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# Who Trades Index Rebalancings? Evidence on Benchmarking and Inelastic Demand*

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**Abstract**

Benchmark index rebalancings are widely used to study non-fundamental demand shocks, but the underlying trading is rarely observed. Exploiting transaction-level data from the Colombian stock market and additions and deletions of stocks from MSCI international equity indexes, we trace who generates benchmark-driven demand, who absorbs it, and how it affects prices. Index demand extends beyond explicit index funds and ETFs: benchmarked but nominally active foreign institutions account for most rebalancing-driven trading. Domestic investors absorb most of the shock, while arbitrage capital plays only a limited role. We show that stock demand curves are steep, especially when retail participation is larger.

**JEL Classification:** F32, G11, G15

**Keywords:** index rebalancings; institutional investors; stock demand elasticity; passive funds; benchmarking; inelastic market hypothesis

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# 1 Introduction

A large empirical literature shows that asset demand curves slope downward, implying that shocks to the supply of assets available to investors, even when unrelated to fundamentals, can have substantial price effects.[1] The Inelastic Market Hypothesis (IMH) (Gabaix and Koijen, 2021) provides a unifying explanation, emphasizing two complementary forces: inelastic demand by large institutions operating under explicit or implicit allocation mandates, and limits to arbitrage and intermediation that restrict the ability of sophisticated investors to absorb order imbalances. While the evidence that stock demand slopes downward is now extensive, direct evidence on these investor-level mechanisms remains limited. In most settings, researchers do not observe who generates predictable non-fundamental demand shocks, who absorbs them, and how that trading maps into price adjustments.

This paper exploits a setting that allows us to open that black box. Using detailed transaction-level data from the Colombian stock market, we study the full set of 18 additions to and deletions of Colombian stocks from MSCI international equity indexes between 2006 and 2017. Unlike prior work that infers trading from holdings or assets under management (AUM), we observe both sides of each trade and the identity of market participants. This allows us to trace investors contributing to benchmark-driven demand shocks and their trading counterparts, that is, the investors who absorb such shocks. Moreover, since MSCI announcements precede actual index recompositions, we can separate the announcement window from the implementation date, when mechanical portfolio adjustments by international investors benchmarked to MSCI are concentrated. This setting, therefore, allows us to measure benchmark-driven demand shocks directly from transactions, trace net order imbalances by investor type, and assess how much of those shocks are offset by arbitrage capital and other investors.

Our analysis delivers three main findings. First, benchmark-driven demand is substantially broader than suggested by the AUM of explicitly passive funds. While ETFs and index funds trade in the expected direction on the actual implementation date, an even larger share of the foreign demand shock comes from nominally active institutions—including pension funds, sovereign wealth funds, and government agencies—whose trading closely resembles that of explicit index trackers. Despite advance announcements of MSCI additions and deletions, these benchmarked but not explicitly passive institutions concentrate 60% of their trading on the implementation date, generating a demand shock roughly 1.7 times larger than that attributable to explicitly passive

[1] This empirical literature started with Shleifer (1986) and Harris and Gurel (1986), and there have been countless contributions across different asset markets since then.

funds. This evidence points to a broader effective passive footprint than implied by standard AUM measures, consistent with theories emphasizing preferred habitats, benchmarking, and implicit mandates (Kashyap et al., 2021; Buffa et al., 2022; Pavlova and Sikorskaya, 2023).

Second, we document a limited role for arbitrage capital in offsetting these shocks. Broker-dealers and hedge funds participate around rebalancing dates, but their net trading is small relative to the aggregate institutional imbalance. Instead, the foreign demand shock is absorbed largely by domestic investors—especially individuals, pension funds, and non-financial corporations—who act as residual liquidity providers, but only at the cost of substantial price adjustments. Third, combining observed quantities with contemporaneous price changes, we obtain transaction-level estimates of steep demand curves. The median implied elasticity in our sample is -0.34, implying that a 1% increase in demand relative to shares outstanding raises prices by roughly 2.9%. This magnitude aligns closely with demand-based asset-pricing frameworks that emphasize segmented demand and limits to arbitrage (Koijen and Yogo, 2019; Gabaix and Koijen, 2021; Haddad et al., 2025). These price effects also vary systematically with the composition of domestic capital available to absorb foreign demand shocks. Stocks in which domestic individuals make up a larger share of the investors taking the other side of foreign demand exhibit less elastic demand and larger price responses, while stocks in which non-financial corporations play a larger role exhibit more elastic demand and smaller price effects, suggesting that domestic corporate holders are more willing to accommodate benchmark-driven imbalances. Taken together, these findings provide direct micro-level evidence consistent with the IMH: benchmark-constrained capital generates large non-fundamental demand shocks that arbitrage capital cannot fully absorb.

While our empirical focus is on Colombian stocks, the mechanisms we study are not unique to Colombia. What is distinctive about our setting is not the country per se, but the ability to observe complete trading around large benchmark-driven foreign demand shocks. The stocks affected by MSCI rebalancings are comparable in size to firms examined in much of the U.S. indexing literature (Chang et al., 2015; Boone and White, 2015; Appel et al., 2016), and the institutional investors generating these flows operate globally. As a result, our findings help better understand the nature and the impact of benchmark-driven demand. They also shed light on how to measure benchmark-driven demand in equity markets. In particular, they suggest that conventional AUM-based measures understate the role of benchmarked but nominally active investors and therefore miss an important share of effective passive demand, with important implications for the estimation of demand elasticities in asset markets. More broadly, by directly observing who generates and who absorbs predictable benchmark-driven shocks—and by separating announcement from implementation—our results provide direct evidence of two key features of modern equity markets: benchmark-driven demand is broader than explicit index funds, and arbitrage capacity is often insufficient to fully offset non-fundamental shocks (Chinco and Sammon, 2024; Pavlova and Sikorskaya, 2023).

# 2 Data and Institutional Framework

To study rebalancing events, we exploit episodes of additions to and deletions of Colombian stocks from MSCI international equity indexes, together with transaction-level data from the Colombian stock exchange, *i.e.*, the *Bolsa de Valores de Colombia* (BVC, henceforth). In this section, we describe these episodes and discuss the main features of the BVC and the proprietary transaction data.

## 2.1 MSCI Additions and Deletions

MSCI indexes are among the most widely tracked international benchmarks for institutional investors in equity markets. Importantly, many of their flagship indexes contain stocks from different countries, and are therefore followed predominantly by large international investors. In our analysis, we use additions to and deletions of stocks from MSCI Standard Indexes, which are the largest in terms of the AUM benchmarked against these indexes.[2]

Using MSCI quarterly index review reports, we identify 18 episodes of additions and deletions of Colombian stocks in the 2006-2017 period.[3] We retrieve from the reports the announcement date, which usually happens around mid-month, and the date when the rebalancing is made effective, which is the last trading day of the month, and thus occurs 11 to 17 days after the announcement. MSCI quarterly reports also provide information on the relative weight of each stock in each index.

To compare our transaction-based elasticities with conventional AUM-based measures, we collect AUM benchmarked to the MSCI Emerging Markets Index (MSCI EM) and the MSCI All Country World Index (MSCI ACWI). Because MSCI reports these figures only for June 2015 and November 2016, we complement them with EPFR Global Fund Flows data, which covers a broad set of mutual funds and ETFs and identifies their benchmark indexes. For each index, we compute

[2]MSCI also provides other indexes, such as Small Caps, Value, and Growth indexes, that might differ in their composition from the Standard Indexes.

[3]Colombia is part of the MSCI All Country World Index, the MSCI Emerging Markets Index, and the MSCI EM Latin America, among other indexes. When a Colombian stock is announced to be included into or excluded from the Standard Indexes, this recomposition affects all of these indexes. Our sample includes 10 additions and 8 deletions. Stock ticker symbols and announcement dates for each episode are given in Appendix Table A1.

the MSCI-to-EPFR AUM ratio in periods where both are available and use the median ratio to scale EPFR AUM in the remainder of the sample period.[4] For explicitly passive funds and ETFs, we rely only on EPFR, whose coverage of these vehicles is near complete.

## 2.2 The Colombian Stock Exchange

The BVC operates as a standard electronic central limit order book. Trades are submitted via authorized broker-dealers registered at the exchange, and buy and sell orders are matched via an automated trading system. In contrast to fragmented markets in the United States and Europe, the BVC is the sole authorized trading venue for Colombian stocks. As a result, the proprietary BVC dataset we exploit reports all transactions in Colombian equities from 2006 to 2017, thereby avoiding biases arising from incomplete reporting (e.g., across multiple trading venues such as multilateral trading facilities, dark pools, or rival exchanges). At each rebalancing event, none of the stocks in our sample had dual listings or were traded through global depositary receipts. Thus, all the transactions around rebalancing events, and hence, any change in ownership for stocks in our sample, are reported in the BVC trading records.

Each record in the BVC dataset includes a time stamp (to the second), transaction price, trade direction, quantity, the executing broker, and a unique investor identifier.[5] When several investors are on the same side of a trade, the exchange records a separate observation for each investor on that side. The exchange also classifies investors into three broad categories: domestic individuals, domestic institutions, and foreign investors.[6] Domestic institutions are further classified into mutual funds, pension funds, non-financial corporations, broker-dealers trading on their own account, and other institutional investors.

