Do Foreign Investors Improve Market Efficiency? *

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Abstract

We study the importance of foreign institutional investors for global capital allocation. We find that stocks that are held more by foreign institutional investors have more informative prices, both unconditionally and conditional on the same level of domestic institutional ownership. Foreign institutions contribute to price informativeness about as much as domestic ones, especially for stocks in developed countries. The effect is robust to using different measures of price informativeness, and is stronger for stocks held more by active investors, by foreign investors from countries with advanced financial systems, and stocks in countries with looser capital controls. We show that the efficiency effects are most likely not due to increased firm information disclosure, but rather due to real efficiency gains.

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1 Introduction

One of the key roles of financial markets is the efficient allocation of capital to real sector.[1] Historically, this function has been facilitated by domestic investors; the importance of foreign investors was lower due to capital controls, asymmetric information, or home bias. However, as globalization increased, financial markets have witnessed a significant inflow of capital from foreign investors. While empirical evidence points to significant benefits of aggregate foreign flows,[2] we know considerably less about the underlying economic mechanisms driving any efficiency gains at the firm level. Do foreign investors improve the informational and real efficiency of individual firms? What types of investors and markets see the highest such gains? How important are foreign investors relative to the domestic ones? In this paper, we aim to answer these and other questions by analyzing the impact of foreign institutional investors on individual firms' stock price informativeness using a large panel data set on firms and investors from 40 countries.

We focus on institutional investors for several reasons. First, through their expertise and superior resources, institutional investors possess a strong advantage over retail investors in identifying inefficiencies in asset prices and correcting them through trading (e.g., Bai, Philippon and Savov, 2016). Second, through their size, they have a distinct ability to affect real decisions in firms either through monitoring or by taking active ownership. Third, they are economically large and are major players in global capital flows (e.g., Ferreira and Matos, 2008; Maggiori, Neiman and Schreger, 2017).[3] Finally, we can take advantage of a large global institutional equity ownership database.

Whether and how foreign investors affect the price informativeness of local stocks is not obvious. On the one hand, foreign investors, may be less able or less inclined to research domestic stock fundamentals, so their price impact may be small. On the other hand, foreign investors may exhibit a smaller degree of home bias and consequently, *conditional on market participation*, be more informed about individual investment opportunities and allocate their capital more

[1] The Q-theory of Tobin (1969) postulates that asset prices should convey useful information about quality of investments. Intermediation-based theories in the spirit of Bagehot (1873) and Schumpeter (1912) focus on lenders' and intermediaries' ability to screen out bad projects. Agency theory (Jensen, 1986) emphasizes contracting features that incentivize managers to pursue value-maximizing investment policies. Empirically, Wurgler (2000) shows benefits of financial markets for investments in a sample of developed economies.

[2] For empirical evidence on the topic, see for example, Chan et al. (1992), Bekaert and Harvey (1995), Stulz (1999), Bekaert et al. (2005), Chari and Henry (2004, 2008).

[3] In our sample from 2000 to 2013, the value-weighted average institutional ownership has increased from 50% to 75% for U.S. stocks, while the average non-U.S. stock has observed an increase in its ownership level from around 5% to 24%.

efficiently. Additionally, foreign investors' participation may indicate that the investment opportunity was too good to pass up, *in spite of* barriers to entry.

To evaluate this hypothesis, we construct a rich panel data set on institutional equity ownership worldwide. Our sample covers almost 24,000 firms from 40 countries, both developed and emerging, between 1999 and 2016. These data have been used before in other contexts (e.g., Ferreira and Matos, 2008), but to our knowledge we are the first to relate institutional ownership worldwide to individual firms' stock price informativeness and real efficiency. We supplement the data with macroeconomic, market, and accounting information. We follow Bai et al. (2016) and define stock-level price informativeness as the predicted variation of cash flows using market prices. As stated in that study, it is a welfare-based measure, and therefore more relevant for real outcomes, than are other conventional measures (e.g., price nonsynchronicity and PIN). In forming predictions, we consider two different horizons: one year and three years.

In our first set of results, we relate foreign institutional ownership to price informativeness at the stock level. We begin with a portfolio-sort approach. Each year, we sort firms within their own home country into quintile portfolios based on their foreign institutional ownership levels and calculate their price informativeness. Subsequently, we aggregate the portfolios informativeness across all years. We find that the average price informativeness of the highest-foreign-owned portfolio is significantly greater than that of the lowest-ownership portfolio. The effect is statistically and economically significant both for short and long horizons. A similar result obtains when we sort stocks based on their domestic ownership levels; however, foreign ownership contributes relatively more to the higher price informativeness. We further conduct our analysis using subsamples of firms located in different economic regions. Our findings hold for U.S. and non-U.S subsamples. However, the effects are markedly different across developed and emerging country subsamples. In developed markets, firms with higher foreign institutional ownership are associated with better price informativeness, but the association breaks in emerging markets.

Next, we consider a double-sort approach in which stocks are sorted based on their foreign ownership within portfolios with different levels of domestic ownership. The results remain similar, suggesting that the two sorts are independent of each other. Notably, the dispersion in price informativeness between high and low-foreign-ownership portfolios is highest for the portfolio with lowest domestic ownership, which underscores an important role of foreign investors in the absence of domestic ownership.

While the portfolio-sort approach is a good way to summarize correlations in the data, a potential concern is that our results may be spuriously attributed to other factors that drive both the ownership and informativeness. To allay this concern, we use a multivariate regression approach. In this setting, we can use time-varying firm characteristics and also take advantage of various fixed effects, across firms, time, countries, and industries. The results are highly statistically significant and broadly corroborate the findings that price informativeness increases with institutional ownership.

Nevertheless, a lingering concern is that of omitted variables bias due to unobserved time-varying characteristics. In particular, price informativeness may be higher not because of high institutional ownership but because of other, related variables. While our multivariate regression approach with various fixed effects is supposed to alleviate such bias, one can never fully account for unobservable time-varying effects. We address this issue by taking advantage of the following institutional regularity: stocks that are added to the global MSCI index subsequently experience a strong increase in foreign ownership. The event generates an economically meaningful, and plausibly exogenous variation in foreign ownership, which we exploit using the difference-in-differences estimation. The exclusion restriction is that price informativeness is not driven by forces other than index reconstitutions, which we believe is economically plausible. We first establish that the shock indeed has a strong positive effect on firm-level foreign institutional ownership. The average firm experiences a 20% increase in foreign ownership when added to the index, relative to an average control firm that is similar to the treated firm along several pre-determined characteristics but does not experience the inclusion event. The effect is simultaneously driven both by the increase in active and passive foreign ownership, which potentially underscores the dual role of institutions as monitors and active traders. We next explore the role of the changes in ownership on price informativeness. We find that prices of stocks that are added to the index become more informative about future fundamentals relative to a control sample of stocks. Specifically, the exogenous change in foreign ownership is predictive of future increases in capital expenditures, but not in R&D. All our tests indicate no visible violation of the parallel trend assumption, which validates the suitability of our empirical approach.

The index inclusion shock may simultaneously lead to a greater information production, based on the fact that indexed stocks become more on the radar screen. It is thus possible that any changes in price informativeness could simply reflect greater access to information by market

investors. At the same time, if firm managers had already seen such information the effect would not necessarily imply greater aggregate efficiency. To evaluate this hypothesis, we first test whether index inclusion indeed leads to more information production. We find that the foreign ownership shock leads to a relatively higher information production as evidenced by an increase in analysts' coverage and increase in stock liquidity. However, when we include the information controls in our price informativeness regressions their effects does not take away the significance of market prices in predicting future earnings. To further assess the information disclosure hypothesis, we examine the variation in aggregate efficiency, estimated as a sensitivity of future firms' cash flows to their contemporaneous investment levels. If disclosure were to affect price informativeness we would predict that aggregate efficiency remain unchanged because it depends on the information available to the firm's manager, which is unaffected by disclosure. On the other hand, if information were new to firm managers we would expect the real efficiency to improve. Our results are consistent with the improved efficiency mechanism. Further, they indicate that foreign institutional ownership has a dominant role in driving aggregate investment efficiency. When we decompose total investment levels into CAPEX and R&D, we observe that the effect of foreign ownership operates largely through CAPEX changes. This result suggests that different sources of institutional ownership may be complementary to each other in the way they affect investments.

One may worry that the results on price informativeness could be driven by the mechanical response of prices of stocks with different fundamental characteristics and possibly different factor loadings. To alleviate this concern, we consider the effect of index reconstitution on post-earnings announcement drift (PEAD). If an exogenous shock to foreign ownership indeed improves market efficiency, one would expect that prices are going to revert back faster to their fundamentals, that is, $PEAD$ should be smaller. This is indeed what we find: following an inclusion in the MSCI index stocks experience a decrease in $PEAD$, defined over one, three, and five day window. Hence, we conclude that the effect on market efficiency is unlikely due to systematic differences in factor exposures of individual stocks.

In the second part of the paper, we explore possible mechanisms driving our results. First, we hypothesize that firms in which active investors make up a bigger share should be more informationally efficient. Indeed, our results show that investors' activeness and expertise are relevant predictors of greater price efficiency, especially when capital flows from foreign institutions. Sec-

ond, we find stronger positive efficiency effects from countries with high financial development. Foreign investors from countries with high financial development or with common law show larger effects on price informativeness, especially when they invest in low financial development or civil law based countries. Third, we hypothesize that frictions in capital flows across countries may limit the effectiveness of foreign flows. In support of this hypothesis, we find that firms located in countries with tighter capital constraints are associated with a weaker impact of foreign investors on efficient allocation of capital.Finally, we explore the time-series variation of the ownership effect. Using a battery of business cycle measures, we find a strong countercyclical behavior in the relationship between institutional ownership and price informativeness.

1.1 Literature Review

Our paper blends two empirical facts: the increasing level of stock price informativeness in the U.S. market (Bai et al., 2016) and the increasing dominance of institutional ownership in the equity market (Gompers and Metrick, 2001). Using a simple portfolio sort approach, Bai et al. (2016) show a positive relationship between institutional ownership and price informativeness. We extend their analysis to a broader coverage of international stocks and also decompose the ownership into domestic and foreign ones. Furthermore, we highlight the role of foreign institutional ownership in price informativeness and the role of economic condition, country-specific financial environment in affecting the efficiency margin.

We also contribute to the literature on the information production of financial markets and firms' investment decisions.[4] Bond, Edmans and Goldstein (2012) survey the literature on information production in financial markets, emphasizing the separation of the genuinely new information produced in markets (revelatory price efficiency) from what is already known and merely reflected in prices (forecasting price efficiency). Chen, Goldstein and Jiang (2007) find that two measures of the amount of private information– stock price nonsynchronicity and probability of informed trading (PIN)–have a strong positive effect on the sensitivity of corporate investment to stock price. In an international setting, Wurgler (2000) finds that financial markets improve the allocation of capital, especially in countries with highly developed financial market (equity market capitalization/GDP). The state ownership is negatively related, while the firm-specific

[4]Examples include Dow and Gorton (1997), Baker, Stein and Wurgler (2003), Goldstein and Guembel (2008), Ozdenoren and Yuan (2008), Bakke and Whited (2010), Bond et al. (2010), Goldstein, Ozdenoren and Yuan (2013), Kurlat and Veldkamp (2015), and Edmans, Goldstein and Jiang (2015).

information and minority investor rights are positively related to the efficiency of capital allocation.

Also is related is a broad literature on institutional investors and market efficiency. This research provides mixed evidence on whether investors' trading improves market efficiency[5]. Campbell, Ramadorai and Schwartz (2009) find that institutions trade aggressively to exploit mispricing around earnings announcements. Boehmer and Kelley (2009) document a positive relationship between institutional shareholdings and the relative informational efficiency of prices, measured as deviations from a random walk. Drawing on a recent trend of quantitative trading, Stein (2009) discusses the potential effect of the increasing institutional ownerships on market efficiency. His focus is mostly on the crowded trading and leverage effects. Our paper differs from the previous studies that focus on the price-based measure of market efficiency, in that it examines a welfare-based measure of price informativeness. In a general equilibrium framework, Kacperczyk, Nosal and Sundaresan (2017) show that the increase in institutional (informed) ownership increases price informativeness and the concentration of ownership leads to lower informativeness.

Our paper further complements the studies related to the institutional investors and market efficiency worldwide. Using a sample of 3189 global firms in 2002, He et al. (2013) show a positive relationship between large foreign block shareholdings and the stock price informativeness (PIN and return non-synchronicity). Lin, Massa and Zhang (2014) investigate the role of country-level governance on the information processing by mutual funds. Using a similar data set, Bena et al. (2017) find that greater foreign institutional ownership fosters long-term investment and innovation output.

Last, our paper is also related to the literature on international capital flows. Hau and Rey (2006) develop an equilibrium model in which exchange rate, equity price, and capital flows are jointly determined. They show that the net equity flows into the foreign market are positively correlated with a foreign currency appreciation, and financial market development. Hau and Rey (2008) document some facts about the mutual fund home bias in an international fund sample. Froot and Ramadorai (2008) find that institutional cross-border flows are linked to fundamentals, while closed-end fund flows are a source of price pressure in the short run. Jotikasthira, Lundblad

[5]On the one hand, Coval and Stafford (2007), Frazzini and Lamont (2008), and Lou (2012) empirically document the price pressure of mutual fund flow-induced trading. Da and Shive (2017) find the ETFs trading increases the stock volatility and correlation. On the other hand, studies by Kacperczyk, Sialm and Zheng (2005, 2008), Kacperczyk and Seru (2007), Cremers and Petajisto (2009), Huang et al. (2011), Kacperczyk, Van Nieuwerburgh and Veldkamp (2014, 2016) suggest that at least some institutional investors have ability to forecast returns.

and Ramadorai (2012) show that flows to funds domiciled in developed markets force significant changes in these funds' emerging market portfolio allocations. These forced trades or "fire sales" affect emerging market equity prices, pairwise correlations, and betas.

The rest of the paper proceeds as follows. The data, as well as empirical results are discussed in Section 2 and Section 3. Section 4 presents further details on the underlying economic mechanism. Section 6 concludes.

2 Data

Our primary data set is a panel that results from matching several databases. First, we merge FactSet[6] (with data on firm-level global institutional ownership), available from 1999 onwards, with Worldscope (for firm-level international stock market and accounting data). FactSet reports holdings for a wide range of institution types, such as mutual funds, hedge funds, pension funds, bank trusts, and insurance companies (Ferreira and Matos, 2008). For non-U.S. firms, FactSet collects ownership data directly from national regulatory agencies, stock exchange announcements (e.g., the Regulatory News Service in the U.K.), local and offshore mutual funds, mutual fund industry directories (e.g., European Fund Industry Directory), and company proxies and financial reports. Even though the data are available at a quarterly frequency, for our purposes, we use the last reported value in each calendar year.

Next, we append the data on returns of open-end equity mutual funds from Lipper. We further add equity index return data from the Morgan Stanley Capital International (MSCI), as well as country-level equity market capitalization, GDP, and industrial production from the World Bank. Finally, we merge bilateral trade data from the International Monetary Fund.

Our aggregated database is at an annual frequency and covers the period of 2000-2016. Following previous studies (e.g., Edmans, Jayaraman and Schneemeier, 2017), we exclude financial firms (one-digit SIC code 6) and firms with market capitalization smaller than $1 million. A firm must have at least four successive years of earnings data and have non-zero institutional ownership value to be included in our sample. We further limit our sample to the countries in which there are at least 20 reporting firms. The final data set consists of 23,811 unique firms for a total of 186,885 firm-year observations.

[6]We thank Miguel Ferreira and Pedro Matos for making their ownership data available. Details can be found at https://wrds-web.wharton.upenn.edu/wrds/ds/factset/holdingsbyfirmmsci/index.cfm?navId=195.

2.1 Institutional Ownership Variables

The data contain 9,449 institutional owners, of which 8,928 are active, and 521 are passive investors. Foreign institutional ownership (FOR_{it}) is the fraction of a firm's i shares held at time t by all institutions domiciled in a country different than the one where the stock is listed, relative to the firm's total number of shares outstanding.[7] FOR_{it} is set to zero if a stock is not held by any foreign institution but is held by at least one domestic institution. Domestic institutional ownership (DOM_{it}) is the fraction of a firm's i shares held at time t by all institutions domiciled in the same country where the stock is listed, relative to the firm's total number of shares outstanding. DOM_{it} is set to zero if a stock is not held by any domestic institution but is held by at least one foreign institution.[8] Total institutional ownership (IO_{it}) is a sum of DOM_{it} and FOR_{it}.

We define active ($ACTIVE_{it}$) and passive ($PASSIVE_{it}$) fractional ownership variables based on institutions' investment types. Following Ferreira and Matos (2008), active institutions are mutual funds, investment advisors, and hedge funds, while other institutions (bank trusts, pension funds, and insurance companies) are considered as passive. This classification is not perfect for several reasons (Ferreira and Matos, 2008). For example, the mutual fund category includes index funds or exchange-traded funds that invest passively. To address this concern, we categorize these two types of funds as passive.[9] Further, we decompose both measures depending on whether active owners are foreign (FOR_ACTIVE_{it}) or domestic (DOM_ACTIVE_{it}). Similarly, we separate passive ownership into $FOR_PASSIVE_{it}$ and $DOM_PASSIVE_{it}$. Finally, for firms listed outside the U.S., we define U.S.-based foreign fractional institutional ownership (FOR_US_{it}) and non-U.S.-based foreign ownership (FOR_NUS_{it}).

We present basic summary statistics on the distribution of ownership data by country in Table 1. Our sample includes 40 countries both from developed and emerging economies. The United States has the largest number of 5,131 listed stocks, while Hungary has the lowest representation with 27 stocks. An average firm in a developed country has a higher value of DOM (19.43%) than

[7] For multinational companies, we are able to track ownership at the trading desk/subsidiary level. As such, the investments from Blackrock London office would be considered domestic from the perspective of investing in U.K. companies, but investments from Blackrock U.S. would be considered as foreign in the same case.

