

# Foreigners at the Gate? Foreign Investor Trading and Behavioral Anomalies of Domestic Individual Investors

This Draft: November 26, 2018

## Abstract

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Using the account-level data of a major Korean securities firm between 1999 and 2005, we examine whether the strength of domestic individual traders' disposition effect is affected by the inflow of foreign investors. Our sample period, beginning just after the liberalization that lifted the cap on foreign investor ownership, allows for an interesting insight into how domestic individuals perceive foreign investors' entry into an emerging stock market. We find that individual investors are more likely to realize paper gains on stocks with large recent foreign investor purchase, which appears to be behaviorally motivated. These individual investors are also less likely to trade stocks with large foreign ownership in the first place, further hinting at their aversion. Our main results are robust to a difference-in-difference analysis based on the inclusion of a stock into the MSCI Korea index.

JEL Classifications: E52, E58, G14, G23

Keywords: Disposition effect, papers gains realized, trading behavior, emerging market, investor sentiment

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*If you do happen to encounter a stranger in your territory, you have to presume that the person is dangerous...*

— Jared Diamond, *The World Until Yesterday*, p. 50

## 1. Introduction

Members of traditional small-scale societies exhibited a strong aversion to encountering strangers; for them, sighting of a stranger posed real danger to their survival. In emerging markets with capital restrictions on foreign ownership, domestic investors can become an island of their own. Upon market liberalization, these investors can thus exhibit a similar fear of foreigners; across the emerging markets, local online investor communities abound with colorful descriptions of foreign investors as “predators,” hinting at their perceived fear of a new, unfamiliar group of traders. In this paper, we examine whether such cognitive bias affects individual investors’ trading decisions on stocks with large foreign inflows.

This issue is particularly important as many emerging markets continue to control foreign investor ownership, where its relaxation remains a contentious issue. For example, despite a recent round of market deregulations, many foreigners still cannot directly purchase A-shares listed in Shanghai and Shenzhen except through the stock connect program with Hong Kong Stock Exchange, and Vietnam has only recently lifted its 49% cap on foreign ownership in public firms. Thus, trading behavior of local investors, and particularly the intensity of their behavioral anomalies (e.g., Odean, 1998; Barber and Odean, 2000; 2001; 2007; Grinblatt and Keloharju, 2000; 2001) in response to the influx of foreign investors following market liberalization, carries much significance. Yet, existing studies remain largely silent on this issue, and we use the account-level data of a major Korean brokerage firm to fill the gap in the literature.

Specifically, our research question is different from the previous literature on the effect of foreign investors in emerging markets in the following manner. Previous studies analyze whether foreign investors have an “edge” (Choe, Kho, and Stulz, 2005) relative to domestic investors, or their impact on the overall market quality (Choe, Kho, and Stulz, 1999). In contrast, we abstract ourselves from any discussion on whether foreign investors are truly informed or destabilizing; instead, we focus on how domestic individual investors *perceive* the presence of foreign investors in the market and respond to it. Do they trade *less* or

*more* irrationally? Do they shun the stocks that foreigners purchase? Given the extant evidence that individual investors' behavioral anomalies are affected by various environmental factors (e.g., Grinblatt and Keloharju, 2001; Li, Massa, Zhang, and Zhang, 2017), we postulate that the lifting of regulation on foreign ownership and the consequent inflow of foreign investment could have a non-trivial impact on these local individuals' cognitive bias.

We predict that the entry of foreign investors would strengthen the behavioral biases of domestic individuals. After all, rich literature on home bias in equity markets (e.g., French and Poterba, 1991; Kang and Stulz, 1997; Coval and Moskowitz, 1999; Grinblatt and Keloharju, 2001; Chan, Covrig, and Ng, 2005) suggests that investors have a familiarity bias, feeling more comfortable investing in stocks close to their own regional or domestic markets. If so, the emergence of a new, unfamiliar group of investors could conceivably strengthen the extent of their behavioral anomalies. After all, U.S. mutual fund investors, for example, exhibit reluctance towards fund managers with foreign-sounding surnames (Kumar, Niessen-Ruenzi, and Spalt, 2015), and in social science and evolutionary psychology literature, a fear of strangers is well known (e.g., Buss, 1995; Boyer and Bergstrom, 2011; Semyonov, Raijman and Gorodzeisky 2006).

However, the entry of foreign investors could also encourage local investors to learn more about each other and shake off their predisposed stereotypes. In a recent study, Bekaert, Hoyem, Hu, and Ravina (2017) show that young investors living in areas with a high fraction of foreign-born populations are more likely to diversify their assets internationally, suggesting that behavioral biases can also be partly alleviated through interactions with a diverse group of investors. Thus, it is also conceivable that foreign investors' entry would alleviate the behavioral biases of domestic individuals, further highlighting the importance of our empirical analysis.

We test our hypothesis using the domestic individuals' tendency toward disposition effect (Shefrin and Statman, 1985), namely their propensity to sell winners too early and hold onto losers for too long. This has been confirmed in numerous studies across different asset classes and time periods (e.g., Ferris, Haugen, and Makhija, 1988; Odean, 1998; Weber and Camerer, 1998; Kumar, 2009; Jin and Scherbina, 2011; Ben-David and Hirshleifer, 2012; Frydman, Barberis, Camerer, Bossaerts, and Rangel, 2014). To the

extent that domestic individual investors' behavioral anomalies likely reflect their cognitive biases, we hypothesize that how they perceive the foreign investors' entry into the domestic market would be reflected in the strength of their disposition effect. For example, if these individual investors *do* have a cognitive fear of foreign investors, then their aversion would manifest itself as more pronounced tendency to realize their gains early out of their perceived fear of being picked off.

Our research question necessitates the availability of account-level data in an emerging country following the introduction of market liberalization policy. To this end, we obtain a randomized daily account-level data of 10,000 individual investor accounts, 6,160 of which make at least one order during our sample period, from a major Korean securities firm between Jan. 1, 1999 and Dec. 31, 2005. This proprietary dataset, to the best of our knowledge, is a representative snapshot of the individual investors populating the Korean market in terms of demographics, allowing us to explore deeper into the effect of the inflow of foreign investors on the behavioral anomalies of individual investors.

Above all, our sample period allows us to analyze the behavior of individual investors just after the introduction of the full market liberalization policy in Korea. The Korean stock market first became open for investment to foreign investors in Jan. 1992, but there was a tight cap of 10% and 3% maximum ownership for foreign investors in total and per individual for each listed firm, respectively.<sup>4</sup> After a series of regulatory relaxations, it was only after the East Asian Crisis on May 25, 1998 that the maximum ownership limits on all non-state-owned listed firms were abolished. Thus, during our sample period, the aggregate trading volume of foreign investors increased from KRW 89 trillion (USD 83 billion) in 1999 to KRW 325 trillion (USD 305 billion) in 2005, nearly a fourfold increase. Combined with the devastating fallout of the East Asian Crisis, the huge influx of foreign investors during our sample period was one of the most attention-grabbing issues within the investor community at the time.

Our main findings are as follows. We first examine the investors' sell vs. hold decision in a similar manner to Kaustia (2010), Linnainmaa (2010), Grinblatt, Keloharju, and Linnainmaa (2012), and Birru

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<sup>4</sup> The cap applied to non-state-owned firms. For state-owned firms, the cap was even more stringent at 8% and 1%, respectively.

(2015). We find that individual investors are more likely to realize their paper gains on a stock in which foreign investors have made a sustained net purchase over the previous week or month, suggesting that the individual investors are more likely to cash in on their gains as they observe an influx of foreigners. This finding is robust to a set of controls aimed at capturing various observed stock-level characteristics. However, these high-foreign-inflow stocks' post-sale long-term stock performance is significantly larger than the post-sale performance of other stocks on which these individual investors realize gains, further hinting that these sales are more likely to be behaviorally motivated.

Yet, it is possible that the relationship between foreign investors' purchase decisions and domestic individuals' stronger tendency toward disposition effect could be driven by other unobserved factors, rendering our analysis open to endogeneity issues. In particular, foreign investors' decision to engage in substantial net purchases of a particular stock could be driven by inherent stock characteristics that similarly affect individual traders' behavioral anomalies, leading to an omitted variable bias. To address this concern, we perform a difference-in-difference analysis using the announcement of a stock's inclusion into the Morgan Stanley Capital International (MSCI) Korea index. Even though MSCI's decision to include a stock is primarily based on market capitalization and is not intended to be indicative of a given stock's future profitability, it significantly increases the inflow of foreign capital into the stock, as many ETFs use it as benchmark.<sup>5</sup> This is a plausibly exogenous change in foreign investors' willingness to hold a particular stock, allowing us to explore deeper into behavioral tendencies of domestic individuals. We find that our sample of individual investors exhibit substantially higher ratios of paper gains realized when investing in stocks announced to be included in the MSCI Korea index relative to non-included peer stocks, instilling further confidence in our baseline finding.

