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Abstract

Previous studies of the effects of stock trading on prices consider an individual trade as the basic unit of analysis. Since many institutional investors' orders are broken up into several trades, the usual approach to measuring price impact or execution cost based on individual trades may be biased. Instead, this paper uses the record of all trades executed by 37 large investment management firms from July 1986 to December 1988 to study the price impact and execution cost of the entire sequence ("package") of trades constituting an order. We analyze the importance of firm capitalization, package size and the management firm's identity as determinants of market impact and trading cost.

Financial economists have long been preoccupied with the equity trading process and its impact on stock prices. Much prior empirical research isolates individual trades and analyzes the behavior of the stock price around each trade. An incomplete list of such research includes Kraus and Stoll (1972), Holthausen, Leftwich and Mayers (1987, 1990), Keim and Madhavan (1991), Chan and Lakonishok (1993), Hausman, Lo and MacKinlay (1992) and Petersen and Umlauf (1991). Evaluating the behavior of stock prices around trades provides a means of discriminating between various hypotheses as to the elasticity of the demand for stocks; yields an estimate of the cost of executing trades and a measure of the liquidity of a market; and permits tests of different models of the determination of quotes and transaction prices.

It is often misleading, however, to consider an individual trade as the basic unit of analysis in the study of trading activity and its effects on prices. For many institutional investors, even a moderately-sized position in a stock may represent a large fraction of the stock's trading volume. It is quite common, for instance, for an active investment management firm to have half a billion dollars invested in equities allocated across fifty stocks. Each position in a stock thus represents an investment of roughly ten million dollars. On the other hand, a typical company in the bottom tier of the S&P500 has daily trading volume of about $2.5 million. An institutional investor wishing to establish a position in a stock would thus have to take up several days' worth of daily volume in the stock. Accordingly, an investment manager's buy or sell order is often broken up into several trades.

Several reasons could account for such order-splitting behavior. If markets are not perfectly liquid, even an uninformed trader may choose to execute an order in a piecemeal fashion, in order to avoid large transitory disruptions in the stock price. Bodurtha and Quinn (1990) provide a case study of such a trading strategy. Kyle (1985), Easley and O'Hara (1987) suggest that informed speculators break their trades up into smaller orders, so as to camouflage themselves as uninformed investors and thereby overcome the adverse selection problem.

Given such order-splitting, therefore, it is only meaningful to study the behavior of stock prices around institutional transactions in the broader

context of the entire sequence (or "package") of trades constituting the order. The methodology commonly used in the existing literature, however, ignores the fact that each trade is part of a larger package. For example, in measuring the market impact of a block trade the price at which the trade is executed is compared to some benchmark price, typically measured on the trade date. This fails to recognize, however, that the benchmark price itself might be affected by other trades from the same order (or by other investors' trades). The same procedure for measuring market impact is also commonly used to measure the cost of executing trades. Again, however, the drawback is that different parts of the same order are being compared to different benchmark prices. Suppose, for example, that we are evaluating the execution performance of an investment manager by comparing each of his trades with some benchmark price on the trade day. If this manager trades several times or on several days, but is able to capture the benchmark price on every trade, we would judge this manager to have zero execution cost and his trades have no price impact. However, the manager's buying pressure could be pushing up the price of the stock over the course of the package. In fact, he may actually be incurring substantial execution cost if his trade prices were compared to a benchmark price from before the initiation of the package. Similarly, comparing prices from before the package with prices after the package ends may reveal a large price impact. Such price impact might not be detected if each trade is treated in isolation and compared to its own benchmark. It is thus necessary to examine the price impact or execution cost of the trade package as a whole.

This paper performs just such an examination. Ideally, one would like information on investors' orders (including those unfilled as well as those actually executed), and information on market conditions at the time when the investment decision is made. Such information, however, is well-nigh impossible to obtain. Instead, this paper uses the next best alternative, namely, the record of trades executed by a sample of 37 large investment management firms. This trading history allows us to identify cases where the same investment manager is in the market for a stock (buying or selling) over the course of several trades within the same day, or over several days. We examine the price

impact of institutional trading packages. The behavior of prices before the initiation of the trading program, as well as the subsequent performance of the stock, are also discussed. The prior behavior of prices allows us to address such issues as whether the behavior of institutional investors is potentially destabilizing, insofar as they tend to chase price trends, or whether they tend to reduce short-term swings by trading in a contrarian manner against prior price movements. Similarly, the returns subsequent to the package provide clues as to whether our sample of investment managers has any superior short-run information. We also provide evidence on the costs of executing trades, using a variety of benchmark prices. Finally, we analyze how our various measures of price impact and execution costs are related to firm capitalization, the relative size of the trade package ("trade complexity"), and the identity of the investment manager undertaking the trades.

There are, of course, many more aspects to the trade execution process, beyond just how an order is split up, that may influence the impact on prices. Typically, a large investment management firm has a trading desk, responsible for order execution. An order may also be accompanied by more or less detailed instructions from the investment manager to the desk as to how the order is to be filled. For example, a value-oriented manager will typically give much leeway to the trading desk, since urgency is not considered critical. A manager following a strategy based on short-term price momentum, on the other hand, will insist on speedy execution. The instructions to the trading desk will, to a greater or lesser degree, constrain the desk's ability to trade strategically in such a way as to reduce execution cost. Within these constraints, the desk has flexibility in choosing which and how many brokers to employ; the time frame within which the order is to be executed; and how the trade is to be brought to the floor--as a market order, limit order or whether a floor broker is to work the order, for example. In general, all these aspects of the trading process will affect the price impact or execution cost of the trade. Our results for price impact and execution cost are therefore best interpreted as averages across a large number of trades made by managers with many different investment styles and many different trading strategies. At the same time, these

considerations also suggest that a study of the differences across institutional investment managers with respect to their price impact or costs should provide clues as to the importance of investment style and trading strategy.

We find that multi-day trade packages make up a very substantial portion of institutional trading--more than half of the dollar value traded in our sample takes four or more days for execution. Such order-splitting behavior on the part of a group of large, sophisticated investors provides strong prima facie evidence that the demand curve for stocks is not always perfectly elastic. Indeed, the price impact associated with trade packages is quite sizeable: the average price change (weighted by the dollar size of the trade) from the open on the package's first day to the close on the last day is almost 1 percent for buys, and -0.35 percent for sells. The overall impact of buys and sells is asymmetric: prices stay high after purchases, but there is a relatively stronger price reversal after sales.

We also provide evidence on the controversial issue of the execution cost of institutional trading. The dollar-weighted round-trip cost relative to the first opening price of a package is 1.32 percent (or forty-nine cents per share); relative to the closing price five days after the package's completion, the dollar-weighted round-trip cost is 0.08 percent (three cents per share). commission costs are 0.19 percent (seven cents per share).

The price impact and execution cost of packages are related to the capitalization of the stock traded and to relative trade size (complexity), as suggested in prior theoretical and empirical research. However, the most dominant influence is the identity of the money management firm undertaking the package. Some preliminary evidence suggests that differences across money managers stem mainly from their demands for immediacy in execution. We find that more impatient managers (those following a growth-oriented strategy, or with higher turnover rates, or executing shorter packages) incur larger price impact and execution cost.

The remainder of the paper is organized as follows. After a discussion of the characteristics of our sample in section I, the behavior of stock prices around institutional trade packages is analyzed in section II. Section III

provides several measures of the market impact cost of trade packages. In the subsequent sections we investigate the importance of various determinants of price impact and execution cost-firm size and trade complexity (section IV), and the identity of the money management firm undertaking the trade (section V). Regression results are presented in section VI, together with some preliminary evidence on the cost of immediacy. A final section contains the conclusions.

I. PRELIMINARIES

A. Data

Our data set records the transactions made by each of 37 large investment management firms from July 1986 until the end of 1988. The trades, both small and large, involve issues listed on the New York and American Stock Exchanges. In total, there are roughly 1.2 million trades, accounting for about 5 percent of the total value of trading on the two exchanges over this period. For each transaction, the stock's CUSIP number, the trade date, trade price, number of shares and dollar commissions are recorded. In addition, each trade is identified as a purchase or sale by the investment manager, who in turn is also identified by a numeric code (although the name of the management firm is not disclosed to us). These data are collected by the transaction cost measurement service of SEI Corp., a large consulting organization in the area of financial services for institutional investors. These data are supplemented by transaction data from tapes supplied by the Francis Emory Fitch Company, and also by data on returns and capitalization from the Center for Research in Security Prices (CRSP) at the University of Chicago.

Several features of our data set represent improvements over previous studies of the price impact of trades. The sample is much larger and covers a more recent period than many previous studies. Each trade is explicitly identified as a purchase or sale by the investment manager, so that it is not necessary to infer trade direction from the prior behavior of prices (as under the "tick test" used in previous studies, and described by Lee and Ready (1991)). The investment manager associated with each trade is also known. The

sample includes a relatively large number of such investment managers, with a variety of different investment styles and trading strategies.

We use each manager's trading history to reconstruct the manager's trading programs in each stock. In particular, we define a "buy package" to be a case where the same manager carries out successive purchases of the same stock; a buy package ends when the manager stays out of the market for the stock for a specified period of time. We choose a five-day break to end a package, although we also replicated the results with packages defined by shorter gaps in trading. "Sell packages" are defined similarly. To illustrate, suppose a manager buys a stock for three days in succession and then, after a one-day gap, engages in another buy transaction in the same stock. Suppose also that there are no further trades in this stock by this manager. Under a one-day gap definition of a package, the first three days' purchases would constitute a buy package, while the last day's trades would make up another buy package. Under a five-day gap definition of a package, all of these trades would be considered as part of one buy package.

B. Summary Statistics for Packages

Applying the five-day gap definition of a package to our sample yields 155,789 packages with a total trade principal value of roughly 187 billion dollars. This is a much larger sample than those employed in previous studies. Table I reports the frequency distribution of trade packages by package length (the number of days within the package on which trades occurred). Panel A describes the results for purchases while panel B provides the results for sales. In each panel, we report the frequency distribution for all trades and also for each of five groups classified by the market value at the end of each quarter of the outstanding equity of the underlying stock. The size classification is based on the quintiles of the size distribution of all NYSE and AMEX stocks.

Previous studies have treated each trade in isolation. From panel A of Table I, however, such transactions make up only 12.9 percent of the dollar value of all purchases. Indeed, in terms of the value of institutional

purchases, only about 20 percent is completed within a day, while as much as 53.2 percent takes four or more days of trading to be completed. Note that, under our definitions, while the length of a package may be, say, five days (meaning that the manager traded on five days from the start to the finish of a package), the number of days elapsed from the package's beginning to its end could be much longer. This is because each day of trading in the package could be followed by a pause of up to four days. Isolated sell transactions make up only 14.4 percent of the value of institutional sales and only about 22 percent of the value of sells is completed in one day; on the other hand, programs taking four or more days account for about half of the value of institutional sales. It is evident, therefore, that focussing on individual transactions, as previous studies have done, provides only a very narrow view of the way in which institutions actually trade, and may yield a very distorted picture of the market impact or execution cost of institutional trades.