For the exclusive purpose of this project, the BVC disclosed the names of foreign institutions involved in the transactions. To obtain a more detailed classification of foreign investors, we therefore manually matched their names to FactSet Ownership and classified each foreign investor into active mutual funds, passive mutual funds, pension funds, exchange-traded funds (ETFs), hedge funds, government institutions (e.g., sovereign wealth funds and central banks), and investment firms. Remaining investors, classified as "Others" include foreign individuals, trust funds, and private endowments.

[4]We apply the MSCI EM scaling factor also to the MSCI EM Latin America and MSCI EM Colombia indexes.

[5]Since February 2012, trading hours have been synchronized with the New York Stock Exchange session, with a closing batch auction during the final five minutes of each trading day.

[6]There are no individual or aggregate ownership limits on foreign investors in Colombia. Foreign individuals and institutions may freely reinvest or repatriate dividends and capital gains.

The BVC dataset comprises approximately 17 million transactions over the sample period. Domestic institutions account for more than half of total traded value. Consistent with global trends in cross-border portfolio investment, foreign participation increases steadily over time. The number of foreign investors rises from 324 in 2006 to nearly 4,000 by the end of 2017, while their share of traded value increases from 4.5% to 31.8%. In addition to the global post-crisis expansion of portfolio flows to emerging markets, two country-level developments contribute to this increase: Colombia's sovereign debt regained investment-grade status in June 2011, and in 2013, taxes on foreign investors' earnings from domestic securities were reduced from 33% to 14%. Between 2012 and 2017, foreign mutual funds account for 7.8% of total traded value, while investment firms, ETFs, and government institutions account for 5.2%, 3.5%, and 2.8%, respectively (Table A2, Panel A).

# 3 Empirical Analysis and Results

We analyze four related aspects of equity index rebalancings. First, we examine the behavior of different classes of foreign and domestic investors in response to these episodes. We then measure the price impact of these episodes and combine price and trading volume data to estimate the demand elasticity of stocks in our sample. Finally, we study how these elasticities vary with the composition of the investor base available to absorb benchmark-driven foreign demand.

## 3.1 Investor behavior and traded quantities

We first identify which investors generate benchmark-driven demand around MSCI rebalancings and which investors absorb it. To facilitate the interpretation of the results, we pool additions and deletions by treating sales as purchases, and vice versa, for deletion events. Since MSCI indexes are mostly tracked by international investors, we begin our analysis by examining foreign investors' behavior in response to the rebalancings. Figure 1, Panel A, provides a first graphical representation of these results. Specifically, it reports the cumulative fraction of outstanding shares purchased by foreigners starting from 3 trading days before the announcement, averaged across episodes. After the announcement date, foreign holdings increase slightly, but most flows into affected stocks occur on the implementation day.

We decompose trading activity by investor type. Figure 2, Panel A, shows the total fraction of outstanding shares purchased by different classes of foreign investors. All foreign investor groups except hedge funds increase (decrease) their holdings of stocks added to (deleted from) MSCI indexes. The key difference across investor types lies in the timing of their trades. As expected, passive mutual funds and ETFs concentrate their purchases on the implementation date and trade little between the announcement and implementation dates (on average, 88% of their trading occurs on the implementation day). More strikingly, benchmark-driven trading extends beyond explicitly passive investors: several nominally active investor types also trade heavily on the implementation date, consistent with implicit benchmarking mandates (about 60% of trading by non-explicitly passive index trackers occurs on the implementation day). Panel B shows the behavior of domestic investors. In aggregate, domestic investors take the opposite side of foreign rebalancing demand and absorb most of the shock. Notably, domestic brokers—who could act as arbitrageurs—do not take large offsetting positions. Instead, individuals, non-financial corporations, and pension funds account for most domestic trading during rebalancing episodes.

We next isolate the component of trading driven by foreigners' willingness to replicate index composition, that is, rebalancing-driven demand shocks, which we later use to estimate demand elasticities. Not all foreign trades around rebalancing dates are necessarily attributable to index tracking; some may reflect speculative motives. We therefore focus on foreign investors who increase their holdings of newly included stocks between the announcement and implementation dates (Figure 2, Panel C), and especially on those who do so exclusively on the implementation date (Figure 2, Panel E). The latter group is most plausibly motivated by passive or benchmark-driven considerations.[7] The resulting patterns closely resemble those in Panel A, except for investment firms and investors classified as "Others", among whom some investors appear to mimic the index while others take offsetting positions, possibly reflecting speculative strategies.

Table 1, Panel A, columns 2–4, reports quantitative measures of rebalancing-driven demand shocks. We compute the total purchases-to-shares-outstanding ratio, $\Delta Q/Q$, using alternative definitions. Column 2 reports purchases by foreign investors trading in the direction of the index between the announcement and implementation. On average, these investors buy 3.2% of outstanding shares, with a median of 2.7%. Column 3 focuses on purchases occurring on the implementation date only, that is, those most likely driven by index replication. These purchases average 2.37% of shares outstanding, with a median of 2.0%, implying that 74% of net foreign flows occur on the implementation day. Column 4 additionally includes domestic investors trading in the direction of the index on the implementation date; results are very similar, reinforcing the view that MSCI rebalancings primarily affect international investors.

We next compare observed rebalancing flows with the flows implied by conventional AUM-

[7] Panels D and F of Figure 2 report the corresponding behavior of domestic investors who sell (buy) newly added (deleted) stocks over the same horizons.

based methodologies to assess how well standard measures capture benchmark-driven demand. Specifically, we compute:

$$\frac{\Delta Q}{Q}^{Conventional}_{i,k} = \frac{\sum_j AUM_j^k w_j^i}{MCAP_i} \tag{1}$$

where $j$ indicates the index the stock is being included into (removed from), $MCAP_i$ is the market capitalization of the stock $i$, $w_j^i$ is the benchmark weight after being included into the index, and $AUM_j$ indicates the AUM benchmarked against index $j$. Consistent with previous studies, we make two assumptions to compute these estimated inflows. We assume that either all funds tracking the indexes rebalance their portfolios accordingly ($k = Total$), or that only passive funds do so ($k = Passive$), and present summary statistics for these inflows in columns 5 and 6 of Table 1, Panel A.

Assuming that all funds rebalance leads to a median estimated inflow (relative to market capitalization) of 16.9%, while using only passive funds implies an inflow of 0.94%. The former substantially overstates flows, while the latter is closer in magnitude but still captures less than half of the rebalancing-driven demand in the data.

This gap arises because a large share of benchmark-driven demand comes from investors that are nominally active but behave similarly to passive funds at rebalancing dates. Among foreigners trading in the direction of the index on the implementation day, passive funds and ETFs purchase 0.87% of outstanding shares, while other foreign investors purchase 1.50%. Non-passive benchmarked investors, therefore, generate rebalancing-driven inflows that are 1.7 times larger than those of explicitly passive funds. By contrast, AUM-based calculations imply that "active" inflows are roughly 17 times larger than passive inflows, substantially overstating both the level and the composition of benchmark-driven demand.

## 3.2 The price effect of index additions and deletions

We measure price effects by examining the dynamics of stocks added to or removed from MSCI indexes. Abnormal returns are computed as $R_{st} - \hat{\beta}_s R_t^{D/s}$, where $\hat{\beta}_s$ is estimated using daily stock returns in the year preceding the event, and $R_t^{D/s}$ denotes the return on the COLCAP—a value-weighted domestic equity index—excluding stock $s$. Returns are measured in Colombian pesos in excess of the domestic deposit rate.[8]

Figure 1, Panel B, depicts the average cumulative abnormal return (CAR) of stocks in our

[8]We use the 90-day term deposit rate, published by the Central Bank.

sample from 3 trading days before the announcement date onwards. As before, deletions are normalized to be additions by multiplying the CAR of removed stocks by -1.[9] CARs rise immediately after the announcement and continue to drift upward until the implementation date (since the implementation day varies across events, this is represented as a shaded area in the figure). We report detailed statistics on the price effect of these rebalancing shocks in the first column of Table 1. In this case, CARs are computed from the day prior to the announcement date to the day of the actual index recomposition.[10] CARs range between 0.87% and 22.32%. The median CAR is 5.45%, and the mean is 6.65%, statistically different from 0 at the 1% level.[11]

These price effects are economically large and comparable to those documented in other index-rebalancing studies. For example, Chang et al. (2015) report average effects of about 5% for Russell 2000 reconstitutions, while Wurgler and Zhuravskaya (2002) find CARs of roughly 3% for S&P 500 additions, rising to 5% for stocks subject to larger demand shocks.

## 3.3 The price elasticity of demand for stocks

Index rebalancing episodes provide a natural framework for estimating stock demand elasticities. We use the theoretical framework developed by Gabaix and Koijen (2021) to guide this exercise. Although their analysis focuses on macro-elasticities—that is, on the effects of flows between bond and equity markets—the main intuition applies directly to our setting.[12] Large price effects arise when demand shocks are generated by investors with strict or implicit portfolio mandates and when arbitrage capital is insufficient to offset them. Both conditions appear to hold in our context: several groups of investors rebalance to closely mimic index composition, and hedge funds and domestic brokers take relatively small offsetting positions.

