencing synchronicity. In short, the above findings, taken together, suggest that it is institutional trading and not institutional holding, which facilitates the incorporation of firm-specific information into stock prices.

5.4. Change analysis

Although the above analysis controls for many firm characteristics that might account for the relationship between synchronicity and institutional trading, there is an endogeneity concern with respect to omitted

[15] Since in 2004 the FSS stopped requiring the reporting of ownership stakes by different types of investors in Business Reports, equivalent to U.S. 10-K reports, our analysis is limited to the period 1998–2003.

Table 6
Change analysis.

Variable	Dependent variable = *Synch*	
	Coeff.	*t*-Stat.
$\Delta FORV$	−0.443	−1.88[c]
$\Delta STDV$	−0.616	−2.45[b]
$\Delta LTDV$	0.221	0.47
$\Delta\log(1+\#ANAL)$	0.060	1.36
$\Delta\log MVE$	−0.116	−2.86[a]
ΔLEV	−0.325	−1.23
ΔMB	−0.000	−3.40[a]
$\Delta SROA$	−0.681	−1.29
$\Delta HERFIN$	−2.369	−2.35[b]
$\Delta CHAEBOL$	0.037	0.29
ΔGDR	0.229	0.47
$\Delta BIG4$	0.119	2.22[b]
$\Delta AveVol$	−4.966	−4.23[a]
Intercept	0.002	0.08
Industry dummy	Yes	
Adjusted R^2	0.058	
N	3723	

The superscripts a, b and c denote the 1%, 5% and 10% levels of significance, respectively, using a two-tailed test. All variables are defined in Appendix B. Reported *t*-values are on an adjusted basis using standard errors corrected for clustering by firm and by year.

correlated variables. To alleviate concerns over omitted correlated variables, we perform a change-based analysis using the model

$$\begin{aligned}\Delta Synch_{jt} = {} & \beta_0 + \beta_1 \Delta FORV_{jt} + \beta_2 \Delta STDV_{jt} + \beta_3 \Delta LTDV_{jt} + \beta_4 \Delta \log(1+\#ANAL)_{jt} + \beta_5 \Delta \log MVE_{jt} \\ & + \beta_6 \Delta LEV_{jt} + \beta_7 \Delta MB_{jt} + \beta_8 \Delta SROA_{jt} + \beta_9 \Delta HERFIN_{jt} + \beta_{10} \Delta CHAEBOL_{jt} + \beta_{11} \Delta GDR_{jt} \\ & + \beta_{12} \Delta BIG4_{jt} + \beta_{13} \Delta AveVol_{jt} + (IndustryDummies) + error \end{aligned} \quad (4)$$

where all variables starting with Δ represent changes in the variables from year $t-1$ to year t and the variables are as defined earlier.

Table 6 presents the results for the above change-based regression, using a reduced sample of 3723 observations. We find that the coefficients of $\Delta FORV$ and $\Delta STDV$ are both significantly negative, while the coefficient of $\Delta LTDV$ is insignificantly positive, which is consistent with the findings of the level-based tests (as reported in Table 5). Overall, the results of our change-based regressions suggest that an increase in the trading activities of foreign and short-term domestic investors leads to a decrease in stock price synchronicity, while the trading activities of domestic long-term institutions are not associated with synchronicity. This finding provides additional assurance that our level-based regression results reported in Table 5 are unlikely to be driven by correlated omitted variables or reverse causality.

6. Results using an alternative measure of firm-specific information flows

Since Roll (1988), a growing body of research in the finance literature[16] has provided evidence that higher synchronicity means a smaller amount of firm-specific information capitalized into stock prices. Put differently, the lower the level of stock price synchronicity, the greater the relative amount of firm-specific information being incorporated into stock prices. For the purpose of our study, an inverse relation between the

[16] See, for example, Morck et al. (2000), Jin and Myers (2006), Chen et al. (2007), Ferreira and Laux (2007), Fernandes and Ferreira (2008), Hutton et al. (2009) and Gul et al. (2010).

