THE JOURNAL OF FINANCE • VOL. LVI, NO. 1 • FEBRUARY 2001

Institutional Trading and Soft Dollars

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ABSTRACT

Proprietary data allow us to distinguish between institutional investors' orders directed to soft-dollar brokers and those directed to other types of brokers. We find that soft-dollar brokers execute smaller orders in larger market value stocks. Allowing for differences in order characteristics, we estimate the incremental implicit cost of soft-dollar execution at 29 (24) basis points for buyer- (seller-) initiated orders. For large orders, incremental implicit costs are 41 (30) basis points for buys (sells). However, we document substantial variability in these estimates, and research services provided by soft-dollar brokers may at least partially offset these costs.

THERE IS A GROWING LITERATURE on the execution costs of trades by institutional investors. Theoretical work on execution costs and execution strategies (e.g., Kyle (1985) and Bertsimas and Lo (1998)) assumes that profit-maximizing investment managers seek to minimize execution costs. Empirical work suggests that the minimization of execution costs is an important component of investment performance. For example, Chan and Lakonishok (1995) and Keim and Madhavan (1997) find that execution costs (including commissions and market impact) are economically significant and that traders appear to behave strategically to reduce these costs.

Measuring execution costs is complicated by the fact that institutions often ask for and receive nonexecution services as a quid pro quo for directing trades to a particular broker. The practice of exchanging nonexecution services (such as data or macroeconomic forecasts) for commissions is wide-

* Conrad is from the University of North Carolina, Johnson is from Aronson+Partners, Philadelphia, PA, and Wahal is from Emory University. Part of this research was conducted while the first author was visiting the University of Michigan. We thank Wayne Wagner, Larry Cuneo, and Mark Edwards of the Plexus Group for providing data. Mehmet Ozbilgin and Keith Maldin provided research assistance and Ron Harris provided excellent computational assistance. We thank seminar participants at Cornell University, Swedish School of Economics, Norwegian School of Management, University of Michigan, University of Notre Dame, Michigan State University, the WFA meetings in San Diego, Laszlo Birinyi, Bill Carney, Jim Chandler, Leo Guzman, Ken Kavajecz, Paul Irvine, René Stulz, Wayne Wagner, Marc Zenner, and two anonymous referees for helpful suggestions.

spread, and is referred to as "soft-dollar payments."[1] Blume (1993) provides an excellent description of the prevalence and use of soft-dollar payments; based on a survey by Greenwich Associates, he reports that roughly 40 percent of total commissions paid in 1989 (or a total of $692 million) involved soft dollars. Recent surveys by Greenwich Associates report that soft-dollar commissions totaled almost $1 billion in 1996, and that 71 percent of institutions use some type of soft-dollar transactions. Soft-dollar arrangements are also receiving renewed scrutiny from the SEC (1996, 1998), which displayed interest in mandating disclosure,[2] as well as industry groups such as the Association for Investment Management Research (AIMR). Indeed, AIMR issued guidelines for soft-dollar use in 1998, noting a "considerable expansion" of soft-dollar use in the investment management industry (AIMR (1997)).

In this paper, we examine the relation between soft-dollar arrangements and execution costs. We use proprietary data on the release of $260 billion in equity trades by 38 institutions that identify both the broker to whom a trade is released and the reason why that broker is chosen. Specifically, the data identify trades sent to soft-dollar brokers versus those sent to other types of brokers; the other broker categories include alternative trading systems, full-service brokers, research/regional brokers, and brokers that do not fall into any of the above categories (nonclassified). To our knowledge, this is the first trade-specific evidence on the execution costs of soft-dollar trades.

In general, orders sent to soft-dollar brokers are smaller, in higher market capitalization stocks, and therefore, arguably easier to fill than orders sent to other brokers. After controlling for differences in order characteristics, we find that the average implicit execution (or market impact) cost for buy (sell) orders sent to soft-dollar brokers is 29 (24) basis points higher than orders sent to full-service brokers. We also examine cost differentials for larger orders and find that incremental implicit execution costs for large orders rise to 41 (30) basis points for buys (sells).

It is possible that the benefits of soft-dollar brokerage (i.e., the value of the services, or the proportion of the commission, rebated to the institutional investor) offset the incremental implicit costs. Rebate arrangements vary from case to case and, unfortunately, our data do not quantify the value of the rebate.[3] If we assume that 60 percent of the commission is returned to

[1] There are several variations in these arrangements. In soft-dollar transactions, a portion of the commission is rebated to the money manager routing the order. The rebate takes the form of soft dollars that are used to acquire research; the SEC has frequently issued rulings explaining what items qualify as "research." If the rebate is routed back to original investors (e.g., a plan sponsor), the arrangement is referred to as directed brokerage. Finally, if the rebate is in (hard) cash, the arrangement is referred to as commission recapture. The SEC Inspection Report (1998) presents evidence that cash rebates are relatively infrequent; only 3 out of 75 brokers involved in the SEC sweep engaged in this practice.

[2] See, for example, Wall Street Journal (1998, 1999).

[3] Private correspondence with the Plexus Group, an industry consultant, and a prominent soft-dollar broker suggests that typically, 50 to 60 percent of the commissions are rebated. For extremely large clients, the rebate can go as high as 70 percent. These estimates are consistent with the findings of the SEC in its Inspection Report.

institutional investors (a reasonable estimate given industry and SEC reports), our data suggest that incremental implicit costs would be positive for 52 percent (66 percent) of our buy (sell) orders. After the rebate, average incremental implicit execution costs fall significantly from 29 basis points (24 basis points) for buys (sells) to 13 basis points (10 basis points). Although the median cost (across buys and sells) after the rebate appears to be an economically significant 14 cents, there is substantial variation in cost estimates, both cross-sectionally and over time. Thus, while *on average*, the benefits received from a 60 percent rebate of commission do not appear to offset incremental implicit costs, for any individual order, they may.

