Subsidizing Liquidity:

The Impact of Make/Take Fees on Market Quality[*]

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Abstract

In recent years most equity trading platforms moved to subsidize the provision of liquidity, using a so-called make/take fee structure. Under this structure submitters of limit orders typically receive a rebate upon execution of their orders, and the exchange covers its costs by charging a higher fee for executed market orders. We provide the first empirical study on the impact of this, now prevalent, fee structure on market quality, market efficiency, and trading activity by analyzing the introduction of liquidity rebates on the Toronto Stock Exchange. Using a proprietary dataset, we find that the liquidity rebate structure leads to decreased spreads, increased depth, increased volume, and intensified competition in liquidity provision. Explicitly accounting for exchange fees and rebates, we further find that trading costs for market orders did not decrease and that per share revenues for liquidity providers increase, despite the reduced bid ask spreads. Finally, we find no evidence for changes in intermediation or market efficiency.

JEL Classification: G12, G14.

Keywords: Liquidity credits, market quality, trading.

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The equity trading landscape has changed dramatically over the last decade. Worldwide, most public markets moved away from human interactions and are now organized as electronic limit order books, where traders either post passive limit orders that offer to trade a specific quantity at a specific price or submit active market(able) orders that "hit" posted limit orders. Posters of passive limit orders provide, or "make", liquidity, submitters of active market orders "take" liquidity. In contrast to traditional intermediated markets, limit order books rely on the voluntary provision of liquidity and must offer enough of it to attract trading. As a result, it is now the industry standard to subsidize passive trading volume.

This practice, known as make/take fees, is controversial. It has been argued that the subsidies caused excessive intermediation by attracting algorithmic traders that solely focus on capturing fee rebates.[1] Moreover, while some market-making firms are in favour of liquidity subsidies, other market participants have voiced concerns that they could result in excessive fees for liquidity takers.[2] To the best of our knowledge, there is no empirical study that conclusively addresses advantages and disadvantages of the make/take fees. The present study aims to fill this gap.

Our analysis is based on trading fee changes on the Toronto Stock Exchange (TSX) and uses a proprietary database. The TSX phased in the liquidity fee rebates on two distinct dates, introducing them on October 01, 2005 for all securities that were interlisted with NASDAQ or AMEX and on July 01, 2006 for the remainder of the securities. We study the 2005 change,[3] after which an active marketable order incurred a per share fee of \$.004 and a passive limit order that is "hit" received a per share fee rebate of \$.00275. Active orders for stocks that did not move to this rebate structure incurred a cost of 1/55 of 1%

[1]See "Rise of the machines: Algorithmic trading causes concern among investors and regulators", The Economist July 30th 2009.

[2]See, for instance, the comments for the make/take fee structure in the options markets sent to the SEC by GETCO at http: //www.getcollc.com/images/uploads/getco_comment_090208.pdf, or the petition by Citadel in favor of a fee cap at http: //www.sec.gov/rules/petitions/2008/petn4-562.pdf. Responding to these concerns, the SEC even imposed a 30-cent ceiling on stock exchanges for 100-share equity trades.

[3]The 2006 event also involved a change in the fees for the NASDAQ and AMEX interlisted securities, making it difficult to isolate the effect of liquidity rebates.

(1.8 basis points) of the dollar value of the transaction and passive orders were free. To put the make/take fees into perspective, the median end July 2005 closing price in our sample of 73 companies that were interlisted with NASDAQ and AMEX is \$6.08. The per share taker fee of \$0.004 translates into a fee of 6.58 basis points at the median, the passive side's per share rebate of \$.00275 translates into 4.52 basis points at the median.

Our empirical strategy is an event study on the introduction of the fee rebates. Since the change affected the incentives for liquidity provision for only a subset of companies, we are able to control for market wide conditions by matching securities that were affected with securities that were not. We then perform tests using a difference-in-differences approach to capture the marginal impact of the fee structure change on market quality, trader welfare, volume, and competition for liquidity provision.

We assess market quality by standard bid-ask spread, depth and market efficiency measures. We find that, compared to the control group, securities that were interlisted on NASDAQ or AMEX experienced a decrease in their time-weighted quoted spreads of 12.1 basis points and an increase in their quoted depth.[4] Studying autocorrelations of midquote returns, and the 5/30 minute and 15/30 minute variance ratios to detect changes in market efficiency, we find no effect. We thus conclude that the fee rebates improve liquidity offered throughout the day and that there is no evidence that they affect market efficiency.

A liquidity taker's welfare is commonly measured by the transaction costs, which are proxied by the effective spread. For a buyer initiated transaction, the effective spread is twice the difference between the average per share price and the prevailing midpoint of the quoted bid and offer prices. We observe a marked decline in effective spreads, which indicates that liquidity makers passed on some of their fee rebate to takers. After adjusting the effective spread to account for the exchange fees, however, we find no evidence that transaction costs have declined — instead we find a (statistically weak) increase.

[4]Bid-ask spreads on the TSX are, on average, larger than those on U.S. exchanges, even though the TSX is one of the world's largest exchanges by market capitalization and trading volume. Since 2005, however, spreads have fallen substantially.

A liquidity maker's per share revenue is commonly proxied by the magnitude of the price reversal after a transaction, and it is measured by the realized spread. For a buyer initiated transaction, the realized spread is twice the difference between the average per share price and the midpoint of the quoted bid and offer prices several minutes after the transaction. Here, too, we observe a decline in the spread, consistent with the idea that liquidity providers pass on some of their rebate. Yet, after adjusting the realized spread to account for the fee rebate, we find an increase. We thus conclude that liquidity makers' revenues have increased as a consequence of the fee rebate.

A key objective of subsidizing liquidity provision is for the exchange to attract more volume. We indeed find an increase in volume, which is somewhat surprising considering that transaction costs actually went up. A potential criticism of fee rebates is that an increase in volume may be caused merely by increased intermediation. The argument is that to capture liquidity rebates, an intermediary such as an algorithm "injects" itself between two traders who would have otherwise transacted on their own. Our data allows us to identify orders that originate from clients, and we study changes in intermediation by analyzing the fraction of client to non-client trades. An increase in this fraction would signify increased intermediation, but we find no supporting evidence that this fraction has changed.

Finally, with the introduction of fee rebates, ceteris paribus, it becomes cheaper to post limit orders. It is then imaginable that institutions see the introduction of rebates as an opportunity to enter the market for liquidity provision. To asses the extent of competition, we count the number improvements of the best bid and offer prices and depth, the number of liquidity providing market participants that are involved in transactions, and we compute the Herdindahl Index of market concentration. The latter, also known as the Herfindahl-Hirschman Index,[5] is widely used as a proxy for the competitiveness of a given industry — for instance, the U.S. Department of Justice and the Federal Trade Commission use it to assess the effects of a merger on competition — and it is computed

[5]See, e.g. Tirole (1988); see also Hirschman (1964) for a discussion of the origin of the index.

as the sum of the squared market shares. The higher the index, the lower the level of competition. In our case, the good provided is liquidity, and thus, loosely, a trader's market share is the fraction of limit order volume that this trader provides.

We find a significant increase in the number of improvements in the bid ask spread and depth, which we show to be driven by improvements in depth. The number of spread improvements, on the other hand, declines. Since the average depth also increases, we conclude that after the fee change, traders compete more aggressively on depth. We further show that the increase in the number of quote improvements is driven by two factors. First, traders compete more aggressively for liquidity provision, as is implied by an decrease in the Herfindahl Index. Second, we find (weak) evidence that the fee rebates attract new entry in the market for liquidity provision.

To summarize our results, we find that competition, particularly on depth, intensifies. Although liquidity providers lower spreads in response to the fee change, their per share revenues increase, taking rebates into account. This hints at the possibility that competition in prices is less relevant than competition for market share in liquidity provision.

Colliard and Foucault (2011) provide some theoretical guidance for the effects of a fee change. They show that trader welfare is affected only by the total fee, i.e. the sum of maker and taker fee, and that the composition itself has no impact, provided the tick size is zero, because quotes adjust to neutralize any make/take fee redistribution. Their model further predicts that the bid-ask spread decreases in the take fee and increases in the make fee. In our study, the take fee increases for stocks with low prices and declines for stocks with high prices. Consistent with the theoretical predictions, we find that spreads decline for low price stocks; the effect for high price stocks is statistically insignificant. The make fee declines unambiguously (from 0 to $-\$.00275$ per share), and we find support for the prediction in that spreads decline.

Foucault, Kadan, and Kandel (2009) find theoretically that the optimal make/take fee composition depends on the relative levels of competition among the liquidity providers and liquidity demanders, and on the relative monitoring costs for these two groups. They

argue that the lower fee (or a rebate) on the liquidity makers will increase the trading rate and the aggregate welfare only under some conditions (for instance, when liquidity providers have higher monitoring costs than liquidity demanders, or when the level of competition among liquidity providers is low when compared to that among liquidity demanders). When these conditions are not satisfied, the optimal make/take fee structure would impose higher fees on makers rather than on takers. Finally, our work also relates to Degryse, Van Achter, and Wuyts (2011) who theoretically study the impact of clearing and settlement fees on liquidity and welfare.

The next section reviews trading on the TSX and the details of the fee changes. Section 2 describes the data, the sample selection, and the regression methodology. Section 3 discusses results on market quality and efficiency. Section 4 describes trader welfare, Section 5 presents results on volume and intermediation, Section 6 discusses competition. Section 7 concludes. Tables and figures are appended.

1 The Toronto Stock Exchange and its Trading Fees

1.1 Trading on the TSX

The Toronto Stock Exchange (TSX) is an electronic-only trading venue, having closed its physical floor in 1997. In 2005 it was the seventh largest exchange world-wide in terms of market capitalization of traded securities, and twelfth largest in dollar trading volume.[6]

Trading on the TSX is organized in an upstairs–downstairs structure. Orders can be filled by upstairs brokers (usually these are very large orders), who have price improvement obligations, or they can be cleared via the consolidated (electronic) limit order book. The TSX limit order book generally follows the so-called price-time priority.[7] It is constructed by sorting incoming limit orders lexicographically, first by their price ("price priority") and then, in case of equality, by the time of the order arrival (with the earlier orders enjoying the "time priority"). Transactions in the limit order book occur when active

[6]Source: *World Federation of Security Exchanges*.

[7]One exception to this rule is a so-called unintentional cross, where time priority is overruled if active and passive orders are submitted by the same broker.

orders — market orders (orders to buy or sell at the best available price) or marketable limit orders (e.g. a buy limit order with a price higher than the current best ask) — are entered into the system. Unpriced market orders occur very infrequently on the TSX, and in what follows we will use the term "active order" to for the marketable portion of an orders, and we using "passive order" for a standing limit order that is hit by an active order. Active orders "walk the book", that is if the order size exceeds the number of shares available at the best bid or offer price, then they continue to clear at the next best price.

All orders must be sent to the TSX by registered brokers (the Participating Organizations (P.O.)). Trading is organized by a trading software (the trading engine), and our data is the audit trail of the processing of the trading engine. We describe the data in more detail in Section 2. Orders of sizes below round lot size (for the companies in our sample this size is 100 shares) are cleared by the so-called Registered Trader (RT). Similarly, portions of orders that are not multiples of the round lot size (e.g. 99 shares of a 699 share order) will be cleared by the RT, after the round lot portion of the order has cleared (e.g. the 99 shares of a 699 share order will clear after, and only if, the 600 shares have cleared).

The TSX equity specialist, or RT, has the obligation to provide minimum fills when there are no standing limit orders, but the RT's powers are small compared to those of the NYSE designated market maker (formerly referred to as the specialist).[8] In contrast to many ECNs, however, the TSX RT is rather a liquidity provider of last resort and it is reflected by the fact that the RT is party in only about 1.3-1.4% of the dollar volume of the transactions that enter our sample (see Table 3). Thus crucially, the TSX with its public, electronic limit order books largely relies on its users to voluntarily supply liquidity by posting limit orders. This system contrasts traditional systems where dealers are institutionally obliged to stand ready to trade and make a market.

[8]Subject to tight rules, the RT has the right to participate in orders to unload a pre-existing inventory position that she or he built up in the process of providing liquidity to markets. The RT has no informational advantage over other traders.

