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Do Brokers of Insiders Tip Other Clients?

William J. McNally,[a] Andriy Shkilko,[a] Brian F. Smith [a]

[a] Financial Services Research Centre, Lazaridis School of Business and Economics, Wilfrid Laurier University, Waterloo, Ontario N2L 3C5, Canada

Contact: wmcnally@wlu.ca (WJM); ashkilko@wlu.ca (AS); bsmith@wlu.ca (BFS)

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Abstract. We examine trading activity around insider transactions on the Toronto Stock Exchange and find evidence that some traders mimic insider positions. Our unique data set allows us to establish a direct connection between insiders, their brokerages, and the brokerages' other clients. The findings are consistent with the possibility that some brokerages tip their clients about insider trades. Insiders in our sample have good timing; returns are usually positive (negative) after insider purchases (sales). Insiders' good timing translates to the mimicking transactions, which appear to be profitable net of trading costs. Evidence consistent with tipping is observed mainly for smaller independent brokerages.

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Keywords: insider trading • broker • tipping

1. Introduction

Active investors in securities markets continuously seek new information to boost their investment performance. Although stock markets are fairly efficient, it is generally accepted that price-relevant nonpublic information may be used to earn abnormal returns. Company insiders are one of the most sought-after sources of such information because of their in-depth knowledge of the firm and its customers. Securities regulators recognize the value of insider knowledge and try to promote market fairness by restricting insiders' ability to trade around information events. Despite the restrictions, a number of studies find that insiders can successfully time future price changes (e.g., Seyhun 1986, Lakonishok and Lee 2001, Huddart et al. 2007, Cohen et al. 2012, among others).

Similar to those studies, we find a significant relation between insider trades and past and future returns in our sample of Canadian equities. Our results show that insiders are successful contrarians, who sell after periods of rising prices and buy after prices have been falling. More importantly, prices change direction soon after insiders finish trading and trend in the direction of the insider trade for at least one subsequent month. Given these findings, insider trades appear to be worth mimicking.

Stock brokers who handle the trades of insiders are in a privileged position. There is a delay between when an insider transacts and when her trade is disclosed to the public. In the interim, the insider's broker possesses valuable information. In this paper, we ask whether some brokers share this information with ("tip") their other clients before insider trades are publicly disclosed. There are several reasons why the broker might share the information. First, tipped trading may make the broker's clients wealthier, leading to repeat business and referrals. Second, the broker may generate extra commissions from the mimicking trades. Third, the broker's most important clients may expect price-relevant information to be preferentially disclosed to them (the so-called *expectation of the first call*).

Our results are consistent with the hypothesis that brokers tip their noninsider clients (third-party clients) about insider trades. We find that the proportion of third-party trading handled by the insider's broker (the broker's market share) significantly increases on the day of the insider trade. The increase in the third-party activity is in the direction of the insider trade. More specifically, the average insider's broker's sell market share goes up from 5.2% on the day before to 6.3% on the day of an insider sale, whereas their buy market share rises to 6.6% (from 5.4%) on the day of an insider purchase. The market share increase is observed only for the insider's broker. When we match the insider's broker to a broker with a similar benchmark market share, we find that trading activity through the matched broker does not increase.

Our data allow for an intraday analysis of third-party activity. We find that the mimicking trades through insiders' brokers tend to cluster in the 90 minutes around the time when the insider orders are sent to the exchange. That is, it appears that some brokers

allow mimicking trades to execute even before submitting insider orders for execution. We find no evidence that such front-running orders receive better execution prices.

We divide brokerage firms into two types: bank-affiliated and independent. There may be different incentives to share information across the two types. Specifically, we expect that the bank-affiliated brokers are less likely to tip. First, Canadian banks (and their brokerages) are subject to tighter regulation. Second, banks may prohibit information sharing because of reputational concerns. Third, to be competitive with the banks that can bundle a variety of financial services, an independent brokerage may resort to sharing nonpublic information to offset its smaller service selection. Finally, independent brokerages are often used by insiders from smaller firms with inherently higher levels of informational asymmetry. Information about insider activity in such firms is in higher demand. Consistent with this expectation, we find that it is the independent brokerages that drive our results. We find no evidence of tipping by the bank-affiliated brokerages. Furthermore, a bootstrap analysis suggests that some of the bank-affiliated brokerages even reduce the third-party activity that would appear to mimic insider trades.

In addition to third-party activity, our data identify trading through the brokerages' own accounts (principal trading). If brokers share information about insider trades with third parties, they may also execute mimicking transactions with their firm's own funds. An analysis of market shares of principal trading yields no evidence of such activity, possibly because the independent brokerages responsible for most of information sharing do relatively little principal trading.

Finally, we ask whether the brokers share information about insider trades indiscriminately or condition sharing on the specific characteristics of insider trades or insiders' firms. We find more third-party trading when insider volume is large, consistent with brokers interpreting large insider volume as a stronger signal. We also find that third-party trading is more pronounced when there is more information asymmetry about the firm; i.e., the firm is smaller and is followed by fewer analysts. Investors in such firms may expect insiders to be more informed and so may be more interested in mimicking them. Finally, third-party trading is more pronounced before corporate news releases, suggesting that insider information becomes more valuable during such periods.

This is not the first study to examine broker tipping of insider trades. It is, however, to our knowledge, the first study to establish direct links from an insider to her broker and from the broker to the broker's third-party clients. The literature on this topic has developed in stages, with each successive contribution providing more substantive but still indirect evidence of these links. Geczy and Yan (2006) find that market makers affiliated with insiders' brokers post more aggressive ask quotes when insiders sell their shares. The authors suggest that increased quoting activity reflects selling by third-party clients who are tipped by the broker. An alternative explanation is that the ask quotes originate from market makers who are trying to reduce their inventory in anticipation of the selling that usually accompanies the disclosure of insider sales. In the absence of market-maker account data, Geczy and Yan are unable to distinguish between these two explanations.

Chakrabarty and Shkilko (2013) find evidence of abnormally high (low) short selling on insider sale (buy) days. Unlike Geczy and Yan (2006), they are able to distinguish between short sales executed by market makers and third-party trades. Furthermore, Chakrabarty and Shkilko establish the first link in the above-mentioned chain—the link between insiders and their brokers. Yet they are unable to establish the second link, the one connecting the brokers to the third-party clients.

Inci et al. (2010) suggest that third-party traders appear to mimic insider trades. The data set used by Inci et al. does not flag insider trades. Instead, the authors merge daily insider trading data with intraday trade data. They note that the procedure is only successful for a relatively small subset of insider trades. More importantly, the authors do not have brokerage information and so are unable to establish the links that are central to our study.

In the context of this literature, our data are uniquely suited for testing the tipping hypothesis because they avoid the shortcomings of the data sets used in previous research. First, our data set directly identifies insider orders and trades. Second, the data set includes a broker identifier, so we can connect the insiders, their brokers, and the brokers' other clients. Third, the data are time-stamped to a microsecond facilitating intraday analysis. Fourth, we observe activity by the brokerages' own accounts. This being said, our data also have shortcomings. The data set does not contain the identity of insiders. Because of this, we are unable to determine whether the results vary across executive roles (i.e., chief executive officer (CEO) versus a lower-ranked manager). For the same reason, we are also unable to distinguish between opportunistic and routine insider trades as do Cohen et al. (2012). Finally, our sample is relatively short and covers only 2.25 years. Despite these shortcomings, the data are ideally suited to achieve the main purpose of the study—to examine the possibility that brokerages are conduits of information from insiders to other clients.

Although our data set is better suited to examine the tipping hypothesis compared with the data sets used

previously, we caution that our evidence is circumstantial. Specifically, we are not in possession of any communication between insiders' brokers and their third-party clients that directly proves the tipping hypothesis. As far as we are aware, none of our sample brokerages has ever admitted sharing nonpublic price-relevant information. As such, we interpret our findings as consistent with the possibility of tipping and not as proof of tipping.

The remainder of the paper is as follows. Section 2 discusses the Canadian legal framework for insider trading and tipping, and it describes the data and filters. Section 3 examines returns around insider trades. Section 4 examines the insider's broker's market share of third-party trading. Section 4 also examines the cross section of brokerages and of insider trades. Section 5 concludes.

2. Securities Law and Data

2.1. Tipping and Insider Trading Regulation

In Canada, tipping is proscribed (as in other developed markets) by the Ontario securities regulations.[1] Tipping occurs when a person with a special relationship to a listed firm informs someone of an undisclosed material fact related to the firm.[2] The definition of a special relationship is intentionally broad and includes brokers and the brokers' clients who learn of a material fact prior to its public disclosure. A material fact is something that affects the market price of the security, often referred to as *price-relevant information*. The finance literature documents that the disclosure of insider trades often affects stock prices. As such, insider trades may be thought of as material facts. Securities regulators in Canada have prosecuted a number of tipping cases, usually involving takeovers. Nevertheless, regulators have never prosecuted a broker for tipping others about a trade by an insider.

