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The Behavior of Stock Prices Around Institutional Trades

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ABSTRACT

All trades executed by 37 large investment management firms from July 1986 to December 1988 are used to study the price impact and execution cost of the entire sequence ("package") of trades that we interpret as an order. We find that market impact and trading cost are related to firm capitalization, relative package size, and, most importantly, to the identity of the management firm behind the trade. Money managers with high demands for immediacy tend to be associated with larger market impact.

FINANCIAL ECONOMISTS HAVE LONG studied 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. See, for example, Kraus and Stoll (1972a), Holthausen, Leftwich, and Mayers (1987, 1990), Keim and Madhavan (1991), Petersen and Umlauf (1991), Hausman, Lo, and MacKinlay (1992) and Chan and Lakonishok (1993). Evaluating the behavior of stock prices around trades provides a means of discriminating among 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.

For many institutional investors, however, even a moderately-sized position in a stock may represent a large fraction of the stock's trading volume. Accordingly, an investment manager's order is often broken up into several trades. It is often misleading, therefore, to consider an individual trade as the basic unit of analysis in the study of trading activity and its effects on prices. This paper uses the record of trades executed by 37 large investment manage-

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ment firms to identify cases in which the same investment manager is in the market for a stock (buying or selling) over the course of several trades. The innovation of this article is to treat the entire sequence ("package") of trades as the basic unit of analysis in our examination of the price impact and execution cost of institutional trading. We also examine the behavior of stock prices immediately before and after trade packages.

Using our definition of a trade package, we find that multi-day trades are 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 by a group of large, sophisticated investors provides strong evidence that the short-term demand curve for stocks is not perfectly elastic, and that large excess demand for a stock can only be accommodated by a price concession. 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. Not only is the price impact larger for buys, but the subsequent reversal is also much smaller than for sells; thus there is an asymmetry in the overall impact of buys and sells.

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 for the average-priced stock in our sample); 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 each way (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 (package size in relation to normal daily volume). However, the 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 managers following a growth-oriented strategy, or with higher turnover rates (who would in general be perceived as being less patient in trade execution) incur larger price impact and execution costs.

The remainder of the article 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 relative trade size (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. Conclusions are contained in Section VII.

I. Preliminaries

A. Data

Our data set records the transactions of 37 large investment management firms from July 1986 until the end of 1988. These data are collected by SEI Corp., a large consulting organization in the area of financial services for institutional investors. We supplement the SEI data with transaction data from the Francis Emory Fitch Company, and also with data from the Center for Research in Security Prices (CRSP). The recorded trades involve issues listed on the New York and American Stock Exchanges. In total, there are roughly 1.2 million trades, representing about 5 percent of the total value of trading on the two exchanges over this period. For each transaction, the stock's CUSIP (Committee on Uniform Security Identification Procedures) number, the trade date, trade price, number of shares, and dollar commissions (before soft dollar rebates) 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 (the name of the manager is not disclosed to us).

The sample is larger than in many previous studies. Since each trade is explicitly identified as a purchase or sale, 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)). We are also able to examine trades according to the identity of the manager. The investment managers in the sample represent all the major investment styles (growth, value, small cap, and large cap) and trading strategies.

B. Trade Packages

We use each manager's trading history to reconstruct the manager's trading packages in each stock. In particular, we define a "buy package" to include the manager's successive purchases of the stock; the 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; we have, however, 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, 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, all of these trades would be considered as part of one buy package.

Ideally, our measure of a trade package corresponds to a money manager's ex ante order. Conceptually, however, our measure might be problematic in some situations—for example, price movements subsequent to a trade may beget further trades, creating a proximate sequence of trades. The issue, therefore, is how well our definition of a package approximates an ex ante

order. We provide the following reasons to think that the approximation is close.

In the first place, several studies with access to investors' ex ante orders (Keim and Madhavan (1993), Perold and Sirri (1993)) find that the proportion of orders not completely executed is small (generally less than six percent), and that the opportunity cost of unexecuted orders is not the dominant component of execution costs. Secondly, active money managers transact in stocks that they believe are substantially mispriced. A small movement in price is not likely to lead them to revise their buying or selling decisions (otherwise, portfolio turnover levels would be far higher than the observed average of 50 percent for institutional investors—see Lakonishok, Shleifer, and Vishny (1992)). Thirdly, the idea of trade packages has been widely used in the investment industry for the last ten years. The widespread acceptance in the industry of the concept of a package provides some assurance that, in practice, the correspondence between a package and an ex ante order is close. Fourthly, on an operational level, we experimented with alternative definitions, using windows of different lengths to end a package. The results are basically unchanged. We have therefore maintained the definition with a five-day trading gap, to allow for the possibility that in the smaller stocks a manager may strategically choose to stay out of the market for long periods of time.

It would, on the face of it, be desirable to know a manager's order, or more generally, his trading intentions. Upon further reflection, however, it is not clear how an investor's original intent can be quantified in any objective manner. Some issues, raised in our discussions with professional traders, include the following. A manager may submit an order with a limit price that is far removed from the market (and hence is not likely to be executed); one may question whether this should be counted as a legitimate unexecuted order, compared to other noncontingent orders. A manager may also provide to the trading desk a number of different substitute stocks, leaving the actual discretion of which stock to buy up to the desk. As another possibility, a manager may submit an order and give the desk time for its execution; before it is executed, however, the manager may cancel the order. This limited set of examples highlights the difficulty in correctly capturing the ex ante order (even if such data were readily available). On this account, the widespread adoption of a comparatively straightforward procedure based on executed orders and observed packages can be more easily understood.