The framework in Gabaix and Koijen (2021) predicts that, as we observe in our data, expected exogenous inflows generate immediate price effects even when the actual inflows materialize later.

[9] In Section 4 we show that additions and deletions have comparable price effects, which is also consistent with the evidence in Chang et al. (2015)

[10] Since the number of days between the announcement and the implementation dates differ across episodes, the average CAR in Table 1 is slightly different than the one in Figure 1, Panel B (where we report the average CAR for each day after the announcement date).

[11] As a robustness check, we estimate abnormal returns using a two-factor international model following Bekaert et al. (2014), with a global factor and a domestic factor $R_t^G, R_t^{D/s}$. Returns are measured in U.S. dollars in excess of the three-month U.S. T-Bill rate. The median and mean CARs are 5.21% and 6.28%, very close to the baseline one-factor estimates. Appendix Table A3 reports the full set of results.

[12] While it is true that stocks are more likely to have closer substitutes, and therefore micro-elasticities should in principle be larger, in absolute value, than macro-elasticities, we argue that, consistent with our empirical evidence, several equity funds face 'implicit' mandates on their portfolio composition similar to those of bond and equity funds.

In their model, the price effect of expected inflow $f_T$ at time $T$ is:

$$p_t = \frac{1}{(1+\rho)^{T-t}} \frac{f_T}{|\xi|} \tag{2}$$

where $\rho$ is the effective discount rate and $\xi$ is the (negative) demand elasticity.[13] Under this framework, a permanent and anticipated inflow—such as those implied by index additions (or deletions) on the implementation date—generates an increase in price on the announcement date and a drift until implementation, consistent with our findings. The overall price effect of the expected inflow, from announcement to implementation, is therefore given by $p_T \equiv \frac{\Delta P}{P} = \frac{f_T}{|\xi|}$. This mapping allows us to estimate the elasticity of demand for the included or excluded stocks from the observed price impact and the expected inflow.

We do not observe the expected inflows directly and proxy them with the actual quantity of shares purchased (sold) by foreigners on the effective inclusion (exclusion) date. These trades are the ones most plausibly driven by index replication, unlike those occurring between the announcement and implementation dates, which may partly reflect speculative motives, and they are also the flows most likely to be anticipated by market participants. More specifically, we compute $f_T$ as $\Delta Q/Q$ from Table 1, Panel A, column 3.[14]

We then calculate the change in stock prices from the day preceding the announcement to the implementation date. The elasticity is given by the ratio of $f_T$ to $-\frac{\Delta P}{P}$, where $f_T$ is proxied by $\frac{\Delta Q}{Q}$. Results from these estimates are shown in Figure 3 for each event and summarized in Table 1, Panel B, Column 3. The elasticity of demand for stocks in our sample ranges between -3.27 and -0.01, with a median of -0.34. The average elasticity is -0.63—larger in absolute value than the median because of a few stocks whose demand is much more elastic than the rest of the sample. When we consider purchases occurring between the announcement and implementation dates (Column 2 in Panel B), the estimated elasticity becomes larger in absolute value but remains close to the baseline value in Column 3, because most inflows materialize on the implementation date. Similarly, estimates do not change substantially when we include purchases by domestic investors, since very few domestic investors rebalance their portfolios toward the indexes (Column 4 in Panel B).

Overall, the demand for stocks in our sample is particularly inelastic, consistent with large

[13] $p_t$ refers to the price impact at time $t$ relative to a baseline price before any shock is announced. In our empirical setup, we treat the stock price prior to the announcement date as the baseline.

[14] It is worth remarking that, in principle, the $Q$ to be used in the denominator of this formula should be the quantity of shares held by investors whose trades are not entirely due to replication motives. Yet, as we explain in detail in Section 4, in our setting purely passive investors—mostly foreigners—hold a negligible fraction of outstanding shares before the rebalancings, so we can simply use total outstanding shares in the computation.

benchmark-driven demand shocks being only partially absorbed by arbitrage capital.

## 3.4 Who absorbs foreign demand and cross-sectional elasticity

We next examine who stands on the other side of benchmark-driven foreign demand shocks and whether the identities of these counterparties help explain cross-stock variation in demand elasticity. Exploiting the transaction-level nature of our data, we identify, for each event, the investors who absorb the foreign shock—those selling to foreigners in index additions and buying from foreigners in deletions—and compute each group's share of foreign-matched net absorption over the event window from announcement to implementation. We complement this event-window measure with pre-event measures based on trading over the three months before the announcement, which help distinguish persistent differences in the investor base from endogenous participation during the rebalancing itself. We focus on the four domestic investor groups that account for most of the shock absorption: individuals, non-financial corporations, pension funds, and brokers; smaller categories are grouped into "Others."[15]

In Table 2, we report the association between stock-specific demand elasticities and the absorption share of the aforementioned domestic investor categories.[16] The most robust patterns involve domestic individuals and non-financial corporations. Stocks in which individuals account for a larger share of absorption exhibit less elastic demand and larger price responses, whereas stocks in which non-financial corporations play a larger role exhibit more elastic demand and smaller price effects. These results appear both when looking at actual event-window trading and when looking at these investors' presence in the three months preceding the event.[17]

Individuals appear willing to accommodate benchmark-driven order imbalances only at larger price concessions. Non-financial corporations, instead, seem more willing to trade against these imbalances when they perceive potential gains, flattening the demand curve. One plausible expla-

[15] In the median event, 17% of foreign trades in the direction of the index are matched by other foreign investors, while the remaining trades are matched by domestic investors. Appendix Table A1 reports the net absorption measure for each investor group in each event.

[16] Because the regressors are investor-group shares, coefficients are interpreted relative to the omitted foreign share. In Columns (1) and (3), the omitted foreign category refers to foreign investors on the opposite side of the absorption measure; in Columns (2) and (4), it refers to foreign investors' share of total trading volume.

[17] In a leave-one-out exercise on the FM-NETABS event-window regression (Column 1 of Table 2), the coefficient on Domestic Individuals remains positive and significant at the 10% level in 17 of 18 subsamples (range: 0.171–0.437). The coefficient on Non-Financial Corporations remains negative and significant at the 10% level in all 18 subsamples (range: $-0.791$ to $-0.516$), and at the 1% level in 16 of 18. No single observation drives either result. These results remain similar also when using a more granular classification of domestic investors.

nation is the prevalence of business-group cross-holdings in the Colombian equity market. Several MSCI event stocks are held by large conglomerates—such as GEA, Grupo Aval, and the Bolívar Group—whose affiliates hold substantial reciprocal stakes. These long-horizon blockholders may be particularly well positioned to absorb benchmark-driven shocks, selling small fractions of their holdings at higher prices without relinquishing control, while in deletions they can accumulate shares at a discount.

Pension funds show a different pattern. Although they absorb part of the foreign shock, their coefficients are not stable across specifications and provide little evidence that their presence in stocks' investor base is systematically associated with the stock demand elasticity.

Finally, greater broker participation in the event window is associated with less elastic demand, but pre-event broker activity does not predict elasticity during the rebalancing period. This pattern is consistent with brokers endogenously participating more intensively in episodes with larger or more persistent price effects—possibly due to speculative motives—rather than with broker presence in the pre-event investor base systematically making a stock more or less elastic.

Taken together, the evidence suggests that cross-sectional differences in price impact reflect not only the size of benchmark-driven foreign demand shocks, but also the composition of the domestic capital available to absorb them. Stocks with a larger retail investor base are more likely to exhibit steeper demand curves, while stocks with a larger presence of large non-financial corporations in the investor base exhibit flatter demand curves.

# 4 Discussions

## 4.1 External validity

Although we focus on a sample of Colombian stocks affected by MSCI index rebalancings, the mechanisms we study are not country-specific. What is distinctive in our setting is not the country per se, but the ability to observe complete trading around large, benchmark-driven demand shocks by international investors. Moreover, the Colombian exchange is comparable in size to many medium-sized equity markets,[18] and the stocks affected by MSCI rebalancings are the largest and most liquid in the domestic market (Appendix Table A2). In market capitalization, they are comparable to the smallest Russell 1000 stocks and the largest Russell 2000 stocks, which are

[18]According to the World Federation of Exchanges (WFE, 2019), Colombia had the fourth-largest stock market in Latin America by market capitalization at the end of 2017, and ranked fourteenth among developing countries.

widely used in the indexing literature (e.g., Chang et al., 2015; Boone and White, 2015; Appel et al., 2016).

Our setting is also informative for measuring demand elasticities when traded quantities are unobserved. In most developed-market studies, demand shocks are inferred from AUM and therefore require assumptions about which investors rebalance after index recompositions. By contrast, our transaction-level data allow us to compute elasticities from actual rebalancing-driven flows and compare them with AUM-based proxies. Elasticities based on actual quantities are much closer to those implied by passive-fund AUM than to those implied by total benchmarked AUM, suggesting that standard AUM-based approaches bracket the true elasticity.[19]

This helps interpret elasticity estimates in developed markets. For U.S. stocks near the Russell 1000/2000 cutoff, Chang et al. (2015) report elasticities ranging from $-1.5$ under universal rebalancing to $-0.46$ under passive-only rebalancing. Our results suggest that the true elasticity in such settings lies closer to the latter, and a simple back-of-the-envelope adjustment yields an implied elasticity around $-0.7$, close to estimates in Koijen and Yogo (2019).