intensity of (foreign and domestic) institutional trading and our synchronicity measure can be viewed as an indication that institutional trading facilitates the flow of firm-specific information to the market and its incorporation into stock prices, thereby reducing synchronicity. Admittedly, however, this information-based interpretation of synchronicity is not without controversy.[17] Noise trading and limits to arbitrage may be responsible for an increase in return volatility. For example, one can argue that institutional trading adds noise in stock returns and thus increases idiosyncratic volatility in stock returns, or decreases synchronicity, which in turn leads to an inverse relation between institutional trading and synchronicity. To further substantiate the hypothesized (inverse) relation between institutional trading and stock price synchronicity, we also consider an alternative measure of synchronicity that focuses on the flow of firm-specific *private* information flows to the market. For this purpose, we first obtain the *annual* measure of the probability of informed trading (*PIN*). Appendix A describes how the *PIN* measure is calculated. We then re-estimate our main regression in Eq. (3) with *PIN* as the dependent variable in lieu of *Synch*.[18]

As mentioned earlier, institutional investors are elite information processors capable of transforming public information into value-relevant private information. These institutional investors may also have an advantage over individual investors in gaining access to and gathering and processing firm-specific private information. Therefore, institutional investors are more likely to make their trading decisions based on firm-specific private information than individual investors. As institutional trading becomes more intense, a firm's shares are more likely to be traded by informed traders, which in turn leads to a higher probability of informed trading. We therefore predict a *positive* relation between the intensity of institutional trading and our proxy for the flow of firm-specific private information to the market, namely, *PIN*. As explained in Appendix A, the *PIN* measure is developed from a structural market microstructure model and captures the relative amount of firm-specific private information incorporated into stock prices via information-based trading.[19]

In estimating our main regressions using *PIN* as the dependent variable in lieu of *Synch*, we keep the same set of control variables as before, because our objective here is not to investigate cross-sectional determinants of private information-based trading activities but, rather, to see whether our main results are robust to the alternative measure of firm-specific information flow. We re-estimate our main regressions in Table 5 with *PIN* as the dependent variable and present the new results in Table 7. As shown in Table 7, the coefficients of *FORV* and *STDV* are 0.037 with $t = 2.73$ and 0.075 with $t = 4.39$, respectively. This suggests that trading by foreign investors and domestic short-term institutions increases the relative amount of firm-specific private information capitalized into stock prices as reflected in our *PIN* measure. We find, however, that *PIN* is not significantly associated with trading by domestic long-term institutions (*LTDV*). We also find that trading by domestic short-term institutions has a larger impact on *PIN* than trading by foreign investors ($p < 0.01$, one-tailed test). To the extent that a higher *PIN* is associated with lower *Synch* or higher firm-specific return variation, the significant positive relations of *PIN* with *FORV* and *STDV*, and the insignificant relation between *Synch* and *LTDV* are in line with our earlier results reported in Table 5. The above results corroborate the view that our *Synch* measure correctly captures the amount of firm-specific information capitalized into stock prices via information-based trading.

Overall, the results reported in Table 7 corroborate our earlier finding that trading by foreign investors and domestic short-term institutions facilitates the capitalization of firm-specific information into stock prices via information-based trading, while trading by domestic long-term institutions does not.

7. Institutional trading and the mispricing of accruals

Thus far, our evidence consistently indicates that foreign investors and domestic short-term institutions facilitate the incorporation of firm-specific information into stock prices via their trading activities, while

[17] A few (unpublished) studies raise questions about this information-based interpretation of synchronicity and provide evidence suggesting that synchronicity may reflect noises in stock returns that are not related to firm-specific information (Ashbaugh-Skaife et al., 2006; Teoh et al., 2008). As in many other studies, our tests are predicated upon the information-based interpretation of synchronicity, given that evidence supporting this interpretation is overwhelming and growing in the contemporary finance (and accounting) literature.

[18] Analysis using the *PIN* measure has fewer observations (2933 firm–year observations) due to data limitations.

[19] We thank Woo-Jong Lee for his assistance in obtaining the data required for computing *PIN*.

Table 7
Results of simultaneous estimations of the relations between foreign and domestic institutional trading and *PIN*, a measure of the probability of informed trading.

Variable	Dependent variable = *PIN*	
	Coeff.	*t*-Stat.
FORV	0.037	2.73[a]
STDV	0.075	4.39[a]
LTDV	0.039	1.63
log(1 + #*ANAL*)	−0.008	−4.36[a]
log *MVE*	−0.013	−11.75[a]
LEV	−0.025	−4.15[a]
MB	0.000	9.83[a]
SROA	−0.048	−3.59[a]
HERFIN	0.013	1.14
CHAEBOL	−0.001	−0.01
GDR	0.006	0.88
*BIG*4	0.001	0.89
AveVol	−0.087	−2.83[a]
Intercept	0.475	22.14[a]
Industry dummy	Yes	
Adjusted R^2	0.192	
N	2933	