Securities laws define insiders to include directors, senior officers (e.g., CEO, chief financial officer, chief operating officer, president, vice president, secretary, treasurer), and large shareholders (holders of more than 10% of shares). Lower-ranked managers are not considered insiders and are not required to report their trading (per the Ontario Securities Act, Section 1).[3] For the period of this study, insiders are required to disclose their trades within 10 days.[4] As in the United States, blackout periods are not required under the Canadian securities law, and firms are not required to disclose having blackout provisions. Canadian companies voluntarily adopt blackout periods much less frequently than the U.S. firms. Bettis et al. (2000) report that 78% of U.S. firms have blackout periods, whereas Beny and Anand (2013) show that only 38% of Canadian firms have blackout provisions.

2.2. Data and Filters

We use a data set obtained from the Toronto Stock Exchange (TSX) with the legal permission of the Investment Industry Regulatory Organization of Canada (IIROC). The data set is titled the Securities Trading Access Message Protocol (STAMP) and covers the period from October 2004 to December 2006.[5] The data set includes a flag that uniquely identifies orders and trades by insiders. Insiders are required by law to disclose their status to their broker, whose systems flag each insider order when it is placed with the exchange. The insider flag is not visible to any other market participant in real time and is used by IIROC for oversight purposes.

The STAMP data contain all market messages including order submissions, cancellations, modifications, and trade fills. Each message is time-stamped to a microsecond. The data also identify the brokerage firm handling each order and trade. Orders and trades are connected by a unique identifier that allows us to trace each trade back to its originating order. In total, the sample contains over 4.5 billion order and trade messages.

A portion of our analysis employs the event-study methodology. We use two event-study time frames: daily and intraday. On the daily level, the insider event is the date when the broker enters the insider's order into the TSX trading system. The vast majority of insider orders are executed quickly within the same day, with less than 1% of orders taking more than a day. As such, for our daily analysis, the difference between insider trades and orders is immaterial, and we refer to insider activity as *trading activity*. At the intraday level, the insider event is the time when the broker enters the insider's order into the TSX trading system. Most insider orders in our sample are executable limit orders. Only a very small number (less than 0.01%) of insider orders are submitted as market orders.

During our sample period, the STAMP database contains 53,743 insider trading days. Because of confounding effects, not all of these trading days are suitable for our analysis, and we apply four filters to mitigate these effects. First, we drop insider trading days that are preceded by another insider trade in the same firm in the previous 10 days (filter 1). We apply this filter because the event window in our daily event study includes the 10 days before the insider trade.[6] Other insider trades executed during the event window may confound the results during these 10 days. This filter reduces the sample to 9,384 insider trading days.

To eliminate the confounding effects of news, we apply filter 2 that removes insider trading days preceded or accompanied by news (on days −10 through 0). We collect news items from the Globe Investor database maintained by The Globe and Mail, Inc., Canada's preeminent financial publisher. The most frequent type of

news is performance results (e.g., revenue and earnings announcements). The second most frequent type is announcements related to product (e.g., new product or product modifications). Together, these two categories account for 56% of all announcements. Other sizeable announcement categories include governance (e.g., changes to the management team or the board of directors) and financials (e.g., issuance/retirement of securities and news about loans). The Globe and Mail transmits the press releases as soon as they are received from the firms. Filter 2 removes 647 insider trading days that had recent or concurrent news releases.

Some of our tests focus on brokerage characteristics. To isolate single brokerages so that we can explore the impact of these characteristics, we apply filter 3, removing event days with several brokerages handling insider trades in the same firm. This filter eliminates 899 insider trading days. Finally, throughout the analysis, we subdivide the sample by the insider's trade direction. Days on which insiders (from the same firm) both sell and purchase cannot be categorized in this manner. To address this issue, filter 4 removes 973 insider trading days during which insiders both sell and buy. The final filtered sample includes 6,865 insider trading days. Among these are 3,104 purchase days and 3,761 sale days. There are 966 firms in the filtered sample. We use this sample in all subsequent tests.

We report the descriptive statistics for the filtered sample in Table 1. There are on average 4.07 (4.85) insider purchase (sale) days per stock during our 27-month sample period. The average daily insider purchase (sale) volume is 34,931 (57,029) shares. This volume is transacted via several trades, with an average purchase (sale) trade size of 4,833 (6,266) shares. As such, there are between seven and nine insider transactions on a typical insider trading day.[7]

The typical daily trading volume on an insider purchase (sale) day is 739,444 (758,338) shares. As such, insider purchases (sales) represent 4.72% (7.52%) of total trading volume. Trading volume on the insider trading days is about 68% larger than it is on other days. Trade sizes are about 70% larger. That insiders choose to trade on days with relatively high volume and on days when trades are large is consistent with prior research. For instance, Sias and Whidbee (2010) show that insiders trade on days when other traders (particularly institutions) are more active. In the next section, we examine trading volume on and before insider trading days in more detail.

In addition to STAMP data, we use Compustat North America to obtain the number of shares outstanding and the book value of equity. Compustat coverage of our sample is quite good; we find Compustat data for 93.76% of the stocks. We use this smaller sample in tests that require Compustat-derived variables. Using it for all tests does not alter our findings. Finally, we use the analyst recommendation file from the Institutional Brokers' Estimate System (I/B/E/S) Detail History to control for analyst recommendation activity and to measure the number of analysts that cover each

Table 1. Descriptive Statistics

Variable	Mean	Std. dev.	25th percentile	Median	75th percentile
No. of insider purchase days per stock	4.07	3.30	2	3	6
No. of insider sale days per stock	4.85	3.45	2	4	7
Daily volume purchased by insiders	34,931	113,572	2,300	7,540	25,000
Daily volume sold by insiders	57,029	215,815	4,503	12,076	33,801
Total volume on insider trading days	749,795	2,846,182	90,357	286,208	802,854
Total volume on insider purchase days	739,444	3,343,119	74,428	242,370	668,320
Total volume on insider sale days	758,338	2,436,054	103,503	322,388	913,886
Total volume on noninsider trading days	446,339	1,083,773	38,656	136,270	400,633
Insider purchase trade size	4,833	20,744	700	1,642	3,875
Insider sale trade size	6,266	23,605	825	1,775	4,489
Third-party trade size on insider trading days	2,427	4,104	581	1,283	2,843
Third-party trade size on noninsider trading days	1,425	5,016	258	603	1,366
Stock price ($)	21.34	27.52	6.93	12.85	27.17
Book-to-market	0.51	0.60	0.29	0.44	0.63
Market capitalization ($million)	5,246	14,954	216	601	2,409
Return volatility	0.03	0.04	0.02	0.02	0.03
No. of of analysts	3.92	4.24	0	2	6

Notes. The table provides cross-sectional descriptive statistics for the sample of insider trades and firms. The sample period spans October 2004 through December 2006. *Daily volume purchased* (*sold*) *by insiders* is expressed as the number of shares. *Total volume on insider* (*noninsider*) *trade days* is the total number of shares traded on the day of insider trades (days without insider trades). *Insider purchase* (*sale*) *trade size* is the average number of shares purchased (sold) by an insider in one trade. *Third-party trade size* is the average number of shares transacted by third parties (noninsiders and nonproprietary accounts) in one trade. *Return volatility* is computed as the standard deviation of daily returns. All the above-mentioned statistics are from the STAMP database. Statistics on the book-to-market ratios and firm sizes (market capitalization) are from Compustat North America. Statistics on the number of analysts are from the I/B/E/S database.

company. Derived from the three data sources (i.e., STAMP, Compustat, and I/B/E/S), Table 1 contains sample statistics on stock prices, book-to-market ratios, market capitalization, return volatility, and the number of analysts.

3. Insider Timing

3.1. Abnormal Returns and Volume Around Insider Trades

Why would a broker share information about insider trades with other clients? One possible motive is that mimicking insider trades can be profitable. As we mentioned earlier, the finance literature often finds that insider trades are followed by abnormal returns. In this section, we examine our sample for evidence of positive abnormal returns following insider purchases and negative abnormal returns following insider sales.

To do so, we compute size-adjusted abnormal returns defined as the stock return on day t minus the mean return of a matched size decile portfolio on that day.[8] Table 2 reports daily abnormal returns in the [−10; +10]-day window around the filtered samples of 3,104 insider purchases and 3,761 insider sales. Corroborating the contrarian and informed views of insider trading, the results show that insiders purchase (sell) after periods of negative (positive) returns and before periods of positive (negative) returns. We note that the ability of insiders to successfully time return reversals has been identified in the prior literature and is not unique to our sample (e.g., Seyhun 1986, Jeng et al. 2003, Inci et al. 2010). Although our data do not allow us to establish the exact reasons behind price reversals, the reversals may be due to the market response to the insider trades or to corporate announcements that often follow insider trades. As discussed in the previous section, our filters drop insider trades that are preceded by corporate announcements, but they retain the trades followed by announcements. Later, we present regression analysis showing that there is more tipping of insider trades that are proximately followed by news announcements.