Lastly, we also find that these individual investors are less likely to purchase stocks with large foreign investor ownership in the first place. Moreover, following a stock's inclusion into the MSCI Korea

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<sup>5</sup> In particular, U.S. denominated Korean ETF market is dominated by BlackRock's iShares MSCI South Korea ETF, with more than \$4.3 billion in assets as of April 2018, which, until February 2013, tracked MSCI Korea index as benchmark.

index, we find a substantially lower number of trades among our sample of individual investors for the newly-included MSCI stock. This further hints at individuals' fears of trading alongside a new group of unfamiliar investors. In short, these individual investors prefer not to trade in stocks with large foreign presence, and when they do so, they tend to cash in on their winnings more frequently.

We thus contribute to the rich literature on disposition effect by revealing that the entry of foreign investors could have a material impact on the behavioral biases of domestic individuals. Although Choe and Eom (2009) document the existence of strong disposition effect among individual traders using the account-level data on KOSPI 200 index futures, they do not explore how these individuals interact with other groups of investors, which may potentially reinforce the severity of one group's behavioral biases. Our findings also extend but differ from Kumar, Niessen-Ruenzi, and Spalt (2015), as we reveal individual investors' aversion toward foreigners in their own trading decisions rather than their indirect delegated investment decisions. Furthermore, we offer direct evidence of individual investors' greater susceptibility toward disposition effect following the entry of foreign investors, which holds important implications for regulators when they consider implementing market liberalization policies.

The rest of this paper is organized as follows. Section 2 outlines the basic methodology and briefly describes our account-level data. Section 3 presents our main results on individual investors' disposition effect. Section 4 engages in robustness checks on alternative explanations for the observed trading patterns. Section 5 concludes the paper.

## **2. Data and Methodology**

### *2.1. Data Description*

Our account-level trading data is obtained from a major Korean securities firm for a period of seven years, between Jan. 1, 1999 and Dec. 31, 2005. Our sample begins less than a year after the full market liberalization on foreign ownership, and the sample period coincides with a period of huge increase in foreign investor trading, making it ideal for the purpose of addressing our research question. The firm has provided a randomized sample of 5,000 home trading system (HTS) accounts and 5,000 brokerage

accounts, taking steps to ensure that our sample is representative of all accounts registered with the firm.

The dataset contains unique anonymized ID code for each individual as well as his or her gender, age, and the ZIP code of primary residence. It further contains daily-level trading data, including purchase and sale indicators, trading volume, price at which the trading occurred, taxes and fees incurred, as well as the account's remaining holding for each stock. This allows us to fully reconstruct each account's position in every stock at each market close. This is merged with the data on stock market prices and trading, provided by FnGuide's DataGuide platform. In addition to price and volume information for each stock, the amount of purchases and sales by three broad investor groups, specifically individuals, domestic institutions, and foreigners, are reported. This information on trading volume and value of each investor group for each stock is also released by Korea Exchange and is available to the public at each market close.

## 2.2. Baseline Empirical Strategy

For each stock  $i$  on day  $t$ , we first calculate foreigners' daily net purchase ( $FNP$ ), namely the difference between their daily purchases and sales in Korean won.

$$FNP_{i,t} = \text{Foreigner Purchase}_{i,t} - \text{Foreigner Sale}_{i,t},$$

Unlike in previous studies on order imbalances, we do not scale this measure by their total trading volume (i.e., the sum of purchases and sales), as we believe that the foreign investors' absolute investment amount in Korean won is more directly visible to individual investors in the public domain and is thus more likely to affect their cognitive capacities and behavioral anomalies. For example, Figure 1 provides a snapshot of foreign investor trading information on Daum Finance page, one of the most popular portal websites in Korea. The page lists the stocks with the highest 5- and 20-day foreign investor inflow and outflow in terms of absolute amount, which provides the rationale for our use of the  $FNP$  measure.<sup>6</sup>

**FIGURE 1 HERE**

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<sup>6</sup> In any case, results remain qualitatively consistent, albeit with marginally weaker significance, when we scale this measure with the sum of foreigner purchase and sale values.

We then engage in logit regressions similar to Kaustia (2010), Linnainmaa (2010), Grinblatt, Keloharju, and Linnainmaa (2012), and Birru (2015) to explore into the investors' sell vs. hold decision. For each investor account, we first identify all trading days when an investor makes at least one sale of a stock. On this day, the stock(s) that have been sold is assigned a value of 1, while all other stocks in the investor's portfolio are given a value of 0, creating an indicator variable denoted  $Sale_{i,t}$ . This is used as the dependent variable for our logit regression, in a similar manner to Linnainmaa (2010) and Birru (2015). We then construct  $Gain_{i,t}$  for every stock in the investor's portfolio on the trading day on which she makes at least one sale in a stock.  $Gain_{i,t}$  is a dummy variable, which takes a value of 1 if the close price (for stocks held) or sale price (for stocks sold) is greater than the value-weighted average purchase price and 0 otherwise.<sup>7</sup> This essentially captures an investor's additional tendency to sell a stock when in a paper gain position relative to a paper loss position. When this enters significantly positively into the logit regression estimating the likelihood of a stock's sale, we may conclude that investors prefer to realize and cash in on their winnings, exhibiting disposition effect. Our central hypothesis is that this sale-gain relationship will be significantly affected by a recent increased presence of foreign investors in a particular stock. Thus, we run logit regression models as specified below:

$$Sale_{i,t} = \beta_0 + \beta_1 Gain_{i,t} + \beta_2 FNP_{i,t-1} + \beta_3 Gain_{i,t} \times FNP_{i,t-1} + \sum_i^n \beta_i X_{i,t} + \varepsilon_{i,t}.$$

If, as we posit, the recent influx of foreign investors' capital into a particular stock instigates more prominent behavioral biases on the part of domestic individuals, we expect this to show up as significantly positive  $\beta_3$ , i.e., their increased desire to cash in on winning stocks with large recent foreign inflows.

However, to estimate this relationship, it is imperative that we control for various stock-level characteristics. First, given that an investors' decision to sell a stock would be primarily influenced by the

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<sup>7</sup> To calculate the average purchase price, we make a simplifying assumption, namely that all investors at the beginning of our sample period enters into the securities firms' accounts with zero initial position, a common restriction in most other related studies (e.g., Birru, 2015).

stock's past returns (Grinblatt and Keloharju, 2001), we control for market-adjusted return over eleven non-overlapping horizons in the identical manner to Grinblatt and Keloharju (2001) and Birru (2015), among others, more specifically days 0, -1, -2, -3, -4, [-19: -5], [-39: -20], [-59: -40], [-119: -60], [-179: -120] and [-239: -180].<sup>8</sup> We also control for the maximum and minimum returns in the same manner as Birru (2015), which take value of 1 if the stock is trading at the highest (lowest) price relative to the past month, respectively, given that investors are more likely to sell if the stock is being traded at monthly highs or lows. We further control for the stock's turnover and four-factor returns, with factor returns constructed in an analogous manner to Fama and French (1992) and Carhart (1997) using the universe of Korean listed stocks with the identical portfolio cut-off points. We also control for the account holder's gender and whether the trade account was made directly via brokerage or through home trading system. Finally, we control for each stock's turnover to represent the level of market liquidity (e.g., Chordia, Roll, and Subrahmanyam, 2001), although we confirm in untabulated analysis that our results are consistent when we use Amihud's (2002) illiquidity measure instead. We control for unobserved heterogeneity using month fixed effect and KSIC 3-digit industry fixed effect, with standard errors clustered by account ID.

For each account-day observation, we further calculate PGR and PLR in the identical manner to Odean (1998), specifically:

$$PGR_{i,t} = \frac{Realized\ Gain_{i,t}}{Paper\ Gain_{i,t} + Realized\ Gain_{i,t}},$$

$$PLR_{i,t} = \frac{Realized\ Loss_{i,t}}{Paper\ Loss_{i,t} + Realized\ Loss_{i,t}}$$

These two measures are calculated over the account's entire portfolio. Given that calculating PGR and PLR over a single trading day may not be informative, we take their difference and accumulate it over a 5-day window.<sup>9</sup>

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<sup>8</sup> Our results are consistent regardless of whether we allow for asymmetric responses to positive and negative past returns.

<sup>9</sup> Accumulation over a longer window, such as a 20-day window, yields consistent results.