## 4.2 Other Potential Channels

Our empirical analysis relies on the assumption that index rebalancing episodes entail sudden shocks to the supply of assets available to investors, which we use to estimate the stock demand elasticity. However, there may be alternative mechanisms explaining the price response to index additions and deletions, such as: (i) an information channel whereby MSCI reveals information about the firm to the market (Dhillon and Johnson, 1991); (ii) an investor recognition channel if greater analyst coverage generates a premium on the stock price (Chen et al., 2004); and (iii) a liquidity channel when new investors holding the stock improve its liquidity and thus its price (Hegde and McDermott, 2003; Pandolfi and Williams, 2019). We discuss additional evidence consistent with our interpretation of index additions and deletions as pure demand shocks due to investors' willingness to replicate the index composition.

**Information:** Two pieces of evidence suggest that the information channel is unlikely to be playing an important role in our setup. First, there is a clear separation between the purchases and sales of foreign and domestic investors. In our sample of events, aggregate trades by all domestic investor categories are on the opposite side of foreign benchmark-driven demand. It is unlikely that the information revealed by MSCI about Colombian firms is segmented by investors' domicile,

[19] Using alternative quantity and price definitions, we obtain median elasticities between $-0.39$ and $-0.47$, close to our baseline estimate and substantially smaller in absolute value than elasticities implied by total benchmarked AUM.

affecting only foreign investors' expectations. This evidence is instead explained by the fact that most foreign investors track their performance against MSCI indexes while domestic investors do not. Second, even if MSCI rebalancings affect only the information set of foreign investors, the timing of purchases and sales is hardly consistent with the information hypothesis, as around 75% of trades occur at implementation rather than on the announcement date, when the information is disclosed.

**Investor recognition:** To analyze the role of investor recognition, we analyze abnormal returns separately for additions and deletions. Under this hypothesis, one would expect an asymmetric response between inclusions and exclusions since deleted stocks should not suddenly lose investor recognition. Thus, prices of added stocks should increase, while the effect should be almost muted for deletions. Contrary to this, we find similar patterns in the CARs of stocks affected by additions and deletions.[20] Moreover, we show that the number of analysts covering affected stocks does not significantly change around these index rebalancings.[21] If investor awareness changes after inclusions and exclusions, one would expect the number of analysts to also be affected by these events.

**Liquidity:** Finally, to rule out the possibility that the price changes following the rebalancings are due to changes in the liquidity of stocks, we analyze whether there are significant liquidity changes for the stocks in our sample. We plot the mean and median bid-ask spreads over a 600-day window centered on the rebalancing announcements. While there appear to be changes in this liquidity measure around the announcement date (which could be consistent with the increased trading we observe in our data), these changes reverse over time for both additions and deletions.[22]

## 4.3 Which demand elasticity are we measuring?

In our empirical analysis, we estimate stock demand elasticity from price and quantity changes between the announcement and implementation of index redefinitions. This raises the question of whose elasticity we measure in our analysis. Following Pavlova and Sikorskaya (2023), purely passive rebalancing-driven trades can be interpreted as shocks to the supply available to 'residual' investors. In our setting, these shocks are generated by foreign investors trading to replicate the index, so the residual demand we estimate is the demand of all other investors: domestic investors

[20] These returns are presented in Appendix Figure A1. Panel B excludes the November 13, 2015 deletion of Isagen because a private auction for the majority of the company's shares took place during the event window. Although the stock initially behaved similarly to other deletion events, the auction process subsequently generated a sharp price increase unrelated to the MSCI rebalancing.

[21] Appendix Figure A2.

[22] Appendix Figure A3.

plus the elastic component of foreign demand. Because these stocks are mostly held by domestic investors, our estimated elasticity is essentially the demand elasticity of domestic investors.

In principle, $\Delta Q/Q$ should be scaled by the holdings of residual (domestic) investors rather than by total outstanding shares. In our setting, however, purely passive, foreign investors hold negligible stakes before MSCI rebalancings. The median share of domestic holdings relative to total outstanding shares is 98% before additions and 91% before deletions. Using total outstanding shares instead of shares held by domestic investors, therefore, makes little quantitative difference in computing the demand elasticity in our sample.

Finally, our baseline focuses on the short window from announcement to implementation and therefore captures short-run elasticity. To assess whether slower rebalancing or arbitrage matters over longer horizons, we recompute the estimates using all trades up to three months after the rebalancing and the corresponding price change. The results are very similar: most rebalancing still occurs around the implementation date, and the median medium-run elasticity remains close to the short-run estimate.[23]

# 5 Conclusion

We use transaction-level data from the Colombian stock market and additions to and deletions from major international equity benchmarks to study who generates benchmark-driven demand, who absorbs it, and how prices respond. Observing the full universe of trades allows us to identify the effective passive footprint of benchmark capital rather than inferring it from AUM.

We show that benchmark-driven trading extends well beyond explicit index funds and ETFs: a broad set of large international investors rebalance in the direction of benchmark changes, even when nominally classified as active, while arbitrage capital plays a limited role. As a result, benchmark-driven order flow generates sizable and persistent price effects. Taken together, our findings highlight that in equity markets characterized by pervasive benchmarking, benchmark-driven demand shocks are only weakly arbitraged, making inelastic demand a fundamental feature of price formation.

[23]Appendix Figure A4 provides visual evidence, and Appendix Table A4 reports the corresponding elasticities.

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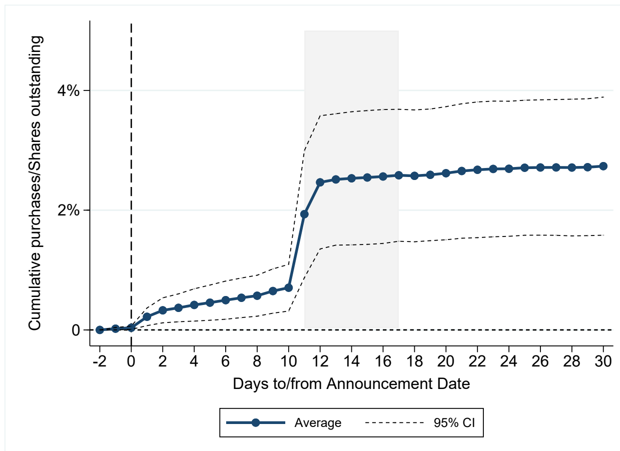
# Figures

Panel A. Cumulative foreign purchases




Panel B. Cumulative abnormal returns

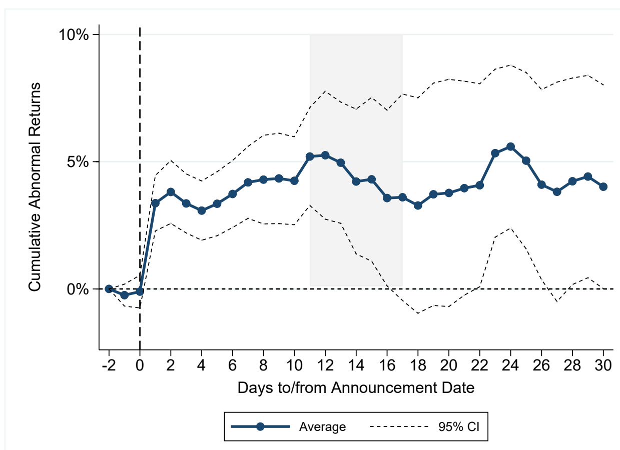
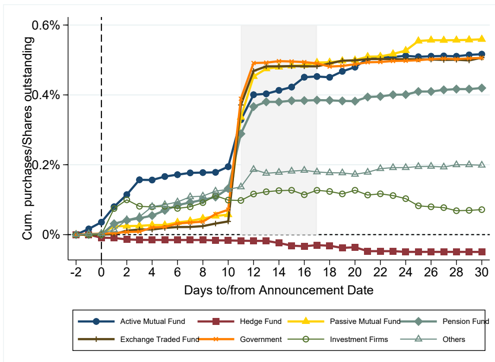


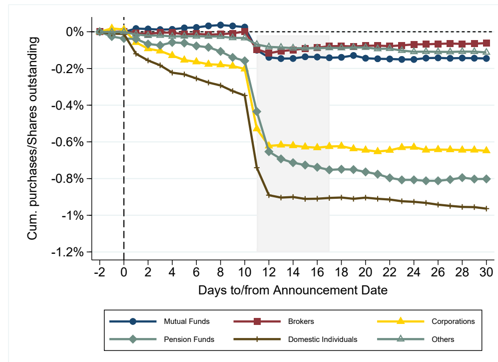

Figure 1: Evolution of Cumulative Purchases by Foreign Investors and Abnormal Returns

*Notes:* This figure presents the cumulative purchases of shares by foreign investors as a percentage of shares outstanding (Panel A) and the cumulative abnormal returns (CARs) during the event window (Panel B). Cumulative purchases over shares outstanding are calculated for each addition/deletion event and averaged across stocks (solid line). For deletions, trades are multiplied by -1. Abnormal returns are calculated as the difference between the stock returns and the implied returns from a single-factor model: $R_{st} - \hat{\beta}_s R_t^{D/s}$. $\hat{\beta}_s$ is calculated using daily stock returns in the year prior to the addition/deletion event with respect to the COLCAP, a value-weighted index for the domestic market, and excluding stock $s$. All returns are measured in domestic currency in excess of the local deposit rate. For deletions, CARs are multiplied by -1. CARs are calculated for each addition/deletion event and averaged across stocks (solid line). CI = Confidence Interval.