In our results, both insider sales and purchases appear to be informed. This result may seem surprising given that some studies find that insider sales are uninformed (e.g., Lakonishok and Lee 2001, Jeng et al. 2003, Jenter 2005). These studies suggest that, unlike purchases, the majority of insider sales are driven by uninformed motives, such as diversification and liquidity. But similar uninformed motives can also drive insider purchases. For instance, Cohen et al. (2012) suggest that corporate bonuses may give insiders excess cash and so motivate purchases. Also, insiders trying to achieve increased voting control may be motivated to purchase shares in their company regardless of their view of the stock's future prospects. As such, there are valid noninformational motives for both insider purchases and sales. Whether sales and purchases should predict returns is therefore an empirical issue.

In contrast to the studies that find insider sales to be uninformed, other studies (e.g., Seyhun 1986, Lin and Howe 1990, Bettis et al. 1997) show that both insider sales and purchases are informed. In addition, Scott and Xu (2004) look at insider sales only and find that large sales are predictive of subsequent stock returns. More recently, Cohen et al. (2012) report nearly symmetric post-trade returns for the opportunistic insider purchases and sales. In summary, the insider trading literature often points to both insider purchases and sales being informed, consistent with our results.

Table 2. Abnormal Returns and Volume Around Insider Trades

	Insider purchase		Insider sale	
Relative day	AR (%)	Abnormal volume	AR (%)	Abnormal volume
−10	0.054	0.011	0.107*	0.005
−9	−0.138*	0.048*	0.200**	0.006
−8	−0.086	0.007	0.043	0.001
−7	−0.056	0.046*	0.127**	0.040*
−6	0.001	0.004	0.153**	0.008
−5	−0.014	0.056*	0.122**	0.044*
−4	−0.137*	0.004	0.269**	0.056*
−3	−0.145**	0.077**	0.278**	0.086**
−2	−0.197**	0.102**	0.367**	0.078**
−1	−0.308**	0.116**	0.558**	0.096**
0	−0.330**	0.206**	0.826**	0.305**
1	0.383**	0.098**	−0.336**	0.131**
2	0.166**	0.031	−0.222**	0.061**
3	0.195**	0.063**	−0.266**	0.072**
4	0.134*	0.051*	−0.181**	0.051*
5	0.141**	0.049	−0.091*	0.065**
6	0.036	−0.017	−0.109**	0.083**
7	0.073	0.000	−0.099*	0.040
8	−0.074	−0.028	−0.065	0.043
9	0.095	0.021	0.030	0.029
10	0.050	0.015	0.019	0.023

Notes. This table reports daily average abnormal returns (AR) and volume around insider trades. We compute size-adjusted abnormal returns by subtracting the daily mean return for all firms in the same CRSP size decile from the daily firm return. To test for statistical significance, we compute mean size-adjusted returns for all event firms on each day during the postevent window [+20; +60]. We then use the time-series mean and variance of size-adjusted returns in the postevent window to test for abnormal size-adjusted returns around the event. When insider purchases (sales) extend over several consecutive days, we consider the series as a single event, during which a large insider order is worked over several consecutive days. As such, the preevent period ends before the series begins, and the postevent period commences after the last trade in the series. Abnormal volume is computed as total third-party volume (expressed as the number of shares) minus mean total third-party volume during the postevent window [+20; +60], divided by the standard deviation of total third-party volume during the postevent window. The sample contains 3,104 insider purchase events and 3,761 insider sale events.

** and * significant at the 1% and 5% levels, respectively.

Table 2 also reports that insider trades are accompanied by abnormally high trading volume that is observed several days before the insider trade and goes on for several days after the trade. Abnormal volume is computed as third-party volume (expressed as the number of shares) minus the average third-party volume during the postevent window [+20; +60]. The resulting difference is scaled by the standard deviation of third-party volume during the postevent window.[9] To illustrate, the results show that third-party volume is 0.077 (0.086) standard deviations higher than the control period average three days prior to an insider purchase (sale).

Abnormally high volume prior to insider trades may appear surprising given the absence of news announcements in the [−10; 0] window. We note that similar volume patterns have been observed in previous studies of insider trading and executive stock options (ESOs). For instance, Heron and Lie (2007) report that ESOs are most often granted during periods of significant price changes and abnormal trading volume. They argue that the grant timing decision is likely endogenous; insiders choose the timing of grants based on the return and volume patterns. They conclude that "it is likely that the abnormal trading gives rise to large price changes, which decision makers exploit" (p. 293). Similarly, Cicero (2009) reports that the days surrounding ESO exercise dates are characterized by large volumes of stock transactions. Following this logic, it may be that insiders in our sample choose to trade in periods with large price changes and abnormally high volume.[10] If insiders are asymmetrically informed about their stock's intrinsic value, then they will trade when price and value diverge (e.g., Jenter 2005, Piotroski and Roulstone 2005). Such divergence often occurs during periods of significant price changes (driven by abnormal volume) but no change in intrinsic value (i.e., no news).

Perhaps an equally important question is, what causes the abnormal volume? Our empirical design excludes two catalysts for trading: news and other insider trades in the [−10; 0] window. In the absence of these catalysts, one possible reason for abnormal volume is uninformed institutional trading. Sias and Whidbee (2010) find that insiders purchase (sell) after periods of significant institutional selling (purchasing). Similarly, the abnormal volume and return patterns in our data may be due to institutional trading. Unfortunately, we cannot examine the hypothesis directly, as there is no comprehensive database of Canadian institutional trading.

To examine post-trade returns in a more rigorous framework, we estimate a pooled regression model of monthly stock returns on indicators for insider sales and purchases in the previous month. Following Cohen et al. (2012), we control for the common determinants of stock returns, such as firm size (log of market capitalization), log book-to-market ratio, and one-month lagged return.[11] We cluster standard errors at the monthly level and include month fixed effects.

The results in Table 3 confirm that insider trades are indicative of returns in the month following. The coefficient on the *Insider purchase* (*Insider sale*) variable in column (3) (column (6)) suggests that insider purchases

Table 3. Stock Performance After Insider Trades

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	−0.001	−0.002	−0.005**	0.002**	0.001	0.000
	(0.07)	(0.14)	(0.00)	(0.00)	(0.37)	(0.77)
Insider purchase	0.018**	0.015**	0.015**			
	(0.01)	(0.01)	(0.01)			
Insider sale				−0.021**	−0.024**	−0.024**
				(0.00)	(0.00)	(0.00)
$Return_{t-1}$	−0.082**	−0.066**	−0.067**	−0.082**	−0.066**	−0.067**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm size		−0.024**	−0.022*		−0.024**	−0.022*
		(0.01)	(0.03)		(0.01)	(0.03)
BM		0.006	0.005		0.005	0.004
		(0.77)	(0.81)		(0.82)	(0.85)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	No	No	Yes	No	No	Yes
No. of obs.	25,116	24,089	24,089	25,116	24,089	24,089
Adj. R^2	0.01	0.01	0.01	0.01	0.01	0.01

Notes. The table reports estimated coefficients from a regression of the return in the month after the insider trade on return determinants, including dummy variables for insider sales and buys. *Firm size* and *BM* are natural logarithms of the market capitalization and the book-to-market ratio, respectively. $Return_{t-1}$ is the return of a given firm over the prior month. Month fixed effects are included where indicated. Standard errors are clustered at the monthly level. *p*-Values are in parentheses. FE, fixed effects.

** and * significant at the 1% and 5% levels, respectively.

Table 4. Insider Trades and Intraday Returns

	Mean	*p*-Value
Insider purchases: Open-to-trade	−0.30**	0.00
Insider purchases: Trade-to-close	0.11	0.08
Insider sales: Open-to-trade	0.74**	0.00
Insider sales: Trade-to-close	−0.09	0.09

Notes. The table reports intraday returns for the first insider trade of the day. We compute returns between market open and the insider trade and between the insider trade and market close. The returns are adjusted via reducing the mean return for firm i by the average return of all firms in the same CRSP size decile during the same intraday time period. Statistical significance is computed as in Table 2 for intraday time periods of similar length.
**Significant at the 1% level.

(sales) are associated with a 1.5% (−2.4%) return in the following month. The economic magnitude of the coefficients is the same as (or larger than) the values reported by Cohen et al. (2012). These results confirm the presence of abnormal returns after insider trades, suggesting that a strategy of mimicking insider trades could be profitable.[12] In Section 4.2, we further examine the profitability of mimicking insider trades.

3.2. Intraday Timing

The results reported in Table 2 suggest that insiders have the ability to time price reversals at the daily level. Next, we examine intraday timing. If insiders have good intraday timing, they should purchase near the lowest intraday price and sell near the highest price. As a result, we should observe the following: (1) negative open-to-trade returns prior to insider purchases, (2) positive trade-to-close returns following purchases, (3) positive open-to-trade returns prior to sales, and (4) negative trade-to-close returns following sales.

Table 4 contains the four above-mentioned (abnormal) return metrics estimated around the first insider trade of the day.[13] The results suggest that insiders have good intraday timing; they purchase (sell) after prices fall (rise). Prices revert after insider trades, but the statistical significance of these reversals is rather low. What explains these moderate reversals? It is unlikely to be news, because our filters drop insider trading days with news announcements. The reversals might be caused by the price impact of the insider trade itself or they might be due to price pressure from mimicking trades. Inci et al. (2010) and Chakrabarty and Shkilko (2013) find evidence consistent with the hypothesis that third parties mimic insider trades on the day of the trade. We examine whether there are mimicking trades in the next section.

