

Do Competing Specialists and Preferencing Dealers Affect Market Quality?

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We empirically demonstrate that the opportunities the Boston Stock Exchange and the Cincinnati Stock Exchange offer members to take the other side of their customers' orders through affiliated market makers (to internalize orders) have little short-run effect on posted or effective bid-ask spreads. This is true despite substantial movement of order flow away from the New York Stock Exchange when trading under one of these regional stock exchange programs begins. These results contrast with the adverse effects of market fragmentation and internalization predicted by some theoretical market microstructure analyses and the popular financial press.

Individuals interested in market structure have long debated whether trading should be concentrated on

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the primary trading venue to increase liquidity, or fragmented among several trading venues to increase competition [see, for example, the Security and Exchange's *Market 2000 Report: Study III, Market Fragmentation, Competition, and Regulation*]. Proponents of concentrating order flow at a single location, such as the New York Stock Exchange (NYSE), argue that a deep, liquid market results. This liquidity, the argument goes, allows investors to execute trades more quickly and at better prices than they could if the orders are fragmented among many venues. Conversely, concentration opponents argue that allowing a single trading venue to dominate trading in a security can harm investors. Should trading become too focused, opponents argue the dominant venue may extract monopoly rents from investors in the form of fees and/or other trading costs. Fragmentation supporters suggest that having several viable trading venues prevents a single venue from extracting rents. This article contributes to the debate regarding market fragmentation by examining changes in market quality surrounding trading rule revisions on two regional stock exchanges that attract order flow from the NYSE. We conclude that the market fragmentation occurring because of these revised-rules trading programs does not adversely affect market quality.

Substantial academic work examines fragmentation and competition for order flow in equity markets. Cohen and Conroy (1990), Davis and Lightfoot (1994), Demsetz (1968), McNish and Wood (1992), Tinic (1972), and Tinic and West (1972) conclude that increased competition in security markets produces tighter quoted bid-ask spreads. These articles compare trading costs across securities and trading systems. A potential drawback to this approach is that it may not suitably control firm-specific attributes and trading system characteristics. Affleck-Graves, Hegde, and Miller (1994), Christie and Huang (1994), and Wood and McNish (1992) note that these studies' results may reflect differences in the assets' fundamental values. We mitigate this problem by examining trading cost differences for a common set of securities traded simultaneously at different venues.

Much of the argument against fragmenting order flow rests on empirical evidence regarding comparative trading costs across trading venues and the types of trades typically executing away from the primary trading venue. Lee (1993) and Petersen and Fialkowski (1994), for example, find that the cost of trading NYSE-listed securities is lower on the NYSE than in the National Association of Security Dealers over-the-counter market (i.e., the third market). Bessembinder and Kaufman (1996), Chordia and Subrahmanyam (1995), Easley et al. (1996), and Lin, Sanger, and Booth (1995) support the notion that a significant portion of the order flow in NYSE-listed stocks directed away from the NYSE is from uninformed traders. The NYSE specialist presum-

ably sets the bid-ask spread to earn a normal profit when providing liquidity to the expected mix of informed and uninformed investors. If the NYSE loses the uninformed order flow, then the NYSE specialist may be forced to widen the spread to recover losses from increased trading with better informed investors, who place orders only when the specialist misprices securities. Because the NYSE typically has the best bid and offer for NYSE-listed securities [see Blume and Goldstein (1997)], fragmenting order flow may increase trading costs to investors. Battalio (1997) and Neal and Reiffen (1996), however, find no evidence of wider spreads when either the purchase of order flow or the purchase of specialist seats by brokerage firms redirects uninformed order flow. Furthermore, Lamoureux and Schnitzlein (1995) study the effect of order flow fragmentation in an experimental setting and conclude that the increased competition leads to tighter spreads and lower trading profits for dealers.

We use a natural experiment to examine whether the direction of order flow away from the primary exchange is associated with wider quoted spreads. Specifically we study trading rule changes the Boston Stock Exchange (BSE) and the Cincinnati Stock Exchange (CSE) instituted to attract order flow in NYSE-listed securities. The Securities and Exchange Commission (SEC) granted temporary approval to the CSE's Preferencing Dealer Program in February 1991 and the BSE's Competing Specialist Initiative in May 1994. Both programs attempt to attract order flow by offering all their members the option to become dealers (specialists) in any security traded on these regional exchanges.¹ Under the trading rule changes, preferencing dealers and competing specialists may receive orders with preference over the regular regional specialists. In particular, whereas traditional trading rules require that incoming trades be allocated to the dealer posting the best quote for the longest time (a first-come, first-served principle), the new trading rules relax time priority. Routing orders to preferencing dealers or competing specialists instead of the regular specialists has implications for the broker-client relationship. One implication of mixing brokerage and dealership is that brokerage firms may easily take the other side of (i.e., internalize) their customers' orders. Prior to the rule changes, if the regional specialist had the best quote, then the broker-affiliated dealer had to improve the quoted price to gain priority over the regular specialist. Since the rule changes, broker-affiliated dealers need only match the best quote. More important, regional exchange

¹ See Appendices A and B for a more complete description of the Competing Specialist Initiative and the Preferencing Program. SEC Release No. 34-27910 indicates that the motivation for allowing the experiments was to increase competition for the NYSE. Both programs received permanent SEC approval in March 1996.

broker-dealers have the option to internalize orders without having to post the best quote.

If brokerage firms exercise this option strategically, then they may internalize orders they deem profitable and send those they deem unprofitable to other market makers. Because dealers set quotes before orders arrive, market makers must quote bid and ask prices based on their assessment of average trader sophistication. Well-informed investors buy from (sell to) the market maker only when the ask price is too low (bid price is too high). Market makers may lose money to better-informed traders as long as they make money providing liquidity to uninformed traders. If a market maker can choose to trade only with uninformed investors, then that market maker is likely to profit more than the average market maker. Selective execution is particularly effective if the dealer to whom the broker sends the informed orders must execute those orders because of the executor-of-last-resort obligations of the specialist function on the primary exchange (here, the NYSE). With increased opportunities for broker-dealers to execute orders selectively, we may find the primary trading venue receiving fewer orders and more of the remaining primary-exchange orders coming from informed investors. Because primary-exchange specialists tend to offer the most competitive quotes, this adverse selection problem associated with fragmenting the order flow may be passed on to investors in the form of wider quoted and effective bid-ask spreads [see Battalio and Holden (1996) and Dutta and Madhavan (1997)].²

Although the BSE's Competing Specialist Initiative and the CSE's Preferencing Dealer Program fragment order flow, they need not lead to wider quoted spreads or increased trading costs. Suppose that broker-dealers move order flow away from the primary exchange to capture a cost advantage arising from lower fees on a particular trading venue or advanced trading technology. Further, assume that there is no systematic relationship between orders imposing adverse selection on the NYSE specialist and the orders the regional broker-dealer desires to exploit this cost advantage. Whereas the quantity of orders the primary specialist receives falls under these circumstances, the orders' average profitability does not change. Hence, the adverse selection problem does not increase. Furthermore, if broker-dealers use this cost advantage to attract orders, then customers' trading costs may fall. For example, suppose that a broker-dealer enjoys a cost

² One does not need asymmetric information to predict wider bid-ask spreads when order flow is directed away from the NYSE. For example, if dealers face fixed order processing costs, then fewer orders imply a higher per share cost. In addition, the decreased order flow may make it more costly for dealers to adjust undesirable inventory positions. These factors also may result in wider spreads.

advantage in executing orders in high-volume stocks because of an investment in trading technology. To capitalize on this cost advantage, the broker-dealer may wish to attract increased order flow quoting higher bid and/or lower offer prices. Tighter spreads and more aggressive quoting by the dealer enjoying the cost advantage result.

