Reputation Effects in Trading on the New York Stock Exchange

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Abstract

Theory suggests that reputations, developed through repeated face-to-face interactions, allow non-anonymous, floor-based trading venues to attenuate the adverse selection problem in the trading process. We identify instances when stocks listed on the New York Stock Exchange (NYSE) relocate on the trading floor. Although the specialist follows the stock to its new location, many floor brokers do not. We use this natural experiment to determine whether reputation affects trading costs. We find a discernable increase in the cost of liquidity in the days leading up to and immediately after a stock's relocation. The increase is more pronounced for stocks with higher adverse selection. Using NYSE audit-trail data, we find that the floor brokers that relocate with the stock obtain lower trading costs than those who do not move. Together, these results suggest the floor of the NYSE plays an important role in the liquidity provision process.

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Theory suggests that reputations, developed through repeated face-to-face interactions, allow non-anonymous, floor-based trading venues to attenuate the adverse selection problem in the trading process. We identify instances when stocks listed on the New York Stock Exchange (NYSE) relocate on the trading floor. Although the specialist follows the stock to its new location, many floor brokers do not. We use this natural experiment to determine whether reputation affects trading costs. We find a discernable increase in the cost of liquidity in the days leading up to and immediately after a stock's relocation. The increase is more pronounced for stocks with higher adverse selection. Using NYSE audit-trail data, we find that the floor brokers that relocate with the stock obtain lower trading costs than those who do not move. Together, these results suggest the floor of the NYSE plays an important role in the liquidity provision process.

The rise to prominence of electronic trading venues in equities (Island, Instinet, and Archiepelago), equity options (International Securities Exchange), and futures (Globex) suggests that physical trading floors may soon be obsolete. Pirrong (1996) and Domowitz (2001) argue automated markets are attractive to investors because they are fast and because they are cheap to develop, operate, and monitor. American Century, a big mutual fund company, estimates the amount it spends on commissions would fall from $150 million to $25 million per year if all of its equity trading were done electronically (see Tully 2003). Perhaps more important, proponents argue electronic trading venues allow investors to reduce implicit trading costs associated with information leakage by giving traders direct control over their orders.[1] Harris (2003), however, suggests that floor-based exchanges will not disappear as long as floors provide valuable services to traders. A large empirical literature suggests floor-based exchanges excel at handling large, difficult orders.[2] Theoretically, Benveniste, Marcus, and Wilhelm (1992)

[1]For example, Tully (2003) notes in a November 10, 2003 Fortune article that "Buyers and sellers sacrifice their anonymity by divulging their orders to the Wall Street middlemen. Most securities firms zealously try to protect that information. But Wall Street is famously a sieve-- information leaks out from everywhere. And those whispers can dramatically move the price of the shares that the fund is in the process of accumulating. "When we're bulking up on a new stock," says American Century's Wheeler, "and we give the buy ticket to a bulge-bracket firm, they can trade ahead of us on a proprietary basis after they execute the first order. We might as well write them a check.""

[2]There is a growing empirical literature that suggests non-anonymous, floor-based trading venues provide lower trading costs for large, difficult orders than anonymous, electronic trading venues. For example, see Chakravarty (2001), Venkataraman (2001), Garfinkel and Nimalendran (2003), Barclay, Hendershott and McCormick (2003), Waisburd (2003), Bessembinder and

and Weinstein (1993) argue that the repeated dealings between floor brokers and specialists on floor-based exchanges allow specialists to penalize brokers who misrepresent their trading intentions (by providing less favorable prices in the future). Pagano and Roell (1992) argue that floor-based trading systems give participants "the opportunity to observe who trades what with whom, how urgently they seem to want to trade, etc." These arguments suggest repeated, face-to-face interactions are one source of the floor's comparative advantage in handling institutional order flow. We use a unique natural experiment to empirically examine whether relationships between brokers and specialists on the floor of the NYSE are economically meaningful.

NYSE trading is organized so that all orders in a particular security go to one physical location on the floor where exchange members wishing to trade that security gather.[3] One individual, the specialist, trades only the securities assigned to that location. Other individuals, floor brokers, might trade securities at several locations but usually handle all of their brokerage firm's orders in a particular security. The regular face-to-face interactions between a specialist and floor brokers allows relationships to form – relationships that Benveniste, Marcus and Wilhelm (1992), Pagano and Roell (1992) and Weinstein (1993) argue play a roll in a security's trading process. If relationships are important in attenuating the adverse selection problem, then exogenous disruptions in these relationships provide an opportunity to examine their economic importance. In this paper, we investigate the joint hypothesis that trading relationships between specialists and floor brokers are important and that these relationships affect the trading process

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Venkataraman (2003), Theissen (1999), and Handa, Scwhartz and Tiwari (2003). Boehmer, Saar and Yu (2004), Madhavan and Panchapagesan (2000), Corwin and Lipson (2002), Coval and Shumway (2001) each present evidence that suggests the floor is informationally rich. Pirrong (1996) notes that "floor traders also argue that their ability to 'look other traders in the eye' also provides valuable information about the motives of their competitors, and that this (to some degree) limits their vulnerability to being 'picked off' by a more informed individual." Baker and Iyer (1992) examine trading crowds in a national option exchange and find that network structure influences price volatility and expected trading volume. They interpret their results as suggesting that the structure of the real communication network among investors may influence market behavior.

[3] A schematic of the floor can be seen at http://marketrac.nyse.com/mt/index/html.

by examining the quoting and trading behavior of a sample of securities changing the location at which they trade on the NYSE floor.

We begin by identifying reallocations of trading locations by individual specialist firms, reorganizations of the NYSE floor due to specialist firm mergers, and the opening of a new trading floor. None of these events are the result of an endogenous change in trading costs. If the imminent departure of the specialist from the current trading location suggests to floor brokers that the specialist will be unable to sanction undesirable and/or reward desirable behavior, then we might observe changes in trading behavior *before* the location change. Specifically, if the floor broker will no longer be subject to a particular specialist's power to sanction or reward (because the specialist has moved locations on the floor), then quoted and effective spreads may widen to compensate for the possibility of additional adverse selection risk. In theory, the old equilibrium unravels when the change in location is anticipated. If trading relationships matter and these relationships are not established instantaneously at the new location, then the disruption in relationships caused by the change in location will manifest itself in the trading behavior of the security for some time *after* the change in location. In summary, if relationships are important, we expect to find a deterioration in trading costs leading up to and continuing for some time after the date securities change location on the NYSE floor.

It is possible that the floor broker community is relatively unimportant to the specialist. For example, relationships with individual floor brokers might be irrelevant because much of the trading strategy is determined by traders at the brokerage firm's trading desk and not by the broker on the NYSE floor. That is, knowing that investors' and the broker's traders are unaffected by NYSE space reallocation decisions, the specialist behaves no differently immediately before and after the change in location. In addition, because many floor brokers at the new location work for the same brokerage firms as those at the former location, the specialist can punish and/or reward the new brokers for the behavior of the other brokers from the same brokerage firm prior to a stock's relocation. These arguments suggest there should be no change in trading behavior when a security's trading location on the floor of the NYSE changes. We begin our analysis by using proprietary NYSE data to demonstrate that individual floor brokers typically do not follow a sample stock to its new trading location. This verifies our claim that relationships are disrupted by the move. Next, using the NYSE TAQ database, we examine relative effective spreads around the time securities change their trading location on the floor of the NYSE.

Surprisingly, we find a discernible increase in effective spreads when a stock moves. Effective spreads begin to increase several days prior to the move and they remain high for some time after the move. Consistent with theory, the increase in trading costs is positively related to the measured adverse selection associated with the moving security and is negatively related to the number of floor brokers who follow the stock to its new location.

Using more refined proprietary data, we examine the execution costs of the individual floor brokers who do and do not follow the stock to its new location. We find that post-move trading costs paid by brokers who move with the specialist are significantly lower than those paid by the brokers who are new to the trading crowd. This result is especially strong in the first few days after the change when the specialist moves to a new floor location and is building reputation with a new trading crowd. We also find that the trading costs incurred for trades between two moving brokers (who have dealt with each other previously) is significantly lower than the costs incurred in trades between a moving and a non-moving (new) broker. Together, these results provide the first direct evidence that face-to-face relationships give floor-based exchanges an advantage over anonymous electronic trading systems in executing large, difficult orders.

The rest of the paper is organized as follows. Section 1 develops the hypotheses to be tested and reviews the data. Section 2 presents the results of trading costs around the specialist's location change. Section 3 reviews in detail the dynamics of the moving and non-moving brokers using CAUD. Section 4 concludes.

1. Hypotheses Development and Data

1.1 Related Literature

The NYSE floor is organized to focus a security's trading at one physical location. Each location typically trades multiple securities, with the exact number being determined by security characteristics such as trading volume. One individual, the specialist, trades only at that location. The exchange charges the specialist with maintaining a "fair and orderly" market in the securities trading at that location. Other individuals, floor brokers, represent customers' trading interests. Because orders are time sensitive, the physical area covered by a single floor broker typically is limited to something less than the entire exchange floor. Depending on the size of the brokerage firm for which they work, a floor broker might trade securities at only a few locations on the exchange floor or might cover many locations. In most cases, a broker executes all of their firm's orders in a given stock. The organization of the exchange trading suggests that specialists and floor brokers trade with each other repeatedly. Furthermore, because trading on an exchange floor is face-to-face, the trading relationship between a specialist and a floor broker is more likely to play a role in the trading process than in an anonymous electronic setting.