1.2 Details of the Change in Trading Fees

During our sample period, the TSX was virtually a monopolist in equities trading in Canada, in contrast to U.S. equities markets that at the time were becoming increasingly fragmented. Lack of fragmentation thus allows us to isolate the impact of liquidity rebates and to obtain insights that one may not be able to obtain from studying U.S. data.

The TSX phased in the liquidity rebates on two discrete dates, introducing them on October 01, 2005 for the TSX companies that were interlisted on NASDAQ or AMEX; on July 01, 2006 all remaining companies switched. In this paper we focus on the 2005 change of fees.[9]

Prior to October 01, 2005, all TSX stocks were subject to the so-called value-based trading fee system, under which the active side of each transaction incurred a fee based on the dollar amount of the transaction (1/50 of 1% a the dollar-amount in the months immediately preceding October 01) and the passive side incurred no fee or rebate. On October 01, TSX-listed stocks that were also inter-listed with NASDAQ and AMEX switched to a volume-based trading regime, under which for each traded share the active side had to pay a fee of $.004 and the passive side obtained a rebate on its exchange fees of $.00275. Dealer crosses incurred a fee of $.002 per share per side. All other securities remained at the prevailing value-based regime, although, the fees were slightly reduced — after October 01, 2005, active orders incurred a fee of 1/55 of 1% of the dollar-amount of the transaction, dealer crosses were charged 1/110 of 1% per traded dollar per side, and passive orders remained free. The value based fee is capped at $50, the volume based fee is capped at $100 and the rebate at $50. For consistency, when using these fees, we will be converting the volume based dollar-fees into basis points fees of the value of the transaction.

Compared to the old value based fee structure, the new volume based billing yields

[9]We restrict attention to the 2005 change for two reasons: first, in 2006 there was a change in the level of fees simultaneously with the switch to a maker-taker fee structure. Second, a difference-in-differences analysis in 2006 has less statistical power because the treatment group, non-interlisted securities, is much larger than the control group, interlisted stocks. That being said, the results that we have for 2006 event are qualitatively similar to the results for the 2005 event.

the TSX higher per share fee revenue for securities that trade below \$6.875. Liquidity takers pay less for securities that trade above \$22.[10] To put these fees into perspective, the median closing price at the end of July 2005 in our sample of the companies that were interlisted with NASDAQ and AMEX is \$6.08. Under the "old" value-based system, the per share taker fee is 1.8 basis points (which is \$0.00111 at the median), there was no maker fee or rebate, and thus the TSX's per share revenue is 1.8 basis points. Under the "new" volume based billing, the taker fee is \$0.004 (or 6.58 basis points at the median), the passive side's rebate is \$.00275 per share (or approximately 4.52 basis points at the median), and thus the TSX's revenue at the median price is about 2 basis points.

2 Data, Sample Selection, and Methodology

2.1 Data Sources

Our analysis is based on a proprietary dataset, provided to us by the Toronto Stock Exchange (TSX). Data on market capitalization, monthly volume, splits, and (inter-) listing status is obtained from the monthly TSX e-Reviews publications. Data on the CBOE's volatility index VIX is from Bloomberg. We analyze the effect of the fee structure change by looking at a 4 month window (2 months before and 2 months after the introduction of the liquidity rebates), from August 01, 2005 to November 30, 2005. The TSX participating organizations are billed at the end of each month, and the event window was chosen to include the month immediately following the change as well as one month after the first bill that was based on the new fee structure. We exclude information for trading days that have no or limited U.S. trading (an example is the U.S. Thanksgiving and the Friday following it); information on scheduled U.S. market closures is obtained from the NYSE Calendar. We also exclude October 11, 2005 and November 21, 2005 as the TSX data included several recording errors for these days.

[10] Total fees coincide for the price p that solves $p \times 1/55 \times 1\% = (\$.004 - \$.00275)$, active fees coincide for the price p that solves $p \times 1/55 \times 1\% = \$.004$.

The TSX data that is provided to us is the input-output of the central trading engine, and it includes all messages that are sent to and from the brokers. The data contains public and private information for all orders, cancellations and modifications sent to the limit order book, public and private information on all trade reports, and details on dealer (upstairs) crosses. Further, the data contains all the system messages and user notifications, for instance, announcements about changes in the stock status, such as trading halts and freezes, announcements about estimated opening prices, indications that there is too little liquidity in the book (the spread is too wide), and so on.

Each message consists of up to 500 subentries, such as the date, ticker symbol, time stamp, price, volume, and further information that depends on the nature of the message. For instance, each order submission, notification and cancellation message contains information about the order's price, total and displayed volume, the orders's time priority, broker ID, trader ID, order number (new and old for modifications), information about the nature of the account (e.g. client, inventory or equity specialist), information about whether an order is submitted anonymously or whether the broker number is to be displayed in the TSX pay-for data feed,[11] information about whether an order is a shortsale, and some further details that we do not exploit in this project.

For each order that is part of the trade, the data further contains the volume of the transaction as well as the public (as sent to the data feeds) and private (the actual) remaining volumes, information on whether an order was filled by a registered trader, and where it was executed (e.g. in the public limit order book, with a specialist outside the limit order book (for oddlots), in the market for special terms orders, or crossed by a broker). The liquidity supplier rebates only affect trades that clear via the limit order book. Consequently, we exclude opening trades, oddlot trades, dealer crosses, trades in the special terms market, and trades that occur outside normal trading hours.

Importantly for the construction of the liquidity measures, the transaction data spec-

[11] In accordance with Canadian regulations, the choice of whether to attribute the order to a particular dealer remains with the dealer. Submitting a non-anonymous order may be advantageous for time priority reasons. Traders can also specify that they do not want to clear against an anonymous order.

ifies the active (liquidity demanding) and passive (liquidity supplying) party, thus identifying each trade as buyer-or seller-initiated. Finally, one useful system message is the prevailing quote — a message that identifies the best bid and ask quotes as well as the depth at the best quotes. This message is sent each time there is a change in the best quotes or the depth at these quotes, and it allows us to precisely identify the prevailing quote at each point in time. This information, too, is crucial when constructing the liquidity measures.

2.2 Sample Selection.

We construct our sample as follows. Out of 3,000+ symbols that trade on the TSX, we include only common stock and exclude debentures, preferred shares, notes, rights, warrants, capital pool companies, stocks that trade in US funds, companies that are traded on the TSX Venture and on the NEX market, exchange traded funds, and trust units. We required that the companies had positive volume in July 2005, according to the TSX e-Review, and were continuously listed between July 2005 and November 2005. We further exclude companies that had stock splits, that were under review for suspension, that had substitutional listings, and that had an average daily midquote below $1.

Differently to commonly applied filters, we retain companies with dual class shares. This is due to a peculiarity of the Canadian market, where, as of August 2005, an estimated 20-25% of companies listed on the TSX made use of some form of dual class structure or special voting rights, whereas in the United States, only about 2% of companies issue restricted voting shares (see Gry (2005)). We excluded Nortel (symbol: NT) because (*i*) it comprised up to 4% of all trading volume, and (*ii*) it was involved in a high profile accounting scandal at the time of our sample period (along with Worldcom and Enron). Finally, to exclude companies that trade very infrequently, we require that there is sufficient trading data to compute realized spreads for 95% of the 80 trading days that comprise our sample.

We determined a company's interlisted status from the TSX e-Reviews. We then classify companies as "interlisted with NASDAQ or AMEX" in our 2005 sample if they were interlisted with NASDAQ or AMEX from August to November 2005 and non-interlisted with NASDAQ and AMEX if they were not interlisted from August to November. Companies that changed their interlisting status during the sample period or for which the status was unclear were omitted from the sample.

We are then left with 73 NASDAQ and AMEX interlisted companies and 374 TSX only and NYSE interlisted companies. In what follows, we will refer to companies that are interlisted with NASDAQ and AMEX as "interlisted", and we will refer to companies that are TSX-only listed or interlisted with NYSE as "non-interlisted".

2.3 Matched Sample

We construct the matched sample as follows. Using one-to-one matching without replacement, we determine a unique non-interlisted match for each of the interlisted securities based on closing price, market capitalization, and a level of competition for liquidity provision, as measured by the Herfindahl Index (formally defined in the next subsection).

One-to-one matching without replacement based on closing price and market capitalization has been shown to be the most appropriate method to test for difference in trade execution costs; see Davies and Kim (2009). We additionally include a measure of competition as a matching criterium, for two reasons. First, the focus of this study is not only trade execution costs but also other variables that are affected by competition, such as traders' behavior, welfare and the levels of intermediation. Second, we aim to identify the impact of the introduction of the liquidity rebates, and according to Foucault, Kadan, and Kandel (2009), who study the make/take fees theoretically, this impact depends on the level of competition among traders.

We randomize the order of matching by sorting the stocks in the treatment group (i.e. the interlisted securities) alphabetically by symbol. The match for each treatment group

security i is then defined to be a control group security j that minimizes the following matching error:

$$matcherror_{ij} := \left|\frac{p_i - p_j}{p_i + p_j}\right| + \left|\frac{MC_i - MC_j}{MC_i + MC_j}\right| + \left|\frac{HHI_i - HHI_j}{HHI_i + HHI_j}\right|, \tag{1}$$

where p_i, MC_i, and HHI_i denote security i's July 2005 closing price, market capitalization as of the end of July 2005, and the average July 2005 value of the Herfindahl Index at the broker level, respectively. Tables 13 and 14 contain the list of interlisted companies and their matches.

2.4 Measuring Competition: The Herfindahl Index

We quantify competition among traders by computing the Herfindahl Index of market concentration (also known as the Herfindahl-Hirschman Index) for liquidity provision per day per stock.[12] The Herfindahl index is widely used as a proxy for the competitiveness of a given industry, for instance, the U.S. Department of Justice and the Federal Trade Commission use it to assess the effects of a merger on competition.

The index is computed as the sum of the squared market shares. In our case, the good provided is liquidity, and thus, loosely, a trader's market share is the fraction of passive limit order volume that this trader provides. The Herfindahl Index for different levels of liquidity providing entities (e.g., broker, trader) per day t per security i is

$$HHI_{it} = \sum_{k=1}^{n_t} \left(\frac{passive\ volume_{it}^k}{\sum_{k=1}^{n_t} passive\ volume_{it}^k} \right)^2, \tag{2}$$

where n_t is the number liquidity providing entities on day t in security i and $passive\ volume_{it}^k$ is the $k-$th entity's total passive volume for that day and security. Higher values of the index correspond to higher levels of market concentration and thus to lower levels of competition (value 1 corresponds to monopolistic liquidity provision).

[12] See, e.g. Tirole (1988); see also Hirschman (1964) for a discussion of the origin of the index.

We consider two levels of liquidity providing entities, namely, the broker and the trader level. At the broker level, the passive volume per security per day is the total intraday passive volume of that broker, excluding dealer crosses. The "broker level HHI" does not differentiate between trades that the broker posts by client request and that he posts on his own account to make a market. To better understand the behavior of institutions that provide liquidity on an ongoing basis, we compute the index for traders that trade on an inventory account; in our data such trades stem from either an inventory or a equity specialist account. We refer to the latter index as the "trader level HHI."

We also compute the plain number of liquidity-providing brokers and liquidity-providing inventory-traders to shed some light on possible changes in competition indices.

2.5 Panel Regression Methodology

For each security in our sample and for each of their matches, we compute a number of liquidity and market activity measures for the 4 month window around the event date (2 months before and after October 01, 2005). Our panel regression analysis employs a difference in differences approach and thus controls for market-wide fluctuations. To additionally control for U.S. events that may affected interlisted securities differentially, we include the CBOE volatility index VIX in our regressions. For each measure, we run the following regression[13]

$$\textit{dependent variable}_{it} = \beta_0 + \beta_1 \textit{fee change}_t + \beta_2 \mathsf{VIX}_t + \sum_{j=1}^{8} \beta_{2+j} \textit{control variable}_{ij} + \epsilon_{it},$$

where $\textit{dependent variable}_{it}$ is the time t realization of the measure for treatment group security i less the realization of the measure for the ith control group match; $\textit{fee change}_t$ is an indicator variable that is 1 after the event date and 0 before; VIX_t is the closing value of CBOE's volatility index for day t, and $\textit{control variable}_{ij}$ are security level control variables for the company and its match: the log of the market capitalization, the log of

[13] In unreported regressions we further controlled for company fixed effects, with similar results.

the closing price, and the share turnover and the daily midquote return volatility in the month before the event window, July 2005.