[8] Alternatively, for the firms with no matched or missing ownership data, we can simply set the values of IO, FOR, and DOM to zero. In this larger sample, the results are qualitatively and quantitatively similar; for more discussion, see Section 3.4.3.

[9] Our empirical results are quantitatively and qualitatively similar if we use the active (IO_INDEP) and passive (IO_GREY) classification of Ferreira and Matos (2008), which can be accessed directly from FactSet/LionShares. We observe slight differences in the ownership levels across the two investing groups.

that of FOR (4.70%), which is largely explained by the strong asymmetric pattern in the U.S., where an average firm has the value of DOM equal to 49.06% and the value of FOR equal to 2.62%. In contrast, the average value of FOR is much higher than DOM in emerging countries, where a typical foreign institution has an average ownership of 4.39% and a domestic institution has a value of 2.60%. In addition, the average firm in a developed country attracts a higher number of institutional investors than the one in an emerging country. The respective numbers are 87 and 25.

In Figure 1, we present the time series of foreign and domestic ownership levels for two different groups of firms: from developed and emerging countries. We aggregate ownership across firms using weights proportional to their stocks' market capitalizations. We observe an increase over time in institutional ownership, especially in developed countries. Domestic institutions are key owners in the United States while foreign owners dominate countries outside the U.S., especially in emerging markets. In Figure 2, we present the time series of average active and passive ownership (both domestic and foreign) for the same regions. In both groups, we observe a dominant role of active investors in institutional ownership. However, passive ownership has been increasing steadily over time, especially in emerging markets.

In Panel A of Table 2, we present the summary statistics for the main institutional ownership variables. The average firm-level institutional ownership in our sample equals 19.5% with an interquartile range between 1.5% and 24.6%. The distribution is highly right skewed with the median equal to 7.5%. Of the 19.5% average ownership, 14.9% is accounted for domestic ownership while the remaining 4.6% comes from foreign ownership. The majority of domestic ownership is active (13.1%) with 1.8% being passive. Similarly, within foreign ownership, active investors own 4% while passive investors 0.6% of the total. Finally, firms outside the U.S. receive almost equal share of foreign ownership from the U.S. institutions (2%) and non-U.S. institutions (2.6%). All the above variables are highly dispersed and vary both across countries, industries, firms, and over time.[10]

2.2 Stock Market and Accounting Variables

We use the correlation of a company's equity market valuation with it's cash flows multiplied by the standard deviation of its cash flows as our primary measure of price informativeness. Scaling

[10]The definitions of variables are provided in Appendix IA.1.

the correlation by the standard deviation reflects the fact that a high level of correlation is more meaningful when the asset itself is quite volatile. This measure is definitionally equivalent to the covariance of market valuation and cash flows, normalized by the volatility of market valuation, which is the definition used in Bai et al. (2016). Similarly, we measure aggregate efficiency as a correlation of investment with earnings, multiplied by the standard deviation of earnings. As before, the multiplicative term is to show that correlation matters more for volatile earnings. This term expresses the amount of variation in earnings that can be explained by investment.

We define market valuation of firm i at time t as the natural logarithm of market capitalization (M_{it}) to total assets (A_{it}), $log(M/A)_{it}$. Our cash-flow variable $(E/A)_{it}$ is earnings before interest and taxes ($EBIT$) divided by total assets. The investment variables include research and development $(R\&D)/A_{it}$, capital expenditure $(CAPEX/A)_{it}$, and total investment $INVESTMENT_{it}$ $= (CAPEX_{it} + R\&D_{it})/A_{it}$, all scaled by assets. Additional accounting variables include the logarithm of sales $log(SALES)_{it}$, measured in \$1000s; $LEVERAGE_{it}$, defined as book debt divided by total assets; $CASH_{it}$, defined as cash holdings scaled by total assets; $TANGIBILITY_{it}$ defined as net property, plant, and equipment scaled by total assets; $FORSALE_{it}$ defined as the percentage of foreign sales in total sales. $CLOSE_{it}$ is the ownership fraction of stock i at time at time t by all corporate insiders in this firm. We also use variables related to market liquidity and public information. $ANALYST$ is the number of analysts covering a given stock (based on a one-year forecast period); $log(VOLUME)$ is the natural logarithm of dollar stock volume in year t; $BID - ASK\ SPREAD$ is the ratio of the difference between close ask and close bid prices over the close mid price calculated at a daily frequency, then averaged within year t; $log(AMIHUD)$ is the natural logarithm of Amihud's liquidity measure, which is the ratio of absolute return over the dollar stock volume calculated using daily frequency, then averaged within year t; $VOLATILITY$ is the daily stock return volatility (in %). To mitigate the effect of outliers, we winsorize all variables at 1%.

Panel B of Table 2 presents the summary statistics for the market and accounting variables. The average firm in our sample has an earnings-to-asset ratio of 0.02 and a log-ratio of market capitalization to asset with -0.32. The $R\&D$-to-asset ratio is 0.02 and $CAPEX$-to-asset ratio is 0.05. The average book leverage of a typical firm in our sample equals 0.22 with a standard deviation of 0.20. On average, tangible assets account for 30% of total assets, foreign sales make up 20% of all sales, and cash accounts for 17% of total assets. Further, corporate insiders on

average hold 30.9% of all shares in a typical firm, but the distribution of this quantity is highly variable across countries and firms. An average company in out sample is covered by 8 analysts and the average daily stock return volatility is 3.2%. We also observe a significant cross-sectional and time-series variation in all the variables.

2.3 Country-level Variables

We measure the intensity of a connection between any two countries using several different indicators: bilateral trade relation, geographical distance, language, border connection, and colonial origin. The bilateral trade relation between any country pair is defined as the sum of their bilateral exports, scaled by the sum of their GDPs. We use reported exports for each country, measured in current U.S. dollars. The remaining connection measures are from Mayer and Zignago (2011). Distance is the population-weighted average between large cities in each country pair. Common language equals 1 if a common language is spoken by over 9% of the population in both countries. Border connection equals 1 if both countries share a common border. Colonial origin equals 1 if two countries share the same colonial origin.

Financial system classification data are from Demirguc-Kunt and Levine (1999). The degree of capital control for each country is based on Chinn-Ito index (Chinn and Ito, 2006), which measures the country's current account restrictions based on extracting the first principle component from the indicator variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions.[11]

3 Empirical Results

In this section, we present our main empirical results regarding the impact of capital flows coming from institutional investors worldwide on the price informativeness of publicly listed stocks. Our primary focus is on differences between domestic and foreign investors.

[11] The binary variables include: an indicator variable for the existence of multiple exchange rates ($k1$), restrictions on current account ($k2$), capital account transactions ($k3$), and a variable indicating the requirement of the surrender of export proceeds ($k4$). $k3$ is the one factor often used for measuring capital controls.

3.1 Portfolio Sorts

We begin by presenting portfolio-sort results. In each year and within each country, we sort firms with non-zero ownership levels into equal-sized portfolio bins according to their institutional ownership. We exploit the within-country variation in the data to account for the possibility that different countries may be characterized by different degrees of institutional access to financial markets. Subsequently, we obtain the measure of price informativeness by estimating the following cross-sectional regression model for each sort bin:

$$E_{i,h}/A_i = a + b_{1,h}log(M/A)_i + b_{2,h}(E_i/A_i) + b_{3,h}SIC1 + e_{i,h} \tag{1}$$

where h is earnings horizon of either one or three years, and $SIC1$ is a one-digit SIC industry classifier. We also include country fixed effects to account for any time-invariant country-specific unobservables. Next, for each bin k, we calculate $PI_{k,t+h}$ for horizon h as $b_{1,h} \times \sigma\left(\log(M/A)\right)$, where the second term in the formula is the cross-sectional standard deviation of log valuation ratios in a given year. We obtain the time series of PI measures for two different horizons and each group k.

In Figure 3, we present the time-series evolution of these measures, broken down by type of institutional investors (across rows) and forecasting horizon (across columns). Each picture shows three lines, each one representative of a given tercile of the ownership sort. We observe that PI has been generally trending up over time. In the cross-section, PI is always strictly increasing in the level of institutional ownership even though the growth rate in PI over time has been highest for the stocks in the lowest-ownership tercile.

We next assess the statistical significance of the average estimates by aggregating the measures for each group across all years. To provide more precision, we sort observations into quintiles. We calculate standard errors using the Newey-West method with four lags. We present the results in Panel A of Table 3. Columns (1)-(3) report the results corresponding to the sorts based on total institutional ownership (IO). The portfolio sorts generate a considerable spread in institutional ownership, ranging from 1.5% for the lowest-ownership quintile to 41.5% for the highest-ownership quintile. We observe a strong increasing pattern in PI across the five portfolios: Low-ownership firms have stock prices, which are much less informative than are prices of high-ownership firms. For both one-year and three-year horizons, the respective differences are highly significant both economically and statistically. We further decompose the effect by conditioning institutional

ownership on its country of origin. We present the results for ownership of foreign institutions (FOR) in columns (4)-(6), and for ownership of domestic institutions (DOM) in columns (7)-(9). We observe qualitatively and quantitatively similar findings across two groups of ownership, which suggests that both types of institutional owners play a non-trivial role in information aggregation of prices for the individual equity they hold.

We next explore the differences in results between stocks with zero institutional ownership and those in the lowest-ownership quintile. We find that the monotonicity property between ownership and price informativeness is most pronounced for sorts on foreign ownership and much less for sorts on domestic ownership, even though the spreads in levels of ownership are bigger for the domestic sort. This suggests that the entry of institutional investors into a particular stock has a much bigger impact on its price efficiency, perhaps because foreign investors have to meet a higher hurdle to overcome investment frictions.

While the results in Panel A are indicative of an important role of institutional investors for price informativeness globally, they do not take into account a significant variation in ownership and its effectiveness across different regions. We further advance our analysis by grouping firms in our portfolio-sort analysis based on four different locations: developed countries, emerging countries, U.S. only, and non-U.S (we report the results for the latter two in the Appendix). Developed countries likely differ from emerging countries in terms of legal environment or financial development. The importance of the U.S. is largely motivated by the empirical observation that it has the highest percentage of institutional ownership and also has the stock market with the largest market capitalization. Our empirical design mimics that in Figure 3. We present the results from the analysis in Panels B and C of Table 3.

In Panel B, we report the results for developed countries. Despite the apparent differences in the levels of average ownership between foreign and domestic investors, the cross-sectional differences in PI persist for both groups of investors. We find that firms with higher institutional ownership levels are associated with greater PI. The effects are statistically and economically significant for both short and long investment horizons. However, we observe markedly different results when we restrict our sample to firms in emerging economies (Panel C). While we find that PI is generally higher for firms with higher total institutional ownership, the results become much weaker when we condition our results on specific subsets of investors. In particular, for short horizons, we observe no statistical difference in price informativeness for portfolios sorted

by domestic ownership and a statistically strong and positive difference for portfolios sorted by foreign ownership. On the other hand, for long horizons, the effect is positive and statistically significant at the 10% level for domestic investors and is insignificant for foreign investors, although the level of spread in PI is greater for the foreign subgroup. One possibility for the weaker effect of domestic investors is the generally low participation of such investors in emerging markets. At the same time, while foreign investors are more prevalent in emerging economies their role may be subdued due to investment constraints or lack of familiarity. We explore these alternative explanations in greater detail in later sections.

One could argue that the impact of foreign ownership on price informativeness is significant only because the variation in FOR coincides with the variation in DOM. While it is true that both variables are strongly correlated in the data, we argue that their effect on price informativeness is independent of each other. To this end, we entertain a conditional double-sort approach in which we first sort all firms within each country and year into quintile portfolios based on their values of DOM and then within each quintile sort we further split them into halves according to their value of FOR.[12] We present the results from this approach in Table 4. Our results indicate a strong impact of foreign ownership over and above that of domestic ownership for both forecasting horizons. The high-foreign-ownership groups have always higher PI for each portfolio quintile and the effects are statistically significant for four out of five quintiles for both horizon breakdowns.

3.2 Regression Results

One of the concerns related to the portfolio sort analysis is that of omitted variables correlated with institutional ownership and also with price informativeness. For example, companies with large assets may have significant institutional ownership and also be more informationally efficient. This would bias the coefficient on the market capitalization downwards. In this section, we establish the robustness of our results with respect to such omitted characteristics. Specifically, we estimate the following pooled regression model using firm-level data:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} + b_{2,h} log(M/A)_{i,t} \times IO_{i,t} + b_{3,h} X_{i,t} + e_{i,t+h} \qquad (2)$$

[12] We consider splits into halves to ensure sufficient statistical power of our tests.

$X_{i,t}$ is a vector of controls, including E/A, $log(Asset)$, $CLOSE$, $LEVERAGE$, $TANGIBILITY$, $log(SALES)$, $FORSALES$, and $CASH$. $e_{i,t}$ is a measurement error. We also include firm, and country×year fixed effects.[13] To account for possible dependence across firms and years, we cluster standard errors at the two dimensions. The coefficient of interest is $b_{2,h}$, which measures average price informativeness conditional on institutional ownership. We present the results in Table 5.

In column (1), we show the results for the specification with a one-year horizon without controls but with all fixed effects. The coefficient of $b_{2,h}$ is statistically significant at the 1% level of significance. In column (4), we show that a similar effect holds for price informativeness with a longer future horizon of 3 years.

To better understand the economic mechanism behind the ownership results, we decompose the total institutional ownership into its two components, FOR and DOM, and estimate the relative contribution to price informativeness of the two types of investors using the following regression model:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} + b_{2,h} log(M/A)_{i,t} \times FOR_{i,t} + b_{3,h} log(M/A)_{i,t} \times DOM_{i,t} + b_{4,h} X_{i,t} + e_{i,t+h} \tag{3}$$

The coefficients of interest are $b_{2,h}$ and $b_{3,h}$, which measure average price informativeness conditional on foreign and domestic institutional ownership, respectively. We present the results in columns (2) and (3) for a one-year horizon, without and with stock-level controls. We find that the effect of foreign institutions on price informativeness is at least as large as that for domestic institutions. In columns (5) and (6), we report the results for a three-year horizon. The results remain qualitatively similar.

The above results may be difficult to interpret because both measures of institutional ownership have different variability in the data. Domestic ownership is about three times as variable as is foreign ownership. Hence, it is difficult to compare their relative importance. To address this issue, we construct another variable For_Ratio, defined as the ratio of foreign to total ownership and use it instead of FOR and DOM in our regression model. We present the results from the estimation in columns (7) and (8). For each of the two horizons, we observe a positive and statistically significant coefficient of the interaction term between For_Ratio and $log(M/A)$, which means that foreign ownership has a stronger effect on price informativeness than does domestic

[13] The results are robust when controlling for industry or industry×year fixed effects.

ownership, even though both are statistically important.

Next, we analyze the impact of institutional ownership separately for developed and emerging countries. For each group, we estimate the regression model in (3), with and without controls. We present the results in Table 6. For brevity, we only report the coefficients of the main variables. In Panel A, we report the results for developed and in Panel B for emerging markets. We observe striking differences between the two groups. The effects are strong and statistically significant for both types of ownership in developed countries but they are significant only for short horizon for emerging countries. In fact, both types of ownership are not statistically different from zero when we look at a long horizon. In untabulated results, we also analyze differences between a subsample of U.S. and non-U.S. firms. For the U.S. sample, we find that domestic ownership has a larger effect on price informativeness than does foreign ownership. In all specifications, the coefficients of FOR are statistically insignificant. The results become markedly different when we consider a sample of non-U.S firms. We find that foreign institutions have a much stronger impact on prices at both shorter and longer horizons. Moreover, while domestic ownership is an important predictor for short horizons, its significance disappears when we consider a three-year horizon period.

Overall, our results suggest that both domestic and foreign institutional ownership are important predictors of price informativeness in the unconditional sample. The effect is much stronger for the sample of developed countries. At the same time, institutions do not improve price efficiency in emerging markets beyond their short-term impact.

3.3 Real Efficiency

Our results show that greater foreign institutions' ownership is associated with higher price informativeness. If so, the question is where the added information is coming from. A hypothesis of interest is whether it is coming from greater information production by the institutions or simply improved disclosure. For example, total information could have remained unchanged but the amount of information that firms with higher ownership disclose could have increased in relative terms, perhaps due to more accurate financial reporting. This would make prices more informative but it would not significantly improve real allocations. We test this disclosure hypothesis by looking at aggregate efficiency, estimated as a sensitivity of future firms' cash flows to their contemporaneous investment levels. If disclosure were to affect price informativeness

then one would predict that aggregate efficiency remain unchanged because it depends on the information available to the firm's manager, which is unaffected by disclosure. Testing this hypothesis is of interest more broadly as aggregate efficiency is a key factor in economic growth.

To this end, we estimate the following regression model:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h}Invest_{i,t} + b_{2,h}Invest_{i,t} \times FOR_{i,t} + b_{3,h}Invest_{i,t} \times DOM_{i,t} + b_{4,h}X_{i,t} + e_{i,t+h} \quad (4)$$

where $Invest$ denotes investment level of firm i at time t. We use three different measures of investment: $CAPEX/A$, $R\&D/A$, and $(CAPEX + R\&D)/A$. All regressions include the same control variables as equation (2). We also include firm and country×year fixed effects. We cluster standard errors at firm and year. Our coefficients of interest are $b_{2,h}$ and $b_{3,h}$, which measure aggregate efficiency conditional on the source of demand for firm's equity. We present the results in Panel A of Table 7.

We present the results for a one-year and a three-year horizons. The results indicate that foreign institutional ownership has a dominant role in driving aggregate efficiency. In all but one case, its effect is positive and statistically significant. On the other hand, domestic ownership only matters for $R\&D$ investments and is insignificant for $CAPEX$ and total investment. We conclude that the informational role of foreign institutional investors operates through better aggregate efficiency while the role of domestic institutions may be partly explained by improved disclosure.