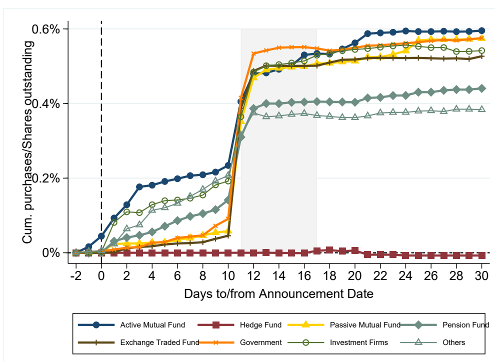
Panel A. All foreign investors



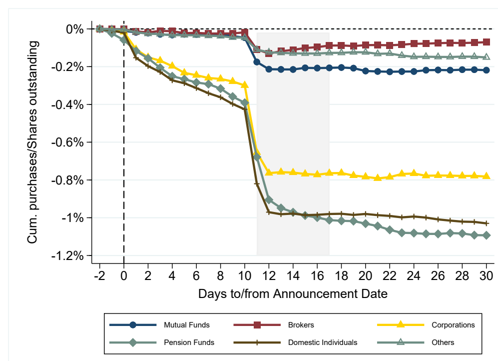

Panel B. All domestic investors



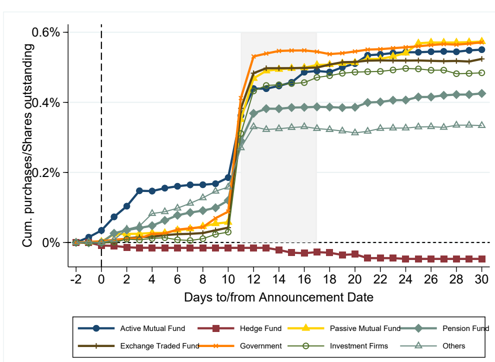

Panel C. Foreign investors buying (selling) the newly included (excluded) stock in $[0, T]$




Panel D. Domestic investors selling (buying) the newly included (excluded) stock in $[0, T]$




Panel E. Foreign investors buying (selling) the newly included (excluded) stock in $T$




Panel F. Domestic investors selling (buying) the newly included (excluded) stock in $T$

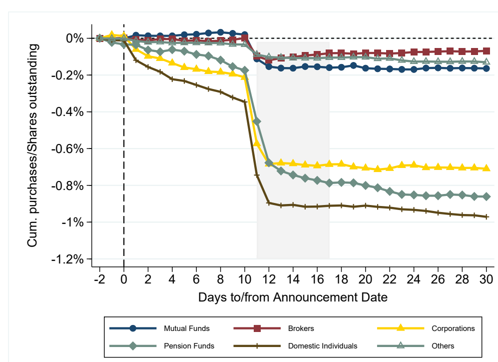



Figure 2: Flows by Investor Group.

*Notes:* The figure presents the cumulative purchases of shares as a percentage of shares outstanding for different investor groups. For deletions, trades are multiplied by -1. Panels A and B display the cumulative purchases of all foreign and domestic investors, respectively. Panel C restricts the sample to foreign investors with net purchases (sales) between the announcement of an addition (deletion) and the implementation date $t \in [0, T]$. Panel D restricts the sample to domestic investors with net sales (purchases) between the announcement of an addition (deletion) and the implementation date $t \in [0, T]$. Panel E restricts the sample to foreign investors with net purchases (sales) on the implementation date $T$. Panel F restricts the sample to domestic investors with net sales (purchases) on the implementation date $T$.

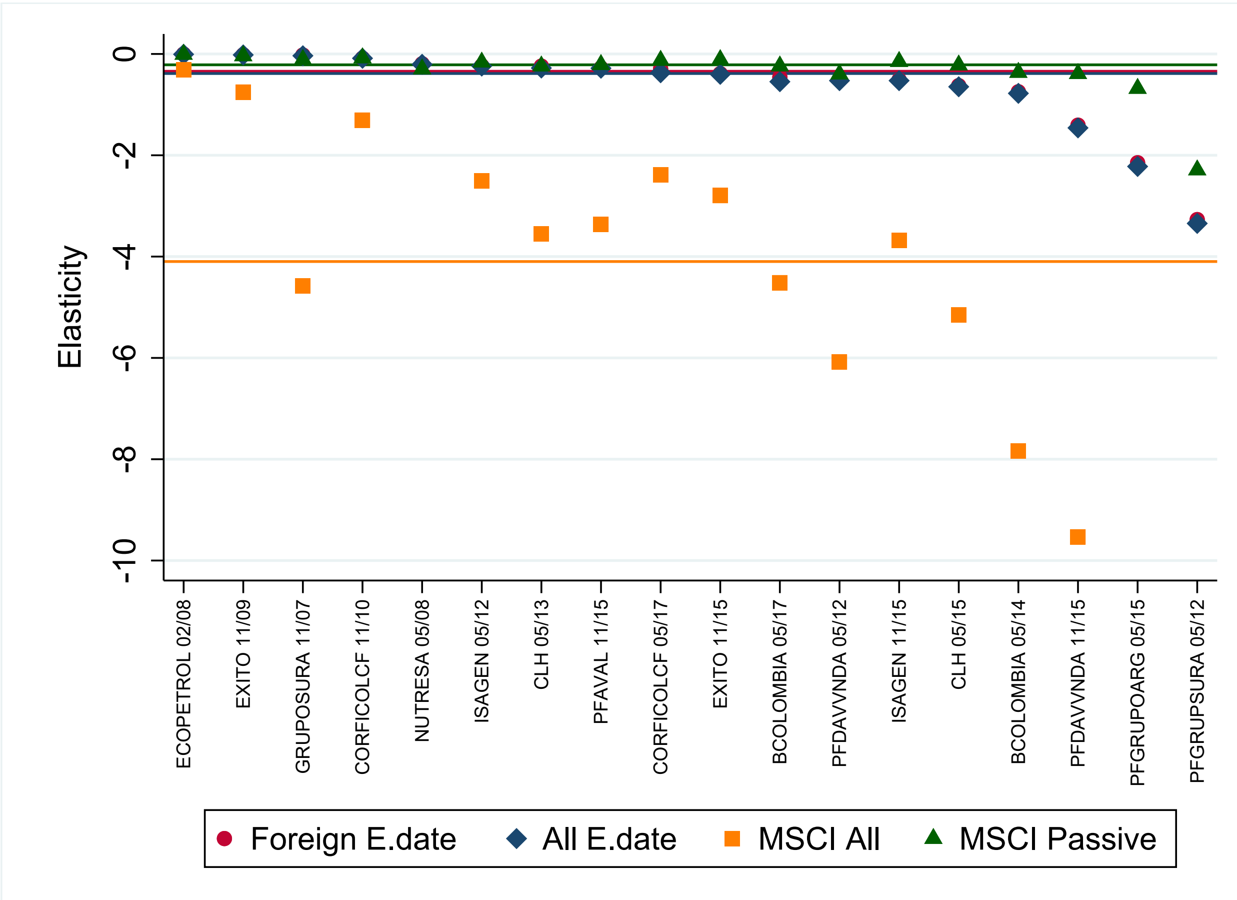



Figure 3: Event-specific Elasticities.

*Notes:* The figure presents the estimated elasticity for each addition/deletion event $i$ in our sample: $-\frac{\Delta Q_i}{Q_i} / \frac{\Delta P_i}{P_i}$. For each case, the relative change in price, $\Delta P_i/P_i$, is calculated as the cumulative abnormal return between the announcement and implementation day. The relative change in quantities, $\Delta Q_i/Q_i$, is calculated in four ways: (i) Flows of foreign investors with net purchases (sales) during the implementation day of additions (deletions) as a proportion of shares outstanding (circles). (ii) Flows among all investors with net purchases (sales) during the implementation day of additions (deletions) as a proportion of shares outstanding (rhombuses). (iii) Expected flows from foreign investors relative to market capitalization, assuming that all funds tracking MSCI indices rebalance after an addition/deletion (squares). (iv) Expected flows from foreign investors relative to market capitalization, assuming that only passive funds tracking MSCI indices rebalance (triangles). Solid horizontal lines indicate the median estimated elasticity obtained with each method.