A particular security's initial trading under one of these revised-rules trading programs significantly shifts order flow from the NYSE to the regional exchange providing revised-rules trading (the sponsoring exchange). This redirection allows us to test whether adverse selection associated with allowing agents to execute orders selectively via internalization (thereby fragmenting the market) manifests itself in an economically meaningful way. Specifically, we examine quoted and effective bid-ask spreads immediately before and after a security begins revised-rules trading on either the BSE or the CSE. Increased order flow on the sponsoring regional suggests that trading firms would find the ability to internalize orders valuable. A wider bid-ask spread after the start of trading under one of the programs would suggest that adverse selection associated with allowing firms to internalize orders is economically significant. Alternatively, a decreased bid-ask spread and more competitive quoting by the regional exchange dealers would be consistent with the notion that brokerage firms are competitive and predominantly use cost rather than informational advantages to internalize orders.

We find that quoted spreads decrease for significantly more than one-half (about 66%) of the securities in our sample when they begin revised-rules trading. Furthermore, we find no evidence that trading costs rise after the stocks begin trading in the regional exchanges' programs. Finally, we find that the BSE and the CSE are more likely to be a part of the National Best Bid and Offer (NBBO) prices after securities begin revised-rules trading on those exchanges. Together, these results suggest that the adverse effects associated with allowing brokerage firms to fragment the market by internalizing order flow may not be as severe as some analyses suggest.

1. Institutional Background, Data, and General Methodology

The rule changes we examine stem primarily from competition among trading venues to execute orders. This competition results largely from two regulatory changes. The first, SEC Rule 19c-3, eliminated off-board trading restrictions for securities listed after April 26, 1979 (referred to as 19c-3 securities). Off-board trading restrictions, such as NYSE Rule 390, limit exchange members' ability to execute orders in securities listed on that exchange at other trading venues. The second change, the establishment of the National Market System (NMS), includes the

Consolidated Tape Association, the Consolidated Quotation System (CQS), and the Intermarket Trading System (ITS). The CQS compiles quotes from and disseminates them to the NYSE, the American Stock Exchange (AMEX), the regional exchanges,³ and the third market. The ITS facilitates trading across the different venues. Although National Association of Security Dealers (NASD) dealers and specialists on regional exchanges executed orders in NYSE-listed securities on their respective trading venues prior to the NMS, quote information on the regional and the third market was often inaccurate/untimely. Thus brokers sending orders in NYSE-listed securities to regional exchanges or the third market often received different execution prices than what they would have received on the NYSE. The NMS eliminated this execution price risk by allowing agents away from the primary exchange to precommit to execute orders at the NBBO.

To investigate the effects of the competitive thrusts from the BSE and CSE, we must determine the securities traded in the revised-rules trading programs and when each first begins trading under those rules. The BSE and CSE provided this information. Each observation in our study represents a case in which a brokerage firm registered as a preferencing dealer or competing specialist introduces an NYSE-listed security to revised-rules trading on the BSE or the CSE.

Because of the potential for adverse selection in the option to internalize customers' orders, we focus on trading by broker-dealers internalizing orders. We do not know which broker-dealers internalize orders. As a proxy, we use broker-dealers having direct access to retail order flow. Not all broker-dealers participating in these programs have such access. For example, Bernard L. Madoff Investment Securities (Madoff) and Hull Trading (Hull) are participants in the CSE's program, but neither has direct access to retail order flow. Madoff purchases much of its order flow from brokerage firms and Hull's trading is proprietary. Our sample does not include securities that Madoff, Hull, or other firms without direct access to retail order flow introduce into the BSE or CSE programs. Sources at the BSE and the CSE identify firms having direct access to retail order flow. We categorize such firms as "internalizers," and stocks first trading in one of the programs by these broker-dealers form our sample.

To have statistical power when examining whether changes occur in order flow and/or market quality statistics around the time the sample securities begin trading in one of these programs requires knowing when a security begins revised-rules trading. We have the exact dates

³ The regional stock exchanges are the Boston Stock Exchange, the Chicago Stock Exchange, the Cincinnati Stock Exchange, the Pacific Stock Exchange, and the Philadelphia Stock Exchange. Arnold, et al. (1996) provide a description of the history and structure of the regional stock exchanges.

on which securities begin trading under the revised rules in the BSE program. Comparable data for the CSE program are unavailable before February 1994. Even thereafter, we have obtained only the month in which revised-rules trading begins for about one-half of the CSE sample. Because of this restriction, we conduct our analysis using monthly intervals. Our sample period runs from February 1994 through June 1995.

We obtain trade and quote data for the affected securities from the NYSE's Trade and Quote (TAQ) data from January 1994 through July 1995. TAQ provides a record of quotes and transactions for securities listed on the NYSE and the AMEX, and those traded on NASD. Each time-stamped quote or trade identifies its trading venue and its price and size. We exclude transaction prices implying a trade-to-trade return of 25% or greater assuming that they are incorrectly recorded. We also exclude nonfirm quotes and quotes with a zero size on one or both sides of the market. For the market quality measures, we exclude opening trades and trades reported late or out of sequence; however, we include these trades in our market share measures. We exclude canceled trades from all statistics. We match trades with quotes using the Blume and Goldstein (1992) adjustment for quote timing. We eliminate a security without complete data from the first trading day of the month prior to its first trade under the revised rules through the last trading day of the month after that initial trade.

The number of securities with at least one registered Designated Dealer⁴ (the official name for market makers other than the "regular" specialist) on the CSE has been constant at about 500 since the preferencing program's initiation. About 45% of these 500 securities have a single Designated Dealer and 55% have multiple Designated Dealers. The mean number of Designated Dealers in securities with at least one Designated Dealer increases over our sample period from 2.16 to about 2.5.