Another question of interest is whether the greater informativeness extends to real firm decisions. Our framework implies that as prices become more informative, they should predict investment levels more strongly. We evaluate this hypothesis by estimating the following pooled regression model:

$$Invest_{i,t+h}/A_{i,t} = a + b_{1,h}log(M/A)_{i,t} \times FOR_{i,t} + b_{2,h}log(M/A)_{i,t} \times DOM_{i,t} + b_{3,h}X_{i,t} + e_{i,t+h} \quad (5)$$

where all variables are identical to those in equation (2). Our coefficients of interest are $b_{1,h}$ and $b_{2,h}$. We present the results in Panel B of Table 7. We find that foreign ownership has a weak predictive power of investment in the short run while domestic ownership predicts investment in the long horizon. When we decompose investment levels into $CAPEX$ and $R\&D$ components, we can see that the effect of foreign ownership operates largely through $CAPEX$ changes while domestic ownership affects only $R\&D$. This result suggests that different sources of institutional

ownership may be complementary to each other in the way they affect investments.

3.4 Identification and Alternative Efficiency Measures

Our regression results so far can be largely interpreted as associations and not as causal relations. One of the potential concerns underlying our analysis is that of omitted variables bias. In particular, price informativeness may be higher for reasons unrelated to institutional ownership but at the same time correlated with that variable. For example, if high-ownership firms are also better governed and if governance is positively related to price informativeness one would expect an upward bias in the main coefficients. While our multivariate regression approach with fixed effects is supposed to alleviate such bias to some degree, it cannot account for unobservable time-varying effects. In this section, we address this concern by taking advantage of exogenous changes to foreign ownership due to MSCI index inclusion. Our implementation is via the difference-in-differences estimation. We further explore the robustness of the identification for different measures of price informativeness. Finally, we briefly discuss the issue of sample selection related to our focus on firms with non-zero institutional ownership.

3.4.1 Difference-in-Differences Approach

Our identification strategy is based on a quasi-natural experiment previously used in the literature (e.g., Bena et al. (2017)). We compare price informativeness of firms newly added to the $MSCI\ ACWI$ index to a sample of comparable firms that did not experience the addition. Several foreign institutions only hold stocks that are part of the index and thus an addition to the index is a positive shock to these stocks' foreign ownership levels. Our identification strategy is based on the argument that firms are added to an index for reasons other than their price informativeness; hence, one can consider the shock as being plausibly exogenous. The exclusion restriction of our test is that any informativeness changes are not due to reasons other than the increase in ownership levels based on index addition.

We require at least five years of accounting and ownership data available for the tested firms (two years before and after the addition year). Our empirical approach is a standard difference-in-differences estimation. In our sample, we have 714 firms affected by the index inclusion treatment. For each firm in the treatment group, we identify five nearest matches using the propensity-score-matching algorithm. Those serve as a counterfactual control group. Our matching, with

replacement, is based on the following ex-ante (one year before addition) characteristics: FOR, DOM, $log(Sales)$, $FORSALES$, Market Capitalization, $log(M/A)$, E/A, $INVESTMENT$, and country fixed effect. Panel A of Table 8 shows the quality of the matching using the average values of each matched characteristic, separately for treatment and control groups. The results indicate that treated firms are ex ante not statistically different from control firms. The only statistically significant difference, at 10% level, is for the level of investments.

Next, we visually inspect the trends in the data around the inclusion period. One of the important objectives of doing that is to assess the plausibility of the parallel-trend assumption that underlies the difference-in-differences methodology. While the assumption is theoretically untestable, one can make some inference based on the observed patterns in the data prior to the shock. In Figure 4, we plot the time series of the difference between treatment and control groups in domestic and foreign ownership, and price informativeness. Year -1 to Year 0 is the window when the treated firm gets added to the index. We find that both foreign ownership and price informativeness increase for treated firms relative to the control group following the shock. At the same time, domestic ownership of the same stocks does not change, which is a good placebo test that general trends in ownership do not drive our results. Further, we do not observe any clear pre trends in both quantities within a three-year window before the shock. This evidence is comforting and suggests that any effect we identify is not a continuation of a general differential trend between the two groups of firms.

Next, we validate the significance of the effects using the multivariate regression framework, which allows us to directly control for any differences in observables across two groups of firms and also time-invariant unobservables. Specifically, for each firm, we define an indicator variable $After$ that is equal to one for the period following the inclusion year, and zero for all years before that. We also define an indicator variable $Treat$, equal to one for firms added to the $MSCI$ $ACWI$ during our sample period, and equal to zero for all firms in the control group. To zoom in on the shock, we restrict the sample to the window from three years before addition to three years after addition (including inclusion year). We estimate the following regression model, separately for FOR and DOM:

$$IO_{i,t} = a + b_1 Treat_i + b_2 After_t + b_3 Treat_i \times After_t + b_4 X_{i,t} + e_{i,t} \tag{6}$$

where IO is a generic variable for FOR and DOM. We present the results in Panel B of Table

8. We find that firms added to the index experience an increase in their foreign ownership by 1.7 percentage points, on average. The effect is statistically significant at the 1% level and economically large given that the average firm in the pre-treatment sample has an average foreign ownership level of 5.1%. On the other hand, the effect for domestic firms is economically much smaller and is statistically insignificant. Hence, we conclude that the shock is economically relevant.

Subsequently, we examine the consequence of the shock for price informativeness by estimating the following regression:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} + b_{2,h} Treat_i \times After_t + b_{3,h} log(M/A)_{i,t} \times Treat_i \times After_t + b_{4,h} X_{i,t} + e_{i,t+h} \tag{7}$$

Our coefficient of interest is $b_{3,h}$ that measures the change in price informativeness of treated firms relative to control firms around the shock. We present the results in Panel C of Table 8. In column (1), we present the results for a one-year horizon. We find that, as a result of the shock, price informativeness of treated firms has increased significantly more on a relative basis. The effect is economically large and statistically significant at the 5% level of significance. In turn, the change in price informativeness for the control firms is statistically not different from zero. In column (2), we consider changes in price informativeness for a three-year horizon. Again, we find a statistically significant difference between treatment and control groups. The effect is three times as large as that for a short horizon and is economically large.

We further show that the sensitivity of future investments to current market valuation improves at a one-year horizon but is much weaker at a three-year horizon. This effect is entirely driven by the increase in R&D expenses (columns 3 and 4) and not $CAPEX$ (columns 5 and 6), which suggests that the effect of foreign institutions operates mostly through the innovation channel.

Figure 5

3.4.2 Post-Earnings-Announcement Drift

One of the possible concerns with the analysis based on covariance-based informativeness measure is that it may also capture effects other than changes in market efficiency. For example, addition to an index differential exposure of individual stocks to risk factors rather than the market

efficiency effect. To address this concern we provide an alternative test, based on post-earnings announcement drift ($PEAD$). The $PEAD$ measure is not subjected to risk-based explanations and is a standard way to capture deviations from price efficiency. To the extent that the presence of foreign investors improves market efficiency one would expect that the size of the drift should decrease in the level of foreign ownership.

Formally, to construct $PEAD$ we need to define unexpected earnings surprises. We consider two different measures of standardized unexpected earnings (SUE): a time-series SUE and a consensus-based SUE.

The time-series SUE is based on a model of seasonal random walk with a drift (e.g., Bernard and Thomas (1989, 1990))[14] ,

$$SUE_{i,t} = \frac{E_{i,q} - E_{i,q-4} - U_{i,t}}{\sigma_{i.t}} \tag{8}$$

where $E_{i,q}$ is the quarterly earnings per share, $E_{i,q-4}$ is the earnings per share at four quarters ago, $U_{i,t}$ and $\sigma_{i.t}$ are mean and standard deviation of $(E_{i,q} - E_{i,q-4})$ over the preceding eight quarters.

The consensus-based SUE is based on analysts' forecasts (Livnat and Mendenhall, 2006). It is computed as the quarter's actual earnings minus the average of the most recent analyst forecasts, divided by the standard deviation of those forecasts. Livnat and Mendenhall (2006) argue that institutional trading reacts more to analysts' consensus-based earnings surprises rather than time series-based earnings surprises.

We implement our empirical tests using the difference-in-differences approach based on index reconstitution. We hypothesize that the magnitude of post earnings announcement drift should decrease after a firm gets added to MSCI index. Formally, we estimate the following regression model:

$$CAR_d1_dn = a + b_{1,h} SUE_{i,t} + b_{2,h} Treat_i \times After_t + b_{3,h} SUE_{i,t} \times Treat_i \times After_t + b_{4,h} X_{i,t} + e_{i,t+h} \tag{9}$$

where CAR_d1_dn denotes the cumulative abnormal return after quarterly earnings announcement. Specifically, it is measured as the cumulative abnormal returns (stock return minus market

[14] The result is robust without this drift term.

return) from the first day to the nth day after earnings announcement. For robustness, we consider the values of $n = 1, 3, 5$.

In Figure 6, we report the time-series behavior of $PEAD$ around the index inclusion period for the three definitions of abnormal returns. Consistent with our hypothesis, we observe that stocks added to the MSCI index experience a drop in $PEAD$ relative to similar stocks that have not been included in the index. This result suggests that an increased foreign ownership is associated with an improvement in market efficiency. We further assess the robustness of this result by estimating a multivariate regression model in (9) with an additional set of control variables X. To allow for serial and cross-sectional dependence in the data we cluster standard errors at the firm and time dimensions. Our coefficient of interest is b_3, which measures the response of abnormal returns to earnings surprises for the group of stocks added to the index relative to the counterfactual control group. We present the results in Panel E of Table 8.

We find that $PEAD$ becomes smaller for stocks added to the index relative to those serving as a control group. The result holds for three different specifications of abnormal returns and is statistically significant at the 5% level. Further, the result is robust to our specification of unexpected earnings surprises. Overall, we conclude that an exogenous shock to foreign institutional ownership has a significant positive effect on market efficiency and is unlikely due to a spurious co-movement between prices and earnings.

3.4.3 Price Synchronicity and Variance Ratio

We also consider alternative measures of price efficiency. Our first alternative is based on price non-synchronicity, following Roll (1988). We calculate this measure as $1 - R^2$, where R^2 is the R-squared from a regression of stock returns on market factor. We obtain stock returns at weekly frequency and estimate the regression model for each stock-year pair.[15] We present the results in Panel F of Table 8. We find that price non-synchronicity increases significantly for stocks added to the index relative to those in the control group.

Another measure of price efficiency is the variance ratio (e.g., Boehmer and Kelley (2009)). In a random walk process, the ratio of long-term to short-term return variances equals one using the same data window. We compute $|1–VR(nday, mday)|$, where VR(nday,mday) is the ratio of the return variance over m days to the return variance over n days, and divided by the length of

[15] We use Wednesday prices to calculate returns. The result is robust when using other days' prices.

the period. We use (1day,5day) in our empirical tests. The results are presented in Panel F of Table 8. We find that the absolute difference of variance ratio decreases for stocks added to the index relative to those serving as a control group, that is, their prices become more informative.

3.4.4 Sample Selection Issues

One of the important features of our analysis is that we only condition our sample on firms that have non-zero total institutional ownership. Hence, our analysis can be purely interpreted from the intensive margin perspective. However, not every firm is held by institutional investors and hence our results could be biased by not accounting for such firms in our analysis. In this section, we present the results corresponding to those reported in Table 3 and Table 5 by conditioning on all firms. In particular, we assume that all firms that are missing in our sample have zero institutional ownership. We repeat the previous tests by first looking at portfolio sort results for the zero-ownership firms and then considering regression results using the full sample of firms. In the latter case, we additionally include an indicator variable $MISSING$ that is equal to one for all firm-years that have zero total ownership and zero for all other observations. This is to account for any specific differences of such firms. We report our results in Table 3 and Table IA.3.

We find that, if anything, the results become stronger when we include the missing firms. First, the portfolio of zero-ownership firms has much lower price informativeness than do all other portfolios. Second, the coefficient of the interaction terms between institutional ownership and market valuation becomes significantly larger in all of the previous specifications. These results are consistent with our hypothesis that lower ownership is associated with lower price informativeness. We further note that our underlying assumption is that firms not included in the analysis have zero institutional ownership. But, some firms may simply have missing information in the database yet be still owned by institutions. If this was the case, however, our findings are biased downwards.

Overall, we conclude that the qualitative aspects of our results are not affected by significant endogeneity concerns.

4 Testing the Economic Mechanism

Our results thus far indicate a strong causal relationship between the degree of foreign institutional ownership and the level of price informativeness and real efficiency. In this section, we shed more light on the possible economic mechanisms behind these results. We consider two different channels through which foreign ownership can affect capital allocation efficiency: information-based and monitoring-based.

4.1 Information-Based Channel

The choice of foreign investors to enter financial markets should be related to their expected impact on information environment in the target market. There are at least three ways in which foreign investors can affect that environment. First, they can affect market liquidity and thus reduce asymmetric information in the market. They can also affect the decision of sell-side analysts to cover the target markets, that is, improve information production. Finally, they can improve risk sharing and thus reduce cost of capital in the market. In all three cases, one would expect market efficiency to improve. In this section, we empirically evaluate all three possibilities in the context of index inclusion experiment that generates the exogenous variation in foreign ownership. To evaluate the differential effect of inclusion, we estimate the regression model similar to that in (6) with various information-relevant measures as dependent variables.

To assess the impact of stock inclusion in the index on its market liquidity, we consider two measures: turnover (trading volume over share outstanding) and bid-ask spread. We present the results in Table 9. We find that stocks that are added to an index, on average, experience a significant increase in their market liquidity, relative to a comparable group of stocks not included in the index. The effect is significant both economically and statistically.

Next, we evaluate the impact of stock index inclusion on the stock's sell-side analyst coverage. Our measure of coverage is based on the number of analysts issuing a one-year forecast in a given year. The data come from I/B/E/S. We present the results in Table 9. Our results indicate that stocks added to index experience a relatively greater increase in analyst coverage relative to those from the control group. The effect is significant both economically and statistically. Hence, stock inclusion may lead to a greater production of relevant information coming from increased analyst coverage. Following the evidence in Hong and Kacperczyk (2010), one can also argue such information should be, on average, less biased thus enhancing its quality.

Last, we look at risk sharing effects of changing the composition of asset ownership by looking at two different measures of cost of capital: idiosyncratic volatility and implied cost of equity (ICOE). We focus on idiosyncratic volatility rather than on total volatility because the addition of a stock to an index mechanically affects the co-movement of the stock with the market and thus its beta. In our study, we follow Gebhardt et al. (2001) and calculate the ICOE using the residual income model. These results are presented in Panel A of Table 11. We find a significant negative relationship between inclusion in the index, and a firm's cost of equity, which would seem to indicate that being included in the index makes it easier for a firm to fund itself. We do not find a significant relationship between inclusion in the index and idiosyncratic volatility, or a firm's beta (although the signs of the coefficients are negative). This can also be seen graphically in Figure 7. The implied cost of equity has a clear and persistent drop post-inclusion of a little over 1%, while idiosyncratic volatility and beta do not change significantly.

4.2 Monitoring-Based Channel

We use the composite governance index from Albuquerque et al. (2018). It is measured based on 16 attributes (divided into four subcategories: board, audit, anti-takeover provisions, and compensation and ownership). One possible channel through which foreign ownership could impact price informativeness is by affecting corporate decisions through monitoring. Therefore we analyze the effects of inclusion in the index on this corporate governance index. The results of this regression are reported in Panel C of Table 11. We do not find a significant relationship between inclusion and governance, leading us to believe that monitoring, at least as measured by this governance index, is not a strong channel through which MSCI index inclusion can affect price informativeness.

5 Cross-Sectional Variation

In this paper, we provide additional cross-sectional evidence that puts limits on the applicability of our conceptual framework. In particular, we exploit variation in terms of investors' trading and monitoring activity, their familiarity with a target country, and the scope of capital controls. In addition, we further exploit the time-series variation in our baseline results.

5.1 Investors' Activeness

One of the possible mechanisms driving our results is that of investors' activeness. To the extent that price informativeness responds to investors' uncovering mispricing in financial markets and properly accounting for risk one would expect that firms in which active investors make up a bigger share being more informationally efficient. Similarly, one could imagine that some investors are simply more skilled in terms of predicting future cash flows. In this section, we explore this hypothesis using two sets of results.

In our first approach, we classify institutions with respect to their activeness and relate price informativeness to relative ownership of the most active investors. We consider three measures of activeness. Our primary measure is defined based on the type of institutional investors. We consider active investors to be mutual funds, hedge funds, and investment advisers. In this classification we exclude index funds and ETFs. We also entertain two alternative measures of activeness: one that aggregates ownership of investors whose foreign or domestic investment return in our sample is above the median value;[16] and another one that takes ownership of investors with long (greater than one year) investment horizon. The former measure captures investors' ability to uncover and trade away mispricing; the latter one relates to investors' ability to monitor and thus improve informational efficiency of the firm. We define generically all three dimensions of active ownership, separately for foreign and domestic owners, as FOR_ACTIVE and DOM_ACTIVE. In a similar vein, we define variables related to passive ownership as $FOR_PASSIVE$ and $DOM_PASSIVE$. Our coefficients of interest are those of variables constructed as interactions between $log(M/A)$ and the various activeness measures. We present the results in Table 10.

In columns (1), (3), and (5), we show the effect on short horizon efficiency for the three activeness measures. We find that activeness is a particularly important determinant of informativeness especially for foreign investors. In all three specifications, we find the coefficients of the respective interaction terms to be positive and highly statistically significant. Similarly, the effect for the interaction terms with domestic ownership is slightly smaller but it is still statistically significant at the 1% level. In columns (2), (4), and (6), we report the results for the specification with a

[16] In each year, we calculate the domestic and foreign investment returns for each institutional investor. Then for each stock, active (passive) ownership is sum of the shares owned by institutions with returns in the top (bottom) 25% among institutions holding this stock. The ranking is done for domestic and foreign institutions each year respectively. Alternatively, we also use market-adjusted domestic and foreign returns and the ranking is exactly similar.

three-year horizon. Again, the coefficients of the FOR_ACTIVE and DOM_ACTIVE continue being positive and statistically significant at the 1% level of significance, except for one case. However, the effects for passive ownership are largely insignificant.

In our second test, we evaluate the hypothesis that price informativeness could be related to investors' expertise. Since expertise is difficult to observe we use ownership by U.S institutional investors as a proxy. In particular, we decompose the foreign ownership as that coming from U.S. investors and that coming from non-U.S. investors and estimate the regression model in (3). We present the results in 11.