The finding that institutional trades are stretched out over several days is consistent with the idea that institutions strategically break their orders up into smaller trades, so as to avoid large market impact in illiquid markets or to avoid the adverse selection problem. Further, the trading desk may choose to break off its trading temporarily if it finds the stock price unacceptable (depending on the constraints imposed by the manager). Alternatively, while a trading package is underway the manager may revise the original order, so that the observed package may not exactly correspond to the manager's intentions at the time the package was initiated.

The bulk of most institutional purchases and sales is concentrated in the 20 percent of stocks with the highest capitalization. This group makes up roughly 52 percent (59 percent) of the number of buy (sell) packages, or about 77 percent (78 percent) of the value of buy (sell) packages. The smallest 40 percent of firms by market capitalization, in contrast, make up only 10 percent (5 percent) of the number of buys (sells), and only about 1 percent of the dollar value of either buys or sells. While one might expect that institutional trades in smaller firms take longer to complete, Table I suggests otherwise for both buys and sells--if anything, packages in the smaller

companies take fewer days from first trade to last trade, at least in terms of the distribution of dollar value by package length, than packages in the larger companies. This finding, however, may be due to differences in managers' investment styles and trading strategies across size groups.[1]

We also replicated Table 1 for the frequency distribution of packages under a one-day gap definition of a package. About a quarter of the principal value of packages runs four days or longer when the one-day gap definition is used, compared to about half when a five-day gap definition is used. This comparison suggests that it is quite common for institutional trading in a stock to be interrupted by pauses, even in the midst of a package. The existence of such lengthy pauses even while a trading package is underway further highlights the pitfalls in analyzing each transaction in isolation.

Table II describes other characteristics of packages (using a five-day gap definition). Panel A provides statistics on the number of shares traded per package. It perhaps comes as no surprise that packages are larger than individual trades--the mean number of shares traded is 35,300 and 36,200 shares for buy and sell packages, respectively. In contrast, the average number of shares traded in a single institutional transaction is less than 10,000 shares (Chan and Lakonishok (1993)). In the extreme, the largest 1 percent of packages exceed 450,000 shares.

The size of a package tends to increase with firm size, perhaps reflecting the differential liquidity in the market for large versus small firms. However, there is no overall tendency for buy and sell packages to differ with respect to the number of shares traded, despite the finding of Chan and Lakonishok (1993) that sell transactions tend to be larger than buy transactions. One reason for this might be that a package corresponds more closely to an order. There is no reason to suppose that buy and sell orders should differ in size, even though they may be broken up differently into individual trades insofar as buys and sells differ with respect to their execution cost.

Panel B presents the distribution of the dollar value of packages. The mean value of a package is roughly $1.2 million. However, there are some very large packages (the top 1 percent of packages are in excess of $16 million) and

the distribution is highly skewed. Indeed, the largest 25 percent of packages by dollar principal account for approximately 75 percent of the total dollar value. In panel C, package size is measured relative to normal daily trading volume. Normal daily volume is computed as the average daily volume over a prior 40-day interval. An institutional package generally represents a substantial portion of normal daily volume--the averages are 0.66 and 0.61 for buys and sells respectively, while the medians are smaller (0.11 and 0.07). Even in the largest firms, an average package takes up 25 percent of normal daily volume, while an average package in the smallest firms is two or three times daily volume. In the extreme, the largest packages are many times larger than normal daily volume in the stock. These statistics illustrate how illiquid the market can be, even in the largest stocks, from the perspective of large institutional investors.

II. THE PRICE IMPACT OF TRADE PACKAGES

In this section, we provide evidence on the behavior of stock prices around institutional packages. Our measures of price behavior adjust for market-wide stock price movements, as reflected in the returns on similarly-sized firms. At the beginning of every quarter, we divide all NYSE and Amex stocks into deciles, based on market capitalization. Since we focus on short-term price movements, the returns are not likely to be large. Hence it is important not to contaminate the measurement of returns with biases in the size-adjustment procedure. One such bias would arise if it were assumed that the size control portfolio were rebalanced daily (Blume and Stambaugh (1983)). Instead, for each day in the sample period, we compute buy-and-hold returns on each of the ten decile portfolios, for a number of different holding periods, ranging from one to thirty days in length. Each stock traded in our sample is assigned its corresponding control decile portfolio, based on its market value of equity outstanding at the beginning of the quarter. In the subsequent analysis, we measure returns in excess of the return on the control decile portfolio over the relevant holding period.

Table III provides summary statistics on stock price behavior around trade packages, for both buy and sell programs (see also Figure 1). Our focus is on excess returns averaged across all packages, using the dollar value of the package as weights (hereafter denoted the principal-weighted average).

On a principal-weighted average basis, institutional money managers tend to buy stocks that have risen in price. In the twenty-day period preceding buy packages, there is a sizeable principal-weighted return of 0.86 percent. Much of this increase occurs before the five- day period immediately preceding purchases. This price appreciation could be indicative of short-term positive feedback trading behavior ("trend-chasing"), in the sense that increases in the stock price trigger trading. Alternatively, money managers could be trading in the wake of news events such as earnings announcements. Another possibility is that managers tend to focus on the same stocks, but they may have different lag times before they actually begin trading. Hence, on average, by the time one institutional investor begins buying, other institutions will already have entered the market, and perhaps will have pushed the price up already. There is evidence, however, that the price increase beforehand is mainly associated with the larger packages. The simple mean return in the twenty-day period prior to buys is -0.18 percent. It may be the case that a manager requires a stronger confirmation (higher return) before initiating large buys, or it may be possible that larger trades are undertaken by managers who follow price momentum.

Buy packages are associated with some pressure on prices. On a principal-weighted average basis, the first day's trade price is 0.33 percent above the opening price. The rise on the first day amounts to roughly twelve cents (one tick), given the average stock price of $36.50 in our sample. By the close on the last day of the package, the price is 0.98 percent higher than the opening price on the first day of the package (after adjusting for movements in the price of similarly-sized stocks). The simple mean excess returns, however, are much smaller--the mean excess return from the opening price to the first day's trade price is 0.11 percent, while the mean excess return from the first open to the last close is 0.39 percent. The price increase over the course of a buy package is consistent with a variety of explanations. As in the preceding

discussion, managers could be acting in a positive-feedback manner or they may be "herding." Alternatively, they could be trading on favorable private information, which is gradually revealed over the course of the package. The liquidity effects of the increased short-term demand for the stock, and perhaps imperfect substitution between stocks in the long run, could also account for the price pressure from buy packages.

If short-term liquidity effects are the source of the price pressure, then there should be a reversal in the stock price after the package ends. In panel A, however, there is only limited evidence of a price reversal immediately after the package. The principal-weighted average return from the close on the last day of the package to the close one day afterwards is positive (0.03 percent), so that the price continues to rise a day after a package. Extending the returns out to five days after the completion of a package yields a reversal of only -0.07 percent. Accordingly, the price stays at the new higher level so that the price change appears to be permanent.

Our sample of investment managers does not appear to have any superior predictive ability with respect to short-term price movements, however. The stocks that they purchase experience average abnormal returns of only 0.05 percent in the twenty-day period following the completion of the package. This finding is consistent with related evidence (Fama (1991), Lakonishok, Shleifer and Vishny (1992)), that professional investors do not display superior performance over longer horizons and over longer sample periods.

Given the evidence in panel A that money managers buy stocks that have risen in price, do they also sell stocks that suffer price declines? The results in panel B for sell packages suggest otherwise: prices also tend to rise in advance of sells, although the principal-weighted average return of 0.38 percent in this case is less than that for buys. The positive return prior to sell packages is consistent with evidence that volume (and hence both buying and selling activity) tends to rise after increases in the stock price (Lakonishok and Smidt (1986)). From the first to the last day of a sell package, the price falls by 0.22 percent. The same factors as in the case of buy packages could account for the price movement over the course of a sell

package. After the completion of a sell package, however, the price partially recovers. The reversal occurs as early as the last day of the package: the return from the average price of the last day's trades to the closing price that day is 0.11 percent, with a further reversal of 0.12 percent one day after the package ends. Our sample of money managers appears to be as unsuccessful in predicting price changes in the period following sales as they are in predicting returns after purchases.

In sum, when institutional trades are analyzed not singly but in terms of packages, purchases are associated with a price change of almost 1 percent from the open on the package's first day to the close on the last day. The corresponding price change of -0.35 percent for sell packages is less dramatic, but still sizeable. Chan and Lakonishok (1993) follow the conventional methodology in studying price impact and measure price changes around each institutional transaction. They find a much smaller return from the open on the trade date to the same day's close--0.34 percent in the case of buys and -0.04 percent for sells. The conventional methodology's use of benchmark prices from around the time of the trade, however, fails to recognize that in most cases an institutional investor is in the market for a stock several days at a time.

The behavior of prices after purchases and after sales displays an intriguing asymmetry, as noted earlier by Kraus and Stoll (1972), Holthausen, Leftwich and Mayers (1987, 1990), Keim and Madhavan (1991), Chan and Lakonishok (1993). Purchases are accompanied by an increase in the stock price with little sign of subsequent reversal; while sales are associated with a price decline, the price recovers afterwards, although not fully. Chan and Lakonishok (1993) review two conjectures as to the sources of the asymmetry. Compared to a purchase, a sale is more likely to be intermediated through a broker or dealer, who is able to hold the stock in inventory. An intermediary is less likely to be involved in a purchase, to the extent that a broker-dealer may not have the stock in inventory, and is generally less willing to enter a short position to accommodate a buyer. The temporary, self-correcting, price concession associated with a sale represents compensation to the intermediary under this

first argument. A second possibility is that purchases represent stronger signals of private information than sales. Since a money manager can always invest in a diversified portfolio, the decision to select a particular issue for purchase may be interpreted as a strong signal of favorable firm-specific private information. Further, a larger purchase may imply more favorable beliefs (and hence a larger price change) than a smaller purchase, thus potentially accounting for the difference between the simple mean returns and the principal-weighted returns for buys. In contrast, the choice of a stock to sell might be related to more mechanical reasons with no information content. Instead, the stock might already have achieved the manager's pre-set goals and is liquidated to finance new purchases. If larger sales are no more informative than small sales, there should not be notable differences between the principal-weighted and simple mean returns--indeed, the principal-weighted average and simple mean returns are generally more similar for sells than for buys.

III. THE EXECUTION COST OF INSTITUTIONAL TRADE PACKAGES

The cost of equity trading is a particularly controversial issue. Many studies find that portfolio managers are unable to match the performance of various passive benchmarks (Brinson, Singer and Beebower (1991), Fama (1991), Lakonishok, Shleifer and Vishny (1992)). The lackluster performance of professional money managers could be due, at least in part, to market impact costs.

Table IV provides measures of the market impact and commission cost of institutional trades (see Figure 2). One commonly-used cost measure is reported in Table IV: for each transaction in a package, we calculate the return from the volume-weighted average of prices on the trade date to the trade price. The cost for a package is the weighted average (using trade principal as weights) across all trades in the package. A positive (negative) return would signify a cost for buys (sells). Under this cost measure, institutional purchases and sales are accommodated at virtually no cost: the cost is 0.03 percent and 0.05 percent for buys and sells, respectively. From this perspective, market impact costs are dwarfed by the average commission cost of 0.19 percent.