The paper proceeds as follows. In Section I we briefly describe the nature of soft-dollar payments. In Section II, we describe our data, and we present our baseline empirical results in Section III. We discuss a number of specification issues and variations in cost differentials in Section IV and conclude in Section V.

I. Quid Pro Quo Relationships in the Brokerage Industry

Blume (1993) documents the history of soft-dollar payments in the brokerage industry. He notes that, beginning in the 1950s, commissions were fixed above competitive levels and created an environment in which brokerage houses competed for clients by providing additional services, such as research. An industry (the "soft-dollar" industry) developed to provide these services. When Congress began considering the elimination of fixed commissions in the early 1970s, this industry lobbied Congress to ensure that commissions could continue to be used to furnish research to investment managers. Congress responded with the inclusion of the Section 28(E) "safe harbor" provision in the 1975 amendments to the 1934 Securities Exchange Act. Thus, even though federal securities laws state that money managers have a fiduciary duty to obtain the best possible execution of securities transactions for their clients, Section 28(E) provides a safe harbor under which a manager can select a broker for reasons other than execution.[4]

Although soft-dollar usage is widespread, comparatively little is known about the effects of soft dollars on trade execution; data on soft-dollar arrangements are limited. Blume (1993) uses trading data aggregated at the level of the brokerage firm, and finds evidence that soft-dollar trades have

[4] Blume (1993) states that definitions of soft dollars fall into three categories. The first involves the exchange of commissions for in-house research (such as buy-sell recommendations). The second category is the use of commissions to purchase third-party research for the investment manager. The third category ("directed brokerage") involves the client directing the investment manager to send trades to a particular broker; the client then receives benefits (such as commission rebates) from the brokerage house. The last two categories of soft dollars typically involve a negotiated "exchange rate" from real (hard) to soft dollars. A typical conversion rate is 2 to 1, that is, $2 of hard dollars generate $1 in soft dollars. Note that although directed brokerage falls under the heading of a quid-pro-quo relationship, the SEC does not consider directed brokerage as falling under the safe harbor of Section 28(e), because the client does not typically retain investment discretion with respect to their own accounts.

a smaller price impact and lower execution costs than other trades in his sample. However, he notes that this result should be interpreted with caution, because soft-dollar trades may differ in important ways from non-soft-dollar trades. Our data allow us to explore the differences in execution quality at the level of the individual trade. To our knowledge, this is the first evidence available on the differences in execution cost and quality for trades sent to soft-dollar brokers.

II. Data

The data are provided by the Plexus Group, a consulting firm to institutional investors that monitors the costs of institutional trading. The data contain information on orders, "broker releases" (portions of the order parceled out to various brokers), and the trades that result from those releases. For each order, the identity of the stock, whether the institution wishes to buy or to sell, the number of shares the institution wishes to trade, and the price on the day before the decision date are identified. The second level of data specifies the broker releases that result from the order, the prices at which the individual trades making up the release are executed, and the commissions per share. Also included is a code that identifies the broker used by each institution for each release, and a code to classify (broadly) the investment style of the institution.

Our data are similar in structure to those used by Keim and Madhavan (1995, 1997) but differ in several respects. First, the time series of the data are different. Keim and Madhavan's data cover the period from 1991 to 1993. The data provided to us include four quarters: the fourth quarter of 1994, the first quarter of 1995, the first quarter of 1996 and the second quarter of 1996.[5] Second, the Keim and Madhavan data cover 21 institutions whereas our data cover 38 institutions. Third, Plexus also provides us with information that allows us to link the broker codes for each institution with reasons why that particular broker is chosen to fill the order. Specifically, each broker-institution combination is classified into one of the following five categories:

1. *Alternate Brokers*: These are usually trading systems that cross trades. Examples of brokers that fall into this category include the Arizona Stock Exchange (AZX) and The Crossing Network.
2. *Full-service Brokers*: Brokers that provide a menu of services (including execution services, portfolio management services, and the provision of data) to their clients fall into this category. Examples include Goldman Sachs and Merrill Lynch.
3. *Research/Regional*: Brokers that execute trades and also provide in-house research services fall into this category. These often include regional brokers. Examples include Hambrecht & Quist and Cowen & Company.

[5] This interspersed sampling is not deliberate but simply because the Plexus Group finds it easier to provide these particular quarters of data.

4. *Soft-dollar*: Brokers that execute trades and in return for the trade provide soft-dollar payments to the client fall into this category. Examples of brokers in this category include Lynch, Jones and Ryan, and Pershing Securities.
5. *Nonclassified*: This group essentially constitutes a catch-all category that Plexus uses for brokers that it cannot easily classify in the above categories. Generically, firms in this group include execution brokers (such as Weeden & Co. and Keane Securities), as well as the brokerage segments of banks and insurance companies (such as Bank One Securities and Sun America Securities).[6]

The information that allows us to link broker codes for each transaction to the five categories is institution specific. In other words, the Plexus data assume that if an institution uses a particular broker for soft-dollar reasons, it does so for all transactions. Although different institutions can (and do) use the same broker for different reasons, such situations are relatively rare. Moreover, even when the same broker (say, Bear Stearns) is categorized as a full-service broker by one institution and a soft-dollar broker by another, the soft-dollar trades of the latter institution are noted as sent to a specific group within the brokerage house (for example, Bear Stearns Soft Desk). In general, broker classifications are fairly stable across institutions.

Our primary interest is in estimating the difference, if any, in the cost of trades sent to soft-dollar brokers. To that end, we focus most of our comparisons on execution cost differentials between orders sent to soft-dollar brokers and those sent to full-service brokers. Because the full-service and research/regional broker categories may also contain an element of both execution and nonexecution services, our cost comparisons are measured with error. Note, however, that the mixing of execution and nonexecution services in the full-service and research/regional category is likely to *reduce* dispersion in cost differentials across broker categories.