In columns (1) and (2), we consider all non-U.S. firms. We find that among the foreign investors, the U.S. institutions have a much stronger impact on price efficiency than do non-U.S. foreign investors. This is particularly true for a long horizon. Similar results obtain when we restrict our universe to developed (non-U.S.) countries, in columns (3) and (4). Again, the role of U.S. institutions in these markets is much stronger. Finally, when we restrict our sample to emerging countries only we find that foreign investors from the U.S. matter predominantly for short-term efficiency and significantly less for long-term efficiency, even though even in this case the coefficient is statistically significant at the 10% level.

Overall, our results suggest that investors' activeness and expertise are relevant predictors for price efficiency, especially when capital flows in from foreign institutions. Moreover, foreign U.S. institutions play a much bigger role than foreign institutions outside the United States. We interpret these findings as consistent with the expert position some investors play in financial markets.

5.2 Investors' Familiarity

Another mechanism possibly driving the role foreign institutional investors in price informativeness is familiarity. Many studies have argued that investors located in proximity of a given market may possess a distinct informational advantage over the rest (e.g., Coval and Moskowitz, 2001). In this section, we evaluate this claim with regard to our information setting. We hypothesize that stocks that are held by institutions coming from countries with a greater degree of familiarity with a home country should exhibit greater price efficiency.

We define familiarity based on a distance metric between a home country of a given stock and a home country of a foreign investor holding this stock. In each case, we define a variable

FOR_CLOSE equal to the fraction of total foreign ownership of investors from countries that are in close proximity with a home country. FOR_FAR is equal to the difference between FOR and FOR_CLOSE. Our first measure of familiarity is based on the degree of bilateral trade between the home country and the domicile country of a foreign investor. We classify an institutional investor as closely related if the bilateral trade between the country of her domicile and the home country of a stock is above the median value of all countries the stock's country trades with. Our second measure is based on geographic distance between the two countries. High proximity is for investors from countries that are below the median distance of all countries relative to the stock's home country. Following Mayer and Zignago (2011), distance is calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population). The third measure is based on similarity in languages. High proximity is for investors who come from countries where the official language is identical to that of the country in which the investor holds the stock. The fourth measure is based on common geographical border. High proximity is for countries that share the same border. Finally, the last measure is based on colonial background. High proximity is for countries that share the same colonial history.

With all the proximity measures, we estimate the following pooled regression model separately for each distance measure:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} \times FOR_CLOSE_{i,t} + b_{2,h} log(M/A)_{i,t} \times FOR_FAR_{i,t} + b_{3,h} X_{i,t} + e_{i,t+h} \tag{10}$$

All regressions include the same control variables as equation (2). We also include industry, firm and country×year fixed effects. We cluster standard errors at firm and year dimensions. Our coefficients of interest are $b_{1,h}$ and $b_{2,h}$. We present the results in Table 12.

In Panel A, we report results for one-year horizon. Both FOR_CLOSE and FOR_FAR are positive and statistically significant in all five cases. For three out of five cases—trade, distance, and colony—the coefficient of FOR_CLOSE is larger in magnitude. These results jointly offer weak support for the hypothesis that similarity amplifies the informativeness effect. The hypothesis is even less supported when we move to a longer three-year horizon, in Panel B. Now, the coefficient of FOR_FAR is generally greater both economically and statistically.

An alternative way to assess the role of investors' familiarity is to look at the level of financial system development of the home and recipient countries. We hypothesize that foreign investors coming from countries with greater financial system development should exert greater impact on

price informativeness of stocks in their target countries. We measure the degree of financial development using three proxies. First, we use the ratio of a country's stock market capitalization relative to its GDP. Countries with above-median level are considered high development. We define the ownership of stock i at time t by institutional investors coming from such countries as $FOR_FIN_High_{i,t}$ and that coming from low-development countries as $FOR_FIN_Low_{i,t}$. Second, we use the law system in the investors' country. Countries with common law are considered high development. We define the ownership of institutions coming from such countries as $FOR_COMMON_{i,t}$ and that coming from civil law countries as $FOR_CIVIL_{i,t}$. Third, we measure development using the predominant form of a country's financial system. Countries that are more market oriented are considered as high development ad those with bank-oriented system as low development. As before, we define variables that are based on fractional foreign ownership of investors coming either from high-development countries ($FOR_MARKET_{i,t}$) or low-development countries ($FOR_BANK_{i,t}$). Using the three measures, we estimate the following pooled regression model:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} \times FINDEV_High_{i,t} + b_{2,h} log(M/A)_{i,t} \times FINDEV_Low_{i,t} + b_{3,h} X_{i,t} + e_{i,t+h} \quad (11)$$

where $FINDEV_High$ and $FINDEV_Low$ are generic names for measures of high and low development. All regressions include the same control variables as equation (2). We also include industry, firm and country×year fixed effects. We cluster standard errors at firm and year dimensions. Our coefficients of interest are $b_{1,h}$ and $b_{2,h}$. We present the results in Table 13. In each panel, we additionally separate out the respective systems of the home country and report results for short and long horizons.

In Panel A, we show the results for FOR_FIN. The results indicate that the degree of stock market dominance does not affect significantly price informativeness in the short horizon. All four coefficients, in columns (1) and (2), are positive and statistically significant. However, we find significant differences when we consider the effects for long horizons: the role of investors coming from more-developed countries is considerably more important than that of less-developed countries. This importance does not depend statistically on the degree of development in the home country even though the economic magnitude of the effect is greater for home country with high development. In Panel B, we report the results for the legal system. The qualitative aspects of the results are very similar to the previous ones. The only visible difference is that foreign investors

from civil law countries do not affect price informativeness in the long run in countries which also have civil law system. Finally, in Panel C, we report the results for the type of financial system. Again, we find no statistical difference between investors coming from market vs. bank-oriented countries in the short horizon. In a three-year horizon, irrespective of whether foreign investors come from market-based or bank-based countries, the effect is insignificant for the firms located in bank-based countries.

Overall, we conclude that there is a skill spillover from high financial development countries to low financial development countries. Foreign investors from countries with high financial development or with common law exert larger effect on price informativeness, especially when they invest in low financial development or civil law based countries. We observe no difference between foreign investors from countries with market-based or bank-based financial system, while the system at a home country is important.

5.3 Capital Controls

Another channel through which we may observe differences in the role of foreign ownership is that of capital controls. We hypothesize that countries in which capital controls are tighter are more difficult to penetrate by foreign investors because foreign investors in these countries cannot trade their assets freely. We evaluate this hypothesis empirically using a measure of capital controls based on Chinn and Ito (2006). Specifically, we define an indicator variable $OPEN_{i,t}$ equal to one if the Chinn-Ito index for the country in which stock i is listed is above the median of all countries in year t, and zero otherwise. We estimate the following pooled regression model:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} \times FOR_{i,t} \times OPEN_{i,t} + b_{2,h} X_{i,t} + e_{i,t+h} \tag{12}$$

All regressions include the same control variables as equation (2). We also include industry, firm and country×year fixed effects. We cluster standard errors at firm and year dimensions. Our coefficient of interest is $b_{1,h}$. We present the results in Table 14.

In column (1), we present the results for a one-year horizon and in column (2) for a three-year horizon. We find that capital controls play a significant role in the way foreign investors affect price informativeness. The effect of moving from the country with high constraints to low constraints is positive and statistically significant at the 1% level. It is also economically large. For a one-year horizon the increase in informativeness is 78% and for a three-year horizon it is

even larger. Notably, for the latter case we observe that the level of informativeness for countries with high constraints is not statistically different from zero. Hence, one can argue that in the long run capital constraints are a strong impediment to foreign investors in their allocation of capital.

5.4 Time-Series Evidence

In our last test, we explore a time-series variation in the importance of institutional investors for price informativeness. In particular, we analyze the aggregate variation at the business cycle level. We consider five different measures of business cycle variables: global recession indicator equal to one for years 2008 and 2009 and zero, otherwise; country-specific aggregate equity index realized volatility; country-specific aggregate equity index returns; country-specific GDP growth; and country-specific industrial production growth. All of the country-specific measures are aggregated using stock market capitalization of each country. We relate these variables to aggregate price informativeness measures. The informativeness measures are constructed using year-by-year regressions of three equal-size portfolios sorted by foreign institutional ownership.[17] Subsequently, we estimate the following time-series regression model:

$$PI_{j,i+h} = a + b_{1,h}FOR_{j,t} + b_{2,h}FOR_{j,t} \times ECONOMIC_t + b_{3,h}ECONOMIC_t + e_{j,t+h} \quad (13)$$

where $PI_{j,t+h}$ is price informativeness at horizon $t+h$ for ownership tercile j; $Economic_t$ is the aggregated measure of economic activity measured at time t. We cluster standard errors at the year level. Our coefficient of interest is $b_{2,h}$. We report the results in Table 15.

In Panel A, we show the results for a one-year horizon. Four out of five measures indicate a statistically stronger sensitivity of PI to foreign institutional ownership during market downturns. The only insignificant result is that for *Index Return*. In Panel B, we present the results for a three-year horizon. Again, we find a countercyclical behavior in the relationship between institutional ownership and price informativeness.

[17] The results are qualitatively and quantitatively similar when we sort the portfolio by total ownership or domestic ownership. The tables are available upon request.

6 Concluding Remarks

The global investment landscape has been changing rapidly over the last few decades. The growing presence of institutional investors and the opening of borders globally resulted in greater penetration of financial markets by capital flows. Given that institutional investors are generally more sophisticated and have more resources to monitor companies than individual households the question is whether individual companies can benefit from their presence. In this paper, we examine the role of institutional capital flows for price informativeness of stocks.

We find that stocks with greater institutional ownership have more informative prices. The effect is mostly confined to stocks located in developed markets and can be attributed both to the presence of domestic and foreign investors. The results are robust to potential endogeneity concerns. Our analyses of various economic mechanisms indicate the important role of institutional activeness, familiarity with the market, and country-specific capital controls. We also find that the increase in price informativeness is mostly due to improved real investment efficiency and not higher information disclosure.

Overall, our results underscore a significant role of foreign institutional investors for price efficiency. They also emphasize the importance of informational and capital frictions for the functioning of capital markets.

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Table 1: Summary Statistics: Countries

The sample period is 2000-2013. # of firms is the number of firms in each country. # of firm-year is the number of firm-year observations. *FOR* and *DOM* are equal-weighted foreign and domestic institutional ownership in percentage level across the whole sample, respectively. Inst. per firm is the average number of institutional investors per firm.

Country	# of firms	# of firm-year	*FOR*	*DOM*	Inst. per firm
		Developed Countries			
Australia	945	6182	4.94	1.47	28
Austria	71	656	8.87	2.00	51
Belgium	105	1022	7.22	2.75	45
Canada	1235	7530	9.03	13.46	54
Denmark	107	941	5.37	10.15	49
Finland	124	1324	8.78	9.16	64
France	651	5541	5.74	4.37	66
Germany	620	5373	6.79	4.49	60
Hong Kong	560	4774	5.32	1.62	34
Ireland	78	639	33.48	0.66	155
Israel	284	1767	8.52	1.21	30
Italy	246	2303	5.99	2.05	53
Japan	3412	32291	3.00	2.43	39
Netherlands	156	1369	19.61	5.26	124
New Zealand	85	691	3.96	1.61	23
Norway	182	1381	6.44	10.45	40
Portugal	50	481	4.07	2.71	54
Singapore	270	2086	6.19	1.14	38
Spain	134	1304	6.15	3.54	98
Sweden	309	2558	6.11	12.54	46
Switzerland	209	2077	12.01	6.07	115
United Kingdom	1428	11193	5.16	17.59	57
United States	5131	42701	2.62	49.06	168
		Emerging Countries			
Brazil	245	1792	10.00	2.59	71
Chile	87	757	3.51	1.02	31
China	2165	11233	3.18	3.38	22
Greece	216	1677	4.06	0.33	19
Hungary	27	218	9.12	1.14	38
India	919	6465	4.01	4.25	21
Indonesia	185	1418	4.94	0.12	25
Malaysia	452	3176	2.41	0.86	16
Mexico	85	769	9.76	0.66	69
Philippines	68	548	5.66	0.08	26
Poland	314	2159	2.42	17.48	20
Russia	169	1094	10.57	0.20	53
South Africa	216	1708	5.82	5.62	44
South Korea	951	7077	4.82	0.16	22
Taiwan	934	7326	3.99	0.85	23
Thailand	219	1755	4.75	0.79	20
Turkey	167	1529	5.30	0.16	21
Developed	7419	50701	4.39	2.60	87
Emerging	16392	136184	4.70	19.43	25
All	23811	186885	4.62	14.86	70

Table 2: Summary Statistics

The sample period is 2000-2016. This table reports the mean, standard deviation, median, 25 percent and 75 percent quantiles, and number of observations for institutional ownership, market, and accounting variables. The definitions of variables are provided in the Appendix.

	Mean	STD	Q25	Median	Q75
N=186,885					
Ownership Variables (%)					
IO	19.48	26.71	1.50	7.51	24.63
FOR	4.62	8.81	0.12	1.26	5.43
FOR_US	2.02	6.26	0.00	0.08	1.39
FOR_NUS	2.60	4.68	0.00	0.57	3.28
DOM	14.86	25.33	0.06	2.56	14.77
FOR_ACTIVE	4.05	8.06	0.08	1.01	4.46
DOM_ACTIVE	13.06	21.95	0.05	2.39	13.51
FOR_PASSIVE	0.61	1.53	0.00	0.00	0.51
DOM_PASSIVE	1.88	4.35	0.00	0.00	0.58
Market and Accounting Variables					
E/A	0.02	0.24	0.01	0.06	0.11
log(M/A)	-0.32	1.00	-0.98	-0.33	0.33
R&D/A	0.02	0.06	0.00	0.00	0.01
CAPEX/A	0.05	0.06	0.02	0.04	0.07
INVESTMENT/A	0.08	0.09	0.02	0.05	0.10
LEVERAGE	0.22	0.20	0.04	0.19	0.34
TANGIBILITY	0.30	0.23	0.11	0.26	0.45
log(SALES)	12.41	2.24	11.24	12.49	13.80
FORSALES	0.20	0.30	0.00	0.00	0.34
CASH	0.17	0.18	0.05	0.11	0.23
CLOSE (%)	30.89	27.48	0.72	27.79	53.12
ANALYST	18.80	15.60	6.00	16.00	28.00
TURNOVER	1.88	2.55	0.62	1.31	2.48
BID-ASK SPREAD(%)	0.24	0.29	0.07	0.14	0.27
IVOL(%)	5.08	2.90	3.22	4.25	5.85
CAPM BETA	1.11	1.82	0.78	1.27	1.64
ICOE	0.11	0.06	0.08	0.10	0.14
Price Non-synchronicity	0.79	0.16	0.60	0.75	0.89
$\|VR(1d, 5d) - 1\|$*(%)*	18.34	14.41	7.13	15.17	25.97

Table 3: Price Informativeness and Institutional Ownership: Single-Sorted Portfolios

This table reports average price informativeness in each group sorted by total (IO), foreign (FOR), and domestic ownership (DOM), respectively. $PI1$ ($PI3$) measures price informativeness in one (three) year horizon, constructed as in equation (1). In Panel A, firms with non-zero ownership are sorted into five equal-sized portfolios sorted by ownership levels within their own country. IO_0 is a portfolio with zero-ownership firms. In Panels B and C, firms with non-zero ownership in developed and emerging countries are sorted into equal-sized tercile portfolios. Newey-West standard errors with four lags are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: All Countries

	IO			FOR			DOM		
	IO(%)	$PI1 \times 100$	$PI3 \times 100$	FOR(%)	$PI1 \times 100$	$PI3 \times 100$	DOM(%)	$PI1 \times 100$	$PI3 \times 100$
IO_0(Zero)	0.00	−5.31	−7.84	0.00	−5.08	−7.52	0.00	−3.49	−5.30
IO_1(Low)	1.50	−5.15	−6.80	0.19	−1.58	−2.90	1.70	−4.85	−6.76
IO_2	8.52	−0.92	−2.37	0.98	−0.16	−0.98	9.32	−0.64	−1.76
IO_3	17.67	0.27	−0.23	2.64	0.64	0.27	18.54	0.66	0.17
IO_4	27.09	1.49	1.83	6.02	0.91	0.52	27.06	1.17	1.40
IO_5(High)	41.53	2.38	2.45	16.62	1.92	1.79	37.35	2.09	2.51
Low-Zero	1.50***	0.16	1.04***	0.19***	3.50***	4.62***	1.70***	−1.36	−1.45*
	(0.16)	(0.65)	(0.30)	(0.03)	(0.16)	(0.69)	(0.15)	(0.91)	(0.71)
High-Low	40.03***	7.53***	9.25***	16.43***	3.50***	4.69***	35.65***	6.93***	9.26***
	(1.12)	(0.61)	(0.69)	(1.41)	(0.17)	(0.33)	(3.04)	(0.97)	(1.29)

Panel B: Developed Countries

IO_1(Low)	5.03	−2.95	−4.43	0.17	−2.33	−3.81	4.69	−3.18	−4.99
IO_2	22.99	0.15	−0.50	2.10	0.11	−0.56	17.59	0.31	−0.24
IO_3(High)	44.02	1.66	1.85	11.68	1.04	0.98	33.97	1.50	1.75
High-Low	38.99***	4.61***	6.28**	11.51***	3.37***	4.79***	29.28***	4.68***	6.74***
	(0.68)	(0.35)	(0.53)	(1.11)	(0.28)	(0.25)	(1.03)	(0.49)	(0.65)

Panel C: Emerging Countries

IO_1(Low)	0.64	2.12	3.06	0.19	2.23	3.11	0.63	2.95	3.38
IO_2	3.53	2.37	3.23	1.41	2.72	3.61	1.82	3.09	3.87
IO_3(High)	15.03	3.26	4.40	11.64	3.02	3.99	3.65	2.73	3.86
High-Low	14.39***	1.14***	1.33**	11.45***	0.79**	0.88	3.02**	−0.22	0.48*
	(1.21)	(0.37)	(0.64)	(0.57)	(0.36)	(0.69)	(1.11)	(0.42)	(0.25)