Theory suggests that the relationships between specialists and floor brokers have important implications for the trading process observed on an exchange. Benveniste, Marcus, and Wilhelm (1992, hereafter BMW) argue that this repeated interaction allows specialists to sanction floor brokers exploiting private information. For example, if a broker returns to the specialist with additional stock for sale immediately after the specialist just bought a block of stock at a favorable price believing that was all the stock the broker had for sale, that floor broker might find the specialist less helpful the next time he needs to sell stock. If the specialist's ability to sanction a particular broker is important in constraining that broker from imposing adverse selection costs on the market, then an impending move by the specialist to a location at which the specialist and that floor broker will no longer trade with each other might affect their interactions. Specifically, the floor broker might be more willing to trade on private information and the specialist (and the other brokers in the crowd) might recognize this possibility and react by being more cautious when interacting with that broker just before the specialist moves.

In addition, we might expect that the specialist and the new floor broker crowd with which the specialist interacts at the new location will take time to become familiar with each other. Although he focuses on borrower-lender relationships, Diamond (1989) presents a model in which reputation building affects how agents behave and equilibrium prices. Diamond shows that borrowers alter their behavior to influence what lenders learn about them. Specifically, borrowers change their behavior to protect good reputations. If there is a sufficient amount of adverse selection, then Diamond demonstrates that time is required before market participants build their reputations. In our setting, this suggests that specialists and floor brokers might alter their trading behaviors in order to establish reputations during the period of time immediately after the specialist moves to a new location if the security being traded has sufficient levels of adverse selection. In addition, if these changes in behavior affect the trading process, then we might observe changes in quotes and transaction prices.

Thus, BMW and Diamond suggest that we might observe changes in the trading process just before and just after specialists change location if the specialist-broker relationship matters in trading securities with adverse selection. To distinguish among securities' levels of adverse selection, we need proxies for the level of adverse selection in trading. Previous empirical work suggests several such proxies. Huang and Stoll (1997) suggest the difference between the effective spread and the realized spread. Bessembinder and Kaufman (1997) use equity market capitalization, trading volume, share price, return variance, and average trade size to control for the level of adverse selection. Stoll (2000) suggests the number of trades in addition to equity market capitalization, share price, dollar volume, and return variance. Sarin, Shastri and Shastri (2000) demonstrate that insider ownership and institutional ownership are positively correlated with other measures of adverse selection. Other work employs coverage by research analysts, intangible assets, and earnings variability. We report results using the difference between the effective and realized spread as our measure of adverse selection. Our conclusions are robust with respect to using other measures.

Our research is related to work of Cao, Choe, and Hatheway (1997) and Corwin (1999) who study specialist behavior. Although they examine cross-sectional differences in the stocks traded by a particular specialist and cross-sectional differences in specialists, we examine how the behavior of a given specialist trading a given stock changes around times in which the specialist must interact with different floor brokers. Hatch and Johnson (2002) document that specialist mergers do not adversely affect execution quality of the stocks traded.

1.2 Data

To identify changes in location on the floor of the NYSE, we obtain "post and panel" data from the Exchange. The NYSE's floor is divided into 20 (17 active) trading posts. Posts are subdivided into as many as 30 "panels," each with a specialist. (A floor's schematic can be seen at the web address http://marketrac.nyse.com/mt/index.html.) Panels are so-named due to the flat-screen panel above the specialist that lists the stocks trading at that location and other pertinent data. Thus, the combination of post (numbered one through twenty) and panel (lettered beginning at A in each post) provides a unique location on the floor. For example, at the time of writing this paper, General Electric stock trades at Post 13 Panel M. It is the only stock traded by that specialist. Lucent is traded at Post 13 Panel R along with CIT Group. AOL and five other stocks trade at 3O. The NYSE's post and panel data provide daily information about the location at which stocks trade beginning in June 1999. We obtain these data from June 1999 through April 2003. To determine changes in location, we first difference these data.

We are not interested in all changes in post and panel. We need the distance the stocks move to be large enough to suggest some turnover in the floor brokers trading the stock. The NYSE floor is divided into five "rooms". The "Garage" contains posts one through four. The "Main Room" consists of posts five through eleven. Posts 12 through 14 are in the "Blue Room" and posts 15 through 17 (currently inactive) are in the "Extended Blue Room." Finally, "Thirty Broad" contains posts 18 through 20. To be included in our sample, a stock must move from one room to another. It is common for floor brokers to be assigned to a specific "room" if the brokerage firm is large enough to have multiple brokers. This prevents a broker from having to cover too much territory, which slows order placement. The broker typically works from a single booth (e.g., the firm's booth in the Main Room) regardless of the mix of stocks trading in that room. Thus, if a stock changes rooms, it is likely to be traded in a different floor broker crowd than it was previously as the brokers in the new room begin coverage.

Our sample consists of all location changes from June, 1999 through April, 2003 involving an entire panel of stocks switching rooms. We require that the panel of stocks remain constant (i.e., the specialist trades the same stocks before and after the switch in location). The fact that the entire panel of stocks changes locations suggests that the specialist and stocks did not change, but that there is a potential change in the floor broker community.

We find six occasions during our sample period in which one or more panels of stocks remains together after a room change. In Table 1, we summarize our sample collection.

[Insert Table 1.]

The July 1999, June 2000 and March 2002 events appear to be internal reorganizations by one or more specialist firms. (Although there are many of these reorganizations, these appear to be the only ones resulting in a panel of stocks changing rooms.) The majority of our sample location changes occur on three dates in 2000; November 20, December 11, and December 20. The November date is the opening of the 30 Broad trading floor. December 11 and 20, 2000, appear to be the result of specialist mergers (Spear Leeds acquiring Jacobson and Fleet buying Meehan). Specialist firms prefer to trade stocks at contiguous posts/panels due to efficiencies that can be gained in support staff. Thus, following specialist mergers, the Exchange typically reallocates space to accommodate the acquiring firm.

To determine the broker turnover associated with these location changes, we acquire NYSE Consolidated equity AUDit-trail data (CAUD). CAUD provides, among other information, the counter-parties to each trade. For electronically submitted orders (SuperDOT), only the member firm's name is provided. For trades involving a floor broker, however, the broker's badge number (both buyer and seller badge numbers if both are floor brokers) is part of the record. The badge number uniquely identifies an individual member. Another important feature of CAUD is that it classifies the counter-parties to a trade as (a) a member of the crowd, (b) an electronically submitted (SuperDOT) order, (c) an order in the limit order book, (d) an order arriving from another trading venue via the Intermarket Trading System (ITS), or (e) an order to execute at the open (an OARS order).

By examining CAUD for a period of time before and after the switch in location, we can estimate how many of the floor brokers follow the specialist to the new location on the floor. We obtain audit-trail data for four weeks before and after the switch. We assume that a broker trades at least once in each of those periods. If that is not true, then we mis-classify that broker as one that did not move to the new location (trades before, but not after) or one that began trading after the switch (trades after, but not before). Table 2 provides some descriptive statistics regarding floor broker turnover around our sample events.

[Insert Table 2.]

In the weeks prior to the switch date, the average sample stock has about 35 different floor brokers executing at least one trade (40 conditional on a stock having at least one broker making a trade pre-switch). On average, fewer than two brokers (4.7% of the 35.66) appear in both the pre- and post-switch trade data. These brokers participate in about 2.7% of the trades, but trade about 6.3% of the shares in the pre-switch period. Thus, brokers choosing to follow the specialist to the new location make fewer, but larger trades than the average broker.

We use both trades and quotes data for our tests. The data come from the Trade and Quote (TAQ) database supplied by the NYSE. This contains all trades reported to the

Consolidated Tape and all quotes posted to the Consolidated Quotation System. Trade data include a to-the-second time stamp, a price, and a quantity. From the quote data, we can determine the NYSE quoted price and depth at the time of the trade. To compute effective and realized spreads, we derive the National Best Bid and Offer (NBBO) quotes. The National Best Bid (NBB) price is the highest price across all markets quoting for that particular security.[2] The National Best Offer (NBO) price is the lowest offer price across all markets posting an offer price for the security. We develop the NBBO at the trade time and five minutes later. With these data, we can compute the NYSE effective and realized spreads.

1.3 Hypotheses tested

We measure effective and realized spreads before and after a security changes trading location on the NYSE floor. Spreads are measured relative to the midpoint of the bid-ask quoted spread. Specialists (and other floor brokers) might offer less price improvement when the change in location is imminent if they are concerned about being taken advantage of. The effective spread measures the trade price in relation to the quoted spread's midpoint. Trades at prices other than quoted prices cause effective spreads to differ from quoted spreads. With trade data, the effective spread is twice the absolute value of the difference between the trade price and the contemporaneous quoted spread's midpoint. Effective spreads measure the cost of immediacy (i.e., trading costs) to liquidity demanders. We have a one-sided hypothesis that the effective spread increases prior to the security changing location and a two-sided hypothesis that the effective spread differs from "normal" immediately after the switch in location.

[2] This would include the NYSE, the regional stock exchanges, and Nasdaq market makers.

We also examine the change in realized spreads around the security's move. The realized spread is twice the difference between the trade price and the midpoint of the quoted bid-ask spread after the trade. The realized spread measures how the market moves after a trade occurs. We expect that informed trades are associated with markets that move afterwards (informed buys are associated with increasing prices and informed sells with decreasing prices), decreasing the spread realized by the liquidity provider. Thus, the realized spread acts as a measure of trading revenue for the liquidity provider (e.g., the specialist). With trade data, we compute the realized spread as the absolute difference between the trade price and the quoted spread midpoint five minutes after the trade occurs. We treat all of our tests for changes in realized spreads as two-tailed tests. The theoretical predictions regarding realized spreads are not unambiguous. If specialists are naive and floor brokers successfully take advantage of them, then we expect to find realized spreads falling in magnitude as informed trades slip past the specialist more frequently. It is possible, however, that the specialist widens the effective spread in anticipation of floor brokers' actions in a way that counteracts the loss of realized trading revenue.

