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ABSTRACT

We study the impact of foreign institutional investors on global capital allocation and welfare using novel firm-level international data. Using MSCI index inclusion as an exogenous shock to foreign ownership, we show that greater foreign ownership leads to more informative stock prices and this effect arises more from increased price efficiency than from improved firm governance. We further show that the impact of capital flows on price efficiency is due to real efficiency gains, as opposed to better information disclosure. Finally, we show that foreign ownership increases market liquidity, reduces firms' cost of equity, and leads to subsequent growth in their real investments, thus improving overall welfare.

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1 Introduction

One of the key purposes of financial markets is to efficiently allocate capital to the real sector.[1] Foreign investors have emerged as an important force in this process. As globalization has increased, financial markets have witnessed substantial inflows of capital from foreign investors. The empirical literature has studied the consequences of financial market liberalization for volatility and aggregate equity prices,[2] but we know considerably less about the *direct* impact of foreign portfolio investments on market efficiency and welfare. Moreover, the evidence on *aggregate* efficiency and welfare in the international economics literature is either inconclusive or finds economically small gains.[3] In this paper, we revisit efficiency and welfare gains due to foreign stock ownership using *disaggregated* panel data on firms and investors from 40 countries.

Whether and how foreign investors affect the price informativeness of local stocks is not obvious. On the one hand, information held by foreign investors could be a subset of the information held by domestic investors or corporate managers, which would imply limited impact on prices and real decisions. Even if such investors could produce unique information, their capacity to invest internationally could be constrained. On the other hand, foreign investors' participation could indicate that the investment opportunity was too good to pass up, thus indicating their being more informed about individual investment opportunities. Further, they can provide unique expertise and better risk sharing, which would then lead to their higher impact on price informativeness and welfare.

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 voting power, they can affect firms' real decisions either through monitoring or by taking active ownership. Third, they are economically large with regard to total global capital flows (e.g., Ferreira and Matos, 2008; Maggiori, Neiman and Schreger, 2017)[4] and can thus meaningfully affect the liquidity and risk sharing of individual stocks.

[1] The Q-theory of Tobin (1969) postulates that asset prices should convey useful information about the 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 the 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] Passari and Rey (2015) provide an excellent summary of this evidence.

[4] In our sample from 2000 to 2013, the value-weighted average institutional ownership increased from 50% to

To conduct our empirical tests, 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 2000 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, real efficiency, and welfare. 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. It is a welfare-based measure and, therefore, more relevant to real outcomes than other conventional measures are (e.g., price nonsynchronicity and variance ratios, which we study for robustness). In forming predictions, we consider two 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 sorting approach, sorting on foreign ownership, and find that the average price informativeness of the portfolio with the highest ownership level is significantly greater than that of the portfolio with the lowest ownership. The effect is statistically and economically significant for both short and long horizons. A similar result is obtained when we sort stocks based on their domestic ownership levels; however, foreign ownership contributes relatively more to the higher price informativeness. In addition, the positive correlation between foreign institutional ownership and price informativeness is stronger in developed markets than in emerging markets.

While the portfolio sorting approach is a good way to summarize correlations in the data, a potential concern is that our results could be driven by other factors that affect ownership and informativeness. To allay this concern, we use a multivariate regression approach in which we can use time-varying firm characteristics and various fixed effects across firms, time, countries, and industries. The results corroborate the finding that price informativeness increases with institutional ownership with a high degree of economic and statistical significance.

To address the possibility of omitted time-varying variables affecting our results, we take advantage of the following institutional regularity: stocks added to the global Morgan Stanley Capital International (MSCI) index subsequently experience a strong increase in foreign ownership. The event generates an economically meaningful and reasonably exogenous variation in

75% for U.S. stocks, while the average non-U.S. stock has observed an increase in its ownership levels from around 5% to 24%.

foreign ownership, which we exploit using 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 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 otherwise similar control firm. We next explore the role of changes in ownership on price informativeness. We find that the prices of stocks that are added to the index become more informative about future fundamentals relative to a control sample of stocks matched on propensity scores. Further, exogenous changes in foreign ownership are predictive of future increases in capital expenditures, but not in research and development ($R\&D$). None of our tests indicate any visible violation of the parallel trend assumption, which validates our empirical approach.

One might still worry that the results on price informativeness could be driven by the mechanical response of the prices of stocks with different fundamental characteristics and potentially 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 more quickly to their fundamentals, that is, the $PEAD$ should diminish. This is indeed what we find: following inclusion in the MSCI index, stocks experience a decrease in $PEAD$, defined over one-, three-, and five-day periods. Hence, we conclude that the effect on market efficiency is unlikely to be due to systematic differences in the factor exposures of individual stocks.

We further assess the robustness of our results to different measures of price informativeness. We consider two popular alternatives: price nonsynchronicity and the variance ratio. Consistent with our hypothesis that foreign investors improve price efficiency, we find that price nonsynchronicity increases and the variance ratio decreases because of index inclusion shock. Both results are statistically and economically significant.

Next, we zoom in on the underlying economic mechanism. We consider two channels through which foreign ownership could affect capital allocation efficiency: information and governance. We test whether index inclusion generates improvements in the stocks' information environment and find evidence supporting this claim. We show that increased foreign ownership leads to (1) higher market liquidity, thus reducing asymmetric information in the market; (2) an increase in

analyst coverage, which leads to improvement in information production; and (3) better market risk sharing resulting in reduced cost of capital in the market. All three effects are statistically and economically highly significant. At the same time, we find no evidence of improved firm governance due to increased foreign ownership, even though the index inclusion shock simultaneously increases the asset ownership of both active (information-oriented) and passive (governance-oriented) institutional owners.

In the last part of the paper, we study the cross-sectional variation in our main results using a number of economically plausible frictions. First, we show that investors' activeness and expertise are relevant predictors of greater price efficiency, especially when capital flows from foreign institutions. Second, we show that foreign investors from countries with high financial development or under a common law system have greater effects on price informativeness, especially when they invest in countries with low financial development or under civil law. Third, we find that firms in countries with tighter capital constraints are associated with a weaker impact of foreign investors on the efficient allocation of capital. We thus propose a new angle through which to analyze the consequences of capital controls.

Overall, our results highlight an important role that foreign institutional investors play in driving price efficiency worldwide. They have a positive impact on the information environment, but less so on the underlying governance structure. Finally, the results show that institutional and legal frictions are important determinants of capital allocation efficiency.

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 sorting approach, Bai et al. (2016) show a positive relation between institutional ownership and price informativeness. We extend their analysis to broader coverage of international stocks and decompose ownership into domestic and foreign ownership. Furthermore, we highlight the role of foreign institutional ownership in price informativeness and welfare and the role of a country's financial environment in affecting the efficiency margin.

We also contribute to the literature on the information production of financial markets and

firms' investment decisions.[5] Bond, Edmans and Goldstein (2012) survey the literature, emphasizing the separation of 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 the probability of informed trading (PIN)—have a strong positive effect on the sensitivity of corporate investment to stock prices. In an international setting, Wurgler (2000) finds that financial markets improve the allocation of capital, especially in countries with a highly developed financial market, or ratio of equity market capitalization to gross domestic product (GDP). State ownership is negatively related while firm-specific information and minority investor rights are positively related to the efficiency of capital allocation.

This study is also related to a broad literature on institutional investors and market efficiency. This research provides mixed evidence on whether investors' trading improves market efficiency. Campbell, Ramadorai and Schwartz (2009) find that institutions trade aggressively to exploit mispricing around earnings announcements. Boehmer and Kelley (2009) document a positive relation 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 negative effects of increasing institutional ownership on market efficiency. The author's focus is mostly on crowded trading and leverage effects. Our paper differs from the previous studies that focus on price-based measures of market efficiency by examining 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 greater concentration of ownership leads to lower informativeness.

Our paper further complements research related to institutional investors and market efficiency worldwide. Using a sample of 3,189 global firms in 2002, He et al. (2013) show a positive relation between large foreign block shareholdings and stock price informativeness (PIN and return nonsynchronicity). Lin, Massa and Zhang (2014) investigate the role of country-level governance in information processing by mutual funds. Using similar data, Bena et al. (2017) find that greater foreign institutional ownership fosters long-term investment and innovation output.

[5] 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).

Finally, our paper is also related to the literature on international capital flows. Hau and Rey (2006) develop an equilibrium model in which exchange rates, equity prices, and capital flows are jointly determined. They show that the net equity flows into the foreign market are positively correlated with foreign currency appreciation and financial market development. Hau and Rey (2008) document 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 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.

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 2000 onward with Datastream/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 United Kingdom), 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 quarterly, 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 MSCI, as well as country-level equity market capitalization, the GDP, and industrial production from the World Bank. We also merge analyst data from I/B/E/S. Finally, we merge bilateral trade data from the International Monetary Fund (IMF).

Our aggregated database has an annual frequency and covers the period 2000–2016. Following previous studies (e.g., Edmans, Jayaraman and Schneemeier, 2017), we exclude financial firms—one-digit Standard Industry Classification (SIC) code 6—and firms with market capitalization

[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.

less than $1 million. A firm must have at least four successive years of earnings data and a nonzero institutional ownership value to be included in our sample. We further limit our sample to countries in which there are at least 20 firms with complete data. The final data set consists of 23,811 unique firms for a total of 186,885 firm–year observations.

2.1 Institutional Ownership Variables

The data contain 9,449 institutional owners, 8,928 active, and 521 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] The variable 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. The variable 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 the 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 passive. This classification is not perfect for several reasons (Ferreira and Matos, 2008). For example, the mutual fund category includes index funds and 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 United States, we define U.S.-based foreign fractional institutional ownership

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

[8] Alternatively, for 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 3.4.4.