C. 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. Table I reports the frequency distribution of trade packages by package length (the number of days within the package on which trades occurred). Panels A and B describe the results for purchases and sales, respectively. In each panel, we report the frequency distribution for all trades and also for each of five size groups classified by the market value of the outstanding equity at

Table I

Frequency Distribution of Trade Packages, by Package Length

Each number in this table represents the percent of packages completed in the indicated number of trading days. Numbers in parentheses report percent of total dollar principal. 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 New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks. 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 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).

Packages in Size Group	1 Day	2–3 Days	4–6 Days	>6 Days
Panel A: Buys (74,581 Packages; $87.0 Billion Principal)				
All Buys	58.5 (20.1)	26.6 (26.7)	9.7 (21.7)	5.3 (31.5)
1 (small) 3.1% of packages 0.2% of principal	48.6 (28.9)	31.2 (27.9)	13.7 (19.4)	6.5 (23.8)
2 7.4% of packages 1.0% of principal	48.2 (29.5)	31.1 (26.0)	14.0 (20.4)	6.7 (24.1)
3 13.2% of packages 4.2% of principal	52.7 (24.3)	29.8 (28.4)	11.3 (20.3)	6.2 (27.0)
4 24.3.% of packages 17.3% of principal	58.6 (21.4)	26.2 (27.0)	9.9 (23.0)	5.3 (28.6)
5 (large) 52.0% of packages 77.4% of principal	61.9 (19.4)	25.0 (26.5)	8.3 (21.5)	4.8 (32.6)
Panel B: Sells (81,208 Packages; $99.7 Billion Principal)				
All Sells	62.7 (22.1)	24.1 (27.2)	8.4 (20.5)	4.9 (30.2)
1 (small) 1.3% of packages 0.1% of principal	57.6 (30.1)	24.1 (25.6)	10.9 (24.8)	7.4 (19.5)
2 4.1% of packages 0.7% of principal	54.7 (24.7)	26.2 (25.1)	11.4 (19.8)	7.7 (30.5)
3 11.2% of packages 4.2% of principal	57.0 (28.7)	25.7 (27.3)	10.6 (20.7)	6.7 (23.3)
4 24.3% of packages 16.5% of principal	62.6 (25.3)	23.5 (28.0)	8.8 (21.2)	5.1 (25.5)
5 (large) 59.1% of packages 78.5% of principal	64.5 (21.0)	23.8 (27.1)	7.5 (20.3)	4.2 (31.6)

the end of each quarter. The size classification is based on the quintiles of the size distribution of all New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks.

Previous studies have treated each trade in isolation. However, only about 20 percent of the value of institutional purchases 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. 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.

The bulk of institutional purchases and sales is concentrated in the largest quintile of stocks. This group makes up approximately 52 percent (59 percent) of the number of buy (sell) packages, or about 77 percent (78 percent) by dollar value. The smallest 40 percent of firms, 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 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]

Table II describes other characteristics of packages. Panel A provides statistics on the number of shares per package. Packages are larger than individual trades—the median number of shares traded is 6,800 and 6,500 shares for buy and sell packages, respectively. In contrast, the median number of shares in a single institutional transaction is less than 3,000 shares (Chan and Lakonishok (1993)). The distribution for packages is highly skewed to the right, and in the extreme, the largest 1 percent of packages exceed 450,000 shares.

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

[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. We also replicated Table I for the frequency distribution of packages under a one-day gap definition of a package. Under this definition, about a quarter of the principal value of packages runs four days or longer, compared to about half when a five-day gap definition is used. It is thus quite common for institutional trading in a stock to be interrupted by pauses, even in the midst of a package.

TABLE II

Mean and Fractiles of Distribution of Trade Packages by Institutional Money Managers

This table reports summary statistics for institutional trade packages. 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 New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks. 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).

	All Buys	(Small) 1	2	3	4	(Large) 5	All Sells	(Small) 1	2	3	4	(Large) 5
Panel A: Shares Traded (Thousands)												
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
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
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 $)												
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
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
99%	16038	780	1622	3948	9042	21568	16402	1484	2552	4925	9137	20960
Panel C: Package Size Relative to Normal Trading Volume[a]												
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
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
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
Panel D: Package Size Relative to 95th Percentile of Trading Volume[b]												
Mean	0.38	4.86	0.66	0.44	0.28	0.11	0.26	1.41	0.83	0.74	0.29	0.10
Median	0.04	0.35	0.24	0.15	0.07	0.01	0.03	0.36	0.27	0.18	0.06	0.01
25%	0.01	0.15	0.08	0.05	0.01	0.00	0.00	0.12	0.09	0.05	0.01	0.00
75%	0.20	0.84	0.67	0.42	0.25	0.07	0.15	1.12	0.79	0.54	0.22	0.06
99%	3.08	10.27	6.30	4.72	3.10	1.36	3.07	16.28	8.14	6.71	2.95	1.35

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

[b] Package size is divided by the 95th percentile of the distribution of trading volume over a prior 40-day interval.

to normal daily trading volume, which 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. 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. A typical package, however, is quite small—the medians are 0.11 and 0.07 for all buys and all sells, respectively. Given the variability in daily trading volume, a package may be large relative to average volume and yet may not be problematic when it comes to execution. To account for this possibility, Panel D of Table II provides summary statistics for package size relative to the 95th percentile of the distribution of daily volume over a prior 40-day interval. The 95th percentile of the distribution of volume captures the upper range of normal daily volume, without being affected by occasional spikes in trading activity. The results with this alternative measure are generally similar to those obtained with average daily volume—the largest packages are still in general several multiples of the 95th percent heaviest prior trading volume.