# Tables

Table 1: Price Change, Investor Behavior, and Elasticities

| | (1) $\Delta P/P$ | (2) Foreign $[0,T]$ | (3) Foreign $[T]$ | (4) All investors $[T]$ | (5) MSCI all | (6) MSCI passive |
|---|---|---|---|---|---|---|
| Panel A. Change in prices ($\Delta P/P$) and quantities ($\Delta Q/Q$) | | | | | | |
| Mean | 6.65 | 3.21 | 2.37 | 2.51 | 24.24 | 1.23 |
| Std. errors | [1.24] | [0.64] | [0.49] | [0.5] | [3.5] | [0.2] |
| Median | 5.45 | 2.74 | 2.00 | 2.13 | 16.88 | 0.94 |
| Min | 0.87 | 0.04 | 0.04 | 0.07 | 3.46 | 0.09 |
| p25 | 3.10 | 1.08 | 0.68 | 0.69 | 15.66 | 0.64 |
| p75 | 8.10 | 4.40 | 3.29 | 3.40 | 30.46 | 1.93 |
| Max | 22.32 | 10.63 | 7.76 | 8.05 | 52.58 | 3.16 |
| No. Obs. | 18 | 18 | 18 | 18 | 18 | 18 |
| Panel B. Elasticities | | | | | | |
| Mean | | -0.84 | -0.63 | -0.67 | -6.67 | -0.34 |
| Std. errors | | [0.23] | [0.19] | [0.2] | [1.91] | [0.12] |
| Median | | -0.47 | -0.34 | -0.39 | -4.10 | -0.21 |
| Min | | -3.91 | -3.27 | -3.35 | -35.12 | -2.29 |
| p25 | | -1.01 | -0.63 | -0.65 | -7.84 | -0.37 |
| p75 | | -0.24 | -0.19 | -0.20 | -2.51 | -0.11 |
| Max | | 0.00 | 0.00 | -0.01 | -0.31 | -0.01 |
| No. Obs. | | 18 | 18 | 18 | 18 | 18 |

*Notes:* Panel A presents summary statistics for the relative changes in price $\Delta P_i/P_i$ and flows $\Delta Q_i/Q_i$. $\Delta P_i/P_i$ is calculated as the cumulative abnormal return between the announcement and implementation day. The relative change in quantities, $\Delta Q_i/Q_i$, includes the flows from investors with trades in the direction of the index rebalancing (i.e., purchases during addition and sales during deletion) and is calculated in five ways: Flows of foreign investors between the announcement and implementation day as a proportion of shares outstanding (column 2). Flows of foreign investors during the implementation day (column 3). Flows among all investors on the implementation date (column 4). Assuming that all funds following MSCI indexes rebalance (column 5) or that only passive funds rebalance (column 6). Elasticities are calculated under each definition of flows in Panel B.

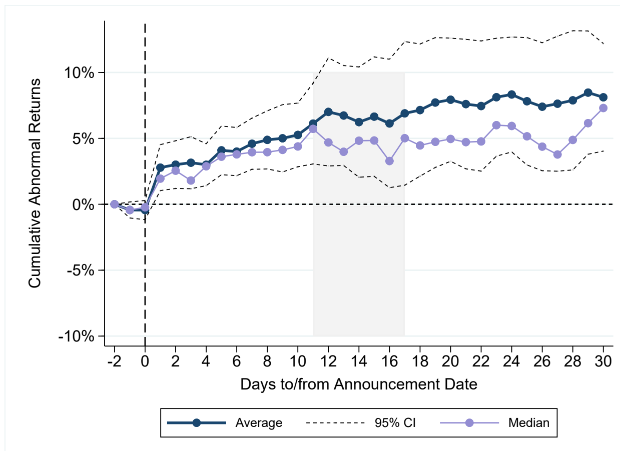
Table 2: Demand Elasticity and Domestic Investor Activity

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Event Window | | Pre-Event 3m | |
| | FM-NETABS | Vol. Share | NETABS | Vol. Share |
| Domestic Individuals | 0.311* | 0.213** | 0.516** | 0.447* |
| | (0.159) | (0.098) | (0.239) | (0.234) |
| Corporations | −0.680*** | −0.494* | −0.161 | −0.685*** |
| | (0.229) | (0.291) | (0.335) | (0.228) |
| Pension Funds | −0.019 | −0.286 | 0.223 | 0.585** |
| | (0.130) | (0.233) | (0.236) | (0.273) |
| Brokers | 0.298** | 0.197 | 0.041 | 0.071 |
| | (0.124) | (0.191) | (0.109) | (0.134) |
| Others | 0.251 | 0.297 | 0.328** | −0.121 |
| | (0.182) | (0.200) | (0.133) | (0.142) |
| Constant | −0.635*** | −0.635*** | −0.635*** | −0.635*** |
| | (0.183) | (0.199) | (0.166) | (0.145) |
| Observations | 18 | 18 | 18 | 18 |
| $R^2$ | 0.409 | 0.294 | 0.509 | 0.625 |

*Notes:* The dependent variable is demand elasticity ($e_i$). Column (1) uses foreign-matched net absorption (FM-NETABS) measured over the event window from announcement to implementation. For each event, foreign directional trades (buys for additions, sells for deletions) are matched to their counterparties; each group's share is its matched counterparty volume divided by total matched volume, including foreign-to-foreign trades. Column (2) uses each group's share of total trading volume over the same event window. Column (3) uses net absorption measured over the three months prior to the announcement month, defined as trading in the direction opposite to the event (net selling before additions and net buying before deletions). Column (4) uses each group's share of total trading volume over the same pre-event window. All investor-group variables are standardized. Heteroskedasticity-robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

# Appendix

Panel A. Cumulative Returns - Additions




Panel B. Cumulative Returns - Deletions

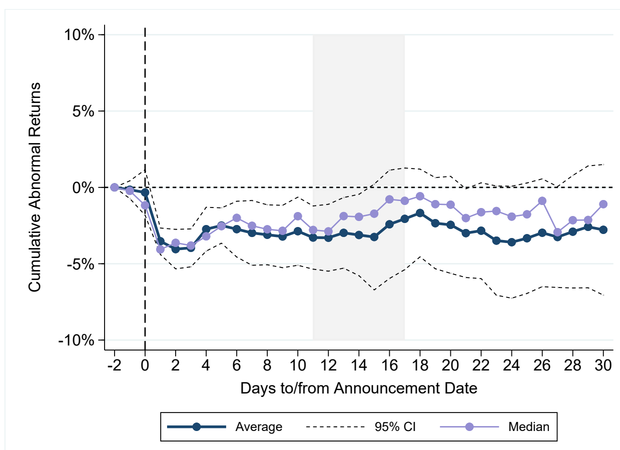



Figure A1: Evolution of Prices during Additions and Deletions

*Notes:* The figure presents the cumulative abnormal returns (CARs) during the event window for stock additions (Panel A) and deletions (Panel B). Abnormal returns are calculated as the difference between the stock returns and the implied returns from a single-factor model: $R_{st} - \hat{\beta}_s R_t^{D/s}$. $\hat{\beta}_s$ is calculated using daily stock returns in the year prior to the addition/deletion event with respect to the COLCAP, a value-weighted index for the domestic market, and excluding stock $s$. All returns are measured in domestic currency in excess of the local deposit rate. CARs are calculated for each event and averaged across stocks (solid line). CI = Confidence Interval. Panel B excludes the November 13, 2015 deletion of Isagen due to a private auction for the majority of the company's shares in the observation window.