### 2.3. Post-Sale Buy-and-Hold Abnormal Returns

However, an alternative hypothesis may be posited for our baseline logit regressions, namely that the sale decision reflects investors' rational decision in anticipation of future return movement. Thus, further analysis is needed to tease out whether this trading behavior reflects behavioral biases. To that end, we sort stocks into different groups every day based on their latest five-day *FNP*. First, we divide the stocks into the top 5% of *FNP* vs. the remaining 95%. As a robustness check, we further sort the stocks into top 30%, middle 40%, and bottom 30% in terms of the latest five-day *FNP*. In other words, we sort the stocks based on the latest level of past-week foreign investor inflow.

Then, in a similar manner to Odean (1998), we compute the buy-and-hold abnormal returns (BHAR) to track the long-term stock performance subsequent to the investors' sale decision for different *FNP*-based groups of stocks. This exercise intends to check whether investors are more likely to cash in on stocks with recent foreign net purchases because they anticipate these stocks to perform poorly going forward. If so, we should expect the post-sale abnormal returns of high-*FNP* stocks with investors in a gain position to lag behind the post-sale abnormal returns of other stocks on which investors realize their gains. On the other hand, if the behavioral explanation holds, there is no reason to expect such significantly negative differences in the post-sale BHARs of high-*FNP* vs. low-*FNP* stocks in which investors realize their gains.

To this end, for each stock  $i$  on day  $t$ , we first calculate the buy-and-hold abnormal return over the next 84, 252, or 504 days. In this study, we use the KOSPI return as the benchmark return  $r_{m,t}$ :

$$\text{BHAR}_{i,t+1:t+k} = \prod_{j=t+1}^{t+k} (1 + r_{i,j}) - \prod_{j=t+1}^{t+k} (1 + r_{m,j}).$$

### 2.4. Endogeneity and Identification Strategy

However, as discussed earlier, the relationship between the inflow of foreign investors and individual investors' disposition effect may still be driven by unobserved factors. We thus need to identify the causal effect of foreign inflows through a setting that allows for plausibly exogenous variations in the

likelihood of foreign investors' purchases. To this end, we focus on a stock's inclusion into the MSCI Korea index.

MSCI makes periodic updates, adding and deleting stocks into the universe of the MSCI Korea index stocks. The index aims to be representative of all large and mid-cap stocks in the Korean stock market, so the index inclusion decisions are almost mechanically driven by market capitalization. However, it is well known that the inclusion into an index can systematically influence investor behavior (e.g., Boyer, 2011; Claessens and Yafeh, 2012). In particular, many passive funds use this index as the benchmark, the most prominent of which is BlackRock's iShares South Korea ETF, with more than \$4 billion in assets under management. Thus, the stocks announced to be included in the index witness significant foreign investor inflows, as Figure 2 demonstrates. There is also substantial frontrunning by foreign investors prior to the stock's actual inclusion. Given that this index inclusion is based on one observable factor, i.e., market capitalization, it is a useful identification tool that isolates the causal effect of foreign investors' inflows.

#### FIGURE 2 HERE

To this end, we employ a difference-in-difference setting (e.g., Card and Krueger, 1994). This requires the identification of a control group of non-MSCI stocks. To this end, we first identify non-MSCI stocks that share similar observable characteristics with those announced for inclusion in the MSCI Korea index. The control group is identified through propensity score matching using the following controls: log market capitalization, book-to-market, previous-month turnover, previous 1-year market-adjusted buy-and-hold return, aggregate foreign investor ownership, previous 1-month foreign investor aggregate net purchase, 1-year beta, and first three digits of the KSIC code. Exact matching is imposed for each calendar month, and matching is performed using the nearest neighbor method without a caliper length restriction, using one-to-three matching method.<sup>10</sup>

Then, we construct two variables, namely  $POST_{i,t}$  and  $MSCI\ Inclusion_{i,t}$ . Over the window of [-60:60] trading days around MSCI inclusion announcements,  $POST_{i,t}$  is an indicator variable that

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<sup>10</sup> Results are consistent when the caliper length restriction is imposed to rule out bad matches.

takes a value of 1 during the post-inclusion-announcement period, and  $MSCI\ Inclusion_{i,t}$  takes a value of 1 for stocks announced to be included and 0 for all non-MSCI control group stocks. We then calculate each account's PGR and PLR separately for each stock in our difference-in-difference sample every day.<sup>11</sup> This PGR and PLR measure is averaged over the previous five-day window to reduce noise. We then take an equal-weighted average of all accounts' five-day average PGR and PLR for a given stock.<sup>12</sup> The difference between these two measures, which we denote  $DGLR_{i,t}$ , indicates how strongly individual investors in our sample exhibit disposition effect in a particular stock  $i$  on a given day  $t$ . We then run a simple regression of the following specification:

$$DGLR_{i,t} = \beta_0 + \beta_1 POST_{i,t} + \beta_2 MSCI\ Inclusion_{i,t} + \beta_3 POST_{i,t} \times MSCI\ Inclusion_{i,t} + \sum_i^n \beta_i X_{i,t} + \epsilon_{i,t}.$$

Naturally, we are interested in the coefficient on the interaction term,  $\beta_3$ . This captures how much the strength of the disposition effect of our individual investors, on average, change for the newly-added MSCI stock relative to the non-MSCI control group following the announcement. Having outlined our empirical strategy, we now proceed with the presentation of our main results.

### 3. Baseline Results

#### 3.1. Summary Statistics

Table 1 summarizes our accounts' trade patterns. Out of 10,000 accounts in our sample, there are 3,840 accounts that do not make a single transaction. After eliminating these accounts, our sample consists of 6,160 accounts, 2,043 of which are brokerage accounts and the remaining 4,117 are HTS accounts. An individual in our sample trades for an average of 5.7 times and 81.3 times during the sample period for a given stock and on aggregate, respectively. Over a seven-year period, the average number of trades per

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<sup>11</sup> Of course, this can only be performed for accounts that hold non-zero holding in any of the MSCI-included or non-MSCI control group stocks.

<sup>12</sup> Results remain consistent when the PGRs and PLRs of each account are value-weighted by the account's holding in the stock under consideration.

account translates to around 11.6 times per year, or roughly once a month. This is roughly in line with Graham, Harvey, and Huang's (2009) survey of U.S. investors between 1999 and 2002, whereby the median investor in their sample trades between once a month and once a quarter. It is also worth noting that account holders trading via the HTS system trade much more frequently than those holding brokerage accounts, with the average number of trades per account three times that of an average brokerage account at 104.8 and 33.9, respectively. Given that the online HTS system, during our sample period, was popular among young investors with high internet literacy, our evidence is closely in line with Graham, Harvey, and Huang (2009), who find young investors to trade much more frequently.

#### **TABLE 1 HERE**

Panel A of Table 2 presents summary statistics of the dataset used for our sell vs. hold regressions, with the data winsorized at the 1% and 99% levels. We find that, on the day of an investor's sale of a stock, sells comprise on average 50.9% of the investor's portfolio. On the day, the investor is in gain position on 43.5% of the stocks on her portfolio on average. On the same day, 13.1% of the stocks in her portfolio trade above the monthly high, while 10.9% of the stocks trade below the monthly low point.

Panel B then provides separate summary statistics on MSCI-included and matched non-MSCI stocks around the time of MSCI Korea index inclusion announcements. We find that investors, on average, exhibit a significant difference in PGR and PLR ratio, with their difference amounting to over 8.2% points on average, suggesting some *prima facie* evidence of disposition effect even among this small sample of stocks used for our difference-in-difference analysis, as previously documented in Odean (1998) or Choe and Eom (2009).

#### **TABLE 2 HERE**

### *3.2. Baseline Regression Results*

We now present our central result, namely the logit regression of an investor's propensity to sell a stock on the interaction of gain dummy and foreigner net purchase and various controls. Table 3 presents our results. When running regressions, we include all stock-day observations where the account holder

sells at least one stock in his or her portfolio; however, in Table A.1 in the Appendix, we confirm that our results remain qualitatively unaffected even when we run regressions over a larger sample where we include all account-stock-day observations and re-evaluate each account's paper gains and losses for all stocks held at the end of every market close.

### TABLE 3 HERE

A positive sign on *Gain* in the regression implies that the investor has a greater propensity to cash in on her winning position, a strong indication of disposition effect. As expected, *Gain* enters significantly positively into the equations in all specifications. Crucially, the interaction term between *Gain* and 5-day *FNP* also turns out to be highly significant at the 1% level, regardless of whether KSIC 3-digit industry and month fixed effects are additionally controlled for. When we measure foreign investors' sustained net flow over a longer window of 20 trading days, the interaction term enters positively into the equation with statistical significance at the 10% level even when 3-digit industry and month fixed effects are added.