Table III, however, suggests that there are sizeable price movements even as successive parts of the same package are being executed. Employing a different benchmark price for each trade in a package is thus tantamount to using a shifting baseline to measure the cost of an adjustment to an institution's portfolio. Accordingly, the cost relative to the same-day volume-weighted average price misstates the market impact cost of institutional trades. Table IV presents three other cost measures, where each trade in a package is compared to a fixed benchmark price taken from either before or after the package.

The first of these measures uses the opening price on the first day of a package as the fixed benchmark. If the portfolio manager's trading intentions were known at the beginning of the first trading day, the price at the opening auction could have been captured (at least for small trades). Indeed, conversations with money managers suggest that in many cases the investment decision has already been made by the open on the first day: many quantitatively-oriented managers, for example, will have in hand by the open the overnight results from their computerized investment models. We calculate the return from the benchmark to each trade in the package (adjusting for the holding period return on the size control portfolio), and average these excess returns across all trades in the package, using trade principal values as weights. This is equivalent to calculating the principal-weighted average price of all trades in the package, and then measuring the return from the benchmark to this average price; this return is then adjusted for price movements in similarly-sized firms. Note that a positive return from the open to the package corresponds to a cost for purchases (since the stock is bought at a principal-weighted average price above the opening price), while a negative return corresponds to a cost for sales (since the stock is sold at a price below the opening).

Instead of using a benchmark price from before the package, a benchmark price can also be taken from the period after a package ends, once the temporary price pressure from the package has eased. Beebower and Priest (1980) adopt this approach. Since the post-execution benchmark is not established until

after a package has ended, it has the added virtue that it cannot be easily "gamed." If, on the other hand, traders are being evaluated against a benchmark that is known before they trade, they can "game" the cost-measurement system and appear to trade favorably. In particular, a trader who cannot do better than the known benchmark can defer trades indefinitely. There is also a natural interpretation to costs measured relative to a post-execution benchmark: once the trading package is completed, has it added value to the portfolio? If purchases (sales) are accomplished at prices below (above) their values after the trading pressure has waned, the package has added value and the manager does not regret executing the transaction. We use the closing prices one and five days after the end of a package for post-execution benchmarks. The excess return from each trade in the package to the post-execution benchmark price is calculated and then averaged across all the component trades, using trade principal as weights, to yield the cost of a package. A positive cost is denoted by a negative return from the package to the post-execution benchmark for buys, or a positive return in the case of sells.

When measured relative to the opening price on the package's first day, the market impact cost in Table IV is fairly large: combining the cost of 0.88 percent for buys with the cost of 0.44 percent for sells yields a round-trip cost of 1.32 percent, or 49 cents per share. This echoes the evidence in Table III that packages are accompanied by sizeable price changes. However, the cost is heavily influenced by large trades--the simple mean round-trip cost of 0.59 percent is much lower than the principal-weighted average.

Since prices stay high after buying activity, the manager generally does not regret having bought when the benchmark is the closing price one day after the package finishes: there is actually a benefit (positive return) of 0.21 percent for buys. However, sales tend to be followed by a partial recovery in the price, so that there is a cost of 0.22 percent relative to the closing price on the day after the package ends. If more time is allowed for the effects of trading to clear, the round-trip cost relative to the closing price five days after the package is 0.08 percent on a principal-weighted average basis, or three cents a share. Stoll (1993) uses data on the securities

industry's aggregate trading gains on equities and estimates an average impact cost of about 0.09 percent on exchange-listed securities over 1986-1988.

While the issue of the market impact costs of institutional trades arouses considerable attention and controversy, remarkably little empirical evidence is available. In part, this is because earlier researchers are unable to distinguish between institutional trades and non-institutional trades. Instead, their focus has been on a subset of trades where institutions are predominant, namely block trades (trades in excess of 10,000 shares). The direction of a trade is also not identified beforehand in previous studies but must be inferred--trades following a price uptick are classified as purchases while those following downticks are classified as sales. Previous research has documented that large block trades have a substantial price impact relative to the prior day's closing price in excess of 1 percent (Kraus and Stoll (1972), Holthausen et al. (1987)). It is difficult to make any exact comparison with the findings in Tables III and IV, given the differences in methodology and samples. As one comparison, in Table III the principal-weighted return from the open on the first day to the average price on the first day is 0.33 percent for buys and -0.24 percent for sells. A perhaps closer comparison is with the corresponding simple means in Table III: these are even less notable, at 0.11 for purchases and -0.26 for sales. Alternatively, when trades are treated as part of a package, the principal-weighted return from the open on the first day to the package is 0.88 percent for buys and -0.44 percent for sells. Again, the mean returns are smaller in magnitude (0.29 percent and -0.30 percent for buys and sells respectively). In sum, our evidence suggests weaker price impacts, even in the context of trade packages, than have been documented in earlier research.

IV. THE ROLE OF FIRM SIZE AND TRADE COMPLEXITY

Table V analyzes the relation between firm size, trade complexity and the behavior of stock prices around institutional trade packages. In order to reduce clutter, we present the principal-weighted means for a subset of our various measures of price behavior. Within each category of firm size

(described in Table I), packages are divided into seven groups by trade complexity--package size relative to normal daily volume, where normal daily volume is measured over a forty day period prior to the package. The breakpoints for these seven groups correspond to the 25-, 50-, 75-, 90-, 95- and 99-percentiles of the distribution of trade complexity within each size classification, as reported in panel C of Table II. In addition, the bottom panel of the table aggregates across complexity groups (using the proportion of dollar principal as weights) within each size classification and thus reports price behavior as firm size varies. Similarly, the last column in the table gives the dollar-weighted average across size groups to yield results for each complexity classification.

In the last column of panel A (buys), there is a tight relation between price impact and trade complexity. The excess return from the open on the first day of the package to the close on the last day is 0.13 percent for the easiest trades, and rises monotonically to 1.85 percent for the most difficult packages. Trades in this latter category also show the largest post-execution reversal (-0.22 percent) in the five days after the completion of a package. The price recovery, however, does not match the run-up in prices over the course of a package, so that the price stays at its new higher level. Specifically, the return from the opening price on the first day to the closing price five days after the end of a package (analogous to the "permanent" price effect in Holthausen et al. (1987, 1990)) is positive for each of the seven complexity groups in the last column, ranging from 0.18 percent for the easiest trades to 1.63 percent for the hardest. This association is not inconsistent with the notion that larger purchases are stronger signals of private information, which becomes impounded into prices. If there is private information underlying the trades, however, it does not appear to be confirmed by large abnormal returns in the following twenty-day period.

The return from the first opening price to the last closing price of a package is not systematically related to firm size. Managers buying smaller stocks, however, are not likely to be trading with the same degree of urgency as when buying large stocks; instead they may trade more opportunistically and

hence generate less market impact. The relative lack of liquidity for the smallest firms is apparent in the price reversal in the five-day period following buy packages: in the smallest firms, the principal-weighted average price reversal is 0.58 percent for the smallest firms while there is no change in the prices of the largest firms.

The picture for sell packages in panel B is muddier. In particular, more complicated sell packages are not necessarily associated with larger price declines. While the return from the first open to the last close is negative in each of the five size groups, there is only mixed evidence of any association between the magnitude of the decline and firm size. Indeed, for the most complicated trades in the smaller firms, the last closing price is on average actually higher than the first opening price. All in all, the results in panel B confirm the impression from the earlier tables that selling activity is not based on disappointing prior performance of the stock or on negative information, so that the price impact of selling activity is only weakly associated with firm size and trade complexity.

Table VI provides statistics on the market impact cost of institutional trade packages, classified by firm size and trade complexity. Here we focus on the polar cases in the body of the table. When measured relative to the first opening price of a package, the easiest packages in the largest firms incur a round-trip cost of 0.18 percent, comprising a cost of 0.10 percent for buys and 0.08 percent for sells. Using the closing price one day after the end of a package results in a cost of 0.14 percent for sells, offsetting a small benefit of 0.03 percent for buys, yielding a round-trip cost of 0.11 percent. The corresponding round-trip cost relative to the closing price five days after the end of a package is 0.07 percent. At the other extreme, the three smallest quintiles of stocks in the most complicated packages (which together account for a similar fraction of principal as the easiest trades in the largest stocks) are associated with a round-trip cost relative to the first opening price of 1.48 percent. These packages incur a round-trip cost of 0.61 percent relative to the closing price one day after the package, or 0.71 percent relative to the closing price five days after the end of the package. If the impact cost is

measured under the usual procedure of comparing each trade with the same-day volume-weighted average price, the relation between round-trip costs, firm size and trade complexity in many cases runs counter to intuition: for instance, the round-trip cost for the easiest packages in the largest firms is 0.18 percent while the three smallest quintiles in the hardest packages incur a round-trip benefit of 0.11 percent.

V. PRICE IMPACT AND EXECUTION COST BY MONEY MANAGER

The average impact costs presented in Table IV are in general not strikingly large, particularly in comparison with the results of prior research. The low magnitude of the impact costs in the aggregate, however, does not imply that investors should be unconcerned with execution costs. In particular, what is of concern to any single institutional investor is not so much the average cost of trading but rather its own cost of trading. The unparalleled features of our data set permit us to go further by working at the level of the individual money management organization.

The performance of a money management firm reflects the combined overall performance of the money manager as well as the trading desk. Our various measures of price impact and execution cost accordingly provide a suite of benchmarks so that the money management organization's performance can be evaluated along several different dimensions. For instance, a "successful" money management organization that is able to seek out liquidity should buy below and sell above the open; similarly, its trades should add value to the portfolio so that it buys at prices below (sells at prices above) the closing price after the end of the package. A firm that trades in a timely fashion and hence does not miss too many opportunities (or one that does not tip its hand before trading) would be characterized by a relatively low return before the initiation of a package. The behavior of the stock price in the five-day period after the completion of a package indicates the firm's skill in avoiding transitory price disruptions, while the stock return over the twenty-day period after the package attests to the quality of the manager's short-term information.

Table VII confirms that there is substantial dispersion across managers in their principal-weighted average round-trip returns. Such variation cannot be simply attributed to noise, since the average return for each manager is based upon several thousand observations. If execution performance is measured relative to the opening price, then one manager is incurring a cost of as much as 2.75 percent whereas another manager is trading at prices 3.28 percent better than the first day's opening, yielding a range of about six percent. The range across managers in costs relative to the closing price five days after the package is smaller but still very substantial (2.17 percent). The latter range indicates how the difference between bad and good execution can amount to a major drain on performance.

Another aspect of an organization's performance involves its timeliness or foregone return, as measured by the five-day excess return before the beginning of the package. The range for the opportunity cost is almost four percent--from a high of 2.12 percent to a low of -1.86 percent. The returns in the five day period after the package's last day vary from a reversal (signifying a cost) of 1.38 percent to a continuation (signifying a benefit) of 0.97 percent, amounting to a range of 2.35 percent. Finally, the money managers' short-term performance in the twenty-day post-package period run from a loss of 1.34 percent to the best short-term performance gain of 2.02 percent.