III. Results

A. Data Description

We follow Keim and Madhavan (1997) and eliminate transactions corresponding to trades of under 100 shares, and stocks trading under $1.00. We also eliminate any order if the price on the day before the decision date, as recorded by Plexus, is not within one percent of the price recorded by CRSP. Orders for Nasdaq stocks are eliminated because these are generally traded net of commissions and are therefore not associated with soft-dollar rebates. Nasdaq stocks traded through Electronic Communication Networks (ECNs),

[6] In earlier versions of the paper, this group is referred to as "execution" brokers. Indeed, in the early part of our sample, these brokers are primarily those that provide pure execution services. In later subperiods, this group starts to serve as a "catch-all" category and Plexus relabels the group as "nonclassified."

where institutions post indications of trading interest, can be associated with commissions. However, because these orders are likely to be substantially different from those traded at the NYSE, we exclude them from the analysis. To eliminate data errors, we exclude observations of buy (sell) orders which have a measured price impact larger (smaller) than 50 percent (−50 percent).[7] These occur fairly infrequently in the data, although they are more prevalent in the 1996 data. In the four quarters of data used, this restriction eliminates (in chronological order) 0.04, 0.05, 0.25, and 0.49 percent of the total sample of orders remaining after other filters are applied.[8]

The transactions originate from 38 institutional investors. Plexus classifies these institutions into three categories: diversified, momentum, and value traders. Of the 38 institutions, 17 fall in the momentum category, 10 in the value category, and 11 in the diversified category. These classifications are loosely based on turnover. Value managers are those whose trading strategies are based on some assessment of fundamental value. Thus, managers who follow a "patient" investment style end up in this group. Momentum traders are essentially short-term technical traders. The diversified group includes institutions that follow quantitative styles (including indexing) that are neither momentum nor value.

B. Order Types, Origin, and Destination

We begin by describing the origin of the orders in the sample and the types of brokers that execute these orders. Recall that the data identify the broker releases that result from an order. All releases from a particular order can go to one of the five broker types described above (a "single broker-type" order), or to a number of different broker types (a "multiple broker-type" order). It is important to distinguish between single and multiple broker-type orders because execution costs are measured at the order level.

Table I shows the number of single broker-type orders received by each broker category for diversified, momentum, value, and all institutions. It also shows the number of multiple broker-type orders and the total number of orders originating from each of these traders.

Approximately 71 percent (120,911) of all orders are single broker-type orders; these orders form the primary sample for our execution cost comparisons.[9] Single broker-type orders represent trades worth approximately $260 billion. By comparison, the Chan and Lakonishok (1995) sample of 155,789

[7] A Dow Jones News Retrieval check on a small subsample of deleted observations shows no unusual activity in these stocks, suggesting that these outliers are indeed due to data errors and not an informational event.

[8] We also perform our analysis after winsorizing the implicit cost measure at the 1 and 99 percent level. Although average execution costs are smaller, cost differentials between the broker types are similar.

[9] To assess whether the exclusion of multiple broker-type orders biases our execution cost estimates, we examine the sequence of releases to all brokers for multiple broker-type orders. We find over 5,000 unique patterns in the identity and sequence of broker releases. However, the frequency of releases involving soft-dollar brokers is extremely small and is therefore unlikely to influence our execution cost comparisons.

Table I

Order Origination and Destination

This table describes the frequency of the types of orders that the sample institutions submit. Brokers are classified into five categories. Alternate refers to automatic execution systems such as the Arizona Stock Exchange. Nonclassified refers to brokers that do not fit into any of the other categories. Full-service brokers are those that provide a range of execution and nonexecution services to their clients. Research/regional refers to brokers that execute trades and also provide research services. Soft-dollar refers to brokers that provide soft-dollar payments in return for trade execution. Orders executed by brokers in any one of these categories are referred to as single broker-type orders. Orders executed by brokers in more than one category are referred to as multiple broker-type orders. Orders from diversified, momentum, and value traders are tallied separately.

	Single Broker-Type Orders					Multiple Broker-Type Orders	All Orders
	Alternate	Full-service	Research	Soft-dollar	Non-classified		
Diversified	1,183	21,471	2,679	1,546	27,975	17,180	72,022
Momentum	20	15,598	6,000	8,244	15,227	22,137	67,101
Value	2,158	8,078	2,551	1,042	7,279	11,589	32,693
All traders	3,361	45,147	11,230	10,832	50,481	50,906	171,817

trade packages represents trades worth $187 billion from 37 institutions between July 1986 and December 1988 and the Keim and Madhavan (1997) sample consists of 62,383 orders from 21 institutions between January 1991 and March 1993 worth $83 billion.

Single broker-type orders are themselves quite unevenly distributed over the five different broker categories. Of the 120,911 single broker-type orders in the sample, 45,147 are filled by full-service brokers, 11,230 by research/regional brokers, 10,692 by soft-dollar brokers, 50,481 by nonclassified brokers, and only 3,361 by alternate brokers.

Table I also shows considerable heterogeneity in origin and destination of orders by institutions with different trading styles, presumably because these trading styles reflect desired differences in the mix of execution quality and nonexecution services. For example, value traders, who are perceived as relatively patient, send a relatively large fraction of trades to alternate brokers, while momentum traders, for whom immediacy is believed to be a concern, send virtually no trades to alternate brokers. Note, however, that momentum traders send over 18 percent of all single-broker orders to soft-dollar brokers, whereas the number and proportion of single broker-type soft-dollar orders of diversified and value traders are substantially smaller.