Table 4: Price Informativeness and Institutional Ownership: Double-Sorted Portfolios

This table reports average price informativeness of portfolios sorted first by domestic (DOM) and then by foreign ownership (FOR). For each country-year, firms with non-zero ownership are first split into equal-sized five groups by domestic ownership, then split by their foreign ownership if they are below or above the 50% threshold. $PI1$ ($PI3$) measures price informativeness in one (three)-year horizon, constructed as in equation (1). Newey-West standard errors with four lags are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

		$PI1 \times 100$				$PI3 \times 100$			
		FOR				**FOR**			
		Low	High	High-Low		Low	High	High-Low	
DOM	IO_1(Low)	−2.21	−0.84	1.38***	(0.21)	−3.07	−1.49	1.58***	(0.31)
	IO_2	−1.10	−0.12	0.98***	(0.33)	−1.90	−0.98	0.92*	(0.49)
	IO_3	0.47	0.88	0.41	(0.33)	−0.35	0.78	1.14***	(0.34)
	IO_4	0.94	1.62	0.68***	(0.14)	1.17	2.52	1.34***	(0.09)
	IO_5 (High)	1.64	2.08	0.44	(0.27)	1.96	2.47	0.51	(0.51)
	High-Low	3.85***	2.91***			5.03***	3.96***		
		(0.46)	(0.24)			(0.70)	(0.31)		

Table 5: Price Informativeness and Institutional Ownership: Regression Evidence

This table shows results from estimating pooled ordinary least squares (OLS) regression models of future earnings on institutional ownership and its interaction term with current market valuation, as in equations (2) and (3). The *E/A* is EBIT to total asset, *log(M/A)* is the log-ratio of market cap to total asset. *IO*, *FOR*, and *DOM* are total, foreign, and domestic institutional ownership, respectively. *For_Ratio* is the foreign ownership over total ownership. The definitions of variables are provided in the Appendix. All regression models include firm, and country×year fixed effects. Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	$E_{i,t+1}/A_{i,t}$			$E_{i,t+3}/A_{i,t}$			$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	0.018***	0.018***	0.009***	−0.009***	−0.009***	−0.025***	0.003	−0.033***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$IO_{i,t}$	−0.009			−0.085***			−0.004	−0.028**
	(0.011)			(0.013)			(0.011)	(0.014)
$FOR_{i,t}$		−0.040**	−0.030**		−0.178***	−0.104***		
		(0.014)	(0.013)		(0.017)	(0.017)		
$DOM_{i,t}$		0.003	0.004		−0.049***	−0.004		
		(0.011)	(0.011)		(0.015)	(0.014)		
$log(M/A)_{i,t} * IO_{i,t}$	0.082***			0.050***			0.070***	0.050***
	(0.005)			(0.008)			(0.005)	(0.008)
$log(M/A)_{i,t} * FOR_{i,t}$		0.105***	0.083***		0.057***	0.054***		
		(0.013)	(0.011)		(0.015)	(0.013)		
$log(M/A)_{i,t} * DOM_{i,t}$		0.077***	0.061***		0.046***	0.038***		
		(0.005)	(0.004)		(0.009)	(0.008)		
$For_Ratio_{i,t}$							−0.008***	−0.008**
							(0.002)	(0.004)
$log(M/A)_{i,t} * For_Ratio_{i,t}$							0.010***	0.016***
							(0.002)	(0.003)
$E_{i,t}/A_{i,t}$			0.237***			0.142***	0.237***	0.142***
			(0.017)			(0.014)	(0.017)	(0.014)
$log(Asset)_{i,t}$			−0.046***			−0.061***	−0.046***	−0.061***
			(0.005)			(0.005)	(0.005)	(0.005)
$CLOSE_{i,t}$			0.001			0.003	0.001	0.003
			(0.002)			(0.003)	(0.002)	(0.003)
$LEVERAGE_{i,t}$			0.058***			−0.018	0.058***	−0.017
			(0.009)			(0.016)	(0.009)	(0.016)
$TANGIBILITY_{i,t}$			−0.019*			0.017	−0.018	0.018
			(0.011)			(0.012)	(0.011)	(0.012)
$log(SALES)_{i,t}$			0.032***			0.014***	0.032***	0.014***
			(0.004)			(0.004)	(0.004)	(0.004)
$FORSALES_{i,t}$			0.002			0.004	0.002	0.004
			(0.003)			(0.006)	(0.003)	(0.006)
$CASH_{i,t}$			0.021*			−0.002	0.021**	−0.001
			(0.011)			(0.014)	(0.010)	(0.014)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	186,714	186,714	186,714	165,344	165,344	165,344	186,714	165,344
R^2	0.677	0.677	0.706	0.612	0.612	0.621	0.706	0.621

Table 6: Price Informativeness and Institutional Ownership: Regional Analysis

This table shows results from estimating a pooled ordinary least squares (OLS) regression model of future earnings on institutional ownership and its interaction with current market valuation as in equation (3) for each country subsample. *E/A* is EBIT to total asset, *log(M/A)* is the log-ratio of market cap to total asset. *FOR* and *DOM* are foreign and domestic institutional ownership. Control variables are same as in Table 5 (not shown). All regression models include firm, and country×year fixed effects. Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Panel A: Developed Countries				**Panel B: Emerging Countries**			
	$E_{i,t+1}/A_{i,t}$		$E_{i,t+3}/A_{i,t}$		$E_{i,t+1}/A_{i,t}$		$E_{i,t+3}/A_{i,t}$	
$log(M/A)_{i,t}$	0.007***	0.002	−0.022***	−0.034***	0.046***	0.029***	0.025***	0.002
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)
$FOR_{i,t}$	−0.061***	−0.055***	−0.183***	−0.131***	−0.017	0.020	−0.186***	−0.049**
	(0.017)	(0.016)	(0.022)	(0.022)	(0.020)	(0.018)	(0.032)	(0.025)
$log(M/A)_{i,t} * FOR_{i,t}$	0.128***	0.097***	0.079***	0.069***	0.046***	0.047***	−0.005	0.012
	(0.016)	(0.013)	(0.018)	(0.016)	(0.013)	(0.011)	(0.026)	(0.023)
$DOM_{i,t}$	0.005	−0.005	−0.042**	−0.019	0.017	0.049**	−0.107***	0.003
	(0.012)	(0.013)	(0.015)	(0.015)	(0.019)	(0.019)	(0.030)	(0.022)
$log(M/A)_{i,t} * DOM_{i,t}$	0.091***	0.071***	0.063***	0.052***	0.034	0.036**	−0.008	−0.004
	(0.005)	(0.005)	(0.009)	(0.008)	(0.021)	(0.018)	(0.017)	(0.014)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	136,022	136,022	120,124	120,124	50,692	50,692	45,220	45,220
R^2	0.677	0.708	0.610	0.618	0.602	0.628	0.581	0.626

Table 7: Investment-to-Earnings, Price-to-Investment Sensitivities

This table shows results of regression analysis of investment-to-earnings, price-to-investment sensitivity and institutional ownership. E/A is EBIT to total asset, $R\&D/A$ is research and development to total asset, $CAPEX/A$ is capital expenditure to total asset, and $INVESTMENT$ is the sum of $R\&D/A$ and $CAPEX/A$. Panel A reports the results for investment-to-earnings sensitivity, and Panel B reports the results for price-to-investment sensitivity. All regression models include firm, and country×year fixed effects. Control variables are same as in Table 5 (not shown). Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Investment-to-Earnings Sensitivity (Aggregate Efficiency)

	Invest=INVESTMENT		**Invest**=R&D/A		**Invest**=CAPEX/A	
	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$Invest_{i,t}$	−0.140***	−0.131***	−0.420***	−0.479***	−0.038**	0.030
	(0.019)	(0.022)	(0.036)	(0.056)	(0.014)	(0.027)
$FOR_{i,t}$	−0.082***	−0.182***	−0.053***	−0.146***	−0.061***	−0.123***
	(0.014)	(0.022)	(0.011)	(0.018)	(0.014)	(0.020)
$Invest * FOR_{i,t}$	0.499***	0.850***	0.574*	1.680***	0.323**	0.188
	(0.151)	(0.166)	(0.314)	(0.292)	(0.137)	(0.174)
$DOM_{i,t}$	0.004	−0.013	−0.004	−0.034*	0.008	0.019
	(0.012)	(0.019)	(0.010)	(0.015)	(0.014)	(0.019)
$Invest * DOM_{i,t}$	0.051	0.132	0.260***	0.849***	0.026	−0.290**
	(0.042)	(0.102)	(0.085)	(0.148)	(0.065)	(0.135)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	186,714	165,344	186,714	165,344	186,714	165,344
R^2	0.705	0.621	0.706	0.623	0.704	0.621

Panel B: Price-to-Investment Sensitivity

	$INVESTMENT_{i,t+1}$	$INVESTMENT_{i,t+3}$	$R\&D_{i,t+1}/A_{i,t}$	$R\&D_{i,t+3}/A_{i,t}$	$CAPEX_{i,t+1}/A_{i,t}$	$CAPEX_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	0.024***	0.021***	0.004***	0.006***	0.019***	0.013***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
$FOR_{i,t}$	0.018**	0.007	0.002	−0.002	0.010**	0.006
	(0.006)	(0.014)	(0.002)	(0.004)	(0.005)	(0.012)
$log(M/A) * FOR_{i,t}$	0.011*	0.007	−0.002	−0.005	0.012***	0.017**
	(0.006)	(0.009)	(0.002)	(0.003)	(0.004)	(0.008)
$DOM_{i,t}$	0.010**	0.022**	−0.003	−0.010***	0.013***	0.034***
	(0.003)	(0.009)	(0.002)	(0.003)	(0.003)	(0.007)
$log(M/A) * DOM_{i,t}$	0.000	0.007*	0.002**	0.007***	−0.001	0.001
	(0.002)	(0.004)	(0.001)	(0.002)	(0.002)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	186,714	167,546	186,714	167,546	186,714	167,546
R^2	0.695	0.663	0.890	0.822	0.634	0.630

Table 8: Difference-in-Differences Model

This table shows results from estimating difference-in-differences regression models of institutional ownership and price informativeness around the year a stock is added to the MSCI ACWI index. Treated Group includes 714 firms added to the MSCI ACWI during the sample period. Control Group includes five firms that best match each treated firm using propensity scores matching. $Treat$ is equal to one if a firm in the treated group, and zero otherwise. $After$ is equal to one in the year when the treated firm is added to the MSCI ACWI and thereafter, and zero otherwise. The E/A is EBIT to total asset, $log(M/A)$ is the log-ratio of market cap to total asset. Panel A reports the comparison of the variables in the treated and control groups in pre-treatment period. Panels B, C, D, E, and F report estimates from the regression models for ownership, price informativeness, real efficiency, post-earnings announcement drift, price non-synchronicity, and variance ratio. Control variables are the same as in Table 5. All regression models include firm and country×year fixed effects. Robust standard errors, clustered at firm and year, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Pre-treatment Comparison

	Treated Group	Control Group	*ttest* (*p value*)
FOR	0.088	0.085	0.43
FOR_ACTIVE	0.078	0.074	0.23
$FOR_PASSIVE$	0.010	0.011	0.17
DOM	0.348	0.353	0.66
$log(M/A)$	0.133	0.081	0.13
$Market_Cap(\$Bil)$	6.276	5.750	0.20
$FORSALES$	0.272	0.262	0.42
E/A	0.109	0.107	0.53
$Analyst$	19.148	18.239	0.15
$Close$	0.266	0.264	0.82
$R\&D/A + CAPEX/A$	0.086	0.081	0.09

Panel B: Ownership

	FOR	DOM	FOR_ACTIVE	$FOR_PASSIVE$
$Treat * After$	0.018***	−0.006	0.011***	0.007***
	(0.002)	(0.004)	(0.001)	(0.001)
Observations	24,230	24,230	24,230	24,230
R^2	0.869	0.975	0.856	0.777

Panel C: Price Informativeness and Investment

	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$CAPEX_{i,t+1}/A_{i,t}$	$CAPEX_{i,t+3}/A_{i,t}$	$R\&D_{i,t+1}/A_{i,t}$	$R\&D_{i,t+3}/A_{i,t}$
$log(M/A) * Treat * After$	0.013**	0.039**	0.003*	0.012**	0.001	−0.004
	(0.006)	(0.016)	(0.001 6)	(0.006)	(0.001)	(0.004)
Observations	24,230	6,716	24,230	6,753	24,230	6,753
R^2	0.667	0.696	0.737	0.742	0.931	0.891

Difference-in-Differences Model (Continued)

Panel D: Aggregate Efficiency

	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$CAPEX_{i,t}/A_{i,t} * Treat * After$	0.134***	0.059
	(0.046)	(0.123)
Observations	20,418	6,716
R^2	0.685	0.654
$R\&D_{i,t}/A_{i,t} * Treat * After$	−0.073	0.664*
	(0.080)	(0.401)
Observations	20,418	6,716
R^2	0.681	0.647

Panel E: Post Earnings Announcement Drift

	$Consensus-based\ SUE$			$Time-series\ SUE$		
	CAR_d1_d1	CAR_d1_d3	CAR_d1_d5	CAR_d1_d1	CAR_d1_d3	CAR_d1_d5
SUE	0.341***	0.412***	0.433***	−0.120***	−0.115**	−0.161***
	(0.021)	(0.024)	(0.025)	(0.030)	(0.035)	(0.039)
$SUE * Treat * After$	−0.120***	−0.115**	−0.161***	−0.211***	−0.165*	−0.238**
	(0.045)	(0.052)	(0.057)	(0.081)	(0.099)	(0.114)
Observations	42,787	42,787	42,787	44,233	44,233	44,233
R^2	0.100	0.098	0.095	0.067	0.067	0.066

Panel F: Price Non-synchronicity and Variance Ratio

	Price Non-synchronicity	$\lvert VR-1\rvert(\%)$
$Treat * After$	0.033***	−0.971*
	(0.010)	(0.573)
Observations	21,722	21,440
R^2	0.345	0.191

Table 9: Difference-in-Differences Model: Liquidity, Volatility, and Analyst

This table shows results from estimating difference-in-differences regression models of institutional ownership and price informativeness around the year a stock is added to the MSCI ACWI index. Treated Group includes 714 firms added to the MSCI ACWI during the sample period. Control Group includes five firms that best match each treated firm using propensity scores matching. $Treat$ is equal to one if a firm in the treated group, and zero otherwise. $After$ is equal to one in the year when the treated firm is added to the MSCI ACWI and thereafter, and zero otherwise. All regression models include firm, and country×year fixed effects. Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Volatility, Beta, and ICOE

	Idio Vol	Beta	ICOE
$Treat * After$	−0.142	−0.039	−0.011***
	(0.206)	(0.059)	(0.003)
Observations	21,722	21,722	17,268
R^2	0.542	0.553	0.582

Panel B: Liquidity and Analyst Coverage

	Turnover	Bid-Ask	Analyst
$Treat * After$	0.201***	−0.036***	2.959***
	(0.044)	(0.007)	(0.302)
Observations	22,790	16,820	24,230
R^2	0.745	0.760	0.912

Panel C: Governance Index

$Treat * After$	−0.009
	(0.007)
Observations	7,784
R^2	0.835

Table 10: Activeness of Institutional Investors

This table shows the results from estimating pooled ordinary least squares (OLS) regression model of future earnings on institutional activeness and its interaction term with current market valuation, as in equation (3). Ownership is divided into active and passive groups based on three different measures. The first measure is based on institutional types. Active institutions include mutual funds, hedge funds, and fund advisors, while passive ones include pension funds, banks, and insurance companies. The second measure is based on holding period. Active (passive) ownership is sum of the shares owned by investors that have holding periods longer (less than or equal) than one year. The third measure is based on the performance of an institutional investor in its domestic and foreign investments. Each year, we calculate investment returns for each institutional investor on their domestic and foreign portfolios. For each stock, year, and investor origin, active (passive) ownership is sum of the shares owned by institutions with returns in the top (bottom) 25% among institutions holding this stock. E/A is EBIT to total assets, $log(M/A)$ is the log-ratio of market cap to total assets. Control variables are same as in Table 5 (not shown). All regression models include firm, and country×year fixed effects. Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Active=Institution Type		**Active Alt. = Holding Period**		**Active Alt.2 = Portfolio Return**	
	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	0.008***	−0.026***	0.008***	−0.026***	0.011***	−0.022***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
$FOR_ACTIVE_{i,t}$	−0.022*	−0.076***	−0.016	−0.100***	0.003	−0.097***
	(0.012)	(0.019)	(0.014)	(0.016)	(0.022)	(0.029)
$FOR_PASSIVE_{i,t}$	−0.012	−0.307***	−0.069	−0.061	−0.037	−0.118***
	(0.053)	(0.083)	(0.040)	(0.053)	(0.028)	(0.029)
$log(M/A) * FOR_ACTIVE_{i,t}$	0.080***	0.071***	0.092***	0.066***	0.174***	0.110***
	(0.011)	(0.015)	(0.010)	(0.013)	(0.024)	(0.030)
$log(M/A) * FOR_PASSIVE_{i,t}$	0.175***	−0.011	0.064	0.048	0.099***	0.109***
	(0.050)	(0.074)	(0.045)	(0.044)	(0.029)	(0.029)
$DOM_ACTIVE_{i,t}$	0.010	0.010	0.008	0.010	0.014	0.049*
	(0.010)	(0.013)	(0.009)	(0.014)	(0.009)	(0.026)
$DOM_PASSIVE_{i,t}$	−0.018	−0.010	−0.010	0.006	−0.021	−0.009
	(0.029)	(0.045)	(0.025)	(0.036)	(0.021)	(0.027)
$log(M/A) * DOM_ACTIVE_{i,t}$	0.053***	0.045***	0.061***	0.051***	0.090***	0.062***
	(0.005)	(0.008)	(0.004)	(0.008)	(0.010)	(0.015)
$log(M/A) * DOM_PASSIVE_{i,t}$	0.110***	0.054	0.067**	−0.042	0.081***	0.060***
	(0.026)	(0.032)	(0.023)	(0.036)	(0.013)	(0.014)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	172,277	153,881	172,277	153,881	171,354	153,008
R^2	0.715	0.629	0.715	0.629	0.714	0.627

