Transaction costs and institutional trading: An examination of small-cap equity funds*

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Abstract

This paper employs a unique dataset of institutional trading from a representative sample of active Australian small-cap equity managers. An analysis of small-cap fund management is important given such institutions trade less liquid securities, as well as providing context to the recent out-performance derived by these investors. This research is primarily concerned with quantifying and analysing the implicit transaction costs incurred by small-cap institutional managers. The key finding is that transaction costs are significant, with total price impact averaging 0.37 percent for purchases, and -0.32 percent for sales on a principal-weighted basis. Consistent with the literature, this paper documents that liquidity, fund investment style and manager identity are all important determinants of price impact. Analysis of a new variable, fund status, reveals that closed funds incur significantly higher total price impact on sales compared to open funds.

JEL Classification: G14; G19
Keywords: Transaction costs, Small-cap Funds, Price Impact, Institutional Trading

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1. INTRODUCTION

Researchers point to the cost of trading as an economically significant phenomenon that materially impacts portfolio decision-making and fund manager performance.[1] In addition to the quantification of trading costs, an analysis of their determinants has been the subject of ongoing research. Most empirical evidence on institutional trading costs has stemmed from studies assessing trading on major U.S. markets ((Chan and Lakonishok (1993, 1995) and Keim and Madhavan (1995, 1997)). These studies have found that price impact costs are significant and are influenced by trade size, firm capitalisation, and investment style.

The paper examines these issues in an Australian context. Since the cost of trading differs across markets, providing out-of-sample (non-U.S.) evidence on trading costs represents an important contribution to the literature.[2] The paper considers the issue in the context of small-cap equities. These securities are less liquid than larger stocks, have lower analyst following, and are more sensitive to trading activity by institutional investors. Of further significance is the fact that this segment of the industry has experienced significant growth in assets under management, combined with superior investment performance even after management fees (Chen *et al.*, 2004). Keim (1999) provides analysis for Dimensional Fund Advisors using a U.S. case study for a passively managed small companies fund targeting the CRSP 9-10 Index. Keim (1999) finds that this fund

[1] Examples include Keim (1999) and Wermers (2000).

[2] Chiyachantana *et al*. (2004) and Domowitz *et al.* (2001) analyse costs across countries and find that trading costs vary across regions. Keim and Madhavan (1997) find that costs differ substantially across dealer versus order driven markets. Since ASX is purely an electronic order driven market where no market makers are involved, it provides an interesting contrast to the dealer driven markets of the U.S.

successfully executes investment rules that avoid excessive transaction costs from trading in less liquid stocks. This is achieved by sacrificing tracking error accuracy in index replication, such that the fund operates with reduced demand for trade immediacy.

According to the Morgan Stanley Capital International (MSCI) Small-Cap index, the Australian small-cap market is the fifth largest small-cap market in the world.[3] No known study assesses the cost of transacting for Australian small-cap funds. International evidence on small-cap funds is sparse.[4] This analysis is particularly timely, given the increased popularity of investment in small-cap funds (Elfverson, 2002).[5] Whilst comprising only a small proportion of the overall Australian market, small-cap equities (benchmarked to the S&P/ASX Small Ordinaries Index) have significantly outperformed the general market, commonly generating a return of almost 40% throughout 2003.[6] As such, small-cap stocks provide an important alternative investment choice to the largest 100 stocks listed on the Australian market. Analysis of small-cap funds is also of theoretical interest, since the cost of trading has surfaced as an important explanation of the observed small-firm effect (Aitken and Ferris, 1991)

Employing a unique dataset, this paper evaluates the transaction costs incurred by twelve actively managed small-cap equity funds offered to institutional investors, which are operated by nine fund managers. Based on the value of funds under management, this

[3] According to the general MSCI index, the entire Australian market ranks lower being the ninth highest ranking in the world. Morgan Stanley Capital International is a leading provider of global indices.
[4] International studies examining small-cap funds include Keim (1999), Gorman (2003) and Otten and Bams (2002).
[5] There is evidence that the demand for this type of investment is exceeding supply in the Australian market, with a number of prominent managers closing funds to new investment.
[6] "Small but sweet returns lure funds" Shauna Black 24 April 2004 The (Adelaide) Advertiser

sample represents more than 55% of the Australian wholesale small-cap funds market. Having concentrated interest in small-capitalisation (less liquid) stocks relative to other funds, it is expected that the trading costs incurred by small-cap funds will be significantly higher than those reported in previous investigations of trading costs on the Australian Stock Exchange (ASX) (Aitken and Frino (1996) and Comerton-Forde *et al*. (2005)).

This paper also extends existing literature by examining the role of fund status on trading costs. Assessment of this issue is motivated by recent industry speculation that the performance of a fund deteriorates with size, beyond some optimal point, with higher costs of trading accounting for the decline in future performance (Fechner, 2004). It is conjectured that in the event of closure, fund sales are more likely liquidity-driven, since sale transactions become a more significant source of fund liquidity that is required for client redemptions and portfolio rebalancing.

The remainder of this paper is organised as follows. Section 2 highlights the relevant institutional details of the small-cap equity industry in Australia. Section 3 describes the unique dataset of small-cap equity transactions and outlines the research design employed. Section 4 reports and discusses the empirical results and the final section concludes.

2. INSTITUTIONAL DETAILS

2.1 The Australian Equities Market

A range of benchmarks are provided to the Australian equity market by Standard and Poor's (S&P). The S&P/ASX 100 comprises the largest 100 stocks that trade on ASX based on both market capitalisation and liquidity considerations. The majority of ASX market capitalisation (75%) is concentrated in these stocks. The Small Ordinaries Index comprises stocks that are included in the S&P/ASX 300 index but not in the S&P/ASX 100. This is the widely accepted definition of Australian small-cap stocks.[7] In June 2004, the number of domestic companies quoted on ASX was 1,459. A large proportion of these stocks (all excluding the largest 300 stocks) might be defined as micro-caps. As such, micro-caps account for a higher proportion (18%) of total market capitalisation than small-caps (7%), but this is simply a result of the large number of stocks (1159) included in the micro-cap segment.

Whilst small-cap stocks represent only a small proportion of the market by capitalisation, they provide an important investment alternative to ASX 100 stocks, whilst maintaining a sufficient level of liquidity. Unlike ASX 100 stocks, Small Ordinaries stocks are less concentrated in the financials sector and offer investors exposure to a wider range of industry sectors including materials, industrials, and consumer discretionary categories. Small-Ordinaries securities possess a reasonable level of trading activity to mitigate illiquidity problems associated with micro-cap stocks. Table 1 reports the trading activity

[7] Whilst the Small Ordinaries definition implies the presence of 200 stocks in the index, at one given time this can range from 150-200 stocks.

of Small Ordinaries stocks relative to ASX/S&P 100 stocks and a micro-caps proxy, over the periods June 2001 to June 2004 and June 2003 to June 2004. The trading volume and trade frequency of small-cap stocks has increased over the period 2001 to 2004. For example, the average trade volume of a typical Small Ordinaries stock was 470,263 over the period June 2001 to June 2004, whilst it averaged 690,594 when measured over the period June 2003 to June 2004. Over the period June 2003 to June 2004, the average daily trade frequency of a typical Small Ordinaries stock is almost a quarter of the daily trade frequency of a typical S&P/ASX 100 stock, and more than three times the size of the micro-cap proxy.