C. Order Characteristics

In Table II we provide descriptive statistics of orders sent to the broker categories. All data are for single broker-type orders only. The purpose of these statistics is to describe the difficulty of, and heterogeneity in, orders executed by the various broker types. Order size is defined in dollar terms

Table II

Descriptive Statistics

This table presents statistics on orders to the five categories of brokers. Only orders executed by one broker-type (single broker-type orders) are included. Alternate refers to automatic execution systems such as the Arizona Stock Exchange. Nonclassified refers to brokers that do not fit into any of the other categories. Full-service brokers are those that provide a range of execution and nonexecution services to their clients. Research/regional refers to brokers that execute trades and also provide research services. Soft-dollar refers to brokers that provide soft-dollar payments in return for trade execution. Relative volume is defined as the number of shares in the order divided by average volume, where average volume is the geometric mean of daily trading volume over the previous five days. The price distribution is for the price the day before the trading decision is made (P_d). The fill rate is computed by calculating the percentage of the order that is filled and averaging across all orders. Market value is the average market value of every firm for each order and is expressed in billions of dollars. Means are presented for relative volume, market value, and fill rate.

	Alternate	Full-service	Research/ Regional	Soft-dollar	Non-classified
Order size ($)					
10th percentile	10,080	13,921	7,954	7,365	11,475
Mean	357,152	1,039,805	1,064,601	505,386	729,345
Median	85,553	147,737	135,702	62,507	89,250
90th percentile	732,228	2,276,999	2,397,563	700,987	1,311,156
Relative volume	0.087	0.193	0.217	0.098	0.165
Market value	7.3	7.1	7.5	10.0	6.5
Buys/sells	0.980	1.012	0.923	0.784	1.276
Fill rate (%)	95.8	97.2	97.0	98.7	90.0
Price					
10th percentile	14.39	15.33	15.05	18.25	13.55
Mean	35.18	37.60	36.95	41.52	35.89
90th percentile	61.92	65.56	65.13	72.12	63.77

and relative volume is defined as the number of shares traded divided by the geometric mean of daily trading volume over the previous five days. The price variable represents the closing price on the day before the trading decision. The buy-sell ratio is computed by dividing the total number of buyer-initiated orders by the total number of seller-initiated orders. The fill rate is computed by calculating the percentage of the order that is filled. Finally, market value is expressed in billions of dollars and is calculated by multiplying the number of shares outstanding for the security by the closing price of the stock on the day before the trading decision.

Orders sent to full-service, research/regional, and nonclassified brokers are typically larger (both in dollar and relative volume terms) than those sent to alternate or soft-dollar brokers. The market value of the securities traded by different types of brokers also differs substantially, with soft-dollar brokers trading in higher market value securities. The buy-sell ratio

is 1.01 for full-service brokers whereas for soft-dollar brokers the ratio is 0.78. Average fill rates are relatively high for all broker types, although fill rates for soft-dollar brokers are somewhat larger than for other brokers. Albeit small, the differences in fill rates suggest that accounting for the opportunity cost of unfilled or partially filled orders may be important in calculating execution costs.

Because price levels can influence commissions measured as a percentage of price, as well as price movements (through the tick), we also provide information on the distribution of prices across the broker types. Although the distributions are generally similar, the prices of securities traded by soft-dollar brokers are slightly higher than those of other brokers. This makes it unlikely that their execution costs, expressed as a percentage of price, are systematically biased upwards compared to those of other brokers.

Overall, Table II shows differences in the difficulty and types of orders executed by the different broker types. Some of these characteristics, such as market value and order size, have been shown to be highly correlated with execution costs. Others (Chan and Lakonishok (1993), Keim and Madhavan (1997)) have found differences in execution costs for buys and sells, although the direction of this difference appears to be sample specific. These differences generally appear in most subperiods and point to the importance of controlling for order difficulty when comparing execution costs across the five categories.

D. Execution Cost Differences

We follow Perold (1988) and Keim and Madhavan (1997) and measure execution costs by calculating both implicit and explicit trading costs. Implicit trading costs for buyer-initiated orders are defined as $((P_t/P_d) - 1)$, where P_t is the volume-weighted average price at which the order is executed and P_d is the closing price on the day before the decision is made to purchase or sell the security. Implicit trading costs for seller-initiated orders are the negative of this return.

Implicit cost measurement is more complicated in our sample than in Keim and Madhavan's because the proportion of unfilled and partially filled orders in our sample is larger than in theirs and because fill rates appear to be systematically related to the brokers executing the order. Therefore, for partially filled and unfilled orders we need to obtain some estimate of the opportunity costs of the order not being filled (see Wagner and Edwards (1993) for a discussion of opportunity costs). We estimate opportunity costs as, where P_{+10} is the price 10 trading days after the decision date. The choice of 10 days to "close the books" corresponds to the 95th percentile in the distribution of the number of days required to fill an order. As a robustness check, we also estimate opportunity costs by closing the book 20 days after the decision date (corresponding to the 99th percentile in the same distribution). Our results are similar.

Explicit trading costs are calculated as commissions per share scaled by P_d; these commissions are paid on only the filled portion of the order.[10] Total execution costs are the sum of implicit and explicit execution costs. So, in summary, total execution costs are calculated as:

$$\text{Filled orders:} \quad \left(\frac{P_t}{P_d} - 1\right) + \frac{Comm}{C_d} \tag{1}$$

$$\text{Partially filled orders:} \quad \left(\frac{Comm}{P_d} + \left(\frac{P_t}{P_d} - 1\right)\right)(\%\,Filled) + \left(\frac{P_{+10}}{P_d} - 1\right)(\%\,Filled) \tag{2}$$

$$\text{Unfilled orders:} \quad \left(\frac{P_{+10}}{P_d} - 1\right) \tag{3}$$

Table III reports average execution costs for the five broker categories; we report explicit costs (commissions) in both percentage form as well as in cents per share. Implicit and total costs are reported only in percentage form. Standard errors (for percentage costs only) appear in parentheses.

The results show substantial differences in total execution costs across the five categories, ranging from a low of 0.30 percent for alternate brokers to a high of 1.076 percent for research/regional brokers. Soft-dollar brokers have the second highest total execution costs, at 0.975 percent. Average commission costs are approximately seven cents per share for full-service brokers compared to nine cents per share for soft-dollar brokers.[11] Expressed as a percentage of price, the difference (in cents) between commissions for soft-dollar and full-service brokers amounts to only 0.8 basis points. The differences in implicit costs between full-service and soft-dollar brokers are larger. Without controlling for the difficulty of orders, the "spread" in total execution costs between full-service and soft-dollar brokers is 16 basis points.[12]

[10] Because differences in fill rates and commissions between broker types could influence our estimates of opportunity costs and explicit execution cost respectively, we also conduct our analysis on the subsample of orders with 100 percent fill rates. Our results are similar.