4. Trading Activity Around Insider Trades

4.1. Daily Activity Through the Insider's Brokerage

The results in the last section suggest that transactions mimicking insider trades have the potential to generate trading profits. Next, we examine whether there is evidence that such transactions are executed through the insiders' brokers. We expect that if a broker shares information about insider trades with third-party clients, the proportion of trading activity through this broker will be higher compared with a benchmark period. This increased activity will be in the direction of the insider trade.

To measure brokerage activity, we compare the brokerage's market share of third-party trading against a benchmark share. Specifically, for each stock i on the insider trading day t we compute broker j's purchase (sell) market share as third-party volume (expressed as the number of shares) purchased (sold) through the broker, $v_{ijt}^{p(s)}$, scaled by the total third-party volume, V_{it}:

$$ms_{ijt}^{p(s)} = v_{ijt}^{p(s)}/V_{it}. \quad (1)$$

Because we scale by the total third-party volume, $ms_{ijt}^{p(s)}$ controls for the changes in the overall volume reported in Table 2. In other words, scaling allows us to distinguish a disproportionate increase in trading by a single brokerage from a general increase in trading across all brokerages. In addition, scaling improves the cross-sectional comparability of our results by preventing trading in large stocks from dominating the averages. Third-party volume excludes insider volume and proprietary volume—that is, trading in the brokerage's own account.

To gauge the statistical significance of $ms_{ijt}^{p(s)}$, we rely on the approach used by Irvine et al. (2007). First, we compute the mean market share across daily average market shares during the benchmark period [+20; +60]. The benchmark market share for both sells and buys is approximately 5.3%. Second, we compute the standard deviation of the market share in a similar manner. Finally, we use a t-test to compare market share (on each event-window day) with the benchmark level. As such, clustering in calendar time does not affect our inferences. Following Irvine et al., our default benchmark period is subsequent to the insider trades, but our results are similar using a preevent benchmark.

Panel A of Table 5 reports the market share of third-party purchases and sales for the insider's broker, for a matched broker, and for the insider's broker on pseudo-event (placebo) days. Columns (1) and (7) contain the insider's broker's market share, ms_{ijt}, for trades in the same direction as the insider trades. We note that the ms_{ijt} estimates in the days preceding the insider trades are not statistically different from the benchmark level of 5.3%. On the days of insider purchases, ms_{ijt}^{p} increases to 6.6% (column (1)), which is an increase of nearly 25%. On the days of insider sales, ms_{ijt}^{s} increases to 6.3% (column (7)), which is an almost 20% increase. Event-day market shares are statistically different from the benchmark at the 1% level.

Table 5. Brokerage Market Share Around Insider Trades

	Insider purchases					Insider sales				
	Insider's broker		Matched broker		Placebo	Insider's broker		Matched broker		Placebo
	Buy share	Sell share	Buy share	Sell share	Buy share	Buy share	Sell share	Buy share	Sell share	Sell share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Market share (%)										
−10	0.055	0.054	0.053	0.053	0.054	0.054	0.052	0.053	0.052	0.055
−9	0.053	0.052	0.054	0.053	0.052	0.053	0.054	0.053	0.052	0.054
−8	0.052	0.053	0.053	0.053	0.052	0.051	0.052	0.055	0.053	0.053
−7	0.055	0.055	0.054	0.055	0.052	0.056	0.053	0.055	0.053	0.050
−6	0.053	0.054	0.054	0.055	0.055	0.052	0.053	0.054	0.051	0.052
−5	0.054	0.055	0.053	0.053	0.055	0.053	0.054	0.053	0.053	0.053
−4	0.054	0.054	0.053	0.052	0.054	0.051	0.054	0.053	0.050	0.054
−3	0.056	0.052	0.052	0.052	0.055	0.056	0.052	0.053	0.052	0.051
−2	0.053	0.052	0.053	0.055	0.055	0.052	0.054	0.053	0.051	0.052
−1	0.054	0.055	0.052	0.053	0.053	0.052	0.052	0.053	0.052	0.053
0	0.066**	0.053	0.050	0.052	0.053	0.056	0.063**	0.051	0.047↓	0.052
1	0.062**	0.052	0.053	0.055	0.055	0.054	0.059	0.056	0.052	0.051
2	0.057	0.053	0.053	0.053	0.053	0.052	0.051	0.054	0.053	0.054
3	0.054	0.052	0.051	0.053	0.053	0.053	0.052	0.054	0.053	0.054
4	0.056	0.055	0.054	0.054	0.055	0.057	0.055	0.050	0.053	0.054
5	0.054	0.054	0.052	0.053	0.051	0.050	0.054	0.054	0.052	0.053
6	0.055	0.055	0.053	0.053	0.054	0.051	0.054	0.052	0.050	0.054
7	0.055	0.055	0.053	0.054	0.052	0.053	0.054	0.054	0.053	0.057
8	0.054	0.052	0.055	0.054	0.054	0.048	0.052	0.055	0.051	0.054
9	0.055	0.054	0.055	0.052	0.050	0.053	0.051	0.055	0.052	0.053
10	0.052	0.053	0.052	0.053	0.054	0.053	0.052	0.052	0.051	0.052
Panel B: Abnormal market share										
−1	0.056	−0.025	−0.038	−0.023	−0.014	−0.018	−0.007	−0.023	−0.022	−0.018
0	0.143**	0.028	−0.016	−0.030	−0.015	−0.012	0.121**	−0.036	−0.045↓↓	0.005
1	0.084**	0.023	−0.002	0.021	0.024	−0.023	0.053	0.022	0.003	−0.022

Notes. The table reports market share (panel A) and abnormal market share (panel B) of third-party trading volume handled by the insider's brokers and matched brokers around insider purchase and sale days. Market share is computed as the number of third-party shares traded through the broker scaled by total third-party volume. Abnormal market share is standardized using the mean and standard deviation from the control period [+20; +60]. Matched brokerages are selected to be of the same type and have the closest market share to the insider's brokerage during the control period. We measure statistical significance of (i) market share in panel A following Irvine et al. (2007) and (ii) the difference between the insider's broker's and the matched broker's market shares following Goldstein et al. (2007). Columns (5) and (10) report the insider's broker's market share on pseudo-event days (placebo days) that do not contain an insider trade. We require that the pseudo-event day has return and volume that closely resemble those observed on the insider trade day.

**Indicates a significant increase in market share over the control period at the 1% level, and ↓↓ and ↓ indicate a significant decline over the control period at the 1% and 5% levels, respectively.

Columns (2) and (6) report the insider's broker's share of trading in the opposite direction to the insider trade. For the opposite direction activity, we find no statistically significant changes in market share. Put together, these results suggest that the third-party clients of the insiders' brokers execute additional volume in the same direction as insiders on days when insiders trade.

If it is the insiders' brokers who share information about insider trades, then increases in market share should be unique to these brokers. To examine whether this is the case, we compute market shares for the matched brokers. We select the matches by choosing the broker with the market share in the same stock that is the closest to that of the insider's broker during the benchmark period. We also require that the matched broker be of the same type as the insider's broker: either bank-affiliated or independent. During the benchmark period, the market shares of the insiders' brokers and their matches are statistically indistinguishable—both about 5.3%.

Column (9) of Table 5 shows that the sell market share of the matched broker declines to 4.7% on the insider sale day, which is a statistically significant decline from the benchmark period. This result suggests that the matched broker is handling fewer third-party sales, consistent with the transfer of market share from the matched broker to the insider's broker. For insider purchases, column (3) shows no statistically significant changes in the matched broker's market share of third-party purchases. A comparison between the

insider's broker's and the matched broker's shares as in Goldstein et al. (2007) confirms that the two brokers have statistically different market shares on days of insider trades. In summary, the data suggest that the increase in market share on insider trading days is observed only for the insider's broker and not for other brokers. This result is consistent with the hypothesis that insiders' brokers share information with third-party clients, who then mimic insider trades.

Is it possible that the abnormal market shares are driven by the abnormal return and volume patterns discussed earlier and not by insider trades? We note that the return and volume patterns are publicly observable. If the insiders' brokers' clients trade on public volume and return information, it is not clear why other brokers' clients do not trade on the same information. This caveat aside, we further examine this issue via a placebo test. The goal of this test is to understand whether additional third-party trading through the insiders' brokers occurs on days when returns and volume resemble those observed on insider trading days but insider trades do not occur.

We structure the placebo test as follows. For each insider trade, we select a pseudo-event day. A pseudo-event day has no insider trade and has a return and volume that closely match those observed on the insider trade day. The match quality is high; there are no statistically significant differences between the volume and returns of the sample day and the pseudo-event day.