<Insert Table 1 here>

2.2 The Small-cap Fund Universe

All Small-cap equity funds in Australia are actively managed. Analysing the prospectuses of these funds, most institutions define their investment scope as including all stocks within the Small Ordinaries Index. According to InvestorWeb, 32 funds comprise the small-cap wholesale funds management industry, and these are managed by 24 unique managers. Based on ASSIRT figures, the total value of funds under management in small-cap equities is $4,203 million as at June 2004.[8] Management fees vary among the funds, ranging from 0.53% to 1.65% per annum. Typically, most institutional small-cap equity funds close by the time they obtain $500 million in funds under management, or approximately 1% of the value of the Small-cap market (Fechner, 2004).

[8] Where retail small-cap funds are included, ASSIRT figures demonstrate that the total small-cap fund industry value based on funds under management is around $6 billion.

3. DATA AND RESEARCH METHOD

3.1 Data

Data on the aggregate daily trades of 12 actively managed small-cap funds (operated by nine different managers) are obtained from the *Portfolio Analytics Database*. The total value of assets under management by these funds is $2,373 million at June 2003 which means that these funds account for over 55% of the small-cap equities universe. In order to ensure representativeness of our sample relative to all small-cap equity managers operating in the market, unreported results indicate that the performance of managers in this paper do not perform differently to managers across the entire industry.

The data comprising the *Portfolio Analytics Database* are collected directly from each fund manager. Provision of this data is granted on the basis that the identity and trading records of each investment manager remains confidential. The data spans a seven and a half year period from October 1996 to March 2004.[9] The complete dataset contains 49,056 observations, representing aggregated daily transactions for each fund manager. Of these, 28,399 are purchases and 20,657 are sales. Each observation contains several fields indicating the dates on which trades took place, the identity of the stock traded, the volume of the stock traded, the direction of trade, the volume weighted average price (VWAP) of all trades by the specified manager in the specified stock on a particular day, and the identity of the broker executing the trade.

[9] Not all funds provided data for this entire sample period, but usually for a subset of this period. The average duration of data provided by these managers is 4.3 years.

ASX SEATS stock price data are obtained from Securities Institute Research Centre of the Asia-Pacific (SIRCA). These data contain detailed daily information about each stock in the Australian market, including opening and closing prices, the daily high and low prices, bid ask spreads and daily trading volumes. For each stock traded by a fund manager on a given day, the relevant price data are matched for each stock. In order to adjust prices for market wide movements, the daily opening and closing values for the All Ordinaries Index and the Small Ordinaries Index are also collected.

3.2 Trade packages

Institutional investors are often break up their orders into multiple trades, spanning several (and not necessarily adjacent) days, in order to disguise their trade execution and therefore avoid excessive market impact costs. Therefore, it is important to distinguish between data reflecting the initial desired order and the actual trades executed. The dataset used in this paper does not contain information about the institution's desired transaction quantity at the time of making an order. However, such information might be implied by *ex post* observations of desired quantity. Chan and Lakonishok (1995) suggest a trade 'packaging' methodology, where individual trades in a stock are aggregated to the order level by combining trades that occur in a specific stock on adjacent days. They propose a five day gap definition. This means that all trades in one particular stock on consecutive days are taken to be part of the same package until no trades are executed in the stock for five consecutive days. This definition is applied to the dataset, resulting in 14,391 observations. These packages form the basis of all analysis of transaction costs. The sensitivity of the method to the time period used (e.g. five days, six days) is also analysed in order to ensure the results are not contingent on the time period chosen.

3.3 Benchmark measures of price impact

Consistent with extant literature the following benchmark measures of price impact are employed:

$$PI_{total} = \ln\left(\frac{price}{open}\right) \quad (1)$$

$$PIt_{emporary} = \ln\left(\frac{price}{close}\right) \quad (2)$$

$$PI_{permanent} = \ln\left(\frac{close}{open}\right) \quad (3)$$

$$PI_{VWAP} = \ln\left(\frac{price}{VWAP}\right) \quad (4)$$

Where PI_{total}, $PI_{temporary}$, $PI_{permanent}$ and PI_{VWAP} represent total, permanent, temporary and VWAP measures of price impact. *price* is the volume weighted price of trades executed within the trade package. *open* is the opening price on the first day of the package. *close* is the closing price on the last day of the package. *VWAP* is the average volume weighted price of the underlying stock on the days that the package is executed.

3.4 Determinants of price impact

In order to assess the determinants of price impact, the following regression model is estimated:

$$PI = \alpha + \beta_1 explicit + \beta_2 lnmcap + \beta_3 \frac{1}{P_i} + \beta_4 lnTrComp + \beta_5 Vol + \beta_6 lnDuration + \beta_7 D_i Broker + \beta_8 D_i Manager + \varepsilon_i \quad (5)$$

Where *PI* in the model refers to the relevant price impact measure. *explicit* is the total brokerage fees paid by a manager for each package, *lnmcap* is the natural logarithm of market capitalisation of the stock, and $1/P_i$ is the reciprocal of the average weighted price

of the package. *lnTrComp* refers the natural logarithm of the ratio between the volume traded in the package over the average daily trading volume forty days before the package begins. *Vol* refers to the standard deviation of the stock returns and proxies volatility. *lnDuration* is the natural logarithm of the number of days it takes to complete a package. D_i*Broker* is a dummy variable which takes the value of 1 if the package engaged multiple brokers and 0 if the package engaged a single broker. D_i*Manager* is a dummy variable for the identity of each fund manager.

As an extension of the basic model, manager identity is decomposed into several explanatory factors in the following model:

$$PI = \alpha + \beta_1 \exp licit + \beta_2 \ln mcap + \beta_3 \frac{1}{P_i} + \beta_4 \ln TrComp + \beta_5 Vol2 + \beta_6 \ln Duration + \beta_7 D_i Bro\ker + \beta_8 Size + \beta_9 DiStatus + \beta_{10} D_i Style + \varepsilon_i \quad (6)$$

Size refers to the average size of the fund in the month the trade package is executed. D_i*Status* is a dummy variable for status of the fund taking on the value of 1 if the package was traded whilst a fund was closed and 0 if the package traded whilst the fund was open. D_i*Style* refers to the fund's investment style, which is decomposed into four categories GARP (growth at a reasonable price), growth, style neutral and value.