[11] The distribution of commissions across broker categories is right-skewed, resulting in average commission costs that appear high. In fact, the distributions for full-service and soft-dollar brokers are multimodal. For full-service brokers, the distribution has peaks around both 3 and 6 cents a share, with a small percentage of brokers charging more than 10 cents per share. The distribution for soft-dollar brokers has peaks around both six and nine cents a share, with the latter being much more common.

[12] We also examine, but do not report, execution costs on a quarterly basis. We find substantial variability in cost estimates over time. This variability may be the result of sampling variation, "true" variation in cost differentials, or it may be the result of systematic differences in order characteristics across quarters.

Table III

Implicit, Explicit, and Total Execution Costs for Orders

This table presents means of implicit, explicit, and total trading costs of orders. Costs are only shown for orders executed by one broker type (single broker-type orders); multiple broker-type orders are excluded. Implicit costs are defined as the sum of price impact and opportunity costs. Price impact is defined as $[(P_t/P_d) - 1]$ where P_t is the volume-weighted average price at which the order is executed and P_d is the price the day before the trading decision is made. For partially filled and unfilled orders, opportunity costs are defined as $[(P_{+10}/P_d) - 1]$ where P_{+10} is the price 10 trading days after the trading decision is made. Percentage explicit costs are defined as commissions per share divided by P_d. Standard errors are in parentheses.

	Alternate	Full-service	Research/ Regional	Soft-dollar	Non-classified	All Brokers
Implicit costs (%)	0.233	0.538	0.707	0.695	0.328	0.471
	(0.08)	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)
Explicit costs (%)	0.069	0.270	0.367	0.278	0.209	0.249
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Explicit costs (cents/share)	1.963	7.105	9.468	9.050	4.640	6.317
Total costs (%)	0.302	0.810	1.076	0.975	0.538	0.720
	(0.05)	(0.01)	(0.03)	(0.09)	(0.01)	(0.01)

Because a univariate comparison of execution costs across broker categories does not control for other important determinants of execution costs, we conduct a multivariate cross-sectional analysis of the execution services provided by brokers in the five broker categories that explicitly controls for other determinants of execution costs.

E. The "Price" of Soft-dollar Arrangements

Our purpose is to establish more refined estimates of the "price" of soft-dollar arrangements by comparing execution costs of brokers in the five categories while controlling for order difficulty, trading styles, and other determinants of total execution costs. The empirical strategy we follow is simple and follows Keim and Madhavan (1997) and Chan and Lakonishok (1995). Specifically, we estimate cross-sectional regressions with implicit execution costs as a dependent variable.

Our independent variables attempt to capture variation in execution costs across broker categories while controlling for known determinants of execution costs. Relative volume is employed as an independent variable because orders that are large relative to normal trading volume are likely to have higher execution costs due to liquidity or adverse selection effects. The logarithm of the market value of equity is used because liquidity is typically greater for larger firms, even after controlling for volume differences. The inverse of the stock price is used to account for price discreteness and

because bid-ask spreads are highly correlated with price levels. Finally, we include indicator variables for each of the five broker categories to capture broker-specific effects. The regressions are estimated without an intercept to avoid perfect collinearity between the five broker category indicator variables and because these indicator variables can be easily compared to each other.

A number of studies (Kraus and Stoll (1972), Holthausen, Leftwich and Mayers (1990)) document substantial differences between buyer- and seller-initiated trades. We follow Chan and Lakonishok (1995, 1997) and Keim and Madhavan (1997) and estimate the regressions separately for buyer- versus seller-initiated orders. This allows us to compare coefficients with these and other studies. The results of the regressions appear in Table IV, with Panel A containing estimates for buy orders and Panel B containing estimates for sell orders.

Five regressions are presented in each panel. The first regression employs data from all institutions and uses the control variables mentioned above and the five broker category indicator variables. The purpose of this regression is to provide a base or benchmark case of cost differences between the broker categories. Chan and Lakonishok (1995) and Keim and Madhavan (1997) find that investment style significantly influences execution costs, and so in the second through fourth regression models we estimate separate regressions for institutions that fall into the diversified, momentum, and value categories. Finally, the fifth model in each panel presents regression estimates from all institutions but controls for institution-specific effects by including indicator variables for each institution. We expect this final regression to represent the most conservative estimate of execution cost differentials; the institution-specific indicator variables not only pick up variation due to investment styles, but if an institution uses proportionally more of a particular type of broker and has different average execution costs, this regression specification would ascribe the difference in execution costs to the institution, rather than to the choice of broker. The large sample size ensures statistical significance for virtually all the coefficients we estimate; therefore, we do not report p-values and focus on economic significance of the coefficients.

In all of the regressions, the coefficients on relative volume are positive, indicating that the execution cost of orders that are large relative to normal trading volume is greater. As observed elsewhere (see, e.g., Keim and Madhavan (1997)), the coefficient of the logarithm of market value is negative for both buyer- and seller-initiated orders. This suggests that trading is more expensive for smaller firms. In addition, the inverse price variable is positive, indicating that execution costs are larger when the fixed costs of trading are higher.