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

(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 listed stocks, with 5,131, while Hungary has the lowest, 27 stocks. An average firm in a developed country has a higher value of DOM (19.43%) than that of FOR (4.70%), which is largely explained by the strong asymmetric pattern in the United States, 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, an average firm in a developed country has a higher number of institutional investors, 87, than one in an emerging country, 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 capitalization. We observe an increase over time in institutional ownership, especially in developed countries. Domestic institutions are the key owners in the United States, while foreign owners dominate countries outside the United States, 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 a median equal to 7.5%. Of the 19.5% average ownership, 14.9% is accounted for by 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% of the total while passive investors own 0.6%. Finally, firms outside the United States exhibit almost an equal share of foreign ownership from U.S. institutions (2%) and non–U.S. institutions (2.6%). All the above variables are highly dispersed and vary across countries, industries, and firms and over time. We provide formal definitions of the variables in Appendix IA.1.

2.2 Stock Market and Accounting Variables

We define the 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 expenditures $(CAPEX/A)_{it}$, and total investments $INVESTMENT_{it} = (CAPEX_{it} + R\&D_{it})/A_{it}$, all scaled by total assets. Additional accounting variables include the logarithm of sales $log(SALES)_{it}$, measured in thousands of dollars; $LEVERAGE_{it}$, defined as book debt divided by total asset; $CASH_{it}$, defined as cash holdings scaled by total assets; $TANGIBILITY_{it}$ defined as net property, plant, and equipment scaled by total assets; and $FORSALE_{it}$, defined as the percentage of foreign sales in total sales. The variable $CLOSE_{it}$ is the ownership fraction of stock i at time t of all corporate insiders in this firm. We also use variables related to market liquidity and public information. The variable $ANALYST$ is the number of analysts covering a given stock (based on a one-year forecast period); $log(VOLUME)$ is the natural logarithm of the dollar stock volume in year t; $BID-ASK$ $SPREAD$ is the ratio of the difference between closing ask and closing bid prices over the closing mid-price calculated at a daily frequency and then averaged within year t; $log(AMIHUD)$ is the natural logarithm of Amihud's liquidity measure, which is the ratio of the absolute return over the dollar stock volume calculated using a daily frequency and then averaged within year t; and $VOLATILITY$ is the daily stock return volatility (as a percentage). 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 E/A ratio of 0.02 and a log ratio $log(M/A)$ of -0.32. The $(R\&D)/A$ ratio is 0.02 and the $CAPEX/A$ 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 comprises 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. We also observe significant cross-sectional and time-series variation in all the variables.

2.3 Country-Level Variables

We measure the intensity of the connection between any two countries using several different indicators: bilateral trade relations, geographical distance, language, border connections, and colonial origin. The bilateral trade relation between any pair of countries 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). The distance variable is the population-weighted average between large cities in each country pair. The variable for common language equals one if a common language is spoken by over 9% of the population in both countries. The border connection variable equals one if both countries share a common border. The variable for colonial origin equals one if the two countries have 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 the 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.[10]

2.4 Price-Informativeness Variables

We use the correlation of a company's equity market valuation with its cash flows multiplied by the standard deviation of its cash flows as our primary measure of price informativeness (PI). The correlation being scaled 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 by 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 shows that correlation matters more for volatile earnings. This term expresses the amount of variation in earnings that can be explained by investment. We present the micro foundation of the informativeness measures in Appendix IA.A.

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

3 Empirical Results

In this section, we present our main empirical results on institutional capital flows and price informativeness.

3.1 Portfolio Sorts

We begin by presenting portfolio sort results. In each year and within each country, we sort firms with nonzero ownership levels into equally sized portfolio bins according to institutional ownership. We exploit the within-country variation in the data to account for the possibility that different countries are characterized by different degrees of institutional access to financial markets. Subsequently, we obtain the measure of price informativeness (PI) by estimating the following cross-sectional regression model for each 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 an 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 investor (domestic or foreign) and forecasting horizon (short or long). Each figure shows three lines, each representative of a given tercile of the ownership sort. We observe that PI is generally trending upward 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 the 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 improve 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) to (3) report the results corresponding to total ownership (IO) sorts. The portfolio sorts generate considerable spread in institutional ownership, ranging from

1.5% for the lowest ownership quintile to 41.5% for the highest. We observe a strongly increasing pattern in PI across the five portfolios: low-ownership firms have less informative stock prices than high-ownership firms do. For both one- and three-year horizons, the respective differences are economically and statistically highly significant.

We further improve on this simple sort in a few ways. First, we decompose the effect by conditioning on the institution's country of origin, which we find preserves the results. Second, we explore the differences between stocks with zero institutional ownership and those in the lowest ownership quintile and find that the entry of foreign investors to a stock has a bigger impact on price informativeness than the entry of domestic investors. Third, we separate firms into developed countries, emerging markets, U.S. only, and non-U.S. countries and find that the previous results tend to be stronger for firms in developed countries, although the effects are somewhat weaker for shorter horizons. Finally, we perform a double sort 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 firms into halves according to their value of FOR.[11] All the results are presented in Tables IA.3 and IA.4 of the Appendix.

3.2 Regression Results

One of the concerns related to the portfolio sort analysis is omitted variables correlated with institutional ownership and with price informativeness. For example, companies with large assets could have significant institutional ownership and be more informationally efficient. This would bias the coefficient of 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:

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

where $X_{i,t}$ is a vector of controls, including E/A, $log(Asset)$, $CLOSE$, $LEVERAGE$, $TANGIBILITY$, $log(SALES)$, $FORSALES$, and $CASH$. $e_{i,t}$ is measurement error. We also include firm and country×year fixed effects.[12] To account for possible dependence across firms and years, we cluster standard errors in the two dimensions. The coefficient of interest is $b_{2,h}$, which measures

[11] We consider splits into halves to ensure that our tests have sufficient statistical power.
[12] The results are robust when controlling for industry or industry×year fixed effects.

average price informativeness conditional on institutional ownership. We present the results in Table 4.

In column (1), we show the results for the one-year specification without controls but with all fixed effects. The coefficient $b_{2,h}$ 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 three years.

To better understand the economic mechanism behind the ownership results, we decompose 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:

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

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 with and without stock-level controls. We find that the effect of foreign ownership on price informativeness is at least as large as that of domestic ownership. 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 exhibit different variability in the data. Domestic ownership is about three times as variable as foreign ownership is. 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 economic effect on price informativeness than domestic ownership does, even though both are statistically important.

Next, we analyze the impact of institutional ownership separately for firms in developed and emerging countries. For each group, we estimate the regression model in (3), with and without controls. We present the results in Table 5. For brevity, we only report the coefficients of the main variables. Panel A reports the results for developed and Panel B reports those 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 a short horizon for emerging countries. For the long horizon, neither type of ownership is statistically different from zero. 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 foreign ownership does. 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.

Overall, our results suggest that domestic institutional ownership and foreign institutional ownership are both 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 institutional ownership is associated with higher price informativeness. Where is the added information coming from? A hypothesis of interest is whether it comes from greater information production by the institutions or simply improved information 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 such a disclosure hypothesis by looking at aggregate efficiency, estimated as the sensitivity of future firms' cash flows to their contemporaneous investment levels. If disclosure were to affect price informativeness, then one would expect aggregate efficiency to remain unchanged because it depends on the information available to the firm's manager, which is unaffected by disclosure. Testing this hypothesis is of broader interest, since 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 the 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 by 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 IA.6 in the Appendix.

We present the results for one-year and three-year horizons. The results indicate that foreign institutional ownership plays 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 only for $R\&D$ investments and is insignificant for capital expenditures and total investment. We conclude that the informational role of foreign investors operates through better aggregate efficiency, while the role of domestic investors 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 better predict investment levels. 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 the 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 IA.6. We find that foreign ownership has a weak predictive power of investment in the short run, while domestic ownership predicts investment in the long run. When we decompose investment levels into capital expenditure and $R\&D$ components, we can see that the effect of foreign ownership operates largely through capital expenditure changes while domestic ownership affects only $R\&D$. This result suggests that different sources of institutional ownership could complement each other in the way they affect investments.

3.4 Identification and Alternative Efficiency Measures

Our 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. In this section, we address this concern by taking advantage of exogenous changes to foreign ownership due to MSCI index inclusion. Our empirical 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 resulting from our focus on firms with nonzero 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 the price informativeness of firms newly added to the $MSCI$ All Country World Index ($ACWI$) 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 assumes 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 that at least five years of accounting and ownership data be available for the tested firms (two years before and two years after the inclusion year). Our empirical approach is a standard difference-in-differences estimation. In our sample, 714 firms with complete accounting and market data are affected by the index inclusion treatment. Our treatment is staggered over multiple years and involves different companies and countries; hence, our results are unlikely driven by specific time trends affecting particular groups of stocks.

For each firm in the treatment group, we identify five nearest matches using the propensity score matching algorithm. These serve as a counterfactual control group. Our matching, with replacement, is based on the following ex-ante (one year before inclusion) characteristics: FOR, DOM, $log(Sales)$, $FORSALES$, *Market Capitalization*, $log(M/A)$, E/A, $INVESTMENT$, and country fixed effects. Panel A of Table 6 shows the quality of the matching by showing the average values of each matched characteristic separately for the treatment and control groups. The results indicate that the treated firms are not statistically different from the control firms. The only statistically significant difference, at the 10% level, is for the level of investments.

Next, we visually inspect trends in the data around the inclusion period. Our goal 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 inferences based on the patterns observed in the data prior to the shock. In Figure 4, we plot the time series of the differences between the treatment and control groups with respect to domestic and foreign ownership and price informativeness. The window from year -1 to year 0 is when the treated firm is 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, the domestic ownership of the same stocks does not change, which suggests 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, as well as 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 the years before it. We also define an indicator variable $Treat$, equal to one for firms added to the $MSCI\ ACWI$ during our sample period and to zero for all firms in the control group. To zoom in on the shock, we restrict our analysis to the window of three years before addition to three years after addition (including the 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 6. We find that firms added to the index experience an increase in foreign ownership of 1.8 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 8.8%. On the other hand, the effect for domestic firms is economically much smaller and statistically insignificant.