Once the matches are constructed, we measure the insiders' brokers' abnormal market share on the pseudo-event days and the days around the pseudo-event days. If the insiders' brokers' market share is driven by volume and return patterns, we should observe positive abnormal market shares on the pseudo-event days even in the absence of insider trading. The results are reported in columns (5) and (10) and contain no evidence of abnormal market share for the insiders' brokers on or around pseudo-event days. The results using the above-mentioned alternative matching procedure are similar. As such, our findings are consistent with the premise that the insider trades themselves (and not the contemporaneous or lagged returns and volume) trigger increases in the insiders' brokers' market shares.

As an additional robustness test, we calculate a standardized measure of abnormal market share, ams_{ijt}, similar to that used by Lakonishok and Vermaelen (1986), Koski and Scruggs (1998), and Sias (2004). For this measure, abnormal market share is the difference between the broker's market share on the event day and the broker's mean market share during the benchmark period. The abnormal market share is then scaled by the standard deviation computed during the benchmark period. The results based on this alternative measure are in panel B of Table 5 and corroborate the results in panel A. For instance, the results suggest that the insiders' brokers' purchase (sell) market share is 0.143 (0.121) standard deviations higher on insider purchase (sale) days compared with the control period.

An alternative explanation for the increase in the insider's broker's market share might be that an analyst affiliated with the insider's brokerage issues a recommendation immediately prior to (or on the day of) the insider trade. It is possible that such a recommendation may trigger third-party trading through the brokerage.[14] To examine this alternative explanation, we estimate the proportion of insider trades for which there is reporting by an analyst at the insider's broker's firm on any day in the event window. After merging our sample of insider trades with I/B/E/S, we find that fewer than 2% of insider trades have coincident analyst recommendations. When we reestimate Table 5 excluding insider events preceded by (or concurrent with) analyst recommendations, our results are unchanged.

Our data set also identifies brokerages' proprietary trades—that is, trades executed in the brokerages' own accounts. If brokerages tip their clients about insider trades, then it is conceivable that they also use the information to trade their own capital. Upon analysis, we find no evidence of significant changes in the market share of proprietary trading. In a subsequent section, we suggest that this may be because the type of brokerage generating most of the evidence of tipping does little proprietary trading.

4.2. Intraday Activity Through the Insider's Brokerage

The STAMP data are time-stamped to the microsecond, which gives us the opportunity to examine the intraday timing of third-party trades relative to insider orders. To study intraday timing, we first split insider trading days into 13 half-hour periods. Then, we focus on the half-hour that contains the first insider order submitted to the exchange that day.[15] We call this period *the event half-hour*. We then measure the insider's broker's market share of third-party trading during the event half-hour and the two half-hour periods surrounding it.[16] Finally, we measure the average half-hour activity in the remaining 10 intraday periods of the event day. To gauge statistical significance, we compare the brokerage's activity to its average half-hour activity during the benchmark period [+20; +60].

Table 6 reports that the insider's broker's share of third-party activity is the highest during the event half-hour and the post-event half-hour. This result suggests that if brokers share information about the ongoing insider trades, they do so quickly. Notably, the insider's broker's market share is also high in the preevent half-hour. This is consistent with the notion that some brokerages allow front-running of their insider clients. That is, even before the insider's order is submitted

Table 6. Intraday Analysis of Broker Market Share

	Insider purchases				Insider sales			
	Insider's broker		Matched broker		Insider's broker		Matched broker	
	Buy share	Sell share	Buy share	Sell share	Buy share	Sell share	Buy share	Sell share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Preevent half-hour	0.063**	0.052	0.050	0.053	0.055	0.071**	0.052	0.043
Event half-hour	0.074**	0.052	0.045	0.051	0.054	0.078**	0.051	0.041
Postevent half-hour	0.076**	0.054	0.047	0.051	0.056	0.073**	0.053	0.042
Rest of event day	0.065**	0.053	0.051	0.052	0.056	0.059**	0.051	0.049

Notes. The table reports the market share of third-party trading volume handled by the insider's broker within the day of insider purchases and sales. We focus on the event half-hour and the surrounding 30-minute periods. The remaining intraday periods are averaged in the *rest of event day* category. The buy (sell) share is computed as the number of third-party shares purchased (sold) through the broker during a 30-minute intraday period scaled by the total third-party volume in the same period. The significance of the market share is measured against the average intraday market share during the control period—the postevent trading window [+20, +60]. Abnormal purchase (sell) share is computed as the 30-minute purchase (sell) share less the average 30-minute purchase (sell) share during the control period further divided by the standard deviation in the control period.

**Significant at the 1% level.

to the exchange, her brokerage executes a nontrivial amount of third-party mimicking volume.

The magnitude of third-party activity is not as pronounced in the remaining 10 half-hour periods, yet it is still greater than the benchmark level. It is possible that the activity remains elevated because some insider trades execute in intraday sequences (as discussed in Section 2.2), in which the first insider order is followed by several additional orders that trigger more third-party volume. It is also possible that the news of the insider trade is disseminated from the tipped third party to other traders as the day unfolds.

Table 6 also reports the insider's broker's market share of the opposite-direction trades and the market share of the matched broker. We find that the insider's broker's market share in the opposite direction is not statistically different from the benchmark. The matched broker's market share in the same direction is somewhat smaller than the benchmark, consistent with the insider's broker absorbing some of the matched broker's market share, but the difference is not statistically significant.

Table 6 shows that most of the insider's broker's abnormal activity occurs in a short time frame around the insider trade. This result raises the question of how the broker shares information with third-party clients. We note that the incremental third-party volume executed by the insider's broker is approximately 7,500 shares.[17] Meanwhile, the average trade size during the 90-minute period surrounding insider trades is nearly 5,000 shares. As such, the incremental volume may require only one or two trades. A broker would only need to reach out to a few clients (or one large client) to trigger an order creating this volume. In fact, the broker may not even need to contact his clients because some brokers have discretionary trading authority. As such, informing a sufficient number of clients to generate the abnormal market share reported here is possible.

In Section 3.1, we suggest that third parties may mimic insider trades to profit from the return reversals that follow. Here, we examine this suggestion in more detail. We begin by discussing the intraday timing of the mimicking trades. Then, we estimate the holding period return (net of trading costs) to mimicking trades. Table 6 shows that mimicking trades tend to cluster in the 90-minute period around insider trades. We proxy for the mimicking trade price using the value-weighted average price (VWAP) during that 90-minute period. We assume that the mimicking trades are those executed through the insider's brokerage in the direction of the insider order. To evaluate the

Table 7. Third-Party Trades and Returns

	Insider purchase	Insider sale
Panel A: Third-party abnormal return (%)		
Open-to-VWAP	−0.28**	0.68**
VWAP-to-close	0.06	−0.04
Panel B: HPR net of trading costs (%)		
1-day	0.00	−0.05
3-day	0.36*	0.44**
5-day	0.64**	0.71**
10-day	0.82**	0.94**
30-day	1.34**	0.53**

Notes. Panel A reports intraday returns associated with third-party mimicking trading around insider trades. We define mimicking trades as third-party trades through the insider's broker executed in the 90 minutes surrounding the first insider order of the day in the direction of the order. For the mimicking trades, we compute the VWAP and use it to calculate return between the market open and the VWAP and between the VWAP and market close. The returns are adjusted for the average return of all firms in the same size decile during the same intraday time period. Statistical significance is computed as in Table 2 for intraday time periods of similar lengths. In panel B, we compute the HPR for mimicking positions accounting for round-trip brokerage commissions and effective spreads. We use holding periods of 1, 3, 5, 10, and 30 days.

** and * significant at the 1% and 5% levels, respectively.

intraday timing, we compute the open-to-VWAP and VWAP-to-close returns as we did with insider trades in Table 4. Panel A of Table 7 suggests that third parties purchase (sell) after periods of intraday price drops (run-ups), and their trades are followed by moderate, albeit statistically insignificant, price reversals. As such, mimickers demonstrate good timing, similar to that of insiders.[18]

Next, we estimate the holding period return (HPR) of the mimicking trades. We do not know when mimickers close their positions, so we analyze five holding periods from 1 to 30 days. We calculate the HPR net of two types of trading costs: brokerage commissions and effective spreads. We assume that each third-party trade requires a $150 full-service commission.[19] This is a conservative estimate because institutional trades and trades in wrap accounts incur smaller commissions. When it comes to effective spreads, we observe these only once, when the positions are opened. If the opening trade is liquidity providing (demanding), we increase (decrease) the HPR by the half-spread. We assume that all closing trades are executed at the VWAP and are liquidity demanding, reducing the HPR by the volume-weighted average effective half-spread on the day of the closing trade.[20] We calculate the net HPR for each round-trip trade and subtract the size-adjusted benchmark return over the same holding period to calculate an abnormal return. Even with the conservative treatment of trading costs, the results in panel B of Table 7 show that positions mimicking insider trades earn positive returns in all of the holding periods except the one-day period.

4.3. The Cross Section of Brokerages

Insider trades in our sample are executed through 69 different brokerages. Nine brokerages (or 13%) are subsidiaries of large banks. The parent banks have a variety of business lines, including retail banking, commercial and investment banking, asset management, research, and insurance. The remaining brokerages (the independents) offer a more restricted set of services. Whereas most of the independents offer investment banking and research services, none offer retail or commercial banking services. Only one-third of independents offer asset management services. In the cases where their service offerings compete, the independents have a much smaller market share than the bank-affiliated brokers. For example, independents handle one-third of all brokerage activity and one-quarter of proprietary trading.