We conduct inference in all regressions in this paper using double-clustered Cameron, Gelbach, and Miller (2011) standard errors, which are robust to both cross-sectional correlation and idiosyncratic time-series persistence.[14] For brevity we display only the estimates for the coefficient β_1 on the fee change dummy, and we omit the estimates for the constant as well as estimates for the coefficients on VIX and on the controls. The number of observations roughly equals the number of companies in the treatment group multiplied with the number of trading days in our sample periods (correcting for a small number of missing observations when a company or its match did not trade for a day), at most 5,840 observations.

Regressions for Subsamples. In addition to analyzing the impact of the fee structure change on the entire sample, we estimate the effects separately for the groups of treatment companies above and below the median with respect to pre-sample (July 31, 2005) market capitalization, total July 2005 trading volume (in shares), the fraction of volume traded on the TSX in July 2005 for interlisted stocks, and the average July 2005 Herfindahl index of market concentration at the broker level. Medians of market capitalization, volume, TSX share of volume and the Herfindahl Index are, respectively, $475 million, 1.795 million shares, 37.8% and 0.2296. We estimated the following equations

$$\begin{aligned} \textit{dependent variable}_{it} &= \beta_0 + \beta_1 \textit{fee change}_t \times \textit{above median}_i \\ &\quad + \beta_2 \textit{fee change}_t \times \textit{below median}_i + \beta_3 \textit{above median}_i \\ &\quad + \beta_4 \mathsf{VIX}_t + \sum\nolimits_{j=1}^{8} \beta_{4+j} \textit{control variable}_{ij} + \epsilon_{it}, \end{aligned} \tag{3}$$

where *above median*$_i$ is an indicator variable that equals 1 if security i has market capitalization (or trading volume, TSX share of volume, Herfindahl index) above the median;

[14] Cameron, Gelbach, and Miller (2011) and Thompson (2010) developed the double-clustering approach simultaneously. We follow the former and employ their programming technique. See also Petersen (2009) for a detailed discussion of (double-) clustering techniques.

similarly for the variable *below median*$_i$.

Furthermore, as we explain in Section 1.2, under the new volume-based make/take fee structure liquidity takers pay lower fees for stocks that trade at high prices (above \$22). We thus also estimated the effects separately for stocks with July 31 closing prices above and below \$22, where the regression equation is the same as (3), except *above median*$_i$ equals 1 if security i's July 31 closing price is above \$22; likewise for *below median*$_i$. We will henceforth refer to a closing price of \$22 as the "break even price."

We report only the estimates of interest, i.e. the estimated coefficients on the interaction terms *fee change*$_t$ × *above dummy*$_i$ and *fee change*$_t$ × *below dummy*$_i$. Results from tests for differences in the coefficients are indicated in the respective tables.

3 Market Quality

3.1 Quoted Liquidity

We measure quoted liquidity using time and trade weighted quoted spreads and depth. The *quoted spread* is the difference between the best price at which someone is willing to buy, or, the offer price, and the best price at which someone is willing to sell, or the bid price. We express the spread measures in basis points as a proportion of a prevailing quote midpoint. *Share depth* is defined as average of the number of shares that can be traded on the bid and offer side; the *dollar depth* is the dollar amount that can be traded at the bid and the offer. We use logarithms of these depth measures to ensure a more symmetric distribution since several Canadian companies, particularly, non-interlisted ones, historically have very large depth with of many times the round lot size. High liquidity refers to large depth and small spreads.

The trade-weighted spread and depth are the prevailing spread and depth averaged over all transactions, and they capture the impact of the trading fee change for executions. The time-weighted measures additionally reflect the availability of liquidity throughout the day.

Results. Figure 1 shows a marked decline in the quoted spread after the event date and an increase in the dollar depth. The summary statistics in Table 3 paint a similar picture. Our panel regressions further confirm these observations. The results for the change in the quoted spread are in the first two columns of Table 4. The first column depicts the time weighted quoted spreads, the second column measures the trade weighted quoted spreads.

The average price for interlisted companies on September 30, 2005, was $12.07, the median price was $5.66. The size of the rebate in 2005 was ¢.275 per share, which translates into 4.56 and 9.72 basis points at the average and median prices respectively for simultaneous passive buy and sell orders. We observe that the estimate on the time-weighted quoted spread declines by 12.09 basis points, the trade-weighted quoted spread declines by 9.34 basis points. The latter is roughly the amount of the rebate at the median price and around double the rebate at the mean price. These results are significant at the 1% level.

When considering subsamples, we find that significant effects arise for stocks that trade below the break-even price for market orders, $22, for all levels of competition and market capitalization, for stocks that have relatively higher share of their volume traded on the TSX, and stocks that have high volume. Further, the coefficient estimates differ significantly for subsamples with respect to the break-even price and with respect to the TSX share of trading.

Table 5 displays the results of our panel regressions on depth. We find that time and trade weighted share and dollar depth all increase significantly. Further, these increases are significant in the subsamples of securities with prices below the break-even price, high competition, high market capitalization, high share of trading volume on the TSX, and low trading volume.

In summary, quoted spreads improve in the sense that they become tighter and depth improves in the sense that more shares/dollar volume can be traded at the best bid and offer prices. We thus find strong evidence that quoted liquidity improved.

3.2 Effective Liquidity

Quoted liquidity measures the best publicly posted conditions. Effective liquidity captures the conditions that traders decided to act upon. The costs of a transaction to the liquidity demander is measure by the *effective spread*, which is is the difference between the transaction price and the midpoint of the bid and ask quotes at the time of the transaction. For the t-th trade in stock i, the proportional effective spread is defined as

$$espread_{ti} = 2q_{ti}(p_{ti} - m_{ti})/m_{ti}, \tag{4}$$

where p_{ti} is the transaction price, m_{ti} is the midpoint of the quote prevailing at the time of the trade, and q_{ti} is an indicator variable, which equals 1 if the trade is buyer-initiated and -1 if the trade is seller-initiated. Our data includes identifiers for the active and passive side for each transaction, thus precisely signing the trades. Further, our data is message by message, as processed by the trading engine, and it includes quote changes. The prevailing quote is thus precisely identified as the last quote before the transaction.

The change in liquidity provider profits is measured by decomposing the effective spread into its permanent and transitory components, namely the *price impact* and the *realized spread*,

$$espread_{ti} = priceimpact_{ti} + rspread_{ti}. \tag{5}$$

The price impact reflects the portion of the transaction costs that are due the presence of informed liquidity demanders, and a decline in the price impact would indicate a decline in adverse selection. The realized spread reflects the portion of the transaction costs that is attributed to liquidity provider revenues. We estimate these revenues using the five-minute realized spread, which assumes that the liquidity provider is able to close his or her position at the quote midpoint five minutes after the trade. The proportional five-minute

realized spread is defined as

$$rspread_{ti} = 2q_{ti}(p_{ti} - m_{t+5\ \min,i})/m_{ti}, \tag{6}$$

where p_{ti} is the transaction price, m_{ti} is the midpoint of the quote prevailing at the time of the t-th trade, $m_{t+5\ \min,i}$ is the midpoint of the quote 5 minutes after the t-th trade, and q_{ti} is an indicator variable, which equals 1 if the trade is buyer-initiated and -1 if the trade is seller-initiated.

Results. Figure 2 plot the 5-day moving averages of the effective spread and the price impact for each of our the treatment group of inter-listed and their control group matches. The figure suggests that the change in the fee structure led to a decrease in the effective spread, and it also indicates a decline in the price impact. Similarly, the summary statistics in Table 3 point to significant improvement of liquidity.

The panel regressions confirm these observations. The third column of Table 4 displays the results for effective spreads and indicate that after the fee change effective spreads fell significantly, by about 10 basis points. We further find significant effects in subsamples with prices below the break-even price of $22, for low market capitalization, high share of volume on the TSX, high trading volume, and all levels of competition. Coefficients for the subsample estimates differ significantly for below vs. above the break-even price and the share of trading volume on the TSX.

The decline in transaction costs, as measured by the effective spread, can be due to liquidity makers foregoing some of their revenue, or it can be attributed to a change in trade informativeness. The former is quantified by the change in realized spreads, the latter by a change in the price impact.

The fourth column of Table 4 displays our regression results for realized spreads. We find that 5-minute realized spreads decline by 5.23 basis points. In subsamples we find significant effects for prices blow the break-even price, high competition, high TSX share of volume, and high volume. The price impact, listed in the fifth column of Table 4

declines by 5 basis points. In subsamples we find significant effects for prices blow the break-even price, low competition, low market capitalization, high TSX share of volume, and high volume.

We thus conclude that the liquidity providers share some portion of the rebate by lowering their revenue and also that the adverse selection declines. The decline in adverse selection is consistent with the idea that narrower spreads attract new, price-sensitive uninformed traders and informed traders with weaker information. Our findings on an increase in volume that we discuss in Section 5 further support this idea.

With perfect competition for liquidity provision, liquidity makers would pass on their credits to liquidity takers across the board. We find, however, that the effective spread declines *only* for the subsample of securities that have higher per share fees for liquidity takers under the new volume based make/take fee system compared to the old value-based billing. Since the realized spread also declines significantly for this subsample, we conclude that liquidity providers only pass on their rebates for the subset of securities that experienced an increase in liquidity takers fees.

Colliard and Foucault (2011) provide some theoretical guidance for the effects of a fee change. Their model predicts that the bid-ask spread decreases in the take fee and increases in the make fee. In our study, the make fee declines (from 0 to $-\$.00275$ per share), and we find that spreads decline, as predicted (see Table 4). The take fee, on the other hand, increases for stocks with low prices and declines for stocks with high prices. Consistent with the theoretical predictions, we find that spreads decline for low price stocks, and that the coefficient for high price stocks is insignificantly different from 0.

3.3 Market Efficiency

We measure market efficiency with two standard proxies, the return autocorrelation and the variance ratio. Specifically, we analyzed the impact of the liquidity rebate structure on the first order autocorrelations of 5-, 15-, and 30-minute midquote returns, and the 5/30

minute and 15/30 minute variance ratios, as described in Campbell, Lo, and MacKinley (1997), calculated for each security each day. Prices that follow a random walk, should have a return autocorrelation of zero. Autocorrelations are negative on average, thus an increase in autocorrelation or a decrease in its absolute value signifies improved market efficiency. The 5-minute/30-minute variance ratio is six times the 5-minute variance of midquote returns divided by the 30-minute variance of midquote returns; similarly for the 15-/30 minute variance ratios. The variance ratio evaluates whether short-term price changes are reversed on average. Such reversals, if they exist, would indicate that over short horizons, trades cause prices to deviate from the (efficient) equilibrium price. As there is usually some excess volatility, the variance ratio is commonly greater than one, and thus a declines in the variance ratio indicates improved market efficiency.

Table 6 displays the results of our panel regressions the impact of the fee change on autocorrelations and variance ratios.[15] We do not find significant effects for any of the measures.

4 Trader Welfare

The effective spread is often considered to be the best measure for transaction costs. The spread does not, however, include exchange fees. To determine a liquidity demander's welfare, it is important to explicitly account for these fees. We thus compute

$$\textit{fee adjusted espread}_{ti} = (2q_{ti}(p_{ti} - m_{ti}) + 2 \times \textit{exchange fee}_{ti})/m_{ti}, \tag{7}$$

where $\textit{exchange fee}_{ti}$ is the per share fee to remove liquidity. Before the change of fees it is $1/50 \times 1\% \times p_{ti}$ for all securities, and after the change it is $1/55 \times 1\% \times p_{ti}$ for non-interlisted stocks and \$0.004 for interlisted stocks.