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

the following regression model:

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

Our coefficient of interest is $b_{3,h}$, which measures the change in the price informativeness of the treated firms relative to the control firms around the shock. We present the results in Panel C of Table 6. In column (1), we present the results for a one-year horizon. We find that, because of the shock, the price informativeness of treated firms increases significantly more on a relative basis. The effect is economically large and statistically significant at the 5% level of significance. In turn, the changes in price informativeness for the control firms are not statistically different from zero. In column (2), we consider changes in price informativeness for a three-year horizon.[13] Again, we find a statistically significant difference between the 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 the one-year horizon but is much weaker at three three-year horizon. This effect is entirely driven by the increase in capital expenditures (columns 3 and 4) and not $R\&D$ expenses (columns (5) and (6)), which suggests that the effect of foreign institutions operates mostly through the less risky investment channel.

We also evaluate whether changes in the index composition affect the aggregate efficiency of the treated firms. To this end, we estimate the following regression model:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} Investment_{i,t} + b_{2,h} Treat_i \times After_t + b_{3,h} Investment_{i,t} \times Treat_i \times After_t + b_{4,h} X_{i,t} + e_{i,t+h} \quad (8)$$

where $Investment$ is a generic variable for two different types of investments: capital expenditures and $R\&D$. We present the results in Panel A of Table 7. The top panel illustrates the results for $CAPEX$ for a short horizon (column (1)) and a long horizon (column (2)). We find that index inclusion shock, on average, improves firms' aggregate efficiency but the effect is statistically significant only for a short horizon. In turn, the results for $R\&D$ in the bottom panel paint the opposite picture. The role of foreign investors is negligible in the short perspective but improves efficiency in the longer horizon.

[13] In order to avoid overlapping forecast period before and after the addition shock, we only compare the observations at three years before and two years after the addition.

Overall, we conclude that most of the results we identified in the OLS regression framework are robust to potential endogeneity concerns via the index inclusion experiment. Foreign investors tend to improve price informativeness, which manifests itself through changes in aggregate efficiency.

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, the addition to an index may reflect 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 $PEAD$ measures the sensitivity of abnormal stock returns following earnings surprise. Notably, the $PEAD$ is not subjected to risk-based explanations and is a standard way to capture deviations from price efficiency. In a fully efficient market, prices immediately adjust to any earnings surprises and the drift should be zero. To the extent that the presence of foreign investors improves market efficiency, one would expect the magnitude of the drift to decrease as foreign ownership increases.

To construct the variable $PEAD$, 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 seasonal random walk model with drift (e.g., Bernard and Thomas (1989, 1990)),

$$SUE_{i,t} = \frac{E_{i,q} - E_{i,q-4} - U_{i,t}}{\sigma_{i.t}} \tag{9}$$

where $E_{i,q}$ measures quarterly earnings per share in quarter q, $E_{i,q-4}$ is earnings per share four quarters before, $U_{i,t}$ and $\sigma_{i.t}$ are the 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 to time series–based earnings surprises.

We hypothesize that the magnitude of the $PEAD$ should decrease after a firm is added to

the MSCI index. Formally, we estimate the following regression model:

$$CAR\_d1\_dn = a + b_{1,h} SUE_{i,t} + b_{2,h} Treat_i \times After_t + b_{3,h} SUE_{i,t} \times Treat_i \times After_t + b_{4,h} X_{i,t} + e_{i,t+h} \tag{10}$$

where CAR_d1_dn denotes the cumulative abnormal return (stock return minus market return) from the first day to the nth day after a quarterly earnings announcement. For robustness, we consider $n = 1$, 3, or 5.

In Figure 5, we show the evolution of the consensus-based $PEAD$ around the index inclusion period for the three horizons of abnormal returns. Consistent with our hypothesis, stocks added to the MSCI index experience a drop in $PEAD$ relative to stocks in the control group, which suggests that increased foreign ownership improves market efficiency. We further assess the robustness of this result by estimating a multivariate regression model. To allow for serial and cross-sectional dependence in the data, we cluster standard errors in the firm and time dimensions. Our coefficient of interest is b_3, which measures the response of abnormal returns to earnings surprises for the treated stocks relative to the counterfactual control group. We present the results in Panel D of Table 6.

We find that $PEAD$ becomes relatively smaller for stocks added to the MSCI index. The result holds for three different specifications of abnormal returns and is statistically significant at the 5% level. Further, the result is robust to alternative specifications 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 to be due to spurious comovement between prices and earnings.

3.4.3 Alternative Efficiency Measures

Our measure of price informativeness is based on cash flow predictability from prices. Although this measure has a solid theoretical foundation, the question remains whether our findings are robust to alternative measures of efficiency. In this section, we consider other popular alternatives. Our first alternative is the price nonsynchronicity of Roll (1988), calculated as $1 - R^2$, where R^2 is the R-squared from a regression of individual stock returns on the market factor. We determine price nonsynchronicity by estimating the market model using weekly stock returns for each

stock-year pair.[14] Conceptually, higher levels of nonsynchronicity indicate greater information revelation in prices and thus more efficient prices.

As before, we first inspect patterns in price nonsynchronicity around the index inclusion period for stocks in the treatment group relative to those in the control group. The results, presented in Figure 5, indicate that the treatment group experiences a significant increase in non-synchronicity upon inclusion in the index. Moreover, we observe no visible differences in pre-trends between the treatment and control groups. We further corroborate the findings using a difference-in-differences regression model for the same measure. Column (1) in Panel E of Table 6 reports the results. We find that price nonsynchronicity 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- to short-term return variances equals one, using the same data window. Any deviation from one should reflect less informative prices. To account for this benchmark, we compute the standardized variance ratio as $|1–VR(nday, mday)|$, where *VR(nday, mday)* is the ratio of the return variance over m days to the return variance over n days, divided by the length of the period. We subsequently use the (1day, 5days) version of the measure in our difference-in-differences estimation model. The results are presented in Panel E of Table 6, column (2). We find that the standardized variance ratio decreases for stocks added to the index relative to those in the 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 interpreted purely 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 Tables 3 and 4 by conditioning on all firms. In particular, we assume that all firms that are missing from our sample have zero institutional ownership. We repeat the previous tests by first looking at the portfolio sort results for the zero-ownership firms and then considering the regression results using the full sample of firms. In the latter case, we additionally include an indicator variable $MISSING$ that is equal

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

to one for all firm–years with zero total ownership and to zero for all other observations. This approach accounts for any systematic reasons such firms do not attract institutional ownership. We report our results in Tables 3 (*IO zero*) and IA.5.

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 all other portfolios do. Second, the coefficient of the interaction terms between institutional ownership and market valuation becomes significantly larger compared to all the previous specifications. These results are consistent with our hypothesis that a lower degree of ownership is associated with lower price informativeness.[15]

4 Testing the Economic Mechanism

Our results thus far indicate a strong causal relation 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, one based on information and the other based on corporate governance.

4.1 The Information-Based Channel

Foreign investors' decisions to enter financial markets should be related to their expected impact on the information environment in the target market. Foreign investors can affect that environment in at least three ways. 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, they can improve information production. Finally, they can improve risk sharing and thus reduce the cost of capital in the market. In all three cases, one would expect market efficiency and welfare to improve. In this section, we empirically evaluate all three possibilities in the context of the index inclusion experiment. Specifically, we estimate a regression model akin to that in formula (6), with various information measures as dependent variables.

We consider two measures of market liquidity: turnover (trading volume over share outstanding) and the bid–ask spread. We present the results in Table 7. We find that stocks that are

[15] We note that our underlying assumption is that firms not included in the analysis have zero institutional ownership. However, some firms may simply have information that is missing from the database but are still owned by institutions. If this were the case, however, our findings would be biased downwards.

added to an index, on average, experience a significant increase in their market liquidity, relative to a comparable group of control stocks. Average turnover increases by about 10% of the standard deviation while the bid–ask spread decreases by close to 15% of the standard deviation. Both effects are economically and statistically significant.

Next, we evaluate the impact of stock index inclusion on the stock analyst coverage. Our measure of coverage is based on the number of sell-side analysts issuing forecast in a given year. We present the results in Table 7. Our results indicate that stocks added to the index experience a relatively greater increase in analyst coverage of about three analysts per stock, that is, 20% of the standard deviation. The effect is significant both economically and statistically. Hence, stock inclusion could lead to the greater production of relevant information coming from increased analyst coverage. Following the evidence of Hong and Kacperczyk (2010), one can also argue such information should be, on average, less biased thus enhancing its quality.

Finally, we examine the risk-sharing effects of the changing composition of asset ownership by looking at two different measures of the cost of capital: idiosyncratic volatility and the implied cost of equity ($ICOE$). We focus on idiosyncratic volatility rather than total volatility because a stock's addition to an index mechanically affects its comovement with the market and thus its beta. We follow Gebhardt et al. (2001) and calculate $ICOE$ using the residual income model. First, Figure 8 graphically shows the differences in the measures of cost of capital around index inclusion. Among the three measures we consider, the patterns in $ICOE$ show the most significant reduction in the cost of equity, consistent with our hypothesis. We further assess the statistical significance of the results using the difference-in-differences regression model. We present the results in Panel B of Table 7. We find a significant negative relation between inclusion in the index and a firm's cost of equity. The result is economically large: as a result of the index inclusion treated firms experience a reduction in their cost of equity of about 1.1% relative to firms in the control group. At the same time, we do not find a significant relationship between inclusion in the index and idiosyncratic volatility or a firm's beta (although the signs of both coefficients are negative).

The reduction in the cost of equity of treated firms suggests that these firms should invest more as a result, since the threshold for accepting profitable projects drops, holding investment opportunities constant. This mechanism leads to a testable hypothesis of changes in investment levels. We assess this hypothesis separately for investments in capital expenditures and $R\&D$ and

report the results in columns (4) and (5) of Panel B. We find a positive effect on both types of investment due to the shock, but the result is statistically more significant for changes in capital expenditures. Overall, our results point to economically significant welfare gains associated with the increased foreign stock ownership, a novel result relative to evidence in the international finance literature.

