

On the role of affiliated brokerage houses in disseminating private information around M&A deals*

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* Authors gratefully acknowledge the financial support of the Scientific and Technological Research Council of Turkey (TUBITAK). The grant number is 119K124.

First draft: January 15, 2024

Abstract

This paper examines how the relationship between target firms and investment banks leads to the dissemination of private information in electronic limit order markets around mergers and acquisition deals. We analyze broker-level limit order book data on M&A deals for all stocks traded in Borsa Istanbul (BIST) between 2005 and 2015. Our findings suggest that brokers affiliated with the advisors of the target firms initiate more buy trades on the target's stock before the official announcements of M&A deals, allowing them to exert higher price impact and exploit the positive announcement returns. On average, net buy trading flow submitted by the affiliated brokers significantly increases by 72% during the pre-announcement period, which starts 30 days before the official announcement and ends on the announcement day. The average price impact of buy trades initiated by affiliated brokers during this period is around 7.7 basis points, significantly higher than that for unaffiliated brokers (5 bps). Thus, our results suggest that the private information percolated through brokerage houses affiliated with the target firm advisors is statistically and economically significant. To the best of our knowledge, our results are first in offering potential economic mechanisms for the information leakage problem around corporate events in BIST.

1. Introduction

This paper aims to provide an economic mechanism for the information leakage problem around corporate events, particularly evident in emerging economies. A key debate in the finance literature covers the recent question of the alternative economic channels by which material information is incorporated into the prices of financial assets (Dai et al., 2017). Mergers and acquisitions (M&A's) provide an ideal playground for testing alternative routes by which the information is impounded into securities prices, as a large body of literature documents illegal insider trading or information leakages before M&A deals (Aktas et al., 2007). M&A activities also carry a significant price impact on both the target and acquirer stocks traded in both emerging and developed markets (Jensen and Ruback, 1983; Mulherin and Boone, 2000; Andrade et al., 2001; Aktas et al., 2004; Yilmaz and Tanyeri, 2016, among many others). The earlier empirical evidence

overwhelmingly highlights illegal insider trading activities (Muelbrock, 1992; Cornell and Sirri, 1992; Chakravarty and McConnell, 1997; 1999) and information leakage problems on target stocks (Keown and Pinkerton, 1981; Dennis and McConnell, 1986; Sanders and Zdanowicz 1992; Keown et al., 1992; Arshadi and Eysell, 1993) around M&A deals. Target firms are also shown to be heavily involved in merger-related activities before the completion of the agreement, contaminating the proper identification of the first day that the M&A deal is started to be priced (Mulherin and Simsir, 2015). Information leakage problems are less evident in developed markets than in emerging economies, where the stock price reaction to M&A deals on the announcement date is much more limited (Yilmaz and Tanyeri, 2017).

Recently, Suk and Wang (2021) underline that the long-term abnormal returns after M&A deals increase with the net purchase ratios of target insiders, suggesting that informed trading of insiders prior to an M&A serves as a credible signal for the outcome of that deal. Dai et al. (2017) investigate the trading patterns of target firms in both equity and derivatives markets and conclude that the likelihood of insider-informed trading activity is associated with a greater presence of hedge funds with short-term investment horizons. Another strand of the literature proposes the conflict of interests within investment banks as a source for informed trading prior to M&A deals. Specifically, researchers question whether asset management divisions actively use the substantial private information held by the investment banking division. Existing studies provide contradictory evidence.

On the one hand, Bodnaruk et al. (2009) highlight that target advisors take positions in the targets before M&A announcements in the expectation of a price increase. Similarly, Jegadeesh and Tang (2010) demonstrate that funds affiliated with the target advisors are on the net-buy side around the M&A announcement. For the corporate bond market, Kedia and Zhou (2014) highlight the role of institutions affiliated with the M&A advisors in disseminating private information about the deal before the official announcement. On the other hand, Griffin et al. (2012) find no evidence that investment bank clients take advantage of connections in the stock market through IPO and SEO underwriting, lending relationships, or even takeover advising. Lowry et al. (2019) observe significant trading of client firms' options by advisor

banks ahead of merger announcements while they do not find kindred evidence for the client firms' stock. These results are consistent with the extended studies in market microstructure literature, which document that informed traders prefer options as they can leverage private information with lower costs via options (Black, 1975) or hide their private information more effectively (Biais and Hillion, 1994; Easley et al., 1998). Therefore, informed trading should occur in options markets (Vijh, 1990; Chan et al., 2002; Chakravarty et al., 2004; Pan and Poteshman, 2006)¹.

In this study, we test the advisor affiliation as an economic mechanism for information dissemination around M&A deals between 2005 and 2015 in an emerging exchange, Borsa Istanbul (BIST), where the primary venue for the price discovery is the stock market rather than the derivatives market. Derivatives markets became operational in BIST in 2012 (Omole et al., 2022). Even though single-stock futures and options are traded in the BIST derivatives market in our sample period, most derivatives trading is on currency futures and options. Omole et al. (2022) show that single-stock options and futures contracts exist for only 21 firms between 2017 and 2021 out of 500+ firms traded in the stock market. Even for the 21 firms that have derivatives trading, the depth is exceptionally limited, where the highest value for the average daily market cap in a single-stock option is a little under 50.000 Turkish Lira (TL) (around 10.000 U.S. Dollars [USD]). Therefore, for most firms traded in BIST, price discovery can only be achieved in stock markets.

Unlike its derivatives market, BIST has a vibrant stock market structured in an order-driven setting where the buy and sell orders match electronically with respect to price and time priority (Aktas and Kryzanowski, 2014). The Capital Markets Law in Turkey mandates all publicly traded firms to disclose their corporate announcements *first* on the fully electronic and centralized disclosure system called the Public Disclosure Platform. Unlike many emerging and developed markets, this mandate provides reliable and accurate identification of exact time stamps on official corporate announcements (Simsir and Simsek, 2022). During

¹ However, the question of whether price discovery is primarily achieved in stock or options market is a controversial debate in market microstructure literature. Easley et al. (1998) theoretically shows that informed traders do not prefer to trade in the derivatives market if the leverage advantage of options is not sufficiently large. For example, Muravyev et al. (2013) highlights the limited price discovery in options markets. Similarly, Collin-Dufresne et al. (2020) underlines that Schedule 13D filers seldomly use derivatives and often exclusively trade in the stock market.

our sample period, no brokerage house in BIST serves as a designated market maker. In addition, there is no heterogeneity across investors regarding the latency of order submission or trade execution. Therefore, none of the brokerage houses in our sample can serve as voluntary market makers. These attributes of our dataset allow us to isolate the role of broker affiliation in disseminating private information surrounding M&A deals.

In an emerging economy, BIST provides an ideal environment for examining the role of market intermediaries in disseminating private information they obtain from the real world to financial markets around corporate events. Turkey offers a distinct opportunity to explore bank affiliation on information dissemination in secondary markets. Commercial and investment banks are usually structured as financial conglomerates with various operations, such as insurance companies, closed-end funds, brokerage firms, and even real estate investment trusts operating in BIST². Bank affiliation has direct consequences in the Turkish equity market. For example, Guner and Onder (2022) have recently shown that bank-affiliated closed-end funds are trading at a discount compared to independent funds, controlling for fund characteristics and market conditions. These results imply that investors are willing to pay a premium to invest in funds affiliated with banks. One reason bank-affiliated funds are traded at a discount may be that financial conglomerates have a competitive advantage in accessing private information through investment or commercial banking activities. This information advantage, however, might create incentive conflicts between asset management and investment/commercial banking entities of the financial conglomerate (Lowry et al., 2019). In this study, we can directly test the conjecture of whether investment banks in Turkey actively use the private information they obtain about the target firm, for which they are the advisors in an M&A deal, in the secondary markets through their affiliated brokerage houses.

Furthermore, unlike many studies for emerging and developed economies, we distinguish traders in the intraday limit order book data at the broker level for all stocks traded in BIST between 2005 and 2015. We,

² Many affiliated firms actively use the name of their parent bank to benefit from its reputation (Guner and Onder, 2022)

therefore, can assign exogenous classifications for potentially informed traders depending on their affiliation with the target firm around M&A announcements at intraday frequency.

To assess whether affiliated brokerage houses disseminate private information and contribute to information leakage in BIST, we first examine the price reaction around M&A deals. In particular, we expect to observe cumulative abnormal returns on target stock to be significant and positive not only on the official announcement day but also before the announcement to argue information leakage problems around M&A deals. We then conjecture that if affiliated brokerage houses have an informational edge, they must be substantial (and abnormal) trading activity by affiliated brokerage houses but not by unaffiliated ones on target firm stock. Moreover, changes in the net trade flow (buyer- minus seller-initiated trades) from affiliated brokers must align with the overall price reaction. In that regard, we expect significant increases (decreases) in the net trade flow of (un)affiliated brokerage houses.

Even though changes in the (net or total) trade flow can indicate informed trading activity, it can also be considered as only suggestive evidence for the role of affiliated brokerage houses in disseminating private information. To directly test whether the customers of affiliated brokerage houses have an information advantage over others, we finally compare the price impact of trades submitted by affiliated brokerage houses to those submitted by unaffiliated brokerage houses. We conjecture that if the customers of affiliated brokerage houses have an information advantage over others, the average price impact of trades initiated by the orders submitted from the affiliated brokerage houses should be higher than trades commenced by orders submitted from unaffiliated brokerage houses. We compute price impact as the ratio between average price changes and value-weighted average prices separately from tick-by-tick data for buyer- and seller-initiated trades.