The superscripts a, b and c denote the 1%, 5% and 10% levels of significance, respectively, using a two-tailed test. All variables are defined in Appendix B. Reported *t*-values are on an adjusted basis using standard errors corrected for clustering by firm and by year.

domestic long-term institutions do not. As an additional validity check, our analysis below focuses on whether and how trading activities by three different types of institutional investors—foreign, domestic short-term and domestic long-term institutions—differentially affect the pricing efficiency of accounting accruals. Our analysis is motivated by Sloan (1996), who finds a negative relation between the accrual component of current earnings and future stock returns. His finding, which is often referred to as an "accrual anomaly," suggests that the market price does not fully reflect the accrual component of earnings being less persistent than the cash flow component of earnings. His analysis further demonstrates that a hedge trading strategy of buying stocks with low accruals and selling stocks with high accruals yields significant abnormal returns in the year following portfolio formation.

Drawing on Sloan's (1996) findings, one can argue that sophisticated institutional investors with superior ability to analyze and interpret published annual financial reports should be better able to understand the differential persistence of the two earnings components, accruals and cash flows, and that their trading activities facilitate the impounding of these two earnings components into stock prices. Given our finding that foreign and domestic short-term institutional investors contribute more to the incorporation of firm-specific information into stock prices via their trading activities than domestic long-term institutions, we predict that a trading strategy that exploits the mispricing of the accrual component of earnings should be less profitable for firms whose shares are more intensely traded by foreign and domestic short-term institutional investors.

To test the above prediction, we first compute the accrual component of annual earnings as follows:

$$Accruals_{j,t} = Earnings_{j,t} - CFO_{j,t} \tag{5}$$

where, for firm j and year t, *Earnings* is earnings from continuing operations standardized by average total assets and *CFO* is cash flow from operations divided by average total assets. Similar to Sloan (1996), we then compute one-year-ahead size-adjusted returns as a proxy for future abnormal returns. One-year-ahead size-adjusted returns are the difference between a firm's annual buy-and-hold return and the average annual buy-and-hold return of the size decile portfolio to which the firm belongs. To calculate the return to the size decile portfolios, all firms are assigned to size deciles based on their market value of equity at the beginning of the year in which the return accumulation period begins. The decile portfolio return is the value-weighted return of all

firms that belong to the size decile portfolio. Annual size-adjusted (buy-and-hold) returns for each size decile portfolio are computed for the 12-month period starting four months after the end of the fiscal year.

To evaluate the profitability of our accrual-based trading strategy, we assign firms into deciles at the beginning of each fiscal year based on the magnitude of accruals and then group them into three portfolios: the lowest (deciles 1 and 2), the middle (deciles 3 through 8) and the highest (deciles 9 and 10). We then calculate future abnormal returns for each portfolio for the year after portfolio construction. Panel A of Table 8 reports the results for the full sample, while Panels B, C and D report the results for the subsamples partitioned by the intensity of institutional trading by foreign, domestic short-term and domestic long-term institutional investors, respectively.

As presented in Panel A of Table 8, we find that, consistent with Sloan (1996), one-year-ahead abnormal returns (i.e., size-adjusted returns) to accrual-based decile portfolios decrease monotonically as we move from low-accrual portfolios (deciles 1 and 2) to high-accrual portfolios (deciles 9 and 10). When we form a hedge portfolio with a long position in the low-accrual portfolio (deciles 1 and 2) and a short position in the high-accrual portfolio (deciles 9 and 10), the return to this hedge portfolio is 15.9%, which is significant both statistically ($t = 4.76$) and economically.

In Panel B of Table 8, we assess the impact of foreign investors' trading activities on the pricing of accruals. For this purpose, we first partition our full sample into two subsamples: one with high *FORV* (above-median *FORV*) and the other with low *FORV* (below-median *FORV*). As shown in Panel B of Table 8, we find that one-year-ahead abnormal returns are also negatively related to accruals for both subsamples. More importantly, we find that the return to the hedge portfolio is smaller for the high-*FORV* subsample (0.092) than for the low-*FORV* subsample (0.225), and this return difference between the two subsamples is significant at the 10% level ($t = 1.82$), as indicated in the last column of the same panel. The above results are in line with the view that foreign investors understand the implication of accruals for future returns and their trading activities reduce the mispricing of accruals.