II. The Price Impact of Trade Packages

This section provides evidence on the behavior of stock prices around institutional packages. Our measures adjust for market-wide stock price movements, as reflected by the returns on similarly-sized firms. The size-adjustment procedure is as follows. We rank and divide all NYSE and AMEX stocks into deciles, based on market capitalization at the beginning of each quarter. A control portfolio is formed from all stocks in the same size decile. The return for a package in a particular stock is measured in excess of the return from buying the control portfolio on the package's first day and holding the portfolio for as long as it takes to execute the package. Our buy-and-hold procedure for the control portfolio avoids the bias discussed by Blume and Stambaugh (1983) that would arise with daily rebalancing.

Figure 1 graphically summarizes the behavior of stock prices around trade packages, for both buy and sell programs. 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). Additional summary statistics are provided in Table III.

A. Buys

On a principal-weighted average basis, money managers tend to buy stocks that have risen in price (relative to the market). In the twenty-day period preceding buy packages, there is a sizeable return of 0.86 percent. Much of this increase occurs before the five-day period 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 herding and responding in common to news events such as earnings announcements. There is evidence,

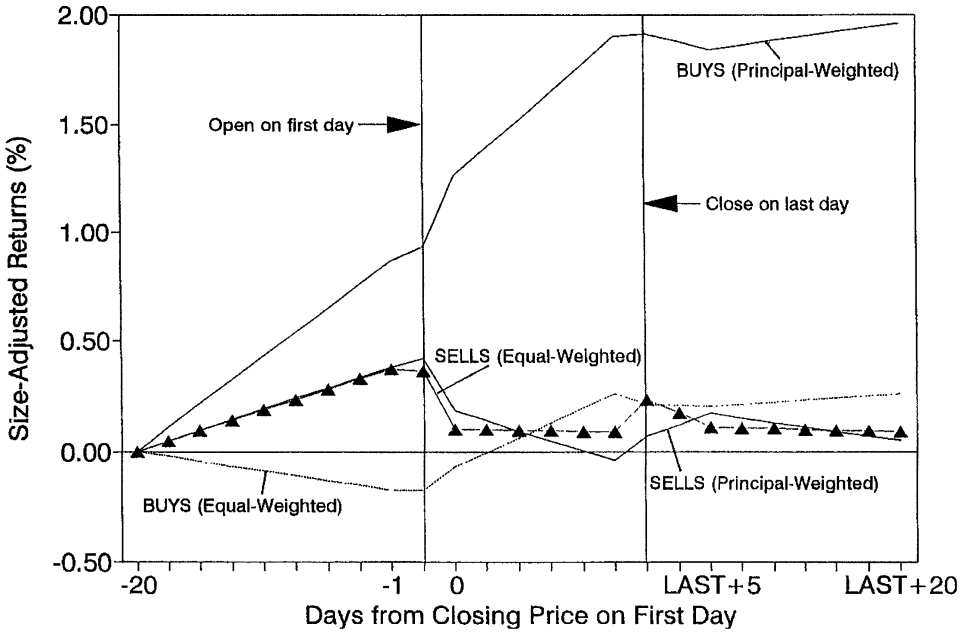

Figure 1. Cumulative size-adjusted returns around institutional trade packages. Returns are calculated for various time intervals around institutional trade packages, beginning from the closing price twenty days before the first day of the package and ending with the closing price twenty days after the last day of the package. Returns are adjusted for the return on a size control portfolio over the corresponding interval. Cumulative average returns are depicted separately for buy packages and for sell packages, where the averaging uses the package's dollar value as weights (principal-weighted) or uses equal weights. A buy (sell) package is a case where the same money management firm executed successive purchases (sales) of the same stock, with a break of less than five days between successive trades. The sample comprises all trades on NYSE and AMEX stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

however, that the price increase beforehand is mainly associated with the larger packages. The simple mean return (i.e., the average return giving equal weight to all packages) 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 that larger trades are undertaken by managers who follow a price momentum strategy.

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. The simple mean returns, however, are much smaller. The return from the opening price to the first day's trade price is 0.11 percent, while the return from the first open to the last close is 0.39 percent.

Table III

Summary Statistics for Returns Before, During, and After Institutional Buy Packages and Institutional Sell Packages

Returns (in percent) are reported for selected intervals before, during, and after institutional buy packages and institutional sell packages. All returns are in excess of the buy-and-hold returns on a matching size decile portfolio over a holding period corresponding to the selected interval. 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. Sample comprises all trades of New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

Panel A: Returns Before Trade Packages

	Performance 20 Days Before Package	From 5 Days Before to Close Before Package	From Close Before Package to Open on First Day
Buys			
Principal-weighted average	0.86	0.23	0.07
Mean	−0.18	−0.08	0.00
Median	−0.55	−0.26	−0.01
Standard deviation	7.83	4.01	1.18
Sells			
Principal-weighted average	0.38	0.21	0.04
Mean	0.37	0.20	−0.01
Median	−0.20	−0.08	−0.03
Standard deviation	8.24	4.18	1.26