Since there are so many aspects to successful execution performance, it would be foolhardy to think that any single measure can represent an individual organization's overall performance. Indeed, a closer inspection of several cases in the body of Table VII illustrates the pitfalls in relying on any single cost measure. Manager number 37, for instance, trades well relative to the pre-execution benchmark (its round-trip cost betters the first day's open by 1.81 percent, ranking fourth in the sample); nonetheless, as of the closing price five days after the package the firm's trades lose money to the amount of -0.22 percent. On the other hand, manager 21 incurs a round-trip cost of 1.47 percent relative to the first open, but the same manager's trades experience benefits of 0.49 percent from the package to the post-execution benchmark. To take another case, manager 15 trades unfavorably relative to both

the pre-execution benchmark (its cost is 0.80 percent) and post-execution benchmarks (0.35 percent cost); it experiences opportunity costs of 0.90 percent and post-package price reversals of 0.26 percent--but when all is said and done, the excess return on its portfolio over the twenty day period following the package's last day is 0.68 percent (the eighth best in the sample). These different examples indicate that no single measure can suffice for evaluating execution cost; instead a comprehensive analysis is necessary.

VI. THE DETERMINANTS OF PRICE IMPACT AND EXECUTION COST

In order to disentangle the various influences on price impact and cost, we fit the following regression model:

$$(1) \qquad r_i = \alpha + \beta c_i + \sum_{j=2}^{5} \delta_j S_{ij} + \sum_{j=2}^{7} \gamma_j D_{ij} + \sum_{j=2}^{37} \phi_j M_{ij} + \varepsilon_i$$

For each package i, we focus on five excess return measures, r_i: from the package's first opening price to the closing price on the package's last day; from the last close to the closing price five days after the end of the package; from the first opening price to the package; from the package to the closing price one day, and five days, after the end of the package. The explanatory variables include c_i, the commission cost for the package in cents per share (the rationale for this definition of commission cost is discussed below), and dummy variables S_{ij}, D_{ij} and M_{ij}, to capture the effects of market capitalization, package complexity and managerial strategy, respectively. For example, S_{ij} takes the value of one if the i-th package involves a stock in the j-th category of firm size and is zero otherwise. The coefficients for the size effects are normalized relative to the first category of firm size (the smallest firms). Similarly, the coefficients for package complexity are normalized relative to the first complexity category (the easiest trades), while the coefficients for the manager effects are expressed relative to the first manager in the data set. Separate regressions are fit for buy packages and for sell packages.

Panel A of Table VIII reports the adjusted R^2 for variants of equation (1) when each set of dummy variables is excluded, one at a time, from the full

model. Most of the explanatory power of the model comes from the identity of the money manager behind the trade: the goodness-of-fit of the model drops markedly when the dummy variables for the money managers are excluded, but is only slightly altered when the dummy variables for firm size and package complexity are dropped.

Panel B of Table VIII reports the estimated coefficients of the full model for buys and, in parentheses, for sells. In light of the very large sample size, the coefficients are generally large relative to their standard errors, and we therefore focus on their economic significance of the coefficients.

The coefficient for commission cost reflects any trade-off between commission expenses and market impact cost.[2] On the whole, however, the coefficient for commission expense is not large. The equation for impact cost relative to the closing price five days after the end of a package for sales provides the strongest evidence for a trade-off between commission cost and market impact cost: the coefficient is -0.87, suggesting that an increase in the commission cost of one cent per share lowers the impact cost by 0.0087 percent, equivalent to a dollar savings of 0.32 cents on a stock with the average price of $36.50. However, commissions include payments for services unrelated to trade execution such as research services. Moreover, some brokers may also rebate part of the commission expenses in the form of "soft-dollar" services. These unobserved components of the commission would confound any association between price impact or cost and commission expenses.

The results for the influence of firm size and package complexity in panel B of Table VIII generally parallel the findings from Tables VI and VII. Instead of presenting the individual coefficients for each of the 36 money managers, we report selected percentiles of the distribution of the coefficients. Controlling for firm size and package complexity, considerable variation still exists across managers with respect to their price impact. The impact from the first opening price of the package to the last closing price ranges from -1.13 percent in the tenth percentile for buys (-0.82 percent for sells) to 0.35 percent in the ninetieth percentile (0.88 percent), yielding a difference of 1.48 percent for buys (1.70 percent for sells). The corresponding

range for the five-day price reversal following a buy package is 0.68 percent and is 0.86 percent for sales. Similar dispersion across managers also exists with respect to their impact costs, although the range varies with the choice of benchmark. When measured relative to the opening price on the first day of a package, the cost ranges from -0.91 percent in the tenth percentile for buys to 0.43 percent in the ninetieth percentile, with a difference of 1.34 percent; the dispersion for sales is similar at 1.45 percent. The spread between the tenth and ninetieth percentiles of costs relative to the post-execution benchmarks is relatively lower (less than 1 percent).[3]

We conjecture that the differences across money managers observed in Table VII stem mainly from differences in their patience or demand for immediacy in trading. Other things equal, a less patient trader will tend to incur larger impact costs, perhaps because he perceives his information to be highly perishable. A manager's degree of patience is difficult to quantify.[4] Nevertheless, a money manager's demand for immediacy is very likely to be related to observable characteristics such as the manager's investment style and portfolio turnover rate. Data on investment style (value versus growth) and on portfolio turnover are available for sixteen of our 37 money management organizations. Other things equal, a portfolio manager with low turnover would be considered a more patient investor with low price impact. An investor for whom immediacy is more important (such as a growth-oriented manager) would tend to have a higher impact cost.

We classify managers either by their style (panel A, Table IX), or into two equally-sized groups on the basis of average portfolio turnover rate (panel B, Table IX), and compare the average round-trip principal-weighted returns achieved by the two groups. In panel A, the differences between the two groups are striking: growth-oriented managers incur a round-trip cost relative to the first open of 0.70 percent while value-oriented managers experience a benefit of 0.40 percent, so that the difference amounts to a full 1.10 percent. Packages executed by growth-oriented managers are also marked by large price impact from the first day's open to the last day's close; in contrast, the packages executed by value-oriented managers are associated with negative price

impact from the first day's open to the last day's close. If growth managers trade with greater impatience and give up a temporary price concession for greater immediacy, while value managers trade more patiently and supply immediacy to other investors, then the price reversals should be larger following the packages of growth-oriented managers. There is indeed a relatively large difference between the 0.09 percent reversal following the packages executed by growth-oriented managers, compared to the 0.20 percent continuation subsequent to value-oriented managers' packages. The larger market impact incurred by growth-oriented managers might be justified if their trades subsequently experience higher returns--on the contrary, however, the short-term performance in the twenty day period following the package is actually somewhat lower for growth-oriented managers than for value-oriented managers. Dramatic differences also arise when managers are classified into high- and low-turnover groups (panel B): managers with high turnover rates experience higher costs and larger price impact across-the-board than do managers with low turnover rates. In particular, there is a difference of 0.30 percent between the price reversal following packages executed by high-turnover managers and the price continuation following packages executed by low-turnover managers. This finding is consistent with the notion that managers with high turnover pay a price concession for greater immediacy.

Since the analysis in panels A and B of Table IX is based on a relatively small subset of our managers, the results are only suggestive of the cost of immediacy in trading. Moreover, the results do not control for differences across managers in the size of their trades, or the capitalization of the traded stocks. Panel C of the table provides an additional clue as to the cost of immediacy. Within each category of firm size and trade complexity as described in Tables V and VI, we calculate the principal-weighted average impact cost and length across all the packages of each of our 37 money managers. Package length is defined as the number of trading days on which trades are executed over the course of a package. All the managers in a size-complexity classification are then divided into two equally-sized groups on the basis of the average package length. We then average the cost measures associated with each group of

managers across all the size-complexity classifications, using the number of dollars traded in each classification as weights. The results thus signify the average market impact cost for short packages (denoting high demand for immediacy) and long packages (denoting low demand for immediacy) for similarly-sized trades in similarly-sized firms.

The results in panel C strongly confirm the cost differences between the packages executed by relatively impatient managers versus relatively patient managers. Impact costs are lower for lengthier packages: the cost relative to the pre-execution benchmark for long packages is 0.79 percent, compared to the cost for short packages of 1.44 percent; the cost relative to the post-execution benchmark is also lower for long packages. In addition, the price pressure from the first open to the last close is lower for lengthier packages, as is the post-package price reversal. There is no evidence that short-term performance is higher after short packages than for long packages. All in all, Table IX provides evidence suggesting that price impact and execution costs are heavily influenced by the trader's demand for immediacy in trading, as proxied by investment style, turnover rate and package length. Further research to spell out the precise nature of these linkages is clearly called for.

VII. CONCLUSIONS

Multi-day trade packages make up a common and sizeable portion of institutional equity trading. Only twenty percent of the dollar value traded in our sample is completed within a day, while more than half of the dollar value traded requires four or more trading days for execution. This finding suggests that the price impact and execution cost of institutional trades is best analyzed at the level of trade packages. Our results are based on an analysis of institutions' actual trading behavior on a very large sample of transactions, both big and small, over two and a half years. The direction of each trade is reported, and we are able to discriminate between different money managers' trades.

As it turns out, the estimates of the price impact of institutional trades are substantially higher when trades are evaluated not individually but in the

broader context of a package. Buy packages are associated with a principal-weighted average price change of almost 1 percent from the open on the package's first day to the close on the last day. The corresponding price change of -0.35 percent for sell packages is less dramatic, but still sizeable. By way of comparison, if the analysis is conducted at the level of individual transactions (Chan and Lakonishok (1992)), the principal-weighted price change from the open to the close on the trade date is 0.34 percent for buys and -0.04 percent for sells.

The overall price impact of purchases and sales is not symmetric, echoing earlier evidence based on individual transactions (Kraus and Stoll (1972), Holthausen et al. (1987, 1990), Keim and Madhavan (1991), Chan and Lakonishok (1992)). Purchases are accompanied by a large increase in the stock price with little sign of subsequent reversal; sales are associated with a relatively smaller price decline, and a relatively stronger reversal, although the price does not fully recover.

Our results on market impact cost, when measured in the broader context of a package, are also substantially higher than comparable results for individual trades, including both block and non-block trades (Chan and Lakonishok (1992)). The round-trip impact cost for packages reaches 1.32 percent when the opening price of the first day is the benchmark and the packages are principal weighted. Giving the same weight to each package would lower the price impact to 0.59 percent. When post-execution benchmarks are used, the average round-trip impact costs are less than 0.10 percent.

There is, of course, no single unambiguous definition of market impact cost. Our various measures differ with respect to the choice of a benchmark price, and each benchmark has some merit and some problems. For example, the opening price as a benchmark can be "gamed"; only trades for less than the open will be executed. We have money managers in our sample who are making money on execution, based on the opening price: they buy below the open and sell above the open. However, based on a post-execution benchmark, some of these money managers perform poorly and several days after the package are sorry for having done the trade (in the sense that they buy above or sell below the post-

execution benchmark). Clearly, buying below the open is not good enough if one day later the price is lower than the price at which the trades were executed. This inconsistency between the two measures might simply be a result of buying from an informed trader who is anxious to get out of his position. Accordingly, the execution performance of a money manager cannot be summarized by one single cost measure; instead it is necessary to conduct a comprehensive examination at the level of packages.