We expect the bank-affiliated brokers to engage in less information sharing than the independent brokers for four reasons: reputational concerns, regulatory oversight, product scope, and clientele effect. Marketing research argues that a positive reputation is central to the success and value of a firm's brand (e.g., Herbig and Milewicz 1995). The largest five banks are among the top six brands in Canada, whereas none of the independent brokers are ranked among the top 100 brands (Brearton 2015). Because of the valuable brand of their parent, the bank-affiliated brokers are likely more concerned with maintaining a reputation for integrity and so are probably less likely to engage in activities that resemble tipping.

In addition to reputational concerns, the bank-affiliated brokerages may have tighter internal controls as a by-product of dual federal and provincial oversight of their parent institutions. By contrast, the independent brokerages are monitored only at the provincial level. Furthermore, the bank-affiliated brokerages attract clients by bundling brokerage and retail banking services. Independent brokerages cannot bundle because they do not do retail banking, so they must work harder to attract and keep clients. Finally, another reason that broker tipping is more likely to occur in independent brokerages is that their clients are more likely to be insiders in smaller firms with sparse analyst following. The greater information asymmetries in such firms increase incentives for tipping. For these reasons, we suggest that the independent brokerages may have more incentives to tip than their bank-affiliated counterparts.

We examine the impact of broker affiliation in two ways. First, we reestimate the brokerage market shares reported in panel A of Table 5 while treating bank-affiliated and nonaffiliated brokerages as two separate groups. The results in panel A of Table 8 confirm our expectations; the abnormal activity on insider trading days is detected only for the independent brokerages. For these brokerages, the average buy market share increases from 4.1% during the benchmark period to 8.1% on days of insider purchases. Similarly, their sell market share increases from 4.2% during the benchmark period to 7.8% on days of insider sales. In the meantime, the market shares of the bank-affiliated brokerages do not significantly change from their benchmark levels. This result is corroborated when we examine the median market shares in panel B.

In Table 9 we report information about the firms whose insiders use different brokerage types. We divide the firms into three groups: (1) those where insiders use only bank-affiliated brokers (38% of firms), (2) those where all insiders use independent brokers (13% of firms), and (3) the remainder (49% of firms). The results suggest that the firms whose insiders use independent brokerages are generally smaller, are followed by fewer analysts, and have lower book-to-market ratios. Such firms typically have a higher degree of asymmetric information, so independent brokers may face higher demand for tips from their third-party clients.

Table 8. Brokerage Market Share Around Insider Trades, by Brokerage Type

	Insider purchase: Broker buy market share		Insider sale: Broker sell market share	
	Bank-affiliated	Independent	Bank-affiliated	Independent
Panel A: Means				
Event day (*day* 0)	0.057	0.081**	0.055	0.078**
[+20; +60]	0.059	0.041	0.058	0.042
Panel B: Medians				
Event day (*day* 0)	0.037	0.051**	0.038	0.056**
[+20; +60]	0.040	0.019	0.039	0.022

Notes. The table reports event-day and benchmark-period market share statistics for brokerages that execute insider trades. The statistics and their significance are computed as in Table 5. Panel A presents the averages and panel B the medians. Bank-affiliated brokerages include nine firms whose parent institution is a bank. Independent brokerages include all other firms.

** denotes statistical significance, at the 1% level, of the difference between market shares during the benchmark period (bottom row) and market shares on the event day (top row).

Our second method for examining differences in tipping across brokerage types relies on a bootstrap procedure. This analysis follows Irvine et al. (2007), who use a bootstrap procedure to create a random distribution of abnormal brokerage activity and compare it to the distribution observed from the data. If some brokerages engage in tipping, the two distributions should diverge. To build the bootstrap distribution, we randomly assign insider purchase and sale events across brokerage firms in proportion to the actual number of events handled by the brokerage. In other words, if a brokerage handles five insider purchases during the sample period, we randomly assign to it, with replacement, five insider purchases from the sample of all purchases. Next, we sum the abnormal buy (sell) market share for each brokerage from the assigned purchase (sale) events. The abnormal market share, ams_{ijt}, is computed as in Section 4.1. Then, we sort the resulting totals and assign each brokerage a rank, from largest to smallest. The resulting distribution represents one draw from a population of brokerage activity that assumes no differences among brokerages' information sharing practices.

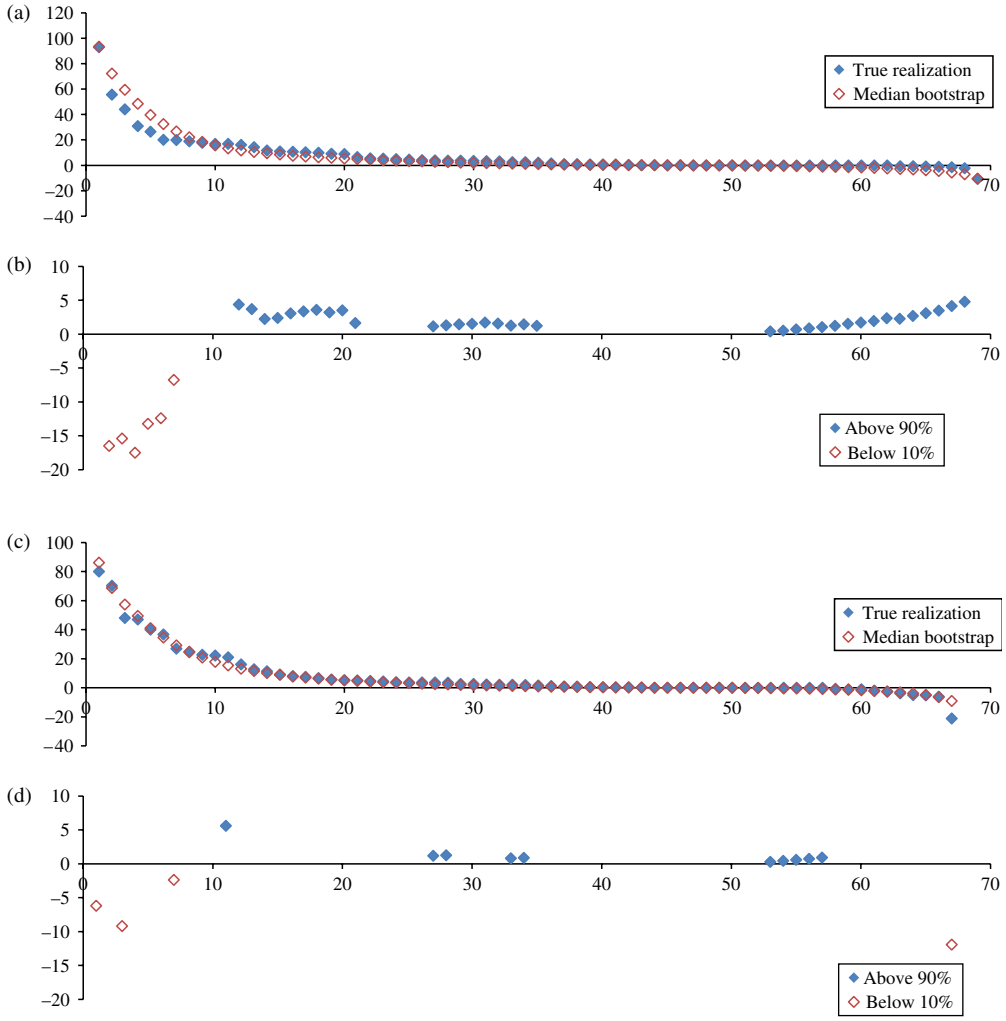
We repeat this procedure 500 times and compute the medians of abnormal buying (selling) for each rank. These medians represent the expected distribution of abnormal brokerage activity. We then compare the expected distribution with the observed distribution. To gauge statistical significance of differences between the two distributions, we compare the observed distribution with the 10th and 90th percentiles for each rank. We consider the difference between the two distributions

Table 9. Descriptive Statistics, by Brokerage Type

	Mean	Std. dev.	25th percentile	Median	75th percentile
Panel A: Bank-affiliated (38% of firms)					
Stock price ($)	22.67	21.47	7.87	15.77	30.10
Book-to-market	0.55	0.39	0.31	0.49	0.68
Market capitalization ($million)	5,858	15,541	260	673	2,592
Return volatility	0.03	0.04	0.01	0.02	0.03
Number of analysts covering stock	3.98	4.30	0	2	7
Panel B: Mix (49% of firms)					
Stock price ($)	18.40	17.34	6.45	11.35	24.11
Book-to-market	0.45	0.27	0.27	0.41	0.56
Market capitalization ($million)	5,578	16,403	228	610	2,652
Return volatility	0.03	0.03	0.02	0.02	0.03
No. of analysts	5.00	4.62	1	4	8
Panel C: Independent (13% of firms)					
Stock price ($)	18.65	40.77	5.80	6.92	17.70
Book-to-market	0.42	0.26	0.23	0.38	0.57
Market capitalization ($million)	3,858	14,653	140	464	1,022
Return volatility	0.03	0.02	0.02	0.03	0.04
No. of analysts	2.12	2.60	0	1	3

Notes. The table provides cross-sectional descriptive statistics for sample firms depending on the brokerage type used by the firm's insiders. We divide the firms into three categories: serviced exclusively by the bank-affiliated brokerages (panel A), serviced by a mix of brokerages of both types (panel B), and serviced exclusively by the independent brokerages (panel C). The statistics are computed as in Table 1.