Our tests require an estimate of what the spread would be without the location change. We use a matched sample of stocks not changing location as our control. The match is based on equity market capitalization, share price, trading volume, and share price volatility. In particular, we find the non-moving stock that minimizes the following expression:

$$score_{i,j} = 3_k\,(c_{i,k} - c_{j,k})^2/[(c_{i,k} + c_{j,k})/2]. \qquad (1)$$

$Score_{i,j}$ is the matching "score" of stock j matched with sample stock i, k is the characteristic number (we examine four), and $c_{i,k}$ ($c_{j,k}$) is the measure of characteristic k of sample stock i (potential matching stock j). In addition to minimizing the sum of equation (1), we require that no individual characteristic differ by the average by more than 100%, i.e., $(c_{i,k} - c_{j,k})^2/[(c_{i,k} + c_{j,k})/2] \leq 1.00$ for each characteristic.

Upon selecting the matching stock, we compute the relevant statistic (effective spread or realized spread) for each sample stock and each matching stock and track the difference between them through time using standard event study methodology. We begin 120 trading days before the change in location occurs and end 100 days afterwards. To assess statistical differences, we conduct a t-test of the mean difference and a Wilcoxon test of the median difference each day. Event-time zero is the first day of trading at the new location.

Table 3 provides descriptive statistics for the sample and control stocks.

[Insert Table 3.]

Both sets of stocks have an average share price in the mid-twenty dollar range and have about 250 trades and 400,000 shares traded in the sample period. The mean effective spread is four or five cents and the mean realized spread is about two cents.

2. Change in Spreads around Stock Location Changes

Our hypotheses are that spreads increase before the change in location and take some period of time to become "normal" after the change in location. The alteration in spreads prior to the switch is due to the disruption in the specialist's ability to punish/reward brokers and the alteration afterwards is due to the market participants' efforts to establish a reputation.

To conduct these hypotheses tests, we examine differences in stock pairs' spreads using standard event-study methodology. A stock pair is a sample (switching) stock and its matched (non-switching) stock. For the stock-pair to be included in the test on a given event day, the sample stock and its matched stock both must have a price of $5.00 or greater and have at least five trades. The price screen decreases the chance that our results are driven by large percentage spreads on low-priced stocks. The second screen insures sufficient data to compute a spread accurately. Conducting these screens on a daily basis maximizes the sample size on a given day, but means that the sample size can change each event day.

2.1 Overall Sample

Daily spreads have considerable volatility. Thus, we convert the daily average spreads to weekly average spreads by equally weighting each day's average spread in a calendar week. We plot the weekly average median differences in the stock-pairs' share-weighted effective spreads from event week -15 through event week +15 in Figure 1. That is, for each stock-pair in the sample on a given event day we subtract the matched stock's share-weighted effective spread for that day from the sample stock's share-weighted effective spread on the same day and compute the median difference. Share-weighting means that large trades receive more weight in the average. We use median differences so the average is not overly influenced by outliers. Results are qualitatively identical with trade-weighting. We then take a simple average of the daily median differences in a given calendar week to produce the figure.

[Insert Figure 1.]

We find that the median difference in effective spreads between the sample and matched stocks is six to ten basis points in the period of time well before the location change and generally that level well afterwards. Beginning about nine weeks before the switch, the spreads on the sample stocks increase relative to their controls. From event week -7 through event week +5, the median spread difference is 10 to 15 basis points. The median difference returns to its pre-switch level by event week +5. With an average sample stock price of about \$26.58, a five basis point increase in effective spread represents over \$0.01 per share. Given that the average dollar effective spread is \$0.0523, this represents an economically meaningful increase in the spread.

To address the statistical significance of the spread change, we conduct standard statistical tests. Table 4 reports the result of a cross-sectional t-test (see, Boehmer, Musumeci and Poulsen 1991) of the daily mean difference is spread between the sample and control stocks and a Wilcoxon test of the daily median difference.[4]

[Insert Table 4.]

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[3] We anticipate that the event (change in location) causes an increase in spread variance, which produces a test statistic rejecting the null hypothesis of zero spread differences more frequently than it should (Brown and Warner, 1980 and 1985). In order to solve this problem we make use of the standardized cross-sectional test developed by Boehmer, Musumeci and Poulsen (1991). The standardized cross-sectional test is the result of combining the standardized-residual technology developed by Patell (1976) and the ordinary cross-sectional methodology proposed by Charest (1978) and Penman (1982). For the standardized cross-sectional residual difference methodology, the standardized spread differential (SSD_{jt}) for each matched-security j for every day t is calculated as follows:

$$SSD_{jt} = \frac{SD_{jt}}{St.Dev_t} \sqrt{1 + \frac{1}{N_t} + \frac{\left(SpreadDiff_{jt} - \bar{BR}_t\right)^2}{\sum_{n=1}^{N}\left(BR_t - \bar{BR}_t\right)^2}}$$

where SD_{jt} is the difference in the spread differential (sample-control) for each security j and each trading day t compared to the spread differential during the benchmark period (BR_t); $St.Dev_t$ is the standard deviation of spread differentials during the benchmark period; $SpreadDiff_{jt}$ is the spread differential during the event window period; $\bar{BR}_t$ is the average spread differential during the benchmark period; and N is the number of days in the benchmark period. The test-statistic is:

$$\frac{\frac{1}{J}\sum_{i=1}^{F} SSD_{jt}}{\frac{1}{J(J-1)}\sum_{i=1}^{J}\left(SSD_{jt} - \sum_{i=1}^{J}\frac{SSD_{jt}}{J}\right)^2}$$

where J is the number of firms used in the computations.

We find evidence of statistically increased spreads (relative to the control group) starting about four weeks before the switch. Although the statistically significant increases in spreads are not consistent on a day-to-day basis in the pre-switch period, the number of large t-statistics exceeds what we expect by chance (13 of 20 using the t-test and 12 of 20 using the Wilcoxon). In the post-switch period, we find similar frequencies of significantly positive spread differences through day +45 (+20) with the t-test (Wilcoxon). That suggests that it takes one or two trading months for spreads to return to "normal" after the location change. Thus, we find weak evidence consistent with an upward dislocation in effective spreads in the time before the switch and elevated spreads afterwards. These results support the hypothesis that reputation effects matter in the trading process.

2.2 Stocks with High Adverse Selection

The prior analysis examines the entire sample. Theory, however, suggests that the stocks most affected by moving are stocks with high adverse selection. In stocks with little private information, ending/starting a relationship should not matter much. To determine whether this intuition is correct, we divide the sample into stocks with high adverse selection and stocks with low adverse selection. We measure adverse selection as the difference between the sample stocks' effective and realized spreads on event days -120 through -100. If the effective spread is much larger than the realized spread (i.e., the stock price moves after a trade), then we conclude that there is substantial adverse selection. We divide the sample stocks into high and low adverse selection sub-samples by comparing each sample stock's adverse-selection measure to the median measure. In Table 5, we provide descriptive statistics for characteristics of the high and low adverse selection sub-samples relative to their matched stocks.

[Insert Table 5.]

Not surprisingly, the high adverse selection sub-sample of stocks have lower stock prices, fewer trades, and higher spreads than the overall sample.

We repeat the event study for the high adverse selection sub-sample. The median differences in the stock-pairs' effective spreads are graphed in Figure 2.

[Insert Figure 2.]

The pre- and post-event effective spread difference between the sample and control stocks is about 50 to 70 basis points (not surprising because we rank based on the sample stock's adverse selection). Around the switch date, this increases to over 100 basis points. This represents an increase in the spread difference of 30-50 basis points. The change is considerably greater than the five basis point increase for the sample overall, which is consistent with the claim that reputations matter more for stocks with greater adverse selection. Given the $15 average share price for the high-adverse-selection sample, this translates into a four to seven cent increase in effective spreads.

As with the overall sample, we conduct statistical tests of the daily effective spread differences in the period of time before and after the switch and report those in Table 6.

[Insert Table 6.]

The evidence of widening effective spreads for the high adverse selection sub-sample is more convincing that for the sample as a whole. With few exceptions, starting 45 days before the switch and continuing 45 days after the switch, the sample stocks' spreads exceed the control stocks' spreads, on average, for each day using at least one of the statistical tests. These results are consistent with a meaningful reputation effect in NYSE trading.

2.3 Changes in Realized Spreads

We have demonstrated that the trading costs investors pay (the effective spread) increases in the period of time prior to the sample stocks' relocation and continues at an elevated level for some time afterwards. We are interested in knowing whether the increase in trading costs paid by the investor for immediacy translates into an apparent increase in trading revenue by the liquidity providers. We use the realized spread as a proxy for this trading revenue. The realized spread compares the trade price to the spread midpoint five minutes after the trade. If a liquidity provider buys (sells) and the price falls (rises) during the five minutes post-trade, then the liquidity provider might lose all or part of the effective spread charged the liquidity demander at the time of the trade assuming that the liquidity supplier holds the inventory position acquired at the time of the trade five minutes later. Should the realized spread increase around the time of the change in location, we would conclude that the liquidity providers (including the specialist) are able to maintain at least a portion of the increase in effective spreads. Should the realized spread remain constant across the change, we would conclude that the increase in effective spread is just sufficient to offset additional adverse selection costs. Should the realized spread fall, we would conclude that liquidity providers are harmed by the change in location.

We provide a plot of the weekly average of the daily median difference in realized spread (sample minus control) for the high-adverse-selection sub-sample in Figure 3.

[Insert Figure 3.]