Using a sample of 37 M&A deals originated for firms publicly traded on bist between 2005 and 2015, we observe a statistically significant and positive price reaction to the M&A announcements. The cumulative average abnormal return on the announcement date is around 5%, indicating that the price reaction is also economically significant. However, the economic and statistical significance of the price reaction around

M&A announcements is lower than the findings documented for developed markets (Yilmaz and Tanyeri, 2016). We further demonstrate a significant price reaction (approximately two weeks) before the official announcement of M&A deals, which is in tandem with the findings of studies that investigate information leakages around corporate events in BIST (Hekimoglu and Tanyeri, 2011; Arslan and Simsir, 2016; Simsir and Simsek, 2022).

Next, we document that brokerage houses affiliated with the investment banks that serve as advisors to the target firm have an important role in disseminating private information before the official announcement of M&A deals. Specifically, we first show statistically and economically significant abnormal trading activity by affiliate brokers during the pre-announcement period, covering 30 days before up until the announcement day. The same results are not evident for unaffiliated brokers. The cumulative average abnormal trading activity for the affiliated brokers reaches 5 million TL (roughly 2.5 million USD) in the pre-announcement period. It is significantly larger than the cumulative abnormal trading activity for unaffiliated brokers (around 3 million TL). We further document abnormal affiliate participation in the overall trading activity in the pre-announcement period, especially starting two weeks ahead of the announcement day.

We then examine the variation in net trades of affiliated and unaffiliated brokerage houses around M&A announcements. We observe that clients of the affiliated brokerage houses take positions on the buy-side much earlier than the observed price impact before M&A deals. In addition, we document that the abnormal net-buy trading activity is statistically significant for affiliated brokers. In contrast, we do not observe abnormal movements in the net trades passing through unaffiliated brokerage houses. Moreover, in line with our expectations, we demonstrate that the net-buy trade volume passing through the affiliated brokerage houses increases on average by 72% during the pre-announcement period, even after controlling for unobserved heterogeneity due to target firms, brokers, and time.

Up to this point, however, our findings provide only suggestive evidence of the private information content of the trades initiated by the customers of affiliated brokerage houses. We then compare the price impact associated with transactions initiated by affiliated and unaffiliated brokerage houses to directly test the

informational differences between these two types of brokers around M&A deals. Our results suggest that the average price impact of buy trades initiated by affiliated (unaffiliated) brokerage houses is around 7.70 (5.09) basis points during the pre-announcement period. We observe a similar finding for the seller-initiated trades where the price impact for affiliated (unaffiliated) brokerage houses is around -8.55 (-6.60) basis points. The differences are statistically significant at a 1% level for both sides of the trade.

Overall, our findings support the conjecture that affiliated brokerage houses have an informational advantage compared to unaffiliated brokerage houses around M&A deals. We provide substantial evidence supporting the studies that argue that the private information on the target stock regarding the M&A deal is (at least in part) disseminated from the brokerage houses affiliated with the investment banks that serve as target advisors. To the best of our knowledge, this study is the first to test advisor affiliation channels as an economic mechanism for information dissemination in stock markets in intraday frequency for a fully order-driven market in an emerging economy. Consequently, we argue that bank affiliations can lead to the intentional disclosure of private information by affiliated brokers before corporate events, even in order-driven markets where brokers are assumed to be passive agents, transmitting clients' orders to the exchange.

These results contribute to the extended literature on disseminating private information around corporate events. The literature on the information leakage problem around M&A deals suggests that financial institutions affiliated with target advisors may actively use private information about the firm's stock in secondary markets. For instance, Jegadeesh and Tang (2010) find that, on average, funds affiliated with the target advisors are net buyers of the target stock before the official announcement of the M&A deal. Dai et al. (2017) highlight the role of short-term hedge funds in exploiting deal-related information before the official announcement. Lowry et al. (2019) document informed trading activity by target advisors in options markets before the announcements. Bittner et al. (2021) identify information leakage between, rather than within, banks around M&A deals. Specifically, they document that banks with closer ties to target advisors in takeovers obtain significantly more stocks of the target firm before the official announcement.

Our results also contribute to the literature on insider trading. The early papers in this literature find a substantial impact of trades illegally initiated by insiders on price formation and overall trade volume (Muelbroek, 1992; Chakravarty and McConnell, 1997; Fische and Robe, 2004, among others). The intraday analyses of legal insider trades support the line of argument suggesting that insider trades lead to faster price discovery in the short term (Aktas et al., 2008; Inci et al., 2010; Inci and Seyhun, 2012). McNally et al. (2017) highlight that brokers tip their clients about insider trades. Barbon et al. (2019) argue brokers' ability to leak information about the order flow of connected clients. Simsir and Simsek (2022) study the short-term impact of legal insider trading on the price discovery process for BIST. In most emerging markets, including BIST, informed trading activity is also documented to start several days before the official announcement of corporate events. Informed trading, proxied by the changes in adverse selection components of the spread, is also shown to have a systematic impact on equity prices in BIST (Savaser and Tiniç, 2023). Existing studies in the literature refer to insider trading, tipping, and other means of dissemination of private information as sources of information leakage before corporate events (Bhattacharya et al., 2000; Bhattacharya and Douk, 2002; Hekimoglu and Tanyeri, 2007; Griffin et al., 2011; Arslan and Simsir, 2016) even though the identity of informed investors is not necessarily confirmed. These studies, therefore, rely on the endogenous classification of informed traders, which may depend on the interaction between different types of traders (Menkveld and Soru, 2023). In that regard, we propose to link the endogenous informativeness of trade with exogenous affiliation between target firms, investment banks serving as advisors, and their broker subsidiaries that operate in BIST. To that end, we provide a direct economic mechanism for disseminating private information before the official announcements of M&A deals.

We also contribute to the literature on the role of intermediaries in order-driven markets where there are no designated market makers. In such trading environments, the classical market microstructure models assume brokers to be passive agents whose sole purpose is to transmit client's orders to the exchange (Harris, 2003). While there is substantial work on the price discovery process in order-driven settings (Parlour, 1998;

Ranaldo, 2004; Foucault et al., 2007; Cao et al., 2009), the number of studies that focus on brokers' role as information aggregators remain limited. The increasing ubiquity of order-driven markets around the globe may lead to the conclusion that the information role of market intermediaries in the price discovery process will be restricted in the future. However, our results suggest that affiliation between target firms, investment banks as advisors, and their affiliated brokerage houses can lead to the intentional disclosure of private information around M&A deals, which implies that even in order-driven settings where there are no designated (or voluntary) market makers, brokers can substantially influence stock price formation.

2. Data

Using the SDC premium database, we obtained merger and acquisition (M&A) deals for all stocks traded in Borsa Istanbul (BIST) between March 2005 and November 2015³. Each entry in the SDC premium database contains the announcement date, the name, and the ticker of the target firm. To assess the role of affiliated brokerage houses in disseminating private information around M&A deals, we only use observations in the SDC sample that have the name of the target advisor available. For some stocks, there are multiple entries within a year. If this is the case, we only use the announcement date attributed to the first observation within the given firm-year. Our final sample contains 37 deals for 34 different stocks.

For all of the target stocks in our sample, the intraday order and trade data come from BIST Datastor. Each entry in our order dataset has the date, time, ticker, order ID, order type, quantity, and price stamps. Moreover, we also observe the broker ID, which provides information about the brokerage house that transmits that order to BIST. Using broker ID, we can identify and examine the heterogenous price impact across brokerage houses before M&A deals on the target firm's stock.

³ Our sample period ends in November 2015 because BIST stopped disclosing the broker ID on publicly available order book data with the introduction of BISTECH system in November 2015. Before the BISTECH system, there was no difference across investors vis-à-vis order submission and trade execution latency. Therefore, there are no high-frequency traders operate in BIST in our sample period. Recent evidence suggests that proprietary trades of brokerage houses (otherwise known as principal trades) have an information advantage over customer (agency) trades during our sample period (Tiniç et al., 2022). In this study, we employ variation at the broker level since we cannot distinguish principal orders from agency orders as the publicly available dataset do not contain information regarding the trader type.

Each entry in the trade data includes the date, time, ticker, quantity, price, and order IDs for both the buy and the sell sides of the trade. Moreover, the trade data includes a trade direction flag indicating the active side of each transaction. Therefore, we do not rely on external trade classification algorithms that are shown to create bias in estimations for BIST stocks (Aktas and Kryzanowski, 2014).

We stack buyer- and seller-initiated trading volumes for each brokerage house on the target's stock around each event in our sample at a daily frequency. In particular, the daily trading volume of each brokerage house is calculated starting one year (252 trading days) before the announcement up until and including the announcement date $[-252,0]$. Let $B_{b,i}$ and $S_{b,i}$ denote the buyer- and seller-initiated trades for broker b around event i . Similar to Bittner et al. (2022), we define two variables, $NETFLOW_{b,i}$ and $BUY_{b,i}$ to capture the direction of the trade around the announcement of the M&A deals as follows:

$$NETFLOW_{b,i} = \begin{cases} \log(B_{b,i} - S_{b,i}) & \text{if } (B_{b,i} - S_{b,i}) > 0 \\ -\log(B_{b,i} - S_{b,i}) & \text{if } (B_{b,i} - S_{b,i}) < 0 \end{cases} \quad (1)$$

$$BUY_{b,i} = \begin{cases} 1 & \text{if } (B_{b,i} - S_{b,i}) > 0 \\ 0 & \text{if } (B_{b,i} - S_{b,i}) < 0 \end{cases} \quad (2)$$

In line with Bittner et al. (2022), we also define the pre-announcement period as the days covering from 30 days before up until the announcement day, that is, $[-30,0]$. Therefore, $PREANN_i$ is a dummy variable that takes one for the period $[-30,0]$ for each event i , and zero otherwise.