As Figure 1 aptly reveals, these two windows are important for the investors, particularly as 5- and 20-day *FNP* are all published and updated daily in major Korean websites. Korean portal websites such as Daum and Naver, whose finance pages serve a similar role to Yahoo! Finance in the U.S., publish the top and bottom 30 stocks of foreigner net flow computed over the previous 5- and 20- day windows. Our evidence reveals that individual investors *do* respond to this information. Given the extant evidence of availability heuristic in the psychology literature (e.g., Tversky and Kahneman, 1973; 1974; Kliger and Kudryavtsev, 2010), we believe that this ease of information availability is important in explaining why we observe investor response to 5- and 20-day *FNP* to be particularly strong.

The evidence in Table 3, i.e., individual investors' greater propensity to realize gains on stocks into which foreign investors made significant inflows over the previous 5- or 20- day window, is consistent with our theory of domestic individuals' fear of a new group of hitherto unfamiliar traders. In this respect, we contribute to the rich literature on individual investors' disposition effect (e.g., Odean, 1998; Grinblatt, Keloharju, and Linnainmaa, 2012; Birru, 2015) by revealing that their interaction with a new group of foreign investors, following the implementation of market liberalization policy, leads to a strengthened

degree of disposition effect toward stocks with large recent purchase by foreign investors.

However, individual investors' heightened tendency to realize gains on stocks with large recent foreign inflows could alternatively be seen as a rational decision on their part if these individuals (correctly) assess these stocks as more likely to perform poorly. To examine whether this is the case, we compare the post-sale BHAR of stocks where our sample of investors realize paper gains, separately for stocks with and without recent foreign investor flows, with the methodology as described in Section 2.3. We report the difference-in-mean as well as Mann-Whitney difference-in-median test results for stocks belonging to the top 5% vs. remaining 95%, or top 30% vs. bottom 30% in terms of the latest 5-day *FNP* evaluated at the market close previous to the day of sale. In other words, if a stock belongs to the top 5% (or remaining 95%) of all listed stocks in terms of foreign net purchase, and the investor realizes a paper gain position on this stock during the next trading day, we track its benchmark-adjusted return performance over the next 84-, 252-, and 504-day windows. This allows us to compare the post-sale performance of PGR stocks belonging to different groups sorted according to the stocks' *FNP*. Table 4 present our results.

#### **TABLE 4 HERE**

Across all time horizons, and regardless of how we define the *FNP*-based percentiles, we find that post-sale BHAR of PGR stocks with large foreign inflows is significantly higher than those without, with statistical significance at the 1% level in all instances.<sup>13</sup> In other words, individual investors are more likely to realize a paper gain position on stocks with large recent foreign inflows, even though these stocks actually perform better subsequent to their sale over the next two-year period compared to other stocks where the investors realize a paper gain position. This strongly suggests that the decision to realize a gain position on stocks with large foreign inflows is unlikely to be motivated by a rational forecast of their post-sale performance. Instead, the evidence is more likely to be consistent with an increased degree of behavioral bias on the part of individual investors, reflecting their fear of foreign inflows.

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<sup>13</sup> For brevity of exposition, we only report the difference-in-mean and difference-in-median results. We find in untabulated results that the point estimates of post-sale BHARs are all negative, hinting at some market timing ability of individual investors, but the statistical significance is much stronger for low-*FNP* stock subsamples, once again consistent with Table 4.

## 4. Discussion

### 4.1. MSCI Index Inclusion Announcements and Difference-in-Difference Analysis

Given the concerns over possible endogeneity driven by unobserved heterogeneity, we proceed with the difference-in-difference analysis as outlined in Section 2.4. For each stock announced to be added in the MSCI Korea index, we identify three matched non-included stocks following the propensity score matching procedure as outlined in Section 2.3. We define pre- and post-announcement periods as 60 days before and after the MSCI's schedule announcement. Then, we analyze the difference-in-difference of investors' five-day PGR and PLR for each stock as well as their difference.<sup>14</sup> Table 5 presents our results.

#### TABLE 5 HERE

Table 5 reveals that, relative to matched non-MSCI stocks, individual investors in our sample exhibit significantly stronger tendency to realize gains, with the difference-in-difference significant at the 1% level. However, the difference-in-difference is insignificant for the case of PLR. Even so, when we focus on the PGR-PLR difference, the difference-in-difference estimate is once again significantly positive at the 5% level, indicating the investors' greater willingness to realize gains, exactly in accordance with our hypothesis. We find that the increased tendency toward disposition effect stems primarily from individual investors' increased propensity to realize gains on stocks with large foreign inflows, which we view as reflecting their heightened fear of being picked off.

However, despite our efforts to include a comprehensive set of controls during the propensity score matching procedure, it is still possible that these controls would affect the investors' overall PGR-PLR difference even among a smaller subsample of matched observations. Thus, in Table 6, we engage in OLS regressions, focusing on the statistical significance of  $POST_{i,t} \times MSCI\ Inclusion_{i,t}$  interaction term turns out to be significant. Table 6 presents our results.

#### TABLE 6 HERE

Table 6 reaffirms our findings; across all specifications, regardless of whether controls and fixed

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<sup>14</sup> We stress that the PGR and PLR for each account-day in this section is computed on a stock-by-stock basis.

effects are added or not, the interaction term enters positively into the regression and is significant at the 5% level. This, in turn, strongly suggests that the individual investors' increased propensity to realize paper gains following a sustained period of foreign investor inflows is unlikely to be driven by an unobserved omitted variable, instilling greater confidence in the causal direction of our hypothesis.

#### *4.2. Foreign Investor Inflow and the Propensity to Trade*

Our empirical findings so far indicate that the behavioral biases of domestic individuals, namely their tendency toward disposition effect, become significantly more pronounced following the inflow of foreign investors. Given that our sample period begins only a few months after the lifting of the maximum ownership limit of foreign investors, we interpret this evidence as being consistent with cognitive fears of a new group of unfamiliar traders. However, our evidence so far explores individual investors' trading behavior while taking their participation as given. Nevertheless, it is possible that, in addition to increasing individual investors' behavioral biases, the presence of foreign investors may also affect their participation decision in the first place.

Thus, in this subsection, we examine the individual investors' propensity to trade. In Table 7, we first utilize our difference-in-difference matched sample in Section 4.1 to examine whether the foreign investor inflow subsequent to a stock's MSCI index inclusion announcement affects the number of trades of individual investors during the 60-day period before and after announcement in our sample. We find that, relative to matched non-MSCI stocks, the average number of trades—both purchases and sales—of individual investors in newly-included MSCI stocks fall substantially following the announcements. This is inconsistent with any potential explanation based on limited investor attention (e.g., DellaVigna and Pollet, 2009; Hirshleifer, Lim, and Teoh, 2009), because a stock's inclusion into the MSCI Korea index is a much-publicized announcement that generates attention and excitement within the investor community. The observed patterns are more consistent with individual investors' desire to shun the stocks that are likely to experience substantial increases in foreign investor presence.

**TABLE 7 HERE**

However, this difference-in-difference analysis only utilizes a small fraction of our sample, so we engage in a similar logit regression to Table 3, albeit examining individual investors' buy vs. hold decision. We posit as follows. If individual investors are worried about foreign investor presence in a particular stock, then they are less likely to invest in it, resulting in a lower likelihood of purchase. With this in mind, in Table 8, we run a buy vs. hold regression similar to Table A.1 in the Appendix, whereby we evaluate each account's portfolio at each market close and create a *Buy* dummy by flagging all purchases as 1 and all stocks remaining held within a portfolio as 0. For measures of foreign investor presence, for which we expect a negative sign on the buy vs. hold equation, we use foreign ownership ratio (foreign ownership as a percentage of the outstanding number of shares), large and small foreign-owned market value dummies for the stocks belonging to the top and bottom 30% of market value of foreign ownership, respectively, and the log of the market value of foreign ownership.<sup>15</sup> These measures are designed to encompass the extent of foreign ownership both relative to the stock's market capitalization as well as the absolute market value of foreign ownership in comparison with other stocks. Given that buy vs. hold decisions are likely to be influenced by similar factors as in sell vs. hold decisions, we use the identical set of controls as in Table 3. Table 8 presents our regression results.

#### **TABLE 8 HERE**

Regardless of the measure used, we find a consistent result, namely that stocks with larger foreign ownership are avoided by individual investors in the first place, resulting in a lower likelihood of purchase. Thus, in addition to our earlier result on these investors' tendency to exhibit stronger disposition effect, our evidence across Tables 7 and 8 suggests that investors are reluctant to participate in trading stocks with large foreign presence. Both are consistent with our "fear of the unknown" hypothesis, whereby individual traders are reluctant to interact with foreign traders, and when they do so, they are more likely to cash in on their winnings quickly.

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<sup>15</sup> We believe that measures of *levels* of foreign ownership are more suitable for the propensity to trade rather than the 5- or 20-day *FNP*, which instead captures a recent trend in *flows*. In any case, the results are consistent when we use the latter.