Figure 1. (Color online) Distribution of Abnormal Brokerage Activity on Insider Trading Days



Notes. The figure reports the cross-broker distribution of abnormal third-party volume shares on insider trading days. Panels (a) and (b) contain results for insider purchases, and panels (c) and (d) contain results for insider sales. In panels (a) and (c), the solid markers represent the sum of the true realizations of abnormal market share of third-party volume on insider trading days. The hollow markers represent the median bootstrap obtained by randomly assigning, with replacement, event-day market share across brokerages. Panels (b) and (d) contain statistical significance tests. For each broker, we estimate whether the true realization of total abnormal activity exceeds (is below) the 90th (10th) percentile of the bootstrap. If so, we compute the difference between the true realization and the bootstrap estimate for the brokerage and report it as a solid (hollow) marker.

for a particular rank to be statistically significant if the observed distribution is below (above) the 10th (90th) percentile of the expected distribution.

Figure 1(a) reports the two distributions for insider purchases. The observed distribution (solid markers) indicates that among the brokerages that execute insider purchases, a relatively small group (to the left of the distribution) stands out as the most active. This result is consistent with our earlier finding that much of the brokerage activity is conducted by a group of bank-affiliated firms. Further, a comparison between the observed and expected (hollow markers) distributions suggests that six of the most active brokerages execute less third-party buy volume than is expected. Figure 1(b) confirms that this observation is statistically significant for the six brokerages. As such, six of the large brokerages reduce third-party activity on insider purchase days. In the meantime, a number of smaller brokerages execute more third-party buy volume than expected, further confirming our earlier suggestion that evidence of tipping is concentrated in the smaller (independent) brokerages.

Figures 1(c) and 1(d) tell a similar story for insider sales. About the same number of brokerages stands out as the most active. Among these, three brokerages appear to significantly reduce third-party selling on days of insider sales. In the meantime, several smaller brokerages increase third-party selling.

4.4. The Cross Section of Events

The results reported thus far are consistent with the notion that brokers share information about insider trades with other clients. Yet it is not clear how detailed the shared information is. Brokers and their third-party clients may condition their activity on trade and firm characteristics. For example, a broker may treat the volume of insider trading as a signal of information quality and generate more tips of large insider trades. Similarly, if some insiders trade in anticipation of corporate news (and if the insiders share their knowledge with their brokers), we would expect more tipping after insider trades that are soon followed by corporate news. Also, the extent of tipping may depend on the level of information asymmetry. With more asymmetry, profit potential from mimicking insider trades may be higher, and so there may be more incentives to seek and share insider information. Finally, brokers and their clients may condition on the returns and volumes that precede the insider trade. We examine the above-mentioned determinants of broker market share in the following cross-sectional regression:

$$\begin{aligned} ams_d = {} & \alpha + \gamma_1 Independent_d + \gamma_2 InsiderVolume_d \\ & + \gamma_3 CAR_{d;t-10,t-1} + \gamma_4 AbnormalVolume_{d;t-10,t-1} \\ & + \sum_{z=1}^{3} \gamma_{4+z} PostTradeEvent\ Qz_d + \gamma_8 \#Analysts_d \\ & + \gamma_9 FirmSize_d + \epsilon_d, \end{aligned} \tag{2}$$

where the dependent variable is the event-day (day d) insider's broker's abnormal market share; *Independent* is a dummy variable equal to 1 if the insider's broker is independent and is equal to 0 otherwise; *InsiderVolume* is the share volume executed by insiders during the event day d scaled by the total third-party volume in that stock on that day; $CAR_{t-10,t-1}$ is the cumulative lagged abnormal return for the stock; $AbnormalVolume_{t-10,t-1}$ is the total third-party volume normalized as in Table 2; *PostTradeEvent Qz*, with $z \in 1, 2$, or 3, is a dummy variable that identifies insider trade quartiles by distance from the subsequent news announcement, e.g., Q1 (Q4) includes insider trades with the nearest (farthest) news announcements with Q4 omitted from Equation (2) to prevent multicollinearity; *#Analysts* is the number of analysts covering the stock, and *FirmSize* is the log of market capitalization.[21] The model is estimated separately for insider purchases and sales.

The regression results are reported in Table 10. As previously, we find a significant difference between the bank-affiliated and independent brokerages, with the abnormal event-day market share being higher for the independent brokerages. Further, we show that the coefficient of *I*nsiderVolume—the variable that is directly observed by the broker but not observed by traders until insider trades are officially reported—is significantly positive in all specifications, consistent with our expectations.[22] The coefficients on the distance from news dummies suggest that broker market shares are larger when an insider trade is soon followed by a news event, consistent with insider information being in higher demand during such periods. Finally, consistent with our expectations, third-party trading is less pronounced in larger firms and in firms followed by more analysts.

Table 10. Determinants of Third-Party Trading Intensity

	Insider purchases	Insider sales
Intercept	0.163**	0.124**
	(0.00)	(0.00)
Independent	0.123**	0.119*
	(0.00)	(0.03)
InsiderVolume	0.002**	0.001**
	(0.00)	(0.01)
$CAR_{t-10,t-1}$	−0.007	−0.024
	(0.68)	(0.18)
$AbnormalVolume_{t-10,t-1}$	0.004	0.006**
	(0.07)	(0.00)
*PostTradeEvent Q*1	0.002**	0.001*
	(0.01)	(0.02)
*PostTradeEvent Q*2	0.000	0.001*
	(0.14)	(0.04)
*PostTradeEvent Q*3	0.001*	0.000
	(0.03)	(0.19)
#Analysts	−0.004**	−0.002**
	(0.00)	(0.00)
FirmSize	−0.011**	−0.007**
	(0.00)	(0.00)
Adj. R^2	0.271	0.272
No. of obs.	4,204	3,435

Notes. The table reports estimated coefficients from regressions that examine cross-sectional variation in the level of the broker's abnormal market share on days of insider trades. Abnormal market share is computed on insider buy (sell) days as the difference between the market share of third-party buy (sell) volume transacted through the insider's broker and the average of this market share during the postevent benchmark period [+20; +60] scaled by the standard deviation computed during the same period. *Independent* is a dummy variable with a value of 1 if the broker is independent. *InsiderVolume* is the volume executed by insiders in stock i on day t scaled by the total third-party volume in that stock on that day. $CAR_{t-10,t-1}$ is the cumulative abnormal return for the stock from day $t-10$ to day $t-1$. $AbnormalVolume_{t-10,t-1}$ is the total third-party volume (expressed as the number of shares) minus mean total third-party volume during the postevent window [+20; +60], divided by the standard deviation of total third-party volume during the postevent window. *PostTradeEvent Q*1(2, 3) is a dummy variable indicating the distance from the next news announcement, with Q1 including insider trades with the nearest news announcements, and Q4 (omitted to prevent multicollinearity) including insider trades with the farthest announcements. *#Analysts* is the number of analysts covering the stock. *FirmSize* is the log of the market capitalization of the insider's firm. *p*-Values are in parentheses.

** and * significant at the 1% and 5% levels, respectively.

5. Conclusions

This paper presents results that are consistent with the hypothesis that some brokers share insider trade information with their third-party clients (i.e., that they tip their clients). We find that on days when insiders buy (sell), their brokers' market share of third-party buys (sells) significantly increases. Brokers are motivated to tip because the insiders in our sample exhibit good return timing. Our analysis shows that third-party transactions that mimic insider trades are profitable net of trading costs. The increase in market share is unique to the insiders' brokerages and only occurs in the same direction as the insiders' trades; brokerages that are similar to those used by the insiders exhibit no abnormal activity. Notably, insiders' brokerages do not execute any mimicking trades in their own accounts.

When we examine intraday data, we find that the insider's broker's market share is highest during the half-hour in which the insider's order is submitted to the exchange and during the subsequent half-hour. The proximity of the mimicking trades suggests that they are connected to the insider's trade. There is also an increase in mimicking trades in the half-hour prior to the insider order submission to the exchange, consistent with front-running. Although some third-party traders trade ahead of insiders, they do not obtain better prices by doing so.

We conduct a cross-sectional analysis of the mimicking activity and draw three conclusions consistent with the tipping hypothesis. First, the evidence of tipping is mainly from independent brokers who are smaller, who are less regulated, and who handle trades for insider clients in smaller firms. Second, there is more tipping activity alongside larger insider trades, which suggests that the volume of trades acts as a signal of the quality of the insider's information. Third, there are more mimicking trades in firms with greater information asymmetry, which likely have greater demand for insider information.