We see little in the way of a change in realized spreads around the move date; the realized spread differential seems to fluctuate around zero. This suggests that the increase in effective spreads is approximately sufficient to compensate liquidity providers for the higher levels of adverse selection in the market at these times. This conclusion is reinforced by the statistical tests reported in Table 7.

[Insert Table 7.]

2.4 Multivariate Analysis of the Difference in Effective Spreads

Thus far, we have demonstrated that effective spreads for the sample (location-switching) stocks rise relative to the control (non-moving) stocks prior to the location change, stay elevated for some time, and then fall. Realized spread exhibit no such trend. To see if the effective-spread result is robust in a multi-variate setting, we estimate the following regression equation:

$$\Delta ES_{jt} = \alpha + \beta_1(\Delta \text{trade Size}_{jt}) + \beta_2(\Delta \text{ \# Trades}_{jt}) + \beta_3(\text{Sample Stock's Adverse Selection}) + \beta_5(\text{High Adverse Selection}_j \times \text{Time Squared}) + \beta_6(\text{Low Moving Brokers}_j \times \text{Time Squared}) + \varepsilon \quad (2)$$

In equation (2), the Δ represents the difference between the sample and control stocks, ES_{jt} is the effective spread for stock j on event-day t, Trade Size_{jt} is the average trade size for stock j on event-day t, # Trades_{jt} is the number of trades for stock j on event-day t, Sample Stock's Adverse Selection Cost is the effective spread on date t less the realized spred on that date for the sample stock, Time Squared is the event date squared, High Adverse Selection is one if the stock j has a greater-than-the-median level of adverse selection prior to the event window and zero otherwise, and Low Brokers Moving is one if stock j has less than the seventh-fifth percentile of brokers moving to the new location and zero otherwise. We include fixed effects for each event day in the regression, but do not report those results.

Based on theory, we expect β4 and β5 to be negative; consistent with a larger effect on ΔES (more curvature in the time series of differences in effective spreads) for sample stocks with high adverse selection and few brokers moving. Trade size and number of trades are control variables (we matched control stocks to sample stocks on market capitalization, price, dollar volume, and volatility). The time series of the sample stock's adverse selection cost is included to allow the level of adverse selection to change throughout the event window. We report the results in Table 8.

[Insert Table 8.]

Given the control imposed by the matched stocks, the additional control variables have only a marginal impact. The difference in effective spreads between the sample and control stock is directly related to the sample stock's adverse selection during the event period. Of particular interest, we see that the time series of effective spread differences is more extremely "humped" (β_4 and β_5 are negative) for stocks with high adverse selection and/or stocks with low brokers moving. This is consistent with a reputation effect.

3. Analyses using the Audit-Trail Data

Having audit-trail data allows us to examine the apparent effects of a change in trading location in some detail. Because we have floor broker identities, we can study the trading behavior of individuals. For example, specialist-involved trades conducted by floor brokers following a specialist to a new location might enjoy lower trading costs than trades conducted by floor brokers with whom the specialist is unfamiliar. Furthermore, it is possible that floor brokers treat each other differently after the move. Trades between moving brokers might enjoy a level of comfort (i.e., a relationship) not evident with a moving broker trades with a new (i.e., non-moving) broker.

To examine the first issue, we use CAUD to identify trades in which a floor broker is on one side and the specialist is on the other side. We then determine whether the floor broker is one that moves with the specialist to the new location or one that does not move. Figure 4 plots the daily, share-weighted average effective spread for trades involving a floor broker and the specialist immediately surrounding the stock's change in location conditional whether the floor broker follows the stock to the new location. In the pre-period, the non-moving brokers are the brokers that cease to trade the stock after the move. In the post-period, the non-moving brokers are the brokers that begin to trade the stock at the new location.

[Insert Figure 4.]

The differences in effective spread increase considerably two days before the move and for a few days after the move (except for day +2). This means that moving brokers get better prices from the specialist than non-moving brokers and is consistent with the claim that reputation matters. We formalize the graph in Table 9, where we report the results of a statistical test for a difference in the median share-weighted effective spreads for moving and non-moving brokers.

[Insert Table 9.]

In Panel A, median spreads between the two groups of brokers are different (in favor of the moving brokers) from eight days before the move to five or seven days post-move. This is consistent with moving brokers receiving better trade prices from specialists than non-moving brokers. The typical difference is about six basis points, which is \$0.015 on a \$25.00 stock.

We noted earlier that moving brokers tended to do fewer, but larger, trades with the specialist. Thus, the univariate results above might simply reflect such differences. To investigate this issue further, we conduct a multivariate analysis. In our regression, we wish to explain the effective spread in trades having a floor broker on one side and the specialist on the other side conditional on whether the broker followed the specialist to the stock's new trading location. Market microstructure theory suggests that we should control for trade size, share price, and trading activity when trying to explain effective spreads. In addition, we distinguish between stocks with above the median level of adverse selection as we measure it and those with below-median levels. We also posit two time effects: one to distinguish the pre- and post-move periods and another to allow for a heightened difference close to the move date. Specifically, we estimate the following regression:

ES = α + β_1(Moving Broker) + β_2(Post-period) + β_3(Days From Day Zero Squared) + β_4(Moving Broker)(Days From Day Zero Squared) + β_5(High Adverse Selection) + β_6(Moving Broker)(High Adverse Selection) + β_7(Trade Size) + β_8(Share Price) + β_9(Number of Trades) + ε (3)

In equation (3), Moving Broker is a binary variable taking a value of one if the broker associated with the trade moves with the specialist and zero otherwise. We posit a negative estimated coefficient. Post-period is a binary variable taking a value of one if the trade date is after the move and zero otherwise. We also allow for a non-linear trend in effective spreads around the change in location with the Days-from-day-zero-squared variable. If concerns about adverse selection increase just prior to the move and if time is required for the specialist to become familiar with new traders after the move, then we expect the coefficient β_4 to be positive (indicating that the advantage moving brokers enjoy over non-moving brokers diminishes over time). High Adverse Selection is a binary variable taking a value of one if the stock trading has higher-than-median adverse selection costs, measured as the effective spread minus realized spread. We use three control variables. Trade Size is the size of the trade in shares, Share Price is the transaction price, and Number of Trades is the number of trades in the day of interest. Table 9 reports the results.

[Insert Table 9.]

As expected large trades and trades with a low share price have higher (percentage) effective spreads than do small trades with high prices. Trades in stocks with high adverse selection tend to have higher effective spreads than trades in stocks with lower levels of adverse selection, but the overall difference is not significant. Turning to the variable of interest, we find that moving brokers enjoy significantly lower (statistically and economically) effective spreads than non-moving brokers and particularly so with the high adverse selection stocks. For high adverse selection stocks, moving brokers trade with effective spreads that are 16 (= $\beta_1 + \beta_3 + \beta_4$) basis points ($0.024 on a $15 stock) less than non-movers on the event day. As we move further from the event day (in either direction), the advantage enjoyed by the moving brokers dissipates (β_2 is positive). This is consistent with the idea that specialists become more concerned about end-game problems in the pre-move period and gradually learn the trading styles of new brokers post-move. If the trend we identify in the ten post-move days of CAUD data we analyze continue, the advantage moving brokers enjoy over new brokers on high adverse selection stocks vanishes about 21 days after the move. There is no advantage for low adverse selection stocks post-move (i.e., β_4 is approximately equal to β_1). Thus, we conclude that, in trades involving the specialist for stocks with high levels of adverse selection, moving brokers enjoy lower trading costs than brokers choosing not to move or brokers that begin trading post-move even when we control for other characteristics that matter in determining the effective spread. This is consistent with a reputation effect in trading.

Finally, we examine the effective spreads in trades between floor brokers before and after the move. Prior to the move, these trades involve trades between individuals who have been trading with each other. Should moving brokers be able to identify non-moving brokers, we might expect to see differences in effective spread emerge before the location change. Should moving brokers be unable to distinguish, then we expect to see no differences. Our results are summarized in Panel B of Table 8. The pre-move effective-spread differences based on whether movers trade with movers or non-movers are generally zero. This is consistent with moving brokers being unable to identify ex-ante who is going to move. After the move, these trades involve trades between individuals who are unfamiliar with each other's trading styles when one broker is a moving broker and the other broker is a non-moving broker, but represent trades between two brokers familiar with each other when moving brokers trade with moving brokers. In this case, we find that the mover-to-mover effective spreads generally are less than the mover-to-non-mover spreads by a few basis points. This is consistent with a reputation effect.

4. Conclusion

We are interested in whether relationships between traders on the floor of the NYSE appear to be important to the trading process. Stated another way, we are interested in estimating the value of the trading floor. To test the hypothesis that relationships matter, we identify instances in which stocks change trading locations on the NYSE floor. For the location switches we study, the specialist and stocks are held constant but the floor brokerage community changes. Studying trading costs, as measured by effective spreads, we find an economically and statistically meaningful increase around the date of the location change relative to a matched sample of stocks not switching for sample stocks with higher-than-median levels of adverse selection. This is consistent with the claim that relationships matter in the trading process of stocks.

Using NYSE audit-trail data, we document additional evidence consistent with trading relationships influencing trading costs. We find that moving floor brokers interacting with specialists enjoy lower effective spreads than non-moving floor brokers interacting with specialists. This statistical relation is maintained in a multivariate setting. Finally, we also find that post-move trades involving a moving and a non-moving floor broker have higher effective spreads than those trades involving two moving brokers.

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Table 1

Descriptive Statistics of Sample Dates

On the dates listed below, the indicated number of stocks changed the location at which they trade on the floor of the NYSE. The move involves the entire panel of stocks moving to a new room on the floor, but continuing to trade as one panel. The apparent reason for the change in location is indicated. Our data cover the period July 1999 through April 2003.