The BSE has embraced internalization more conservatively than the CSE. In the sample period, it limits each broker-dealer to 20 stocks in which it can register as a competing specialist and allows no more than three specialists in a given stock. At the end of our sample period, only two securities have the maximum number of specialists.

Table 1 provides descriptive statistics for the trading firms participating in the Preferencing Dealer Program and the Competing Specialist Initiative and the degree of competition for market-making services in the traded securities. Panel A lists both well-known, national securities firms and smaller, regional firms as program participants. Dealer activity varies widely. For some (e.g., Shearson/Smith Barney)

⁴ SEC Release No. 34-37046 formally defines a Designated Dealer and the associated responsibilities.

Table 1
Cincinnati Stock Exchange Designated Dealers, Boston Stock Exchange Competing Specialists, and the number of securities in which they become dealers/specialists between February 1994 and June 1995

Panel A: Securities traded by specific Designated Dealers and Competing Specialists

Firm name of Designated Dealer (DD) or Competing Specialist (CS)	Does the firm have direct access to retail order flow?	Number of securities in which markets made as of January 1994 ^a	Number of securities added between February 1994 and June 1995 ^b
Advantage Securities (DD)	Yes	0	0
Bloom and Co. (DD)	Yes	10	0
Bodel Inc. (DD)	No	0	N.A. ^c
Dain Bosworth (DD)	Yes	6	3
Dean Witter (CS)	Yes	0	8
Fidelity Brokerage (DD)	Yes	0	2
Garden State (CS)	No	0	N.A.
Gill Trading (DD)	No	128	N.A.
Group One (DD)	Yes	0	0
Hawthorne (CS)	Yes	0	2
Hull Trading (DD)	No	16	N.A.
Lashco (DD)	Yes	0	0
Madoff Investment Sec. (DD)	No	310	N.A.
National Financial Serv. (DD)	Yes	0	0
National Financial Serv. (CS)	Yes	0	17
Olde Discount Brkg. (DD)	Yes	299	12
Paine Webber (DD)	Yes	109	13
Paine Webber (CS)	Yes	0	3
Pershing (DD)	Yes	113	8
Piper Jaffray (DD)	Yes	0	1
Prudential Securities (DD)	Yes	4	16
Redwood Trading (DD)	No	11	N.A.
D.E. Shaw (DD)	No	5	N.A.
Smith Barney (DD)	Yes	337	53
Timber Hill (DD)	No	39	N.A.
Total		1387	138

the CSE-imposed 350 security limit during our sample period may be binding. Other CSE participants (e.g., Piper Jaffray) register in few securities. The Competing Specialist Initiative on the BSE has substantially fewer participants. Only National Financial Services approaches the 20-security maximum the BSE allows. Two brokerage firms participate in both programs.

Panel B reports the time series of additions to our sample. With the exception of July 1994, when Smith Barney initiated revised-rules trading in 53 securities, the distribution of event dates is fairly evenly spread throughout the sample period. A separate analysis of the 53 securities added in July 1994 finds no substantive differences between the effects associated with adding those securities and the effects associated with the sample as a whole.

Table 1 suggests that few brokerage firms internalize orders via these programs. Several reasons might explain this. First, many brokerage firms sell or purchase order flow. If a broker sells order flow,

Table 1
(continued)

Panel B: Dates of security additions during the sample period

Month/Year	Number of CSE securities introduced	Number of BSE securities introduced
2/94	1	N.A.
3/94	0	N.A.
4/94	3	N.A.
5/94	2	N.A.
6/94	1	N.A.
7/94	53	6
8/94	6	0
9/94	6	3
10/94	2	4
11/94	0	1
12/94	2	4
1/95	2	0
2/95	5	4
3/95	4	3
4/95	11	2
5/95	11	0
6/95	0	3

A Designated Dealer is an agent with approval from the Cincinnati Stock Exchange (CSE) to perform market making functions on the CSE. A Competing Specialist is a Boston Stock Exchange (BSE) member approved by the exchange to offer market-making services in competition with the "regular" BSE specialist assigned to a given stock.

^aJanuary 1994 represents the month prior to the start of our sample period.

^bThis is the number of securities in which the indicated broker-dealer is the first to trade in one of the revised-rules programs.

^cN.A. = not applicable. We do not include securities first traded in the programs by broker-dealers who do not have direct access to retail order flow.

then there are no orders to internalize. Market makers cannot internalize purchased orders in either program during our sample period. Second, fixed start-up costs (e.g., technology and personnel) imply that dealers need a minimum level of order flow to begin internalizing. The initial experimental nature of the programs during our sample period magnifies these start-up costs. Because the SEC approved the programs only for 6- to 9-month periods at a time, brokerage firms may have hesitated to incur the fixed, up-front costs. Finally, internalization is politically sensitive; some firms may have assessed the political costs as excessive. For example, Merrill Lynch discontinued their routine, exchange-based internalization program in October 1995.⁵

⁵ See "Merrill Shifts on Small Investors' Orders," *Wall Street Journal*, October 20, 1995. Personal conversations with Merrill officials verify that they discontinued the routine routing of small orders to the Boston and Pacific Stock Exchanges at the end of trading on October 31, 1995. See Battalio et al. (1996) for an analysis of this decision.

We compare trading statistics from the month before a given security's inclusion in one of the programs with corresponding statistics estimated in the first month following the security's inclusion. We align the time series of trades and quotes in event time, with the month of security's inclusion being time zero. We examine two general types of trading statistics: volume of trades and market quality measures.

First we want to know whether the distribution of trades across trading venues changes after a security's inclusion in one of the regional's revised-rules trading programs. The maintained hypotheses for the market-share tests are that exchanges want to attract order flow and that members execute orders on the venue most advantageous to them. If these hypotheses are true, then we can use the redirection of order flow associated with changes in trading rules to infer the changes' usefulness to their members.

Our market quality measures are the time-weighted average of the quoted bid-ask spread and the liquidity premium. The time-weighted spread (TWS) weights the quoted spread for a given security by the amount of time that spread is quoted during the month of interest. Thus a security with a spread of one-eighth of a dollar for half the month and one-quarter of a dollar for half the month has a TWS of \$0.1875. If brokers use an informational advantage to execute orders selectively, then we may find that spreads for NYSE-listed securities widen after those securities begin trading in one of the programs. If firms use a cost advantage, then we anticipate decreased spreads. Finally, the programs' effects may not be economically meaningful, or traders may use both informational and cost advantages to internalize orders. In these latter cases, the spreads may not change.