There are substantial differences in coefficient estimates across the broker categories in each regression. In the first regression specification, which uses the entire sample, the implicit cost differential between full-service brokers and soft-dollar brokers is 0.29 percent (29 basis points) for buyer-

Table IV

Implicit Execution Cost Regressions

This table presents estimates of cross-sectional regressions of implicit execution costs for orders on broker category indicator variables and control variables. Control variables include relative volume (the number of shares traded divided by the geometric mean of daily trading volume over the previous five days), the log of market value of equity, and the inverse of the price on the day prior to the trading decision. Only orders executed by one broker-type are included (multiple broker-type orders are excluded). The sample consists of all subperiods and the regressions are estimated separately for buy and sell orders. Institutional investors are categorized (by Plexus) into one of three categories: Momentum investors represent short-term technical traders, value investors trade based on an assessment of fundamental value, and the diversified group includes institutions that use quantitative methods (including indexing) that are neither momentum nor contrarian. Because indicator variables are used for all broker categories, the regressions are estimated without an intercept. The last regression includes institution-specific indicator variables (one per firm) instead of indicator variables for institution type. *F*-statistics that test whether the broker-type coefficients are equal are reported in the last column.

Sample	Relative Volume	Log (Market Value)	Inverse Price	Alternate Indicator	Full-service Indicator	Research/ Regional Indicator	Soft-dollar Indicator	Nonclassified Indicator	Institution Indicator Variables	*N*	*F*-Test
Panel A: Buy Orders											
All institutions	0.0040	−0.0007	0.0239	0.0099	0.0098	0.0100	0.0127	0.0094	—	62,787	53.6
Diversified institutions	0.0001	−0.0009	0.0145	0.0125	0.0136	0.0141	0.0194	0.0131	—	30,471	45.9
Momentum institutions	0.0049	−0.0005	0.0665	−0.0047	0.0063	0.0108	0.0078	0.0049	—	21,905	54.2
Value institutions	0.0002	−0.0011	0.0132	0.0143	0.0166	0.0150	0.0178	0.0142	—	10,411	49.6
All institutions, with indicator variables	0.0033	−0.0004	0.0250	0.0142	0.0145	0.0147	0.0160	0.0159	*Yes*	62,787	39.5
Panel B: Sell Orders											
All institutions	0.0034	−0.0008	0.0627	0.0133	0.0188	0.0187	0.0212	0.0156	—	58,264	92.3
Diversified institutions	0.0006	−0.0019	0.0545	0.0307	0.0332	0.0331	0.0381	0.0295	—	24,384	89.6
Momentum institutions	0.0024	−0.0004	0.0617	0.0017	0.0175	0.0163	0.0191	0.0165	—	22,955	48.9
Value institutions	0.0024	−0.0017	0.0808	0.0276	0.0226	0.0298	0.0234	0.0270	—	10,925	38.7
All institutions, with indicator variables	0.0026	−0.0010	0.0675	0.0116	0.0108	0.0141	0.0126	0.0097	*Yes*	58,264	42.6

initiated orders and 0.24 percent (24 basis points) for seller-initiated orders.[13] The regressions estimated separately for institutions in the diversified, momentum, and value categories also show considerable variation in execution cost differentials across the broker categories. For diversified institutions, the implicit cost differential between full-service brokers and soft-dollar brokers is 58 basis points for buys and 49 basis points for sells. For momentum institutions, the corresponding estimates are 15 and 16 basis points, and for value institutions, the estimates are 12 and 8 basis points respectively. Note that, despite the variation in point estimates, the differential between soft-dollar brokers and full-service brokers is always positive across both buys and sells.

Our final regression specification in Table IV includes all institutions, but controls for institution-specific effects by including an indicator variable for each institution. As expected, the cost differentials in the broker category indicator variables drop from those in the first regression specification. However, they remain positive. For buyer-initiated orders, the implicit cost differential between full-service brokers and soft-dollar brokers is 15 basis points, and for seller-initiated orders, the cost differential is 18 basis points.

To obtain "all-in" estimates of total cost differentials, we must incorporate the differences in explicit costs as well. In the full sample, the explicit cost differential between full-service and soft-dollar brokers for both buy and sell orders is approximately one basis point. Adding these to the implicit cost differentials from the base regressions implies that the total cost differential is 30 basis points for buys and 25 basis points for sells.[14]

It is possible that the benefits of soft-dollar brokerage offset the incremental market impact costs. As described earlier, these benefits can come in many forms. Unfortunately, our data do not quantify the portion of the com-

[13] The coefficients on broker-type in Table IV (and all future tables) can be reconciled with the average costs of orders for each broker type by including the effects of the control variables. For example, the coefficient on full-service brokers in the first regression of Table IV is 0.0098, or close to 1 percent. If we multiply the coefficients on the control variables by their respective sample averages for full-service orders, we calculate a total control variable effect of −0.0095. Adding this to the full-service broker coefficient of 0.0098, the implied average implicit cost of full-service brokers is 0.0003, or 3 basis points. This is equal to the (univariate) implicit cost for buy orders executed by full-service brokers. (The implicit execution cost for sell orders executed by full-service brokers is 104 basis points; the average of buys and sells for full-service brokers, reported in Table III, is 54 basis points.) Thus, we can interpret the differences in the coefficients on broker types as cost differentials, after accounting for the effects of the control variables. Note that Keim and Madhavan (1997) interpret coefficients in a similar manner; their institution-specific coefficients are of similar magnitude to our broker-type coefficient estimates.

[14] Adding percentage explicit and implicit costs in this fashion implicitly assumes that these elements of total cost are independent. In fact, there is a negative but extremely small correlation between explicit and implicit costs in our sample. Moreover, adding average percentage explicit costs is likely to understate the difference in commissions between soft-dollar and full-service brokers, because soft-dollar orders tend to be in higher-priced stocks. However, we have also performed the regression analysis with total, rather than with implicit costs as the dependent variable. The results are qualitatively similar and are available on request.