Finally, we construct an affiliation measure to assess the heterogeneities across brokerage houses with respect to information percolation and price discovery around M&A deals. Specifically, the relationship between target firms and brokerage houses is captured $AFFILIATED_{b,i}$ dummy, which takes the value one if the investment bank affiliated with broker b serves as an advisor to the target firm in the event i and zero otherwise.

Table 1 describes the summary statistics and the pairwise correlations among the variables. We observe that the mean for NETFLOW is around -0.08, indicating that the absolute difference between buy and sell

volume for a given broker is around -1 million Turkish Lira (TL) on average. We also observe that for some trading days, there can be substantial trade imbalances through some brokers in our sample. The sample maximum and minimum for *NETFLOW* are 17.63 and -17.93, indicating that for a given broker on a single stock, the trade imbalances can reach up to 48 and 61 million TL on the buy and sell side, respectively. In our sample, on average, 1% of the observations belonging to brokerage houses are affiliated with target stocks. 149 different brokers send orders to the BIST for the target stocks in our sample. The number of unique affiliated brokerage houses is 16. In Table 1 – Panel B, we observe a significant positive correlation between *NETFLOW* and *BUY*, as expected.

Insert Table 1 here.

3. Methodology

We start our analyses by investigating the average stock price response around M&A announcements in Borsa Istanbul. For each event, we stacked daily cumulative abnormal returns in the event period, beginning 30 days before the announcement and ending five days after the announcement [-30,5]. Let $R_{i,t}$ be the percentage return for the target firm's stock for the event i on day t . The (market-adjusted) abnormal return $AR_{i,t}$, is then calculated as the difference between the return of the target stock and the market index (BIST100) return on day t , that is, $AR_{i,t} = R_{i,t} - R_{m,t}$. Then, the cumulative abnormal returns are given by $CAR_{i,t} = \sum_{d=-29}^t (AR_{i,d} + AR_{i,d-1})$.

To examine the average stock price response, we run the following model:

$$CAR_{i,t} = \kappa_t \sum_{t=-20}^5 DAY_{i,t} + \gamma_t + \delta_s + \varepsilon_{i,t} \quad (3)$$

Where $DAY_{i,t}$ provides the dummies for $t \in [-20,5]$ for event i . δ_t corresponds to *date* fixed effects to control for the unobserved variation in each day of the event period. γ_s provides the *stock* fixed effects to account for the unobserved characteristics attributed to target firms. When testing the statistical significance of the coefficients, we cluster the standard errors at the stock and date level.

To assess whether affiliated brokers play any role in leaking information concerning the M&A deal, we first examine the heterogeneities across different brokers (affiliated vs. unaffiliated) with respect to the total trade volume around the announcement. Specifically, we then investigate whether the changes in trade volumes are unusual by computing the abnormal trade volume calculated as the difference between realized and expected trading volume for a given trading day. The expected trading volume for each event is calculated as the average daily trading volume of the target's stock in the estimation window [-250, -190].

Next, we examine whether there are unexpected changes in affiliate participation, calculated as the ratio between the trade volume initiated by the orders submitted from the affiliated brokers and the total trade volume. Abnormal affiliate participation is the difference between realized and expected affiliate participation, obtained as the average daily affiliate participation of the target's stock in the estimation window.

We then examine both groups (target affiliated and unaffiliated) vis-a-vis the signed trade flow around the announcement. If the affiliated brokerage houses are informed, we expect the signed trading volume to be in tandem with the overall price reaction. Furthermore, to examine whether the signed trade flow significantly differs between affiliated and unaffiliated brokerage houses during the pre-announcement period of M&A deals, we estimate the following equations:

$$\begin{aligned}
 NETLFW_{b,i} &= \beta_0 PREANN_i \\
 &+ \beta_1 AFFILIATED_{b,i} \\
 &+ \beta_2 PREANN_i * AFFILIATED_{b,i} + \theta_{s,t} + \mu_{b,t} + \varepsilon_{b,i}
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 BUY_{b,i} &= \beta_0 PREANN_i \\
 &+ \beta_1 AFFILIATED_{b,i} \\
 &+ \beta_2 PREANN_i * AFFILIATED_{b,i} + \theta_{s,t} + \mu_{b,t} + \varepsilon_{b,i}
 \end{aligned} \tag{5}$$

In both models, the coefficient of interest, β_2 , provides the average changes in the signed trade flow before the official announcement of M&A deals. That is, equations (4) and (5) enable us to examine whether the signed (informed) trade flow from affiliated brokerage houses significantly changes during the pre-announcement period.

Finally, we compare the price impact of trades initiated by the orders submitted from affiliated brokerage houses to the ones submitted by unaffiliated brokers to determine whether the customers of affiliated brokerage houses have the informational edge ahead of M&A announcements. We expect that if the connected brokers tip the privy information to their clients, the price impact of the trades initiated by the orders submitted from affiliated brokerage houses should be higher than that of trades initiated by the orders transmitted by unaffiliated brokers. For each transaction of the target's stock in the pre-announcement period, we calculate the price impact as the ratio between average price changes and the value-weighted average price ($PI = \Delta P/VWAP$). To that end, we can separate the price impact for both the direction of the trade (buyer- vs. seller-initiated) and the trader type (affiliated vs. unaffiliated).

4. Results

We present the estimates obtained from equation (3) in Figure 1. In line with the overwhelming empirical evidence in the existing literature, we document a significant price impact for the target stock on the day of the M&A announcement. In particular, the cumulative average abnormal return of the target firm at the announcement date of the deal, $\widehat{\kappa}_0$, is around 5.5%. The average stock price response is statistically significant at a 5% level. Similar to the findings of the recent studies on corporate announcements in BIST (Hekimoglu and Tanyeri, 2011; Arslan and Simsir, 2016; Simsir and Simsek, 2023), we observe that the information regarding the M&A deal seems to start to be incorporated into the prices a week before the official announcement day. Specifically, we follow point estimates for days -3, -2, and -1, $\{\widehat{\kappa}_{-3}, \widehat{\kappa}_{-2}, \widehat{\kappa}_{-1}\}$, which are around 3.1%, 3.7%, and 4.1%, and all are statistically significant at a 10% confidence level. We further test the significance of the cumulative abnormal return for several sub-periods in the pre-

announcement period using Brown and Warner's (1985) event study methodology⁴. We observe that the cumulative abnormal return for the pre-announcement period $CAR[-30,0]$ is 5.8% and is statistically significant at a 5% level. While $CAR[-30,-11]$ is approximately 1% and statistically insignificant, $CAR[-10,0]$ equals 4.8% and is statistically significant at a 5% level. These findings may imply that the news associated with the M&A deal arrives at (disseminated to) the market earlier than (approximately two weeks prior to) the official announcement.

Insert Figure 1 here.

To assess whether the brokerage houses affiliated with the target stock play a role in disseminating material information ahead of merger announcements, we first examine whether there are abnormal trading levels in the pre-announcement period. For the pre-announcement period of a given event, we calculate the daily abnormal trading as the difference between realized trade volume and the expected trade volume, which is taken as the average daily trading volume in the estimation window $[-250,-190]$. Our construct enables us to obtain daily abnormal trade volumes for both the affiliated and unaffiliated brokers, along with the total. Table 2 provides the daily average abnormal volume for affiliated and unaffiliated brokers. The results presented in Table 2 – Panel A suggest brokers affiliated with target advisors initiate unexpectedly high trading volumes for most days (25 out of 30) in the pre-announcement period. In Panel B, however, we do not observe similar results for the unaffiliated brokers. Even though the abnormal trading activity for the unaffiliated brokers is also significant for 15 days in the pre-announcement period, the differences in abnormal trading levels between affiliated and unaffiliated brokers are only negative; that is, unaffiliated abnormal trading levels are higher only for eight days in the pre-announcement period. This finding may indicate that affiliated brokers are the main contributors to the total abnormal trading activity. Therefore, we can argue that the statistical and economic significance of the abnormal trading activity is, on average, higher for affiliated brokers than unaffiliated ones. We also plot the daily average (cumulative) average abnormal trade volumes in Figure 2 (3). Similar to our results in Table 2, we observe that affiliated brokers

⁴ Appendix A provides the daily average abnormal returns.

significantly contribute to abnormal trading activity, especially in the two weeks before the announcement. The cumulative average abnormal trading activity for affiliated brokers reaches up to 5 million Turkish Lira (TL) (roughly equalling 2.5 million U.S. Dollars) on the announcement day, and it is significantly larger than the daily cumulative average abnormal trade volume for unaffiliated brokers, which is around 3 million TL.

Insert Table 2 here.

Insert Figures 2 and 3 here.