The liquidity premium (LP) measures how close transaction prices are to the midpoint of the contemporaneous bid-ask spread. The reported liquidity premium is the share-weighted average of the absolute difference between the transaction price and the midpoint of the contemporaneous NBBO spread. Assuming that the spread is set symmetrically around the equilibrium price, the LP provides a per share estimate of execution costs for market orders (i.e., the price of liquidity). Again, we compute averages for periods just before and after a security begins trading in one of the programs. To conclude that the market structure changes benefit market quality, we require significantly decreased liquidity premia.⁶

⁶ The liquidity premium used here and in Lee (1993) is unable to perfectly measure the effective spread because it must infer the trader initiator. More complete data, such as that available to Petersen and Fialkowski (1994), would enable us to do a better job at measuring the effective spread.

Finally, we investigate how aggressively the sponsoring regional market makers place quotes for stocks they trade. A potential benefit of increasing order flow away from the primary exchange is that market makers on the sponsoring regionals may post more competitive quotes as they observe more order flow. We examine the fraction of time that regional market makers post quotes establishing or equaling the NBBO before and after they begin revised-rules trading in one of the regional's programs.

2. Market Share of Trades

Of the 138 sample stocks, 30 are from the BSE's Competing Specialist Initiative and 108 are from the CSE's program. We document changes in where both small and large orders execute around the time that revised-rules trading begins on either the CSE or the BSE. Trades eligible for automatic execution on the sponsoring regional (<1300 shares on the BSE and <2100 shares on the CSE) we categorize as small trades. Easley and O'Hara's (1987) theoretical model suggests that large trades are more likely to be informed. Consistent with this theory, Lin et al. (1995) find that the adverse selection component of the bid-ask spread for NYSE-listed securities increases uniformly with trade size. If we document a shift in small-trade executions away from the NYSE, then theory suggests that we are more likely to capture an event imposing adverse selection costs on the NYSE specialist. Both programs capture substantial amounts of small-order flow from the NYSE for the regional exchange sponsoring the program.

2.1 The Boston Stock Exchange program

Thirty securities began revised-rules trading in the Competing Specialist Initiative between July 1994 and June 1995, are traded by internalizing dealers, and have complete TAQ data. Panel A of Table 2 reports market shares of orders across different trading venues the month before and the month following the security's initial inclusion in the BSE program. We report the results separately for trades eligible and ineligible for automatic execution in Boston. The Total column reveals almost no change in the mix of small and large orders around the beginning of trading in the program. Likewise, little happens to the market share of large or small orders executed on the other (not BSE) regionals or in the third market. The fraction of small BSE trades rises substantially, from 3.7% of all trades to over 7%, and the NYSE's share of these trades falls. The BSE's share of small orders jumps from 4.7% (0.373/0.7962) to nearly 9%, while the NYSE's share falls from 36% to 31.6%. Thus the vast majority of the BSE's gain appears to come directly from the NYSE.

Table 2
How trading in the Boston Stock Exchange Competitive Specialist Initiative or the Cincinnati Stock Exchange Prefrencing Dealer Program affects where orders in NYSE-listed securities are executed

Panel A: Where orders in NYSE-listed securities execute before and after they begin trading in the BSE's Competitive Specialist Initiative

Order Size ^a	Trading Venue									
	NYSE		BSE		Other regional exchanges ^d				Third market	
	Pre ^b	Post ^c	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Small	29.00%	25.38%*	3.73%	7.12%*	28.70%	28.22%	18.19%	19.47%	79.62%	80.19%
Large	16.63%	15.61%*	0.34%	0.49%*	1.93%	1.93%	1.48%	1.79%*	20.38%	19.81%
All	45.63%	40.99%*	4.07%	7.61%*	30.63%	30.15%	19.67%	21.26%	100.0%	100.0%

Panel B: Where orders in NYSE-listed securities execute before and after they begin trading in the CSE's Prefrencing Program

Order Size	Trading Venue									
	NYSE		CSE		Other regional exchanges				Third market	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Small	54.14%	47.80%*	0.24	3.09%*	20.68%	22.63%	9.15%	10.71%	84.21%	84.23%
Large	14.18%	13.75%	0.01%	0.17%	0.80%	0.94%	0.80%	0.91%	15.79%	15.77%
All	68.62%	61.54%*	0.25%	3.26%*	21.48%	23.57%	9.95%	11.62%	100.0%	100.0%

Table 2
(continued)

Panel C: Where orders in NYSE-listed securities execute before and after they begin trading in either program

Order Size	Trading Venue									
	NYSE		Sponsoring exchange		Other regional exchanges		Third market		Total	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Small	38.85%	33.87%*	2.37%	5.57%*	25.69%	26.05%	14.70%	16.10%	81.56%	81.59%
Large	15.52%	15.00%*	0.20%	0.37%*	0.92%	1.56%	1.20%	1.46%*	17.84%	18.39%
All	54.37%	48.87%*	2.57%	5.94%*	26.61%	27.61%	15.90%	17.56%	100.0%	100.0%

The reported numbers equal the total number of orders in NYSE-listed securities in the sample executed on the indicated trading venue in the months immediately prior to and subsequent to the month in which those securities are introduced to Boston's Competing Specialist Initiative or Cincinnati's Preferencing Dealer Program divided by the total number of orders in those securities executed at all trading venues in the same event months.

^aSmall orders are eligible for the relevant exchange's automatic order execution system (<1300 shares in Boston and <2100 on the CSE).

^b"Pre" refers to the month immediately prior to the month in which an NYSE listed security begins trading in the CSE Preferencing Dealer Program or the BSE Competitive Specialist Initiative.

^c"Post" refers to the month immediately after the month in which a NYSE listed security begins trading in one of the revised-rules programs, (which ever of the latter two that is not the sponsoring exchange for a particular security).

^dOther regionals include the Chicago, Pacific, and Philadelphia Stock Exchanges and either the Boston or the Cincinnati Stock Exchange

*The nonparametric sign test is used to determine whether the percentage of trades executed at a particular trading venue increase for a proportion of the securities in our sample significantly different from 50%. Two-tailed tests are used. The asterisk denotes that the test result indicated a significant test statistic at the 0.01 level.

2.2 The Cincinnati Stock Exchange program

Panel B of Table 2 presents comparable data for the CSE market share effects. As with the BSE sample, there appears to be no effect on the mix of small and large orders or on the market shares of the other (not CSE) regionals and the third market. The CSE enjoys a substantially increased fraction of small orders executed (from less than 0.3% to about 3.1%), all appearing to come directly from the NYSE.