Panel B: Returns During Trade Packages

	From Open on First Day to Average Price on First Day	From Average Price on First Day to Average Price on 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
Buys				
Principal-weighted average	0.33	0.64	0.98	0.01
Mean	0.11	0.33	0.39	−0.05
Median	0.06	0.08	0.11	−0.08
Standard deviation	1.79	1.91	3.26	1.72
Sells				
Principal-weight average	−0.24	−0.22	−0.35	0.11
Mean	−0.26	−0.01	−0.13	0.14
Median	−0.20	−0.30	−0.02	0.07
Standard deviation	1.79	1.86	3.20	1.59

Table III—*Continued*

Panel C: Returns After Trade Packages

	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
Buys				
Principal-weighted average	−0.02	0.03	−0.07	0.05
Mean	−0.02	0.05	−0.01	0.05
Median	−0.03	−0.08	−0.18	−0.30
Standard deviation	1.06	2.10	3.81	7.67
Sells				
Principal-weighted average	0.03	0.12	0.10	−0.02
Mean	−0.01	0.02	−0.12	−0.14
Median	−0.02	−0.08	−0.25	−0.47
Standard deviation	1.02	2.03	3.72	7.44

The price increase over the course of a buy package is consistent with various 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. Short-term liquidity effects, and perhaps imperfect substitution between stocks in the long run, could also account for the price pressure from buy packages. It may also be the case that the price changes while a package is underway may lead to a revision in the manager's original intention. More trades may be submitted if the price movement confirms the manager's original beliefs, or trades may be cut short if the price moves against the manager. These possibilities have been raised in the literature on herding (Kraus and Stoll (1972b), Scharfstein and Stein (1990)) and trend-chasing (De Long et al. (1990)). If managers are responding to price changes before or during their trades, therefore, their original ex ante orders may not coincide with the observed packages that are executed.

If short-term liquidity effects are at work, then there should be a reversal in the stock price after the package ends. However, there is only limited evidence of a price reversal. On the contrary, for buy packages the principal-weighted average return from the close on the last day to the close one day afterwards is slightly positive (0.03 percent).[2] Extending the returns out to five days after

[2] To provide some indication as to the standard errors of our estimates, consider the excess return from the closing price on the package's last day to the closing price a day later. The standard deviation of this return is 2.10 percent for buys (calculated across all 74,581 buy packages) and 2.03 percent for sells (across all 81,208 sell packages). The standard error of the mean is thus about 0.008 for buys and 0.007 for sells. These calculations assume that the observations are mutually uncorrelated, so the true standard errors may be much larger.

the completion of a package yields a modest reversal of only −0.07 percent (or about three cents for the average-priced stock in our sample). 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 predictive ability with respect to short-term price movements. 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 (discussed in Fama (1991) and Lakonishok, Shleifer, and Vishny (1992)) that use longer horizons and sample periods and generally find that professional investors do not display superior performance.

B. Sells

Prices also tend to rise in advance of sells (Panel A of Table III), 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)). On the first day of a sell package, the price drops by 0.24 percent from the open, and there is a further decline from the first to the last day of 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 following sales as they are in predicting returns after purchases.

C. Overview

In sum, when institutional trades are analyzed in terms of packages instead of individually, purchases are associated with a price change of almost 1 percent from the open on the package's first day to the close on its last day. The corresponding price change of −0.35 percent for sell packages is less dramatic. Chan and Lakonishok (1993) 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 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 (1972a), Holthausen, Leftwich, and Mayers (1987, 1990), Keim and Madhavan (1991), Chan and Lakonishok (1993). The magnitude of the overall price impact for buys and sells is very different, reflecting in part the stronger reversal after sells than after buys.

Chan and Lakonishok (1993) review various conjectures as to the sources of the asymmetry.

III. The Execution Cost of Institutional Trade Packages

The cost of equity trading is a controversial issue. Many studies find that portfolio managers are unable to match the performance of various passive benchmarks (Brinson, Hood, and Beebower (1986), Berkowitz, Finney, and Logue (1988), Lakonishok, Shleifer, and Vishny (1992) and under-perform by about one or two percent. The existing literature on the price impact of block trades suggests that market impact costs are nonnegligible and hence may account, at least in part, for managers' poor performance. Table IV provides several different measures of the market impact and commission cost of institutional trades. Each measure of market impact cost compares the execution price to a particular benchmark price, so that a positive cost indicates that purchases (sales) are carried out at prices above (below) the benchmark. Our earlier caveats about the possible endogeneity of trade packages are worth reiterating. In particular, the observed package may not in all cases correspond to the ex ante order.

A. Same-Day Benchmark

Following one commonly-used cost measure, we compare each transaction in a package to the volume-weighted average price calculated over all transactions in the stock on the trade date. Note that trades belonging to a given package but executed on different days have different benchmarks. The cost for a package is the weighted average (using trade principal as weights) across all trades in the package. 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. Based on this benchmark, market impact costs are dwarfed by the average commission cost in our sample of 0.19 percent.

However, the manager may be incurring substantial execution cost if his trade prices were compared to a fixed benchmark price taken from a period disjoint from the package. Suppose, for example, that an investment manager trades on several days and is able to capture the day's volume-weighted average price on every trade. Then, under the above procedure, the manager would have zero execution cost, even though the manager's buying pressure could be pushing up the price of the stock over the course of the package. In order to address this shortcoming, we also use three other cost measures based on benchmarks from disjoint trading periods.

B. Pre-Execution Benchmark

An alternative cost measure 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

Table IV

Summary Statistics for Percentage Price Impact Cost and Commission Rate for Institutional Buy and Sell Packages (A Positive Number Denotes a Cost; a Negative Number Denotes a Benefit)

This table reports summary statistics on price impact cost and commission cost for buy packages (Panel A) and sell packages (Panel B). 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. Sample comprises all trades of New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stock by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987).