In Panel C of Table 8, we partition our full sample into two subsamples using the trading intensity of short-term domestic institutions: one with high *STDV* and the other with low *STDV*. As seen in Panel C of Table 8, we find that one-year-ahead abnormal returns decrease with the magnitude of accruals for both subsamples. Moreover, we find that the return to the hedge portfolio is smaller for the high-*STDV* subsample (0.073) than for the low-*STDV* subsample (0.253). This return difference is significant at the 1% level ($t = -2.77$). The above results are consistent with the view that domestic short-term institutions facilitate the incorporation of firm-specific information into stock prices via their trading activities, leading us to observe the one-year-ahead return to the hedge portfolio is lower for the high-*STDV* subsample than for the low-*STDV* subsample.

Panel D of Table 8 reports the results for the two subsamples of firms with high *LTDV* and low *LTDV*. Similar to the results reported in both Panels B and C of Table 8, the results in Panel D show that one-year-ahead abnormal returns decrease with the magnitude of accruals for both high-*LTDV* and low-*LTDV* subsamples. We find, however, that the return to the hedge portfolio does not differ significantly between the high-*LTDV* subsample (0.127) and the low-*LTDV* subsample (0.190). This finding is in line with our earlier findings that, unlike foreign and short-term domestic institutions, the trading activities of domestic long-term institutions do not necessarily facilitate the incorporation of firm-specific information into stock prices via their trading activities.

We next conduct a regression analysis to further examine the relation between the accrual component of earnings and future stock returns after controlling for other variables that are deemed to affect future stock returns. Specifically, we estimate the regression model

$$\begin{aligned} SAR_{j,t+1} = {} & a_0 + a_1 ACC^{dec}_{j,t} + a_2 Size_{j,t} + a_3 \log BM_{j,t} + a_4 EP_{j,t} + a_5 FORV\_H_{j,t} + a_6 STDV\_H_{j,t} \\ & + a_7 LTDV\_H_{j,t} + a_8 ACC^{dec}_{j,t} * FORV\_H_{j,t} + a_8 ACC^{dec}_{j,t} * STDV\_H_{j,t} + a_8 ACC^{dec}_{j,t} * LTDV\_H_{j,t} \\ & + (industrydummies) + error \end{aligned} \tag{6}$$

where, for firm j and year t (or $t+1$), $SAR_{j,t+1}$ is the one-year-ahead size-adjusted return; $ACC^{dec}_{j,t}$ is the decile rank of an accrual-based decile portfolio, scaled to range from zero to one; $Size_{j,t}$ is the natural log of the year-end market capitalization; $\log BM_{j,t}$ is the natural log of the ratio of the book value of common equity to the

Table 8
Institutional trading and the mispricing of accruals.

Accrual-based decile portfolio	Mean	*t*-Statistics
Panel A: Hedge portfolio test for the full sample		
Deciles 1 and 2	0.046	1.68[c]
Deciles 3–8	−0.009	−0.68
Deciles 9 and 10	−0.113	−5.87[a]
Return to the hedge portfolio	0.159	4.76[a]

Accrual-based decile portfolio	High *FORV*		Low *FORV*		Difference
	Mean	*t*-Stat.	Mean	*t*-Stat.	*t*-Stat.
Panel B: Hedge portfolio test for high FORV versus low FORV					
Deciles 1 and 2	0.025	0.69	0.063	0.025	0.69
Deciles 3–8	0.015	0.83	−0.036	0.015	0.83
Decile 9 and 10	−0.067	−2.59[a]	−0.162	−0.067	−2.59[a]
Return to the hedge portfolio	0.092	1.82[c]	0.225	0.092	1.82[c]
Accrual-based decile portfolio	High *STDV*		Low *STDV*		Difference
	Mean	*t*-Stat.	Mean	*t*-Stat.	*t*-Stat.
Panel C: Hedge portfolio test for high STDV versus low STDV					
Deciles 1 and 2	0.044	1.17	0.047	1.21	0.26
Deciles 3–8	0.004	0.23	−0.024	−1.08	0.34
Deciles 9 and 10	−0.029	−1.08	−0.206	−7.93[a]	4.69[a]
Return to the hedge portfolio	0.073	1.70[c]	0.253	5.40[a]	−2.77[a]
Accrual-based decile portfolio	High *LTDV*		Low *LTDV*		Difference
	Mean	*t*-Stat.	Mean	*t*-Stat.	*t*-Stat.
Panel D: Hedge portfolio test for high LTDV versus low LTDV					
Deciles 1 and 2	0.038	0.96	0.051	1.37	1.03
Deciles 3–8	0.010	0.56	−0.031	−1.40	0.83
Deciles 9 and 10	−0.089	−3.41[a]	−0.139	−4.91[***]	1.65[c]
Return to the hedge portfolio	0.127	3.15[a]	0.190	3.63[***]	0.28