2.3 Combined sample results

Panel C of Table 2 presents statistics for all 138 stocks. We determine small and large orders relative to the sponsoring exchange's automatic execution cutoff. We include in the Other Regional Exchange column the BSE (CSE) trades in securities introduced into the CSE (BSE) program. These results confirm what we find examining the programs individually: the sponsoring exchange gains small-order market share at the NYSE's expense. That the market shares of the other regionals and the third market do not fall when the BSE and the CSE initiate revised-rules trading suggests that broker-dealers are not simply shifting the venue on which they compete with New York. This trading redirection from New York appears to be incremental, not a substitution of one non-NYSE trading source for another.⁷

Our results support the contention that these programs significantly (both statistically and economically) affect where small orders execute. We find no evidence that overall trading activity (measured by either number of transactions or share volume) changes systematically around these dates. Neither mean-levels parametric tests nor nonparametric tests of proportions reject the null hypothesis that trading activity in the month after a security's introduction into one of these programs equals the previous month's activity. In the next section we examine whether the direction of order flow away from the primary exchange relates to measurable adverse selection. Because theory suggests that we can associate any small-order flow fragmentation with adverse selection, we report the effect on market quality statistics for the combined sample only. Separate analyses reveal no qualitative market quality differences between the two programs.

3. Market Quality Statistics

The previous section's results imply that permitting order internalization appeals to NYSE-member brokers: introducing an NYSE-listed

⁷ We conduct a *daily* analysis of market share for the 82 stocks for which we could obtain precise dates for the initiation of revised-rules trading. Results indicate that the sponsoring regional exchange's share of trade increases from 2% to 5.5% between event days -1 and 0 . Conversely, the NYSE's share fell from 54% to about 50% between the same two event days.

Table 3
Quoted spreads the month before and the month after a security's introduction into either the Boston Stock Exchange Competing Specialists Initiative or the Cincinnati Stock Exchange Preferencing Dealer Program between February 1994 and June 1995

Time weighted spread		Before ^a		Difference in means test statistic ^c	Percentage of securities with increased spreads ^d
			After ^b		
NBBO	Mean	\$0.1699	\$0.1638	1.495	65.94%
	Standard deviation	\$0.0344	\$0.0324		
NYSE	Mean	\$0.1778	\$0.1725	1.230	65.94
	Standard deviation	\$0.0361	\$0.0350		

The time-weighted National Best Bid and Offer (NBBO) spread is the inside bid and ask prices across all National Market System trading venues as re-created from the Trades and Quotes (TAQ) database weighted by the fraction of time during the relevant month the spread is active. The time-weighted New York Stock Exchange (NYSE) spread is the analogous statistic for the quote attributed to the NYSE on TAQ.

^aThe month prior to a security's first inclusion in one of the revised-rules trading programs.

^bThe month after a security's first inclusion in one of the revised-rules trading programs.

^cA parametric difference in mean spread before versus mean spread after.

^dA test of whether the indicated proportion differs from 0.5. Both reported numbers are significantly different from 50% at the 0.01 level.

security into either program is associated with the redirection of a substantial portion of small trades from the NYSE to the sponsoring regional. We wish to know if changes in the time-weighted spread or in the liquidity premium are associated with this redirection of order flow. If revised-rules trading severely increases adverse selection, then we expect the primary market maker to widen spreads to protect against the typically better-informed pool of orders. We should, therefore, observe both TWS and LP increases.

Table 3 compares the TWS for our sample securities in the month before the security begins trading in one of the programs with the corresponding statistic in the month after. The mean quoted NBBO spread decreases by \$0.0061. Of the 138 stocks, 91 have lower spreads after they begin trading in one of the programs. This fraction (65.9%) differs significantly from 50% at the 0.01 level. We reach similar conclusions examining the NYSE spread instead of the NBBO. Thus the quoted spread decreases for significantly more than 50% of the sample firms. Because neither the number of daily transactions nor the shares traded daily changes from immediately before to immediately after the sample stocks enter the programs, we cannot attribute the spread decrease to an increasing volume of trade.⁸

Table 4 reports average LP for securities trading in markets where the contemporaneous bid-ask spread width is 1/4. We do not re-

⁸ An alternative to widening spreads is decreasing the size (depth) of the quotes. We find no evidence consistent with systematically smaller size after trading in one of the programs begins.

Table 4
Liquidity premia for small orders in NYSE-listed securities the month before and the month after these securities enter either the Boston Stock Exchange Competing Specialist Initiative or the Cincinnati Stock Exchange Preferencing Dealer Program between February 1994 and June 1995 when the contemporaneous bid-ask spread is \$0.25

Trading venue	Statistic	Month before ^a	Month after ^b	Statistical test of difference ^c
NYSE	SW-LP ^d	\$0.0558	\$0.0489	N.A.
	EW-LP ^e	\$0.0496	\$0.0462	-1.0766
	Median LP ^f	\$0.0496	\$0.0478	.4265, -1.715*
	Daily trades	17.03	15.45	N.A.
Sponsoring regional ^g	SW-LP	\$0.0694	\$0.0591	N.A.
	EW-LP	\$0.0651	\$0.0549	-1.3445
	Median LP	\$0.0640	\$0.0546	.4839, -0.1796
	Daily trades	0.54	1.54	N.A.
Other regionals ^b	SW-LP	\$0.0696	\$0.0639	N.A.
	EW-LP	\$0.0632	\$0.0593	-1.2594
	Median LP	\$0.0630	\$0.0602	.4307, -1.6234*
	Daily trades	8.44	8.86	N.A.
Third market	SW-LP	\$0.0738	\$0.0687	N.A.
	EW-LP	\$0.0679	\$0.0635	-1.213
	Median LP	\$0.0710	\$0.0635	.4242, -1.741*
	Daily trades	4.18	4.98	N.A.

The liquidity premium (LP) is the absolute difference between the trade price and the midpoint of the contemporaneous quoted inside bid-ask spread. Small orders are trades with a size that makes them eligible for the automatic execution system of the relevant exchange (<1300 shares for Boston and <2100 shares for Cincinnati).

^aThe month prior to the security's first trading under the revised rules on either the BSE or the CSE.

^bThe month after the security's first trading under the revised rules on either the BSE or the CSE.

^cThe difference test for EW-LP compares the across-firm, equally weighted LP in event month -1 to event month +1. The cross-sectional standard deviations are used for the test. The difference test for median LP is a test of whether the proportion of LP increasing between event month -1 and event month +1 is different from 0.5. The number pair reported is (proportion of firms with LP increasing, the z-statistic for that proportion differing from 0.5).

^dThe share-weighted LP. Every observed LP is weighted by the size of the trade regardless of the security.

^eThe equal-weighted (across securities) LP. A share-weighted LP is computed for each security. These LP are equally weighted.

^fThe median share-weighted LP across securities.

^gThe BSE for those securities involved in the Competing Specialist Initiative and the CSE for those securities involved in the Preferencing Dealer Program.

^bThe Chicago Stock Exchange, the Pacific Stock Exchange, the Philadelphia Stock Exchange, and the Boston (Cincinnati) Stock Exchange for stocks traded in the Cincinnati (Boston) Stock Exchange program.

*Significantly different from 0.5 at the 0.1 level.

port the LP for transactions occurring when the spread width is 1/8 because of TAQ data limitations. Specifically, TAQ does not indicate which party initiates the trade; therefore, we cannot attribute any price improvement. In addition, the number of executions occurring in markets with spreads of 3/8 or greater is so small that we omit them from the analysis.