Regardless of the specific cost measure, we find that market impact differs greatly across money managers. Indeed, our regression analysis suggests that the importance of firm size and trade complexity as determinants of price impact and execution cost pales beside the importance of the identity of the money manager behind the trade. Some preliminary evidence suggests that the differences across money managers are, in turn, related to their different degrees of urgency to trade, as indicated by such variables as investment style, portfolio turnover and package length. Packages executed over a shorter number of days are associated with an impact of 1.44 percent relative to the pre-execution benchmark; the corresponding impact cost for lengthier packages, holding trade complexity and firm size constant, is 0.79 percent. Costs also tend to be generally higher for growth-oriented managers than for value-oriented managers, and are higher for managers with high turnover rates.

The idea that a higher demand for immediacy in trade execution tends to be associated with a larger price impact or execution cost is not new. For example, Loeb (1983) measures trading cost as the spreads quoted for immediate execution of orders of varying size. It would be naive, of course, to think that an institutional investor would bring its entire order to market at once and bear the cost of immediate execution. Instead, as we have documented in this paper, an institutional order is likely to be worked over a period of several days. Only by tracking the behavior of the stock price around and during the entire sequence of trades can any reliable measure of price impact or execution cost be obtained.

Footnotes

[1]There is some weak evidence in Table I that buy packages take longer to complete than sell packages--53.2 percent of the value of buy packages take four days or longer, compared to 50.7 percent for sell packages. This evidence suggests that sales may be easier for the market to accommodate than purchases.

[2]The commission cost for institutional investors (at least for trading in U.S. equities) is customarily set on a cents per share basis, irrespective of the stock price level. For a given package, the less expensive broker is thus the one charging fewer cents per share. Nonetheless, the cheaper broker, if given packages in lower-priced stocks for execution, will appear to have a high percentage commission rate. In assessing the relation between commission cost and market impact cost across packages with different price levels, therefore, it is necessary to express the commission cost on a dollar, rather than on a percentage, basis.

[3]Since the opening price on the first day of a package is known if and when a manager begins to trade, managers might differ in several respects: their skill in seeking out liquidity, ability to trade in advance of information, as well as how they react to price changes after the opening price. If, on the other hand, the benchmark price is not established until after a manager has finished trading, the dispersion across managers would be expected to be smaller.

[4]Other influences on price impact or execution cost such as the competence of the portfolio manager and trading desk, as well as the management firm's investment in trading facilities, cannot be measured.

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Table I

Frequency distribution of trade packages, by package length
(percent of principal in parentheses)

The sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. The length of a package is the number of days in the package on which trading occurred. Results are presented for all packages, and also classified by the capitalization of the stock at the end of the prior quarter. The size classification is based on the quintiles of the size distribution of all NYSE and Amex stocks.

Panel A: Buys (74,581 packages; $87.0 billion principal)

Size group	1 Trade	1 Day	2-3 Days	4-6 Days	> 6 Days
1	37.1 (20.0)	48.6 (28.9)	31.2 (27.9)	13.7 (19.4)	6.5 (23.8)
3.1% of packages 0.2% of principal					
2	35.6 (16.9)	48.2 (29.5)	31.1 (26.0)	14.0 (20.4)	6.7 (24.1)
7.4% of packages 1.0% of principal					
3	40.8 (15.3)	52.7 (24.3)	29.8 (28.4)	11.3 (20.3)	6.2 (27.0)
13.2% of packages 4.2% of principal					
4	49.9 (13.7)	58.6 (21.4)	26.2 (27.0)	9.9 (23.0)	5.3 (28.6)
24.3% of packages 17.3% of principal					
5	52.8 (12.5)	61.9 (19.4)	25.0 (26.5)	8.3 (21.5)	4.8 (32.6)
52.0% of packages 77.4% of principal					
All	48.8 (12.9)	58.5 (20.1)	26.6 (26.7)	9.7 (21.7)	5.3 (31.5)

Panel B: Sells (81,208 packages; $99.7 billion principal)

1	46.8 (19.4)	57.6 (30.1)	24.1 (25.6)	10.9 (24.8)	7.4 (19.5)
1.3% of packages 0.1% of principal					
2	45.6 (16.5)	54.7 (24.7)	26.2 (25.1)	11.4 (19.8)	7.7 (30.5)
4.1% of packages 0.7% of principal					
3	45.8 (17.3)	57.0 (28.7)	25.7 (27.3)	10.6 (20.7)	6.7 (23.3)
11.2% of packages 4.2% of principal					
4	54.6 (17.0)	62.6 (25.3)	23.5 (28.0)	8.8 (21.2)	5.1 (25.5)
24.3% of packages 16.5% of principal					
5	55.3 (13.7)	64.5 (21.0)	23.8 (27.1)	7.5 (20.3)	4.2 (31.6)
59.1% of packages 78.5% of principal					
All	53.6 (14.4)	62.7 (22.1)	24.1 (27.2)	8.4 (20.5)	4.9 (30.2)

Table II

Mean and fractiles of distribution
of trade packages by institutional money managers

The sample comprises all trades of NYSE and AMEX stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. Results are presented for all packages, and also classified by the capitalization of the stock at the end of the prior quarter. The size classification is based on the quintiles of the size distribution of all NYSE and Amex stocks.

Panel A: Shares Traded (thousands)

	All buys	(Small) 1	2	3	4	(Large) 5	All sells	(Small) 1	2	3	4	(Large) 5
Mean	35.3	8.9	15.6	22.8	36.6	42.3	36.2	18.4	25.5	29.6	35.3	38.9
Median	6.8	3.2	6.0	8.0	8.7	6.3	6.5	5.0	8.0	10.0	8.2	5.4
10%	0.5	0.5	0.6	0.8	0.5	0.5	0.4	0.8	0.9	0.9	0.5	0.3
25%	1.7	1.3	2.0	2.5	2.0	1.4	1.5	2.0	2.3	2.5	1.7	1.1
75%	26.9	7.5	15.5	21.6	30.0	31.2	28.0	17.6	23.1	30.0	30.0	27.0
90%	85.1	20.0	39.0	53.6	89.4	101.3	89.0	50.0	61.0	75.0	87.9	98.4
95%	150.0	35.0	60.4	96.1	147.6	192.9	160.0	89.6	101.9	125.5	153.9	180.0
99%	450.0	92.6	144.0	242.8	407.1	545.0	463.8	204.2	247.2	300.0	400.0	535.1

Panel B: Dollar Value of Package (thousand $)

	All buys	(Small) 1	2	3	4	(Large) 5	All sells	(Small) 1	2	3	4	(Large) 5
Mean	1167	68	159	379	850	1723	1228	124	242	487	846	1619
Median	175	23	66	138	202	270	197	32	78	162	201	239
10%	14	4	7	14	13	19	13	5	8	12	12	15
25%	44	10	24	45	47	58	44	12	25	44	42	50
75%	801	51	150	350	779	1371	854	111	231	482	763	1166
90%	2733	126	343	903	2164	4398	2847	279	592	1211	2191	3956
95%	5284	238	606	1524	3600	7903	5463	487	990	1992	3684	7403
99%	16038	780	1622	3948	9042	21568	16402	1484	2552	4925	9137	20960

Panel C: Package Size Relative to Normal Trading Volume[a]

	All buys	(Small) 1	2	3	4	(Large) 5	All sells	(Small) 1	2	3	4	(Large) 5
Mean	0.66	2.19	1.75	1.19	0.72	0.25	0.61	3.24	2.25	1.57	0.69	0.22
Median	0.11	0.89	0.68	0.42	0.18	0.03	0.07	0.92	0.70	0.46	0.15	0.03
10%	0.00	0.16	0.08	0.04	0.01	0.00	0.00	0.11	0.07	0.03	0.01	0.00
25%	0.02	0.39	0.25	0.14	0.04	0.01	0.01	0.33	0.23	0.12	0.03	0.01
75%	0.53	2.09	1.71	1.15	0.66	0.17	0.39	2.97	2.13	1.49	0.59	0.14
90%	1.57	4.75	4.14	2.84	1.78	0.60	1.38	8.23	5.38	3.62	1.69	0.51
95%	2.86	7.77	6.63	4.68	3.06	1.13	2.66	12.99	8.40	6.10	2.96	1.02
99%	7.98	23.38	17.48	12.21	7.70	3.31	8.17	31.54	21.90	16.31	7.76	3.11

[a]Normal trading volume is computed as the average daily trading volume over a prior 40-day interval.

Table III

Mean, standard deviation and fractiles of distribution of returns around and during institutional buy packages (panel A) and institutional sell packages (panel B)

Sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock with a break of less than 5 days between successive trades. Multi-day returns over a selected interval are in excess of the buy-and-hold returns on a matching size decile portfolio over a holding period corresponding to the selected interval.

	Performance 20 days before package	From 5 days before to close before package	From close before package to open on first day	From open on first day to average price on first day	From first day to last day of package	From open on first day to close on last day of package	From average price on last day to close on last day	From close on last day to open on day after package	From close on last day to close on day after package	From close on last day to close five days after package	Performance 20 days after package
Panel A: Buys											
Average by principal	0.86	0.23	0.07	0.33	0.64	0.98	0.01	-0.02	0.03	-0.07	0.05
Mean	-0.18	-0.08	0.00	0.11	0.33	0.39	-0.05	-0.02	0.05	-0.01	0.05
Standard deviation	7.83	4.01	1.18	1.79	1.91	3.26	1.72	1.06	2.10	3.81	7.67
Proportion > 0	0.46	0.46	0.49	0.53	0.55	0.54	0.46	0.49	0.48	0.48	0.48
Median	-0.55	-0.26	-0.01	0.06	0.08	0.11	-0.08	-0.03	-0.08	-0.18	-0.30
10-percentile	-9.00	-4.20	-1.05	-1.43	-1.54	-2.80	-1.60	-1.04	-1.99	-4.40	-8.40
25-percentile	-4.70	-2.20	-0.48	-0.54	-0.63	-1.11	-0.70	-0.48	-0.98	-2.20	-4.30
75-percentile	3.80	1.72	0.46	0.77	0.79	1.69	0.55	0.43	0.92	2.00	3.90
90-percentile	8.90	4.20	1.04	1.77	2.07	3.90	1.54	0.99	2.20	4.60	8.80
Panel B: Sells											
Average by principal	0.38	0.21	0.04	-0.24	-0.22	-0.35	0.11	0.03	0.12	0.10	-0.02
Mean	0.37	0.20	-0.01	-0.26	-0.01	-0.13	0.14	-0.01	0.02	-0.12	-0.14
Standard deviation	8.24	4.18	1.26	1.79	1.86	3.20	1.59	1.02	2.03	3.72	7.44
Proportion < 0	0.51	0.51	0.52	0.60	0.58	0.47	0.46	0.51	0.52	0.53	0.53
Median	-0.20	-0.08	-0.03	-0.20	-0.30	-0.02	0.07	-0.02	-0.08	-0.25	-0.47
10-percentile	-8.40	-3.90	-1.03	-1.85	-1.85	-3.30	-1.27	-0.98	-1.97	-4.40	-8.40
25-percentile	-4.30	-1.95	-0.48	-0.91	-0.78	-1.47	-0.48	-0.46	-0.96	-2.30	-4.30
75-percentile	4.20	1.93	0.42	0.40	0.53	1.16	0.73	0.43	0.87	1.85	3.60
90-percentile	9.60	4.50	0.97	1.26	1.58	3.00	1.63	0.96	2.10	4.30	8.40

Table IV

Mean, standard deviation and fractiles of distribution of percentage price impact cost and commission rate, for buy packages (panel A) and sell packages (panel B)

Sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. Impact cost from the open on first day to package is measured as follows. We measure the returns from the opening price on a package's first day to each trade in the package; the cost for the package is then the principal-weighted average of these returns in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval. Impact costs from the package to the closing price one (five) days after the package's last day are similarly defined, using the principal-weighted average of the excess returns from each trade in the package to the closing price one (five) days after the package's last day. Cost using the same-day volume-weighted price is the return from the volume-weighted average of all transaction prices in the stock on the trade date to the trade price; the cost for a package is the principal-weighted average of the costs for all trades in the package.