Table 11: Price Informativeness and Institutional Ownership: The Role of U.S. Investors

This table shows results from estimating pooled ordinary least squares (OLS) regression model of future earnings on institutional ownership and its interaction term with current market valuation, as in equation (3). Foreign ownership (FOR) is decomposed into FOR_US and FOR_NUS depending on whether the investor is from U.S. or Non-U.S. countries. E/A is EBIT to total assets, $log(M/A)$ is the log-ratio of market cap to total assets. All regression models include firm, and country×year fixed effects. Control variables are same as in Table 5 (not shown). Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Developed (Ex U.S.)		**Emerging**	
	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	0.014***	−0.020***	0.029***	0.001
	(0.002)	(0.003)	(0.002)	(0.004)
$DOM_{i,t}$	0.028	−0.038	0.049**	0.003
	(0.017)	(0.036)	(0.019)	(0.022)
$FOR_US_{i,t}$	−0.066**	−0.133***	0.008	−0.072
	(0.025)	(0.032)	(0.023)	(0.044)
$FOR_NUS_{i,t}$	−0.018	−0.094**	0.028	−0.039
	(0.023)	(0.042)	(0.025)	(0.036)
$log(M/A) * DOM_{i,t}$	0.048***	0.008	0.036**	−0.003
	(0.015)	(0.018)	(0.018)	(0.014)
$log(M/A) * FOR_US_{i,t}$	0.055***	0.067***	0.062***	0.054*
	(0.016)	(0.023)	(0.017)	(0.030)
$log(M/A) * FOR_NUS_{i,t}$	0.130***	0.031	0.036**	−0.021
	(0.025)	(0.042)	(0.014)	(0.035)
Controls	Yes	Yes	Yes	Yes
Observations	93,375	83,673	50,692	45,220
R^2	0.660	0.575	0.628	0.627

Table 12: Price Informativeness and Institutional Ownership: Familiarity

This table shows results from estimating pooled ordinary least squares (OLS) regression model of future earnings on institutional ownership and its interaction term with current market valuation, as in equation (10). Foreign ownership (FOR) is decomposed into FOR_CLOSE and FOR_FAR depending on the connection closeness between the home country and each foreign country. The connection closeness is measured by five different variables respectively, including bilateral trades, geographical distance, language commonality, border connection and colony origin. E/A is EBIT to total assets, $log(M/A)$ is the log-ratio of market cap to total assets. Panel A reports the results for a 1-year horizon, and Panel B reports the results for a 3-year horizon. All regression models include firm, and country×year fixed effects. Control variables are same as in Table 5 (not shown). Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: 1-Year Horizon

	Bilateral Trade	Geographical Distance	Language	Border	Colony
	$E_{i,t+1}/A_{i,t}$				
$log(M/A)_{i,t}$	0.007***	0.007***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$FOR_CLOSE_{i,t}$	−0.032***	−0.030	−0.044**	−0.045	0.052
	(0.011)	(0.020)	(0.016)	(0.026)	(0.063)
$FOR_FAR_{i,t}$	−0.011	−0.027*	−0.012	−0.023	−0.030**
	(0.030)	(0.015)	(0.018)	(0.014)	(0.012)
$log(M/A) * FOR_CLOSE_{i,t}$	0.092***	0.096***	0.073***	0.049*	0.183***
	(0.011)	(0.009)	(0.013)	(0.027)	(0.054)
$log(M/A) * FOR_FAR_{i,t}$	0.067***	0.082***	0.105***	0.100***	0.088***
	(0.025)	(0.021)	(0.012)	(0.010)	(0.010)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	172,277	172,277	172,277	172,277	172,277
R^2	0.714	0.714	0.714	0.714	0.714

Panel B: 3-Year Horizon

	Bilateral Trade	Geographical Distance	Language	Border	Colony
	$E_{i,t+3}/A_{i,t}$				
$log(M/A)_{i,t}$	−0.027***	−0.027***	−0.027***	−0.027***	−0.027***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
$FOR_CLOSE_{i,t}$	−0.108***	−0.160***	−0.099***	−0.053	−0.057
	(0.020)	(0.032)	(0.030)	(0.044)	(0.155)
$FOR_FAR_{i,t}$	−0.072**	−0.054**	−0.110***	−0.120***	−0.109***
	(0.028)	(0.023)	(0.022)	(0.022)	(0.016)
$log(M/A) * FOR_CLOSE_{i,t}$	0.062***	0.060***	0.047**	0.071	0.160
	(0.012)	(0.020)	(0.019)	(0.040)	(0.152)
$log(M/A) * FOR_FAR_{i,t}$	0.089***	0.074***	0.079***	0.064***	0.064***
	(0.023)	(0.020)	(0.013)	(0.015)	(0.012)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	153,881	153,881	153,881	153,881	153,881
R^2	0.628	0.628	0.628	0.628	0.628

Table 13: Price Informativeness and Institutional Ownership: Knowledge Spillover

This table shows results from estimating pooled ordinary least squares (OLS) regression model of future earnings on institutional ownership and its interaction term with current market valuation, as in equation (11). Origin countries are classified into two groups by three indicators: financial development index (market capitalization over GDP) above the median level, the law system (common or civil law), and financial system (market or bank based). In addition, foreign investors origins are separated by these three measures. FOR_FIN_High (FOR_FIN_Low) denotes the foreign ownership from higher (lower) financial development countries, which the total equity market capitalization over GDP is above (below) median. FOR_COMMON (FOR_CIVIL) denotes the foreign ownership from countries with common (civil) law. FOR_MARKET (FOR_BANK) denotes the foreign ownership from countries with market-based (bank-based) financial system. E/A is EBIT to total assets; $log(M/A)$ is the log-ratio of market cap to total assets. All regression models include firm, and country×year fixed effects. Control variables are same as in Table 5 (not shown). Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Origin Country Financial Development			
	High	**Low**	**High**	**Low**
	$E_{i,t+1}/A_{i,t}$		$E_{i,t+3}/A_{i,t}$	
$log(M/A)_{i,t}$	0.002	0.022***	−0.034***	−0.007
	(0.003)	(0.002)	(0.003)	(0.004)
$FOR_FIN_High_{i,t}$	−0.054***	0.004	−0.133***	−0.068**
	(0.016)	(0.014)	(0.023)	(0.027)
$FOR_FIN_Low_{i,t}$	−0.012	0.073	−0.142	0.028
	(0.055)	(0.062)	(0.100)	(0.110)
$log(M/A) * FOR_FIN_High_{i,t}$	0.091***	0.081***	0.063***	0.038**
	(0.016)	(0.011)	(0.020)	(0.018)
$log(M/A) * FOR_FIN_Low_{i,t}$	0.191***	0.116**	0.128	0.026
	(0.054)	(0.057)	(0.086)	(0.070)
Observations	127,233	42,926	113,787	38,032
R^2	0.725	0.654	0.634	0.623

	Origin Country Law System			
	Common	**Civil**	**Common**	**Civil**
$log(M/A)_{i,t}$	−0.010***	0.023***	−0.048***	−0.006**
	(0.003)	(0.002)	(0.005)	(0.003)
$FOR_COMMON_{i,t}$	−0.075***	−0.001	−0.155***	−0.075***
	(0.021)	(0.017)	(0.038)	(0.023)
$FOR_CIVIL_{i,t}$	−0.144**	0.003	−0.191	−0.030
	(0.055)	(0.037)	(0.113)	(0.054)
$log(M/A) * FOR_COMMON_{i,t}$	0.093***	0.068***	0.086***	0.040**
	(0.019)	(0.013)	(0.031)	(0.017)
$log(M/A) * FOR_CIVIL_{i,t}$	0.166***	0.071**	0.197**	−0.004
	(0.053)	(0.034)	(0.093)	(0.045)
Observations	72,054	89,317	62,593	82,257
R^2	0.730	0.636	0.637	0.593

	Origin Country Financial System			
	Market	**Bank**	**Market**	**Bank**
$log(M/A)_{i,t}$	−0.002	0.022***	−0.038***	−0.006
	(0.003)	(0.002)	(0.003)	(0.004)
$FOR_MARKET_{i,t}$	−0.052***	−0.003	−0.105***	−0.095***
	(0.019)	(0.020)	(0.025)	(0.026)
$FOR_BANK_{i,t}$	0.002	0.087	−0.220**	0.052
	(0.056)	(0.052)	(0.108)	(0.102)
$log(M/A) * FOR_MARKET_{i,t}$	0.088***	0.064***	0.083***	0.027
	(0.015)	(0.011)	(0.024)	(0.017)
$log(M/A) * FOR_BANK_{i,t}$	0.201***	0.172***	0.173**	0.028
	(0.044)	(0.061)	(0.072)	(0.072)
Observations	99,350	72,927	87,274	66,607
R^2	0.726	0.634	0.635	0.602

Table 14: Price Informativeness and Institutional Ownership: Capital Controls

This table shows results from estimating pooled ordinary least squares (OLS) regression model of future earnings on institutional ownership and its interaction term with current market valuation, as in equation (12). *OPEN* is based on Chinn-Ito index (Chinn and Ito, 2006) that measures the financial openness of each country. It is an indicator variable equal to one if the openness index is above median level in each year, otherwise to be zero. E/A is EBIT to total assets; $log(M/A)$ is the log-ratio of market cap to total assets. Control variables are same as in Table 5 (not shown). All regression models include firm and year fixed effects. Robust standard errors, clustered at firm and year levels, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	0.018***	−0.005
	(0.003)	(0.003)
$FOR_{i,t}$	−0.038**	−0.176***
	(0.016)	(0.032)
$OPEN_{c,t}$	−0.006	−0.024**
	(0.006)	(0.012)
$log(M/A) * OPEN_{c,t}$	−0.017***	−0.032***
	(0.004)	(0.004)
$FOR * OPEN_{c,t}$	0.035	0.125***
	(0.022)	(0.037)
$log(M/A) * FOR_{i,t}$	0.060***	0.020
	(0.013)	(0.021)
$log(M/A) * FOR * OPEN_{c,t}$	0.047***	0.078**
	(0.013)	(0.028)
Controls	Yes	Yes
Observations	165,138	147,551
R^2	0.711	0.624

Table 15: Price Informativeness and Institutional Ownership: Economic Conditions

This table shows results from estimating regression model of price informativeness on institutional ownership and its interaction with economic conditions. The dependent variable is price informativeness measured in one and three years horizons, respectively, and constructed as in equation (1). Firms are sorted into low, median, and high ownership groups, if their foreign ownership levels are below or above the 33.3%, 66.7% threshold in each country-year group. *FOR* is the equal-weighted foreign ownership in each group of firms. The economic condition is measured by five different measures: global recession indicator (equal to one for year 2008 and 2009, otherwise set to zero), country equity index realized volatility, equity market return, GDP growth, industrial production growth. All these measures are weighted by the total market capitalization of each country. Robust standard errors, clustered at year level, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Price Informativeness (1-year horizon)

		Economic Condition Measure				
		Global Recession	**Realized Volatility**	**Index Return**	**GDP Growth**	**IP Growth**
FOR	0.207***	0.191***	0.115***	0.213***	0.288***	0.232***
	(0.021)	(0.020)	(0.041)	(0.021)	(0.024)	(0.018)
*FOR*Economic*		0.104***	6.336**	−0.059	−0.030***	−1.164***
		(0.031)	(2.941)	(0.099)	(0.006)	(0.310)
Economic		−0.004**	−0.150	0.003	0.001	0.065*
		(0.002)	(0.212)	(0.007)	(0.001)	(0.035)
Observations	42	42	42	42	42	42
R^2	0.541	0.561	0.559	0.544	0.570	0.571

Panel B: Price Informativeness (3-year horizon)

		Economic Condition Measure				
		Global Recession	**Realized Volatility**	**Index Return**	**GDP Growth**	**IP Growth**
FOR	0.292***	0.280***	0.193***	0.310***	0.341***	0.308***
	(0.020)	(0.020)	(0.041)	(0.020)	(0.045)	(0.025)
*FOR*Economic*		0.077*	6.841***	−0.177**	−0.018	−0.706
		(0.046)	(2.312)	(0.080)	(0.013)	(0.482)
Economic		−0.002	−0.139	0.007	0.000	0.003
		(0.003)	(0.251)	(0.006)	(0.001)	(0.025)
Observations	42	42	42	42	42	42
R^2	0.599	0.606	0.611	0.610	0.608	0.609

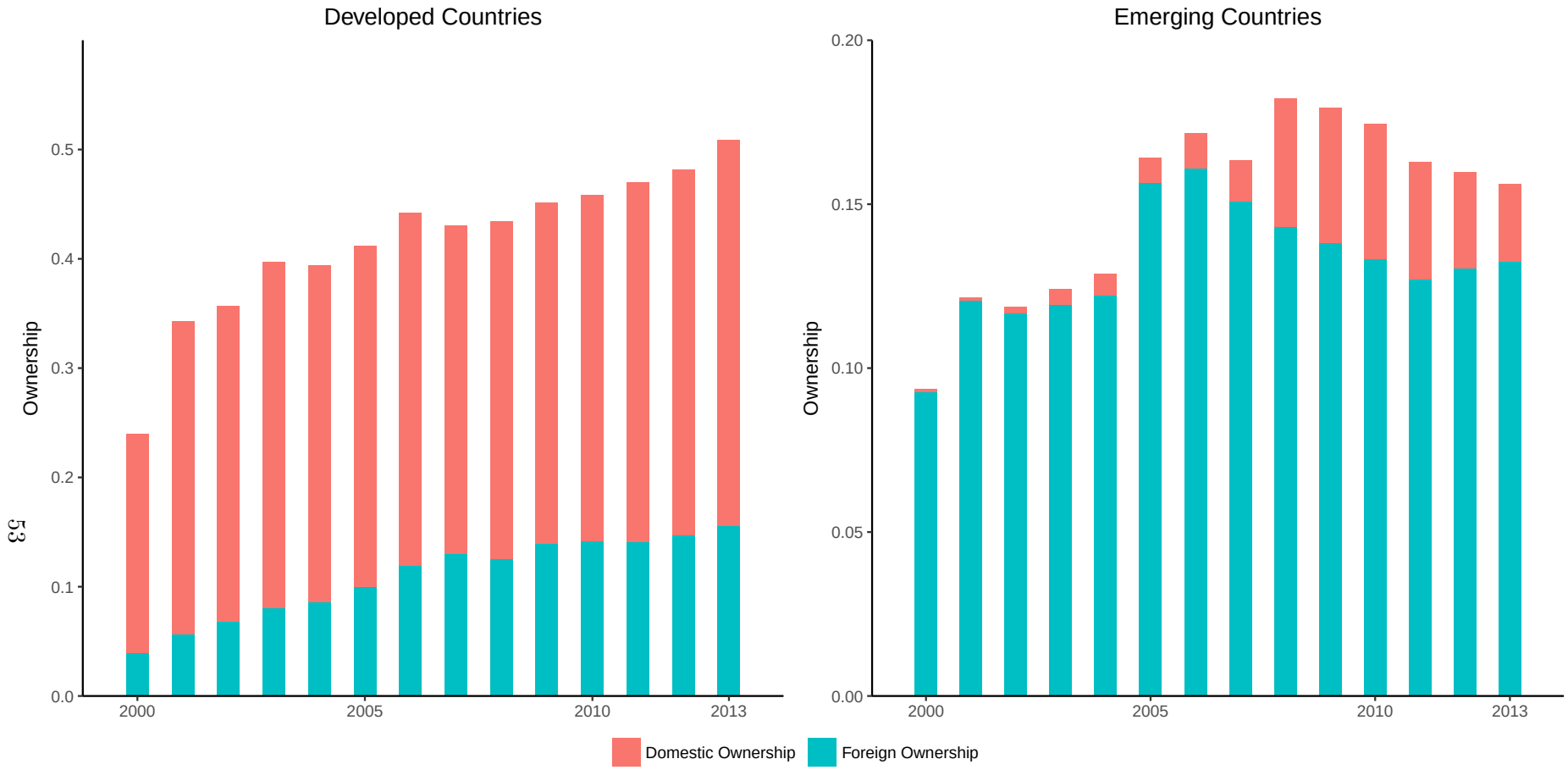


Figure 1: Institutional Ownership: Domestic vs Foreign

This figure shows the domestic and foreign institutional ownership in each country sample from 2000 to 2013. In each year, we calculate the average institutional ownership weighted by market capitalizaton.