Similarly, the realized spread is considered to measure the benefit to the liquidity

[15]The table displays the results using signed autocorrelations; results for absolute values are similar.

provider. To explicitly account for liquidity rebates, we compute

$$\textit{rebate adjusted rspread}_{ti} = (2q_{ti}(p_{ti} - m_{t+5\ \min,i}) + 2 \times \textit{fee rebate}_{ti})/m_{ti}, \tag{8}$$

where $\textit{fee rebate}_{ti}$ is the per share maker fee rebate. It is 0 for all securities before the fee change. After the change it is 0 for non-interlisted stocks and \$.00275 for interlisted stocks.

Results. Focussing only on effective and realized spreads and omitting exchange fees may give the misleading impression that liquidity demanders unambiguously benefit while liquidity takers obtain reduced revenue. Figure 3 shows instead that after the fee change, the passive side benefited, and it indicates that the costs for the active side did not decrease.

Table 7 shows the regression results for fee and rebate adjusted spreads. We find that the fee adjusted effective spreads increase, although the significance is only at the 10% level. The table also shows that total liquidity provider revenues increase, and thus the liquidity rebates more than compensate the liquidity providers for the revenue that is passed on to liquidity demanders. Furthermore, there are stark differences in revenues between low and high competition and low and high price stocks.[16]

Colliard and Foucault (2011) predict that the fee adjusted effective spread (the "cum fee" spread in their paper) increases in the total fee. In our case, total fees decline for stocks priced below \$6.875 (see Section 1.2). In separate, unreported regressions, we found that for the subsample with prices below \$6.875, exchange fee adjusted effective spreads increase by 15.1 basis points (significant at the 1% level), and with prices above \$6.875 exchange fee adjusted effective spreads decrease by 3.2 basis points (insignificantly different from 0); coefficients differ at the 1% level.

[16]The increase for low price stocks is probably in part caused by the fact that the fixed amount rebate has a stronger relative impact when the price is low.

5 Volume

One key question that relates to the changes in fees is whether it had any effect on trading behavior. If traders engage in the same transactions irrespective of the exchange fees, then the change in fees is merely redistributive and has no impact on aggregate welfare.

To detect changes in behavior, we study the impact of the fee change on volume, that is the number of shares traded, the dollar amount of all trades, and the number of transactions. We further decompose these numbers into volume that stems from clients and non-clients to understand if there are changes in intermediation.

Aggregate Volume. Table 8 displays our results on volume and the number of transactions, measured in logarithms. Our results suggest that the fee change increases volume, dollar volume, and the numbers of transactions. This implies that the demand for liquidity went up, even though, as we discussed in Section 4, transaction costs did not decline for the liquidity demand side.

Intermediated Volume. The increase in volume could stem from two sources. First, improved conditions may attract new traders. We proxy for this effect by analyzing whether there was a change in client volume. Second, traders who engage, loosely, in market making activities may find it easier, or even attractive, to trade in and out of their inventories. Such behavior would result in an increase in intermediation. We proxy for the extent of intermediation by the fraction of volume that occurs between a client and an intermediary.[17] If the only cause for the increase in volume is intermediation, then investors may loose on aggregate as intermediaries receive compensation for their services.[18]

Table 9 displays our findings on total client volume and shows that it increases significantly. This finding is consistent with the result on the decreased price impact if one believes that the reduced spreads attract price sensitive or less well informed traders. Ta-

[17] Our data identifies client trades as well as equity specialist, broker inventory, and option market maker trades. We classify all parties other than clients as intermediaries.

[18] This is a loose statement that assumes negligible search costs for investors who want to trade.

ble 10 shows our findings on intermediated trades and indicates no change in the extent of intermediation.

6 Competition in Liquidity Provision

With the introduction of fee rebates, ceteris paribus, it becomes cheaper to post limit orders. It is then imaginable that institutions see the introduction of rebates as an opportunity to enter the market for liquidity provision. To asses the extent of competition, we count the number improvements of the best bid and offer prices and depth, the number of liquidity providing market participants that are involved in transactions, and we compute the Herdindahl Index of market concentration (introduced in Section 2.4).

6.1 Improvements in the Quoted Bid-Ask Spread and Depth.

The first column Table 12 summarizes our findings on the total number of improvements of either spread or depth. We find a significant increase in the number of improvements, which indicates increased competition. The second and third columns show that this increase is driven by improvements in depth and that the number of spread improvements goes down. Since the average depth also increased, we conclude that after the fee change, traders compete more aggressively on depth. The decline in the number of spread improvements is consistent with the increase in average depth. As depth increases, fewer trades walk the book and there may be fewer opportunities to improve the spread after the book was depleted. Furthermore, since quoted spreads decline, there is less room for improving the spread.

Our findings on the increase in the number of quote improvements are consistent with Foucault, Kadan, and Kandel (2009) who predict, in particular, that the liquidity providers' monitoring activity increases as their fee decreases.

6.2 Market Participation and Concentration.

The increase in the number of quote improvements could be driven by two factors: first, existing traders may compete more aggressively, and second, the liquidity rebates may have attracted new traders. The Herfindahl Index at the trader level, which we focus on here, is based the shares of passive volume that traders provide from their inventory, and it captures the first factor.

The first column of Table 11 displays our results on the trader level HHI and shows that market concentration declines/competition increases. Looking at the subsample of stocks that trade below $22, we find competition increases significantly. This finding is consistent with the significant increase in depth that we observe there.

To assess market participation, we count the number of liquidity providing brokerages and the number of liquidity providing inventory traders. The number of brokers per security per day is the number of unique broker IDs that were on the passive side of transactions. The number of inventory traders is the number of unique trader IDs that traded on an inventory or equity specialist account and that were on the passive side of transactions. Table 2 shows for interlisted stocks that the median numbers of brokers and inventory traders were 12 and 4, respectively. Columns two and three in Table 11 reveal that the number of brokers and traders both increased after the change, although the coefficient on the number of traders is significant only at the 10% level.

7 Conclusion

We study the introduction of fee rebates for passive volume on the Toronto Stock Exchange. During our sample period, the TSX was virtually a monopolist in equities trading in Canada; in contrast, U.S. equity markets were becoming increasingly fragmented. Lack of fragmentation allows us to isolate the impact of liquidity rebates and to obtain insights that one may not be able to obtain from studying U.S. data.

Consistent with theoretical predictions, we observe that the introduction of the rebates

led a substantial decline in bid-ask spreads. We further observe an increase in depth and volume. The increase in volume is somewhat surprising because we identify that transaction costs, accounting for both the spread and the exchange fees, did not go down.

The increase in depth is consistent with our results on competition, which indicate that, after the introduction of the fee rebates, liquidity providers compete more aggressively for market share in the "make" market. Moreover, although we identify that liquidity providers lower their spreads in response to the fee change, their per share revenues increase, taking rebates into account. Together these findings indicate that competition in prices may be less relevant than competition for market share in liquidity provision.

Finally, although we find no evidence for increased intermediation for our sample period, the increase in per share revenues suggests that algorithmic market making may well be very profitable.

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Table 1
Summary Statistics on Trading Activity for Interlisted companies and their non-interlisted matches

The table lists aggregate trading volume related figures for the August-November 2005 sample period for NASDAQ/AMEX-interlisted companies and their respective matches. Percentage numbers are for the share that the respective figure has of total volume.

		Interlisted with NASDAQ/AMEX		Non-Interlisted	
Total Volume (excluding special terms market)	Share Volume	1,847,794,191		2,140,879,197	
	Dollar Volume	$ 20,517,866,297		$ 26,768,731,058	
	Transactions	1,966,642		1,451,526	
Intraday		1,313,804,000	71.1%	1,349,823,200	63.0%
		$ 14,726,937,292	71.8%	$ 15,962,222,831	59.6%
		1,808,270	91.9%	1,247,051	85.9%
Open		28,873,204	1.6%	46,924,654	2.2%
		$ 356,600,562	1.7%	$ 584,311,868	2.2%
		32,269	1.6%	48,900	3.4%
Afterhours		87,457,828	4.7%	107,148,290	5.0%
		$ 2,180,634,369	10.6%	$ 2,215,202,425	8.3%
		21,516	1.1%	17,704	1.2%
Dealer Crosses		413,080,078	22.4%	631,005,919	29.5%
		$ 3,056,619,162	14.9%	$ 7,753,556,056	29.0%
		5,248	0.3%	7,595	0.5%
Oddlots		4,579,081	0.2%	5,977,134	0.3%
		$ 197,074,912	1.0%	$ 253,437,878	0.9%
		99,339	5.1%	130,276	9.0%
Equity Specialist (oddlots+normal trades)		66,763,881	3.6%	92,300,034	4.3%
		$ 276,512,711	1.3%	$ 362,617,083	1.4%
		269,071	13.7%	325,678	22.4%
Number of Market Orders		1,240,327		779,492	
Non-Client Market Order Volume		493,981,000	27%	393,193,700	18%
Non-Client Market Order Transactions		585,996	30%	293,166	20%
Client Market Order Volume		819,823,000	73%	956,629,500	82%
Client Market Order Transactions		1,222,274	70%	953,885	80%

Table 2
Pre-sample Summary Statistics of Interlisted companies and their matches

The table lists some summary statistics that characterize the NASDAQ/AMEX-interlisted companies and their respective matches for the pre-sample month of July. Unless otherwise specified, the numbers are average per day per company. The letter M signifies millions. Intra-day volume refers to transactions that occur in the open market during regular trading hours (9:30-16:00), excluding odd-lot trades, special terms orders and dealer crosses.

		NASDAQ/AMEX interlisted	Non-interlisted
Total July intra-day volume in shares	Mean	2,837,000	3,784,000
	StE	(4,426,000)	(9,333,000)
	Median	1,308,000	1,857,000
Total July intra-day dollar volume		$37.1M	$39.7M
		($95M)	($125M)
		$8.617M	$12.4M
Total July transactions		4,407	3,320
		(6413)	(5209)
		2,354	1,870
Closing price end July 2005		$ 11.95	$ 12.13
		(17.30)	(17.09)
		$ 6.08	$ 6.12
Market capitalization end July 2005		$1,330M	$1,500M
		($4,540M)	($6,020M)
		$475M	$392M
Time weighted daily quoted spread in bps		73.76	93.83
		(52.87)	(60.03)
		60.77	90.18
Time weighted quoted dollar spread (in cents)		¢4.781	¢6.271
		(¢4.644)	(¢5.210)
		¢3.525	¢4.578
Time weighted dollar depth		$15,196	$20,759
		(13,173)	(16,632)
		$11,786	$16,825
Herfindahl Index, Broker Level		0.235	0.249
		(0.075)	(0.081)
		0.23	0.247
Herfindahl Index, Market Marker Level		0.476	0.592
		(0.171)	(0.209)
		0.471	0.607
Number of Brokers		12.73	12.16
		(5.384)	(5.504)
		11.9	11.45
Number of Market Making Traders		5.88	4.576
		(5.176)	(5.536)
		4.15	3.1

Table 3
Summary Statistics of Interlisted companies and their matches

The table lists some summary statistics that characterize the NASDAQ/AMEX-interlisted companies and their respective matches for the sample period August-November 2005, per day per company. All measures for spreads and transaction costs are in basis points of the prevailing midquote. The standard error presented for the difference in difference is adjusted by factor $\sqrt{73}$.