	Open on first day to package (%)	Package to close one day after last day (%)	Package to close five days after last day (%)	Using same-day volume-weighted price (%)	Commission rate (%)
Panel A: Buys					
Average by principal	0.88	0.21	0.13	0.03	0.19
Mean	0.29	0.14	0.10	0.06	0.31
Standard deviation	2.32	2.77	4.14	0.80	0.32
Proportion > 0	0.49	0.49	0.49	0.54	0.99
Median	0.00	-0.03	-0.10	0.04	0.20
10-percentile	-1.90	-2.70	-4.70	-0.67	0.08
25-percentile	-0.63	-1.30	-2.40	-0.23	0.12
75-percentile	1.10	1.40	2.30	0.36	0.35
90-percentile	2.60	3.20	5.20	0.81	0.65
Panel B: Sells					
Average by principal	-0.44	0.22	0.22	-0.05	0.19
Mean	-0.30	0.18	0.05	-0.14	0.29
Standard deviation	2.33	2.65	4.01	0.79	0.57
Proportion < 0	0.53	0.49	0.51	0.60	0.00
Median	-0.17	0.06	-0.09	0.10	0.21
10-percentile	-2.60	-2.60	-4.60	-0.91	0.09
25-percentile	-1.18	-1.16	-2.30	-0.43	0.13
75-percentile	0.50	1.39	2.20	0.16	0.33
90-percentile	1.82	3.10	4.90	0.57	0.56

Table V

Principal-weighted average returns (in percent) around and during institutional buy packages (panel A) and sell packages (panel B), classified by market value of outstanding equity at end of prior quarter, and complexity (package principal value in relation to average daily volume over a prior 40-day period)

Sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock with a break of less than 5 days between successive trades. Returns are measured in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

	Smallest firms	2	3	4	Largest firms	All firms
Panel A: Buys						
(a) Easiest						
1st open to last close	-1.26	0.32	0.34	0.15	0.12	0.13
Last close to close+5	-0.58	-0.11	-0.08	0.33	0.00	0.05
Pre-20 performance	-4.91	-0.89	-0.07	-0.61	-0.28	-0.34
Post-20 performance	-1.51	0.16	0.22	0.71	0.07	0.18
Percent of principal	0.02	0.03	0.10	0.17	0.83	1.14
Average complexity	0.19	0.11	0.06	0.02	0.00	0.02
(b) Complexity group 2						
1st open to last close	-0.34	-0.27	0.22	0.38	0.13	0.17
Last close to close+5	-0.52	0.10	-0.10	0.03	0.05	0.04
Pre-20 performance	-0.63	-0.76	-0.69	0.18	0.05	0.03
Post-20 performance	-1.13	-0.25	0.09	-0.20	-0.01	-0.05
Percent of principal	0.02	0.10	0.36	0.92	2.00	3.41
Average complexity	0.62	0.45	0.26	0.10	0.02	0.14
(c) Complexity group 3						
1st open to last close	0.11	0.19	0.56	0.67	0.43	0.47
Last close to close+5	-0.07	-0.03	-0.19	0.01	0.06	0.04
Pre-20 performance	0.23	0.05	0.19	0.17	0.33	0.29
Post-20 performance	-0.50	-0.30	0.21	0.01	0.12	0.10
Percent of principal	0.02	0.19	0.77	3.04	11.50	15.52
Average complexity	1.38	1.10	0.72	0.37	0.08	0.33
(d) Complexity group 4						
1st open to last close	0.53	2.06	1.21	1.14	0.77	0.87
Last close to close+5	-0.80	-0.67	-0.46	-0.23	0.02	-0.05
Pre-20 performance	0.51	0.82	0.63	1.19	0.68	0.76
Post-20 performance	-1.10	-0.87	0.24	0.01	-0.04	-0.03
Percent of principal	0.03	0.24	1.02	4.64	21.19	27.12
Average complexity	3.02	2.59	1.77	1.09	0.33	0.95
(e) Complexity group 5						
1st open to last close	1.68	1.82	2.28	1.39	0.83	1.00
Last close to close+5	-0.48	-0.52	-0.63	-0.17	-0.01	-0.07
Pre-20 performance	1.00	0.43	1.62	0.72	1.07	1.03
Post-20 performance	0.93	-1.04	0.16	-0.10	0.19	0.13
Percent of principal	0.02	0.12	0.66	2.86	14.05	17.71
Average complexity	6.03	5.17	3.60	2.33	0.82	2.01
(f) Complexity group 6						
1st open to last close	1.79	0.70	2.13	1.81	1.13	1.29
Last close to close+5	-0.99	-0.82	-0.13	-0.38	-0.05	-0.12
Pre-20 performance	6.10	0.29	2.46	1.02	0.89	0.98
Post-20 performance	-1.26	-2.20	0.72	-0.61	0.22	0.07
Percent of principal	0.03	0.19	0.82	3.71	18.51	23.25
Average complexity	13.07	9.82	6.99	4.47	1.84	4.02
(g) Most difficult						
1st open to last close	2.31	3.26	3.60	1.72	1.77	1.85
Last close to close+5	-0.14	-0.69	-0.38	-0.80	-0.07	-0.22
Pre-20 performance	-0.55	6.02	2.16	2.18	1.56	1.73
Post-20 performance	4.94	0.64	-0.22	-0.25	0.08	0.02
Percent of principal	0.02	0.09	0.44	2.00	9.30	11.85
Average complexity	37.35	27.29	20.51	13.74	6.50	12.30
(h) All trades						
1st open to last close	1.12	1.45	1.75	1.30	0.90	
Last close to close+5	-0.58	-0.55	-0.35	-0.27	0.00	
Pre-20 performance	1.63	1.05	1.29	0.97	0.81	
Post-20 performance	0.02	-0.91	0.27	-0.19	0.10	
Percent of principal	0.16	0.95	4.17	17.34	77.37	
Average complexity	2.13	1.70	1.19	0.71	0.25	

Table V (continued)

	Smallest firms	2	3	4	Largest firms	All firms
Panel B: Sells						
(a) Easiest						
1st open to last close	-3.38	-0.45	-0.08	0.17	0.08	0.08
Last close to close+5	-0.70	-0.12	-0.48	-0.10	-0.08	-0.10
Pre-20 performance	-8.13	1.30	0.51	1.12	0.20	0.36
Post-20 performance	-6.41	0.42	-0.60	-0.02	-0.08	-0.09
Percent of principal	0.01	0.02	0.07	0.14	0.91	1.14
Average complexity	0.15	0.10	0.05	0.01	0.00	0.01
(b) Complexity group 2						
1st open to last close	-2.67	-0.99	-0.25	0.07	0.08	0.05
Last close to close+5	-1.01	-0.32	-0.33	-0.17	-0.05	-0.09
Pre-20 performance	-1.82	0.66	1.40	1.46	0.15	0.41
Post-20 performance	-3.94	-0.68	-0.32	-0.17	-0.16	-0.18
Percent of principal	0.01	0.05	0.31	0.79	2.23	3.39
Average complexity	0.60	0.42	0.27	0.08	0.02	0.10
(c) Complexity group 3						
1st open to last close	-0.99	-1.25	-0.44	-0.32	-0.16	-0.21
Last close to close+5	-1.27	-0.15	-0.18	0.01	-0.10	-0.09
Pre-20 performance	1.62	1.32	1.60	1.34	0.10	0.37
Post-20 performance	-1.71	0.22	-0.46	-0.13	-0.15	-0.16
Percent of principal	0.02	0.14	0.86	2.89	10.11	14.01
Average complexity	1.69	1.27	0.86	0.32	0.07	0.29
(d) Complexity group 4						
1st open to last close	-3.30	-0.80	-0.68	-0.57	-0.37	-0.42
Last close to close+5	-0.07	0.16	-0.04	0.15	-0.02	0.01
Pre-20 performance	1.25	1.52	1.46	0.91	-0.01	0.21
Post-20 performance	-0.76	0.56	-0.54	0.18	-0.15	-0.11
Percent of principal	0.02	0.20	1.08	4.53	20.11	25.95
Average complexity	4.80	3.34	2.33	1.01	0.27	0.84
(e) Complexity group 5						
1st open to last close	-1.19	-1.91	-0.31	-0.03	-0.68	-0.57
Last close to close+5	-1.43	0.67	0.21	0.21	0.03	0.07
Pre-20 performance	-4.23	3.58	1.74	2.00	0.05	0.44
Post-20 performance	-2.03	-0.54	-0.04	0.41	-0.11	-0.03
Percent of principal	0.02	0.11	0.61	2.72	14.51	17.98
Average complexity	10.01	6.69	4.60	2.23	0.72	1.84
(f) Complexity group 6						
1st open to last close	-0.86	-0.39	0.38	0.38	-0.73	-0.50
Last close to close+5	-0.71	0.06	-0.30	0.00	0.21	0.15
Pre-20 performance	-2.14	3.20	4.35	1.33	-0.23	0.21
Post-20 performance	-1.10	1.11	1.61	0.02	0.15	0.20
Percent of principal	0.02	0.14	0.89	3.57	20.90	25.51
Average complexity	20.98	12.53	9.33	4.50	1.69	3.79
(g) Most difficult						
1st open to last close	3.12	0.57	0.64	0.37	-0.28	-0.12
Last close to close+5	-0.88	1.16	0.50	0.09	0.51	0.45
Pre-20 performance	1.43	13.48	2.52	3.52	0.34	1.02
Post-20 performance	1.11	0.95	1.31	0.42	-0.16	0.01
Percent of principal	0.01	0.06	0.37	1.89	9.69	12.02
Average complexity	42.04	47.15	31.83	14.22	5.68	12.42
(h) All trades						
1st open to last close	-1.19	-0.80	-0.13	-0.05	-0.46	
Last close to close+5	-0.78	0.29	-0.03	0.08	0.10	
Pre-20 performance	-0.73	3.73	2.38	1.62	0.01	
Post-20 performance	-1.15	0.46	0.34	0.15	-0.06	
Percent of principal	0.10	0.73	4.18	16.53	78.46	
Average complexity	2.85	2.16	1.52	0.68	0.22	