missions rebated or the value of the research "purchased" with the soft-dollar commissions. Typically, these quid-pro-quo arrangements are negotiated on a case by case basis. Although the lack of data prevents us from directly assessing the trade-offs, we can provide some bounds on the extent to which the proportion of the commission returned in the form of soft dollars can offset the incremental execution costs. We first estimate the implicit cost regression using data from all broker types *except* soft-dollar brokers. We use the coefficient estimates from this regression to forecast the implicit costs for each soft-dollar order, based on order characteristics. Next, we subtract this predicted cost from the actual implicit cost of the order; we translate this percentage abnormal cost into cents per share by multiplying by the stock price on the day immediately preceding the decision date for the order. This results in a distribution of abnormal implicit costs (in cents per share) across soft-dollar orders. For each order, we can compare the magnitude of this incremental implicit cost against the commission charged for that order. In our sample, if 60 percent of the total commission is returned as soft dollars, then 52 percent (66 percent) of our soft-dollar buy (sell) orders continue to have positive incremental costs. Across buy and sell orders, the median incremental cost after the 60 percent "rebate" is 14 cents, although there is considerable dispersion in the distribution. In percentage terms, the average difference falls substantially to 13 basis points for buys and 10 basis points for sells, relative to base incremental implicit costs (without the rebate) of 29 (24) basis points. Thus, the adverse market impact costs of soft-dollar brokerage slightly outweigh the (assumed) 60 percent rebate of commission for the representative order in our sample; however, the reduction in the net costs, combined with the variation in the estimates, implies that for any *individual* order, the benefits of soft-dollar brokerage may offset the costs.

F. Execution Cost Differentials for Large Orders

In Table V, we restrict our analysis to a subset of larger orders.[15] This serves two purposes. First, this analysis serves as a check to ensure that the results in Table IV are not driven by a few small (and therefore relatively unimportant) orders. Second (and related), if larger orders are more difficult to fill, then differences in execution quality may be both more apparent and more important. For the regressions in Table V, we restrict the sample to orders above the 90th percentile in order size for each broker category.[16]

[15] We thank an anonymous referee for this suggestion.

[16] Note that we cannot define the cutoff as the 90th percentile of order size for all broker categories because of the differences in the distribution of order size across the broker categories. In particular, because soft-dollar brokers generally execute smaller orders, such a cutoff would create a sample with virtually no orders executed by soft-dollar brokers. Of course, the fact that institutional investors do not send their largest trades to soft-dollar brokers may be a reflection of the higher execution costs observed in Table IV.

Table V

Implicit Execution Cost Regressions for 90th Percentile of Order Size

This table presents estimates of cross-sectional regressions of implicit execution costs for orders on broker category indicator variables and various control variables. Only orders executed by one broker-type and orders above the 90th percentile in order size for each category are included (multiple broker-type orders and orders below the 90th order size percentile for each category are excluded). The sample consists of all subperiods and the regressions are estimated separately for buy and sell orders. Because indicator variables are used for all broker categories, the regressions are estimated without an intercept. For each type of trade (buy or sell), the first column represents the regression of execution costs on control variables and broker category variables alone, whereas the second column represents the regression of execution costs on control variables, broker category variables, and institution-specific indicator variables. *p*-values appear in parentheses below parameter estimates.

	Buys		Sells	
Relative volume	0.0006	0.0001	0.0004	0.0003
	(0.04)	(0.05)	(0.07)	(0.07)
Log (market value)	−0.0035	−0.0024	−0.0012	−0.0004
	(0.00)	(0.00)	(0.00)	(0.06)
Inverse price	0.0919	0.1249	0.0009	0.0113
	(0.00)	(0.00)	(0.00)	(0.04)
Alternate indicator	0.0503	0.0497	0.0387	0.0030
	(0.00)	(0.00)	(0.00)	(0.00)
Full-service indicator	0.0555	0.0524	0.0310	0.0157
	(0.00)	(0.00)	(0.00)	(0.00)
Research/Regional indicator	0.0551	0.0516	0.0368	0.0115
	(0.00)	(0.00)	(0.00)	(0.00)
Soft-dollar indicator	0.0596	0.0540	0.0340	0.0182
	(0.00)	(0.00)	(0.00)	(0.00)
Nonclassified indicator	0.0542	0.0508	0.0291	0.0098
	(0.00)	(0.00)	(0.00)	(0.00)
Institution indicator variables	—	Yes	—	Yes
N	5,922	5,922	6,262	6,262

We present two sets of regressions in the table. The first is a regression for all institutions without an institution-specific variable, whereas the second regression includes institution-specific indicator variables.

From the base regression, the execution cost differential between soft-dollar and full-service brokers for large orders is 41 basis points for buys and 30 basis points for sells. For the buyer-initiated orders, this reflects an increase of 12 basis points from the full sample (all order sizes) and an increase of 6 basis points for seller-initiated orders. The execution cost differentials between soft-dollar and full-service brokers from the regressions with institution-specific indicator variables are 16 basis points for buys and 25 basis points for sells. These differentials are one basis point (seven basis points) larger than those for the full sample for buys (sells). Thus, the positive differential between soft-dollar and full-service brokers remains in a subsample of the larger orders; moreover, the evidence in both regression specifications suggests that the soft-dollar differential increases somewhat for larger orders.

IV. Robustness Checks

We conduct a number of specification checks to assess the robustness of our results. First, the standard errors of the execution cost estimates may be understated due to correlation between the buying and selling of shares in the same securities by the investment managers in our sample. We check for such correlations by examining the frequency of trades (buys and sells) by different investment managers in the same security over the duration of the order. We find these frequencies to be extremely small; Keim and Madhavan (1997) also check for dependencies in their data and find very little evidence of significant correlations.

Second, although large sample sizes ensure statistical significance, this can be misleading with regard to the precision of the estimates. To provide a better sense for the stability of the coefficients, we re-estimate the regressions for all institutions (with and without institution-specific indicator variables) on a quarterly basis using identical control variables. We present these results in Table VI. In Panel A, we report the implicit cost differentials between soft-dollar and full-service brokers based on each of these regressions. Across all regression specifications, the average cost differential between soft-dollar and full-service brokers is 19 basis points. This differential is positive in 12 out of 16 cases. The standard deviation of the differential (across the different specifications and quarters) is 36 basis points; the minimum value is -28 basis points and the maximum is 96 basis points. Thus, although the overall evidence suggests that soft-dollar trades are more costly than orders sent to full-service brokers, there is clearly a large amount of variation in the estimates. This variation could come from "real" intertemporal variation in the costs (and benefits) of soft-dollar brokerage, or could simply reflect a lack of precision in the cost estimates for either full-service or soft-dollar brokers.