4. RESULTS

4.1 Descriptive statistics

Table 2 reports descriptive statistics for the trade packages that are generated using the 'five day gap' definition.[10] Fifty eight percent of packages are purchases whilst 42% are

[10] Not all of the fund manager's individual trades are packaged. About 15% of the sample are omitted due to managers reporting transactions prices that are either not within the high/low prices reported for the

sales. For both purchases and sales the frequency of packages traded in Small Ordinaries stocks is approximately 67%. Packages trading S&P/ASX100 stocks account for approximately 10% of the remaining transactions, indicating that approximately 23% of package trades are in micro-cap stocks. For both purchases and sales, around 30% of trades are conducted using multiple brokers. This is consistent with Chiyachantana *et al.* (2004) which illustrates that the engagement of multiple brokers is common, where an average number of brokers per decision is 1.3. Jones and Lipson (2001) argue the use of several brokers in trade execution is evidence of managers 'working' an order, in a similar fashion to breaking up an order and executing it over several days.

The sample includes packages in over 500 different stocks over the seven and a half year sample period. These stocks are sorted into size quartiles, each year, based on average market capitalisation. A breakdown of the size classification by market capitalisation appears in Panel B of Table 2. The average size of stocks in the smallest quartile is 37 (32) million dollars for purchases (sales) and the average size of stocks in the largest quartile is 947 (968) million dollars for purchases (sales).

<Insert Table 2 here>

Consistent with Chan and Lakonishok (1995), package value is an increasing function of stock size. For purchases, the mean package value for the smallest market capitalisation quintile is $165,000, whilst the mean package value for the highest market capitalisation quintile is $420,000. Similarly, for sales, the mean package value for the smallest market

stock in a given day, or because there was no transaction in the stock on the day that the manager claimed to have traded it.

capitalisation quintile is $144,000, whilst the mean package value for the highest market capitalisation quintile is $503,000.

Panel D of Table 2 reports descriptive statistics for package size relative to normal trading volume. For packages in the smallest capitalisation stocks, this ratio is in excess of three (3.15 for purchases and 3.41 for sales) indicating that the fund manager is seeking to execute over three times the average daily trading volume of the stock. In contrast, packages in the highest capitalisation stocks typically execute around 0.40 times the typical trading volume of the respective stock. These observations are consistent with Chan and Lakonishok (1995) who, for example, find that the ratio of package size to trading volume for the smallest stock is 3.24 whilst for the largest stocks is 0.69.

Panel E of Table 2 reports the average daily trade volatility, where volatility is measured as the natural logarithm of the ratio of the high and low prices in a stock on a particular day. The mean volatility for purchases (sales) is 0.039 (0.042) for the stocks in the smallest market capitalisation category. In contrast, the volatility of purchases (sales) for the stocks in the highest market capitalisation category is 0.017 (0.017). As such, volatility is a decreasing function of stock size.

4.2 The Behaviour of Stock Prices Surrounding Trade Packages

Analysis of the behaviour of stock prices surrounding trade packages is useful in understanding the conditions under which managers choose to initiate trades, as well as the impact of such trades. Figure 1 illustrates the average cumulative price returns surrounding the trade packages. These returns are measured at various time intervals

before, during and after the package. Consistent with extant literature, returns are presented on a principal-weighted and equal-weighted basis for both purchases and sales. Principal-weighted measures are weighted by package value.

<Insert Figure 1 here>

Principal-weighted returns and equal-weighted returns generally exhibit similar patterns for purchases. Figure 2 demonstrates that the overall price increase is in excess of 2.5% throughout the analysis period for both measures. A notable exception is the period before the package is executed. The principal-weighted measure reports a slight increase (0.001%) in prices whilst the equal-weighted measure reports a decline of 0.22%. This trend is also reported by Chan and Lakonishok (1995), who argue that this difference might be explained by managers requiring a stronger confirmation of performance (higher previous return) before initiating larger purchase packages. Further, the desire to trade stocks that have been performing well is reflective of momentum trading strategies.

Figure 2 exhibits a clear pattern of price increases in advance of sales with both the principal-weighted and equal-weighted measures reporting an increase in returns of 0.66% and 0.995% (respectively) leading up to trade in the package. This result is consistent with Chan and Lakonishok (1995). A likely explanation for this is that managers are selling stocks at a point where they believe that the stock is fully valued. The fact that returns of sales measured on an equal-weighted basis typically decline during a package, confirms this view. This trend is not observed in the case of the principal-weighted measure. Such an observation may reflect the fact that managers who initiate sales of smaller value packages are more information driven than those initiating

the sale of larger value packages. Whilst mean returns continue to rise after a sale, both on a principal and equal-weighted basis, the principal-weighted returns outperform the returns of the equal-weighted measure further indicating the possibility of greater information content in the sale of smaller packages.

This result regarding sales is contrary to general intuition, since one would expect that information would result in a desire to deal with larger volumes of a stock.[11] However, the justification for this is that package value represents the interaction of two distinct variables; price and volume. The trends presented for sales may be more indicative of price than volume, in that the sale of lower priced stocks is driven more by information than higher priced stocks. Easley, Kiefer, O'Hara and Paperman (1996) provide evidence of this, finding that trading based on private information is more common for infrequently traded stocks.[12] Whilst information events are less frequent (and perhaps less studied) for smaller stocks, these events have a greater impact on trading because, relative to frequently traded stocks, infrequently traded stocks get less interest from liquidity traders and hence the likelihood of trading with an informed trader is higher.

As illustrated in Figure 1, stock prices continue to rise following purchases, for both equal-weighted and principal-weighted measures. This is mainly indicative of

[11] Important theoretical models in the field of market microstructure have been built on the assumption that informed traders prefer to trade larger amounts of a security than smaller amounts. A notable example is the adverse information model of Easley and O'Hara (1987). At the heart of the model is that trade size is indicative of the level of information that a prospective trader possesses, with higher volumes indicating higher levels of information.

[12] Infrequently traded stocks are synonymous with lower market capitalisation stocks and hence lower priced stocks. Evidence of this is reported in Table 1 where a typical Small Ordinaries Index stock possessed only 16% of the trading frequency of a typical ASX 100 stock whilst a micro-cap stock possessed only 5%.

information. If only short-term liquidity effects were in play, one would expect a reversal of the upward trends in prices after a purchase package is completed (Chan and Lakonishok, 1995). The returns based on the principal-weighted measure increase by about 1.25% following a trade package. The returns increase for the equal-weighted measure is higher averaging at about 1.49%. The fact that the returns increase for the equal-weighted measure is higher than the principal-weighted measure is consistent with the argument that packages in lower priced stocks have greater information content. However, volume is also important in explaining the overall differences between these measures in the period surrounding a trade package. Overall, the returns using the principal-weighted measure for purchases are 0.71% higher than the equal-weighted measure. As previously discussed this is because active managers would be more willing to trade larger volumes when there is prior evidence of positive performance.