Table VI

Principal-weighted average market impact costs (in percent) for institutional buy packages (panel A) and sell packages (panel B), classified by market value of outstanding equity at end of prior quarter, and complexity (package principal value in relation to average daily volume over a prior 40-day period)*

	Smallest firms	2	3	4	Largest firms	All firms
Panel A: Buys						
(a) Easiest						
First open to package	0.16	0.07	0.17	0.27	0.10	0.13
Package to close+1	-0.30	0.32	0.22	-0.10	0.03	0.02
Package to close+5	-1.55	0.18	0.07	0.21	0.02	0.05
Cost relative to same-day average	0.07	-0.07	0.06	0.20	0.05	0.07
(b) Complexity group 2						
First open to package	-0.32	-0.23	0.13	0.26	0.09	0.12
Package to close+1	-0.05	0.13	0.12	0.12	0.10	0.11
Package to close+5	-0.50	0.09	0.04	0.11	0.09	0.09
Cost relative to same-day average	-0.01	-0.10	0.00	0.09	0.07	0.07
(c) Complexity group 3						
First open to package	-0.06	-0.03	0.37	0.47	0.31	0.34
Package to close+1	-0.07	0.48	0.22	0.22	0.14	0.16
Package to close+5	0.08	0.38	0.09	0.21	0.18	0.18
Cost relative to same day average	-0.13	-0.09	-0.03	0.03	0.07	0.06
(d) Complexity group 4						
First open to package	0.07	1.24	1.01	0.87	0.60	0.67
Package to close+1	0.72	0.91	0.12	0.29	0.21	0.23
Package to close+5	-0.10	0.19	-0.14	0.10	0.20	0.17
Cost relative to same day average	-0.23	-0.04	0.01	0.03	0.04	0.04
(e) Complexity group 5						
First open to package	1.46	0.77	1.89	0.98	0.71	0.81
Package to close+1	0.37	1.28	0.42	0.48	0.07	0.17
Package to close+5	-0.34	0.72	-0.02	0.26	0.04	0.08
Cost relative to same day average	-0.15	-0.23	-0.03	0.01	0.02	0.01
(f) Complexity group 6						
First open to package	1.06	0.81	1.66	1.79	1.09	1.24
Package to close+1	0.30	0.42	0.88	0.30	0.15	0.21
Package to close+5	-0.60	-0.64	0.57	0.02	0.07	0.07
Cost relative to same day average	-0.01	-0.19	-0.02	0.02	0.02	0.02
(g) Most difficult						
First open to package	2.02	2.94	2.93	1.60	1.83	1.85
Package to close+1	2.42	1.49	-0.21	0.15	0.37	0.32
Package to close+5	1.15	0.78	-0.21	-0.54	0.37	0.20
Cost relative to same day average	-0.21	-0.08	0.01	-0.05	0.00	-0.01
(h) All trades						
First open to package	0.75	1.00	1.41	1.10	0.81	
Package to close+1	0.60	0.83	0.33	0.29	0.17	
Package to close+5	-0.11	0.19	0.08	0.05	0.15	
Cost relative to same day average	-0.13	-0.12	-0.01	0.02	0.03	

Table VI (continued)

	Smallest firms	2	3	4	Largest firms	All firms
Panel B: Sells						
(a) Easiest						
First open to package	-2.14	-0.62	-0.40	-0.16	-0.08	-0.12
Package to close+1	-0.05	0.07	0.41	0.26	0.14	0.17
Package to close+5	-0.71	0.01	-0.15	0.22	0.09	0.10
Cost relative to same day average	0.01	-0.10	-0.18	-0.22	-0.13	-0.15
(b) Complexity group 2						
First open to package	-2.60	-0.73	-0.45	-0.10	-0.07	-0.10
Package to close+1	0.32	-0.13	0.15	0.17	0.10	0.11
Package to close+5	-1.05	-0.51	-0.11	0.03	0.09	0.06
Cost relative to same day average	-0.04	-0.06	-0.08	-0.13	-0.10	-0.10
(c) Complexity group 3						
First open to package	-1.61	-1.20	-0.68	-0.43	-0.21	-0.28
Package to close+1	0.32	0.01	0.24	0.17	0.08	0.10
Package to close+5	-0.35	-0.17	-0.02	0.15	-0.05	-0.01
Cost relative to same day average	-0.22	-0.17	-0.08	-0.10	-0.09	-0.10
(d) Complexity group 4						
First open to package	-1.94	-0.83	-0.71	-0.57	-0.32	-0.38
Package to close+1	0.46	0.24	0.23	0.17	-0.01	0.03
Package to close+5	0.14	0.21	0.11	0.21	-0.05	0.00
Cost relative to same day average	-0.18	-0.12	-0.10	-0.04	-0.06	-0.06
(e) Complexity group 5						
First open to package	-1.86	-0.91	-0.53	-0.11	-0.58	-0.51
Package to close+1	0.53	-0.19	0.49	0.26	-0.02	0.05
Package to close+5	-0.76	0.61	0.49	0.30	-0.02	0.06
Cost relative to same day average	-0.06	-0.06	-0.04	-0.06	-0.05	-0.05
(f) Complexity group 6						
First open to package	-1.44	-0.55	0.01	0.20	-0.69	-0.51
Package to close+1	1.70	1.48	0.51	0.63	0.13	0.24
Package to close+5	1.76	1.57	0.23	0.58	0.13	0.22
Cost relative to same day average	-0.36	-0.23	0.00	-0.03	-0.03	-0.03
(g) Most difficult						
First open to package	3.83	0.04	0.19	-0.19	-0.62	-0.50
Package to close+1	-2.52	1.39	1.24	1.00	0.95	0.97
Package to close+5	-1.25	2.74	1.51	0.99	1.27	1.24
Cost relative to same day average	1.91	-0.07	0.08	-0.06	-0.03	-0.03
(h) All trades						
First open to package	-1.08	-0.72	-0.37	-0.21	-0.47	
Package to close+1	0.39	0.58	0.47	0.41	0.16	
Package to close+5	0.10	0.86	0.35	0.40	0.17	
Cost relative to same day average	0.06	-0.14	-0.04	-0.06	-0.05	

Note for Table VI

*Sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. Impact cost from the open on first day to package is measured as follows. We measure the returns from the opening price on a package's first day to each trade in the package; the cost for the package is then the principal-weighted average of these returns in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval. Impact costs from the package to the closing price one (five) days after the package's last day are similarly defined, using the principal-weighted average of the excess returns from each trade in the package to the closing price one (five) days after the package's last day. Cost using the same-day volume-weighted price is the return from the volume-weighted average of all transaction prices in the stock on the trade date to the trade price; the cost for a package is the principal-weighted average of the costs for all trades in the package.

Table VII

Principal-weighted average round-trip returns (in percent) by money management firm, with ranking in parentheses (rank 1 is best performance, rank 37 is worst performance)*

Manager	From open on first day to package[a]	From package to close 5 days after last day[b]	5 days before first day	From close on last day to close 5 days after package	20 days after package
1	1.28 (28)	0.00 (12)	0.42 (21)	0.02 (14)	0.38 (12)
2	0.74 (20)	-0.10 (15)	0.10 (18)	-0.01 (15)	0.29 (18)
3	0.56 (17)	-0.48 (31)	0.31 (20)	-0.59 (33)	-0.55 (29)
4	-2.30 (2)	0.29 (8)	-0.32 (11)	0.45 (5)	0.36 (13)
5	-0.51 (6)	0.27 (9)	-1.23 (5)	0.42 (6)	0.33 (16)
6	-1.98 (3)	0.94 (1)	-1.47 (3)	0.97 (1)	0.57 (10)
7	0.09 (10)	0.61 (2)	-0.13 (16)	0.69 (3)	1.63 (2)
8	0.08 (9)	-0.32 (26)	-0.19 (12)	-0.27 (25)	-0.27 (24)
9	0.75 (21)	0.33 (5)	-0.15 (14)	0.03 (13)	-0.05 (21)
10	2.15 (35)	-0.54 (32)	2.12 (37)	-0.57 (31)	-0.57 (31)
11	0.70 (19)	-0.21 (21)	-0.14 (15)	-0.18 (22)	0.26 (19)
12	0.13 (12)	-0.22 (23)	-0.35 (10)	-0.01 (16)	0.06 (20)
13	0.06 (8)	-1.23 (37)	-1.01 (8)	1.38 (37)	-1.34 (37)
14	1.05 (25)	-0.23 (24)	0.48 (22)	-0.38 (28)	-0.94 (34)
15	0.80 (23)	-0.35 (28)	0.90 (28)	-0.26 (24)	0.68 (8)
16	1.64 (31)	0.00 (14)	0.56 (25)	-0.33 (27)	-0.37 (27)
17	2.13 (34)	-0.73 (34)	2.08 (36)	-1.13 (36)	-0.70 (33)
18	-3.28 (1)	-0.16 (18)	-1.21 (6)	-0.59 (32)	-0.98 (35)
19	0.48 (16)	-0.30 (25)	0.04 (17)	-0.33 (26)	-0.65 (32)
20	0.13 (11)	-0.33 (27)	0.75 (26)	-0.03 (17)	-0.23 (23)
21	1.47 (29)	0.49 (3)	-0.15 (13)	-0.04 (18)	0.35 (14)
22	0.40 (14)	-1.16 (36)	-1.46 (4)	-0.15 (20)	0.89 (5)
23	-1.55 (5)	0.26 (10)	-1.68 (2)	0.55 (4)	0.61 (9)
24	1.07 (26)	0.33 (6)	0.50 (24)	0.35 (8)	1.40 (4)
25	0.67 (18)	0.32 (7)	0.83 (27)	0.41 (7)	1.41 (3)
26	2.01 (33)	-0.70 (33)	1.62 (33)	-0.69 (34)	-0.55 (30)
27	1.73 (32)	-0.14 (17)	1.93 (35)	-0.24 (23)	0.84 (6)
28	-0.38 (7)	-0.16 (19)	-0.59 (9)	0.22 (10)	0.32 (17)
29	0.77 (22)	-0.99 (35)	0.22 (19)	-0.79 (35)	-0.43 (28)
30	1.51 (30)	-0.41 (29)	0.50 (23)	-0.48 (29)	0.33 (15)
31	2.75 (37)	-0.17 (20)	1.53 (32)	-0.54 (30)	-0.22 (22)
32	0.92 (24)	-0.48 (30)	1.78 (34)	-0.08 (19)	-1.21 (36)
33	2.44 (36)	0.00 (13)	1.42 (31)	-0.16 (21)	-0.35 (26)
34	0.17 (13)	-0.11 (16)	1.06 (29)	0.07 (11)	-0.33 (25)
35	1.21 (27)	0.47 (4)	1.14 (30)	0.24 (9)	0.53 (11)
36	0.41 (15)	0.11 (11)	-1.16 (7)	0.07 (12)	2.02 (1)
37	-1.81 (4)	-0.22 (22)	-1.86 (1)	0.74 (2)	0.68 (7)
Mean	0.50	-0.14	0.19	-0.11	0.11
Std. deviation	1.33	0.47	1.10	0.50	0.78
Median	0.70	-0.16	0.22	-0.08	0.26
10-percentile	-1.84	-0.78	-1.46	-0.71	-0.95
25-percentile	0.09	-0.38	-0.47	-0.43	-0.49
75-percentile	1.38	0.27	0.98	0.23	0.59
90-percentile	2.13	0.47	1.81	0.58	1.40
Range	6.03	2.17	3.98	2.35	3.36

Notes for Table VII

*Sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. Round-trip returns are the returns for buy packages minus the return on sell packages. Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

[a]Excess returns are computed from the opening price on a package's first day to each trade in the package; the return for a package is the principal-weighted average of these returns across all trades in the package.