Next, we investigate whether there are unexpected changes in the affiliated broker participation, calculated as the ratio between the affiliated trading volume and the total trading volume on the target stock. Abnormal affiliate participation is the difference between realized and expected affiliate participation, which is the average daily participation in the estimation window. For our sample, the average daily participation for the affiliate brokers in the estimation window is around 41 basis points (bps). We present the average abnormal trade participation in Table 3 and Figure 4 for each trading day in the pre-announcement period. The results presented in Table 3 indicate that brokers' trading activity on target stock significantly increases in the pre-announcement period, especially two weeks ahead of the official announcement day. Specifically, the daily average abnormal affiliate participation varies between 113 bps and 42 bps between [-10,-2], indicating that average affiliate participation at least doubles (and some days almost triples) its expected levels. Therefore, the rise in affiliate broker trading is not only statistically significant but also economically significant in the pre-announcement period. We further notice that the increase in the affiliate broker participation roughly coincides with the abnormal rise in the returns, as we previously noted that the statistical economic significance of the $CAR[-10,0]$ is much larger compared to $CAR[-30,-11]$.

Insert Table 3 and Figure 4 here.

We further examine whether there are abnormalities in the net trading activity (the buyer-initiated minus the seller-initiated trades) for the affiliated brokerage houses in the pre-announcement window. Figure 5

presents the daily cumulative average net trading volume for affiliated and unaffiliated brokers. In Figure 5, we observe that the daily cumulative net trade volume for affiliated brokers reaches up to 20 million TL (10 million USD). In line with our expectations, we observe that clients of affiliated (unaffiliated) brokers are predominantly on the buy (sell) side of the trade in the pre-announcement period. To examine whether the net trading activity of affiliated and unaffiliated brokers is unexpected, we compute the daily abnormal net trade volume for each type of brokerage house as the difference between the daily realized trading volume and the expected volume, which is calculated as the average daily net trading volume over the estimation window. The cumulative average abnormal net trading volumes for affiliated and unaffiliated brokerage houses are presented in Figure 6. We observe that over the stock of the target firm, there is a significant abnormal net trading activity for the affiliated brokerage houses (reaching over 350.000TL in the pre-announcement period). In contrast, the abnormal net trading volume for unaffiliated brokerage houses is statistically and economically insignificant. Similar to our previous findings, we observe that the cumulative average abnormal net volume generated by the orders that the customers of affiliated brokerage houses submit becomes positive approximately four weeks before the official announcement day. Therefore, we can argue that clients of brokers affiliated with target advisors start to take net buy positions on target firms' stock much earlier than the initial price reaction to the M&A news. These findings may underline the importance of brokerage houses affiliated with advisor investment banks in disseminating private information about the target firm.

Insert Figures 5 and 6 here

Table 4 – Panels A and B document the estimates obtained from equations (4) and (5), respectively, and the relationship between the target firm and the brokerage houses is measured by whether a brokerage house is affiliated with the investment bank serving as an advisor to the target firm in the M&A deal. The results in Table 4 – Panel A suggest that the net trading flow submitted through affiliated brokerage houses is positive on average. We expect informed traders to be on average on the buy side since our previous results suggest that cumulative average abnormal returns are also positive. In all three specifications, the coefficient of the

interaction term, $\hat{\beta}_2$, is statistically significant. Using the most conservative estimate, we can argue that informed trading activity proxied by the net trading flow from the affiliated brokerage houses increases by 72% in the pre-announcement period, even after controlling for unobserved heterogeneity across brokers, stocks, and time. A similar relationship is observed in Panel B, where we document that when trading the target stock, the customers of the affiliated brokerage houses are significantly more likely to be on the net buy side compared to the customers of unaffiliated brokerage houses during the pre-announcement period of M&A deals. Overall, these results suggest that 1) The abnormal returns on the announcement days are smaller, and the price reaction starts much earlier than the official announcement day of M&A deals. 2) There is abnormal trading activity generated by the customers of the affiliated brokerage houses on the target stock during the pre-announcement period. 3) The trade direction of the customers of the affiliated brokerage houses during the pre-announcement period is in line with the overall price reaction. 4) The increase in the net-buy trades is significantly more evident for the affiliated brokerage houses during the pre-announcement period, even after controlling for unobserved heterogeneity across stocks, brokers, and time. These four items may further provide suggestive evidence for customers of affiliated brokerage houses to have an information advantage on target stock over others. Moreover, these findings may also imply that target advisors disseminate private information about the target stock through their affiliated brokerage houses in secondary markets prior to the official announcements of M&A deals.

Insert Table 4 here

To empirically test whether customers of the affiliated brokerage houses have an information advantage over others, we finally compare the price impact of trades initiated by the orders submitted from affiliated brokerage houses to unaffiliated ones during the pre-announcement period. We conjecture that if the customers of affiliated brokerage houses have an informational edge, the price impact of trades initiated by the orders submitted through affiliated brokerage houses should be higher than trades commenced by orders submitted through other brokerage houses. For each day in the pre-announcement period, we compute the ratio between average price changes and value-weighted average prices from tick-by-tick data for buyer and

seller-initiated trades. Figure 6 – Panel A shows that the average price impact of buy trades initiated by the orders submitted through affiliated (unaffiliated) brokerage houses is around 7.70 (5.09) basis points. Moreover, in Figure 6 – Panel B, we observe that the average price impact for sell trades initiated by the orders submitted from the affiliated (unaffiliated) brokerage houses is approximately -8.55 (-6.60) basis points. These results suggest that brokers affiliated with investment banks that serve as advisors in M&A deals have a higher price impact than unaffiliated brokers on the stock of the target firm, not only on the buy side but also on the sell side of the trade. The results of simple t-tests suggest that a 2.61 (-1.95) basis points difference in price impact per trade is statistically significant at a 1% level for buyer- (seller-) initiated trades. Given that the absolute price impact of an average trade is 8.3 basis points in our sample, the additional price impact attributed to the affiliated brokerage houses is also economically significant.

Insert Figure 6 here

Overall, we document significant abnormal trading activity for the affiliated brokers but no abnormal trading activity for unaffiliated brokers on target stock in the pre-announcement period, supporting the arguments for informed trading activity by affiliated brokers. We further show that customers of the brokerage houses affiliated with advisors of the target firm are significantly on the buy-side when trading the target firm's stock before official announcements of the M&A deals. Combining this finding with the average positive stock response would suggest that affiliated brokerage houses have an information advantage over the others. In addition, we show that in the pre-announcement period, trades that the customers of affiliated brokerage houses submit have a higher price impact compared to those that are submitted by customers of unaffiliated brokerage houses.

These findings support the conjecture that the relationship between the target firm and the investment banks that serve as advisors in M&A deals is a potential mechanism that leads to the dissemination of private information regarding the target firm's stock. Therefore, we can argue that investment banks can disseminate the private information they obtain about their clients around M&A deals to secondary markets by using their affiliated brokerage houses as a channel. To that end, we argue that broker affiliations in centralized

limit order book markets can lead to the intentional disclosure of private information prior to corporate events.

5. Conclusion

In this study, we aim to unravel a potential economic mechanism associated with information leakage surrounding corporate events, particularly within the realm of mergers and acquisitions (M&A). Specifically, we examine the role played by brokerage houses affiliated with investment banks, emphasizing their substantial impact on the intentional disclosure of material information before the M&A deals are officially completed. Our results underscore significant abnormal trading patterns, net buy positions, and heightened price impact attributed to these affiliated brokers, highlighting their active role in shaping the information dissemination process and challenging conventional perceptions of brokers as mere conduits for trade execution in order-driven markets.

Looking beyond the context of emerging economies where our study is situated, our findings offer universal insights into the intricate dynamics of information flow in financial markets. We demonstrate that broker affiliations carry significant implications for understanding how private information is disseminated, emphasizing the need for a nuanced consideration of these affiliations even in order-driven markets. Leveraging a comprehensive dataset, we provide a robust foundation for future investigations into the evolving role of financial intermediaries in shaping information transmission dynamics. The implication of our results extends to regulators, investors, and researchers, offering a valuable perspective on the multifaceted nature of information dissemination around corporate events.

Tables and Figures

PANEL A: DESCRIPTIVE STATISTICS				
	NETFLOW	BUY	PREANN	AFFILIATED
OBSERVATIONS	118,823	118,823	118,823	118,823
MEAN	-0.083	0.761	0.528	0.010
STD.DEV	6.775	0.426	0.499	0.101
MINIMUM	-17.93	0	0	0
MAXIMUM	17.69	1	1	1
PANEL B: PAIRWISE CORRELATIONS				
NETFLOW	1.000			
BUY	0.775***	1.000		
PREANN	-0.002	-0.004	1.000	
AFFILIATED	0.000	-0.006*	0.002	1.000

Table 1 – Descriptive statistics and pairwise correlations: This table provides descriptive statistics and pairwise correlations of each variable used in our analyses. NETFLOW is the logarithmic transformation of the absolute difference in buy and sell flows at the broker-date level. BUY is a dummy variable that takes one if NETFLOW is positive. PREANN is a dummy variable that takes one for the period covering 30 days before [-30,0] an M&A announcement (event) and zero otherwise. AFFILIATED is defined as a dummy variable that takes one if a broker is affiliated with the advisor of the target firm for an M&A deal. ***, **, *, respectively, denote statistical significance at a 1% level.