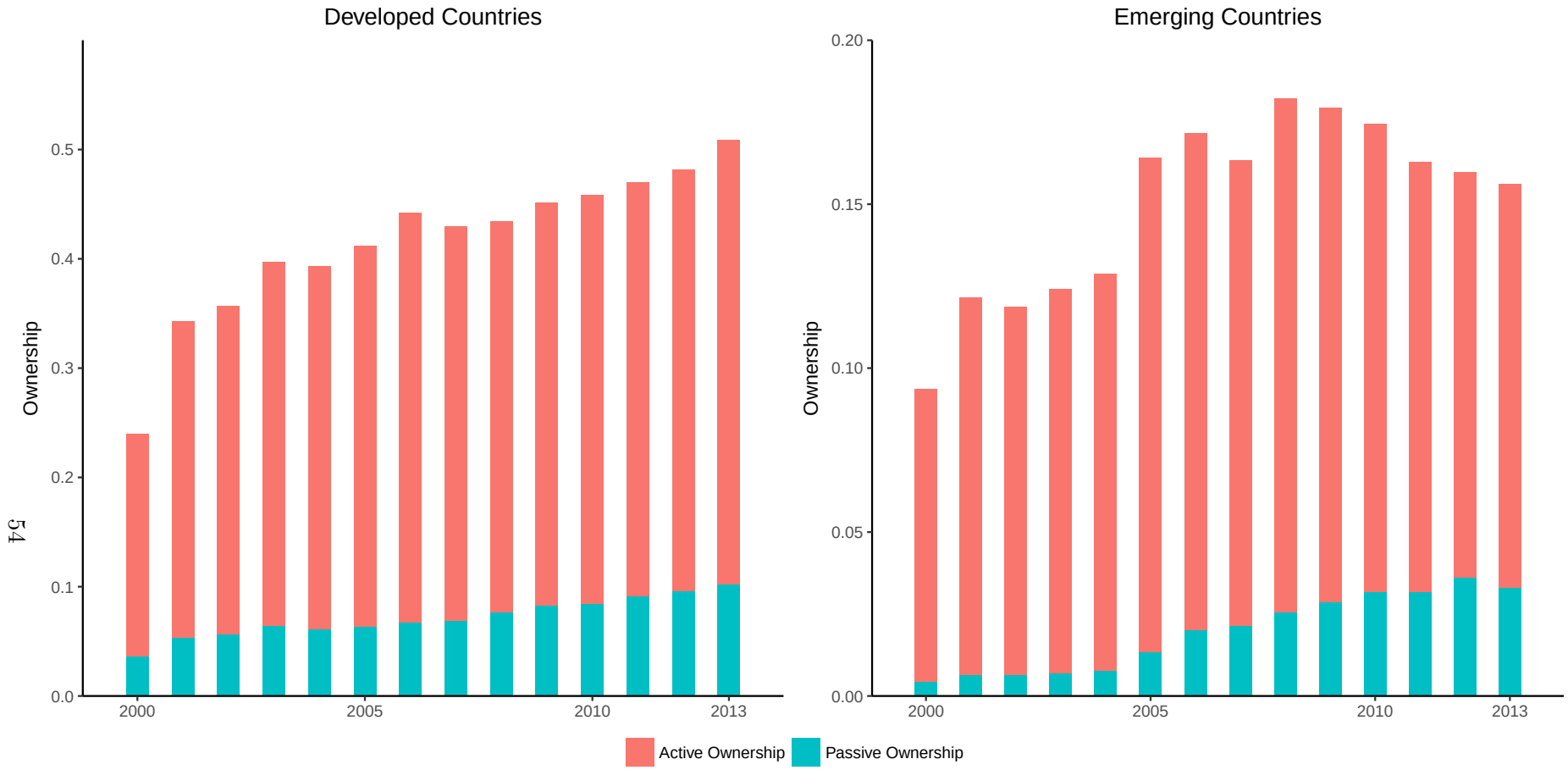


Figure 2: Institutional Ownership: Active vs Passive

This figure shows the active and passive institutional ownership in each country sample from 2000 to 2013. In each year, we calculate the average institutional ownership weighted by market capitalizaton.

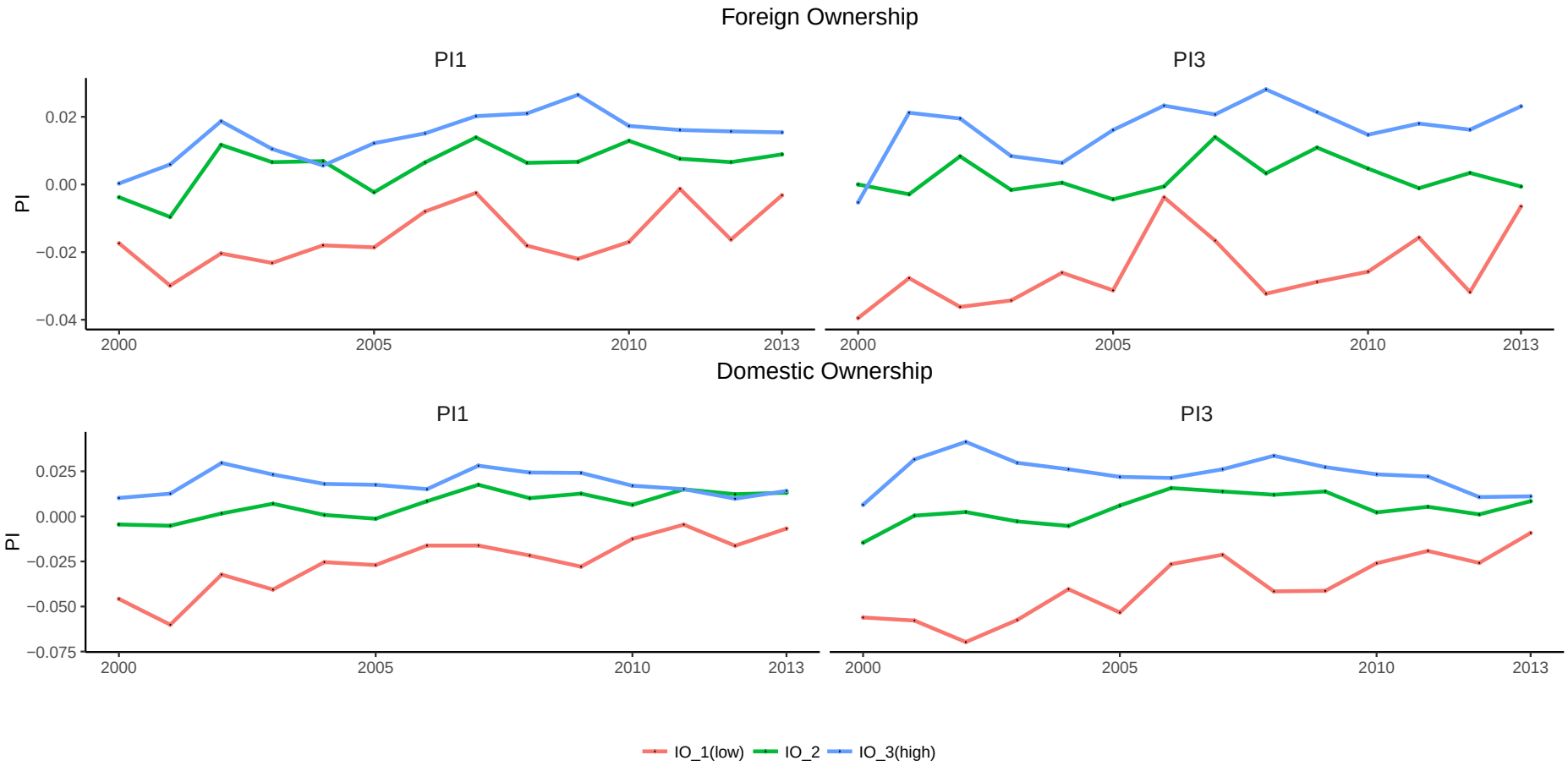
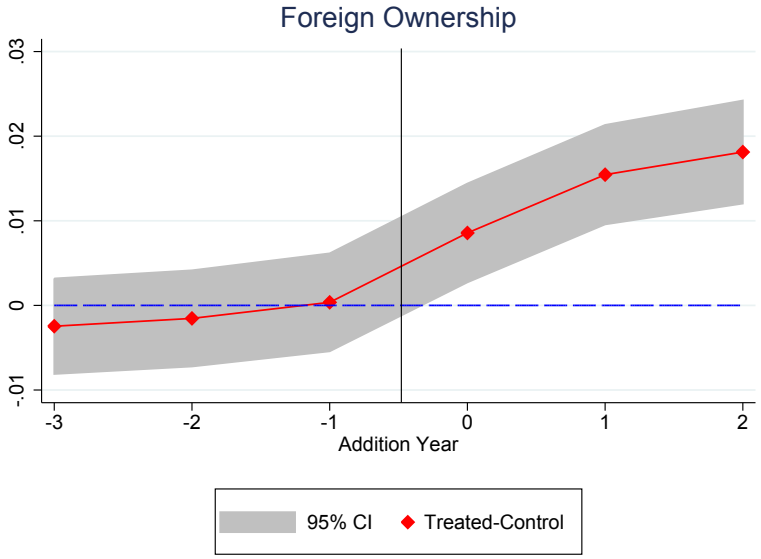
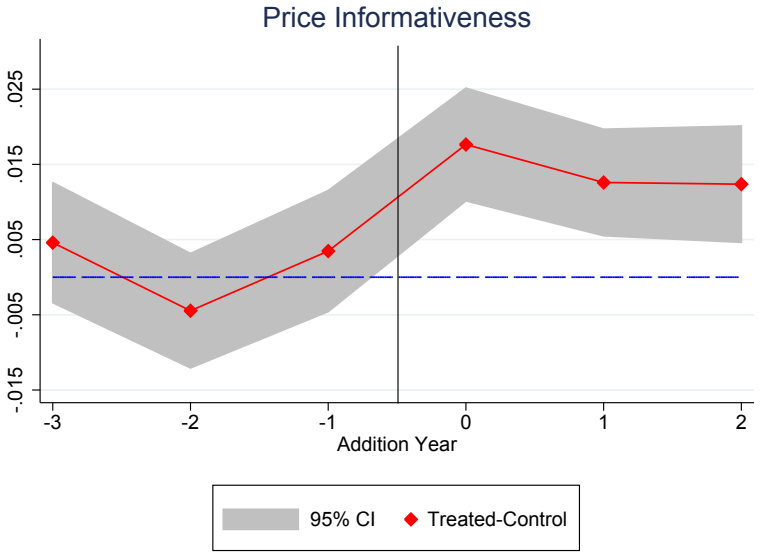


Figure 3: Price informativeness over time and across institutional ownership

$PI1$ and $PI3$ are price informativeness measures in one and three years horizons, respectively, constructed as in Formula (1). We estimate a separate regression model for each year t = 2000:2013 for each ownership group from low to high sorted by domestic (DOM) and foreign ownership (FOR), respectively.





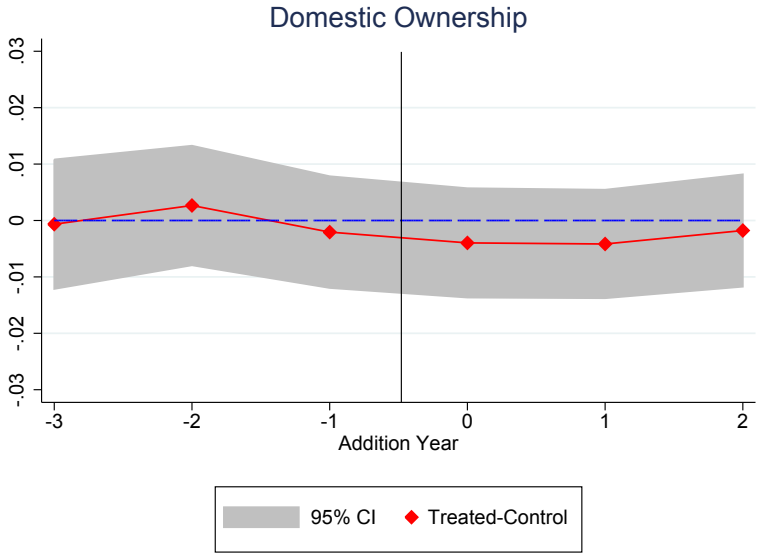


Figure 4: Ownership and Price Informativeness Surrounding the Additions to MSCI

This figure shows point estimates and 95% confidence interval of the differences in ownership (*FOR* and *DOM*) and price informativeness between treated firms and control firms around stock additions to the MSCI ACWI index. Year 0 is the year when the treated firms added to the MSCI ACWI index.

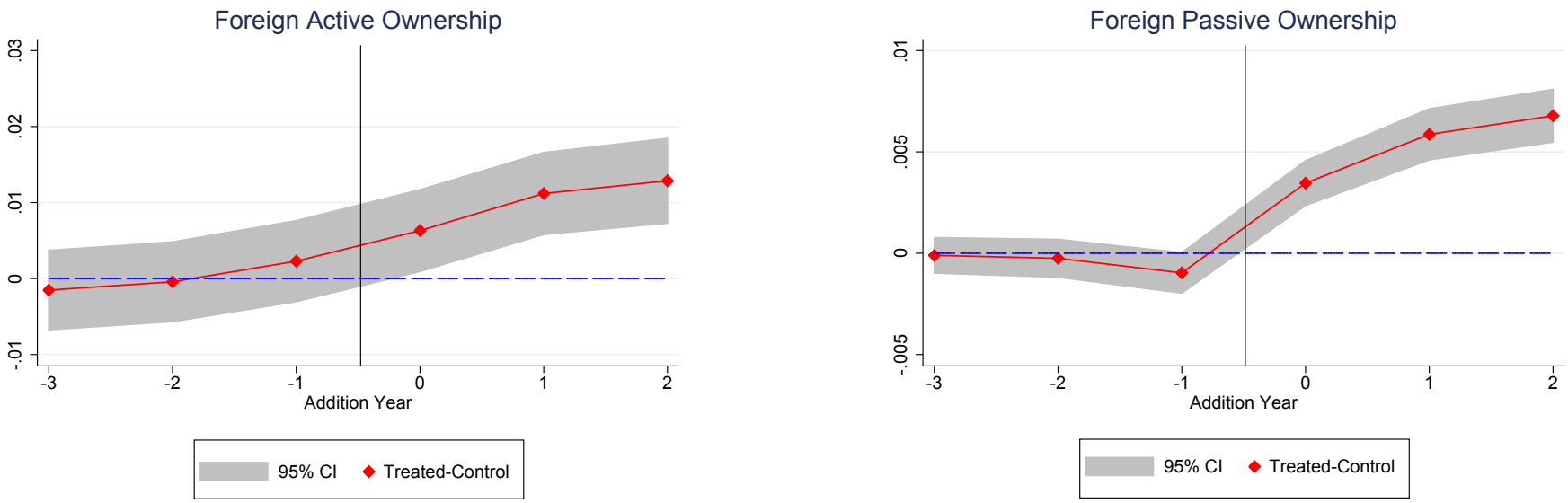


Figure 5: Foreign Institutional Ownership Surrounding the Additions to MSCI

This figure shows point estimates and 95% confidence interval of the differences in ownership (FOR_ACTIVE and $FOR_PASSIVE$) between treated firms and control firms around stock additions to the MSCI ACWI index. Year 0 is the year when the treated firms added to the MSCI ACWI index.

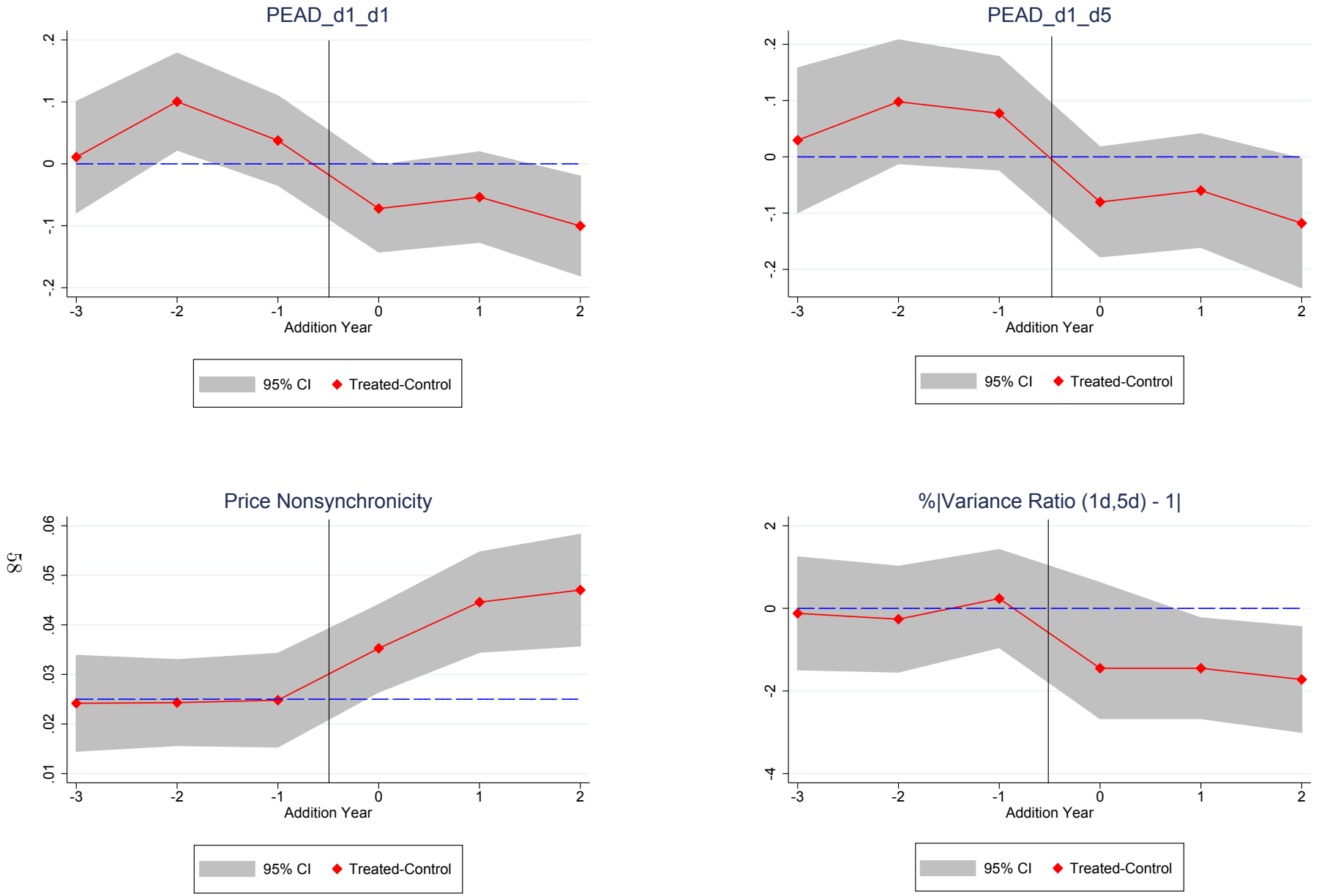


Figure 6: PEAD, Price Nonsynchronicity and Variance Ratio Surrounding the Additions to MSCI

This figure shows point estimates and 95% confidence interval of the sensitivity of the post earnings announcement to the earnings surprise, price nonsynchronicity and variance ratio, between treated firms and control firms around stock additions to the MSCI ACWI index. Year 0 is the year the first year after the treated firms added to the MSCI ACWI index.