4.2 The Governance-Based Channel

An alternative channel through which institutional ownership could affect price efficiency is improved corporate governance through better monitoring. To the extent that increased institutional ownership increases incentives to better monitor, one could expect better efficiency as a result. This function could be especially facilitated by large passive owners, as has been suggested in the literature. We assess the relevance of index inclusion on different types of ownership by decomposing foreign ownership into active and passive components. We present the effect of index inclusion on the two types of ownership in Figure 6. The results indicate that both types of ownership increase due to index inclusion, even though the magnitude of the change is 60% larger for active investors. Given that passive investors increase their presence one could expect they could improve the governance inside the firms they hold.

We test this hypothesis formally by using the composite governance index of Albuquerque et al. (2018). The index is based on 16 attributes divided into four subcategories: board, audit, anti-takeover provisions, and compensation and ownership. We estimate the difference-in-differences regression model with the governance index as a dependent variable. The results are reported in Panel D of Table 7. We do not find a significant relation between index inclusion and governance, leading us to believe that monitoring, or governance, more broadly, is not a dominant channel through which MSCI index inclusion can affect price informativeness. A possible reason why we find no significance is the absence of serious agency problems that would limit the efficient allocation of capital inside treated firms.

In sum, our results indicate that institutional owners are more likely to improve price efficiency through their impact on the information environment than through their effect on governance structure inside the firms they own.

5 Cross-Sectional Evidence

In this section, we provide additional cross-sectional evidence that tests limits of our conceptual framework. In particular, we exploit variation in terms of investors' trading and monitoring activity, their investing expertise, their familiarity with a target country, their legal and finance background, and the scope of capital controls.

5.1 Investor Activeness

One of the possible factors driving our results is investor activeness. To the extent that price informativeness responds to investors' uncovering mispricing in financial markets and properly accounting for risk, one would expect firms with larger shares of active investors to be more informationally efficient.

We classify institutions with respect to their activeness and relate price informativeness to the relative ownership of the most active investors. We consider three measures of activeness. Our primary measure is defined based on the type of institutional investor. We consider active investors to be mutual funds, hedge funds, and investment advisors. In this classification, we exclude index funds and exchange traded funds. We also entertain two alternative measures of activeness: one that aggregates the ownership of investors whose foreign or domestic investment return in our sample is above the median value;[16] and another one that aggregates the ownership of investors with a 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 the firm's informational efficiency. We generically define all three dimensions of active ownership separately for foreign and domestic owners as FOR_ACTIVE and DOM_ACTIVE, respectively. In a similar vein, we define the 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 8.

Columns (1), (3), and (5) of Table 8 show the effects on short-horizon efficiency for the three activeness measures. We find that activeness is an important determinant of informativeness,

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

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 weaker but still statistically significant at the 1% level. Columns (2), (4), and (6) report the results for the specification with a three-year horizon. Again, the coefficients of FOR_ACTIVE and DOM_ACTIVE continue to be positive and statistically significant at the 1% level, except in one case. However, the effects for passive ownership are largely insignificant.

5.2 Investor Expertise

One could also imagine that some investors are simply more skilled in terms of predicting future cash flows and that differences in investors' expertise affect our results. Since expertise is difficult to observe, we use ownership by U.S institutional investors as a proxy. In particular, we decompose foreign ownership into that of U.S. investors and that of non–U.S. investors and estimate the regression model in (3). We present the results in Table IA.7 in the Appendix. Overall, our results suggest that investors' activeness and expertise are relevant predictors of price efficiency, especially when capital flows in from foreign institutions. Moreover, foreign U.S. institutions play a much bigger role than foreign institutions do outside the United States. We interpret these findings as consistent with the expert position some investors play in financial markets.

5.3 Investor Familiarity

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

We define familiarity based on a distance metric between the home country of a given stock and that of a foreign investor holding this stock. In each case, we define the variable FOR_CLOSE as the fraction of total foreign ownership of investors from countries that are in close proximity to the home country. By construction, 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 level of bilateral trade between the investor's country of domicile and a stock's home country is above the median value for all countries with which the stock's country trades. Our second measure is based on the geographic distance between the two countries. Investors from countries that are below the median distance of all countries relative to the stock's home country are considered in close proximity. Following Mayer and Zignago (2011), distance is calculated using the great circle formula, which uses the latitudes and longitudes of the most important cities/agglomerations (in terms of population). The third measure is based on the similarity in languages. Investors from countries where the official language is identical to that of the country of the stock the investor holds are in close proximity. The fourth measure is based on common geographical borders. Countries are in close proximity if they share a border. Finally, the last measure is based on colonial background, with countries that have the same colonial history being in close proximity.

We estimate the following pooled regression model separately for each proximity measure:

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

All the regressions include the same control variables as equation (2). We also include firm, and country×year fixed effects. We cluster standard errors by firm and year. Our coefficients of interest are $b_{1,h}$ and $b_{2,h}$. We present the results in Table IA.8 in the Appendix. In Panel A, we report the results for a one-year horizon. Both FOR_CLOSE and FOR_FAR are positive and statistically significant in all five cases. For three of the five cases—trade, distance, and colony—the coefficient of FOR_CLOSE is larger. These results jointly offer weak support for the hypothesis that similarity amplifies the informativeness effect. The hypothesis is less supported when we move to a longer, three-year horizon, as shown in Panel B. Now, the coefficient of FOR_FAR is generally greater both economically and statistically.

5.4 Investors' Legal and Financial Background

We hypothesize that foreign investors from countries with greater financial system development should exert a greater impact on the 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 levels

are considered to have a high level of development. We define the ownership of stock i at time t by institutional investors from highly developed countries as $FOR\_FIN\_High_{i,t}$ and that by institutional investors from low-development countries as $FOR\_FIN\_Low_{i,t}$. Second, we use the legal system in the investors' country. Countries under common law are considered highly developed. We define the ownership of institutions from such countries as $FOR\_COMMON_{i,t}$ and the ownership of institutions 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 highly developed and those with a bank-oriented system are considered less developed. As before, we define variables that are based on the 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:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} \times FINDEV\_High_{i,t} + b_{2,h} log(M/A)_{i,t} \times FINDEV\_Low_{i,t} + b_{3,h} X_{i,t} + e_{i,t+h} \quad (12)$$

where $FINDEV\_High$ and $FINDEV\_Low$ are the generic names for measures of high and low development, respectively. All the regression models include the same control variables as equation (2). We also include firm, and country×year fixed effects. We cluster standard errors by firm and year. Our coefficients of interest are $b_{1,h}$ and $b_{2,h}$. We present the results in Table IA.9 in the Appendix. In each panel, we additionally separate out the respective systems of the home country and report the results for short and long horizons. Overall, we conclude that there is spillover from highly financially developed countries to countries of lesser financial development. Foreign investors from highly financially developed countries or from countries under common law exert a larger effect on price informativeness, especially when they invest in stocks from countries of low financial development or civil law–based countries. We observe no differences between foreign investors from countries with a market-based or a bank-based financial system, whereas the financial system of the home country is important.

5.5 Capital Controls

We hypothesize that countries with tighter capital controls are more difficult for foreign investors to penetrate, 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:

$$E_{i,t+h}/A_{i,t} = a + b_{1,h} log(M/A)_{i,t} \times FOR_{i,t} \times OPEN_{i,t} + b_{2,h} X_{i,t} + e_{i,t+h} \tag{13}$$

All the regression models include the same control variables as equation (2). We also include firm and year fixed effects. We cluster standard errors by firm and year. Our coefficient of interest is $b_{1,h}$. We present the results in Table 9.

Column (1) of Table 9 presents the results for a one-year horizon and column (2) those 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 a country with high constraints to one with 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 it is even larger for a three-year horizon. Notably, in the latter case, we observe that the level of informativeness for countries with high constraints is not statistically different from zero. Hence, in the long run, capital constraints could be a strong impediment to foreign investors in their allocation of capital.

6 Concluding Remarks

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

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 to the presence of both domestic and foreign investors. The results are robust to potential endogeneity concerns. Our analyses indicate the important role of active institutions, market familiarity, and country-specific capital controls. We also find that the increase in price informativeness is mostly due to improved real investment efficiency and not to better information disclosure.

Overall, our results underscore the significant role of foreign institutional investors in 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
CAR_d1_d1(%)	0.22	4.61	-1.78	0.01	1.97
CAR_d1_d3(%)	0.23	5.60	-2.57	0.04	2.81
CAR_d1_d5(%)	0.31	6.21	-2.97	0.09	3.33
SUE(Consensus)	1.22	3.06	-0.25	0.87	2.45
SUE(Time-series)	-0.05	1.55	-0.88	0.12	0.88

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		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	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: 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.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$E_{i,t+1}/A_{i,t}$			$E_{i,t+3}/A_{i,t}$			$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	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 5: 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 4 (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**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$E_{i,t+1}/A_{i,t}$		$E_{i,t+3}/A_{i,t}$		$E_{i,t+1}/A_{i,t}$		$E_{i,t+3}/A_{i,t}$	
$log(M/A)_{i,t}$	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 6: Institutional Ownership and Price Informativeness: Difference-in-Differences Model

This table shows results from estimating difference-in-differences regression model of institutional ownership and price informativeness around the year a stock is added to the MSCI ACWI index. Treatment 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 treatment 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, and E report estimates from the regression models for ownership, price informativeness, post-earnings-announcement drift, price nonsynchronicity, and variance ratio. Control variables are the same as in Table 4. 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

	(1)	(2)	(3)	(4)
	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

	(1)	(2)	(3)	(4)	(5)	(6)
	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$	$CAPEX_{i,t+1}/A_{i,t}$	$CAPEX_{i,t+3}/A_{i,t}$	$R\&D_{i,t+1}/A_{i,t}$	$R\&D_{i,t+3}/A_{i,t}$
$log(M/A) * Treat * After$	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: Post-Earnings-Announcement Drift

	(1)	(2)	(3)	(4)	(5)	(6)
	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 E: Price Nonsynchronicity and Variance Ratio

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

Table 7: Economic Channel: Difference-in-Differences Model

This table shows results from estimating difference-in-differences regression model of aggregate efficiency (Panel A), volatility, beta, implied cost of equity, CAPEX, and R&D investments (Panel B), liquidity and analyst coverage (Panel C), and governance (Panel D) around the year a stock is added to the MSCI ACWI index. Treatment group includes 714 firms added to the MSCI ACWI during the sample period. For each treated firm control group includes five firms that best match the treated firm using propensity scores matching. $Treat$ is equal to one if a firm in the treatment 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, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Aggregate Efficiency

	(1)	(2)
	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$CAPEX_{i,t}/A_{i,t} * Treat * After$	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 B: Volatility, Beta, ICOE, and Investment

	(1)	(2)	(3)	(4)	(5)
	Idio Vol	Beta	ICOE	CAPEX	R&D
$Treat * After$	−0.142	−0.039	−0.011***	0.007***	0.0017*
	(0.206)	(0.059)	(0.003)	(0.002)	(0.000 9)
Observations	21,722	21,722	17,268	23,823	23,823
R^2	0.542	0.553	0.582	0.666	0.874

Panel C: Liquidity and Analyst Coverage

	(1)	(2)	(3)
	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 D: Governance Index

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

Table 8: 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 4 (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.