The share-weighted mean LP for small trades in 1/4-spread markets falls across all trading venues, including the NYSE. The decrease on the NYSE is \$0.0069; that on the sponsoring regional market is \$0.0103. Neither mean decrease is statistically significant at traditional levels. That the NYSE liquidity premium does not increase is particularly interesting. If adverse selection problems are serious, then we expect that the LP would increase on the market with the executor-of-last-resort responsibilities when orders move from that exchange. These results suggest that the adverse selection associated with this order-flow redirection from the primary exchange is not severe. In fact, the NYSE's LP decreases for significantly (at the 0.10 level) more than 50% of the securities (56.35%).⁹

A general downward trend in quoted spreads and liquidity premia may occur during our sample period. Two robustness checks, however, suggest that this is not the case. First, we find no further changes in any of our statistics when we move the postevent horizon from 1 to 2 months. Order flow, quoted spreads, and liquidity premia are unchanged between the first and second months after a security begins trading in one of the programs. Second, we conduct a parallel test generating random "event dates" within the sample period for the sample securities. We find no significant changes in any of the statistics around these alternative dates, using both parametric and nonparametric tests.

A potential benefit of increased order flow on alternative trading venues is that dealers on those venues may quote more aggressively as they "see" more of the flow.¹⁰ To determine if this happens on the sponsoring regional, we compute the fraction of the time during the month of interest that the sponsoring regional quotes the best bid and/or offer price. By computing the fraction of the time the regional is at the NBBO after establishing a new best bid and/or offer, we also examine whether sponsoring regional dealers improve the NBBO more frequently after revised-rules trading begins. Table 5 summarizes the results.

As found in prior work [see Blume and Goldstein (1997)], the NYSE is part of the NBBO or sets it over 95% of the time. We find, however, that the sponsoring regional participates in the NBBO and improves it significantly more often after these programs begin. The fraction of the time that regionals participate on at least one side of the NBBO increases, on average, from 2.5% in the month before the security trades

⁹ The liquidity premium of large trades in 1/4-spread markets on the NYSE does not change after a security begins trading in one of the regionals' programs.

¹⁰ We thank the referee for suggesting this analysis.

Table 5
Frequency with which the Boston Stock Exchange and the Cincinnati Stock Exchange quotes are at the National Best Bid and Offer before and after a security begins trading in the Competing Specialist Initiative or the Preference Program between February 1994 and June 1995

Fraction of time at ^a	NYSE		Other regionals		Sponsoring regional	
	Before	After	Before	After	Before	After
Best bid ^b	.9611	.9589	.2374	.2402	.0183	.0816**
Best ask	.9643	.9548	.2268	.2365*	.0153	.0889**
Best bid after establishing new best	.9385	.9368	.0104	.0097	.0006	.0027**
Best ask after establishing new best	.9447	.9320	.0098	.0105	.0005	.0042**
Either or both best bid and/or ask	.9942	.9932**	.3529	.3621	.0285	.1571**
Either or both best bid and/or ask after establishing new best	.9908	.9881	.0199	.0197	.0011	.0069**

The reported numbers are the time the indicated trading venues quoted price is equal to the most favorable price quoted at all of the ITS trading venues divided by the total time available in the month. Before and after refer to the month immediately prior to and the month immediately following the month in which those securities are introduced into one of the programs.

^aEqually weighted average across all securities in the Competing Specialist Initiative or the Preferencing Program.

^bThe test conducted is a sign test. The null is that one-half the firms have smaller fractions before being traded in one of the programs and one-half have larger.

*The proportion of firms with a smaller fraction before revised-rules trading differs from 0.5 at the 0.1 level.

**The proportion of firms with a smaller fraction before revised-rules trading differs from 0.5 at the 0.1 level.

under the revised rules to 15.7% in the month after. Thus regional broker-dealers apparently post competitive quotes more frequently after trading in these programs begins.

In summary, these programs do not appear to have adverse short-term effects on market quality as we measure it. The average quoted bid-ask spread decreases for a significant proportion of our sample securities. Effective trading costs, as measured by the average distance that trades occur from the midpoint of the bid-ask spread, do not increase. Together, the results suggest that adverse selection associated with introducing NYSE-listed securities into these programs is economically insignificant.¹¹

¹¹ There is no substantive difference if we examine only stocks not subject to SEC Rule 19c-3.

4. Conclusions

Judging from the significant movement of orders away from the NYSE in response to recent rule changes making multiple-firm internalization possible on the CSE and the BSE, the option to internalize orders in NYSE-listed stocks appears valuable. We associate statistically and economically significant increases in the market share of trades on the exchange permitting internalization with introducing NYSE-listed securities into the CSE's Preferencing Program or the BSE's Competing Specialist Initiative. This evidence suggests that internalization stimulates competition for order flow and demonstrates that a trading venue can attract order flow if the trading organization provides a valuable service to its members.

A more interesting question is whether the market fragmentation caused by the ability to internalize affects market quality. We analyze two market quality statistics: the width of the quoted spread and the closeness of the execution price to the NBBO spread's midpoint (i.e., the liquidity premium). We find that both NBBO and NYSE quoted spreads decrease slightly immediately after the programs' initiation. Although the mean decrease is not statistically significant at traditional levels, over 65% of the sample securities' spreads decrease. One possible explanation is that broker-dealers on the regional exchanges manage their inventory risk by placing limit orders on the NYSE, which narrow the quoted spread in some cases [see Greene (1996)]. A second explanation for the decreased spread is that some broker-dealers allow their customers' orders to receive a more favorable price by exposing them as revised quotes.¹² Regardless of the explanation, we find that the regional exchanges are more likely to match the NBBO after, rather than before, a security begins trading in one of these programs. Likewise, the point estimate of the average liquidity premium falls for small trades executed in 1/4-spread markets. Although not statistically significant, the short-run liquidity premia decrease occurs across all trading venues, including the NYSE. The liquidity premium's failure to increase is not consistent with the regional's trading programs (and the associated order flow fragmentation) having an economically meaningful adverse selection effect on trading costs. Overall, we conclude that initiating trading under these programs does not appear to adversely affect our market quality measures.

We cannot say definitively why adverse selection does not appear in the data. Broker-dealers may partition orders based on beliefs about

¹² Suppose the quote is 20 to 20 1/4 and a broker-dealer receives a market sell order. That order could be executed immediately at 20. Some broker-dealers, however, guarantee the 20 and enter a bid of 20 1/8. If another broker-dealer hits that bid, then the customer receives the improved price.

the informativeness of the orders (i.e., adverse selection exists), but such a partition may have minimal economic significance. It also is possible that regional exchange cost efficiencies exist in addition to adverse selection and that the two offset each other. Alternatively, broker-dealers may not use their knowledge of order informativeness when deciding where to execute the order. If the person taking the order (in sales) is different from the person executing it (in trading), then there may be less than perfect institutional retention of whether the order is or is not informed. Finally, broker-dealers may deliberately choose not to use such information in order to retain customer goodwill.