PRE- ANNOUNCEMENT PERIOD	PANEL A: AFFILIATED (TARGET ADVISOR) BROKERS		PANEL B: UNAFFILIATED BROKERS		DIFFERENCE
	ABNORMAL VOLUME (1)	t-STATISTICS (2)	ABNORMAL VOLUME (1)	t-STATISTICS (2)	
-30	0.1**	(1.72)	0.03	(0.3)	0.07
-29	0.14***	(2.53)	0.11*	(1.34)	0.03
-28	0.05	(0.84)	0.16**	(1.85)	-0.11
-27	0.11**	(2.01)	0.21***	(2.4)	-0.1
-26	0.05	(0.89)	0.09	(1)	-0.04
-25	0.08*	(1.47)	0.07	(0.82)	0.01
-24	0.02	(0.32)	0.07	(0.8)	-0.05
-23	0.08*	(1.43)	0.06	(0.73)	0.02
-22	0.12**	(2.07)	0.01	(0.16)	0.11
-21	0.16***	(2.89)	0.11*	(1.34)	0.05
-20	0.15***	(2.71)	0.08	(0.99)	0.07
-19	0.1**	(1.75)	0.14*	(1.63)	-0.04
-18	0.15***	(2.65)	0.09	(1.06)	0.06
-17	0.06	(1.03)	0.06	(0.74)	0
-16	0.05	(0.95)	0.11*	(1.33)	-0.06
-15	0.17***	(2.91)	0.03	(0.34)	0.14
-14	0.18***	(3.11)	0.11*	(1.33)	0.07
-13	0.24***	(4.2)	0.16**	(1.86)	0.08
-12	0.17***	(3.06)	0.12*	(1.41)	0.05
-11	0.19***	(3.33)	0.15**	(1.79)	0.04
-10	0.31***	(5.46)	0.03	(0.3)	0.28
-9	0.32***	(5.65)	0.11*	(1.33)	0.21
-8	0.48***	(8.52)	0.15**	(1.73)	0.33
-7	0.24***	(4.22)	0.15**	(1.74)	0.09
-6	0.2***	(3.44)	0.08	(0.88)	0.12
-5	0.13**	(2.27)	0.02	(0.28)	0.11
-4	0.19***	(3.35)	0.08	(0.9)	0.11
-3	0.25***	(4.31)	0.05	(0.63)	0.2
-2	0.33***	(5.72)	0.06	(0.73)	0.27
-1	0.12**	(2.06)	0.32***	(3.69)	-0.2
0	0.3***	(5.32)	0.97***	(11.36)	-0.67

Table 2 - Daily average abnormal trading volume in target stocks around M&A announcements: This table shows the Turkish Lira-denominated (TL-denominated) average abnormal trade volume for each trading day in the pre-announcement period for affiliated and unaffiliated brokers. Panel A and B provide the abnormal trading levels for affiliated and unaffiliated brokers, respectively. In each panel, the first column represents the abnormal volume in millions of TL, and the second column presents the corresponding t-statistics. For each group (affiliated, unaffiliated), the abnormal volume is the difference between the realized volume and the expected volume proxied by the average volume in the estimation window [-250, -190]. Standard errors are obtained as the standard deviation of the daily trade volume in the estimation window. ***, **, * respectively denote statistical significance at 1%, 5%, and 10% levels.

PRE-ANNOUNCEMENT PERIOD	ABNORMAL PARTICIPATION	t-STAT	PRE-ANNOUNCEMENT PERIOD	ABNORMAL PARTICIPATION	t-STAT
-30	0.0032	(1.15)	-14	0.0037*	(1.32)
-29	0.003	(1.05)	-13	0.0045*	(1.62)
-28	-0.0004	(0.13)	-12	0.0035	(1.25)
-27	0.0009	(0.32)	-11	0.0033	(1.19)
-26	0.0005	(0.17)	-10	0.011***	(3.92)
-25	0.0018	(0.64)	-9	0.0079***	(2.83)
-24	-0.0004	(0.15)	-8	0.0113***	(4.03)
-23	0.0019	(0.66)	-7	0.0048**	(1.7)
-22	0.0043*	(1.55)	-6	0.0052**	(1.84)
-21	0.0036	(1.28)	-5	0.0042*	(1.5)
-20	0.0039*	(1.38)	-4	0.0049**	(1.77)
-19	0.0013	(0.46)	-3	0.0075***	(2.66)
-18	0.0034	(1.21)	-2	0.0098***	(3.51)
-17	0.0009	(0.32)	-1	-0.0001	(0.03)
-16	0.0001	(0.04)	0	-0.0005	(0.17)
-15	0.0054**	(1.93)	AVERAGE PARTICIPATION [-250,-190]	0.0041	

Table 3 - Daily average abnormal participation of affiliated brokers. This table provides the daily abnormal participation for affiliated brokers in the pre-announcement period. Daily participation for affiliated brokers is calculated as the ratio between the Turkish-Lira-denominated (TL-denominated) daily trade volume of affiliated brokers and the TL-denominated total trade volume. The abnormal daily participation is the difference between realized daily participation and the expected daily participation proxied by the average daily participation in the estimation window [-250,-190]. ***,**,* respectively denote statistical significance at 1%, 5%, and 10% levels.

	PANEL A: NETFLOW			PANEL B: BUY		
	(1)	(2)	(3)	(1)	(2)	(3)
AFFILIATED	-0.342 (0.335)	-0.631 (0.479)	-0.349 (0.337)	-0.00802 (0.0177)	-0.0194 (0.0233)	-0.0113 (0.0178)
PREANN30 * AFFILIATED	0.721* (0.424)	1.067* (0.633)	0.734* (0.426)	0.0449** (0.0226)	0.0849*** (0.0305)	0.0510** (0.0226)
PREANN30			-0.413*** (0.110)			-0.0304*** (0.00632)
INTERCEPT	-0.0832*** (0.0197)	-0.0822*** (0.0198)	0.135** (0.0615)	0.761*** (0.00112)	0.761*** (0.00112)	0.777*** (0.00351)
Observations	118,823	118,823	118,823	118,823	118,823	118,823
Adjusted R-squared	0.018	0.018	0.008	0.188	0.195	0.179
Broker FE	YES	NO	YES	YES	NO	YES
Stock FE	NO	NO	YES	NO	NO	YES
Date FE	NO	NO	YES	NO	NO	YES
Stock-Date FE	YES	YES	NO	YES	YES	NO
Broker-Date FE	NO	YES	NO	NO	YES	NO

Table 4 – Broker-level regressions: This table provides the results for the following model: $NETFLOW_{b,i} = \beta_0 PREANN_i + \beta_1 AFFILIATED_{b,i} + \beta_2 AFFILIATED_{b,i} * PREANN_i + \theta_{s,t} + \mu_{b,t} + \varepsilon_{b,i}$ where NETFLOW is the logarithmic transformation of the absolute difference in buy and sell flows at the broker-date level. BUY is a dummy variable that takes one if NETFLOW is positive. AFFILIATED is defined as a dummy variable that takes one if a broker is affiliated with the advisor of the target firm for an M&A deal. $\theta_{s,t}$ corresponds to target stock-date fixed effects. Similarly, $\mu_{b,t}$ corresponds to broker-date fixed effects. The values in parenthesis are robust standard errors. ***, **, * respectively denote statistical significance at 1%, 5%, and 10% levels.

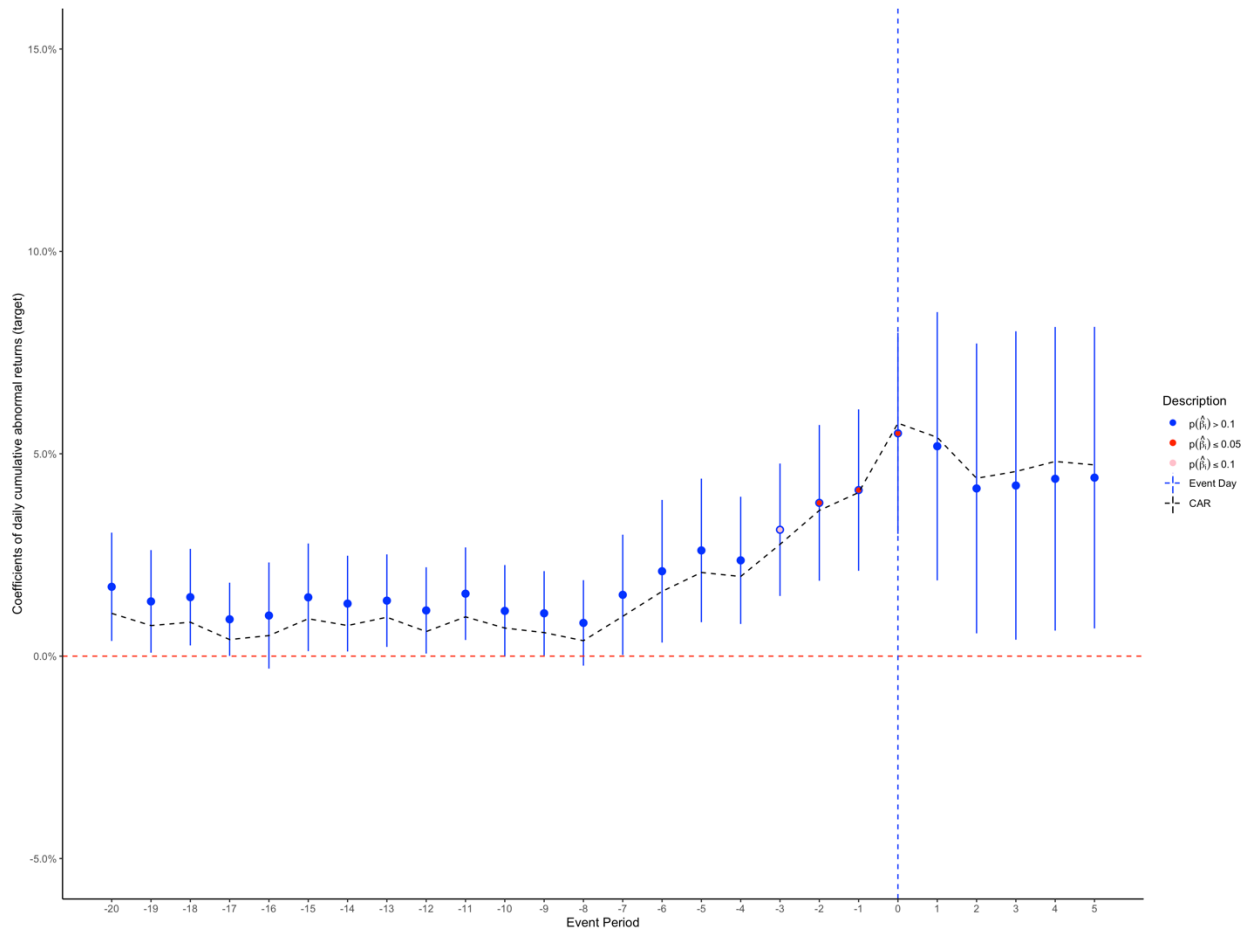


Figure 1 - Daily cumulative average abnormal returns in target stocks around M&A announcements. This figure provides the point estimates and the corresponding standard errors for 20 days before the announcement and five days after using the following equation: $CAR_{i,t} = \beta_t \sum_{t=-20}^5 DAY_{i,t} + \delta_t + \gamma_s + \varepsilon_{i,t}$, on a sample at the stock level stacked with respect to each event ranging from 30 days before to five days after the M&A announcement. Standard errors are clustered at the target stock and date level.