		Treatment group of NASDAQ/AMEX Interlisted Stocks		Control Group of non-interlisted Stocks		
		Before	After	Before	After	Diff-in-Diff
Intraday Dollar Volume (in logs)	Mean	13.08	13.1	13.36	13.22	0.169**
	StE	(1.594)	(1.643)	(1.412)	(1.503)	(0.081)
	Median	12.97	13.04	13.25	13.2	
Time-weighted quoted spread		70.59	71.63	88.96	103.2	-13.25***
		(50.510)	(52.070)	(55.090)	(65.890)	(3.430)
		53.86	66.71	84.47	87.17	
Effective spread		60.58	62.18	79.28	91.93	-11.05***
		(42.310)	(43.570)	(49.520)	(60.660)	(3.112)
		45.18	60.35	77.23	81.42	
Time weighted dollar depth (in logs)		9.364	9.38	9.722	9.637	0.101***
		(0.667)	(0.714)	(0.576)	(0.618)	(0.038)
		9.336	9.279	9.725	9.591	
Exchange fee adjusted effective spread		64.58	81.72	83.28	95.56	4.862
		(42.300)	(56.170)	(49.520)	(60.660)	(3.445)
		49.18	72.6	81.22	85.05	
Rebate adjusted realized spread		18.19	30.8	39.16	43.05	8.726***
		(20.940)	(32.510)	(31.300)	(38.090)	(2.717)
		12.75	21.11	34.87	35.4	
Share of Client to Non-Client Dollar Volume		45.7%	46.0%	41.3%	40.7%	0.78%
		(0.081)	(0.092)	(0.092)	(0.103)	(0.009)
		46.3%	46.3%	40.8%	40.8%	
Herfindahl Index, Market Maker level		0.449	0.428	0.596	0.607	-0.0317**
		(0.174)	(0.170)	(0.213)	(0.214)	(0.014)
		0.464	0.424	0.608	0.606	

Table 4

Panel Regressions Results for Marginal Changes in Bid-Offer Spreads

Dependent variables are treatment group value minus control group value for time-weighted and trade-weighted quoted spread, effective spread and 5-minute realized spreads and price impact. All dependent variables are measured in basis points of the prevailing midquote. For all tables that follow, the following specifications apply: The treatment group in 2005 are the NASDAQ and AMEX interlisted securities. Each dependent variable is regressed on a dummy variable set equal to one for dates after October 01, 2005 and zero before, daily market volatility as measured by the CBOE VIX index, and the following control variables for the security and its match: log(market capitalization) and log(price) at July 31, 2005, and dollar turnover and return volatility in July 2005. Coefficients for volatility, control variables, and the constant are not reported for brevity. The full sample for 2005 is 73 securities. Standard errors are in parentheses; * indicates significance at the 10% level, ** at the 5% level, **+ at the 2%, and *** at the 1% level. Standard errors are robust to time series and cross-sectional correlation. Results other than the full sample are split by the median for the control group for July 2005 market capitalization ($475M), total volume (1.795M shares), share of volume traded on the TSX (37.8%), and the Herfindahl Index (.2296; a smaller value indicates higher competition). The break-even price for market orders is $22; for higher prices, market orders are cheaper under the new regime. We report only the coefficient estimates for the interaction terms; see Section 2.5 for the full specification for the estimated equation. We test for equality of coefficients , where "Yes" indicates that we reject the hypothesis.

	time weighted quoted spread	trade weighted quoted spread	effective spread	5 min realized spread	5 min price impact
full sample	-12.0928***	-9.3401***	-10.0538***	-5.2311**	-5.0015**+
	(3.4968)	(2.8437)	(3.0374)	(2.3381)	(2.0678)
			— break even price for market orders —		
above $22	-1.6723	-1.2625	-1.0578	-1.7872	0.7251
	(5.1254)	(3.7694)	(4.0810)	(2.5619)	(3.2556)
below $22	-13.7469***	-10.6247***	-11.4844***	-5.7810**	-5.9144**+
	(3.8598)	(3.1530)	(3.3793)	(2.6466)	(2.3920)
Different Coefficient?	Yes**	Yes**	Yes**	–	–
			— Herfindahl Index —		
low competition	-13.1704**	-10.4836**	-11.4119**	-3.9198	-7.8241**
	(5.9463)	(4.7917)	(4.9770)	(3.9657)	(3.7789)
high competition	-11.0444***	-8.2329***	-8.7383**+	-6.4991**+	-2.2761
	(3.5352)	(3.0805)	(3.5879)	(2.7042)	(2.6600)
Different Coefficient?	–	–	–	–	–
			— Market Capitalization —		
above median	-7.3514***	-4.5349**	-4.8206*	-2.5039*	-2.3538
	(2.7585)	(2.2464)	(2.7051)	(1.3444)	(2.3949)
below median	-16.7061***	-14.0315***	-15.1628***	-7.9036*	-7.5986**
	(6.0966)	(4.9732)	(5.2298)	(4.3566)	(3.7889)
Different Coefficient?	–	Yes*	Yes*	–	–
			— % of Trading on the TSX —		
above median	-19.9044***	-16.0330***	-16.4611***	-6.7781**	-9.9369***
	(5.2438)	(4.1096)	(4.4782)	(3.1764)	(3.1433)
below median	-4.0643	-2.4458	-3.4548	-3.6372	0.0748
	(3.7863)	(3.3739)	(3.6459)	(3.4358)	(2.8261)
Different Coefficient?	Yes**+	Yes***	Yes**	–	Yes**
			— Share Trading Volume —		
above median	-15.5000***	-12.5071***	-14.3684***	-6.8560**+	-7.5999***
	(4.8567)	(3.7086)	(4.0492)	(2.9331)	(2.6160)
below median	-8.7777*	-6.2767	-5.8707	-3.6713	-2.4701
	(4.7358)	(4.1754)	(4.4619)	(3.6929)	(3.4007)
Different Coefficient?	–	–	–	–	–

Table 5
Panel Regressions for Depth at the Best Bid and Offer Prices

Dependent variables are treatment group value minus control group value for the logarithm of depth (the average of the size of the bid and ask) at transactions and time-weighted. Dependent variables are measured in the log of the number of shares and the log the dollar amounts respectively. Specifications for the panel regression and significance levels are as in Table 4.

	share depth throughout the day	share depth at transaction	$ depth throughout the day	$ depth at transaction
full sample	0.0898**+	0.0837**+	0.1133***	0.1070***
	(0.0369)	(0.0360)	(0.0394)	(0.0384)
		— break even price for market orders —		
above $22	0.0992	0.0688	0.0414	0.0111
	(0.0777)	(0.0633)	(0.0985)	(0.0838)
below $22	0.0884**	0.0861**	0.1247***	0.1223***
	(0.0402)	(0.0398)	(0.0419)	(0.0414)
Different Coefficient?	–	–	–	–
		— Herfindahl Index —		
low competition	0.0562	0.0397	0.0865	0.0695
	(0.0498)	(0.0501)	(0.0533)	(0.0526)
high competition	0.1226**+	0.1263***	0.1393***	0.1434***
	(0.0489)	(0.0458)	(0.0522)	(0.0496)
Different Coefficient?	–	–	–	–
		— Market Capitalization —		
above median	0.1294***	0.1229***	0.1304**+	0.1241***
	(0.0482)	(0.0450)	(0.0511)	(0.0476)
below median	0.0513	0.0454	0.0967*	0.0903
	(0.0512)	(0.0514)	(0.0551)	(0.0549)
Different Coefficient?	–	–	–	–
		— % of Trading on the TSX —		
above median	0.1025**	0.1090**	0.1405***	0.1469***
	(0.0497)	(0.0479)	(0.0503)	(0.0486)
below median	0.0768	0.0576	0.0854	0.0658
	(0.0492)	(0.0486)	(0.0549)	(0.0535)
Different Coefficient?	–	–	–	–
		— Share Trading Volume —		
above median	0.0559	0.0563	0.0982*	0.0985*
	(0.0507)	(0.0493)	(0.0523)	(0.0511)
below median	0.1228**+	0.1103**	0.1280**+	0.1153**
	(0.0484)	(0.0479)	(0.0534)	(0.0520)
Different Coefficient?	–	–	–	–

Table 6
Panel Regressions on Market Efficiency Measures

Dependent variables are treatment group value minus control group value for two of the standard measures for market efficiency, namely x-minute autocorrelation and x-/y-minute variance ratios. Details on these measures are in Section 3. We ran a number of variations with respect to the computations of these measures (for instance, with and without absolute values) and the results are similar as those presented here in that there is no significant effect. Specifications for the panel regression and significance levels are as in Table 4.

	5-minute autocorrelation	15-minute autocorrelation	30-minute autocorrelation	5/30-minute variance ratio	15/30-minute variance ratio
full sample	0.0026	0.0061	0.0018	-0.0062	0.0083
	(0.0068)	(0.0082)	(0.0098)	(0.0081)	(0.0082)
			— break even price for market orders —		
above $22	-0.0214	-0.0145	-0.0014	-0.0118	-0.0157
	(0.0155)	(0.0187)	(0.0200)	(0.0166)	(0.0243)
below $22	0.0064	0.0095	0.0023	-0.0053	0.0122
	(0.0072)	(0.0085)	(0.0109)	(0.0093)	(0.0089)
Different Coefficient?	–	–	–	–	–
			— Herfindahl Index —		
low competition	0.0017	0.0162	0.0038	-0.0082	-0.0032
	(0.0101)	(0.0102)	(0.0145)	(0.0146)	(0.0117)
high competition	0.0035	-0.0032	-0.0000	-0.0042	0.0190*
	(0.0088)	(0.0123)	(0.0132)	(0.0104)	(0.0098)
Different Coefficient?	–	–	–	–	–
			— Market Capitalization —		
above median	0.0048	-0.0136	0.0006	0.0007	0.0104
	(0.0090)	(0.0115)	(0.0132)	(0.0137)	(0.0108)
below median	0.0004	0.0262***	0.0031	-0.0132	0.0061
	(0.0106)	(0.0093)	(0.0149)	(0.0112)	(0.0122)
Different Coefficient?	–	–	Yes***	–	–
			— % of Trading on the TSX —		
above median	0.0133	0.0063	0.0013	-0.0137	0.0136
	(0.0090)	(0.0101)	(0.0164)	(0.0134)	(0.0109)
below median	-0.0083	0.0060	0.0023	0.0015	0.0029
	(0.0089)	(0.0132)	(0.0111)	(0.0135)	(0.0118)
Different Coefficient?	Yes*	–	–	–	–
			— Share Trading Volume —		
above median	0.0026	0.0016	0.0032	-0.0105	0.0070
	(0.0077)	(0.0123)	(0.0162)	(0.0108)	(0.0092)
below median	0.0027	0.0107	0.0005	-0.0019	0.0096
	(0.0106)	(0.0107)	(0.0113)	(0.0135)	(0.0126)
Different Coefficient?	–	–	–	–	–

Table 7
Panel Regressions for Transaction Costs and Rebate Benefits

Dependent variables are treatment group value minus control group value for proportional effective spreads, adjusted for active-order exchange fees, and realized 5 minute spreads, adjusted for exchange fee rebates as described in (7) and (8). Dependent variables are measured in basis points of the prevailing midquote. Specifications for the panel regression and significance levels are as in Table 4.

	exchange fee adjusted effective spreads	rebate adjusted realized 5 minute spreads
full sample	5.6538*	8.0544***
	(3.3209)	(2.5238)
	— break even price for market orders —	
above $22	-2.4563	-0.2473
	(4.1147)	(2.6138)
below $22	6.9440*	9.3770***
	(3.7366)	(2.8674)
Different Coefficient?	Yes*	Yes**+
	— Herfindahl Index —	
low competition	9.8563*	13.1860***
	(5.4822)	(4.3179)
high competition	1.5773	3.0968
	(3.8412)	(2.7434)
Different Coefficient?	–	Yes**
	— Market Capitalization —	
above median	2.2950	4.8913***
	(3.1257)	(1.5057)
below median	8.9320	11.1541**+
	(5.7850)	(4.7828)
Different Coefficient?	–	–
	— % of Trading on the TSX —	
above median	0.0434	7.0562**
	(4.5590)	(3.3096)
below median	11.4313**+	9.0830**+
	(4.6074)	(3.8770)
Different Coefficient?	Yes*	–
	— Share Trading Volume —	
above median	1.7195	6.6988**
	(4.1914)	(2.9735)
below median	9.4669*	9.3517**
	(5.1549)	(4.1513)
Different Coefficient?	–	–

Table 8
Panel Regressions for Volume and Transactions

Dependent variables are treatment group value minus control group value for the logarithms of share volume, dollar volume and the number of transactions. Note that an incoming active order can trigger multiple transactions. Specifications for the panel regression and significance levels are as in Table 4.