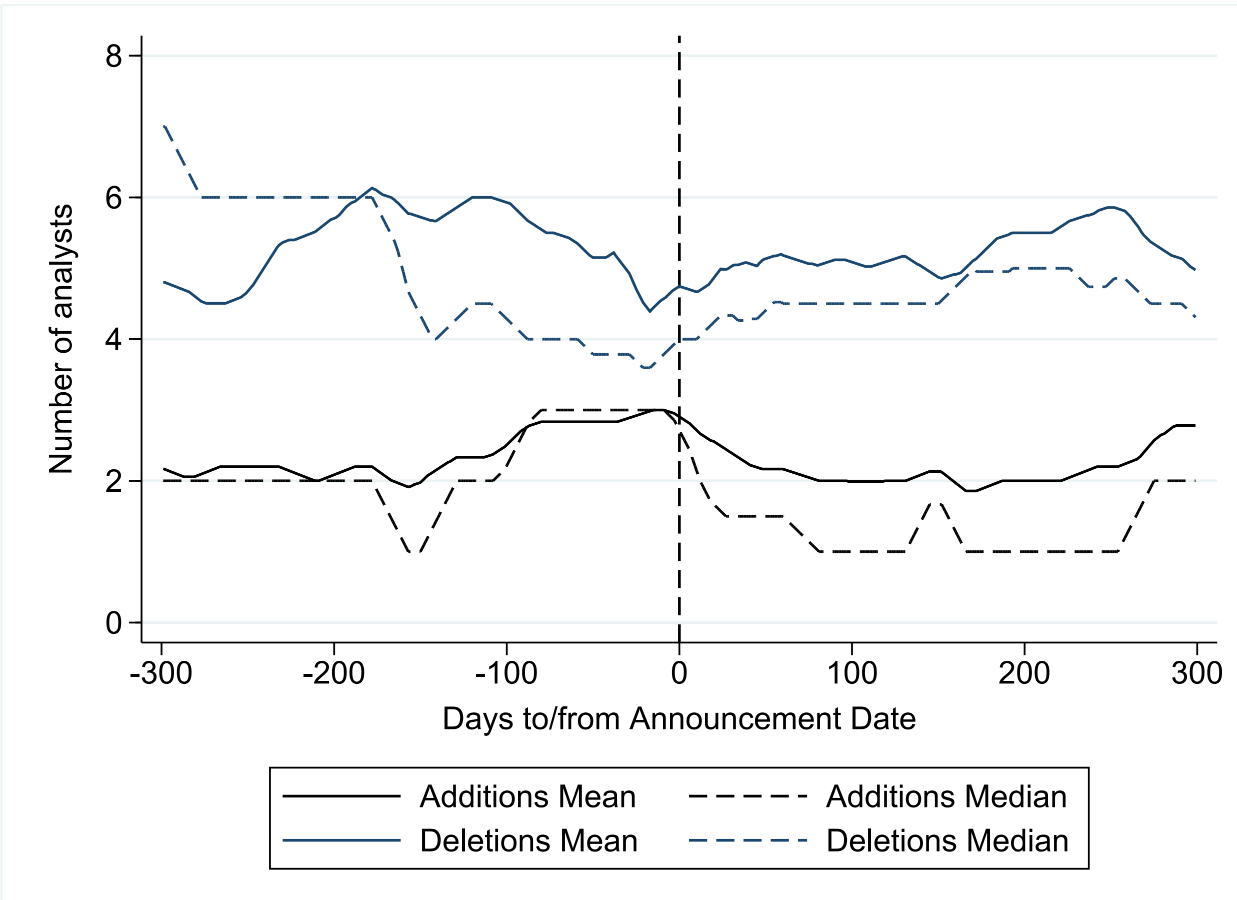



Figure A2: Analyst Coverage of Event Stocks

*Notes:* The figure presents the mean (solid line) and median (dashed line) number of analysts covering added and deleted stocks in a +/-300 trading days window around the event. The series is smoothed with a 20-day moving average.

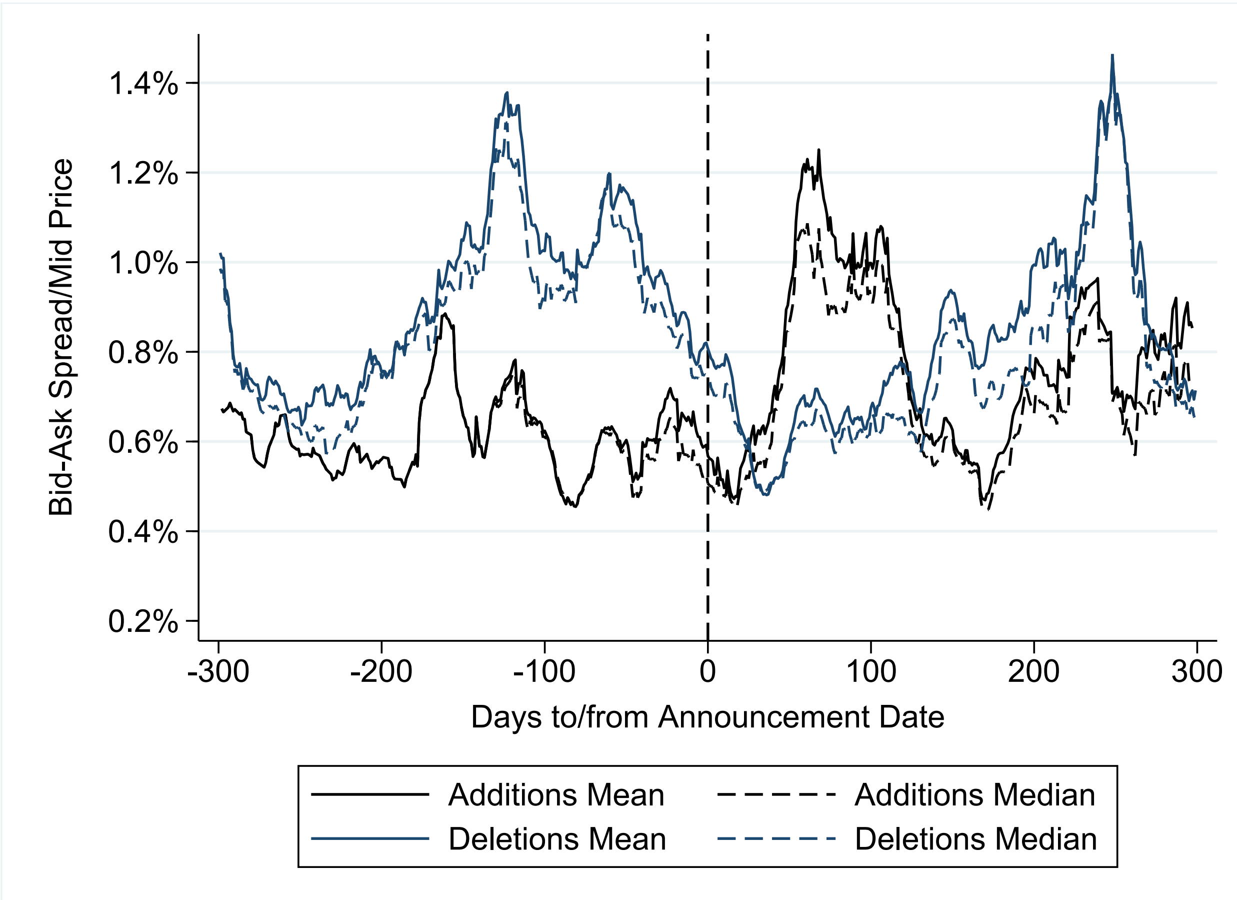
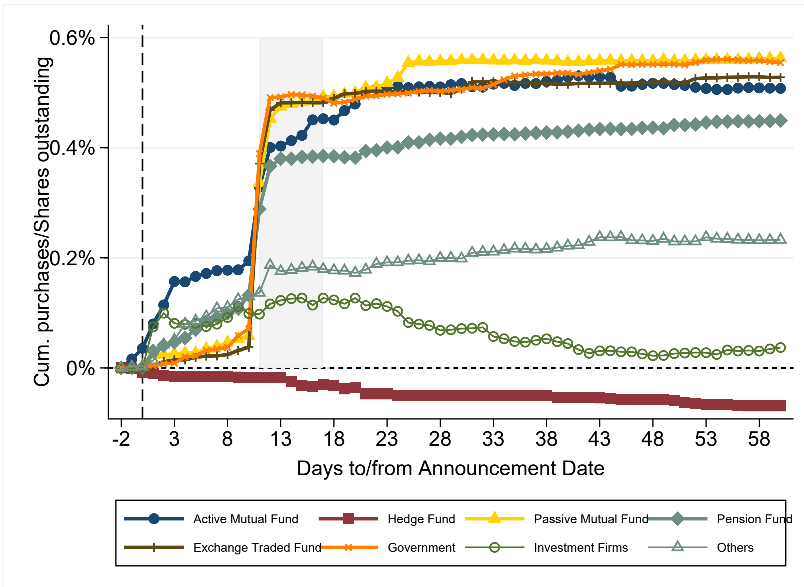



Figure A3: Bid-Ask Spread of Event Stocks

*Notes:* The figure presents the mean (solid line) and median (dashed line) of the bid-ask spread for added and deleted stocks in a +/-300 trading days window around the event. The bid-ask spread is normalized relative to the mid price of each stock. The series is smoothed with a 20-day moving average.

Panel A. All Foreign Investors




Panel B. Foreign investors buying (selling) the newly included (excluded) stock in $T$

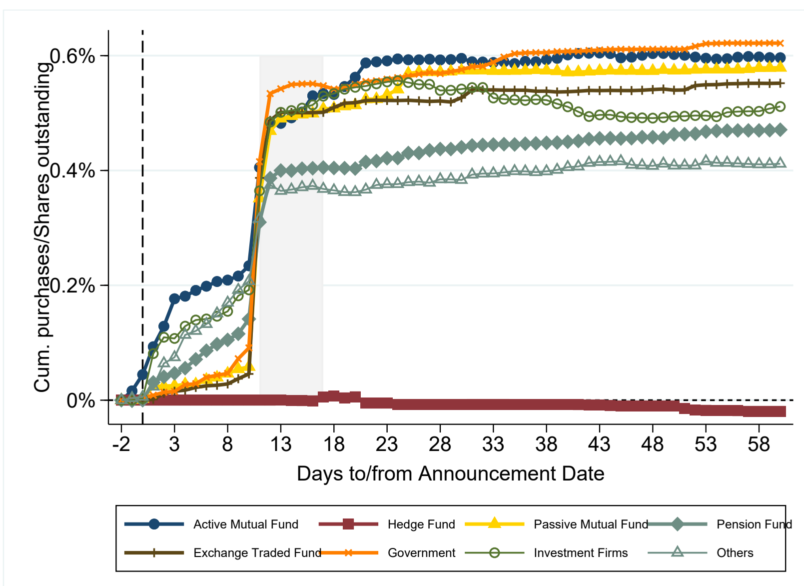



Figure A4: Flows by Investor Group

*Notes:* This figure presents the cumulative purchases of shares by foreign investors as a percentage of shares outstanding. For deletions, trades are multiplied by -1. Panel A displays the cumulative purchases of all foreign investors. Panel B restricts the sample to foreign investors with net purchases (sales) on the implementation date $T$.