4.3 Price Impact Results

Panel A of Table 3 presents summary statistics for the four price impact measures used for the full sample. On a principal-weighted basis, the pre-execution (total) price impact measure for purchases averages 0.37%. Subsequent to the trade, the reported post-execution (temporary) impact is 0.30% and there is no reversal in returns following the trade package. This result is consistent with previous findings, which reports price continuation following a purchase. Chan and Lakonishok (1995) report price impact for purchases of 0.88% for the pre-execution measure and that prices continue to rise by 0.21% for the post execution measure. Aitken and Frino (1996) report price impact for purchases of 0.27% for the pre-execution measure and a continuation of 0.06% for the post-execution measure. Synonymous with the discussion in section 4.2, this result is

indicative of managers acting on information. Permanent price impact for purchases is substantial at 0.67% further supporting this view. A continuation for purchases is also observed using an equal-weighted measure. On an equal-weighted basis, total price impact is 0.04% and the temporary price impact is -0.34%.

<Insert Table 3 here>

Moreover, whilst total price impact on a principal-weighted average basis is 0.37%, sales exhibit similar price impact of 0.32%. This 'symmetry' between purchases and sales is uncommon, since studies usually document much smaller price impact for sales relative to purchases. Aitken and Frino (1996) find that the total cost for purchases on a principal-weighted basis is 0.27% whilst for sales it is 0.03%.[13] Chan and Lakonishok (1995) report that on a principal-weighted basis, the total price impact for purchases is 0.88% whilst for sales is 0.44%. Comerton-Forde *et al*. (2004) report that on a principal-weighted basis, the total price impact for purchases is 0.34%, whilst for sales is 0.16%. Most previous studies document smaller price impact for sales because they report substantial price reversal subsequent to the block trade, and much smaller permanent impact relative to purchases. Previous research has only found evidence of information for purchases, and has attributed the reversal observed for sales as trades that are not information motivated. These trades simply satisfy the liquidity needs of the manager (Chan and Lakonishok, 1995).

On a principal-weighted basis, there is some evidence of price reversal subsequent to a sale. As a result of this reversal, on a principal adjusted basis, sales incur much smaller

[13] One should note that the results of Aitken and Frino (1996) are not directly comparable to the results of this paper as Aitken and Frino analysed trades at the transaction level without employing any packaging methodology. As such their results are likely to underestimate costs (Chan and Lakonishok, 1995).

permanent impact costs (0.19%) relative to purchases (0.67%). These results imply that sales are far more liquidity driven than purchases. However, the results for sales using the equal-weighted measure provide an interesting contrast to these findings. On an equal-weighted basis, the mean total price impact for sales is 0.41% whilst the mean temporary price impact is 0.11%. This suggests that sale packages also exhibit price continuation.[14] Further, on an equal-weighted basis, permanent price impact costs for sales are higher than for purchases. For sales, permanent costs are 0.52% whilst for purchases, permanent costs are 0.38%. Clearly, this contrast between the results based on principal-weighted and equal-weighted means, indicates that the motivation for smaller value trade packages is far more related to information than to the liquidity needs of the manager. This finding is consistent with the discussion in section 6.2 regarding the post trade returns surrounding sale packages.

Whilst there are differences between the principal-weighted and equal-weighted measure, the substantially different magnitudes of total costs proposed by each measure detracts from the goal of producing a definitive conclusion of what the true cost of trading is for Australian Small-Cap fund managers. One measure has to be favoured over the other in order to obtain this conclusion, and it is likely that the results of the principal weighed measure are more indicative of price impact. This is because the theory of price impact

[14] These differences between the principal-weighted and equal-weighted mean results for sales are consistently found when using alternative gap-definitions for the design of the trade packages. In addition to the 5-day package definition used for this paper, 3-day, 7-day and 9-day gap definitions are examined, with all yielding similar trends in the results.

relies on price movement surrounding block trades indicating that smaller trades should have less weighting.[15]

Overall, the average round trip transaction cost of a package in this sample is 0.69% on a principal-weighted basis. These findings are economically significant. Based on the holdings of these fund managers, it is estimated that the average cumulative abnormal returns earned by these managers is 1.42% over a six month period (Chen *et al.*, 2004). This suggests that costs are large enough to offset a substantial proportion of the superior returns generated by these fund managers.[16] Further, as expected, these costs are higher than previously reported Australian findings. Aitken and Frino (1996) report execution costs of no greater than 0.30% for a round trip transaction. Since the institutions studied by these authors do not specialise in smaller capitalisation stocks, their costs of trading are lower since they would predominantly trade more liquid ASX100 stocks.

Panel B of Table 3 is presents the summary statistics for packages involving Small Ordinaries stocks only. If managers traded Small Ordinaries stocks exclusively, then their costs of trading is even higher, being 0.65% for purchases and 0.63% for sales. By taking occasional positions in larger stocks, managers are able to greatly reduce their average trading costs.

<Insert **Error! Reference source not found.** here>

[15] Whilst the price component of package value is fundamental to explaining the differences between principal-weighted and equal-weighted means, the volume component of package value is a far more relevant variable when deciding on the plausibility of cost magnitudes reported in each measure.
[16] The relative spread estimated for this sample is 1.05% for purchases and 0.92% for sales. For a round trip transaction this corresponds to costs of 1.97% indicating that total implicit costs (2.66%) are substantial.

4.4 Price Impact Determinants

The results presented in the previous section demonstrate that price impact costs, especially on a principal-weighted basis, are substantial for both purchases and sales. Table 4 analyses principal-weighted costs based on a number of package characteristics including size and trade complexity. As discussed in section 4.3, the purchase of Small Ordinaries stocks results in greater reported price impact than the entire sample. Further, the results in Table 4 indicate that purchases (or sales) of more liquid stocks (S&P/ASX 100 stocks) allow managers to reduce costs. On average, the managers appear to incur no costs (in fact substantial benefits) when they trade constituent stocks of S&P/ASX 100. As illustrated in Table 4, the total price impact of an ASX100 stock purchase is -1.09% whilst for a sale it is -0.84%; both results implying a benefit. This result is consistent with the discussion of Keim (1999) in that manager of small-cap funds face a trade-off between abiding by the fund's proposed investment scope (strictly Small Ordinaries Index stocks) and reducing costs by trading in larger cap stocks. These managers seem to be taking the role of liquidity provider when taking positions in larger-cap stocks incurring negative costs for these trades that offset the high costs of trading typically experienced with small-cap stocks.