Date	Number of Stocks	Apparent Reason for Location Change
July 28, 1999	11	Internal reallocation by Fleet
June 1, 2000	100	Internal reallocations by LaBranche, Fleet, and Susquehanna
November 20, 2000	410	Opening new trading floor at 30 Broad Street
December 11, 2000	380	Spear Leeds acquires Benjamin Jacobson
December 20, 2000	167	Fleet acquires Meehan
March 25, 2002	28	Internal reallocations by Performance, Susquehanna, and Van Der Moolen

Table 2

Descriptive Statistics Regarding Floor Broker Trading in the Sample Stocks that Switch Trading Locations on the Floor of the New York Stock Exchange between July 1999 and April 2003

We capture the number of unique badge numbers the NYSE audit file indicates trade in the sample stocks in the weeks prior to the change in location. We examine what fraction of those brokers also trade in the weeks after the change in location and compute the fraction of trades and shares those brokers do in the pre-switch sample period.

Statistic	
Mean number of Floor Brokers making a Trade Pre-Switch	35.66
Percent of Stocks with at least One Broker Pre-Switch	89.16
Mean number of Brokers making a Trade Pre-Switch Conditional on at least One Broker making at least One Trade Pre-Switch	39.99
Percent of Floor Brokers Moving with Specialist	4.70
Percent of Trades done in the Pre-Switch Period done by Brokers that Move	2.69
Percent of Shares done in the Pre-Switch Period done by Brokers that Move	6.32

Table 3

Descriptive Statistics for the Sample of Stocks changing Location and the Matched Control Stocks that do not Switch

The sample stocks changed the room on the floor of the NYSE in which they trade between July 1999 and April 2003. An entire panel of stocks made the switch and continued to trade as a panel post-switch. Each sample stock is matched with a non-switching stock on the basis of market capitalization, share price, trading volume, and share price volatility.

		Mean	Median	Std. Dev.	Minimum	Maximum
Trade Price	Sample	$ 26.58	$ 23.32	$ 16.54	$ 5.00	$ 106.26
	Control	$ 27.63	$ 23.83	$ 17.44	$ 5.00	$ 134.20
# of Trades	Sample	248.51	67	665.81	5	54,610
	Control	256.93	67	867.76	5	53,592
# of Shares	Sample	396,537.62	67,100.00	1,298,025.78	500	83,542,128
	Control	403,265.82	70,100.00	1,453,923.23	500	72,218,552
Trade-Weighted Effective Spread	Sample	$ 0.0469	$ 0.0219	$ 0.0747	$ 0.0004	$ 3.2482
	Control	$ 0.0424	$ 0.0204	$ 0.0705	$ 0.0001	$ 2.9182
Trade-Weighted Realized Spread	Sample	$ 0.0234	$ 0.0092	$ 0.0513	$ -1.1410	$ 1.5542
	Control	$ 0.0202	$ 0.0081	$ 0.4210	$ -1.5004	$ 1.3906
Share-Weighted Effective Spread	Sample	$ 0.0523	$ 0.0239	$ 0.0913	$ 0.0004	$ 5.7508
	Control	$ 0.0477	$ 0.0225	$ 0.0901	$ 0.0001	$ 4.9317
Share-Weighted Realized Spread	Sample	$ 0.0201	$ 0.0075	$ 0.0614	$ -1.5429	$ 2.0755
	Control	$ 0.0176	$ 0.0067	$ 0.0499	$ -1.6212	$ 2.1772
# of Buy Trades	Sample	131.63	34	356.5 3	0	26,936
	Control	135.92	34	470.05	0	29,436
# of Sell Trades	Sample	116.88	32	330.05	0	27,674
	Control	121.02	32	434.06	0	33,225

Table 4

Differences Between the Volume-Weighted Effective Spreads of the Sample Stocks Changing Trading Locations on the NYSE Floor and a Matched, Control Group of Stocks not Switching

Control stocks are selected based on market capitalization, share price, trading volume, and stock price volatility. To compute the reported number, we take the difference between the volume-weighted average effective spread of the stock moving to a new location and its matched stock that did not change location. The statistical test for the mean difference being positive is conducted using the Boehmer, Musumeci, and Poulsen (1991) t-statistic with the period -120 through -80 as the base period. We use the Wilcoxon test to examine the differences in medians.

Days Relative to Move	Mean Difference (Basis Points)	Median Difference (Basis Points)	Days Relative to Move	Mean Difference (Basis Points)	Median Difference (Basis Points)
-75	10.31	9.46	0	**83.62****	**17.42****
-65	-18.12	6.88	1	**113.02***	**15.29****
-55	-101.05	5.10	2	28.70	5.38
-45	91.87	**20.09****	3	89.67	**18.44****
-35	29.96	**15.35****	4	41.61	7.92
-25	**59.62****	13.21	5	**43.61****	6.01
-20	**33.73***	**18.87****	6	**73.00***	**14.70****
-19	-9.49	**15.84***	7	**63.80****	11.48
-18	**88.55****	**12.89***	8	**42.88***	14.85
-17	**63.71****	**13.82***	9	**57.25***	8.60
-16	**42.98***	13.40	10	**35.16****	**15.17****
-15	91.84	6.86	11	83.93	11.16
-14	**16.12****	**11.39***	12	**32.01****	**13.69***
-13	**84.00****	**13.15***	13	62.61	**10.02***
-12	**64.13***	6.68	14	43.77	6.34
-11	54.56	9.60	15	38.27	9.46
-10	**63.68****	**14.65****	16	**39.21****	**11.68***
-9	**64.22****	**15.53****	17	**71.46****	11.63
-8	**49.56***	12.53	18	68.24	**20.65****
-7	**69.88***	**13.41***	19	70.82	**10.31***
-6	**43.15***	3.98	20	**45.53****	**20.43****
-5	50.53	**9.18***	25	**63.03***	13.81
-4	48.31	12.29	35	**79.80****	6.68
-3	-1.58	3.43	45	**17.46****	5.30
-2	**84.48***	**13.85***	55	43.92	**10.82****
-1	-17.73	**13.62****	60	20.03	12.96

* The difference is statistically significant at the .95 confidence level.
** The difference is statistically significant at the .99 confidence level.

Table 5

Descriptive Statistics for the Sample of Stocks Changing Location having High Levels of Adverse Selection and their Matched, Control Stocks that do not Switch

The sample stocks changed the room on the floor of the NYSE in which they trade between July 1999 and April 2003. An entire panel of stocks made the switch and continued to trade as a panel post-switch. Adverse selection is measured as the difference between the effective spread (absolute value of the difference between the trade price and the trade-time quoted spread midpoint) and the realized spread (absolute difference between the trade price and the quoted spread's midpoint five minutes after the trade). The high-adverse-selection sub-sample has adverse selection measures greater than the median measure for all sample stocks. Each sample stock is matched with a non-switching stock on the basis of market capitalization, share price, trading volume, and share price volatility.

		Mean	Median	Std. Dev.	Minimum	Maximum
Trade Price	Sample	$ 15.59	$ 14.33	$ 7.36	$ 5.00	$ 99.79
	Control	$ 17.25	$ 15.46	$ 9.16	$ 5.00	$ 99.88
# of Trades	Sample	88.38	34	203.96	5	11,459
	Control	88.10	38	163.55	5	4,723
# of Shares	Sample	147,344.06	34,400	474,454.23	500	26,079,700
	Control	142,916.94	38,800	433,409.40	500	27,844,800
Trade-Weighted Effective Spread	Sample	$ 0.0833	$ 0.0527	$ 0.0952	$ 0.0009	$ 3.2480
	Control	$ 0.0719	$ 0.0446	$ 0.0910	$ 0.0001	$ 2.9182
Trade-Weighted Realized Spread	Sample	$ 0.0367	$ 0.0223	$ 0.0638	$ -0.7471	$ 1.5542
	Control	$ 0.0347	$ 0.0207	$ 0.0540	$ -1.5004	$ 1.1344
Share-Weighted Effective Spread	Sample	$ 0.0928	$ 0.0572	$ 0.1193	$ 0.0009	$ 5.7508
	Control	$ 0.0804	$ 0.0485	$ 0.1197	$ 0.0001	$ 4.9317
Share-Weighted Realized Spread	Sample	$ 0.0311	$ 0.0187	$ 0.0801	$ -1.7000	$ 2.8080
	Control	$ 0.0301	$ 0.0181	$ 0.0660	$ -1.6212	$ 2.1772
# of Buy Trades	Sample	45.58	17	111.60	0	7,410
	Control	45.40	18	87.95	0	3,326
# of Sell Trades	Sample	42.81	17	97.78	0	4,752
	Control	42.69	19	80.18	0	2,137

Table 6

Differences Between the Share-Weighted Effective Spreads for Sample Stocks with High Adverse Selection that Switch Trading Locations a Matched, Control Group of Stocks not Switching

Adverse selection is measured as the difference between the average effective and average realized spread between 100 and 120 trading days before the switch. The high adverse selection sub-sample is the group of sample stocks with above-median measures of adverse selection. Control stocks are selected based on market capitalization, share price, trading volume, and stock price volatility. To compute the reported number, we take the difference between the volume-weighted average effective spread of the stock moving to a new location and its matched stock that did not change location. The statistical test for the mean difference being positive is conducted using the Boehmer, Musumeci, and Poulsen (1991) t-statistic with the period -120 through -80 as the base period. We use the Wilcoxon test to examine the differences in medians.