	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		
Principal-weighted average	0.88	−0.21	−0.13	0.03	0.19
Mean	0.29	−0.14	−0.10	0.06	0.31
Median	0.00	0.03	0.10	0.04	0.20
Standard deviation	2.32	2.77	4.14	0.80	0.32
			Panel B: Sells		
Principal-weighted average	0.44	0.22	0.22	0.05	0.19
Mean	0.30	0.18	0.05	0.14	0.29
Median	0.17	0.06	−0.09	−0.10	0.21
Standard deviation	2.33	2.65	4.01	0.79	0.57

auction could have been captured (at least for small trades). 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.

When measured relative to the opening price on the package's first day, the market impact cost is fairly large (see Table IV): 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 for the average-priced stock in our sample. 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, and the median costs are also lower.

C. Post-Execution Benchmarks

Instead of using a price from before the package, a price can also be taken as a benchmark from the period after a package ends, once the short-term price pressure from the package has eased.[3] Beebower and Priest (1980) adopt this approach. There is a natural interpretation to costs measured relative to a post-execution benchmark. If purchases (sales) are accomplished at prices below (above) their values after the trading pressure has waned, the package has added value to the portfolio (generated an abnormal return) and the manager does not regret executing the transaction.

We use the closing prices one and five days after a package ends 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.

Since prices stay high after buying activity, the manager generally does not regret buying when the benchmark is the closing price one day after the package: there is actually a benefit 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. 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.[4] Stoll (1993) uses data on the securities industry's aggregate trading profits on equities and estimates an average impact cost of about 0.09 percent on exchange-listed securities over 1986 to 1988.

[3] 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.

[4] The standard deviation for the cost relative to the closing price five days after the package is 4.14 percent for purchases (based on 74,581 packages) and 4.01 percent for sales (based on 81,208 packages). The standard error of the mean is thus less than 0.02 percent (assuming that the observations are uncorrelated).

D. Overview

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 (1972a), Holthausen, Leftwich, and Mayers (1987)). It is difficult to make any exact comparison with the findings in Tables III and IV, given the differences in methodologies and samples. In general, our evidence suggests weaker price impacts, even in the context of trade packages, than have been documented in earlier research based on individual trades. Specifically, our highest estimate of round-trip impact cost is 1.32 percent (based on our pre-execution benchmark). Assuming an average turnover rate of 50 percent (Lakonishok, Shleifer, and Vishny (1992)), our results on execution cost can account for up to half of the performance shortfall documented in the literature. Lakonishok, Shleifer, and Vishny (1992) discuss other possible reasons for the underperformance of money managers.

IV. The Role of Firm Size and Trade Complexity

We have also followed the lead of prior research and analyzed the relation between firm size, trade size, and the behavior of stock prices around institutional trade packages. These results are available upon request. It is also important to see how market impact costs vary with these factors, as a prerequisite to evaluating the success of any proposed investment strategy. Other things equal, a larger trade is more likely to be associated with larger liquidity effects, or with more severe adverse selection problems (Kyle (1985), Easley and O'Hara (1987)). In practice, larger trades would be considered by traders to be more difficult to execute without high impact costs. While in general the difficulty of a trade is a multi-dimensional attribute, we follow the spirit of industry practice and interpret complexity in terms of package size relative to normal volume.

Table V provides statistics on market impact cost, classified by firm size and trade complexity, for a round-trip transaction (a buy package and a sell package). Within each classification of firm size, we rank and categorize packages by our measure of 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 bottom panel of the table aggregates across all complexity groups (using the proportion of dollar principal as weights) and thus reports results as firm size varies. Similarly, the last column in the table gives results for each complexity classification. In order to simplify the presentation, we report only the principal-weighted means, and only for a subset of our complexity classifications. Note that positive values in the table denote costs while negative values denote benefits. Similar results (available upon request) have also been obtained using an alternative measure of trade complexity (package size relative to the 95th percentile of daily volume over a prior 40-day period).

The polar cases in Table V illustrate the variation in impact costs. At one extreme of Table V, the easiest packages in the largest firms incur a round-trip

Table V

Principal-weighted Average Round-Trip Impact Costs (in Percent) Classified by Firm Size and Relative Package Size (A Positive Number Denotes a Cost; a Negative Number Denotes a Benefit)

This table reports summary statistics on price impact cost under different benchmarks. 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. Round-trip costs are the costs for buy packages plus the costs for sell packages. Sample comprises all trades of New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1987). Packages are classified by market value of outstanding equity at end of prior quarter, and by package principal value relative to average daily volume over a prior 40-day period.