	(1)	(2)	(3)	(4)	(5)	(6)
	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 9: 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 (13). *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 4 (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.

	(1)	(2)
	$E_{i,t+1}/A_{i,t}$	$E_{i,t+3}/A_{i,t}$
$log(M/A)_{i,t}$	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

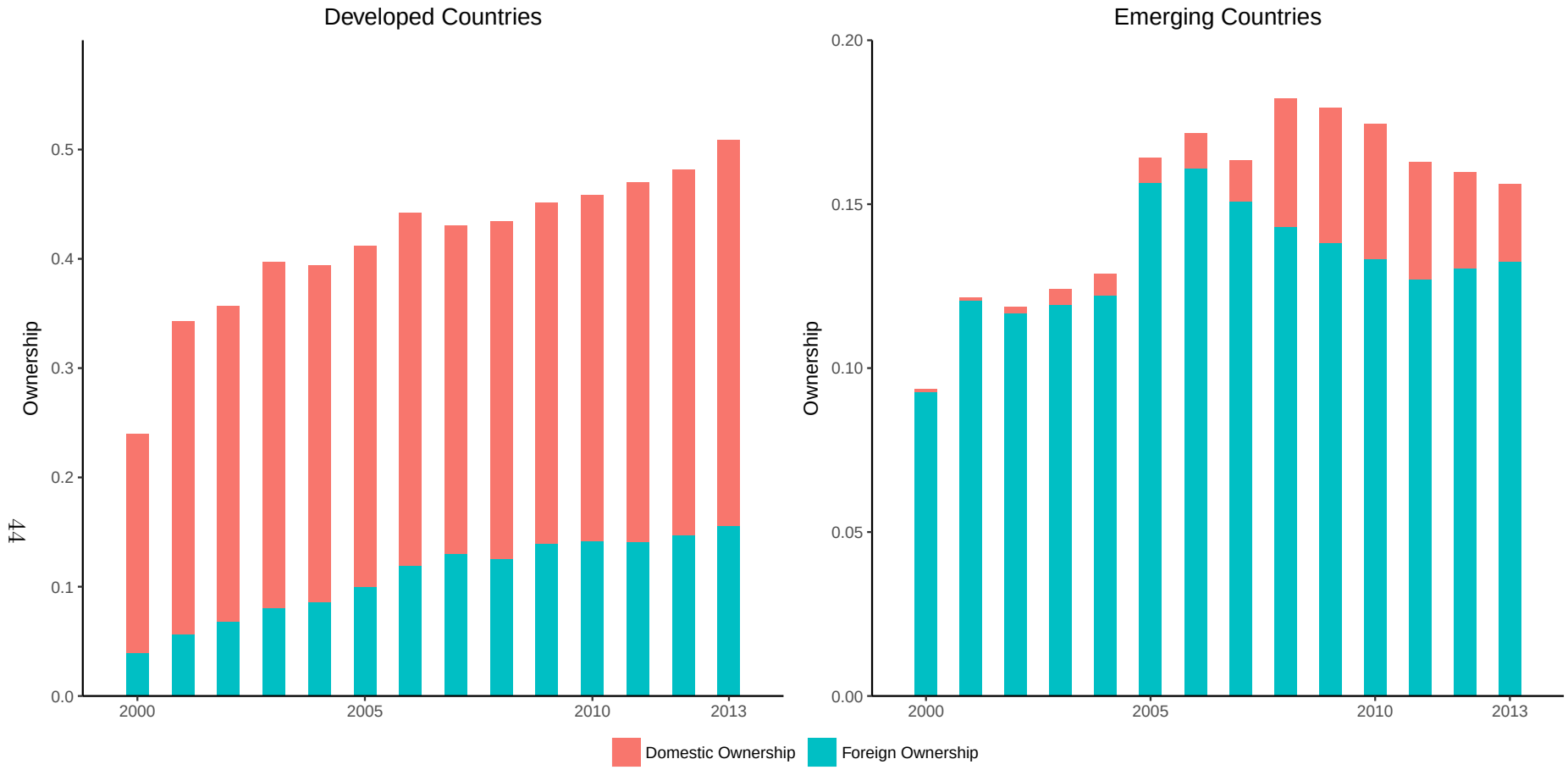


Figure 1: Institutional Ownership: Domestic vs Foreign

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.

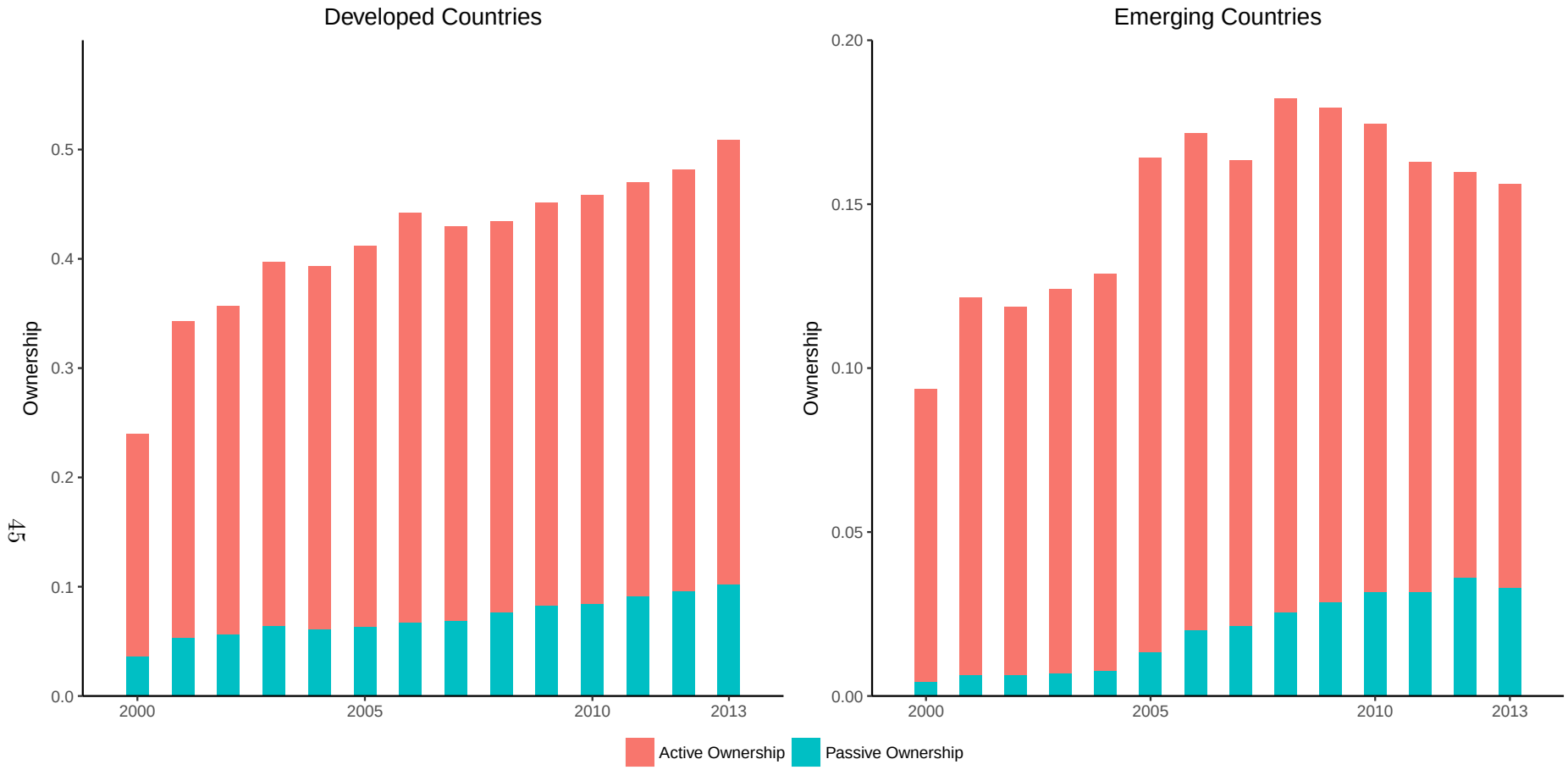


Figure 2: Institutional Ownership: Active vs Passive

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.