Days Relative to Move	Mean Difference (Basis Points)	Median Difference (Basis Points)	Days Relative to Move	Mean Difference (Basis Points)	Median Difference (Basis Points)
-75	26.09	72.98	0	**221.56****	**117.88****
-65	-42.18	24.58	1	**288.59***	**110.13****
-55	-193.66	56.84	2	**113.95****	61.67
-45	210.73	**116.15****	3	209.67	**107.21****
-35	93.66	**91.77****	4	**146.74****	**102.18****
-25	**171.41****	**118.93****	5	**135.13****	**82.95****
-20	**117.62****	**110.64****	6	**211.15****	**105.51****
-19	-4.88	**92.09****	7	**165.71****	95.47
-18	**240.97****	**85.57****	8	113.65	**77.34****
-17	**188.45***	**103.34****	9	162.19	106.86
-16	**120.61***	**137.32****	10	**118.30****	**138.88****
-15	230.61	**146.18****	11	**218.06****	**94.88****
-14	**69.35****	**123.29***	12	**88.17****	**79.01***
-13	**225.23****	**107.95****	13	**193.44****	70.89
-12	182.14	126.28	14	**130.01***	85.48
-11	**160.53***	**94.89****	15	110.97	83.03
-10	**163.88****	**108.04****	16	**134.08****	**109.53****
-9	**175.47****	**134.89****	17	**184.21****	**79.42****
-8	**144.11****	66.54	18	**230.03****	**132.72****
-7	180.61	**100.90****	19	**198.40***	**98.23****
-6	128.50	69.91	20	**127.36****	**95.94****
-5	**146.32****	**57.11***	25	**168.11****	**97.76***
-4	**125.49***	76.26	35	**196.32***	88.92
-3	28.00	51.25	45	71.78	86.46
-2	**231.16****	**121.03****	55	99.29	57.18
-1	11.01	87.74	65	51.93	80.87

* The difference is statistically significant at the .95 confidence level.
** The difference is statistically significant at the .99 confidence level.

Table 7

Differences Between the Share-Weighted Realized Spreads of Sample Stocks that Switch Trading Locations on the NYSE Floor and a Matched, Control Group of Stocks not Switching

Control stocks are selected based on market capitalization, share price, trading volume, and stock price volatility. To compute the reported number, we take the difference between the volume-weighted average realized spread of the stock moving to a new location and its matched stock that did not change location. The statistical test for the mean difference being positive is conducted using the Boehmer, Musumeci, and Poulsen (1991) t-statistic with the period -120 through -80 as the base period. We use the Wilcoxon test to examine the differences in medians.

Days Relative to Move	Mean Difference (Basis Points)	Median Difference (Basis Points)	Days Relative to Move	Mean Difference (Basis Points)	Median Difference (Basis Points)
-75	-55.14	16.92	0	48.39	33.26
-65	-33.14	-43.42	1	**85.06****	18.34
-55	47.04	-1.82	2	-28.98	-33.28
-45	19.57	-5.69	3	-12.67	-36.03
-35	-43.40	-40.66	4	-19.94	14.07
-25	6.76	-7.09	5	**92.69****	26.19
-20	51.26	-21.80	6	109.15	38.80
-19	19.61	**39.98***	7	-23.09	-36.16
-18	5.30	-2.29	8	-92.66	-28.18
-17	-31.51	16.00	9	8.58	-5.65
-16	34.27	-19.61	10	38.24	**38.15****
-15	93.77	14.79	11	-48.67	-56.38
-14	**90.09***	3.89	12	68.77	3.98
-13	**119.63****	30.32	13	-38.05	**-66.13****
-12	41.05	23.51	14	**26.38****	12.95
-11	-19.88	0.29	15	-31.84	-24.94
-10	-12.82	13.11	16	82.41	41.49
-9	**107.64****	56.87	17	-47.04	-70.38
-8	-26.13	-0.86	18	12.06	50.95
-7	-16.96	-24.48	19	69.82	33.29
-6	-46.37	-29.94	20	33.80	-10.01
-5	-56.08	-11.20	25	-20.88	17.68
-4	**37.31****	17.64	35	51.97	-3.52
-3	-137.55	32.44	45	**30.05****	12.65
-2	66.76	13.37	55	101.39	33.11
-1	6.31	-0.56	65	-54.05	-3.79

* The difference is statistically significant at the .90 confidence level.
** The difference is statistically significant at the .95 confidence level.
*** The difference is statistically significant at the .99 confidence level.

Table 8

Differences in Effective Spread Between Sample and Control Stocks Around the Location Change

The dependent variable is the difference of the Effective Spread between the stocks that experienced a location change and control stocks. The estimates shown are obtained from a fixed effects (event time) regression model. High Adverse Selection is a binary variable taking a value of 1 if the sample stock has higher-than-median levels of adverse selection. High Adverse Selection x Time Squared is an interactive variable between the high adverse selection variable and the square of event time relative to the switch date. Low Moving Brokers is a binary variable taking a value of 1 if the fraction of moving brokers is less than the 75th percentile of the sample stocks. Low Moving Brokers x Interval Squared is an interactive variable between the moving brokers variable and the square of event time relative to the day when location change occurs. Adverse Selection Costs is daily average of the difference between the Effective Spread and the Realized Spread for the sample stocks. Trade Size Difference is the daily average difference between the trade size (in shares) of sample and control stocks. Number of Trades Difference is the daily average difference between the number of trades of sample and control stocks. Trade Price Difference is the daily average difference between the inverse of the trade price sample and control stocks. Post-switch is a binary variable taking the value of 1 for trades occurring on trading days after the location change. T statistics are shown in parentheses. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level respectively).

	Model 1	**Model 2**	**Model 3**	**Model 4**
High Adverse Selection x Time Squared x 1,000,000	**-3.30*** **		**-3.25*** **	**-3.25*** **
	(-16.18)		**(-16.16)**	**(-16.17)**
Low Moving Brokers x Time Squared x 1,000,000		**-0.934*** **	**-0.457*** **	**-0.456*** **
		(-12.72)	**(-8.47)**	**(-8.45)**
Adverse Selection Costs	**0.6593*** **	**0.6351*** **	**0.6596*** **	**0.6600*** **
	(31.01)	**(29.42)**	**(31.03)**	**(31.04)**
Trade Size Difference x 1,000,000	-0.275**	-0.293**	-0.276**	-0.275**
	(-1.99)	(-2.11)	(-1.99)	(-1.99)
Number of Trades Difference x 1,000,000	1.38*	1.44*	1.44*	-1.45*
	(1.68)	(1.74)	(1.75)	(1.76)
Trade Price Difference	1.4857***	1.4700***	1.4854***	1.4838***
	(74.49)	(69.67)	(74.46)	(73.99)
Post-switch				0.0022***
				(5.07)
Constant	-0.0124***	-0.0153***	-0.01107***	-0.0121***
	(-24.00)	(-26.56)	(-21.09)	-20.02)
Number of Observations	138,647	138,647	138,647	138,647
R^2	0.40	0.39	0.40	0.40

Table 9

Differences in Median Share Weighted Effective Spread for Moving and Non-Moving Brokers Around the Location Change

The Table shows the median Share Weighted Effective Spreads paid by the brokers who move with the specialist and those who do not move. The median values are obtained from CAUD and are reported from trading day -10 to trading day +10 around the location change. Panel A shows the median Share Weighted Effective Spreads for trades between the moving/non-moving brokers and the specialist. Panel B shows the median Share Weighted Effective Spreads for trades where both counterparties are moving brokers and for trades where one counterparty is a moving broker and the other counterparty is non-moving broker. * shows significance at the 5% significance level.

Panel A: Trades Between a Moving/Non-moving Broker and the Specialist

Interval	Movers' Median Spread	Non-movers' Median Spread	Interval	Movers' Median Spread	Non-movers' Median Spread
-10	0.3430	0.3715	0	**0.1453**	**0.1966***
-9	0.1720	0.1878	1	**0.1008**	**0.2244***
-8	**0.1130**	**0.1732***	2	**0.1210**	**0.1338***
-7	**0.0944**	**0.1311***	3	0.1187	0.2814
-6	**0.1235**	**0.1404***	4	**0.2004**	**0.1940***
-5	**0.1161**	**0.2002***	5	**0.0593**	**0.2056***
-4	**0.1003**	**0.1343***	6	0.0988	0.1324
-3	**0.1033**	**0.1206***	7	**0.0535**	**0.1193***
-2	0.0949	0.1850	8	0.2073	0.1877
-1	**0.1008**	**0.3324***	9	0.0847	0.1031
			10	0.1398	0.1333

Panel B: Trades Between Moving Brokers and Between Moving and Non-moving Brokers

Interval	Median Spread for Trades Between Movers	Median Spread for Trades Between Movers and Non-movers	Interval	Median Spread for Trades Between Movers	Median Spread for Trades Between Movers and Non-movers
-10	0.2013	0.1813	0	**0.2012**	**0.2215***
-9	0.2571	0.2029	1	0.1781	0.1840
-8	**0.2075**	**0.2260****	2	**0.1727**	**0.2039***
-7	0.2328	0.2284	3	**0.1633**	**0.1838***
-6	0.2535	0.2256	4	**0.1714**	**0.2043***
-5	0.1982	0.1887	5	**0.1665**	**0.1892***
-4	0.2364	0.2491	6	**0.2044**	**0.2649***
-3	0.2029	0.1929	7	**0.1675**	**0.2274***
-2	**0.1598**	**0.1823***	8	**0.1633**	**0.2060***
-1	0.2176	0.2203	9	0.2239	0.2235
			10	0.2704	0.2215

Table 10

Effective Spread of Moving and Non-moving Brokers Around the Location Change

The dependent variable is the Effective Spread paid by moving and non-moving brokers for trades with the specialist. The period covered is from day -10 to day +10 around the day when the stock changes location. Moving Broker is a binary variable that takes the value of 1 if the broker moves with the specialist and 0 otherwise. Moving Broker x Time Squared is an interactive variable between the variable indicating whether the broker moves or not and the square of event time relative to the day when location change occurs. High Adverse Selection is a binary variable that classifies stocks based on the magnitude of the adverse selection costs measured as the difference between effective spread and realized spread. Stocks with high (low) adverse selection costs have a value of 1 (0). Moving Broker x High Adverse Selection is an interaction variable between the Moving Broker variable and the High Adverse Selection variable. Post-switch is a binary variable taking a value of 1 for trades occurring in trading days after the location change. Moving Broker x Post-switch is an interaction variable between the Moving Broker variable and the Post-switch variable. Trade Size is the size (in shares) of each trade. Trade price is the inverse price of each trade. Number of Trades is the daily number of trades. T statistics are shown in parentheses. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level respectively).