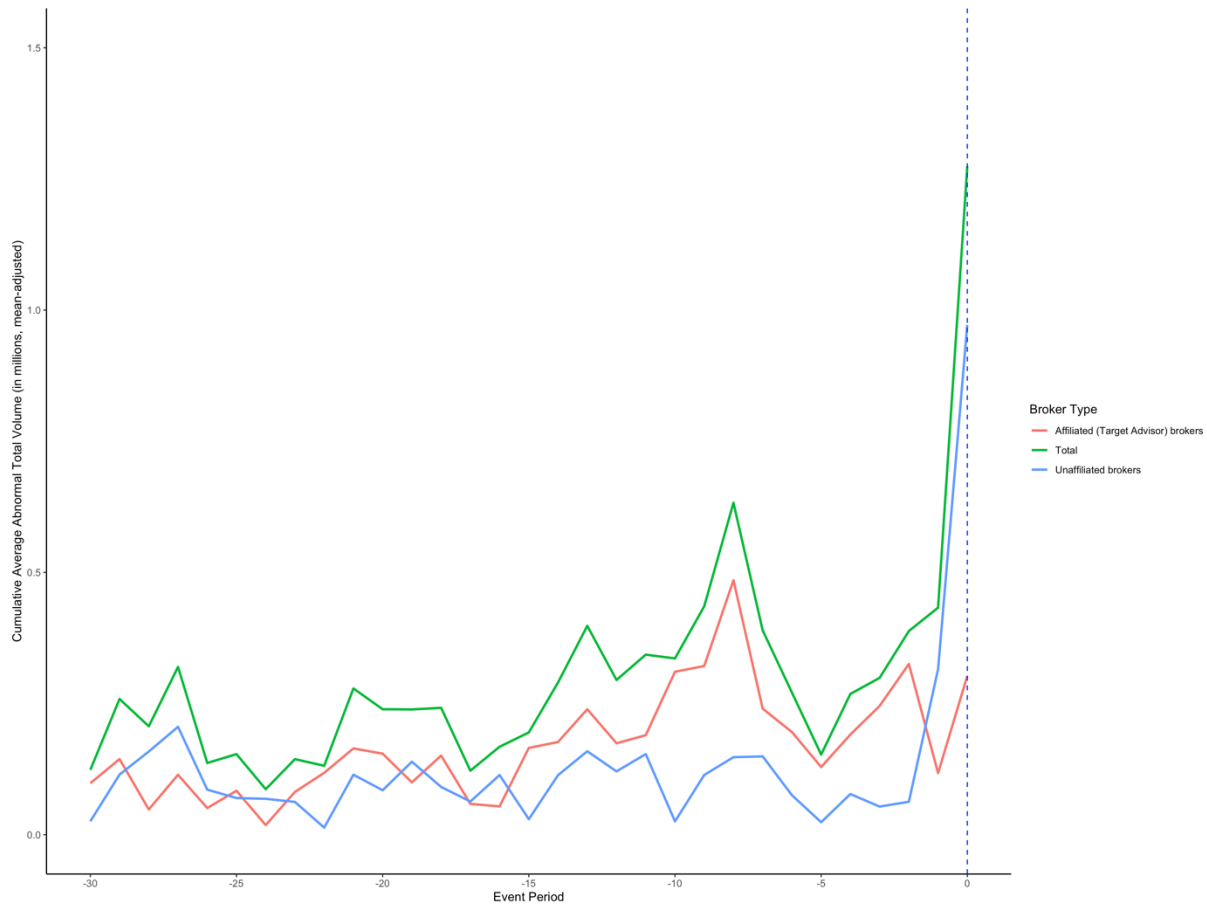


Figure 2 - Daily average abnormal trading volume in target stocks around M&A announcements. This figure provides the Turkish Lira-denominated (TL-denominated) average abnormal trade volume for each trading day in the pre-announcement period for affiliated and unaffiliated brokers, along with the total. For each group (affiliated, unaffiliated, and total), the abnormal volume is the difference between the realized volume and the expected volume proxied by the average volume in the estimation window [-250, -190].

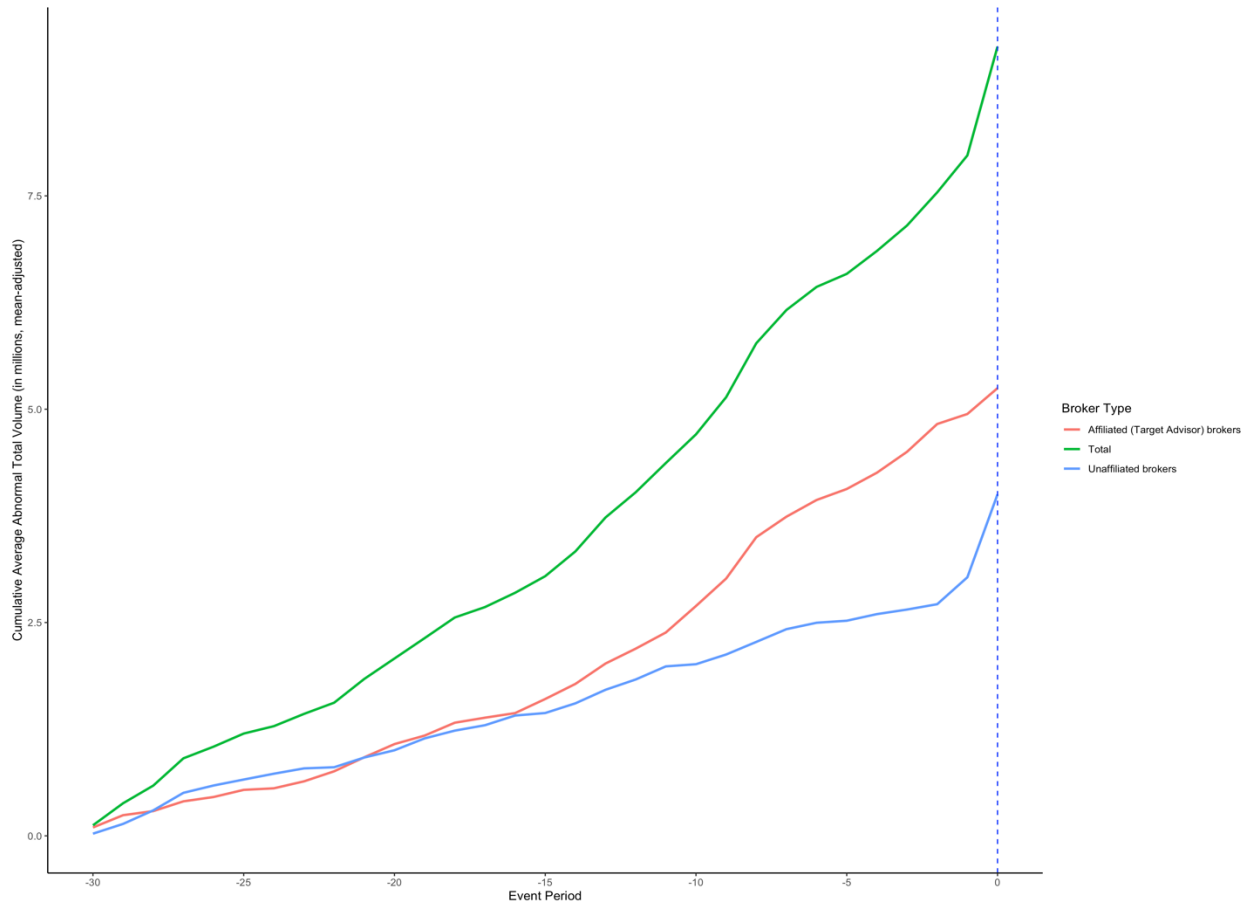


Figure 3 - Daily cumulative average abnormal trading volume in target stocks around M&A announcements. This figure provides the Turkish Lira-denominated (TL-denominated) cumulative average abnormal trade volume for each trading day in the pre-announcement period for affiliated and unaffiliated brokers, along with the total. For each group (affiliated, unaffiliated, and total), the abnormal volume is the difference between the realized volume and the expected volume proxied by the average volume in the estimation window [-250, -190].