## 5. Conclusion

Using a novel account-level dataset of Korean individual investors' trading between 1999 and 2005, we explore whether their behavioral biases become more severe in response to the influx of foreign investors into the domestic stock market. Our sample period, beginning only a few months after the full market liberalization and the relaxation of maximum ownership limit for foreign investors on all non-state-owned listed firms, allows us to gain unique insights into how these individual investors perceive foreigners entering the stock market. Consistent with the literature on evolutionary psychology, we find evidence supporting the “fear of the unfamiliar” hypothesis. We find that individual investors are more likely to realize their gains and sell off their position in a stock that has witnessed a sustained recent increase in foreigner net purchase, which does not appear to be driven by their expectations of future returns. Using plausibly exogenous increases in foreign investors' inflow following the announcement of a stock's inclusion into the MSCI Korea index, and by engaging in a difference-in-difference analysis of a matched subsample, we further establish that the statistically significant relationship between foreign investors' inflows and disposition effect is unlikely to be driven by unobserved heterogeneity. Moreover, these individuals appear less willing to trade in stocks with high foreign ownership in the first place.

Given that the restrictions on foreign ownership of local firms remain commonplace in many developing markets, our study offers a valuable insight into how domestic individuals perceive foreign investors and adjust their behavior accordingly following the introduction of market liberalization policies. Through our account-level data, we capture first hand evidence of individual investors' “barbarians at the gate” mentality. In fact, even though two decades have passed since the repeal of capital restrictions on foreign investment in equity markets, domestic individuals remain highly suspicious of foreign investors.<sup>16</sup> If so, there is no reason to believe that our main result, namely increased behavioral biases of local individual investors in response to an influx of foreign investors, would be a short-term, transitory

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<sup>16</sup> When Deutsche Bank released an analyst report in Jan. 2018 criticizing Celltrion, a leading biopharmaceutical firm in Korea, of failing to recognize R&D expenditure as immediate expenses, popular local online investment communities cried foul and claimed it was a thinly guised attempt at manipulating stock prices to benefit their short-selling foreign clients.

phenomenon. This thus raises a delicate question for policymakers in emerging markets contemplating a relaxation of capital restrictions on foreign investors: how should the local individual investors' fear of foreign investors, as reflected through their heightened behavioral biases, be addressed? Though there are no easy answers, this bears important ramifications for investor protection and long-term stability of the equity markets across various emerging markets.

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**Table 1. Basic Information about the Account-Level Data**

This table summarizes our account-level data. Trade numbers are reported separately for at the account-stock and account levels. Trading amount is investors' aggregate amount of purchases and sales in millions of Korean Wons.

	Min.	Median	Mean	Max.	St. dev.	Obs.
<i>Number of trades</i>						
No. of trades (per account-stock)	1.000	3.000	5.720	601.0	10.72	87,498
No. of trades (per account)	1.000	27.00	81.30	2,832.0	163.1	6,160
<i>Trading amount (in million wons)</i>						
Buy amount (per account-stock)	0.000	3.345	13.41	6,295.1	58.92	87,498
Buy amount (per account)	0.002	37.48	190.5	18,157.6	570.7	6,160
Sell amount (per account-stock)	0.000	3.993	12.08	3,267.1	40.97	81,246
Sell amount (per account)	0.018	48.68	168.0	23,314.9	488.3	5,842
<i>Brokerage accounts only</i>						
No. of trades (per account-stock)	1.000	2.000	4.360	124.0	6.100	15,881
No. of trades (per account)	1.000	12.00	33.89	1,077.0	76.17	2,043
Buy amount (per account)	0.007	16.86	82.79	10,113.4	334.1	2,043
Sell amount (per account)	0.054	25.90	94.37	4,216.5	231.0	1,849
<i>HTS accounts only</i>						
No. of trades (per account-stock)	1.000	3.000	6.030	601.0	11.47	71,617
No. of trades (per account)	1.000	40.00	104.82	2,832.0	187.8	4,117
Buy amount (per account)	0.002	58.41	244.0	18,157.6	650.6	4,117
Sell amount (per account)	0.018	64.57	202.0	23,314.9	566.2	3,993

**Table 2. Summary Statistics**

Panel A of this table presents summary statistics of the dataset.  $Sale$  is an indicator variable that equals 1 if stock  $i$  was sold by investor  $p$  on day  $t$ , and 0 for all other stocks held in the investor's portfolio on the same day.  $FNP$  is the foreign investor's net purchase on the previous 5-day window, expressed in the unit of KRW 100 billion.  $Gain$  takes a value of one if the stock's latest close price or sale price is greater than the value-weighted average purchase price. Turnover is the daily trading value scaled by the stock's market capitalization.  $MKT$ ,  $SMB$ ,  $HML$ , and  $UMD$  are four-factor returns of Korean stocks constructed in the analogous manner to Carhart (1997).  $MAX$  and  $MIN$  are dummy variables if the closing price of the stock is trading at a price higher (lower) than the highest (lowest) value of the previous month.  $RET$  is the stock's previous return in excess of the market index (KOSPI index) over the specified window. We further include male investor dummy, and whether his account is normal brokerage account or HTS account, with  $Brokerage$  being the dummy variable that takes a value of 1 for brokerage accounts. Continuous variables are winsorized at the 1% and 99% levels. Panel B then presents the summary statistics of our difference-in-difference sample over a 120-day window surrounding MSCI Korea index inclusion announcement. For each stock announced to be included in the MSCI Korea index during our sample period, we identify a control group of non-MSCI stocks through propensity score matching, using the following variables as controls and with one-to-three nearest neighbor matching without a caliper length restriction: log market capitalization, book-to-market, previous-month turnover, previous 1-year market-adjusted buy-and-hold return, aggregate foreign investor ownership, previous 1-month foreign investor aggregate net purchase, 1-year beta, and first three digits of the KSIC code to control for industry. For each stock-day observation, we calculate the investors' average PGR and PLR (as defined in Odean, 1998) over the previous five-day window, and we also count their number of trades, buys, and sells. The PGR-PLR difference is denoted DGLR.

## Panel A. Main Sample

	Min.	Median	Mean	Max.	St. dev.	Obs.
$Sale_{i,t}$	0.000	1.000	0.509	1.000	0.500	320,000
5-day $FNP_{i,t-1}$	-5.710	0.000	0.001	3.488	0.055	320,000
$Gain_{i,t}$	0.000	0.000	0.436	1.000	0.496	320,000
<i>Controls</i>						
$Turnover_{i,t-1}$ (%)	0.000	0.020	0.047	3.442	0.087	320,000
$MKT_t$ (%)	-0.188	-0.051	-0.054	0.038	0.027	320,000
$SMB_t$ (%)	-0.056	0.001	0.000	0.105	0.017	320,000
$HML_t$ (%)	-0.058	0.000	-0.001	0.052	0.014	320,000
$UMD_t$ (%)	-0.129	0.001	0.001	0.062	0.015	320,000
$MAX_{i,t}$	0.000	0.000	0.131	1.000	0.338	320,000
$MIN_{i,t}$	0.000	0.000	0.109	1.000	0.312	320,000
$RET_{i,t}$	-0.143	-0.005	-0.002	0.143	0.050	320,000
$Brokerage_p$	0.000	0.000	0.146	1.000	0.354	320,000
$Male\ investor\ dummy_p$	0.000	1.000	0.664	1.000	0.472	320,000

## Panel B. Difference-in-Difference Sample for MSCI Index Inclusion Announcements

	Min.	Median	Mean	Max.	St. dev.	Obs.
Number of trades	0.000	1.000	2.132	34.000	2.958	2,000
Number of sells	0.000	0.000	0.965	18.000	1.764	2,000
Number of buys	0.000	1.000	1.168	20.000	1.833	2,000
PGR (5-day average)	0.000	0.094	0.142	1.000	0.178	2,000
PLR (5-day average)	0.000	0.011	0.059	1.000	0.138	2,000
DGLR (5-day average)	-1.000	0.053	0.082	1.000	0.215	2,000