Overall, the results are consistent with the notion that information sharing is common for a large subset of brokerage firms handling insider trades on the Toronto Stock Exchange. These results augment the existing literature that has so far been unable to establish a direct link between insiders, their brokers, and the brokers' third-party clients in the context of tipping.

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Endnotes

[1] Canada does not have a national securities regulator; securities regulation is a provincial responsibility. Because the Toronto Stock Exchange is located in the province of Ontario, equity trading in Canada is largely governed by the Ontario Securities Act and regulated by the Ontario Securities Commission.

[2] This paragraph draws from National Policy 51-201: *Disclosure Standards* (2002), Part III, 3.1 (1) and Part IV, 4.1 (2).

[3] http://www.ontario.ca/laws/statute/90s05#BK215 (accessed December 5, 2015).

[4] Per the National Instrument 55-104: *Insider Reporting Requirements and Exemptions* (2010). Subsequently, in 2010, the reporting deadline was shortened to five days.

[5] Although the TSX provides more recent STAMP data, trading in Canadian equities has fragmented across multiple exchanges since 2006. New Canadian exchanges do not provide intraday trading data to academic researchers, so any analysis of more recent TSX data will omit a significant portion of trading activity.

[6] Our results do not change when we use shorter event windows and less restrictive filters corresponding to these windows. For instance, [−5; +5]-day and [−3; +3]-day windows accompanied by, respectively, five-day and three-day filters yield similar results.

[7] Our data, unlike the Thomson Reuters U.S. insider trade data, do not contain insider identities. As such, we do not know if insider trades are from one or several insiders.

[8] Using the TSX and Center for Research in Security Prices (CRSP) size portfolios yields similar results. We test for significance of the abnormal returns in the same manner as Irvine et al. (2007). Specifically, we compute mean size-adjusted returns for all event firms on each day during the postevent window [+20; +60]. We then use the time-series mean and variance of size-adjusted returns in the postevent window to test for significance of abnormal returns around the event.

[9] Irvine et al. (2007) scale daily volume by the number of shares outstanding to ensure cross-sectional comparability. Because the shares outstanding variable is not available for all sample firms as we discuss in Section 2.2, we use an alternative scaling technique. We compute abnormal volume as third-party trading volume minus the benchmark period mean divided by the benchmark period standard deviation. Koski and Scruggs (1998), Sias (2004), and Blau and Wade (2012) use a similar approach. Our benchmark period is [+20; +60], as in Irvine et al. (2007). The results are similar when we use the [−60; −20] benchmark period. Our findings also hold when we scale by the number of shares outstanding using a reduced sample.

[10] Similarly, Kyle (1985) predicts that insiders trade when there is increased trading.

[11] The original sample includes 27 months, but the analysis in Table 3 requires one-month lags and is therefore estimated over 26 months. Given that the sample includes 966 firms, the panel size is $966 \times 26 = 25{,}116$. A few of the specifications include variables constructed from Compustat data, which was incomplete and so reduced the sample size slightly.

[12] Similar to Cohen et al. (2012), we also estimate portfolio alphas using the calendar portfolio approach. The results are qualitatively similar to those reported in Table 3 and are available upon request.

[13] Abnormal returns are computed by subtracting the coincident size decile portfolio return. Results using raw returns are similar. When we include all insider trades instead of focusing on the first insider trade of the day, the results are similar although lower in magnitude.

[14] A number of studies document increased trading associated with the release of analyst reports. i.e., Irvine et al. (2007), Juergens and Lindsey (2009), and Christophe et al. (2010).

[15] We focus on the first insider order because it represents the first learning opportunity for the third-party traders. As a robustness

exercise, we repeat this test using all insider orders and also using the first insider trade and all trades.

[16] We discard insider trading days where the first insider order is submitted during the first or the last half-hour of the trading day. Retaining these days does not materially change the results.

[17] This figure is obtained as follows. Table 5 shows that the insider's broker's market share increases by 0.010 (= 0.063 – 0.053) on days of insider sales and by 0.013 on days of insider purchases. Given the total volume of 749,795 shares executed on an average insider trade day (see Table 1), the incremental volume executed by the insider's broker is about 7,500 shares.

[18] Unreported results show that the third-party volume that occurs in the 30 minutes before insider order submission obtains prices that are marginally worse than those of insider trades themselves. As such, front-running does not appear particularly lucrative.

[19] Per *Motley Fool* (2007).

[20] As a robustness check, we use the closing prices instead of the VWAP. Our results are similar.

[21] When we estimate the model as a panel, using standard errors clustered across firms and across time, the results are similar. These results are available upon request.

[22] The dependent variable and the *I*nsiderVolume variable are scaled by the total daily volume, and as such, an additional control for contemporaneous volume is not necessary. As a robustness check, we use the day's volume as a control in Equation (2) and obtain similar results.

References

Beny LN, Anand AI (2013) Private regulation of insider trading in the shadow of lax public enforcement: Evidence from Canadian firms. *Harvard Bus. Law Rev.* 3(2):215–256.

Bettis J, Coles J, Lemmon M (2000) Corporate policies restricting trading by insiders. *J. Financial Econom.* 57(2):191–220.

Bettis C, Vickrey D, Vickrey WD (1997) Mimickers of corporate insiders who make large-volume trades. *Financial Analysts J.* 53(5): 57–66.

Blau B, Wade C (2012) Informed or speculative: Short selling analyst recommendations. *J. Banking Finance* 36(1):14–25.

Brearton S (2015) Canada's top 100 brands. *Globe Mail* (February 26), http://www.theglobeandmail.com/report-on-business/rob-magazine/canadas-top-100-brands/article23217643/.

Chakrabarty B, Shkilko A (2013) Information leakages in financial markets: Evidence from shorting around insider sales. *J. Banking Finance* 37(5):1560–1572.

Christophe S, Ferri M, Hsieh J (2010) Informed trading before analyst downgrades. *J. Financial Econom.* 95(1):85–106.

Cicero DC (2009) The manipulation of executive stock option exercise strategies: Information timing and backdating. *J. Finance* 64(6):2627–2663.

Cohen L, Malloy C, Pomorski L (2012) Decoding inside information. *J. Finance* 67(3):1009–1043.

Geczy C, Yan J (2006) Who are the beneficiaries when insiders trade? An examination of piggybacking in the brokerage industry. Working paper, University of Pennsylvania, Philadelphia.

Goldstein MA, Hotchkiss ES, Sirri ER (2007) Transparency and liquidity: A controlled experiment on corporate bonds. *Rev. Financial Stud.* 20(2):236–273.

Herbig P, Milewicz J (1995) The relationship of reputation and credibility to brand success. *J. Consumer Marketing* 12(4):5–10.

Heron RA, Lie E (2007) Does backdating explain the stock price pattern around executive option grants? *J. Financial Econom.* 83(2):271–295.

Huddart S, Ke B, Shi C (2007) Jeopardy, non-public information, and insider trading around SEC 10-K and 10-Q filings. *J. Accounting Econom.* 43(1):3–36.

Inci A, Lu B, Seyhun H (2010) Intraday behavior of stock prices and trades around insider trading. *Financial Management* 39(1): 323–363.

Irvine P, Lipson M, Puckett A (2007) Tipping. *Rev. Financial Stud.* 20(3):741–768.

Jeng L, Metrick A, Zeckhauser R (2003) Estimating the returns to insider trading: A performance-evaluation perspective. *Rev. Econom. Statist.* 85(2):453–471.

Jenter D (2005) Market timing and managerial portfolio decisions. *J. Finance* 60(4):1903–1949.

Juergens J, Lindsey L (2009) Getting out early: An analysis of market making activity at the recommending analyst's firm. *J. Finance* 64(5):2327–2359.

Koski J, Scruggs J (1998) Who trades around the ex-dividend day? Evidence from NYSE audit file data. *Financial Management* 27(3):58–72.

Kyle AS (1985) Continuous auctions and insider trading. *Econometrica* 53(6):1315–1335.

Lakonishok J, Lee I (2001) Are insider trades informative? *Rev. Financial Stud.* 14(1):79–111.

Lakonishok J, Vermaelen T (1986) Tax-induced trading around ex-dividend days. *J. Financial Econom.* 16(3):287–319.

Lin J-C, Howe JS (1990) Insider trading in the OTC market. *J. Finance* 45(4):1273–1284.

Motley Fool (2007) What's wrong with full-service brokers? (December 21), http://www.fool.com/investing/brokerage/whats-wrong-with-full-service-brokers.aspx.

Piotroski J, Roulstone D (2005) Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations? *J. Accounting Econom.* 39(1):55–81.

Scott J, Xu P (2004) Some insider sales are positive signals. *Financial Anal. J.* 60(3):44–51.

Seyhun N (1986) Insiders' profits, costs of trading, and market efficiency. *J. Financial Econom.* 16(2):189–212.

Sias R (2004) Institutional herding. *Rev. Financial Stud.* 17(1):165–206.

Sias R, Whidbee D (2010) Insider trades and demand by institutional and individual investors. *Rev. Financial Stud.* 23(4):1544–1595.