	volume in shares	dollar volume	trans-actions
full sample	0.1709**	0.1945**+	0.20***
	(0.0752)	(0.0821)	(0.06)
	— break even price for market orders —		
above $22	-0.0136	-0.0719	0.06
	(0.1854)	(0.1925)	(0.12)
below $22	0.2003**+	0.2369***	0.22***
	(0.0806)	(0.0879)	(0.07)
Different Coefficient?	–	–	–
	— Herfindahl Index —		
low competition	0.0929	0.1228	0.12
	(0.1052)	(0.1135)	(0.08)
high competition	0.2466**+	0.2640**+	0.27***
	(0.0988)	(0.1088)	(0.09)
Different Coefficient?	–	–	–
	— Market Capitalization —		
above median	0.1285**	0.1297*	0.17***
	(0.0629)	(0.0685)	(0.05)
below median	0.2124	0.2577*	0.22**
	(0.1296)	(0.1402)	(0.11)
Different Coefficient?	–	–	–
	— % of Trading on the TSX —		
above median	0.2058*	0.2440**	0.21**
	(0.1152)	(0.1172)	(0.10)
below median	0.1347	0.1431	0.18**+
	(0.0905)	(0.1076)	(0.07)
Different Coefficient?	–	–	–
	— Share Trading Volume —		
above median	0.0830	0.1255	0.16**
	(0.0825)	(0.0930)	(0.08)
below median	0.2574**	0.2626**	0.23**+
	(0.1184)	(0.1274)	(0.09)
Different Coefficient?	–	–	–

Table 9
Panel Regressions for Total Volume by Trader Type

Dependent variables are treatment group value minus control group value for the logarithms of share volume, dollar volume and transactions, split by client and non-client orders. The tables thus allows to determine if there was an increase in the total share/dollar/transaction volume that can be attributed to clients vs. non-clients. Variables are computed such that the sum of client and non-client volume would be twice the daily volume. Specifications for the panel regression and significance levels are as in Table 4.

	share volume		dollar volume		transactions	
	non-client	client	non-client	client	non-client	client
full sample	0.2007***	0.1511*	0.2245***	0.1745**	0.2160***	0.1716**+
	(0.0769)	(0.0781)	(0.0827)	(0.0850)	(0.0624)	(0.0693)
			— break even price for market orders —			
above $22	0.0210	-0.0358	-0.0341	-0.0939	0.1164	0.0089
	(0.1434)	(0.2084)	(0.1436)	(0.2151)	(0.1176)	(0.1473)
below $22	0.2286***	0.1808**	0.2648***	0.2172**+	0.2317***	0.1974***
	(0.0855)	(0.0825)	(0.0919)	(0.0899)	(0.0693)	(0.0745)
Different Coefficient?	Yes***	–	Yes*	–	Yes**	–
			— Herfindahl Index —			
low competition	0.1050	0.0809	0.1369	0.1106	0.1738**	0.0710
	(0.1027)	(0.1109)	(0.1107)	(0.1191)	(0.0823)	(0.0910)
high competition	0.2929***	0.2191**	0.3088***	0.2365**	0.2566***	0.2690***
	(0.1064)	(0.1003)	(0.1141)	(0.1105)	(0.0876)	(0.0918)
Different Coefficient?	–	–	–	–	–	–
			— Market Capitalization —			
above median	0.1327**	0.1137	0.1336**	0.1150	0.1505***	0.1623***
	(0.0608)	(0.0716)	(0.0638)	(0.0776)	(0.0518)	(0.0629)
below median	0.2678**	0.1876	0.3141**	0.2326	0.2805***	0.1806
	(0.1341)	(0.1316)	(0.1437)	(0.1422)	(0.1061)	(0.1143)
Different Coefficient?	–	–	–	–	–	–
			— % of Trading on the TSX —			
above median	0.2681**	0.1812	0.3071**+	0.2194*	0.2684***	0.1835*
	(0.1210)	(0.1186)	(0.1207)	(0.1213)	(0.0933)	(0.1078)
below median	0.1315	0.1198	0.1396	0.1278	0.1623**	0.1593**
	(0.0865)	(0.0958)	(0.1038)	(0.1122)	(0.0750)	(0.0769)
Different Coefficient?	–	–	–	–	–	–
			— Share Trading Volume —			
above median	0.0632	0.0911	0.1049	0.1336	0.1215*	0.1736*
	(0.0805)	(0.0901)	(0.0894)	(0.1005)	(0.0704)	(0.0886)
below median	0.3364***	0.2105*	0.3429***	0.2156*	0.3093***	0.1704*
	(0.1222)	(0.1203)	(0.1306)	(0.1291)	(0.0966)	(0.0978)
Different Coefficient?	Yes*	–	–	–	–	–

Table 10
Panel Regressions on Fraction of Intermediated Trades

Dependent variables are treatment group value minus control group value for the share volume between clients and non-clients, measured in percent of total volume. Specifications for the panel regression and significance levels are as in Table 4.

	Share Volume	Dollar Volume	Transactions
full sample	1.070	1.070	0.690
	(0.980)	(0.980)	(0.850)
	— break even price for market orders —		
above $22	0.910	0.910	0.930
	(1.930)	(1.920)	(2.150)
below $22	1.100	1.100	0.650
	(1.070)	(1.070)	(0.880)
Different Coefficient?	–	–	–
	— Herfindahl Index —		
low competition	0.970	0.970	1.780
	(1.440)	(1.440)	(1.200)
high competition	1.170	1.180	-0.370
	(1.190)	(1.190)	(1.020)
Different Coefficient?	–	–	–
	— Market Capitalization —		
above median	0.000	0.000	-0.730
	(1.050)	(1.050)	(1.060)
below median	2.120	2.120	2.080*
	(1.580)	(1.590)	(1.180)
Different Coefficient?	–	–	Yes*
	— % of Trading on the TSX —		
above median	1.560	1.570	1.560
	(1.400)	(1.400)	(1.090)
below median	0.560	0.560	-0.210
	(1.210)	(1.210)	(1.150)
Different Coefficient?	–	–	–
	— Share Trading Volume —		
above median	-0.230	-0.230	-0.550
	(1.290)	(1.290)	(0.950)
below median	2.340*	2.330*	1.890
	(1.300)	(1.300)	(1.230)
Different Coefficient?	–	–	Yes*

Table 11
Panel Regressions on Competition Indicators

Dependent variables are treatment group value minus control group value for the Herfindahl Index, the number of liquidity providing brokers and the number of liquidity providing traders that trade on inventory accounts. The Herfindahl Index is defined in (2), and the regressions are based on the traders who provide liquidity using their inventory accounts. The number of brokers is the number of broker IDs that are on the passive side of trades, the number of inventory traders is the number of trader IDs, per stock per day, that are on the passive side of trades while using their inventory account. A decrease in the Herfindahl Index indicates a decrease in market concentration and thus an increase in competition for liquidity provision. Specifications for the panel regression and significance levels are as in Table 4.

	Herfindahl Index on inventory traders	number of brokers	number of inventory traders
full sample	-0.0350**+	0.6903**	0.5007*
	(0.0144)	(0.3410)	(0.2617)
	— break even price for market orders —		
above $22	0.0325	-0.6283	0.1746
	(0.0362)	(0.5968)	(0.6439)
below $22	-0.0459***	0.8996**+	0.5525*
	(0.0144)	(0.3717)	(0.2886)
Different Coefficient?	Yes**	Yes**	–
	— Herfindahl Index —		
low competition	-0.0305*	0.6522	0.2476
	(0.0180)	(0.4214)	(0.2154)
high competition	-0.0392*	0.7274	0.7470*
	(0.0209)	(0.5009)	(0.4404)
Different Coefficient?	–	–	–
	— Market Capitalization —		
above median	-0.0114	0.0573	0.4874
	(0.0163)	(0.3202)	(0.4215)
below median	-0.0588***	1.3062**+	0.5137*
	(0.0212)	(0.5500)	(0.2657)
Different Coefficient?	Yes**	Yes**	–
	— % of Trading on the TSX —		
above median	-0.0474**	0.8972	0.9778**+
	(0.0212)	(0.5471)	(0.3804)
below median	-0.0224	0.4777	0.0104
	(0.0180)	(0.3668)	(0.3055)
Different Coefficient?	–	–	Yes**
	— Share Trading Volume —		
above median	-0.0334*	0.3055	0.4937
	(0.0187)	(0.4320)	(0.4318)
below median	-0.0367*	1.0647**	0.5075*
	(0.0204)	(0.4944)	(0.2698)
Different Coefficient?	–	–	–

Table 12
Panel Regressions for Improvements in the Best Bid-Offer

Dependent variables are treatment group value minus control group value for the total number of improvements at the best-bid-offer (BBO) as well as the decomposition of this number into the number of improvements in the best-bid and offer prices and depth. Specifically, the number of improvements in the BBO is computed, for each stock and day, by counting the number of times that there is an increase in the number of shares available at the bid or offer for a fixed or an improved prices and the number of times that the bid is increased or the offer decreased. Specifications for the panel regression and significance levels are as in Table 4.

	Number of BBO improvements	spread improvements	depth improvements	Number of BBO changes
full sample	102.2**+	-54.3***	156.5***	236.3***
	(41.2)	(9.8)	(47.3)	(58.0)
		— break even price for market orders —		
above $22	76.5	-179.9**	256.4	127.0
	(230.1)	(78.6)	(220.0)	(285.7)
below $22	106.3***	-34.4***	140.7***	253.6***
	(41.2)	(9.1)	(39.5)	(82.8)
Different Coefficient?	–	Yes*	–	–
		— Herfindahl Index —		
low competition	-4.2	-48.9***	44.7**+	31.1
	(28.4)	(17.1)	(18.9)	(50.7)
high competition	205.8***	-59.5***	265.3***	435.9***
	(72.0)	(15.2)	(82.9)	(99.4)
Different Coefficient?	Yes***	–	Yes***	Yes***
		— Market Capitalization —		
above median	189.2***	-71.6***	260.8***	406.2***
	(73.1)	(16.3)	(83.8)	(97.5)
below median	17.6	-37.5**	55.1**	71.0
	(37.3)	(17.0)	(27.5)	(72.4)
Different Coefficient?	Yes**	–	Yes**+	Yes***
		— % of Trading on the TSX —		
above median	59.6*	-42.6**	102.2***	166.1***
	(32.8)	(21.3)	(19.7)	(63.9)
below median	146.0*	-66.3***	212.3**+	308.4***
	(76.8)	(9.9)	(89.4)	(103.4)
Different Coefficient?	–	–	–	–
		— Share Trading Volume —		
above median	208.3***	-38.2**	246.5***	383.2***
	(73.2)	(16.6)	(78.8)	(100.4)
below median	-1	-70.0***	69.0*	93.4
	(53.4)	(23.8)	(37.5)	(94.7)
Different Coefficient?	Yes**+	–	Yes**	Yes**

Figure 1
Quoted Liquidity: Spreads and Depth

The top left panel plots the time-weighted quoted spreads for the group of NASDAQ/AMEX interlisted securities and their matches (labelled as "TSX"). The bottom left panel plots depth at the best bid and offer prices. The top and bottom right panels plot the differences of, respectively, quoted spreads and depth for interlisted securities vs. their non-interlisted matches. All plots are 5-day moving averages. Spreads are measured in basis points of the midpoint, depth is measured in the logarithm of the average dollar amount available for trading at the best bid and offer prices.