<Insert Table 4 here>

The costs of trading stocks outside the S&P/ASX 100 Index and the Small Ordinaries Index are reported in Table 4 as 'Other'. From the discussion of Section 3.1, it is implied that this category represents the micro-cap sector. As such, it is expected that the overall costs of trading these stocks is higher than those reported for Small Ordinaries stocks. This is not observed. For example, the total price impact costs for purchases in the 'other'

category are 0.40% whilst they are 0.65% for Small Ordinaries stocks. A possible explanation for this observation is that given the strict criteria for S&P index classification, many stocks that have high market capitalisation and a reasonable level of liquidity are not included in these indices. In particular stocks that are newly listed on ASX, that have potential to be part of the ASX100 or Small Ordinaries Index, cannot be classified as such until a certain period of trading. This is because when a stock is newly listed experiences high levels of trading activity, and S&P needs time to evaluate whether this is a characteristic of the stock, or there is just abnormal trading activity surrounding the float. As such, the true definition of 'micro-cap' might not be synonymous with all the stocks in the 'Other' category of Table 4.

Table 4 also illustrates trends in price impact costs based on classification by market capitalisation of the stock underlying the package. The clear trend is that the highest capitalisation stocks possess substantially lower execution costs (in fact benefits) for both purchases and sales. For example, total price impact for purchases is 0.86% for the smallest capitalisation stocks, whilst it is -0.13% for the highest market capitalisation stocks. Similar results are obtained for trade complexity. The most 'complex' packages have incurred much higher price impact costs relative to the least complex. For example, total price impact for purchases is 0.82% for the most complex packages, whilst it is -0.18% for the least complex packages. Similar results are obtained for sales. These results suggest that total costs are inversely related to market capitalisation and are positively related to package complexity.

Table 4 also reports that the use of multiple brokers substantially increases costs for managers across all forms of price impact and for both purchases and sales. For example, sales utilising a single broker incur costs of 0.21% while those utilising multiple brokers incur much higher costs at 0.44%. Similarly, trades that take more than one day to execute incur substantially higher costs. For example the total cost is -0.05% for sales that are executed over one day, while they are 0.52% for packages executed over several days. These results are consistent with Chiyachantana *et al.* (2004) who find that the use of multiple brokers substantially increases price impact costs, as does the execution of trades over several days.

A more formal analysis of the above issues is conducted using equation 5. The results of this model are reported in Table 5. The regression model is estimated separately for both purchases and sales, and for the total and VWAP price impact measures. The adjusted R^2 of the OLS regression are reported in Panel A of Table 5. The range of adjusted R^2 reported is consistent with previous studies examining the determinants of price impact.[17] Further, Panel A illustrates that the full model specification is generally superior (higher adjusted R^2) to the exclusion of any variable from the model.

An analysis of the differences in the adjusted R^2 for each of the models indicates that manager identity and volatility are the key drivers of price impact for sales and manager identity is the key driver for purchases. For example, when manager identity is removed from the model examining the determinants of total impact costs for purchases, the

[17] Chiyachantana *et al.* (2004) typically find full model adjusted R^2 of 0.01 to 0.02. Chan and Lakonishok (1995) report adjusted R^2 of 0.06 to 0.08. In an Australian context, Comerton-Forde *et al*. (2005) report values of 0.05 to 0.09.

adjusted R^2 is reduced from 0.0671 to 0.0282. This is consistent with Chan and Lakonishok's (1995) finding that manager identity is a key driver of price impact. Volatility also has significant explanatory power for the total cost for sales. The exclusion of volatility from the model gives rise to a reduction in the adjusted R^2 from 0.1131 to 0.0736.

Panel B of Table 5 reports the coefficient and the significance of each variable in the full model. Consistent with Domowitz *et al.* (2001) where the coefficient for explicit costs is significant it is also positive for purchases, implying a positive relation between price impact costs and explicit costs. This relationship is insignificant for sales. The coefficient for market capitalisation is a negative function of stock size for total price impact costs, for both purchases and sales.

<Insert Table 5 here>

The coefficient of the reciprocal of price is positive and significant. This finding is consistent with Keim and Madhavan (1997). It implies that the higher the price of stock (the lower the reciprocal of price), the lower the costs of transacting. This is consistent with the finding that higher market capitalisation stocks are generally negatively related to costs as companies with larger market capitalisation typically have higher prices. Surprisingly the results suggest that trade complexity is generally insignificant. Only the total price impact for purchases exhibits a significant result, with price impact being negatively related to complexity. This result is at odds with the predicted positive relation between price impact and complexity from the results in Table 4. It is likely that the

relationship between trade complexity and price impact is influenced by the effects of other variables in the regression model.[18]

The results reported in Table 5 also indicate that volatility is positively and significantly related to total price impact for sales. This is consistent with the results presented by Chiyachantana *et al.* (2004).[19] However, it is surprising that volatility is not also a significant variable for purchases given that previous literature suggests that volatility is a dominant feature of smaller capitalisation stocks (Cheung and Ng, 1992).

Consistent with the mean statistics reported in Table 4, the regression results reported in Table 5 illustrate that costs are significantly and positively related to duration. This result is in line with Chiyachantana *et al.* (2004) who also find a positive coefficient for packages trading on multiple days. Further, the regression results reported in Table 5 confirm that the use of multiple brokers results in greater impact costs for purchases. However, contrary to the trends reported in Table 4 the use of multiple brokers seems to negatively impact on costs for sales.

Manager identity is decomposed into several factors to give some indication of the aspects of manager identity that are responsible for influencing costs. Table 6 reports regression results based on a regression model that decomposes manager identity into

[18] If the natural log of the trade complexity measure is not taken, then it is found that trade complexity positively relates to price impact even for sales. However, since the non-transformed variable is highly skewed, incorporation of the variable in its raw form is undesirable since it would promote heteroskedasticity in the model.

[19] This result is not sensitive to the proxy of volatility utilised in the regression model. The results are regenerated using the logarithm of the ratio of high to low prices as a proxy for volatility. The regression model using this alternative measure of volatility produces similar to those obtained using standard deviation of returns and therefore are not presented.

three factors; fund size, fund style and fund status. The key finding is that value managers possess relatively lower trading costs than growth orientated or style neutral managers. Value traders might behave more patiently taking time to submit their order and hence minimise their costs. This reasoning is similar to Keim and Madhavan's (1997) comparison of active versus index funds. The reported regression results demonstrate that value traders incur lower costs (negative coefficient) in comparison to growth and style neutral traders, who have higher costs.

The results of Table 6 illustrate that fund size, is negatively related to price impact implying that larger funds pay lower execution costs. This finding is at odds with theory that claims that the market impact of costs grow with increased assets under management, since managers are forced to trade larger positions in a stock (Christopherson *et al.*, 2002).

<Insert Table 6 here>

Given industry interest in the effect of small-cap fund closure on performance, the relationship between fund status and trading costs is formally investigated. This is motivated by the number of institutional small-cap providers who have strategically decided to close their funds to new money, citing potential future difficulties in their size eroding investment returns. The regression results in Table 6 report that fund status is important for sales. The total price impact of sales is negatively associated with closure. That is, closed funds exhibit lower total price impact. Sales are particularly important for closed funds, as they provide the only source of liquidity to provide for fund redemptions and the purchase of new stocks. In addition, closed funds may be required to trade more

extensively following a large redemption, such that the portfolio's composition and tracking error best reflects the investment objectives set by the fund manager. This suggests that sales for closed funds are more likely to be liquidity driven than for open funds. These results suggest fund status may be an important driver of the price impact asymmetry between purchases and sales that is commonly observed in extant literature.