	(1)		(2)	
	Coefficient	*t*-Value	Coefficient	*t*-Value
Panel E: Cross-sectional regressions of stock returns on accruals and other predictors of returns				
ACC^{dec}	−0.141	−3.75[a]	−0.398	−3.50[a]
SIZE	0.034	4.50[a]	0.032	3.13[b]
log *BM*	0.270	5.88[a]	0.253	5.91[a]
EP	0.013	0.51	0.023	0.81
FORV_H			−0.136	−1.09
STDV_H			−0.082	−1.30
LTDV_H			0.014	0.22
ACC^{dec} * *FORV_H*			0.207	2.01[c]
ACC^{dec} * *STDV_H*			0.230	2.68[b]
ACC^{dec} * *LTDV_H*			−0.062	−0.56
Intercept	−0.871	−5.95[a]	−0.727	−3.54[a]
Industry dummy	Yes		Yes	
Adjusted R^2	0.071		0.104	

The superscripts a, b and c denote the 1%, 5% and 10% levels of significance, respectively, using a two-tailed test. All variables are defined in Appendix B. Each reported coefficient represents the average of estimated coefficients from ten annual regressions. Each reported *t*-value is computed using the empirical distribution of ten annual coefficients (after correcting for serial correlation).

market value of common equity; $EP_{j,t}$ is the ratio of earnings per share divided by the fiscal year-end stock price; $FORV\_H_{j,t}$ is an indicator variable that equals one if *FORV* is higher than its median, and zero otherwise; and $STDV\_H_{j,t}$ ($LTDV\_H_{j,t}$) is an indicator variable that equals one if *STDV* (*LTDV*) is higher than its median, and zero otherwise.

Panel E of Table 8 reports the results of the Fama–MacBeth (1973) regression in Eq. (6).[20] Column 1 reports the result of a baseline regression without including institutional trading variables and their interactions with ACC^{dec}. The coefficient of ACC^{dec} is significantly negative, which is consistent with the results reported in Panel A of Table 8.[21] Column 2 of Panel E presents the result of the full-model regression in Eq. (6): We find that the coefficients of $ACC^{dec} * FORV\_H$ and $ACC^{dec} * STDV\_H$ are significantly positive, while the coefficient of $ACC^{dec} * LTDV\_H$ is insignificant. These results are consistent with those reported in Panels B to D of Table 8, suggesting that the mispricing of accruals is mitigated for such firms whose shares are traded more intensely by foreign and domestic short-term institutions, while it is not affected by trading by domestic long-term institutions. In short, the results reported in Table 8, taken together, imply that trading by foreign investors and domestic short-term institutions mitigates the mispricing of accruals by facilitating the incorporation of firm-specific information into stock prices.

8. Summary and concluding remarks

Using a large sample of firms listed on the KSE over 1998–2007, this paper investigates whether and how trading by foreign and domestic institutional investors impacts the incorporation of firm-specific information into stock prices, captured by stock price synchronicity. Our results reveal the following. First, stock price synchronicity decreases significantly with the intensity of trading by foreign investors and domestic institutions. Second, among domestic institutions with differing investment horizons, short-term institutions such as securities and investment trust companies play a more important role in facilitating firm-specific information flow to the market via their trading activities than long-term institutions such as banks and insurance companies. Third, we show that trading by foreign investors and domestic short-term institutions facilitates firm-specific information flow to a greater extent than trading by long-term domestic institutions. Fourth, the above findings are robust to potential endogeneity biases and an alternative measure of firm-specific information flow. We also find that it is institutional trading, and not institutional shareholdings, which facilitates the incorporation of firm-specific information into stock prices. Finally, we provide further evidence that the trading activities of foreign and domestic short-term institutions reduce accrual mispricing, while those of domestic long-term institutions do not.

Overall, our results are consistent with the view that foreign and domestic short-term institutions in emerging markets are more actively involved in information-based trading than domestic long-term institutions, and, thus, that the trading activities of the former facilitate the incorporation of firm-specific information into stock prices to a greater extent than the trading activities of the latter. However, since our analyses are performed in an emerging economy where firm ownership is typically concentrated in the hands of a few controlling shareholders and large business groups play a dominant role, we caution against generalizing our results to other developed economies with diffuse ownership and strong corporate governance. Given the scarcity of empirical evidence on the informational role of shareholdings and trading by foreign institutions vis-à-vis domestic institutions, we recommend further research on the economic consequences of foreign versus domestic institutional trading in other contexts, including the effect on the cost of capital, firm valuation and the efficiency of capital allocation and investment in emerging markets.