**Table 3. Individuals' Sell vs. Hold Decision and the Effect of Foreign Inflow**

This table presents the logit regression results of individual investors' propensity to sell a stock on the interaction of gain and foreigner net purchase. The panel thus consists of all stock-day observations for all stocks either sold or remaining in an account's portfolio on the day of a stock sale initiated by the account holder. For variable definitions, see the accompanying explanation to Table 2. In column (1) and (2), we use the cumulative foreigner net purchase over the previous 5-day window, while in columns (3) and (4), we use cumulative foreigner net purchase over the previous 20- window. Controls used in the analysis are all outlined in Panel A of Table 2, with the following non-overlapping past return horizons as controls: -1, -2, -3, -4, [-19: -5], [-39: -20], [-59: -40], [-119: -60], [-179: -120] and [-239: -180]. Standard errors are clustered by account and are in parentheses, although results are consistent with double clustering on account and calendar month. In columns (2) and (4), we further control for KSIC 3-digit industry and month fixed effects. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Dependent variable: $Sale_{i,t}$			
	(1)	(2)	(3)	(4)
$Gain_{i,t}$	0.575*** (0.062)	0.541*** (0.061)	0.575*** (0.062)	0.541*** (0.061)
$Gain_{i,t} \times 5\text{-Day } FNP_{i,t-1}$	<b>0.417***</b> <b>(0.072)</b>	<b>0.316***</b> <b>(0.070)</b>		
5-Day $FNP_{i,t-1}$	<b>0.156***</b> <b>(0.043)</b>	<b>0.120***</b> <b>(0.042)</b>		
$Gain_{i,t} \times 20\text{-Day } FNP_{i,t-1}$			<b>0.054**</b> <b>(0.026)</b>	<b>0.045*</b> <b>(0.027)</b>
20-Day $FNP_{i,t-1}$			<b>0.056***</b> <b>(0.017)</b>	<b>0.032*</b> <b>(0.018)</b>
Constant	-0.408*** (0.077)	-1.400*** (0.192)	-0.409*** (0.077)	-1.407*** (0.191)
KSIC 3-digit industry fixed effect	NO	YES	NO	YES
Calendar month fixed effect	NO	YES	NO	YES
Controls	YES	YES	YES	YES
No. of obs.	320,000	319,999	320,000	319,999
Pseudo R-squared	0.089	0.103	0.089	0.103

**Table 4. Post-Sale BHARs of Stocks with Realized Gains: Foreign-Inflow-Based Subsamples**

This table presents the performance of stocks sold by individual investors at a gain over the next 84, 252, and 504 trading date, similar to Odean (1998)'s Table 6. KOSPI index return is used as the benchmark. We consider two sets of subsamples: (i) when an individual investor realizes gain on a stock belonging to the top 5% vs. remaining 95% of the latest five-day foreign net purchase among all listed stocks (Panel A), or (ii) when the same five-day foreign net purchase belongs to the top 30% (large) vs. bottom 30% (small) (Panel B). We perform difference-in-mean as well as Mann-Whitney difference-in-median tests. For difference-in-mean tests, we report standard errors in parentheses, and for difference-in-median tests, we report the Mann-Whitney  $\chi$ -statistic. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Post-sale BHAR over:		
	Next 84 trading days	Next 252 trading days	Next 504 trading days
<i>Panel A. Top 5% vs. remaining 95% of 5-day FNP</i>			
<b>Difference-in-mean</b>			
Top 5% vs. remaining 95%	0.011*** (0.003)	0.013*** (0.004)	0.062*** (0.007)
No. of obs.	90,456	89,059	84,823
<b>Difference-in-median</b>			
Top 5% vs. remaining 95%	0.042*** (17.924)	0.065*** (22.303)	0.098*** (28.739)
No. of obs.	90,456	89,059	84,823
<i>Panel B. Top 30% vs. bottom 30% of 5-day FNP</i>			
<b>Difference-in-mean</b>			
Top 30% vs. bottom 30%	0.023*** (0.003)	0.025*** (0.005)	0.061*** (0.007)
No. of obs.	66,623	65,619	84,823
<b>Difference-in-median</b>			
Top 30% vs. bottom 30%	0.027*** (12.045)	0.032*** (11.329)	0.034*** (9.115)
No. of obs.	66,623	65,619	84,823

**Table 5. Difference-in-Difference Analysis around MSCI Index Inclusion Announcements**

This table presents the results of basic difference-in-difference analysis over a 120-day window surrounding MSCI Korea index inclusion announcements. For each stock announced to be included in the MSCI Korea index during our sample period, we identify a control group of non-MSCI stocks through propensity score matching, using the following variables as controls and with one-to-three nearest neighbor matching without a caliper length restriction: log market capitalization, book-to-market, previous-month turnover, previous 1-year market-adjusted buy-and-hold return, aggregate foreign investor ownership, previous 1-month foreign investor aggregate net purchase, 1-year beta, and dummy variables based on the first three digits of the KSIC code. For each stock-day observation, we calculate the investors' average PGR and PLR over the previous five-day window for each stock in our sample. The PGR-PLR difference is denoted DGLR, Pre- and post-announcement days are defined as 60 trading days before and after the announcement. We also note that the number of stock-day observations between MSCI and non-MSCI stocks do not equal 1:3 despite one-to-three nearest neighbor matching, as some stocks are not held at various horizons by the individual investors in our sample during the 120-day windows. We use the Huber-White robust standard errors. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Pre-announcement			Post-announcement			Diff. in diff.
	MSCI	Non-MSCI	Difference	MSCI	Non-MSCI	Difference	
5-day average PGR	0.108 (0.009)	0.174 (0.008)	-0.066*** (0.012)	0.119 (0.007)	0.138 (0.007)	-0.019* (0.010)	<b>0.048***</b> <b>(0.016)</b>
No. of stock-day obs.	310	650	960	346	694	1,040	<b>2,000</b>
5-day average PLR	0.077 (0.007)	0.057 (0.006)	0.020** (0.009)	0.073 (0.009)	0.047 (0.005)	0.026** (0.010)	<b>0.005</b> <b>(0.013)</b>
No. of stock-day obs.	310	650	960	346	694	1,040	<b>2,000</b>
5-day average DGLR	0.031 (0.012)	0.118 (0.009)	-0.087*** (0.015)	0.046 (0.012)	0.091 (0.008)	-0.044*** (0.014)	<b>0.043**</b> <b>(0.020)</b>
No. of stock-day obs.	310	650	960	346	694	1,040	<b>2,000</b>

**Table 6. Difference-in-Difference Analysis: OLS Regression Results**

This table presents the OLS regression results of investors' average PGR-PLR difference for each stock (computed over the previous five-day window) on the interaction of MSCI inclusion and post-announcement dummies as well as all controls used for first-stage matching in Table 5, whose estimates we omit for brevity. Column (1) presents our regression results without controls, and we add the identical controls as in Table 3 in column (2). We further include KSIC 3-digit and calendar month fixed effects in column (3). Standard errors in parentheses are clustered by stock. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Dependent variable: $DGLR_{i,t}$		
	(1)	(2)	(3)
$MSCI\ Inclusion_{i,t}$	-0.087*** (0.014)	-0.097*** (0.031)	-0.147*** (0.038)
$POST_{i,t}$	-0.027** (0.012)	-0.028 (0.021)	-0.025 (0.022)
$POST_{i,t} \times MSCI\ Inclusion_{i,t}$	<b>0.042**</b> <b>(0.020)</b>	<b>0.055**</b> <b>(0.027)</b>	<b>0.073**</b> <b>(0.032)</b>
KSIC 3-digit industry fixed effect	NO	NO	YES
Calendar month fixed effect	NO	NO	YES
Controls	NO	YES	YES
No. of obs.	2,000	2,000	2,000
Adjusted R-squared	0.022	0.100	0.214

**Table 7. Difference-in-Difference Analysis: Number of Trades**

This table re-estimates the difference-in-difference analysis in Table 5, albeit for investors' average number of trades, purchases, and sales during the 60-day period before and after the MSCI announcement. Pre- and post-announcement days are defined as 60 trading days before and after the announcement. We use the Huber-White robust standard errors. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Pre-announcement			Post-announcement			Difference-in-Difference
	MSCI	Non-MSCI	Difference	MSCI	Non-MSCI	Difference	
Number of trades	2.984	1.774	1.210***	2.231	2.037	0.194	<b>-1.016***</b>
	(0.264)	(0.090)	(0.236)	(0.129)	(0.103)	(0.165)	<b>(0.324)</b>
No. of obs	310	650	960	346	694	1,040	<b>2,000</b>
Number of purchases	1.439	0.854	0.585***	0.899	0.889	0.010	<b>-0.575***</b>
	(0.161)	(0.056)	(0.170)	(0.079)	(0.057)	(0.098)	<b>(0.196)</b>
No. of obs	310	650	960	346	694	1,040	<b>2,000</b>
Number of sales	1.545	0.920	0.625***	1.332	1.148	0.184	<b>-0.441**</b>
	(0.138)	(0.060)	(0.151)	(0.087)	(0.070)	(0.112)	<b>(0.188)</b>
No. of obs	310	650	960	346	694	1,040	<b>2,000</b>