5. CONCLUSION

This paper makes several contributions to the literature examining institutional trading costs. The research provides out-of-sample (non-U.S.) evidence on the costs of trading, whilst addressing an important and increasingly popular asset class – small-cap equities. Employing a representative sample of actively managed small-cap equity funds that are available to wholesale investors, this paper analyses the trades of twelve institutions over the period October 1996 to March 2004. The results indicate that manager trading costs are substantial, with the average cost of a round-trip transaction being 0.69% on principal-weighted basis. This result is economically significant, since the average cumulative abnormal return for small-cap funds is estimated to be 1.42% over a six-month period, on a holdings basis (Chen *et al.*, 2004). This implies that if a manager were to purchase a stock, and to subsequently sell the stock after 6 months, the portfolio is likely to incur a net return of 0.73% above the S&P/ASX Small Ordinaries benchmark. In other words, almost half of the excess performance is eroded by market impact costs.

The paper also isolates the costs associated with trading Small Ordinaries stocks only. On a principal-weighted basis, total price impact averaged 0.65% for purchases and -0.63% for sales, implying a round-trip transaction cost of 1.27%. This suggests that the

overall transactions costs incurred by small-cap managers are reduced by the fact that they trade stocks outside their specified investment universe.

Consistent with previous literature, liquidity and manager identity are found to be important determinants of transaction costs. However, volatility has a stronger impact on the results for sales than prior studies. This is to be expected since lower priced small stocks are commonly associated with higher volatility of returns (Cheung and Ng, 1992). Price impact costs are positively related to duration, with trade packages taking multiple days to execute incurring higher costs. The investment style of active small-cap equity managers also influences costs, with the more patient value style of managers incurring much lower transaction costs than growth managers.

This paper also extends the literature by testing the effect of fund status on price impact. Fund closure has become an important consideration in this segment of the Australian market, and is supported by recent evidence in the U.S. and Australia that fund size erodes investment performance (Chen *et al.*, 2004 and Chan *et al.*, 2004). The results of this paper highlight significant differences in the price impact composition of closed and open funds. Further, the sales of closed funds appear to be more motivated by liquidity than open funds. The asymmetry between purchases and sales for closed funds is also larger. As such, fund status is an important driver of the price impact asymmetry between purchases and sales, in this sample. Future research should examine this issue more closely by determining the timing decision and performance benefits from altering an open fund's status.

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Figure 1: Cumulative Returns Around Institutional Trade Packages

Figure 1 reports the average cumulative price returns of a trade package, before, during and after the package. Returns are measured at the time intervals indicated; from 20 days before the start of the package to five days before the package, for five days before the package until a day before the package, from a day before the package until the opening price on the first day of the package, from the opening price on the first day of the package until the closing price on the last day of the package, from the closing price on the last day of the package to closing price a day after the package, from the closing price a day after the package to the closing price five days after the package, from five days after the package to 20 days after the end of trading in the package. Returns are presented on a principal-weighted and equal-weighted basis for both purchases and sales. Principal-weighted measures are weighted by package value.

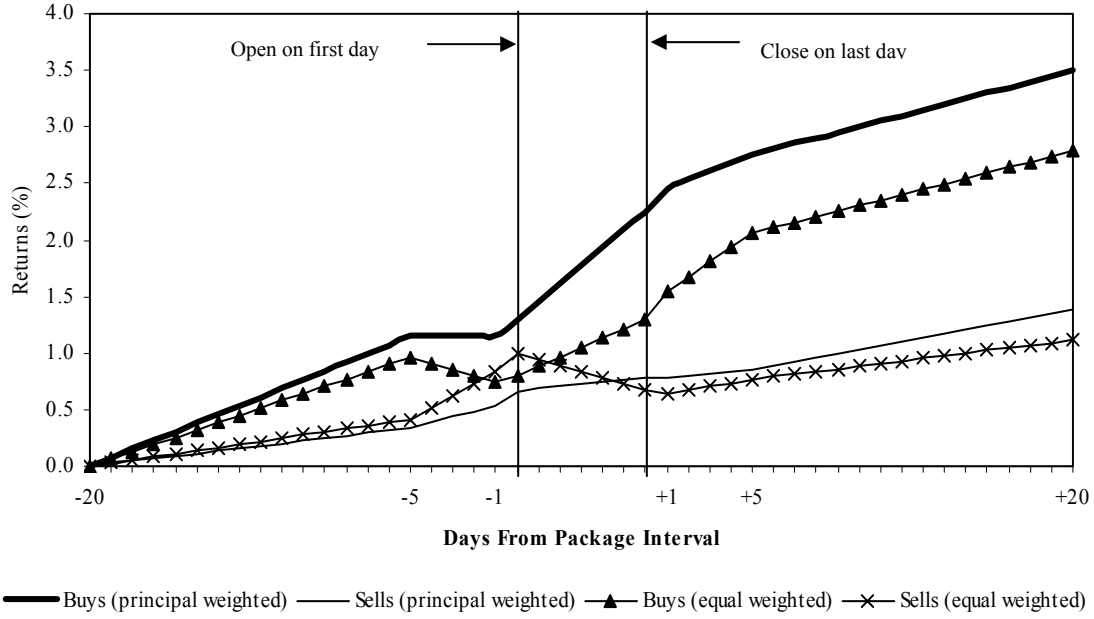

Table 1: The Relative Trading Activity of Small-Ordinaries Stocks

Data on the trading activity of Small Ordinaries, S&P/ASX 100 and micro-cap stocks is collected on a quarterly basis. There is no index that captures the micro-cap sector on the ASX, therefore this sector is proxied by the All Ordinaries stocks minus the S&P/ASX 300 stocks. This results in the largest 200 (and possibly most liquid) micro-cap stocks being included in this category. The reported variables include the average daily value traded, the average daily trade volume, the average daily trade frequency and the average daily off-market volume for a typical stock in each category. All results are reported over a four year period from June 2001 to June 2004 and a one year period from June 2003 to June 2004.