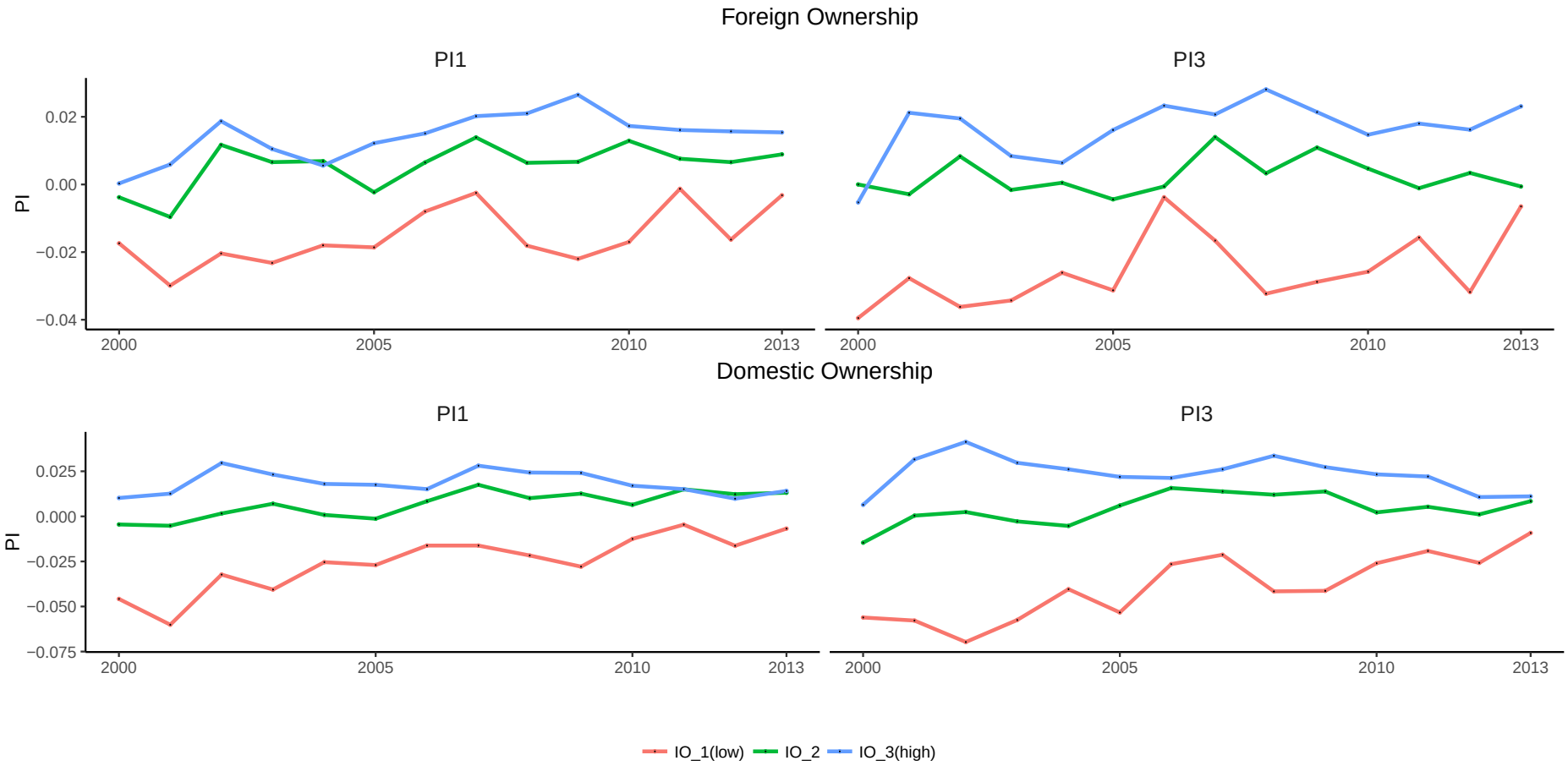
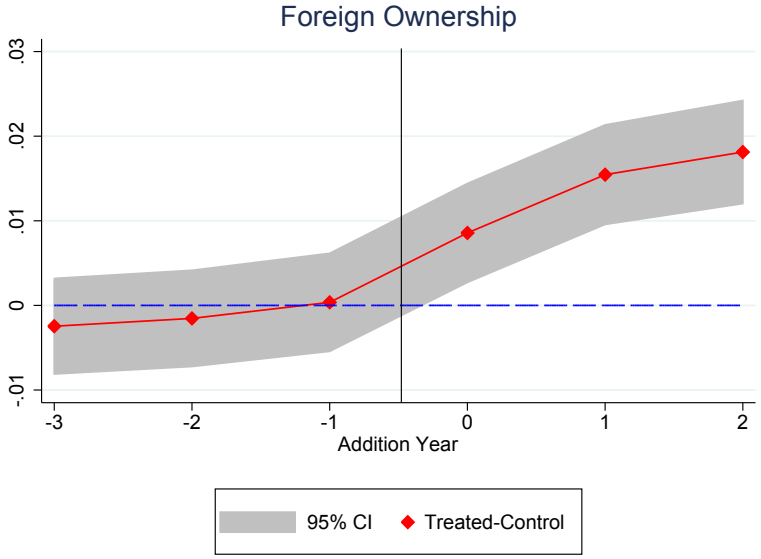
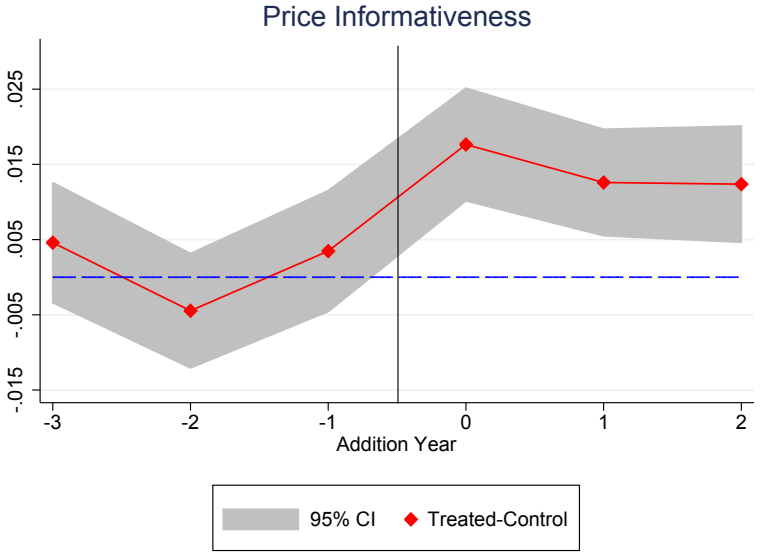


Figure 3: Price informativeness over time and across institutional ownership

$PI1$ 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.





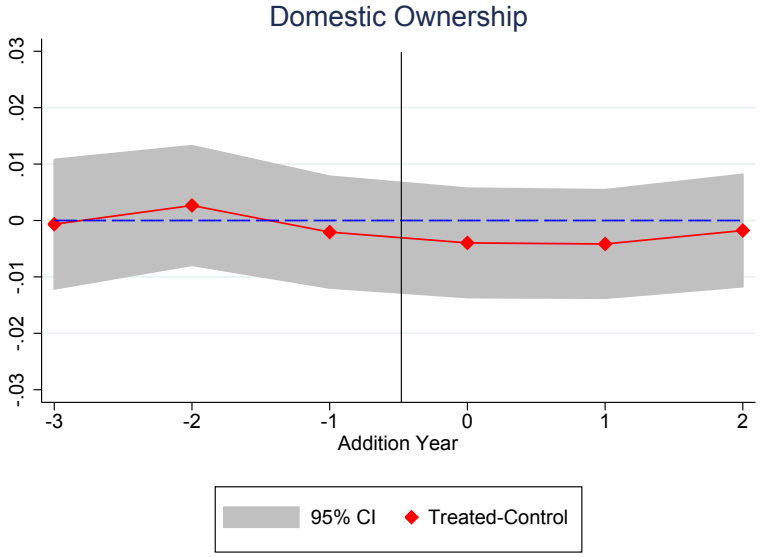


Figure 4: Ownership and Price Informativeness Surrounding the Additions to MSCI

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.

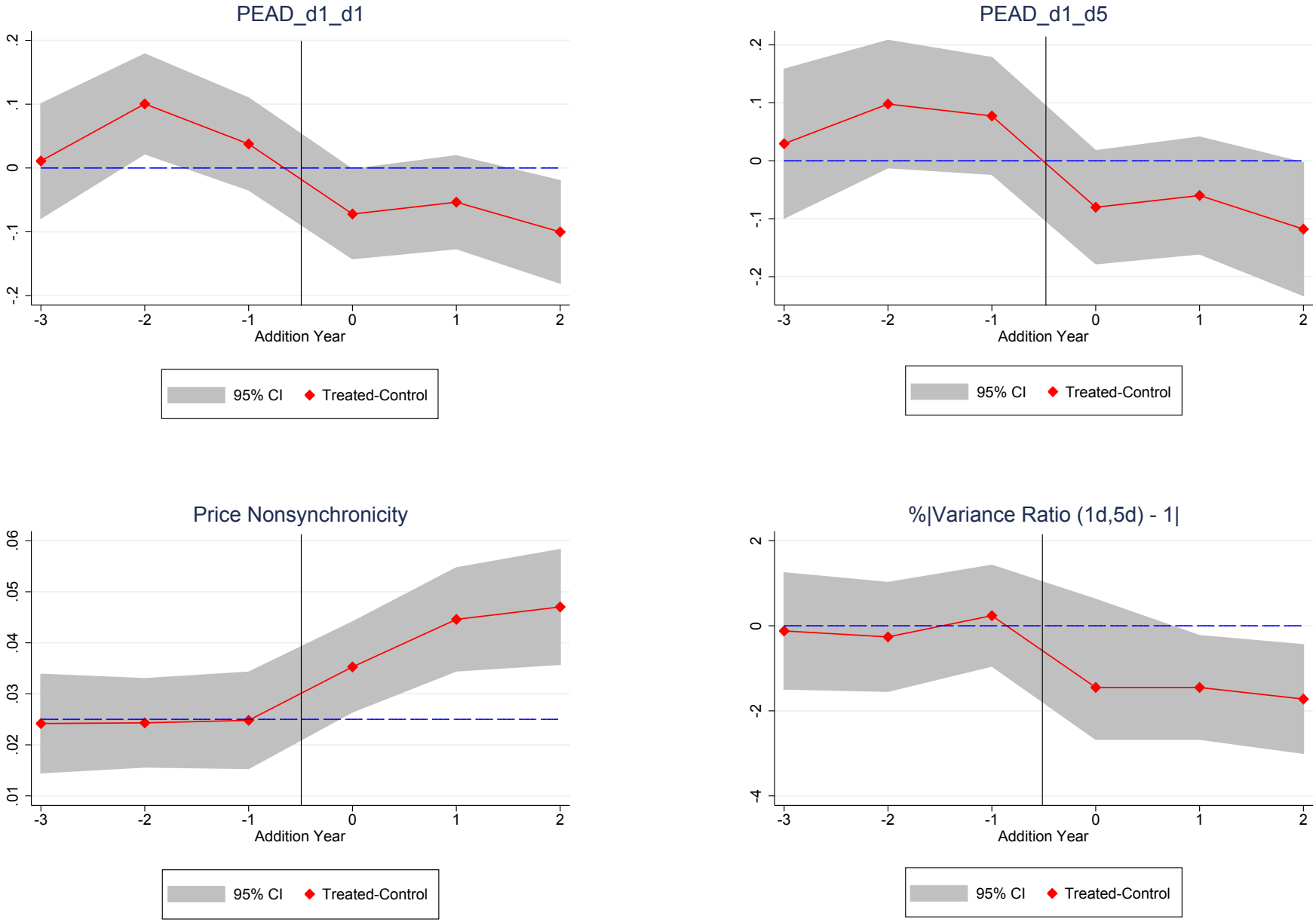


Figure 5: PEAD, Price Nonsynchronicity and Variance Ratio Surrounding the Additions to MSCI

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.