	Model 1	**Model 2**	**Model 3**
Moving Broker	**-0.1297*** **(-3.52)**	-0.0236 (-1.44)	-0.0214 (-1.02)
Moving Broker x Time Squared	**0.0006***** **(3.29)**	**0.0006**** **(2.16)**	**0.0006**** **(2.30)**
Moving Broker x High Adverse Selection Class	**-0.2054***** **(-3.18)**	**-0.1906***** **(-3.24)**	**-0.1946***** **(3.08)**
Moving Broker x Post-switch	**0.1811***** **(3.60)**		
High Adverse Selection	0.0237 (0.59)	0.0218 (0.53)	0.0202 (0.48)
Trade Size (x 1,000,000)	**0.0548*** **(1.90)**	0.0500 (1.62)	**0.0511*** **(1.74)**
Trade Price	**9.5733***** **(6.53)**	**9.6086***** **(6.46)**	**9.6644***** **(6.29)**
Number of Trades (x 1,000)	-0.0001 (-0.62)	-0.0001 (-0.60)	-0.0000 (-0.17)
Post-switch	**-0.1256**** **(-2.15)**	-0.0824 (-1.63)	
Constant	**0.0925*** **(1.80)**	0.0652 (1.37)	0.0087 (0.15)
R^2	0.338	0.333	0.328

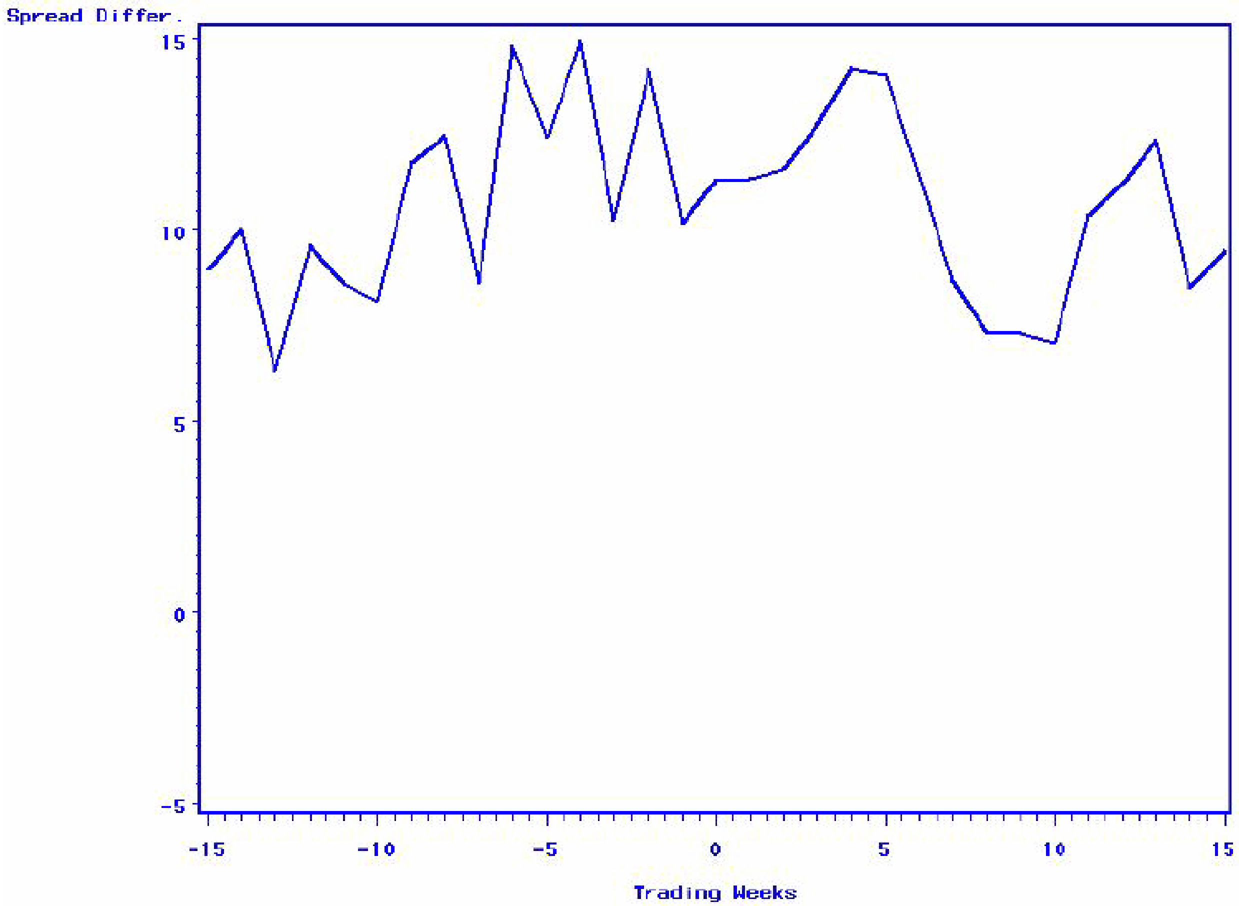

Figure 1. Difference in Effective Spreads: Sample Stocks minus Control Stocks.

Sample stocks are stocks changing the trading location on the floor of the NYSE in the period between July 1999 and April 2003. Control stocks are non-switching stocks matched to the sample stocks based on trading volume, market capitalization, stock price, and stock price volatility. The effective spread is the absolute value of the difference between the trade price and the midpoint of the contemporaneous quoted spread. The reported number is the calendar week average (equally weighting each day) of the across-stock-pair median.

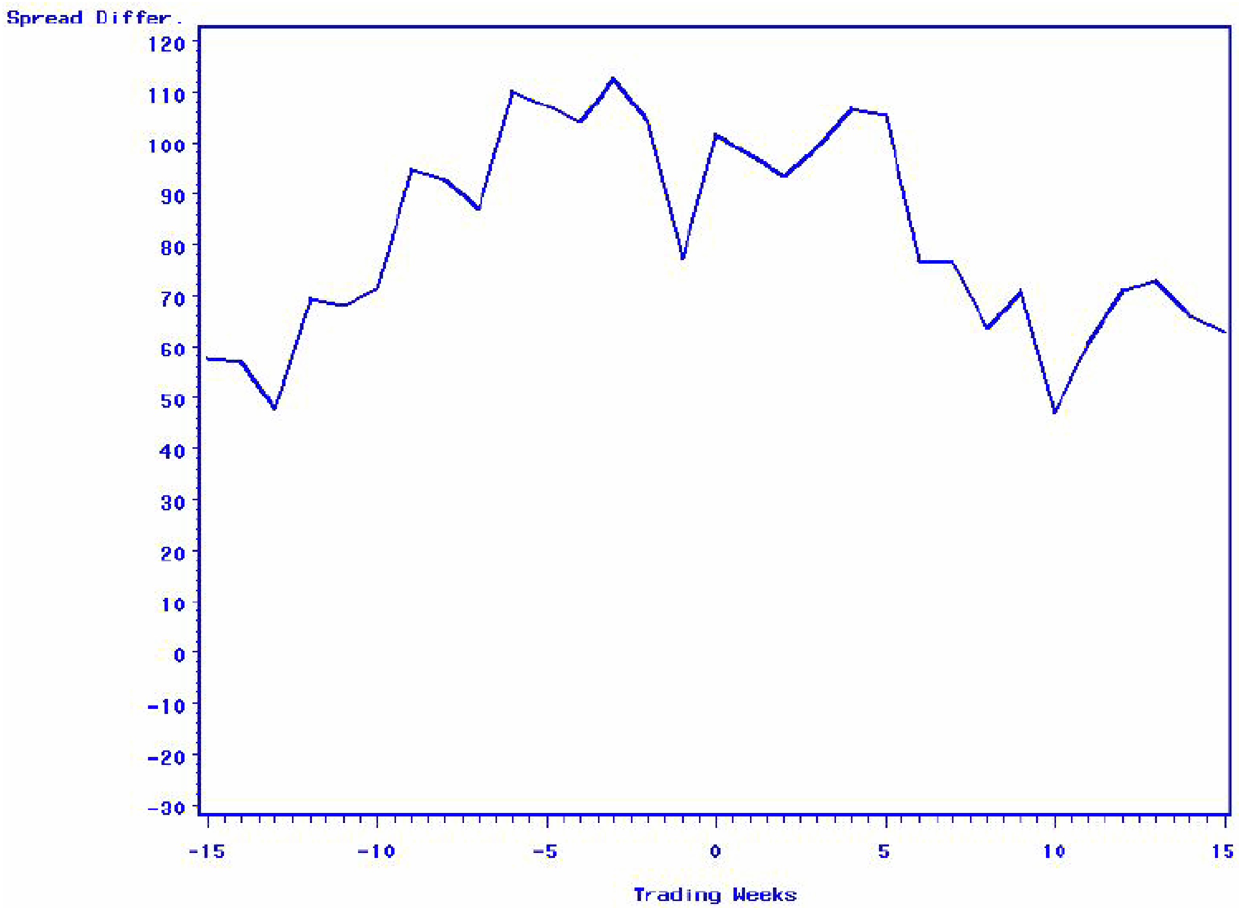

Figure 2. Difference in Effective Spreads for High Adverse Selection Sample: Sample Stocks minus Control Stocks.