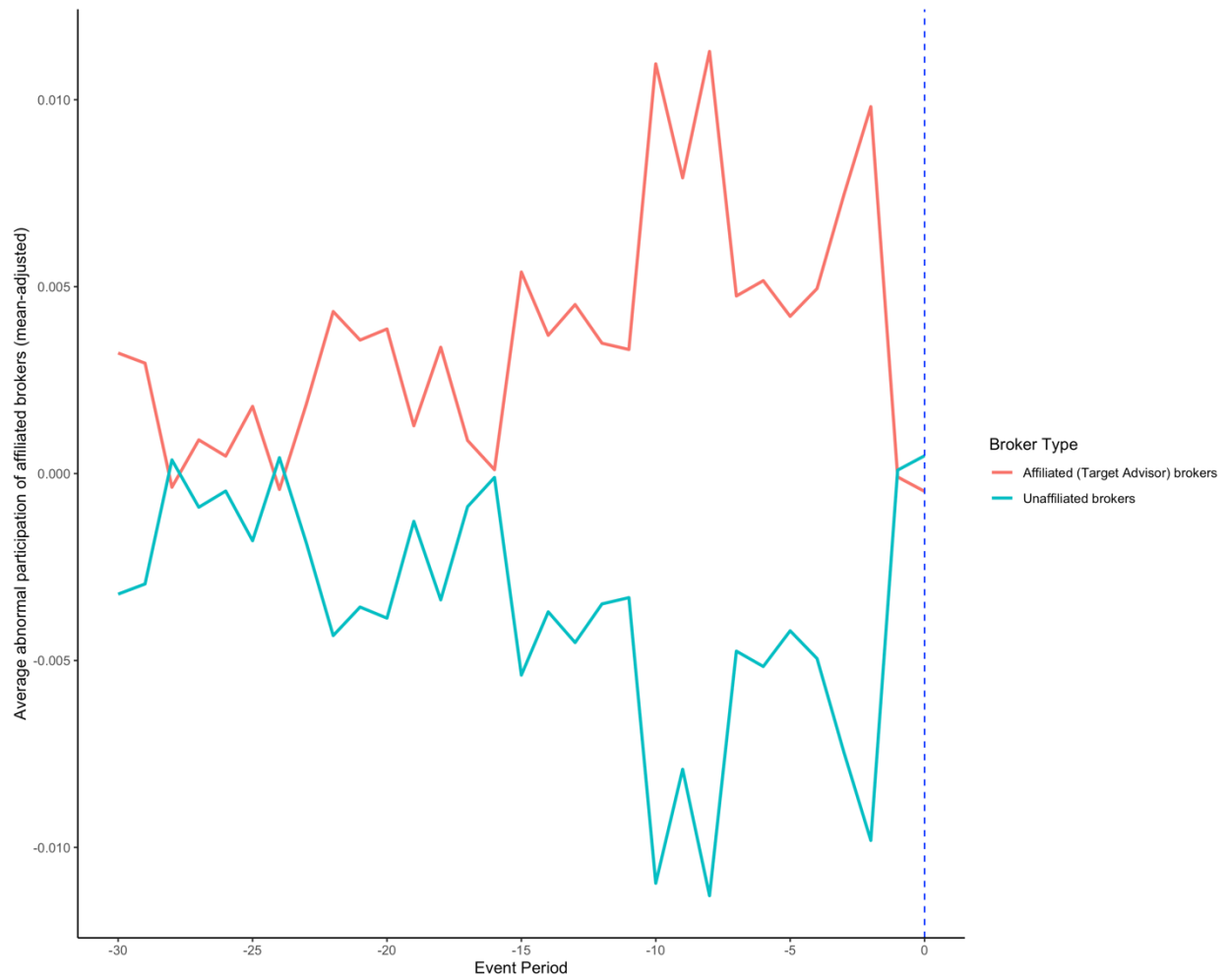


Figure 4 - Daily average abnormal participation of brokers. This figure provides the daily abnormal participation for affiliated and unaffiliated brokers. Daily participation for each group is calculated as the ratio between the Turkish-Lira-denominated (TL-denominated) daily trade volume of a group (affiliated or unaffiliated) and the TL-denominated total trade volume. The abnormal daily participation is the difference between realized daily participation and the expected daily participation proxied by the average daily participation in the estimation window [-250,-190].

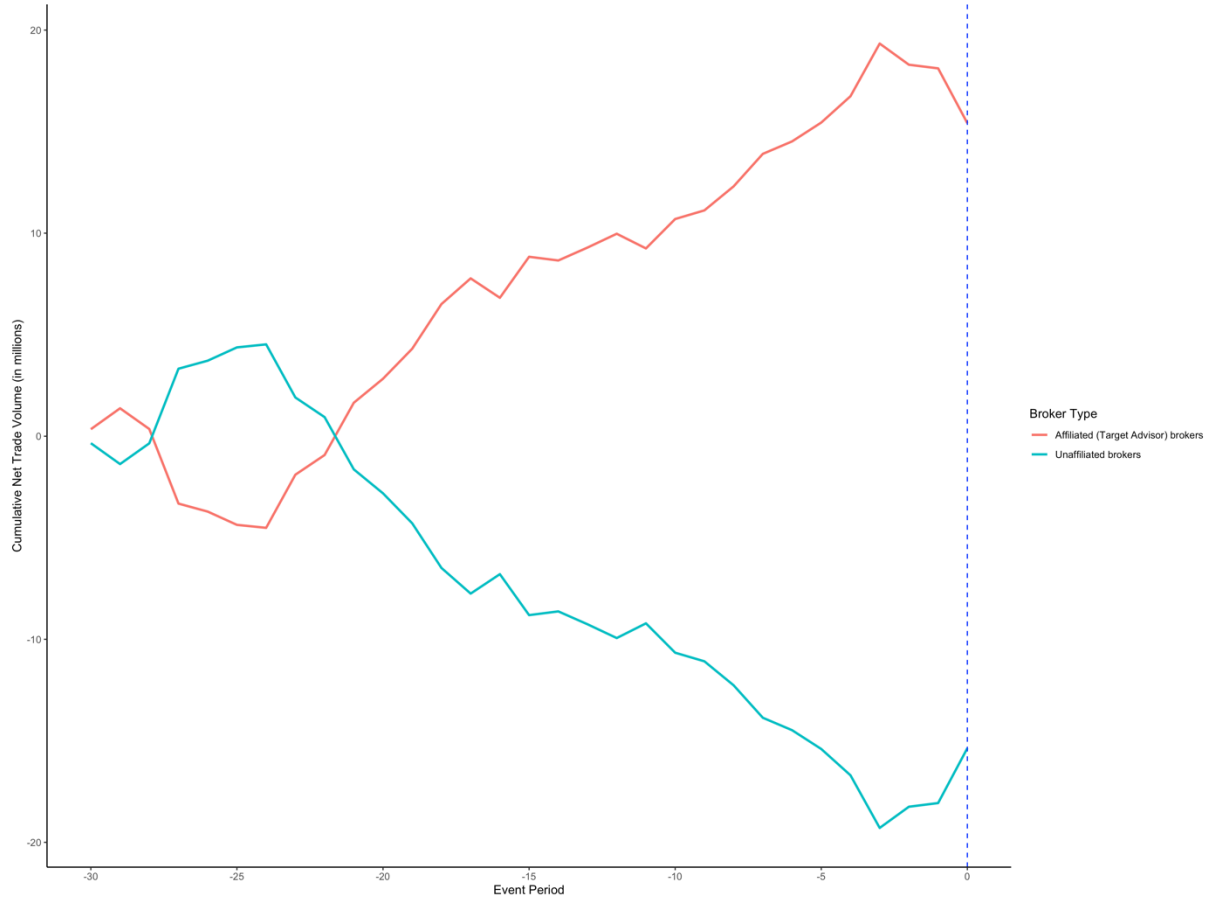


Figure 5 – Daily cumulative net trade volume to target stocks around M&A announcements. This figure provides the cumulative average net flows transmitted to Borsa Istanbul by affiliated and unaffiliated brokerage houses for the target stock during the pre-announcement period [-30,0]. Net flows is calculated as the difference between buyer-initiated trade volume and the seller-initiated trade volume. All values are denominated in the local currency, Turkish Lira.