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[20] Each reported coefficient represents the average of the estimated coefficients from ten annual regressions. Each reported *t*-value is computed using the empirical distribution of ten annual coefficients (after correcting for serial correlation).

[21] As reported in Table 8, the coefficient of *SIZE* is positively significant, which is not consistent with the finding of Sloan (1996). However, it is consistent with the international evidence on the accrual anomaly for some of the code-law countries reported in Pincus et al. (2007).

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Appendix A. Alternative measure of firm-specific information flow

We use the probability of informed trading (*PIN*) developed by Easley et al. (2002) as an alternative dependent variable in our study. The variable *PIN* is measured using a structural market microstructure model where trade comes from either informed or uninformed traders. On a day with no information events, uninformed buyers and uninformed sellers arrive at the rates of ε_b and ε_s, respectively. Information events occur with probability α. Information events are either good news with probability $(1-\delta)$, or bad news with probability δ. Let μ denote the arrival rate of informed traders when an information event occurs. Informed traders will buy when they observe good news and will sell upon observing bad news. Thus, on bad event days, the arrival rate of buy orders is ε_b and the arrival rate of sell orders is $\varepsilon_s+\mu$. On good event days, the arrival rate of buy orders is $\varepsilon_b+\mu$ and the arrival rate of sell orders is ε_s. Easley et al. (2002) show that, under certain conditions, *PIN* for a stock in a given period is measured as

$$PIN=\frac{\alpha\mu}{\alpha\mu+\varepsilon_s+\varepsilon_b} \tag{a1}$$

where $\alpha\mu$ is the arrival rate for information-based orders and $\alpha\mu+\varepsilon_s+\varepsilon_b$ is the arrival rate of all orders. The variable *PIN* measures the probability of information-based trading by informed traders. To obtain the annual *PIN* measure for each firm in our sample, transaction data are retrieved from the Trade and Quote database provided by the Institute of Finance and Banking (IFB) of Seoul National University (IFB/KSE database). The IFB-KSE database has each order time-stamped with the time it arrived at the exchange and the time the order was executed, which allows us to identify whether a specific order was initiated by a buyer or a seller. Based on the number of daily buys and sells for each trading day, we obtain $\theta=(\mu,\ \varepsilon_b,\ \varepsilon_s,\ \alpha,\ \delta)$ to maximize the likelihood function for the total number of buys and sells on a single day, for each stock in each year. We then compute yearly *PIN* measures for each stock using the formula in Eq. (a1).

Appendix B. Variable definitions

Variable		Definition
Panel A: Stock price synchronicity		
R^2	=	coefficient of determination from the estimation of the firm–year estimation of the model in Eq. (1)
Synch	=	stock price synchronicity measured by $\log[R^2/(1-R^2)]$
Panel B: Probability of informed trading measure		
PIN	=	annual probability of information-based trading measure of Easley et al. (2002)
Panel C: Variables of interest used in main regressions		
FORV	=	sum of total shares purchased and sold by non-resident foreign investors as a fraction of annual trading volume
DOMV	=	sum of total shares purchased and sold by domestic institutional investors as a fraction of annual trading volume ($DOMV=STDV+LTDV$)
STDV	=	sum of total shares purchased and sold by domestic securities and investment trust companies as a fraction of annual trading volume
LTDV	=	sum of total shares purchased and sold by domestic insurance companies and banks as a fraction of annual trading volume
Panel D: Control variables		
$\log(1+\#ANAL)$	=	log(1 + number of analysts following)
$\log MVE$	=	log of market capitalization

LEV	=	total debt/total asset
MB	=	market value of equity/book value of equity
SROA	=	standard deviation of ROA measured over the past five years using 10 half-yearly observations
HERFIN	=	sales revenue-based Herfindahl index of industry-level concentration
CHAEBOL	=	1 if a firm belongs to one of the 30 largest chaebols, and 0 otherwise
GDR	=	1 if a firm is cross-listed, and 0 otherwise
BIG4	=	1 if a local auditor is a member of a Big 4 firm, and 0 otherwise
AveVol	=	average daily trading volume/shares outstanding

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