	June 2001 to June 2004				**June 2003 to June 2004**			
	Avg. Daily Value Traded ($)	Avg. Daily Trade Volume	Avg. Daily Trade Frequency	Off-Market Volume	Avg. Daily Value Traded ($)	Avg. Daily Trade Volume	Avg. Daily Trade Frequency	Off-Market Volume
ASX 100	13,104,576	2,110,604	353	763,445	15,967,542	2,671,994	402	924,851
Small Ords	543,784	470,263	58	161,513	803,995	690,594	70	214,260
Microcaps	181,111	259,298	16	38,144	264,405	461,919	22	66,913

Table 2: Descriptive Statistics for Trade Packages using a 'Five day Gap' Definition

Trade packages are generated using a 5-day gap definition, which assumes that all adjacent trades in a stock by one manager are part of one large order until the stock is not traded by the manager for five consecutive days or more. Panel A reports the frequency of packages for buys and sells. Panel B gives a break down of the size classification of the stocks traded in the packages for both buys and sells. The smallest stocks are denoted as 1 whilst the largest stocks are denoted as 4. Panel C reports summary statistics for the dollar value of packages based on this size classification. Panel D reports the package size relative to normal trading volume. Normal trading volume is defined as the average daily volume of a stock over 40 days before the package. Panel E reports summary statistics for the average daily volatility of package traded stocks. Volatility is defined as the natural logarithm of the ratio of the high and low prices in a stock on a particular day. The average of the volatility of the stock on the beginning date of the package and on the end date of the package is taken to obtain the average daily volatility measure.

Panel A: Frequency of Packages										
	Purchases					**Sales**				
All Stocks	8,323					6,068				
Small Ord Stocks	5,457					4,110				
ASX 100 Stocks	701					579				
Multiple Brokers	2,497					1,876				
		(Small)			**(Large)**	**All**	**(Small)**			**(Large)**
	All Buys	**1**	**2**	**3**	**4**	**Sells**	**1**	**2**	**3**	**4**
Panel B: Breakdown of Size Classification by Market Capitalisation (Millions)										
n	8,323	325	1,360	3,351	3,287	6,068	303	865	2,462	2,438
Mean	518	37	110	309	947	539	32	113	325	968
SD	605	17	48	118	769	576	27	53	123	694
Q1	191	27	76	220	613	200	20	74	226	642
Median	378	36	101	290	784	416	30	104	310	847
Q3	675	48	136	391	1,070	745	40	148	420	1,080
Panel C: Dollar Value of Packages (Thousands)										
n	8,323	325	1,360	3,351	3,287	6,068	303	865	2,462	2,438
Mean	364	165	294	358	420	398	144	288	365	503
SD	625	264	431	643	688	758	194	494	636	951
Q1	65	27	49	63	81	64	26	35	59	97
Median	162	87	145	155	183	164	75	111	149	218
Q3	394	176	349	379	444	420	170	304	388	547
Panel D: Package Size Relative to Normal Trading Volume										
n	8,136	302	1,316	3,279	3,239	5,941	277	833	2,426	2,405
Mean	0.93	3.15	1.97	0.83	0.40	0.90	3.41	1.97	0.76	0.37
SD	3.31	12.93	3.53	1.96	1.35	2.30	5.65	3.84	1.53	0.77
Q1	0.08	0.35	0.28	0.11	0.05	0.07	0.48	0.19	0.08	0.05
Median	0.25	1.03	0.80	0.28	0.13	0.22	1.34	0.62	0.24	0.13
Q3	0.79	3.00	2.24	0.81	0.34	0.74	3.86	2.13	0.79	0.35
Panel E: Average Daily Volatility										
n	7,899	259	1,198	3,224	3,218	5,793	225	782	2,375	2,411
Mean	0.020	0.039	0.025	0.019	0.017	0.020	0.042	0.028	0.019	0.017
SD	0.018	0.051	0.022	0.014	0.013	0.020	0.042	0.025	0.017	0.014
Q1	0.010	0.018	0.011	0.010	0.009	0.009	0.016	0.013	0.010	0.009
Median	0.015	0.029	0.019	0.016	0.014	0.015	0.030	0.021	0.015	0.013
Q3	0.024	0.046	0.031	0.023	0.020	0.024	0.049	0.035	0.022	0.019

Table 3: Summary Statistics for Price Impact Measures

Summary statistics (means, standard deviation, and quartiles) for four price impact measures are presented here for both purchases and sales. *Total* refers to total price impact and is the logarithmic return from the opening price on the first day of the package to the weighted average price of the package. *Temp* refers to temporary price impact and is the logarithmic return from the closing price on the last day of the package to the weighted average price of the package. *Perm* refers to permanent price impact and is the logarithmic return from closing on the last day of the package to the opening price on the first day of the package. *VWAP* is the logarithmic return from average volume weighted price of the stock on the days a package traded, to the volume weighted average price of the package. Panel A reports summary statistics including the principal-weighted average measure (weighted by package value) for the full sample of stocks. Panel B reports the same results for Small Ordinaries Stocks Only.

	Purchases				Sales			
Statistics	**Total**	**Temp**	**Perm**	**VWAP**	**Total**	**Temp**	**Perm**	**VWAP**
				Panel A: Full sample				
Principal-weighted	0.37	-0.30	0.67	0.04	-0.32	-0.13	-0.19	0.03
Mean	0.04	-0.34	0.38	0.05	-0.41	0.11	-0.52	0.07
SD	3.39	2.73	4.79	4.11	4.67	3.27	6.66	3.68
Q1	-1.09	-0.93	-1.22	-0.27	-1.31	-0.49	-1.65	-0.32
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q3	1.11	0.38	1.76	0.31	1.06	0.54	1.40	0.24
				Panel B: Small Ordinaries Stocks Only				
Principal-weighted	0.65	-0.30	0.95	-0.01	-0.63	0.19	-0.82	0.00
Mean	0.08	-0.32	0.40	0.01	-0.51	0.21	-0.72	-0.03
SD	3.77	3.26	4.66	3.63	4.32	3.16	6.50	1.01
Q1	-0.99	-0.92	-1.16	-0.26	-1.38	-0.44	-1.77	-0.34
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Q3	1.22	0.39	1.87	0.32	0.89	0.60	1.21	0.24

Table 4: Package Characteristics and the Cost of Trading

Principal-weighted average costs of trading are reported for both purchases and sales. A positive figure denotes a cost, whilst a negative denotes a benefit. *Total* refers to total price impact and is the logarithmic return from the opening price on the first day of the package to the weighted average price of the package. *Temp* refers to temporary price impact and is the logarithmic return from the closing price on the last day of the package to the weighted average price of the package. *Perm* refers to permanent price impact and is the logarithmic return from closing on the last day of the package to the opening price on the first day of the package. *Vwap* is the logarithmic return from average volume weighted price of the stock on the days a package traded, to the volume weighted average price of the package. Costs are reported based on the type of stock that was traded, whether they were a constituent of the Small Ordinaries Index or the S&P/ASX100. The 'Other' category represents average costs for stocks that are not included in either of these two indices – typically micro-caps. Costs are reported based on the market capitalisation classification of the stock underlying the package. The smallest stocks are denoted as 1 whilst the largest stocks are denoted as 4. Costs are reported based on the trade complexity of the package defined as the logarithmic ratio of the package trade volume to the average trading volume 40 days prior to the beginning of the package. Costs are reported based on package duration, whether the package was executed over a single day or over several days. Costs are reported based on the number of brokers executing the package; whether the package was executed by a single broker, or several brokers.