We cannot measure the liquidity premia in markets where the prevailing quote is at minimum tick size. These markets represent about 85% of the observed trades in our sample of stocks. If price improvement rates in 1/8-spread markets vary across trading venues, then we cannot comment on that dimension of market quality. For example, Ross et al. (1996) find that 10% of the SuperDot market orders submitted during NYSE trading hours in minimum tick markets received price improvement in January 1996. If the regionals improve a smaller fraction of shares traded, then order flow fragmentation may lower execution quality for investors. In addition, we do not address how order flow fragmentation affects limit order traders. Fewer small NYSE market orders may disadvantage limit order traders.

We also ignore anecdotal evidence that allowing brokers to assume some dealer functions produces lower (in some cases, zero) commissions. The popular press suggests that commissionless trading is not free trading and notes the relationship with internalization (see, "There's No Such Thing as a Free Trade," in *New York Times*, April 30, 1995). One major discount broker substantiated this relationship in October 1995 advertising.¹³

Finally, these programs may not cause sufficient market fragmentation to produce meaningful adverse selection problems. Perhaps the securities selected for internalization programs are immune to the problem. Even so, an adverse selection problem may arise if the list is expanded. Possibly order flow fragmentation, as significant as it appears, may be insufficient to elicit the problem, but additional fragmentation will make the problem apparent.

Our study examines only short-run effects on a few market quality measures. Overall, however, our evidence suggests an economically

¹³ Olde Discount Brokerage, Inc., notes that the firm may make a market in the stocks included on their list of stocks eligible for commissionless trading, and an analysis of the list suggests substantial overlap with the list of stocks for which Olde acts as a preferencing dealer on the CSE. Olde literature indicates that, for stocks in which Olde does charge a commission, the commission on a 1000 share trade is \$0.052 per share.

insignificant adverse selection problem associated with fragmenting the market by making it easier for retail brokerage houses to execute orders selectively in NYSE-listed securities. We believe that our study provides some information useful to traders, exchange administrators, and market regulators. We also feel that the programs provide a natural experiment in which to measure how adverse selection affects market making. Informational asymmetries play an important role theoretically, but we have few opportunities to examine their importance empirically.

Appendix A: BSE Competing Specialist Initiative

The following are excerpts from *SEC Release No. 34-34078* (May 18, 1994), which contained the order granting temporary approval for 1 year to proposed rule changes permitting competing specialists on the floor of the Boston Stock Exchange. Permanent approval was granted in *SEC Release No. 34-37045*.

Essence of the rule change

The BSE rules governing the auction market principles of priority, parity, and precedence remain unchanged. Thus if the specialists are quoting the same price, the earliest bid/offer at that price has time priority and will be filled first up to its specified size; and if the specialists are on both price and time parity, then all bids/offers equal to or greater than the size of the contra side order are on parity and entitled to precedence over smaller ones. The Boston limit order book is integrated. Competitive specialists must clear orders through the regular specialist and provide print protection for limit orders.

In addition to facilitating competition among the specialists, the BSE proposal permits *preferenced order routing*. Orders may be directed to any specialist based on the request of the firm submitting the order, or, if a particular specialist is not specified, then the orders will be directed to the regular specialist. If an order is entered into the BSE's automated order routing system (BEACON) by a member firm affiliated with a specialist, that order automatically will be routed to that member firm's affiliated specialist, thereby preventing member firms affiliated with a specialist from routing nonprofitable orders through BEACON to the other specialists when market conditions are unfavorable.

The only instance where preferencing would force a competitor with clearly established priority on the BSE floor to step aside to a preferred order is when the best BSE bid (ask) is less (greater) than that listed in the ITS. In such a circumstance, the BSE specialist does not have priority at the NBBO and therefore BEACON will route the order to whomever is the designated specialist.

Finally, all BSE market and marketable limit orders routed to a designated specialist will continue to be exposed for fifteen seconds to allow the specialist to execute the order at a price better than the NBBO before automatic execution at the NBBO.

Purpose

The purpose of the proposed rule change is to permit competing specialists on the floor of the BSE. The BSE Competing Specialist Initiative will permit up to three specialists in each stock, who would compete with each other for order flow.

Scope

The scope of the program is limited in that each competitor may specialize in a maximum of 10 stocks, unless the Market Performance Committee approves an increase of up to 20 stocks per applicant firm.

Caveat

Purchased order flow cannot be preferenced.

Appendix B: CSE Preferencing Program

The following are excerpts from several SEC releases referring to the CSE Designated Dealer Program. *SEC Release No. 34-28866* (February 2, 1991) contained the order granting the initial 6-month pilot period. Permanent approval was granted in *SEC Release No. 34-37046*.

Essence of the rule change

The CSE rule changes provide an exception to the CSE's time priority requirements between designated dealers when one designated dealer is interacting with his or her own customer's order flow.

Specifically, CSE Rule 11.9, parts (l), (m), and (u) are altered under the CSE preferencing program. These rule changes modify the CSE's time priority rules to permit a broker-dealer to act as 'Dealer of the Day' and thus have priority over same-priced broker-dealer or professional agency interest entered prior in time to his or her bid or offer when the broker-dealer is interacting with the public agency market and marketable limit orders that he represents as agent. The only time a preferencing dealer would not be able to internalize an order is when a limit order on the CSE was at the NBBO. There is a central limit order book in Cincinnati, but it is seldom used in practice. Limit orders are held until they become marketable. One modification requested of the CSE program was to require preferencing dealers offer print protection for their limit orders.

Purpose

The CSE stated that it was attempting to increase the amount of retail business transacted on the exchange. Prior to this program, the CSE had attempted to increase business and liquidity by developing electronic interfaces with retail order-delivery systems, and increasing the number of issues traded in the NSTS (the CSE's electronic trading system) through the creation of a primary Designated Dealer of broker-dealer by establishing them as Dealer of the Day in such issues. Dealer of the Day status obligates the dealer to guarantee execution of all public agency orders up to 2099 shares. However, in the CSE's view, the Dealer of the Day category did not overcome the lack of incentive in the CSE's multiple broker-dealer environment for a dealer to direct his own retail order flow to the exchange. This is because the Dealer of the Day could lose all or a portion of his own retail order flow to other broker-dealers who are quoting at the NBBO. Thus, the *preferencing pilot* was the next step in the CSE's effort to attract retail order flow, enhancing liquidity and efficiency, while protecting customer orders by requiring that limit orders be satisfied before a dealer can execute same priced customer orders and ensuring that these orders continue to be executed at the NBBO.