Cost Relative to	Smallest Firms	2	3	4	Largest Firms	All Firms
Panel A: 25th Percentile of Relative Package Size Distribution						
Opening price on first day of package	1.98	0.69	0.57	0.43	0.18	0.25
Closing price 1 day after last day of package	0.25	−0.25	0.19	0.36	0.11	0.15
Closing price 5 days after last day of package	0.84	−0.17	−0.22	0.01	0.07	0.05
Same-day volume weighted average price	0.06	0.03	0.24	0.42	0.18	0.22
Panel B: 50th–75th Percentiles of Relative Package Size Distribution						
Opening price on first day of package	1.55	1.17	1.05	0.90	0.52	0.62
Closing price 1 day after last day of package	0.39	−0.47	0.02	−0.05	−0.06	−0.06
Closing price 5 days after last day of package	−0.43	−0.55	−0.11	−0.06	−0.23	−0.19
Same-day volume weighted average price	0.09	0.12	0.05	0.13	0.16	0.16
Panel C: 90th–95th Percentiles of Relative Package Size Distribution						
Opening price on first day of package	3.32	1.68	2.42	1.09	1.29	1.32
Closing price 1 day after last day of package	0.16	−1.47	0.07	−0.22	−0.09	−0.12
Closing price 5 days after last day of package	−0.42	−0.11	0.51	0.04	−0.06	−0.02
Same-day volume weighted average price	−0.09	−0.17	0.01	0.07	0.07	0.06
Panel D: Top 1% of Relative Package Size Distribution						
Opening price on first day of package	−1.81	2.90	2.74	1.79	2.45	2.35
Closing price 1 day after last day of package	−4.94	−0.10	1.45	−0.85	0.58	0.65
Closing price 5 days after last day of package	−2.40	1.96	1.72	1.53	0.90	1.04
Same-day volume weighted average price	−2.12	−0.01	−0.07	0.01	0.03	0.02
Panel E: All Trades						
Opening price on first day of package	1.83	1.72	1.78	1.31	1.28	
Closing price 1 day after last day of package	−0.21	−0.25	0.14	0.12	−0.01	
Closing price 5 days after last day of package	0.21	0.67	0.27	0.35	0.02	
Same-day volume weighted average price	−0.19	0.02	0.03	0.08	0.08	

cost of 0.18 percent when measured relative to the first opening price of a package. The corresponding round-trip cost relative to the closing price five days after the end of a package is 0.07 percent. There is very little trading activity at the other extreme of the table (the largest trades in the smallest stocks), so it is necessary to aggregate some of the cells in order to provide a meaningful comparison. 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 0.71 percent relative to the closing price five days after the end of the package. If the impact cost is measured by 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.

A voluminous amount of research focuses on investing in low-capitalization stocks. In Table V, the impact cost is not systematically related to firm size. Managers investing in smaller stocks, however, are not likely to be trading with the same degree of urgency as when they invest in large companies nor would they take similarly sized positions. Instead, strategic breaking up of orders and opportunistic trading may be more commonplace for smaller stocks—in Table II, the average size of a package is lower for small stocks than for large stocks.

V. Price Impact and Execution Cost by Money Manager

The average impact costs presented in Table IV are in general not strikingly large. This does not imply, however, 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. Our data set allows us to examine costs at the level of the individual money management organization.

The execution performance of a money management firm depends upon both the money manager and the trading desk.[5] Our various measures of price

[5] Numerous intangible factors also affect the outcome of the trade execution process. Typically, a large investment management firm has a trading desk, responsible for order execution. An order submitted to the desk may also be accompanied by more or less detailed instructions from the investment manager as to how the order is to be filled. Depending upon the manager's investment style, for example, there may be a higher or lower degree of urgency to trade. 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 in Tables III and IV 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.

impact and execution cost provide a set of benchmarks to evaluate a money management organization's performance along several different dimensions. In the context of trading, a "successful" money management organization would be regarded as one that is able to buy below and sell above the open or one that is able to buy at prices below (sell at prices above) the closing price after the end of the package. A firm that trades a stock 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 price movement in the stock before the initiation of a package. The behavior of the stock price in the five-day period after the completion of a package can be suggestive of the firm's skill in avoiding transitory price disruptions, while the stock return over the twenty-day period after the package provides an indication of the quality of the manager's stock-picking skills in the short-run.

Table VI confirms that there is substantial dispersion across managers in their principal-weighted average round-trip returns. If execution performance is measured relative to the opening price, then the difference between the top and bottom 10 percent of managers is about four percent. The corresponding difference in costs relative to the closing price five days after the package is smaller but still very substantial (1.25 percent). Such large variation across managers' average returns (which are based upon several thousand observations) suggests that the identity of the money management firm may have an impact on execution performance. The other variables reported in Table VI display similar ranges across managers.

Since there are so many aspects to successful execution performance, no single measure can completely capture an individual organization's overall performance. To take a specific case, manager number 37 trades at prices that are on average 1.81 percent better than the pre-execution benchmark; nonetheless, the firm's trades lose money because the closing price five days after the package is on average 0.22 percent worse than the execution price. As another example, manager 21 incurs a substantial round-trip cost of 1.47 percent relative to the first open, but its trades add value to the portfolio (by 0.49 percent). These examples indicate that no single measure suffices for evaluating execution cost; instead a comprehensive analysis is necessary.

VI. The Determinants of Price Impact and Execution Cost

The variables influencing price impact and cost are, of course, correlated. In this section, we use a regression model to disentangle the separate effects of firm size, relative package size and the money manager's identity. The focus in the previous sections is on principal-weighted means; the regression model, however, uses no such weighting scheme. We also provide some direct evidence on the cost of immediacy.

Table VI

Mean, Standard Deviation, and Fractiles of Distribution of Principal-Weighted Average Round-Trip Price Impact Costs and Returns (in Percent) Across 37 Money Management Firms

Price impact costs and returns are calculated for each package, and a principal-weighted average cost or return is calculated over all packages executed by each money management firm. This table summarizes the distribution of these average costs and returns across the 37 money management firms in the sample. 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 costs (returns) are the costs (returns) for buys plus (minus) the costs (returns) for sells. The sample comprises all trades of New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks by 37 institutional money management firms from July 1, 1986 to December 30, 1988 (excluding October 1988).