[b]Excess returns are computed from each trade in a package to the closing price five days after the package's last day; the return for a package is the principal-weighted average of these returns across all trades in the package.

Table VIII

Regression results[a]

A. Adjusted R^2 (in percent) for full model, and models with each set of dummy variables excluded one set at a time. Results from the equation for sells are in parentheses.

	Return (in %) from:									
	First open to last close		Close one day after package to close five days after		Open on first day to package		Package to close one day after package		Package to close five days after package	
Full model	4.69	(2.42)	0.54	(0.42)	7.01	(3.53)	0.54	(0.42)	0.40	(0.48)
Excluding manager effects	1.39	(0.84)	0.11	(0.13)	1.77	(0.96)	0.21	(0.22)	0.04	(0.19)
Excluding size effects	4.59	(2.30)	0.53	(0.38)	6.89	(3.25)	0.53	(0.40)	0.39	(0.43)
Excluding complexity effects	4.14	(2.37)	0.48	(0.37)	6.59	(3.49)	0.45	(0.35)	0.38	(0.38)

B. Estimated coefficients for full model for buys and for sells (in parentheses).

		Return (in %) from:									
		Open on first day to close on last day		Close on last day to close five days after package		Open on first day to package		Package to close one day after last day		Package to close five days after last day	
Intercept		1.14	(-0.59)	-0.29	(-0.64)	0.83	(-1.01)	0.40	(0.27)	0.01	(-0.24)
Commission		0.09	(-0.69)	0.39	(-0.26)	0.09	(-0.09)	-0.25	(-0.61)	0.40	(-0.87)
Size	2	-0.26	(0.29)	0.29	(0.53)	-0.27	(0.30)	0.10	(0.16)	0.30	(0.53)
	3	-0.36	(0.57)	0.23	(0.55)	-0.29	(0.51)	-0.02	(0.22)	0.16	(0.62)
	4	-0.49	(0.68)	0.30	(0.65)	-0.36	(0.65)	-0.06	(0.18)	0.18	(0.70)
(Largest)	5	-0.65	(0.66)	0.32	(0.69)	-0.48	(0.75)	-0.08	(0.06)	0.16	(0.62)
Complexity	2	-0.02	(0.07)	0.06	(-0.12)	-0.01	(0.11)	0.03	(-0.05)	0.05	(-0.15)
	3	0.20	(-0.08)	0.04	(-0.05)	0.13	(0.03)	0.11	(-0.10)	0.11	(-0.16)
	4	0.36	(-0.26)	-0.12	(-0.00)	0.27	(-0.08)	0.08	(-0.15)	-0.03	(-0.18)
	5	0.74	(-0.28)	-0.28	(0.15)	0.55	(-0.10)	0.17	(-0.06)	-0.09	(-0.03)
	6	1.18	(-0.32)	-0.20	(0.34)	0.86	(-0.20)	0.33	(0.03)	0.12	(0.22)
(Hardest)	7	1.47	(0.10)	-0.32	(0.39)	1.05	(-0.08)	0.56	(0.28)	0.10	(0.57)
Manager											
10-percentile		-1.13	(-0.82)	-0.39	(-0.46)	-0.91	(-0.59)	-0.48	(-0.25)	-0.47	(-0.60)
25-percentile		-0.54	(-0.28)	-0.24	(-0.22)	-0.39	(-0.14)	-0.39	(-0.20)	-0.34	(-0.32)
Median		-0.28	(0.02)	-0.09	(-0.10)	-0.15	(0.04)	-0.26	(-0.09)	-0.19	(-0.19)
75-percentile		0.10	(0.22)	0.09	(0.03)	0.08	(0.30)	-0.13	(0.02)	-0.06	(-0.05)
90-percentile		0.35	(0.88)	0.29	(0.40)	0.43	(0.86)	0.00	(0.12)	0.20	(0.27)
Range between 10- and 90-percentiles		1.48	(1.70)	0.68	(0.86)	1.34	(1.45)	0.48	(0.37)	0.67	(0.87)

Note for Table VIII

[a]Regression estimates of the model,

$$r_i = \alpha + \beta C_i + \sum_{j=1}^{3} \delta_j S_{ij} + \sum_{j=1}^{6} \gamma_j D_{ij} + \sum_{j=1}^{36} \phi_j M_{ij} + \varepsilon_i$$

where r_i is the return (in %) from: the opening price on the package's first day to the closing price on the package's last day; the closing price one day after, to the closing price five days after, the package's last day; the opening price on the package's first day to the package; the package to the closing price one day after the package's last day; the package to the closing priced five days after the package's last day. All returns are in excess of the buy-and-hold return on a matching size decile control portfolio over the corresponding interval. C_i is the dollar commission cost; S_{ij} is a dummy variable for the package's classification by market capitalization; D_{ij} is a dummy variable for the package's classification by complexity; M_{ij} is a dummy variable for the money manager. The equation is estimated separately for buys and for sells. The sample comprises all trades of NYSE and Amex stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). A buy (sell) package in a stock is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. There are five classifications by market capitalization, corresponding to the quintiles of the distribution of value of outstanding equity at the end of the prior quarter for all NYSE and Amex stocks. There are seven classifications by trade complexity, corresponding to the 25th, 50th, 75th, 90th, 95th and 99th percentiles of the distribution within each size category of package principal value in relation to average daily volume over a prior 40-day period.

Table IX

Average round-trip principal-weighted returns (in percent) of money management firms, classified by investment style (panel A); by portfolio turnover rate (panel B); by package length (panel C)

In panels A and B, the sample comprises all trades of NYSE and Amex stocks by 16 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987); in panel C the sample comprises all trades by the full set of 37 institutional money management firms. A buy (sell) package in a stock is a case where the same money management firm executes successive purchases (sales) of the same stock, with a break of less than 5 days between successive trades. Round-trip returns are the returns for buy packages minus the return on sell packages. Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

	From open on first day to package	From package to close 5 days after last day	From open on first day to close on last day of package	From close on last day to close 5 days after package	Performance 20 days after package
			(A) Classified by investment style		
Growth	0.70	0.05	0.88	-0.09	-0.20
Value	-0.40	-0.04	-0.71	0.20	0.34
			(B) Classified by portfolio turnover rate		
High turnover	0.87	-0.07	0.782	-0.11	0.30
Low turnover	-0.49	0.13	-0.45	0.19	0.20
			(C) Classified by package length[a]		
Short packages	1.44	-0.13	1.56	-0.23	0.17
Long packages	0.79	-0.02	0.83	-0.02	0.47

[a]Package length is the number of days in the package on which trading occurred.

FIGURE 1

STOCK PRICE BEHAVIOR

AROUND AND DURING INSTITUTIONAL TRADE PACKAGES

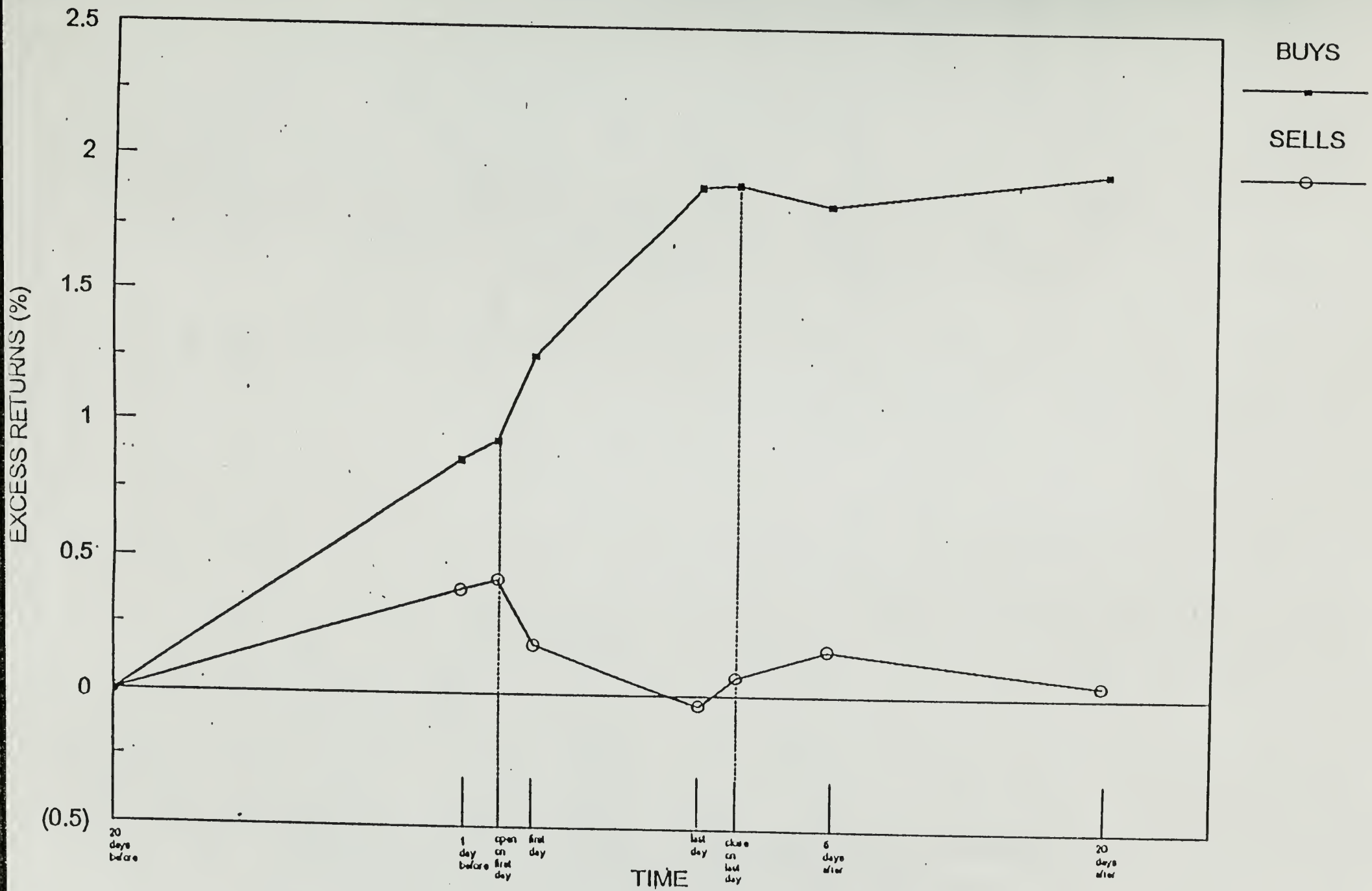

FIGURE 2
MEASURES OF EXECUTION COST
FOR INSTITUTIONAL TRADE PACKAGES