As noted in *SEC Release No. 34-27910*, "the CSE believes that the proposed rule change is a necessary competitive response which recognizes the realities of a changing market environment with respect to retail order flow. Competitive pressures have led many brokerage firms to become specialists on regional exchanges so that they can interact with their own customer orders."

Scope

The scope of the program was initially limited to 60 issues per preferencing dealer. Over the past 4 years, this limit has been extended to 350 issues.

Caveat

Purchased order flow cannot be preferenced.

References

Affleck-Graves, J., S. Hegde, and R. Miller, 1994, "Trading Mechanisms and the Components of the Bid-Ask Spread," *Journal of Finance*, 49, 1471-1488.

Arnold, T., P. Hersch, J. Mulherin, and J. Netter, 1997, "Merging Markets," working paper, University of Georgia.

Battalio, R., 1997, "Third Market Broker-Dealers: Cost Competitors or Cream Skimmers? An Empirical Analysis," *Journal of Finance*, 52, 341-352.

- Battalio, R., and C. Holden, 1996, "Why Doesn't Decimal Trading Eliminate Payment for Order Flow and Internalization?," working paper, Indiana University.
- Battalio, R., J. Greene, and R. Jennings, 1996, "Does the Choice of Trading Venue Matter for Common Stock Executions?: Assessing Merrill Lynch's Decision Concerning Trading on the Regional Stock Exchanges," working paper, Indiana University.
- Bessembinder, H., and H. Kaufman, 1996, "Quotations and Trading Costs on the Domestic Equity Exchanges," working paper, University of Arizona.
- Blume, M., and M. Goldstein, 1992, "Differences in Execution Prices among the NYSE, the Regionals, and the NASD," working paper, University of Colorado.
- Blume, M., and M. Goldstein, 1997, "Quotes, Order Flow and Price Discovery," *Journal of Finance*, 52, 221-244.
- Chordia, T., and A. Subrahmanyam, 1995, "Market Making, the Tick Size, and Payment-for-Order-Flow: Theory and Evidence," *Journal of Business*, 68, 543-576.
- Christie, W., and R. Huang, 1994, "Market Structures and Liquidity: A Transactions Data Study of Exchange Listings," *Journal of Financial Intermediation*, 3, 300-326.
- Cohen, K., and R. Conroy, 1990, "An Empirical Study of the Effect of Rule 19c-3," *Journal of Law and Economics*, 33, 277-305.
- Davis, J., and L. Lightfoot, 1994, "Fragmentation vs. Consolidation of Securities Trading: Evidence from the Operation of Rule 19c-3," working paper, Securities and Exchange Commission.
- Demsetz, H., 1968, "The Cost of Transacting," *Quarterly Journal of Economics*, 82, 33-53.
- Dutta, P., and A. Madhavan, 1996, "Competition and Collusion in Dealer Markets," *Journal of Finance*, 52, 245-276.
- Easley, D., and M. O'Hara, 1987, "Price, Trade Size, and Information in Securities Markets," *Journal of Financial Economics*, 19, 69-90.
- Easley, D., N. Kiefer, and M. O'Hara, 1996, "Cream-Skimming or Profit-Sharing? The Curious Role of Purchased Order Flow," *Journal of Finance*, 51, 811-834.
- Greene, J., 1996, "The Impact of Limit Order Executions on Trading Costs on the New York Stock Exchange," working paper, Georgia State University.
- Lamoureux, C., and C. Schnitzlein, 1995, "When it's not the only Game in Town (The Effect of Bilateral Search on the Quality of a Dealer Market)," working paper, University of Arizona.
- Lee, C., 1993, "Market Integration and Price Execution for NYSE-Listed Securities," *Journal of Finance*, 48, 1009-1038.
- Lin, S., G. Sanger, and G. Booth, 1995, "Trade Size and Components of the Bid-Ask Spread," *Review of Financial Studies*, 8, 1153-1183.
- McInish, T., and R. Wood, 1992, "Price Discovery, Volume and Regional/Third Market Trading," working paper, University of Memphis.
- Neal R., and D. Reiffen, 1996, "The Effect of Integration between Broker/Dealers and Specialists," in A. Lo (ed.), *Industrial Organization and Regulation of the Securities Industry*, University of Chicago Press, Chicago.
- New York Times*, 1995, "There's No Such Thing as a Free Trade," April 30.

Do Competing Specialists and Preferencing Dealers Affect Market Quality?

Petersen, M., and D. Fialkowski, 1994, "Posted Versus Effective Spreads: Good Prices or Bad Quotes?," *Journal of Financial Economics*, 35, 269–292.

Ross, K., J. Shapiro, and K. Smith, 1996, "Price Improvement of SuperDot Market Orders on the NYSE," working paper, New York Stock Exchange.

SEC, 1994, *Market 2000 Report: Study III, Market Fragmentation, Competition, and Regulation*.

SEC, 1990, "Notice of Filing of Proposed Rule Change by the Cincinnati Stock Exchange Relating to the Preferencing of Public Agency Market and Marketable Limit Orders by Approved Dealers and Other Proprietary Members," *SEC Release No. 34-27910*.

SEC, 1991, "Order Approving Proposed Rule Change and Notice of Filing and Order Granting Accelerated Approval of Amendment to Proposed Rule Change of the Cincinnati Stock Exchange Relating to the Preferencing of Public Agency Market and Marketable Limit Orders by Approved Dealers and Other Proprietary Members," *SEC Release No. 34-28866*.

SEC, 1994, "Order Granting Temporary Approval for One Year to Proposed Rule Change Permitting Competing Specialists on the Floor of the Exchange," *SEC Release No. 34-34078*.

SEC, 1996, "Self-Regulatory Organizations; Boston Stock Exchange, Inc.; Order Granting Approval of Proposed Rule Change Permitting Competing Specialists on the Floor of the Exchange," *SEC Release No. 34-37045*.

SEC, 1996, "Self-Regulatory Organizations; The Cincinnati Stock Exchange; Order Granting Approval to Proposed Rule Change to Adopt Permanently Rules Regarding the Preferencing of Public Agency Orders," *SEC Release No. 34-37046*.

Tinic, S., 1972, "The Economics of Liquidity Services," *Quarterly Journal of Economics*, 86, 79–93.

Tinic, S., and R. West, 1972, "Competition and the Pricing of Dealer Service in the Over-the-Counter Stock Market," *Journal of Financial and Quantitative Analysis*, 7, 1707–1727.

Wall Street Journal, 1995, "Merrill Shifts on Small Investors' Orders," October 20, p. C1.

Wood, R., and T. McNish, 1992, The Effect of NYSE Rule 390 on Spreads, Premiums and Volatility, working paper, University of Memphis.