	Cost (%) Relative to (+ is Cost, − is Benefit)		Return (%)[c]		
	Opening Price on First Day of Package[a]	Closing Price 5 Days After Last Day of Package[b]	5 Days Before First Day	From Close on Last Day to Close 5 Days After Package	From Close on Last Day to Close 20 Days After Package
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	−0.47	−1.46	−0.71	−0.95
25-percentile	0.09	−0.27	−0.47	−0.43	−0.49
75-percentile	1.38	0.38	0.98	0.23	0.59
90-percentile	2.13	0.78	1.81	0.58	1.40
Difference between 90- and 10-percentiles	3.97	1.25	3.27	1.29	2.35

[a] 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. Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

[b] 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. Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

[c] Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

A. Regression Analysis

We use the following regression model:

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

For each package i, we use as the dependent variable r_i two measures of price impact and two measures of execution cost. The price impact measures are: the excess return from the first opening price to the closing price on the package's last day, and from the last close to the closing price five days after the end of the package. The cost measures are: from the first opening price to the package, and from the package to the closing price five days after the end of the package. The explanatory variables include the commission cost for the package in dollars per share, c_i, and dummy variables to capture the effects of market capitalization, S_{ij}, package complexity, D_{ij}, and managerial strategy, M_{ij}.[6] For example, M_{ij} takes the value of one if the ith package is traded by the jth manager and is zero otherwise. The coefficients for S_{ij}, D_{ij}, and M_{ij} are normalized relative to the first category of each effect (the smallest firms, the easiest trades, and the first manager in the data set, respectively). Separate regressions are fit for buy packages and for sell packages.

Panel A of Table VII assesses the relative importance of each set of dummy explanatory variables. It 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. For example, in the equation for the return from the first open to the last close for buys, the R^2 of the model drops markedly from 4.69 percent to 1.39 percent 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 VII reports the estimated coefficients of the full model for buys, along with the significance levels of their t-statistics (results for the equation for sells are in parentheses). Since the observations are not independent, the statistical significance levels should be interpreted with caution, and we therefore focus on the economic significance of the coefficients.

The coefficient for commission cost reflects any trade-off between commission expenses and market impact cost.[7] It might be argued that a higher commission cost is associated with better execution. On the whole, however, the coefficient for commission expense is not large (even when it has the hypothesized sign). The largest coefficient with the hypothesized sign 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 an average-priced stock. The weak association between price impact or cost and commission expenses may, however, be due to various unobserved com-

[6] We use dummy variables as explanatory variables in the regression in order to mitigate the effects of outlier observations.

[7] 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.

Table VII
Regression Results

Regression estimates of the model,

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

where r_i is the return from the opening price on the package's first day to the closing price on the package's last day; the return from the closing price on the package's last day to the closing price five days after; the impact cost relative to the opening price on the package's first day; the impact cost relative to the closing price five days after the package's last day. All returns and costs 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 relative package size; M_{ij} is a dummy variable for the money manager. The equation is estimated separately for buys and for sells. 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 New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks. There are seven classifications by relative package size 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. 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).

Panel 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

	Price Impact				Execution Costs			
	Dependent Variable: Return (%) From				Dependent Variable: Cost (%) Relative to			
	Opening Price on First Day to Closing Price on Last Day		Closing Price on Last Day to Closing Price Five Days After Package		Opening Price on First Day		Closing Price Five Days After Package	
Full model	4.69	(2.42)	0.54	(0.42)	7.01	(3.53)	0.40	(0.48)
Excluding manager effects	1.39	(0.84)	0.11	(0.13)	1.77	(0.96)	0.04	(0.19)
Excluding size effects	4.59	(2.30)	0.53	(0.38)	6.89	(3.25)	0.39	(0.43)
Excluding complexity effects	4.14	(2.37)	0.48	(0.37)	6.59	(3.49)	0.38	(0.38)

Panel B: Estimated Coefficients for Full Model for Buys and for Sells (in Parentheses)

Intercept	1.14*	(−0.59)*	−0.29	(−0.64)*	0.83*	(1.01)*	−0.01	(−0.24)
Commission	0.09	(−0.69)*	0.39	(−0.26)	0.09	(0.09)	−0.40	(−0.87)
Size								
2	−0.26*	(0.29)*	0.29*	(0.53)*	−0.27*	(−0.30)*	−0.30*	(0.53)*
3	−0.36*	(0.57)*	0.23*	(0.55)*	−0.29*	(−0.51)*	−0.16	(0.62)*
4	−0.49*	(0.68)*	0.30*	(0.65)*	−0.36*	(−0.65)*	−0.18*	(0.70)*
(Largest) 5	−0.65*	(0.66)*	0.32*	(0.69)*	−0.48*	(−0.75)*	−0.16	(0.62)*
Relative package size								
2	−0.02	(0.07)*	0.06	(−0.12)*	−0.01	(−0.11)*	−0.05	(−0.15)*
3	0.20*	(−0.08)	0.04	(−0.05)	0.13*	(−0.03)	−0.11*	(−0.16)*
4	0.36*	(−0.26)*	−0.12*	(−0.00)	0.27*	(0.08)*	0.03	(−0.18)*
5	0.74*	(−0.28)*	−0.28*	(0.15)*	0.55*	(0.10)*	0.09	(−0.03)
6	1.18*	(−0.32)*	−0.20*	(0.34)*	0.86*	(0.20)*	−0.12	(0.22)*
(Biggest) 7	1.47*	(0.10)	−0.32*	(0.39)*	1.05*	(0.08)	−0.10	(0.57)*
Manager								
Difference between 90- and 10-percentiles[a]	1.48	(1.70)	0.68	(0.86)	1.34	(1.45)	0.67	(0.87)
Number of manager coefficients significant at 5% level	24	20	7	11	24	24	9	15

[a] The estimated regression coefficients for the dummy variables representing manager effects are ranked and the percentiles are calculated. The summary statistic reported in the table is the difference between the ninetieth and tenth percentiles of the set of 36 estimated coefficients.