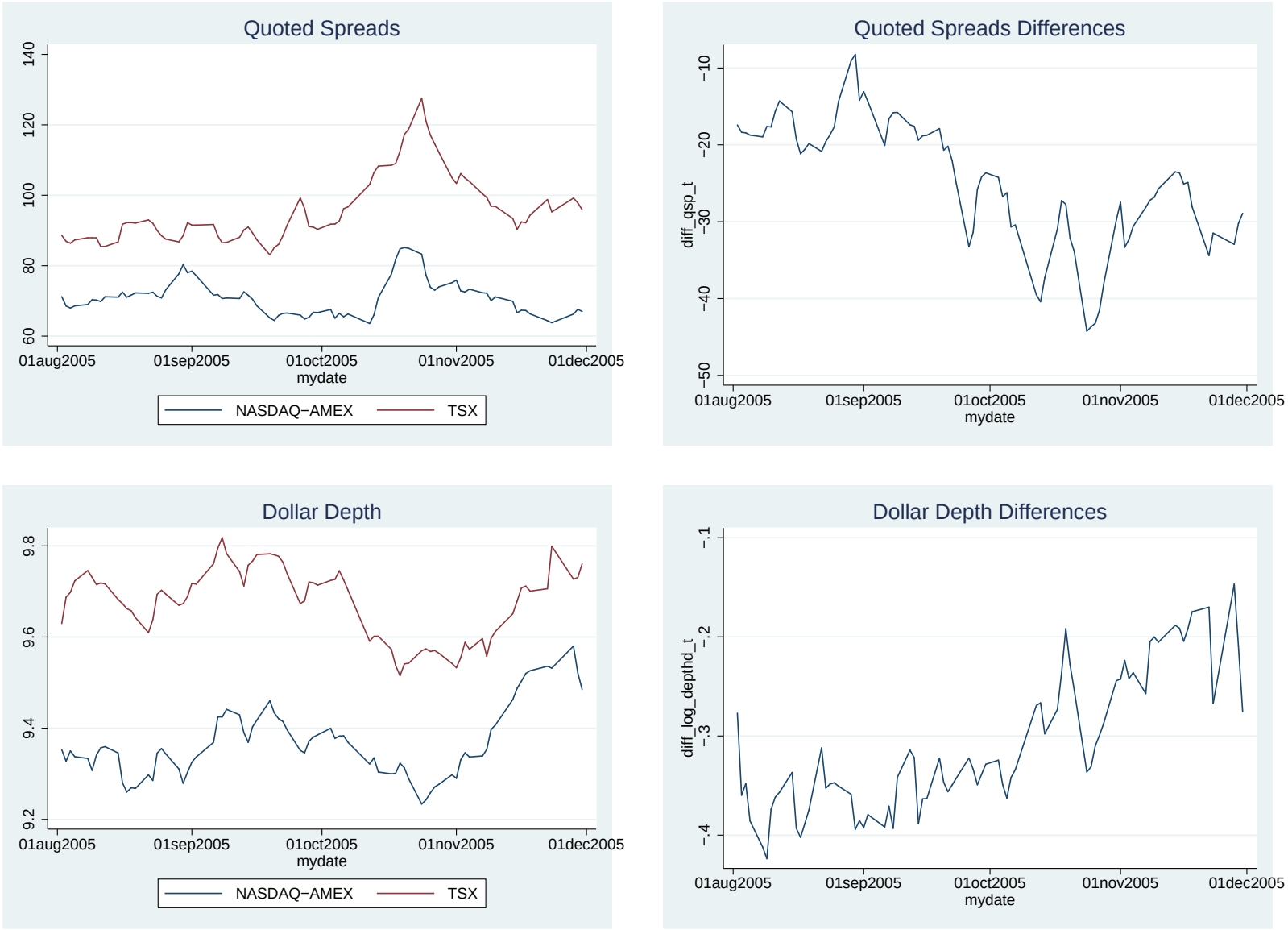


Figure 2
Effective Liquidity: Price Impacts and Effective Spreads

The left panel plots the trade-weighted effective spread for the group of NASDAQ/AMEX interlisted securities and their matches (labelled as "TSX"). The bottom left panel plots the trade-weighted 5-minute price impact. The top and bottom right panels plot the differences of, respectively, effective spreads and price impact for interlisted securities vs. their non-interlisted matches. All plots are 5-day moving averages. Spreads and price impact are measured in basis points of the midpoint.

Figure 3
Plots of Trade Execution Costs for Active Orders and Benefits for Passive orders

The left panel plots the trade-weighted exchange fee adjusted effective spread for the group of NASDAQ/AMEX interlisted securities and their matches (labelled as "TSX"). The bottom left panel plots the trade-weighted 5-minute rebate adjusted realized spread. The top and bottom right panels plot the differences of, respectively, adjusted effective and realized spreads for interlisted securities vs. their non-interlisted matches. All plots are 5-day moving averages. Spreads are measured in basis points of the midpoint.

Figure 4
Plots of Dollar Volume

The left panel plots the average daily intra-day dollar volume (all trades against standing orders in the limit order book) for the group of NASDAQ/AMEX interlisted securities and their matches (labelled as "TSX"). The right panel plots the differences of the average dollar volume for interlisted securities vs. their non-interlisted matches. All plots are 5-day moving averages. Dollar volume is expressed by its logarithm.

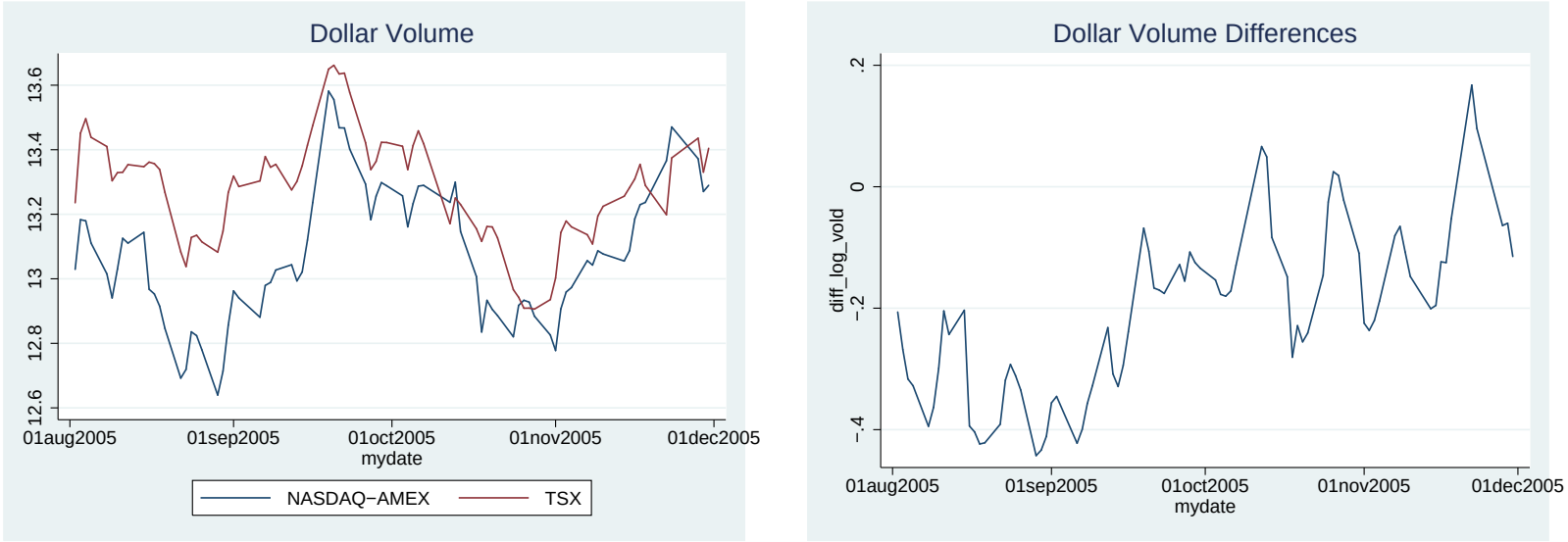
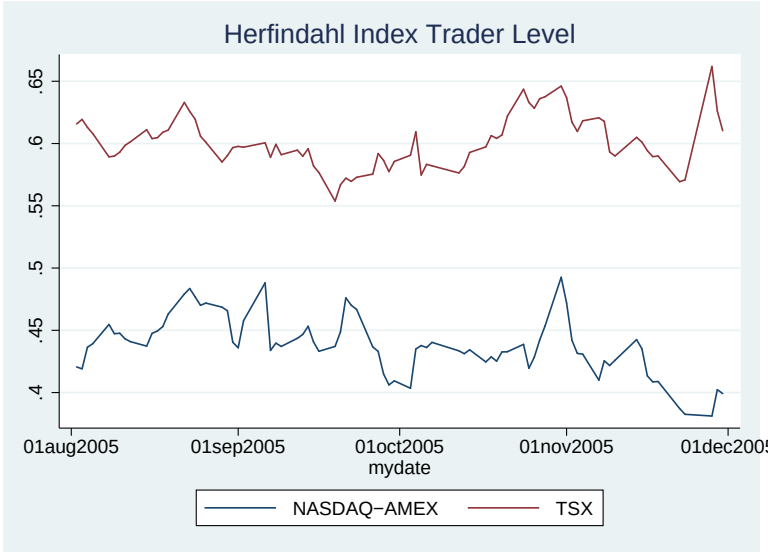


Figure 5
Plots of the Herfindahl Index

The left panel plots the average of the per day per stock trader level Herfindahl Index (see Section 2.4) for the group of NASDAQ/AMEX interlisted securities and their matches (labelled as "TSX"). The right panel plots the differences of the trader level HHIs for interlisted securities vs. their non-interlisted matches. All plots are 5-day moving averages.



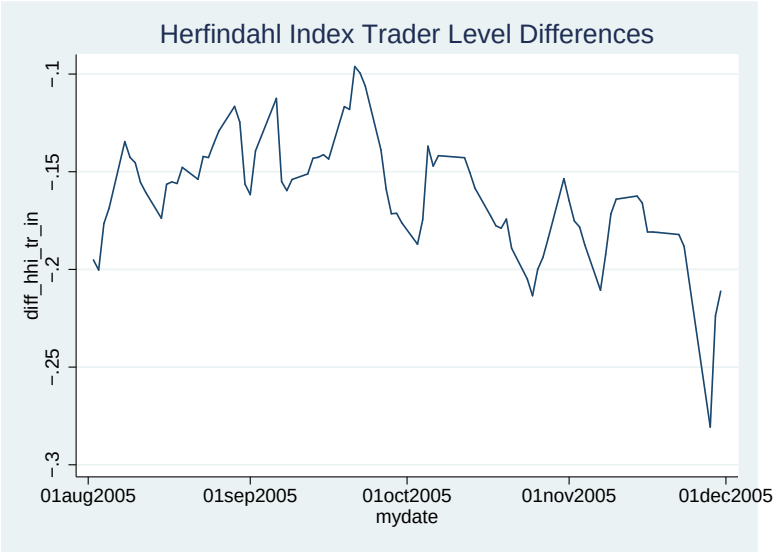
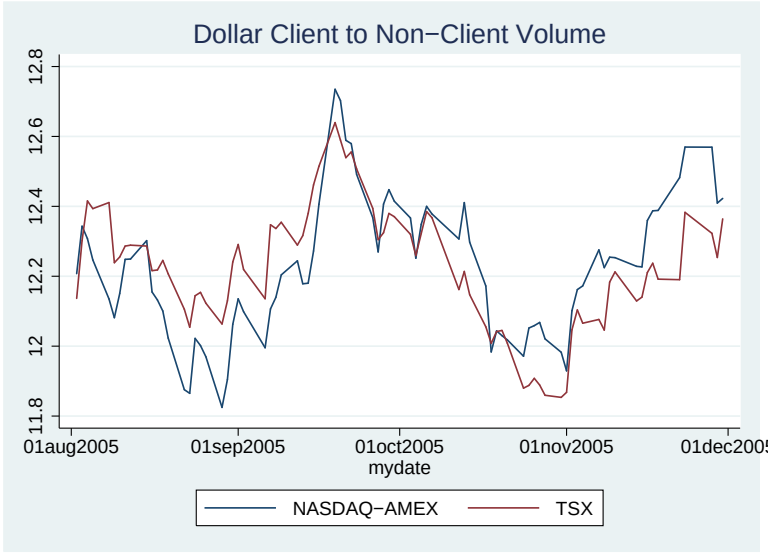
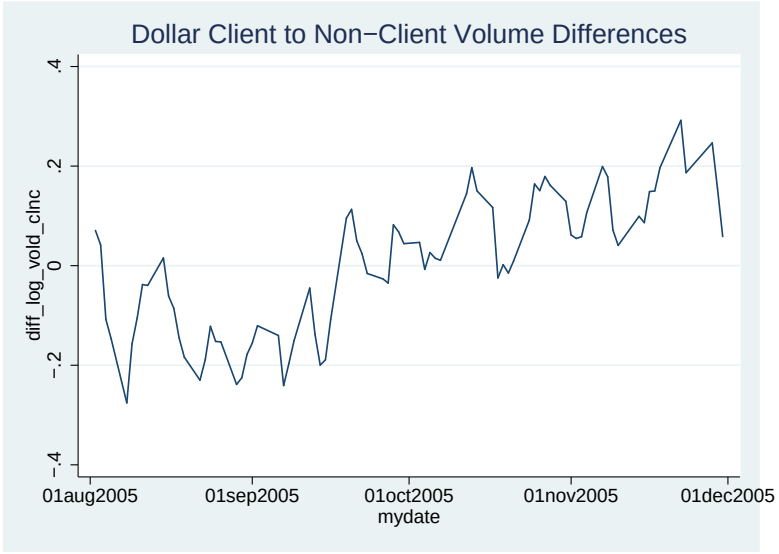
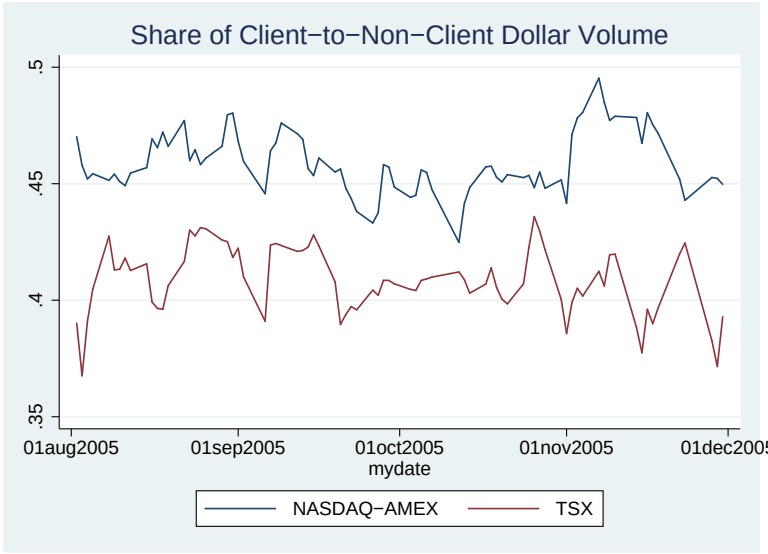