Sample stocks are stocks changing the trading location on the floor of the NYSE in the period between July 1999 and April 2003. Control stocks are non-switching stocks matched to the sample stocks based on trading volume, market capitalization, stock price, and stock price volatility. Adverse selection is measured as the difference between the effective spread and the realized spread. The high-adverse-selection sub-sample is the group of sample stocks with adverse selection measures exceeding the median measure. The effective spread is the absolute value of the difference between the trade price and the midpoint of the contemporaneous quoted spread. The realized spread is the absolute difference between the trade price and the midpoint of the quoted spread five minutes after the trade. The reported number is the calendar week average (equally weighting each day) of the across-stock-pair median effective spread.

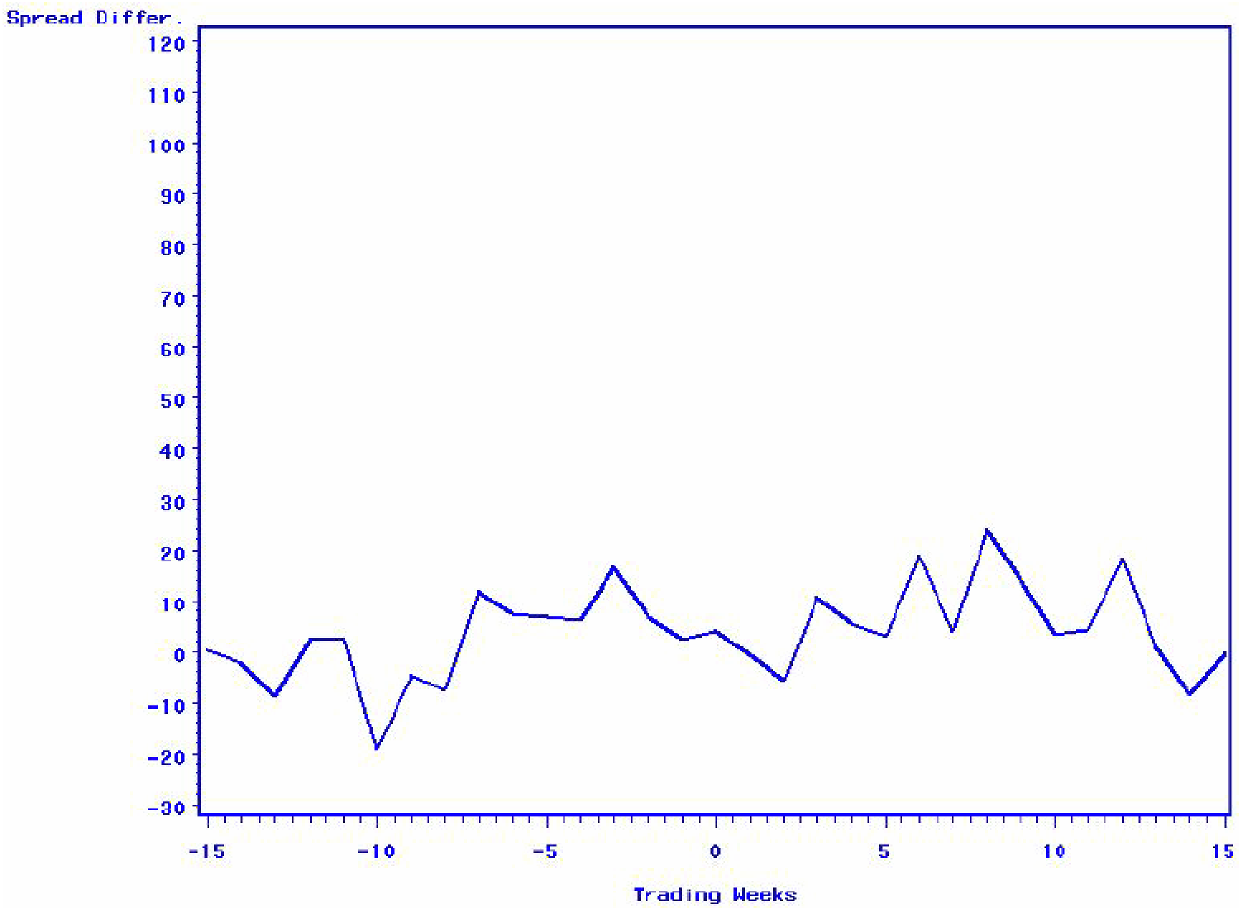

Figure 3. Difference in Realized Spreads for High Adverse Selection Sample: Sample Stocks minus Control Stocks.

Sample stocks are stocks changing the trading location on the floor of the NYSE in the period between July 1999 and April 2003. Control stocks are non-switching stocks matched to the sample stocks based on trading volume, market capitalization, stock price, and stock price volatility. Adverse selection is measured as the difference between the effective spread and the realized spread. The high-adverse-selection sub-sample is the group of sample stocks with adverse selection measures exceeding the median measure. The effective spread is the absolute value of the difference between the trade price and the midpoint of the contemporaneous quoted spread. The realized spread is the absolute difference between the trade price and the midpoint of the quoted spread five minutes after the trade. The reported number is the calendar week average (equally weighting each day) of the across-stock-pair median realized spread.

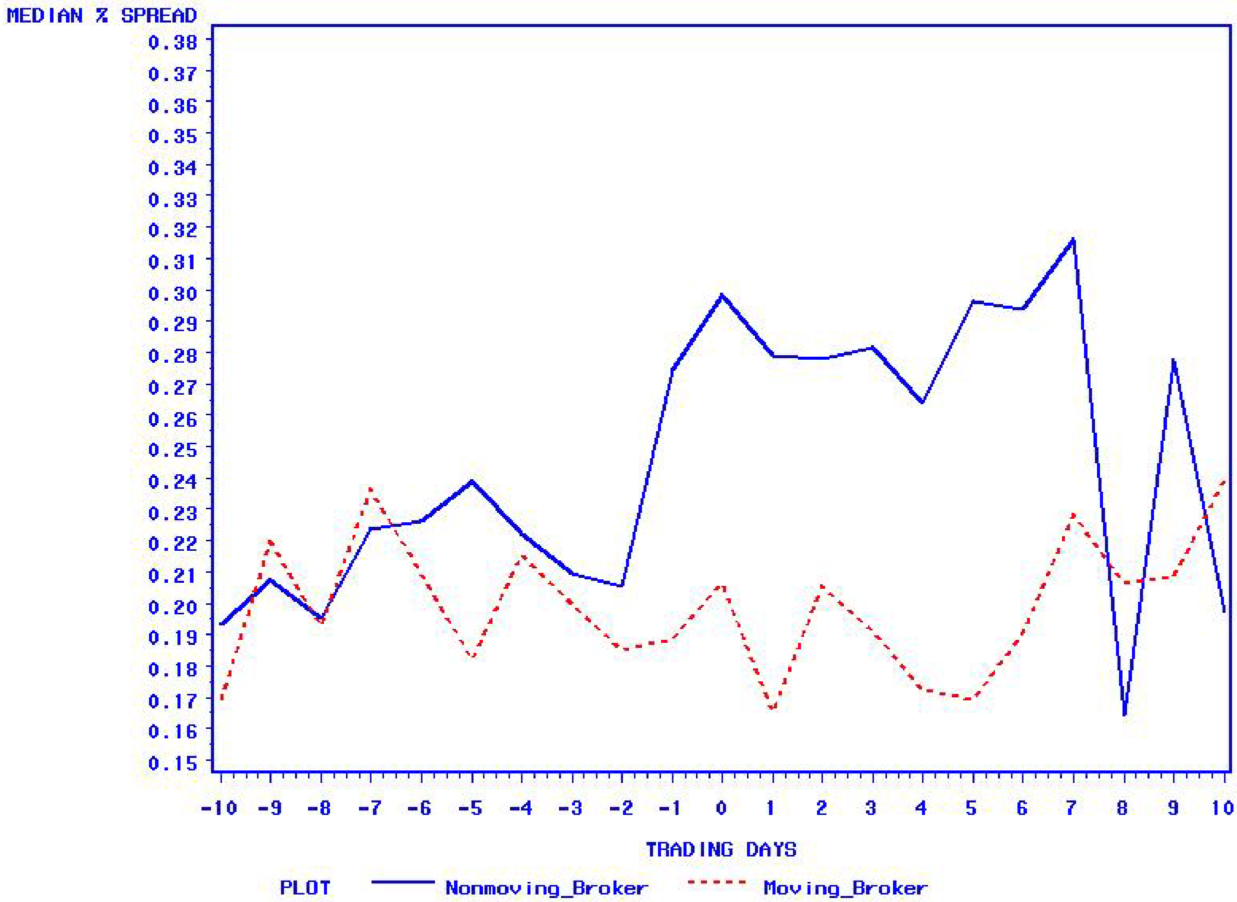

Figure 4. Share Weighted Effective Spreads for Moving and Non-moving Brokers Around the Specialist's Location Change

The Figure shows the median Share Weighted Effective Spreads computed for trades in which a floor broker is on one side and the specialist is on the other side. Using CAUD we define the Moving Broker as a floor broker that moves with the specialist to the new location and the Non-moving Broker as one that does not move. We report the median values in basis points for each trading day around the specialist's location change (day 0).