## Table A1: Addition/Deletion events and FM-NETABS shares

| Company | Symbol | Type | Event | Announcement | FM-NETABS Share | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Individuals | Corporations | Pension F. | Brokers | Others | Foreign |
| Grupo de Inversiones Suramericana | GRUPOSURA | Common | Addition | 11/6/2007 | 0.558 | 0.099 | 0.014 | 0.118 | 0.108 | 0.103 |
| Ecopetrol SA | ECOPETROL | Common | Addition | 2/13/2008 | 0.722 | 0.120 | 0.001 | 0.064 | 0.032 | 0.060 |
| Grupo Nutresa SA | NUTRESA | Common | Deletion | 5/6/2008 | 0.029 | 0.024 | 0.788 | 0.050 | 0.027 | 0.082 |
| Almacenes Exito SA | EXITO | Common | Addition | 11/11/2009 | 0.148 | 0.064 | 0.392 | 0.272 | 0.021 | 0.102 |
| Corporacion Financiera Colombiana SA | CORFICOLCF | Common | Addition | 11/10/2010 | 0.267 | 0.020 | 0.566 | 0.045 | 0.065 | 0.037 |
| Grupo Aval Acciones y Valores SA | PFAVAL | Preferred | Addition | 11/15/2011 | 0.422 | 0.137 | 0.097 | 0.136 | 0.091 | 0.118 |
| Banco Davivienda SA | PFDAVVNDA | Preferred | Addition | 5/15/2012 | 0.258 | 0.261 | 0.062 | 0.198 | 0.161 | 0.061 |
| Grupo de Inversiones Suramericana | PFGRUPSURA | Preferred | Addition | 5/15/2012 | 0.151 | 0.163 | 0.202 | 0.119 | 0.113 | 0.253 |
| Isagen SA | ISAGEN | Common | Addition | 5/15/2012 | 0.288 | 0.202 | 0.025 | 0.113 | 0.228 | 0.145 |
| Cemex Latam Holdings SA | CLH | Common | Addition | 5/15/2013 | 0.018 | 0.023 | 0.000 | 0.077 | 0.017 | 0.864 |
| Bancolombia SA | BCOLOMBIA | Common | Deletion | 5/14/2014 | 0.246 | 0.153 | 0.158 | 0.177 | 0.075 | 0.191 |
| Cemex Latam Holdings SA | CLH | Common | Deletion | 5/12/2015 | 0.150 | 0.152 | 0.031 | 0.164 | 0.099 | 0.403 |
| Grupo Argos SA | PFGRUPOARG | Preferred | Deletion | 5/12/2015 | 0.296 | 0.192 | 0.138 | 0.056 | 0.043 | 0.275 |
| Almacenes Exito SA | EXITO | Common | Deletion | 11/12/2015 | 0.286 | 0.132 | 0.049 | 0.173 | 0.041 | 0.319 |
| Banco Davivienda SA | PFDAVVNDA | Preferred | Deletion | 11/12/2015 | 0.212 | 0.171 | 0.060 | 0.117 | 0.090 | 0.350 |
| Isagen SA | ISAGEN | Common | Deletion | 11/12/2015 | 0.163 | 0.080 | 0.514 | 0.074 | 0.064 | 0.106 |
| Corporacion Financiera Colombiana SA | CORFICOLCF | Common | Deletion | 5/15/2017 | 0.296 | 0.118 | 0.000 | 0.152 | 0.051 | 0.383 |
| Bancolombia SA | BCOLOMBIA | Common | Addition | 5/15/2017 | 0.134 | 0.162 | 0.214 | 0.121 | 0.062 | 0.307 |
| | | | | *Mean* | 0.258 | 0.126 | 0.184 | 0.123 | 0.077 | 0.231 |
| | | | | *Median* | 0.252 | 0.135 | 0.079 | 0.118 | 0.064 | 0.168 |

*Notes:* This table presents company names, stock symbols, stock type, announcement date, and FM-NETABS shares for each event in the sample. FM-NETABS shares are the fraction of foreign directional trades (buys for additions, sells for deletions) matched to each domestic investor group or to other foreign investors over the event window from announcement to implementation.

Table A2: Summary Statistics - Colombian Stock Market

| | 2006-2011 | 2012-2017 |
|---|---|---|
| Panel A. Traded volume by investor group (% of total traded value) | | |
| Domestic Investors | 91.9 | 76.3 |
| Brokers | 11.0 | 18.6 |
| Corporations | 16.3 | 12.9 |
| Domestic individuals | 41.3 | 19.2 |
| Mutual funds | 5.5 | 4.8 |
| Pension funds | 11.8 | 12.7 |
| Others | 5.9 | 8.0 |
| Foreign Investors | 8.1 | 23.7 |
| Active mutual funds | 1.1 | 5.0 |
| Passive mutual funds | 1.7 | 2.8 |
| Exchange-Traded Funds | 2.0 | 3.5 |
| Pension funds | 0.4 | 1.8 |
| Government institutions | 0.4 | 2.8 |
| Hedge funds | 0.1 | 0.3 |
| Investment firms | 0.8 | 5.2 |
| Others | 1.5 | 2.4 |
| Panel B. Event stocks vs. other stocks (million USD) | | |
| Stock with addition/deletion events | | |
| Average Market Capitalization | 12,130 | 14,653 |
| Median Market Capitalization | 4,970 | 7,482 |
| Average yearly traded value | 1,841 | 1,638 |
| Median yearly traded value | 1,005 | 1,143 |
| Other stocks | | |
| Average Market Capitalization | 1,842 | 2,509 |
| Median Market Capitalization | 684 | 838 |
| Average yearly traded value | 222 | 245 |
| Median yearly traded value | 3 | 6 |

*Notes:* Panel A presents the share of volume traded by different types of investors. Classification of domestic investors as reported by the Colombian Exchange. Foreign institutions are classified based on a manual web search of names as well as a cross-reference with FactSet Ownership. Panel B compares the market capitalization and the yearly trading value in USD of stocks with addition/deletion events and other listed companies in Colombia.

Table A3: Elasticities with Cumulative Abnormal Returns from 2-factor Model

| | | $\Delta$Q/Q | | Elasticities | | | |
|---|---|---|---|---|---|---|---|
| | **$\Delta$P/P** | **Foreign** | **All investors** | **Foreign** | **All investors** | **MSCI all** | **MSCI passive** |
| Mean | 6.28 | 2.37 | 2.51 | -0.37 | -0.40 | -3.73 | -0.15 |
| Std. errors | [1.24] | [0.49] | [0.5] | [0.19] | [0.2] | [1.79] | [0.10] |
| Min | -1.39 | 0.04 | 0.07 | -2.35 | -2.43 | -17.49 | -0.75 |
| p25 | 2.62 | 0.68 | 0.69 | -0.56 | -0.61 | -6.75 | -0.31 |
| Median | 5.21 | 2.00 | 2.13 | -0.35 | -0.38 | -4.23 | -0.21 |
| p75 | 7.94 | 3.29 | 3.40 | -0.09 | -0.09 | -2.17 | -0.10 |
| Max | 21.87 | 7.76 | 8.05 | 2.05 | 2.09 | 21.98 | 1.43 |
| No. Obs. | 18 | 18 | 18 | 18 | 18 | 18 | 18 |

*Notes:* The table presents summary statistics for the relative changes in price $\Delta P_i/P_i$ and flows $\Delta Q_i/Q_i$, and the estimated demand elasticity. $\Delta P_i/P_i$ is calculated as the cumulative abnormal return between the announcement and implementation day. Abnormal returns are calculated using a two-factor international asset pricing model. The relative change in quantities, $\Delta Q_i/Q_i$, is calculated in two ways: (i) Flows of foreign investors with net purchases (sales) during the implementation day of additions (deletions) as a proportion of shares outstanding. (ii) Flows among all investors with net purchases (sales) during the implementation day of additions (deletions) as a proportion of shares outstanding. *MSCI all* refers to elasticities calculated using expected flows from foreign investors relative to market capitalization, assuming that all funds tracking MSCI indices rebalance after an addition/deletion. *MSCI passive* refers to elasticities calculated assuming that only passive funds tracking MSCI indices rebalance.

Table A4: Medium-run elasticities

| | $\Delta P/P$ | | $\Delta Q/Q$ | Elasticities | |
|---|---|---|---|---|---|
| | [0,T] | [0, 60] | Foreign [0,60] | (1) | (2) |
| Mean | 6.65 | 3.72 | 3.74 | -1.14 | -2.28 |
| Std. errors | [1.24] | [3.58] | [0.67] | [0.43] | [0.89] |
| Median | 5.45 | 3.44 | 3.57 | -0.60 | -0.53 |
| Min | 0.87 | -35.38 | -0.05 | -8.09 | -10.91 |
| p25 | 3.10 | -1.69 | 1.37 | -1.12 | -2.99 |
| p75 | 8.10 | 8.72 | 6.87 | -0.26 | -0.08 |
| Max | 22.32 | 41.31 | 9.21 | 0.00 | 1.24 |
| No. Observations | 18 | 18 | 18 | 18 | 18 |

*Notes:* The table reports summary statistics for the relative changes in price $\Delta P_i/P_i$ calculated as the cumulative abnormal return between the announcement and implementation day (0 to T) and between the announcement and 60 business days (0 to 60). The relative change in quantities is calculated between t=0 and t=60, $\Delta Q_i/Q_i$, and includes the flows from investors with trades in the direction of the index rebalancing (i.e., purchases during addition and sales during deletion). Elasticities are calculated using the flows in the full period relative to the returns during the announcement and implementation (column 1) and relative to the returns in the 60-day window (column 2).