**Table 8. Individual Investors' Buy vs. Hold Decision: The Role of Foreign Ownership**

This table presents the logit regression results of the individual investors' propensity to purchase a stock in a similar manner to Table 3. The dependent variable is an indicator variable that takes a value of 1 if the investor purchases it on day  $t$ , and 0 for all other stocks held in the investor's portfolio on the same day. Foreign ownership is the number of shares held by foreign investors divided by the total number of shares outstanding. Top 30% Foreign MktVal and Bottom 30% Foreign MktVal are dummy variables that take a value of 1 if the market value of foreign-owned shares in the stock is in the top and bottom 30% of the entire stock market universe, respectively. Lastly, Log Foreign MktVal is the log of the market value of foreign-owned shares in the stock. Due to incidental parameters problem, we run regressions with KSIC 2-digit industry fixed effect rather than 3-digit fixed effects. In all specifications, we also control for month fixed effect. Standard errors in parentheses are clustered by account. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Dependent variable: $Purchase_{i,t}$			
	(1)	(2)	(3)	(4)
<i>Foreign Ownership</i> $_{i,t-1}$	<b>-0.002**</b> (0.001)			
<i>Top 30% Foreign MktVal</i> $_{i,t-1}$		<b>-0.059**</b> (0.027)		
<i>Bottom 30% Foreign MktVal</i> $_{i,t-1}$			<b>0.216***</b> (0.028)	
<i>Log Foreign MktVal</i> $_{i,t-1}$				<b>-0.016***</b> (0.003)
Constant	-2.143*** (0.059)	-2.160*** (0.058)	-2.215*** (0.057)	-2.045*** (0.063)
KSIC 2-digit industry fixed effect	YES	YES	YES	YES
Calendar month fixed effect	YES	YES	YES	YES
Controls	YES	YES	YES	YES
No. of obs.	3,479,020	3,479,020	3,479,020	3,479,020
Pseudo R-squared	0.056	0.055	0.056	0.056

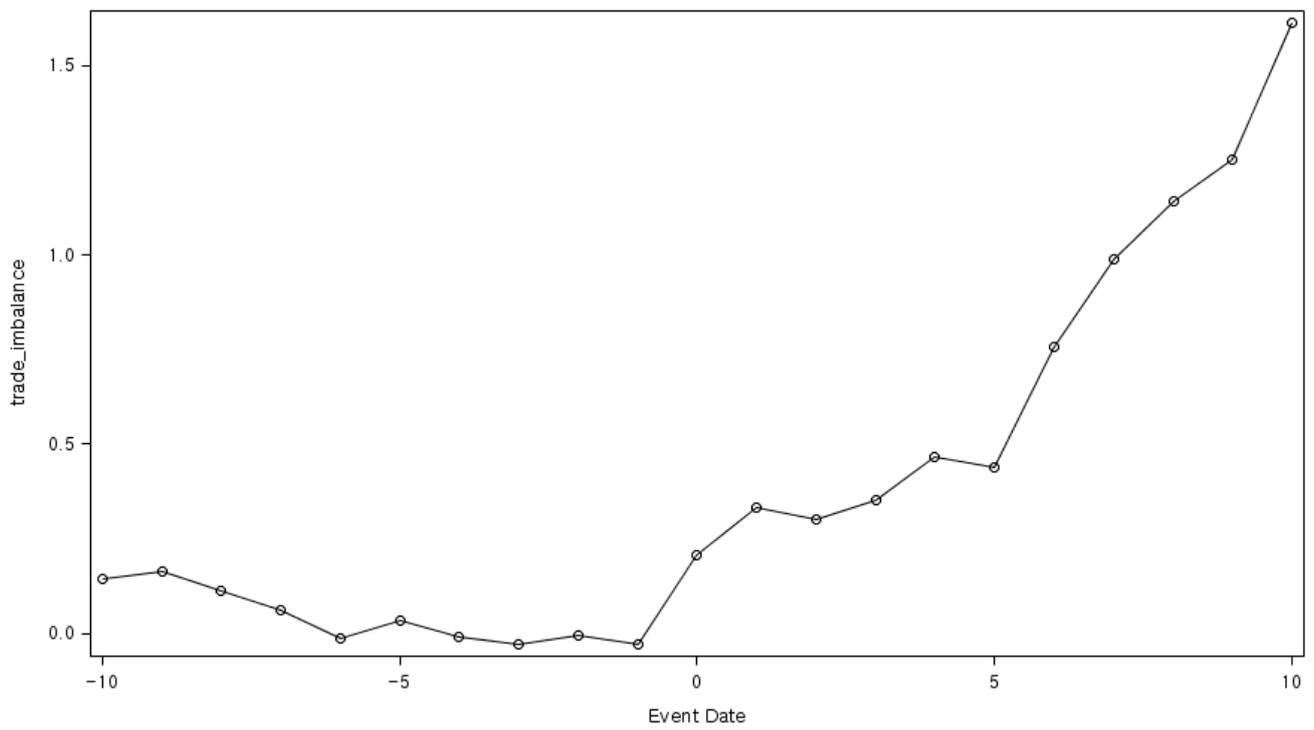
**Figure 1. Online Availability of Information on Foreign Investors' Net Purchase**

This figure provides a snapshot of Daum Finance, one of the Korean portal website's finance section, which provides a list of stocks with the largest inflows and outflows of foreign investors over the previous 5- and 20- day windows. [http://finance.daum.net/domestic/influential\\_investors](http://finance.daum.net/domestic/influential_investors), taken on Nov. 23, 2018