Figure 6
Plots of Intermediated Dollar Volume

The top left panel plots the daily dollar volume of client-to-non-client trades for the group of NASDAQ/AMEX interlisted securities and their matches (labelled as "TSX"). We consider such trades to be intermediated trades. The bottom left panel plots the daily client-to-non-client share of total dollar volume. The top and bottom right panels plot the differences of, respectively, levels of and shares of total volume of client-to-non-client dollar volume for interlisted securities vs. their non-interlisted matches.







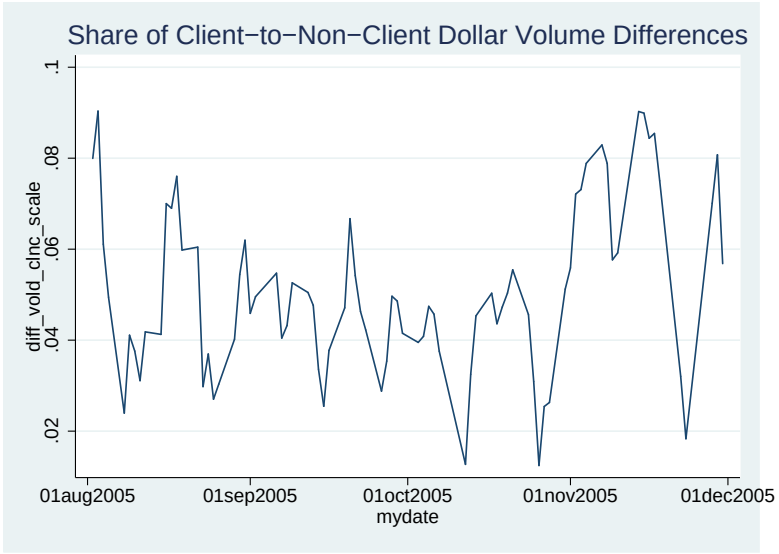


Table 13
List of all interlisted companies and their non-interlisted matches, Part I

Treatment Group: Interlisted with AMEX or NASDAQ		Control group match: non-interlisted	
ABZ	ABER DIAMOND CORPORATION	SBY	SOBEYS INC.
AEZ	AETERNA ZENTARIS INC.	ITX	ITERATION ENERGY LTD. J
ANP	ANGIOTECH PHARMACEUTICALS INC.	AGF.NV	AGF MANAGEMENT LTD. CL 'B' NV
ARZ	AURIZON MINES LTD. J	ENE	ENDEV ENERGY INC.
ATY	ATI TECHNOLOGIES INCORPORATED	TA	TRANSALTA CORPORATION
AXP	AXCAN PHARMA INC.	IMN	INMET MINING CORPORATION
BEV	BENNETT ENVIRONMENTAL INC.	STY	STYLUS ENERGY INC.
BGO	BEMA GOLD CORPORATION J	UTS	UTS ENERGY CORPORATION
BLD	BALLARD POWER SYSTEMS INC.	IUC	INTERNATIONAL URANIUM CORPORATION J
BRA	BIOMIRA INC.	CEK	CASPIAN ENERGY INC. J
CBJ	CAMBIOR INC.	NS	NORSKE SKOG CANADA LIMITED
CEF.NV.A	CENTRAL FUND OF CANADA LTD. CL 'A' NV	SWP	SASKATCHEWAN WHEAT POOL INC.
CLG	CUMBERLAND RESOURCES LTD. J	ANO	ANATOLIA MINERALS DEVELOPMENT LIMITED J
COM	CARDIOME PHARMA CORP.	KEC	KICK ENERGY CORPORATION J
CRY	CRYPTOLOGIC INC.	AAH	AASTRA TECHNOLOGIES LIMITED
CSN	COGNOS INC.	CTR.NV	CANADIAN TIRE CORP. LTD. CL 'A' NV
DAX	DRAXIS HEALTH INC.	IXL	INNOVA EXPLORATION LTD. J
DII.SV	DOREL INDUSTRIES INC. CL 'B' SV	AGA	ALGOMA STEEL INC.
DSG	DESCARTES SYSTEMS GROUP INC. (THE)	GWE	GREY WOLF EXPLORATION INC.
DSM	DESERT SUN MINING CORP. J	ARG	AMERIGO RESOURCES LTD. J
ECG	ENVOY COMMUNICATIONS GROUP INC.	EDV	ENDEAVOUR MINING CAPITAL CORP. ORDINARY J
ELD	ELDORADO GOLD CORPORATION	BBD.MV.A	BOMBARDIER INC. CL 'A' MV
EXF.SV	EXFO ELECTRO-OPTICAL ENGINEERING INC. SV	QUA	QUADRA MINING LTD.
FMI	FORBES MEDI-TECH INC.	WF	WHITE FIRE ENERGY LTD.
FNX	FNX MINING COMPANY INC.	ATA	ATS AUTOMATION TOOLING SYSTEMS INC.
FRG	FRONTEER DEVELOPMENT GROUP INC. J	CSY	CSI WIRELESS INC.
FSV.SV	FIRSTSERVICE CORPORATION SV	CCL.NV.B	CCL INDUSTRIES INC. CL 'B' NV
GAC	GEAC COMPUTER CORPORATION LTD.	HBC	HUDSON'S BAY COMPANY
GAM	GAMMON LAKE RESOURCES INC. J	FAP	ABERDEEN ASIA-PACIFIC INCM INVESTMENT CO LTD.
GSC	GOLDEN STAR RESOURCES LTD.	OIL	OILEXCO INCORPORATED J
HUM	HUMMINGBIRD LTD.	MRG	MERGE CEDARA EXCHANGECO LIMITED EXCHANGEABLE
HYG	HYDROGENICS CORPORATION	SGF	SHORE GOLD INC. J
IDB	ID BIOMEDICAL CORPORATION	KFS	KINGSWAY FINANCIAL SERVICES INC.
IE	IVANHOE ENERGY INC.	UEX	UEX CORPORATION J
IMG	IAMGOLD CORPORATION	LIM	LIONORE MINING INTERNATIONAL LTD.
IMO	IMPERIAL OIL LTD.	RY	ROYAL BANK OF CANADA

Table 14
List of all interlisted companies and their non-interlisted matches, Part II

Treatment Group: Interlisted with AMEX or NASDAQ		Control group match: non-interlisted	
IMX	IMAX CORPORATION	GND	GENNUM CORPORATION
IOL	INTEROIL CORPORATION J	CCA.SV	COGECO CABLE INC. SV
KRY	CRYSTALLEX INTERNATIONAL CORPORATION J	TBC	TEMBEC INC.
MAE	MIRAMAR MINING CORPORATION	IVW	IVERNIA INC. J
MEC.SV.A	MAGNA ENTERTAINMENT CORP. CL 'A' SV	ITP	INTERTAPE POLYMER GROUP INC.
MFL	MINEFINDERS CORPORATION LTD. J	CYT	CRYOCATH TECHNOLOGIES INC.
MPV	MOUNTAIN PROVINCE DIAMONDS INC. J	COB.SV.A	COOLBRANDS INTERNATIONAL INC. CL 'A' SV
MR	METALLICA RESOURCES INC. J	ACA	ASHTON MINING OF CANADA INC.
MX	METHANEX CORPORATION	MNG	MERIDIAN GOLD INC.
NG	NOVAGOLD RESOURCES INC. J	PTI	PATHEON INC.
NGX	NORTHGATE MINERALS CORPORATION	DY	DYNATEC CORPORATION
NNO	NORTHERN ORION RESOURCES INC. J	TRE	SINO-FOREST CORPORATION
NRM	NEUROCHEM INC.	SWG	SOUTHWESTERN RESOURCES CORP. J
NSU	NEVSUN RESOURCES LTD. J	CDV	COM DEV INTERNATIONAL LTD.
ONC	ONCOLYTICS BIOTECH INC.	CNH	CINCH ENERGY CORP. J
OTC	OPEN TEXT CORPORATION	RUS	RUSSEL METALS INC.
OZN	OREZONE RESOURCES INC. J	ZL	ZARLINK SEMICONDUCTOR INC.
PAA	PAN AMERICAN SILVER CORP.	CRW	CINRAM INTERNATIONAL INC.
PCR	PERU COPPER INC. J	SMF	SEMAFO INC. J
PDL	NORTH AMERICAN PALLADIUM LTD.	IFP.SV.A	INTERNATIONAL FOREST PRODUCTS LTD. CL 'A' SV
QLT	QLT INC.	BVI	BLACKROCK VENTURES INC.
RIM	RESEARCH IN MOTION LIMITED	WN	WESTON LTD. GEORGE
RNG	RIO NARCEA GOLD MINES LTD.	MAL	MAGELLAN AEROSPACE CORPORATION
SNG	CANADIAN SUPERIOR ENERGY INC. J	BGC	BOLIVAR GOLD CORP. J
SOY	SUNOPTA, INC.	SGB	STRATOS GLOBAL CORPORATION
SSO	SILVER STANDARD RESOURCES INC.	RRZ	RIDER RESOURCES LTD.
SVN	724 SOLUTIONS INC.	RVE	ROCKYVIEW ENERGY INC.
SW	SIERRA WIRELESS, INC.	FE	FIND ENERGY LTD.
TEO	TESCO CORPORATION	KCO	KERECO ENERGY LTD.
TGL	TRANSGLOBE ENERGY CORPORATION J	WLE	WESTERN LAKOTA ENERGY SERVICES INC.
TLC	TLC VISION CORPORATION	CGS.SV	CANWEST GLOBAL COMMUNICATIONS CORP. SV
TNX	TAN RANGE EXPLORATION CORPORATION J	WPT	WESTPORT INNOVATIONS INC.
VAS	VASOGEN INC.	VIA	VIRGINIA GOLD MINES INC. J
WED	WESTAIM CORPORATION (THE)	WTN	WESTERN CANADIAN COAL CORP. J
YM	YM BIOSCIENCES INC. J	DDS	LABOPHARM INC.
YRI	YAMANA GOLD INC. J	AGI	ALAMOS GOLD INC. J
ZIC	ZI CORPORATION	TOS	TSO3 INC. J