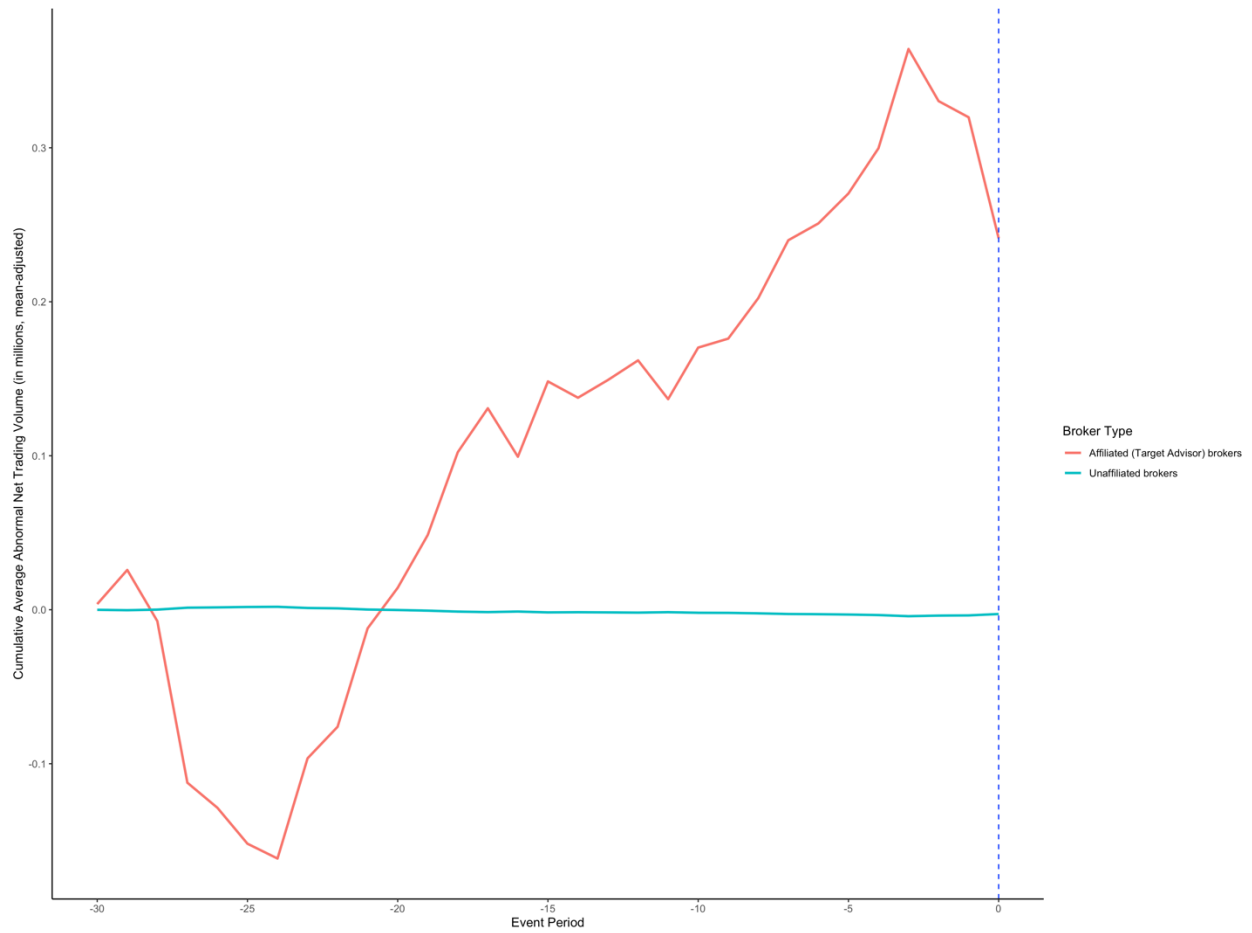


Figure 6 – Daily cumulative average abnormal volumes in target stocks around M&A announcements. This figure provides the mean-adjusted cumulative daily average abnormal net trading volumes around M&A announcements. Net trade volume is the difference between buyer-initiated and seller-initiated trading volumes. For each trading day in the pre-announcement period [-30,0], we calculate the abnormal net volume as the difference between the realized and the expected net volume proxied by the average net volume in the estimation window [-250, -190].

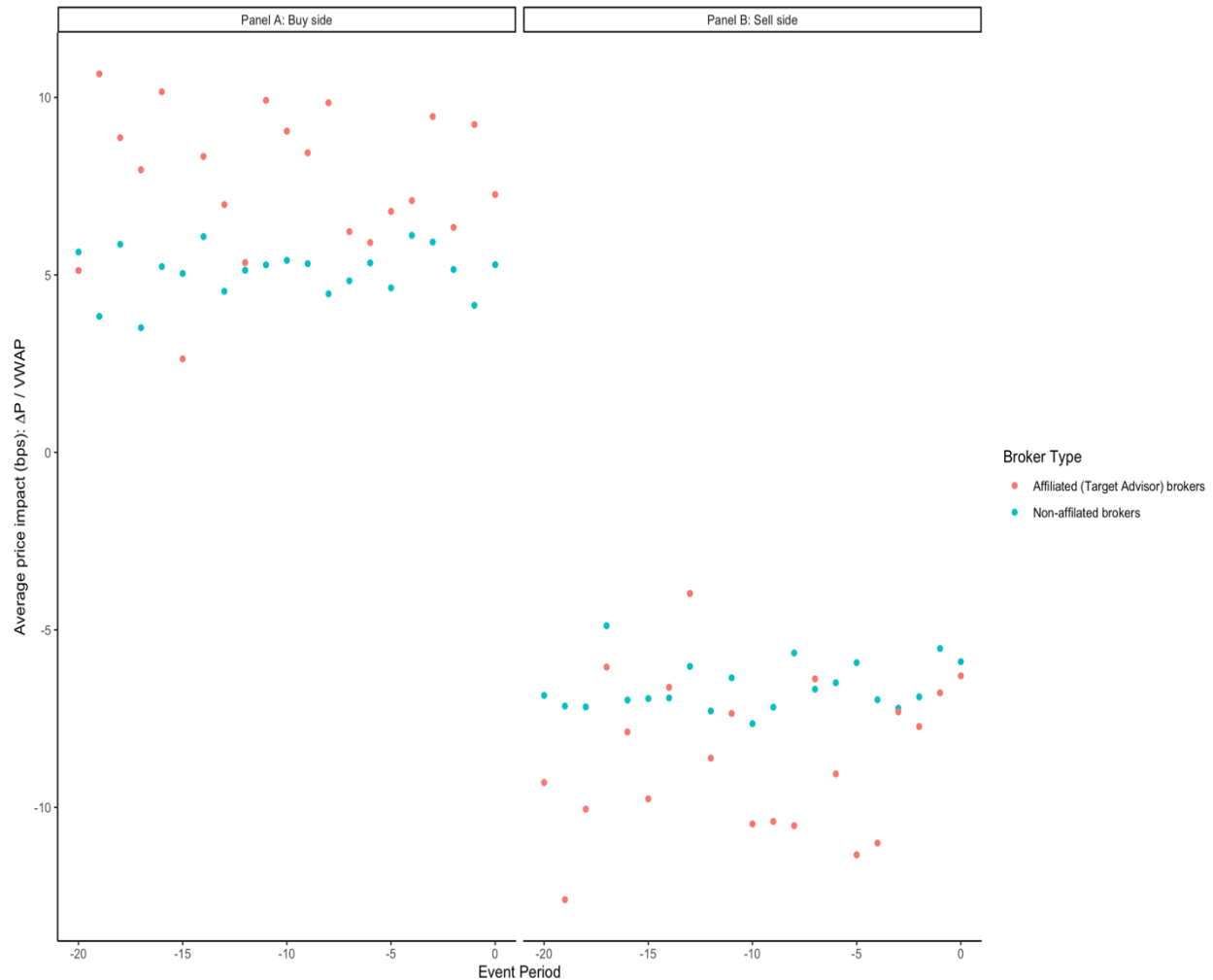


Figure 7 – Comparison of price impact with respect to different brokerage houses. This figure compares the average price impact of different brokerage houses on target stock around M&A announcements. The Y-axis corresponds to the average price impact computed by the ratio of price changes to the value-weighted average price for each broker type (affiliated and unaffiliated). The X-axis corresponds to the days in the pre-announcement period [-30,0]. A brokerage house is said to be affiliated if a bank affiliated with the broker is in the same business group as the target advisor. Panel A and B correspond to the buy and sell side of the trade, respectively. In Panel A, the average difference in the price impact between affiliated and unaffiliated brokerage houses is 2.61 basis points with a corresponding t-value equaling 5.39 ($p < 0.01$). In Panel B, the average difference in the price impact between affiliated and unaffiliated brokerage houses is around -1.94 basis points with a corresponding t-value equaling -4.50 ($p < 0.01$). Given that the average absolute price impact in our sample is 8.3 bps, the additional price impact attributed to affiliated brokerage houses is also economically significant.

APPENDIX

PRE-ANNOUNCEMENT PERIOD	AVERAGE ABNORMAL RETURN	t-STAT	PRE-ANNOUNCEMENT PERIOD	AVERAGE ABNORMAL RETURN	t-STAT
-30	-0.006	(-1.24)	-14	-0.002	(-0.32)
-29	-0.001	(-0.27)	-13	0.002	(0.39)
-28	-0.003	(-0.59)	-12	-0.004	(-0.68)
-27	-0.001	(-0.22)	-11	0.004	(0.7)
-26	0.005	(0.92)	-10	-0.003	(-0.53)
-25	0.004	(0.86)	-9	-0.001	(-0.22)
-24	0.002	(0.36)	-8	-0.002	(-0.39)
-23	-0.003	(-0.53)	-7	0.006	(1.16)
-22	0.007	(1.29)	-6	0.006	(1.18)
-21	0.003	(0.51)	-5	0.005	(0.9)
-20	0.005	(0.93)	-4	-0.001	(-0.19)
-19	-0.003	(-0.58)	-3	0.008*	(1.52)
-18	0.001	(0.16)	-2	0.008*	(1.61)
-17	-0.004	(-0.82)	-1	0.004	(0.85)
-16	0.001	(0.19)	0	0.017***	(3.29)
-15	0.004	(0.8)			

Table A - Daily average abnormal returns. This table provides the daily average abnormal returns for all days in the pre-announcement period. Daily abnormal returns are calculated as the difference between the realized return for the target stock and the market return (BIST 100 Index). In line with Brown and Warner (1985), standard errors are calculated as the standard deviation of daily abnormal returns in the estimation window [-250,-190]. ***, **, * respectively denote statistical significance at 1%, 5%, and 10% levels.

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