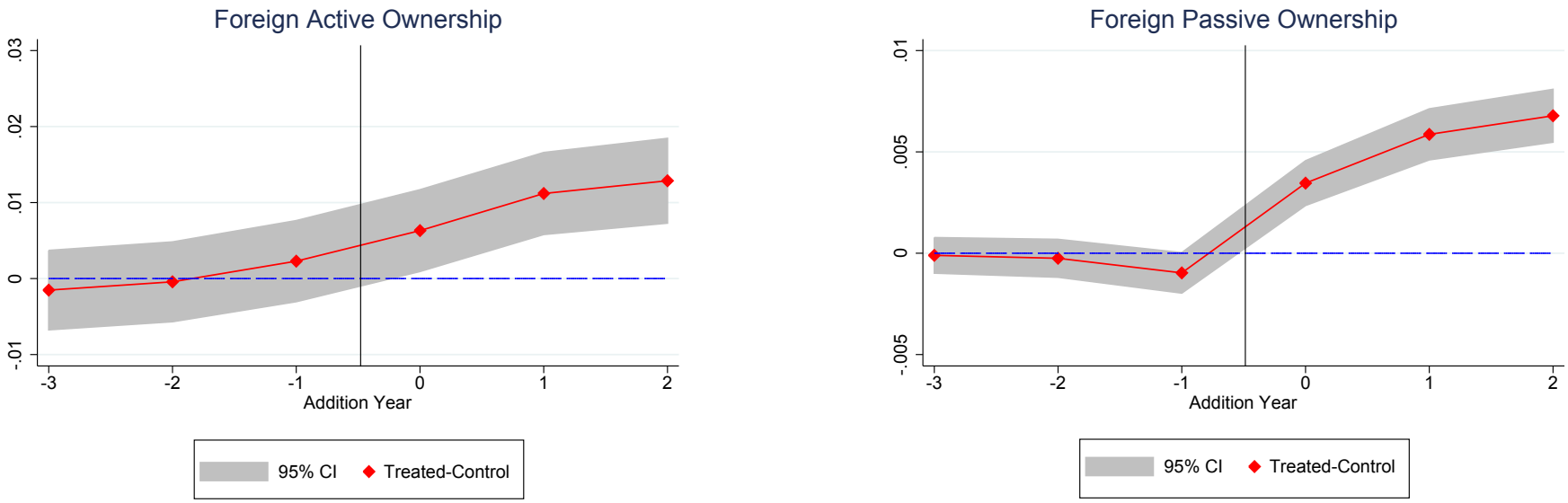
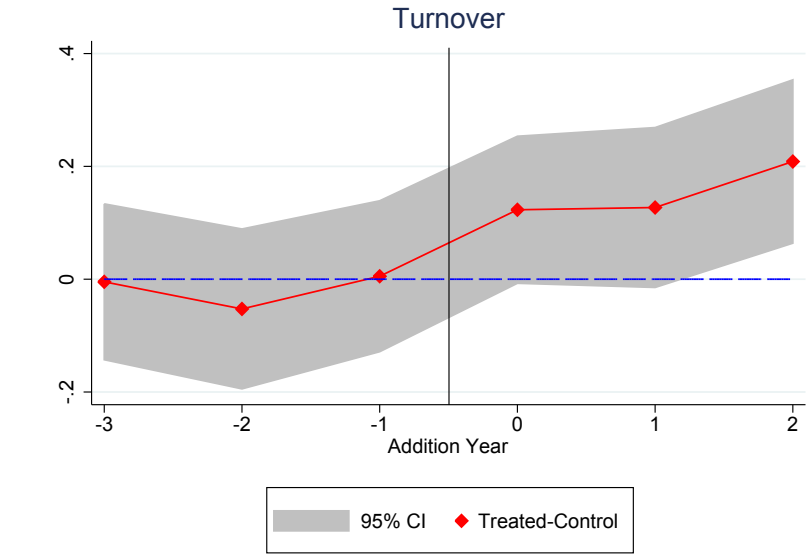
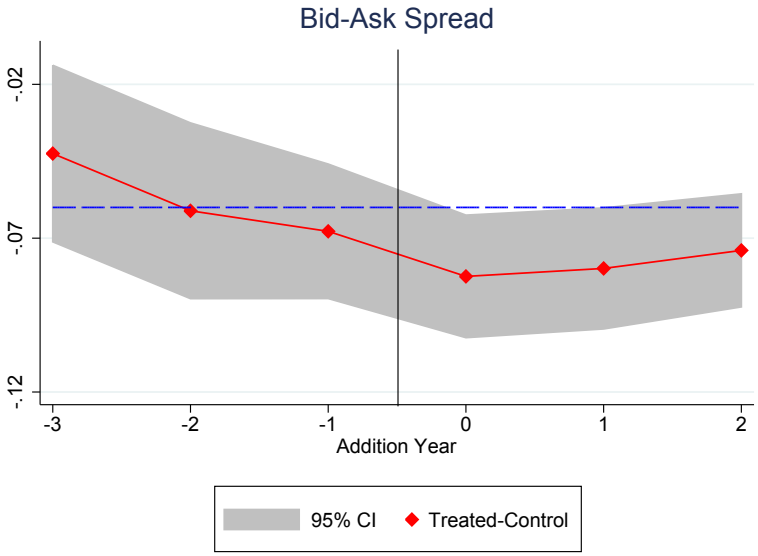


Figure 6: Foreign Institutional Ownership Surrounding the Additions to MSCI

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.





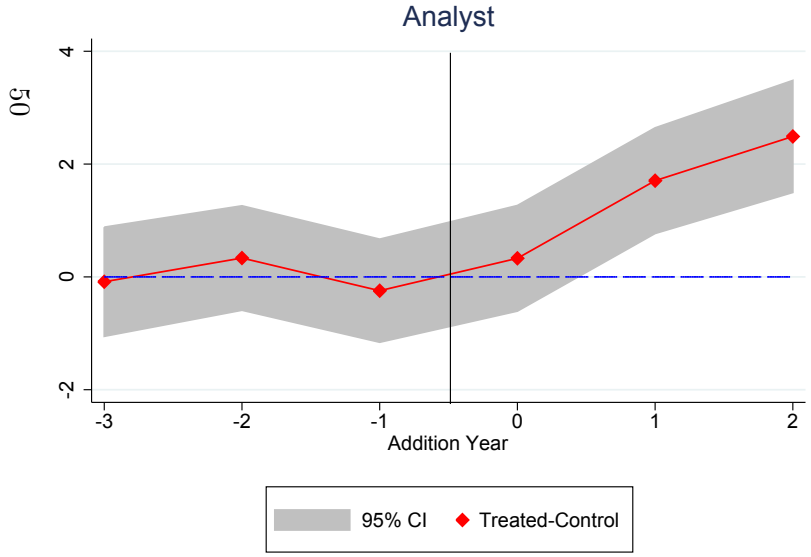


Figure 7: Liquidity Surrounding the Additions to MSCI

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.