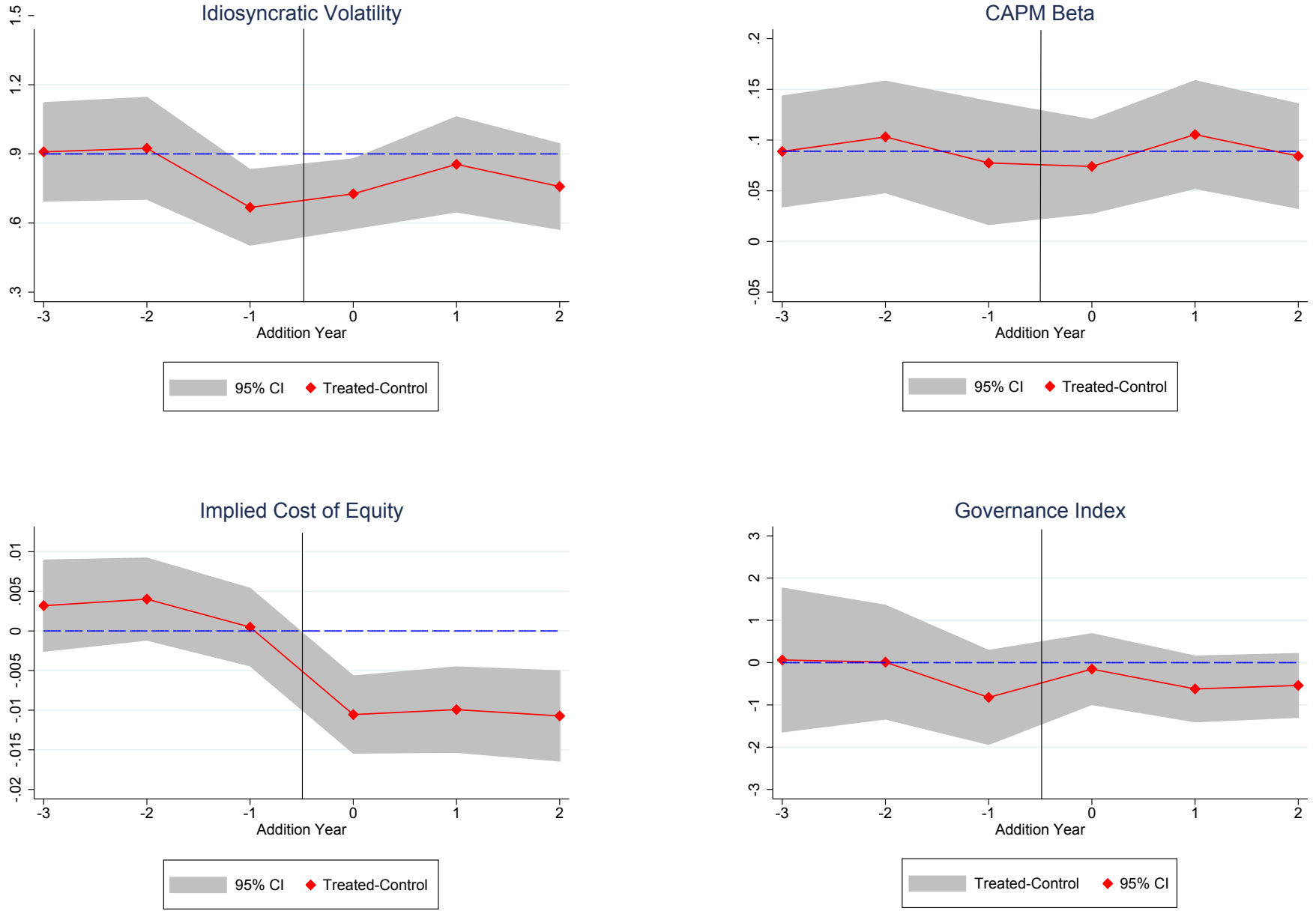
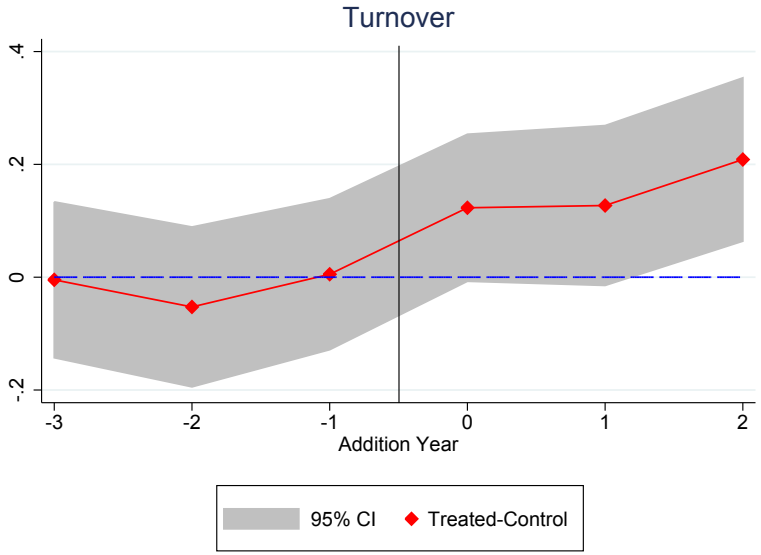
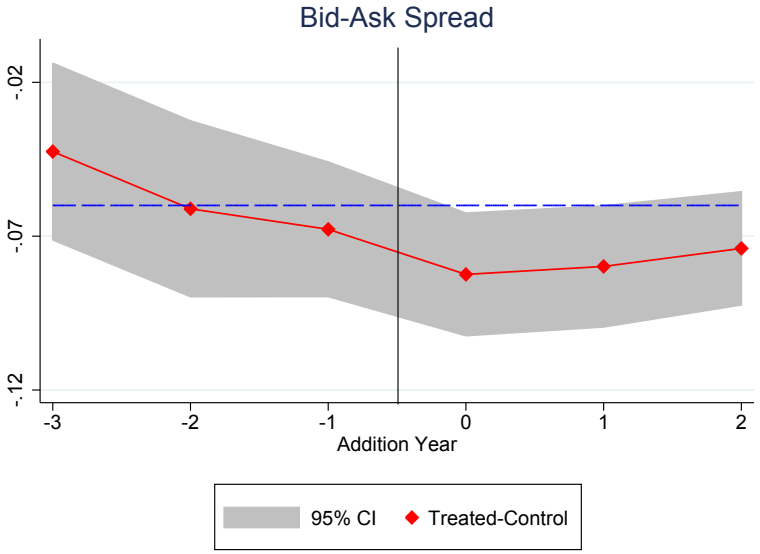


Figure 7: Volatility and ICOE Surrounding the Additions to MSCI

This figure shows point estimates and 95% confidence interval of the volatility, market beta, implied cost of equity, governance index between treated firms and control firms around stock additions to the MSCI ACWI index. Year 0 is the first year after the treated firms added to the MSCI ACWI index.





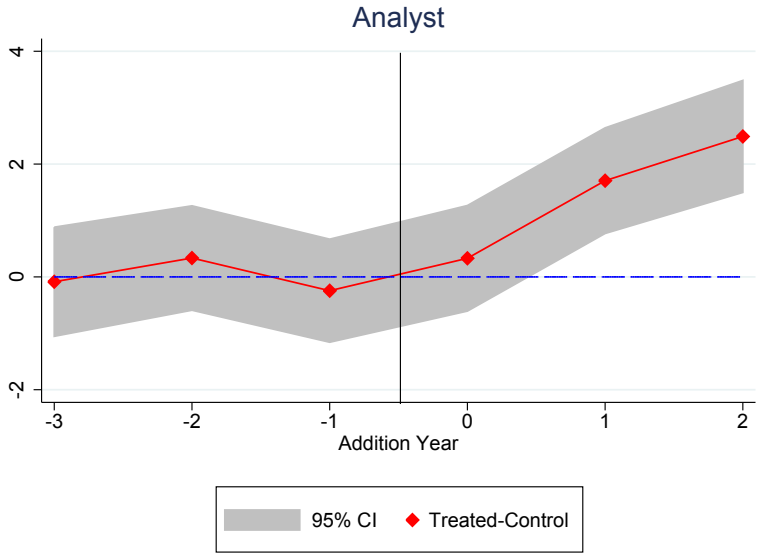


Figure 8: Liquidity Surrounding the Additions to MSCI

This figure shows point estimates and 95% confidence interval of the turnover ratio, bid-ask spread, analyst coverage between treated firms and control firms around stock additions to the MSCI ACWI index. Year 0 is the first year after the treated firms added to the MSCI ACWI index.

Appendix to

"Do Foreign Investors Improve Market Efficiency?"

Abstract

This appendix presents supplementary results not included in the main body of the paper.

Table IA.1: Variable Definition

Variable	Definition
Ownership Variables (Source: FactSet Ownership)	
IO	ownership by all institutions.
DOM	ownership by all institutions domiciled in the same country as where the stock is listed.
FOR	ownership by all institutions domiciled in a different country as where the stock is listed.
FOR_US	ownership by all institutions domiciled in US and the stock is listed in Non-US countries.
FOR_NUS	ownership by all institutions domiciled in a different country (Non-US) as where the stock is listed.
DOM_ACTIVE (Institution type)	ownership by all domestic active institutions (e.g., mutual funds, independent investment advisers and hedge funds).
FOR_ACTIVE (Institution type)	ownership by all foreign active institutions (e.g., mutual funds, independent investment advisers and hedge funds).
DOM_PASSIVE (Institution type)	ownership by all domestic passive institutions (e.g., bank trusts, insurance companies, and other institutions).
FOR_PASSIVE (Institution type)	ownership by all foreign passive institutions (e.g., bank trusts, insurance companies, and other institutions).
DOM_ACTIVE (Holding period)	ownership by all domestic institutions with holding periods longer than one year.
FOR_ACTIVE (Holding period)	ownership by all foreign institutions with holding periods longer than one year.
DOM_PASSIVE (Holding period)	ownership by all domestic institutions with holding periods shorter than or equal to one year.
FOR_PASSIVE (Holding period)	ownership by all foreign institutions with holding periods shorter than or equal to one year.
FOR_CLOSE (Bilateral trade)	ownership by institutions domiciled in a foreign country that have strong bilateral trades (above median level each year) with the country where the stock is listed.
FOR_FAR (Bilateral trade)	ownership by institutions domiciled in a foreign country that have weak bilateral trades (below median level each year) with the country where the stock is listed.
FOR_CLOSE (Geographic distance)	ownership by institutions domiciled in a foreign country that have long distance (above median level each year) with the country where the stock is listed.
FOR_FAR (Geographic distance)	ownership by institutions domiciled in a foreign country that have short distance (below median level each year) with the country where the stock is listed.
FOR_CLOSE (Language)	ownership by institutions domiciled in a foreign country that speak same language with the country where the stock is listed.
FOR_FAR (Language)	ownership by institutions domiciled in a foreign country that speak different language with the country where the stock is listed.
FOR_CLOSE (Border)	ownership by institutions domiciled in a foreign country that have connected border with the country where the stock is listed.
FOR_FAR (Border)	ownership by institutions domiciled in a foreign country that have no connected border with the country where the stock is listed.
FOR_CLOSE (Colony)	ownership by institutions domiciled in a foreign country that have same colony origin with the country where the stock is listed.
FOR_FAR (Colony)	ownership by institutions domiciled in a foreign country that have different colony origin with the country where the stock is listed.
FOR_FIN_High	ownership by foreign institutions from a country with high financial market developement index (total equity market capitalization scaled by GDP above median level each year).
FOR_FIN_Low	ownership by foreign institutions from a country with low financial market developement index (total equity market capitalization scaled by GDP below median level each year).
FOR_COMMON	ownership by foreign institutions from a country has common law system.
FOR_CIVIL	ownership by foreign institutions from a country has civil law system.
FOR_MARKET	ownership by foreign institutions from a country has market-based financial system.
FOR_BANK	ownership by foreign institutions from a country has bank-based financial system.

Variable Definition (Continued)

Variable	Definition
Key and Control Variables (Source: Worldscope)	
E/A	EBIT divided by total assets.
log(M/A)	Logarithm of market capitaliation divided by total assets.
R&D/A	Research and development expenditures divided by total assets.
CAPEX/A	Capital expenditures divided by total assets.
INVESTMENT	the sum of Research and development expenditures and Capital expenditures, divided by total assets.
LEVERAGE	Ratio of total debt to total assets.
TANGIBILITY	Net property, plant, and equipment, divided by total assets.
log(SALES)	Logarithm of sales ($1000).
FORSALES	Foreign sales, divided by total sales.
CASH	Cash and/or liquid items, divided by total assets.
CLOSE	Ratio of shares held by insiders to total shares.
OPEN	OPEN is a dummy variable based on Chinn-Ito index (Chinn and Ito, 2006), equal to one is the openness index is above the medium level every year.
ANALYST	The number of analyst coverage at the end of each year.
log($Volume)	Logarithm of dollar trading volume at each year.
Bid_Ask Spread	Ask price minus bid price, then scaled by mid price.
log(Amihud)	Logarithm of Amihud price impact measure.
VOLATILITY	Realized volatility by daily returns, measured at each year.

Table IA.2: Summary Statistics: Other Ownership Variables

This table reports the mean, standard deviation, median, 25 percent and 75 percent quantiles, for the different institution ownership.

	Mean	STD	Q25	Median	Q75
Ownership Variables (%)					
FOR_ACTIVE (return)	1.42	3.04	0.00	0.11	1.51
FOR_PASSIVE(return)	0.94	2.51	0.00	0.01	0.65
DOM_ACTIVE (return)	3.55	7.61	0.00	0.03	2.64
DOM_PASSIVE (return)	2.67	6.15	0.00	0.01	1.92
FOR_ACTIVE (Holding period)	4.34	8.56	0.05	1.00	4.89
FOR_PASSIVE (Holding period)	0.32	1.41	0.00	0.00	0.15
DOM_ACTIVE (Holding period)	14.23	24.47	0.02	2.30	14.13
DOM_PASSIVE (Holding period)	0.71	2.66	0.00	0.00	0.20
FOR_CLOSE (Bilateral trade)	3.83	7.88	0.01	0.82	4.27
FOR_FAR (Bilateral trade)	0.68	3.07	0.00	0.00	0.37
FOR_CLOSE (Geographic distance)	2.30	6.18	0.00	0.19	1.82
FOR_FAR (Geographic distance)	2.37	5.60	0.00	0.26	2.26
FOR_CLOSE (Language)	1.79	5.87	0.00	0.00	1.02
FOR_FAR(Language)	2.88	6.58	0.00	0.46	2.71
FOR_CLOSE (Border connection)	0.79	3.65	0.00	0.00	0.13
FOR_FAR (Border connection)	3.88	7.78	0.05	0.89	4.39
FOR_CLOSE (Colony)	0.08	0.70	0.00	0.00	0.00
FOR_FAR (Colony)	4.59	8.92	0.09	1.19	5.21
FOR_FIN_High	4.05	8.36	0.05	0.92	4.39
FOR_FIN_Low	0.62	1.45	0.00	0.01	0.63
FOR_COMMON	3.61	7.91	0.03	0.75	3.66
FOR_CIVIL	1.15	2.42	0.00	0.12	1.23
FOR_MAKRET	3.91	8.20	0.03	0.86	4.18
FOR_BANK	0.76	1.74	0.00	0.04	0.76

Table IA.3: Price Informativeness and Institutional Ownership: Sample with Zero Ownership

This table shows results of pooled ordinary least squares (OLS) regression of future earnings on institutional ownership and its interaction term with current market valuation as in equation (3). The *E/A* is EBIT to total asset, *log(M/A)* is the log-ratio of market cap to total asset. *IO*, *FOR* and *DOM* are total, foreign and domestic institutional ownership, respectively. *For_Ratio* is the foreign ownership over total ownership. All regression models include firm and country×year fixed effects. Robust standard errors clustered in firm and year levels are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	$E_{i,t+1}/A_{i,t}$			$E_{i,t+3}/A_{i,t}$		
$log(M/A)_{i,t}$	−0.023***	−0.024***	−0.020***	−0.052***	−0.052***	−0.053***
	(0.003)	(0.003)	(0.002)	(0.005)	(0.005)	(0.005)
$IO_{i,t}$	0.035**			−0.035*		
	(0.014)			(0.019)		
$FOR_{i,t}$		0.024	−0.054**		−0.112***	−0.187***
		(0.020)	(0.018)		(0.028)	(0.029)
$DOM_{i,t}$		0.041**	−0.019		−0.005	−0.068**
		(0.014)	(0.015)		(0.023)	(0.025)
$log(M/A)_{i,t} * IO_{i,t}$	0.143***			0.112***		
	(0.009)			(0.009)		
$log(M/A)_{i,t} * FOR_{i,t}$		0.201***	0.133***		0.168***	0.111***
		(0.019)	(0.015)		(0.024)	(0.021)
$log(M/A)_{i,t} * DOM_{i,t}$		0.131***	0.089***		0.098***	0.060***
		(0.008)	(0.007)		(0.009)	(0.008)
$E_{i,t}/A_{i,t}$			0.300***			0.283***
			(0.016)			(0.023)
$log(Asset)_{i,t}$			−0.018**			0.001
			(0.007)			(0.010)
$CLOSE_{i,t}$			0.003			0.007
			(0.003)			(0.006)
$LEVERAGE_{i,t}$			−0.026**			−0.153***
			(0.011)			(0.021)
$TANGIBILITY_{i,t}$			−0.017			0.061***
			(0.013)			(0.017)
$log(SALES)_{i,t}$			0.033***			0.016***
			(0.004)			(0.006)
$FORSALES_{i,t}$			−0.003			0.001
			(0.004)			(0.009)
$CASH_{i,t}$			0.018*			−0.047**
			(0.010)			(0.024)
Observations	248,336	248,336	248,336	220,993	220,993	220,993
R^2	0.646	0.646	0.694	0.580	0.580	0.604