Although there is little we can do to affect the precision with which the costs of soft-dollar brokers are estimated, we can attempt to improve the precision in the benchmark execution cost by using a broader sample of brokers. In Panel B, we report estimates of cost differentials from regressions in which we only employ one broker-type indicator variable instead of five; this variable takes on a value of one if the order is sent to a soft-dollar broker and zero otherwise. As a result, the cost comparisons from these regressions are between soft-dollar brokers and all other brokers. These comparisons show a positive cost differential in each quarter (i.e., in 16 out of 16 cases) that averages 28 basis points. Moreover, the variation in the differential declines by almost half; the standard deviation of the difference across specifications and quarters is 20 basis points.

Third (and related to the issue of intertemporal variation above), it is possible that overall market movements may influence the execution cost measures and hence the cost differentials. For example, in a rising market, the execution cost of buy orders is likely to be higher. To adjust for the possible influence of market movements, we perform two tests. We follow

Table VI

Incremental Implicit Cost Differentials from Quarterly Regressions

This table presents cost differentials from quarterly cross-sectional regressions of implicit execution costs for orders on broker category indicator variables and various control variables. The control variables are relative volume, the logarithm of market value, and inverse price. Parameter estimates for control variables are not shown. Only orders executed by one broker-type are included (multiple broker-type orders are excluded). To compute the spread (or cost differential) between soft-dollar and full-service brokers, the regressions are estimated with indicator variables for all broker types. To compute the spread between soft-dollar and all other brokers, the regressions are estimated with only one indicator variable for soft-dollar brokers.

	Buys				Sells			
Quarter	94Q4	95Q1	96Q1	96Q2	94Q4	95Q1	96Q1	96Q2
Panel A: Implicit Cost Differentials in Basis Points between Soft-dollar and Full-service Brokers								
From regressions without institution indicator variables	12	41	9	−8	38	2	96	19
From regressions with institution indicator variables	16	49	−37	−28	4	−17	83	31
Panel B: Implicit Cost Differentials in Basis Points between Soft-dollar and All Other Brokers								
From regressions without institution indicator variables	8	35	2	33	42	9	38	23
From regressions with institution indicator variables	11	45	48	30	8	10	76	34

Chan and Lakonishok (1995) and adjust the implicit execution cost measure by subtracting the return of the NYSE/AMEX size decile corresponding to the security (and computed over the duration of the order) from the implicit execution cost. We also adjust for market movement by introducing the decile return as an additional explanatory variable in the cross-sectional regressions. In either specification, the cost differentials remain positive.

Fourth, we examine whether discreteness in either commissions (cents) or price impacts (ticks) at the individual trade level influence our results. Specifically, we model the effect of broker choice on the propensity to pay an extra cent (tick) by estimating order probit regressions on explicit (implicit) costs at the trade level. The results are consistent with those observed at the order level: In seven out of eight specifications, soft-dollar brokers are associated with higher commissions than full-service brokers. In eight out of eight specifications, soft-dollar brokers are associated with higher price impacts than full-service brokers. Overall, alternative specifications, estima-

tion techniques, trade-level, and subsample tests result in different average estimates of cost differentials across broker types. Generally, however, the cost differentials remain positive.

V. Conclusions

The paucity of data on soft-dollar payments is responsible for the lack of systematic evidence on the magnitude and impact of these payments. We regard our study as a first step in providing such evidence. We analyze proprietary data on the release of $260 billion of orders by 38 institutions to the brokerage industry. We find that, on average, institutions send smaller orders in larger market capitalization stocks to soft-dollar brokers. Controlling for order characteristics, we find that the average incremental implicit cost of soft-dollar orders in our sample is approximately 29 basis points for buys and 24 basis points for sells. Because commission costs (explicit execution costs) are also higher for soft-dollar brokers, we find that the total execution cost differential between soft-dollar and full-service brokers is 30 basis points for buys and 25 basis points for sells. Controlling for institution-specific effects, across all subperiods, we find that the average implicit cost of soft-dollar orders is approximately 15 basis points higher for buys and 18 basis points higher for sells.

These results show that soft-dollar trades generate incremental costs through differences in market impact, and not just differences in commission. Because execution of orders at favorable prices is more difficult for large orders, we investigate the magnitude of incremental market impact for a subsample of large orders in our sample. Our estimates of implicit cost differences for orders above the 90th percentile in order size for each broker category are larger than those observed in the overall sample: 41 basis points for buys and 30 basis points for sells.

In subperiod analysis, we find considerable variation in the magnitude of incremental cost estimates over time; however, the differential between soft-dollar brokers and full-service brokers is generally positive. When soft-dollar brokers are compared to the full sample of all other broker types, the differential is consistently positive.

Our results suggest that the incremental implicit costs of sending orders to soft-dollar brokers are economically meaningful. It is, of course, possible that the benefits of soft-dollar brokerage offset the costs. These benefits typically take the form of research, although they can include such items as (cash) commission rebates. Although our data do not quantify the value of soft dollars received (in either services or cash) in individual orders, we calculate incremental costs on an order-by-order basis after allowing for a 60 percent return of the commission. These "bounds" indicate that for the representative order in our sample, the incremental implicit cost of an order executed by soft-dollar brokers is slightly higher than the value of the soft dollars returned to the institution. Given the dispersion in the distribution of incremental costs across orders, however, it is clearly possible for the

benefits to outweigh the costs for any individual order. Regardless of whether the benefits offset the costs, our results indicate that recognizing the trade-off between execution quality and nonexecution services is important in assessing investment performance and in understanding trading behavior.

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