* Denotes significance at the 5 percent level or better.

ponents of commissions. Commissions include payments for services unrelated to trade execution such as research services, and some brokers may also rebate part of the commission expenses in the form of "soft-dollar" services.

The results for the influence of firm size and package complexity in Panel B of Table VII generally parallel the findings from the previous section of this article, and from other work as well. Controlling for firm size and package complexity, considerable variation still exists across managers with respect to their impact costs. When the cost is measured relative to the opening price on the first day of a package, the difference between the top and bottom ten percent of managers for buys is 1.34 percent; the dispersion for sales is similar at 1.45 percent. The spread between the top and bottom ten percent of managers by costs relative to the post-execution benchmarks is lower.[8]

B. The Cost of Immediacy

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.[9] 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 16 of our 37 money management organizations. Other things equal, a portfolio manager with a longer investment horizon (low turnover) is considered a patient investor and will tend to have a lower demand for liquidity. An investor for whom immediacy is more important (such as a growth-oriented manager) would tend to have higher impact cost.

We classify managers either by their style (Panel A, Table VIII), or into two equally-sized groups on the basis of average portfolio turnover rate (Panel B), 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. Similar differences also exist between growth-oriented and value-oriented managers in terms of their price impact from the first day's open to the last day's close. If

[8] 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.

[9] 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, are not observable by us.

Table VIII

Average Round-Trip Principal-Weighted Price Impact Costs and Returns (in Percent; Standard Deviation in Parentheses) of Money Management Firms, Classified by Investment Style (Panel A), by Portfolio Turnover Rate (Panel B), and by Package Length (Panel C)

Price impact costs and returns are calculated for each package, and a principal-weighted average cost or return is calculated over all packages executed by each money management firm. In Panels A and B, 16 money management firms with available data on investment style and portfolio turnover rate are classified into two groups: by investment style in Panel A (9 growth and 7 value), or by whether portfolio turnover rate is higher or lower than the median turnover rate, in Panel B. This table reports the average costs or returns in each category of money management firms. For Panel C, in each size-complexity classification of Table V, all active money managers (out of a total of 37) are divided into two equally sized groups based on the average length of their packages. The mean reported in Panel C for each category is the weighted average across all the size-complexity classifications (using the relative dollar value traded in each classification as weights). Standard deviations across all the observations within each category of money managers are reported in parentheses. 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 costs (returns) are the costs (returns) for buy packages plus (minus) the costs (returns) on sell packages. The sample comprises all trades of New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks by 16 institutional money management firms from July 1, 1986 to6 December 30, 1988 (excluding October 1987).

	Cost (%) Relative to: (+ is cost, − is benefit)		Return (%) From[c]		
	Opening Price on First Day of Package[a]	Closing Price 5 Days After Last Day of Package[b]	From Open on First Day to Close on Last Day of Package	From Close on Last Day to Close 5 Days After Package	From Close on Last Day to Close 20 Days After Package
Panel A: Classified by Investment Style					
Growth	0.70 (1.86)	−0.05 (0.26)	0.88 (1.89)	−0.09 (0.35)	−0.20 (0.67)
Value	−0.40 (1.42)	0.04 (0.61)	−0.71 (1.63)	0.20 (0.65)	0.34 (0.37)
Panel B: Classified by Portfolio Turnover Rate					
High turnover	0.87 (1.33)	0.07 (0.46)	0.78 (1.52)	−0.11 (0.47)	0.30 (0.44)
Low turnover	−0.49 (2.09)	−0.13 (0.43)	−0.45 (2.22)	0.19 (0.56)	0.20 (0.55)
Panel C: Classified by Package Length					
Short packages	1.44 (0.92)	0.13 (0.18)	1.56 (0.85)	−0.23 (0.21)	0.17 (0.28)
Long packages	0.79 (0.65)	0.02 (0.23)	0.83 (0.86)	−0.02 (0.27)	0.47 (0.21)

[a] 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. Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

[b] 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. Returns are in excess of the buy-and-hold returns on a matching size decile control portfolio over the corresponding interval.

[c] Returns are in excess of the buy-and hold returns on a matching size decile control portfolio over the corresponding interval.

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

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. In fact, 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. These findings are consistent with the notion that growth-oriented managers and managers with high turnover pay a price concession for greater immediacy.

Since the analysis in Panels A and B of Table VIII 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 Table VIII provides an additional clue as to the cost of immediacy. Within each of the 35 categories of firm size and trade complexity as described in Table V, we calculate the principal-weighted average impact cost and length across all the packages of each money manager. 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. All in all, Table VIII 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. Some caution in interpreting our results for packages is warranted, however, since our measure of a package is based on observed trades rather than the ex ante order.

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 -0.3 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 (1993)), 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 (1972a), Holthausen, Leftwich, and Mayers (1987, 1990), Keim and Madhavan (1991), Chan and Lakonishok (1993)).

Our results on market impact cost, when measured for packages, are also substantially higher than comparable results for individual trades, including both block and nonblock trades in Chan and Lakonishok (1993). 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" with relative ease; 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. 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 and portfolio turnover. Costs 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 article, 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.

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