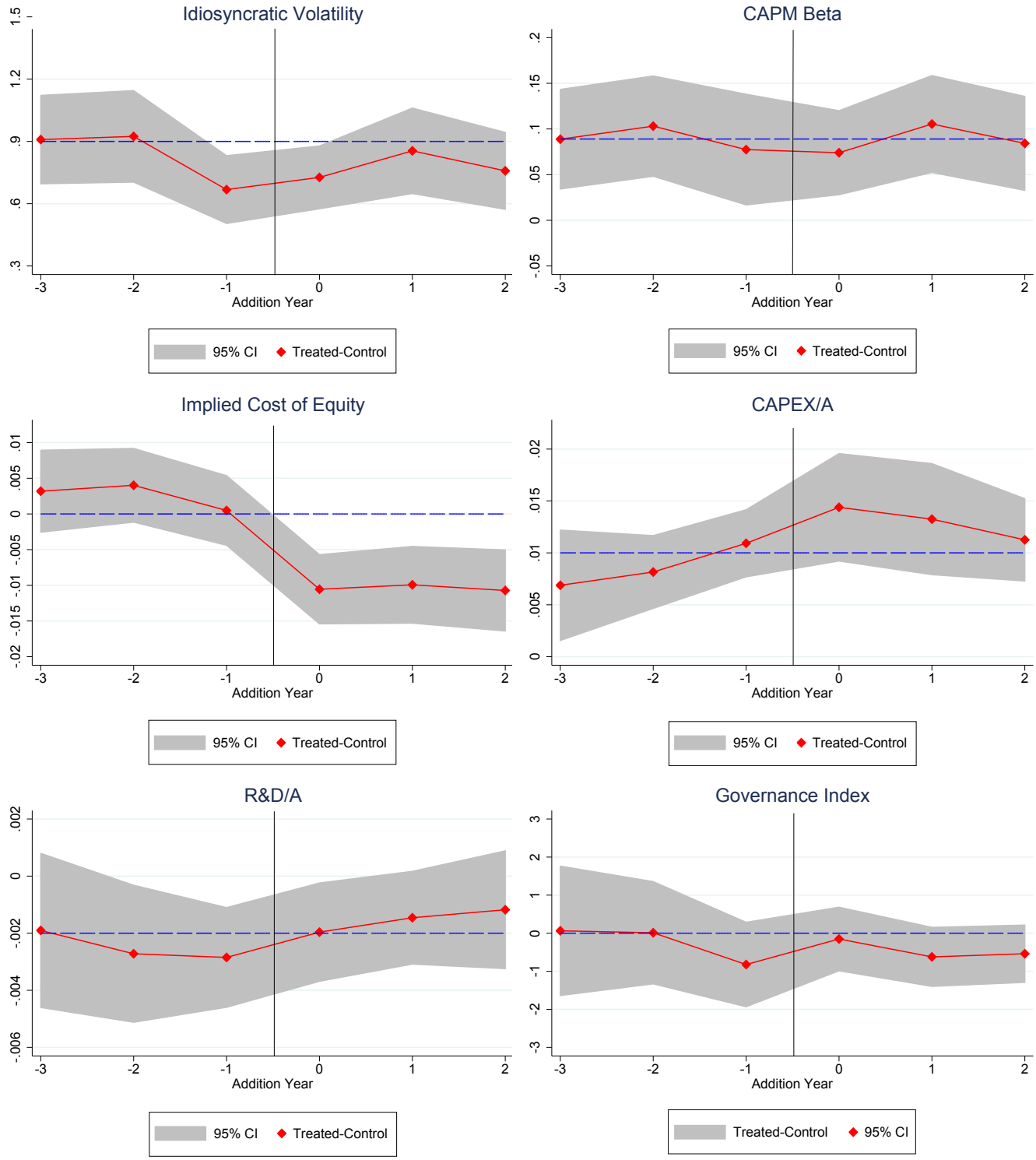


Figure 8: Volatility, Market Beta and Investment Surrounding the Additions to MSCI

This figure shows point estimates and 95% confidence interval of the volatility, market beta, implied cost of equity, governance index, CAPEX and R&D 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.

IA.A Motivating Price Informativeness

In this section, we lay out the micro foundation of the measure of price informativeness we use to test the main predictions of the paper. We also discuss the role of different information sets in market efficiency. Our framework is based on that of Bai, Philippon, and Savov (2016).

IA.A.1 Frim Value

In q-theory, a firm with investment k in new capital and productivity z, will have an ex post fundamental value of

$$v(z,k) = (1+z)(\bar{k}+k) - k - \frac{\gamma}{2\bar{k}}k^2$$

where $\bar{k}$ is the firm's current assets and γ is a parameter that guides the adjustment costs. If the discount rate is normalized to zero, the investment equation becomes

$$\gamma\frac{k^*}{\bar{k}} = E[z|\mathscr{I}_m]$$

where $\mathscr{I}$ is the information set of the firm's manager and k^* is the value-maximizing level of capital. Therefore, the ex post maximized value of the firm is

$$\frac{v(z,k^*)}{\bar{k}} = 1 + z + \frac{z}{\gamma}E[z|\mathscr{I}_m] - \frac{1}{2\gamma}E[z|\mathscr{I}_m]^2$$

If z is assumed to have mean 0, then the ex ante average value for a continuum of firms is

$$E[v(z,k^*)] = \bar{k} + \frac{\bar{k}}{2\gamma}V[E[z|\mathscr{I}_m]]$$

The last equation reflects aggregate welfare, which depends linearly on the value of current assets and the cross-sectional variance of productivity under the managers' information sets. We now show further details on the nature of this information.

IA.A.2 Information Environment

A firm's manager has information about z generated from the firm itself (inside information), which is denoted

$$\eta = z + \epsilon_\eta$$

where $\epsilon_\eta \sim N(0, \sigma_\eta^2)$. Similarly, traders also have (independent) information about z, denoted

$$s = z + \epsilon_s$$

where $\epsilon_s \sim N(0, \sigma_s^2)$. Finally, to account for the fact that traders and managers have common information sources, we assume that traders obtain a signal from the manager:

$$\eta' = \eta + \epsilon_{\eta'}$$

where $\epsilon_{\eta'} \sim N(0, \sigma_{\eta'}^2)$. In the model, η and s are fundamental sources of information that can improve welfare. The traders only see η' and s, while the managers observe η, η', and p, the price, which provides a signal of s. Therefore, none of them has complete information.

IA.A.3 Equilibrium and Measures of Price Informativeness

Managers use their information sets to pick k, so their optimal decision becomes

$$k^* = \frac{\bar{k}}{\gamma} E[z|\eta, \eta', p]$$

Traders influence the price using their information sets, so the price becomes

$$p = \alpha E[F(z, k^*)|\eta', s] + \beta u$$

where F is the payoff of the claim traded in the market and u is noise trading demand. Aggregate efficiency depends on how much of the managers' information is reflected in future cash flows:

$$V_M = V[E[z|\eta, \eta', q]]$$

where q is a measure of market value.

A first-order approximation yields forecasting price efficiency, a measure of informational efficiency of prices alone:

$$V_{FPE} = V[E[z|q]]$$

The part of V_M that is due to market prices (revelatory price efficiency) is

$$V_{RPE} = V[E[z|\eta, \eta', q]] - V[E[z|\eta, \eta']]$$

When prices are not very informative, the above measure is low and, when prices are informative, the above measure is high. The measure we focus on in the paper is FPE, which we express as

$$\sqrt{V_{FPE}}$$

which is the predicted variation of future cash flows from current market prices. When traders produce more information, prices become more informative and, therefore, FPE increases.

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 U.S. and the stock is listed in non-U.S. countries
FOR_NUS	Ownership by all institutions domiciled in a different country (non-U.S.) 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 has 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 has 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 has long geographic distance (above median level each year) to the country where the stock is listed
FOR_FAR (Geographic distance)	Ownership by institutions domiciled in a foreign country that has short geographic distance (below median level each year) to the country where the stock is listed
FOR_CLOSE (Language)	Ownership by institutions domiciled in a foreign country that speaks same language as the country where the stock is listed
FOR_FAR (Language)	Ownership by institutions domiciled in a foreign country that speaks different language as the country where the stock is listed
FOR_CLOSE (Border)	Ownership by institutions domiciled in a foreign country that has connected border with the country where the stock is listed
FOR_FAR (Border)	Ownership by institutions domiciled in a foreign country that has no connected border with the country where the stock is listed
FOR_CLOSE (Colony)	Ownership by institutions domiciled in a foreign country that has same colonial origin as the country where the stock is listed
FOR_FAR (Colony)	Ownership by institutions domiciled in a foreign country that has different colonial origin as the country where the stock is listed
FOR_FIN_High	Ownership by foreign institutions from a country with high financial market development 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 development index (total equity market capitalization scaled by GDP below median level each year)
FOR_COMMON	Ownership by foreign institutions from a country with a common law system
FOR_CIVIL	Ownership by foreign institutions from a country with a civil law system
FOR_MARKET	Ownership by foreign institutions from a country with a market-based financial system
FOR_BANK	Ownership by foreign institutions from a country with a 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 capitalization 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 (in $1000)
FORSALES	Foreign sales divided by total sales
CASH	Cash and/or liquid items divided by total assets
CLOSE	Ratio of shares held by insiders to total shares
OPEN	OPEN is an indicator variable based on Chinn-Ito index (Chinn and Ito, 2006), equal to one if the openness index is above the median level
ANALYST	The number of analysts covering a stock at the end of each year
log($Volume)	Logarithm of dollar trading volume
Bid_Ask Spread	Ask price minus bid price scaled by mid price
log(Amihud)	Logarithm of Amihud's price impact measure
VOLATILITY	Realized volatility of daily stock returns

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: Regional Analysis

This table shows the price informativeness in each group sorted by total (IO), domestic (DOM) and foreign ownership (FOR), for different country subsamples. Firms are sorted into low, median, high ownership groups, if their ownership are below or above the 33.3%, 66.7% threshold in each country-year group. $PI1$ and $PI3$ are price informativeness measures in one and three years horizons, respectively, constructed as in equation (1). Newey-West standard errors with four lags are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	IO			*DOM*			*FOR*		
				Panel A: U.S.					
	IO(%)	$PI1 \times 100$	$PI3 \times 100$	*DOM*(%)	$PI1 \times 100$	$PI3 \times 100$	*FOR*(%)	$PI1 \times 100$	$PI3 \times 100$
*IO*_1(Low)	12.57	−4.72	−7.45	11.80	−4.77	−7.54	0.09	−4.00	−6.68
*IO*_2	55.90	0.71	−0.27	52.79	0.88	−0.06	1.44	0.20	−0.88
*IO*_3(High)	89.02	2.08	2.65	84.65	1.94	2.63	6.72	1.12	1.00
H-L	76.45***	6.80***	10.10***	72.84***	6.71***	10.17***	6.63***	5.11***	7.68***
	(1.49)	(0.82)	(1.01)	(1.52)	(0.87)	(1.01)	(0.93)	(0.5)	(0.56)
				Panel B: Non-U.S.					
*IO*_1(Low)	1.47	−0.37	−0.62	1.06	−0.54	−1.12	0.20	−0.15	−0.57
*IO*_2	6.85	0.63	0.56	3.31	0.70	0.71	1.99	0.85	0.87
*IO*_3(High)	20.63	1.99	2.37	7.72	1.80	2.30	12.89	1.65	2.02
H-L	19.16***	2.35***	2.99***	6.66***	2.34***	3.42***	12.69***	1.80***	2.59***
	(1.09)	(0.24)	(0.41)	(0.76)	(0.2)	(0.37)	(0.69)	(0.28)	(0.37)

Table IA.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 IA.5: 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

Table IA.6: 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 4 (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 IA.7: 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 4 (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 IA.8: 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 (11). 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 4 (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 IA.9: 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 (12). 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 4 (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