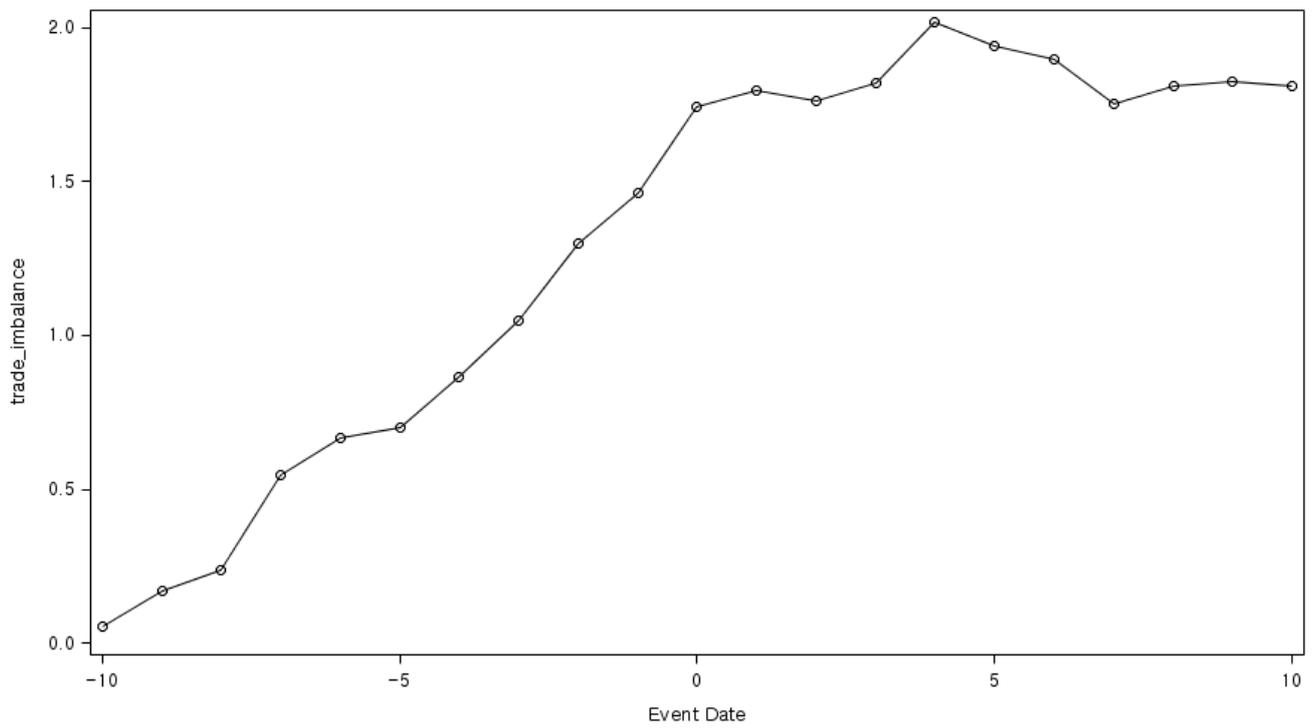
외국인/기관매매				11.23 10:18 기준   실시간				외국인/기관매매				11.23 10:18 기준   실시간			
코스피		코스닥		코스피		코스닥		코스피		코스닥		코스피		코스닥	
외국인 매매종목				기관 매매종목				외국인 매매종목				기관 매매종목			
기존일: 11.16 ~ 11.22 단위: 백만원, 천주				5거래일				기존일: 10.26 ~ 11.22 단위: 백만원, 천주				20거래일			
순매수 종목		순매도 종목		순매수 종목		순매도 종목		순매수 종목		순매도 종목		순매수 종목		순매도 종목	
종목명	금액	수량	등락률	종목명	금액	수량	등락률	종목명	금액	수량	등락률	종목명	금액	수량	등락률
필라코리아	42,953	782	+0.18%	삼성전자	210,448	4,979	0.00%	필라코리아	140,139	2,839	+0.36%	셀트리온	268,281	1,212	+1.35%
LG화학	28,814	84	-0.15%	삼성전자우	88,933	2,592	0.00%	SK하이닉스	124,050	1,574	-0.87%	KODEX 200	226,828	8,456	-0.02%
한국항공우주	26,392	813	-0.78%	아모레퍼시픽	86,197	548	0.00%	대한항공	74,173	2,327	-1.54%	아모레퍼시픽	163,934	1,057	0.00%
대한항공	23,881	724	-1.54%	호텔신라	85,964	1,029	+2.17%	대우조선해양	59,030	1,725	+1.59%	호텔신라	151,819	1,918	+1.81%
대우조선해양	23,348	653	+1.15%	KODEX 200	71,233	2,653	-0.06%	한화에너지...	52,299	1,676	-2.13%	KB금융	146,840	3,062	+0.11%
고려아연	21,310	49	-0.79%	LG유플러스	54,684	3,467	-0.62%	삼성전자우	51,902	1,330	-0.44%	LG유플러스	137,725	9,075	-0.62%
롯데케미칼	19,925	70	+0.53%	삼성전기	44,444	383	+1.34%	롯데쇼핑	51,212	233	+0.23%	SK텔레콤	96,652	355	-0.17%
현대중공업	19,579	146	+0.37%	SK텔레콤	36,370	130	-0.17%	넷마블	49,493	449	+3.28%	현대서비스	74,614	386	-1.18%
롯데쇼핑	15,829	71	+0.23%	셀트리온	36,360	162	+1.35%	GS건설	47,735	1,162	+0.38%	삼성바이오로직스...	71,947	188	0.00%
넷마블	15,681	127	+3.28%	TIGER 200	35,433	1,320	-0.09%	한국항공우주	42,967	1,351	-0.78%	SK이노베이션	66,784	333	-1.22%
삼성엔지니어링	15,249	847	-1.37%	LG생활건강	33,799	29	-0.09%	메리츠증권증권	39,657	9,195	+1.05%	신한지주	63,906	1,492	-0.12%
삼성중공업	14,025	1,854	+0.26%	신한지주	31,919	752	-0.12%	GS리테일	38,955	1,079	-0.55%	삼성전기	62,197	792	+0.45%
GS건설	13,704	337	+0.25%	현대차	31,285	309	+0.86%	롯데케미칼	36,206	123	+0.35%	우리은행	62,101	644	+0.91%
현대미포조선	11,119	105	0.00%	NAVER	30,799	279	+4.57%	우리은행	35,309	2,228	-0.31%	KT&G	58,515	586	0.00%
유한양행	10,818	45	0.00%	SK하이닉스	30,572	449	-0.58%	삼성물산	35,172	339	+3.01%	하나금융지주	56,949	1,458	-0.90%
대림산업	10,790	124	+0.80%	KT&G	29,816	297	0.00%	POSCO	32,074	126	-0.20%	현대차	54,348	523	+0.54%
LG디스플레이	9,828	557	-1.43%	KB금융	29,714	635	+0.21%	키움증권	29,147	359	-0.50%	유한양행	45,359	192	-0.63%
현대백화점	8,082	89	-0.44%	한진칼	29,112	998	-1.84%	현대차2우B	25,606	369	-1.12%	LG이노텍	40,844	410	+0.32%
아시아나항공	7,963	1,877	+0.93%	우리은행	24,319	234	+0.91%	대림산업	25,423	314	+0.57%	투신닷컴	36,183	998	-0.54%
두산중공업	7,939	739	+0.46%	신세계	22,467	80	+4.37%	LG전자	24,430	386	+0.58%	TIGER 200	35,869	1,333	-0.11%
메리츠증권증권	6,685	1,521	+1.05%	현대엘리베이	17,282	189	+0.32%	GS	24,393	489	-1.16%	KODEX 200선물...	32,254	3,812	+0.06%
한화에너지...	6,654	200	-2.13%	아모레G	16,189	258	-1.88%	LG디스플레이	24,119	1,429	-1.14%	한진칼	32,024	1,132	+1.69%
현대제철	6,583	151	+1.28%	한국물마	15,072	242	+0.94%	현대제철	23,450	537	+1.05%	NAVER	31,341	282	+5.48%
한국타이어	6,533	154	+0.36%	신세계인터내셔...	12,885	73	+5.60%	제일기획	20,233	923	+0.44%	신세계	28,480	101	+3.85%
키움증권	6,489	78	-0.50%	삼성화재	12,729	45	-0.88%	카카오	19,542	223	+2.35%	SK	26,576	99	-0.92%
CJ대한통운	6,088	42	0.00%	KODEX 200TR	10,747	1,291	-0.06%	엔씨소프트	17,458	36	-1.25%	한온시스템	25,224	2,356	+0.49%
농심	6,059	24	-1.41%	S-Oil	10,624	96	0.00%	삼성생명	16,234	171	-0.81%	KODEX 코스닥1...	23,576	3,175	-0.35%
POSCO	5,957	23	0.30%	삼성SDI	10,577	52	2.16%	아시아나항공	15,758	3,883	+0.70%	한진칼	23,530	782	-1.67%
롯데지주	5,659	104	+0.54%	삼성생명	10,057	113	-0.70%	삼성엔지니어링	14,827	781	-0.55%	삼성화재	23,075	80	-0.88%
영원무역	5,556	142	-1.61%	KODEX 코스닥1...	9,659	1,327	-0.28%	투신인프라코어	14,671	1,760	+0.84%	신세계인터내셔...	21,382	122	+4.20%

Figure 2. Foreigners' Cumulative Trade Imbalance around MSCI Inclusion Events

Panel A. Around MSCI inclusion announcements



Panel B. Around actual MSCI inclusions



**Table A.1. Individual Investors' Sell vs. Hold Logit Regressions: The Effect of Foreign Investor Inflow with holding**

This table re-estimates columns (2) and (4) of Table 3, albeit for a full sample of stock-day observations whereby we include all stocks remaining held in an account's portfolio at each market close, not just on days when the account holder makes a sale. Standard errors are clustered by account and are in parentheses, although results are consistent (albeit with marginally weaker significance) with double clustering on account and calendar day. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Dependent variable: $Sale_{i,t}$	
	(1)	(2)
$Gain_{i,t}$	0.871*** (0.048)	0.871*** (0.048)
$Gain_{i,t} \times 5\text{-Day } FNP_{i,t-1}$	<b>0.236***</b> <b>(0.041)</b>	
$5\text{-Day } FNP_{i,t-1}$	-0.001 (0.027)	
$Gain_{i,t} \times 20\text{-Day } FNP_{i,t-1}$		<b>0.060***</b> <b>(0.018)</b>
$20\text{-Day } FNP_{i,t-1}$		-0.035*** (0.013)
Constant	-2.797*** (0.080)	-2.798*** (0.080)
KSIC 2-digit industry fixed effect	YES	YES
Calendar month fixed effect	YES	YES
Controls	YES	YES
No. of obs.	3,435,551	3,435,551

**Table A.2. Individual Investors' Sell vs. Decision: Account Fixed Effect and Time Clustering**

This table re-estimates Table 3 with different fixed effect and/or clustered standard error specifications. In all specifications, we include account ID fixed effect. In columns (2) and (4), we further include month fixed effect, as in Table 3. Columns (1) and (2) report standard errors clustered by account, while columns (3) and (4) uses time (i.e., trading day) clustered standard errors. Results are consistent when double clustering on account ID and calendar day are performed instead. \* denotes significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level, respectively.

Variable	Dependent variable: $Sale_{i,t}$			
	(1)	(2)	(3)	(4)
$Gain_{i,t}$	0.575*** (0.062)	0.541*** (0.061)	0.575*** (0.043)	0.541*** (0.042)
$Gain_{i,t} \times 5\text{-Day } FNP_{i,t-1}$	<b>0.417***</b> <b>(0.072)</b>	<b>0.316***</b> <b>(0.070)</b>	<b>0.417***</b> <b>(0.076)</b>	<b>0.316***</b> <b>(0.073)</b>
$5\text{-Day } FNP_{i,t-1}$	0.156*** (0.043)	0.120*** (0.042)	0.156*** (0.052)	0.120** (0.047)
KSIC 3-digit industry fixed effect	YES	YES	YES	YES
Calendar month fixed effect	NO	YES	NO	YES
Account ID fixed effect	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Clustering by account	YES	YES	NO	NO
Clustering by time	NO	NO	YES	YES
No. of obs.	320,000	319,999	320,000	319,999
Pseudo R-Squared	0.089	0.103	0.089	0.103