		Purchases				Sales			
Package Characteristics		**Total**	**Temp**	**Perm**	**VWAP**	**Total**	**Temp**	**Perm**	**VWAP**
Stock	**Small Ords**	0.65	-0.30	0.95	-0.01	0.63	-0.19	0.82	0.00
	ASX100	-1.09	0.94	-2.03	0.02	-0.84	0.93	-1.76	-0.11
	Other	0.40	-0.98	1.38	0.20	0.21	0.65	-0.44	-0.07
Market Cap	**1(smallest)**	0.86	-1.27	2.13	-0.05	1.17	-0.22	1.39	-0.42
	2	0.90	-1.12	2.02	0.26	2.34	-0.39	2.73	0.28
	3	0.75	-0.77	1.52	-0.17	0.39	0.12	0.27	-0.06
	4(largest)	-0.13	0.39	-0.53	0.18	-0.17	0.26	-0.43	-0.06
Trade Complexity	**1(least)**	-0.18	-0.10	-0.09	0.02	-0.18	0.10	-0.28	-0.01
	2	-0.05	-0.19	0.14	-0.04	-0.17	0.26	-0.42	0.00
	3	-0.36	-0.19	-0.17	-0.10	-0.11	0.22	-0.33	0.07
	4(most)	0.82	-0.39	1.20	0.13	0.65	0.08	0.57	-0.08
Single vs Multiple Days	**Single**	-0.32	-0.50	0.18	-0.25	-0.05	0.11	-0.17	-0.05
	Multiple	0.68	-0.21	0.88	0.17	0.52	0.15	0.37	-0.02
Single vs Multiple Brokers	**Single**	-0.21	-0.36	0.15	-0.19	0.21	0.03	0.18	0.00
	Multiple	0.89	-0.24	1.13	0.25	0.44	0.24	0.20	-0.06

Table 5: The Determinants of Price Impact

Table 5 reports the regression results for two measures of price impact based on the following model:

$$PI = \alpha + \beta_1 \exp licit + \beta_2 \ln mcap_i + \beta_3 \frac{1}{Pi} + \beta_4 \ln TrComp_i + \beta_5 Volatility + \beta_6 \ln Duration + \beta_7 D_i Bro\ker + \beta_8 D_i Manager + \varepsilon_i$$

Where *explicit* is the total brokerage fees paid by a manager for each package, *lnmcap* is the natural logarithm of market capitalisation of the stock, and $1/P_i$ is the reciprocal of the package weighted average price. $lnTrComp_i$ refers the natural logarithm of the ratio between the volume trading in the package over the average normal trading volume in the package five days before the package begins. *Volatility* refers to the standard deviation of the stock returns and proxies volatility. *lnDuration* is the natural logarithm of the amount of days it takes to complete a package. $D_i Broker$ is a dummy variable which takes the value of 1 if the package engaged multiple brokers and 0 if the package engaged only one. $D_i Manager$ is a dummy variable for the identity of each fund manager. Panel A reports the adjusted R^2 for each price impact measure for the full model, and when each variable is excluded from the model. Panel B reports the coefficients of the full model for each price impact measure, as well as the statistical significance of each measure. The reported *F*-stat statistics and the significance levels are based on running the regression with robust standard errors to account for heteroskedasticity.

	Purchases		Sales	
	Total	**VWAP**	**Total**	**VWAP**
Panel A: Model's Adjusted R^2 (%)				
Full Model	6.71	0.60	11.31	1.14
Ex. Explicit	6.54	0.60	11.32	1.12
Ex. Mcap	6.65	0.57	11.22	0.74
Ex. 1/P	6.48	0.61	10.97	1.13
Ex. Tcomp	6.40	0.62	9.63	1.00
Ex. Volatility	6.66	0.60	7.36	1.15
Ex. Duration	6.38	0.43	10.30	1.12
Ex. Brokers	6.65	0.60	11.13	1.11
Ex. MgID	2.82	0.41	9.45	0.54
Panel B: Significance of Each Variable				
Constant	2.66 ***	1.71	3.06 *	-5.47 *
Explicit	0.07 ***	0.02	0.02	0.04 *
Mcap	-0.12 **	-0.13	-0.18 ***	0.30 *
1/P	0.21 ***	0.04	0.17 *	0.04
TrComp	-0.09 ***	-0.02	0.03	-0.01
Volatility	-5.54	-3.10	53.76 ***	-0.48
Duration	0.28 ***	0.26 ***	0.69 ***	-0.10
Brokers	0.26 **	0.13 **	-0.60 ***	-0.21
Manager ID				
Mgr 11	-0.36 *	0.76 ***	-0.29	-0.56 ***
Mgr 15	-1.16 ***	0.45 **	-1.11 ***	-0.23
Mgr 18	-1.41 ***	0.22	0.12	-0.53 **
Mgr 19	-2.15 ***	0.34	-1.70 ***	-0.72 ***
Mgr 20	-0.89 ***	0.22	0.20	-0.24
Mgr 29	-0.56 ***	0.56 ***	-0.12	-0.53 ***
Mgr 36	-0.94 ***	0.62 ***	4.29	4.07
Mgr 38	-0.41	0.66 **	-0.10	-0.24
F-statistic	34.9 ***	5.3 ***	20.07 ***	8.45 ***

***, **, and * indicates significance at the 1%, 5% and 10% level, respectively.

Table 6: Decomposition of Manager Identity in the Regression Model

Table 6 reports the regression output two different measures of price impact based on the following model:

$$PI = \alpha + \beta_1 \exp licit + \beta_2 \ln mcap_i + \beta_3 \frac{1}{Pi} + \beta_4 \ln TrComp_i + \beta_5 Volatility + \beta_6 \ln Duration + \beta_7 D_i Bro\ker + \beta_8 Size + \beta_9 D_i Status + \beta_{10} D_i Style + \varepsilon_i$$

Where *explicit* is the total brokerage fees paid by a manager for each package, *lnmcap* is the natural logarithm of market capitalisation of the stock, and $1/P_i$ is the reciprocal of weighted average package price. $lnTrComp_i$ refers the natural logarithm of the ratio between the volume trading in the package over the average normal trading volume in the package forty days before the package begins. *Volatility* refers to natural logarithm of the high and low price of the stock on the starting date of the package and proxies volatility. *lnDuration* is the natural logarithm of the amount of days it takes to complete a package. $D_i Broker$ is a dummy variable which takes the value of 1 if the package engaged multiple brokers and 0 if the package engaged only one. *Size* refers to the average annual size of the fund based on monthly values. $D_i Status$ is a dummy variable for status of the fund taking on the value of 1 if the package was traded whilst a fund was closed and 0 if the package traded whilst the fund was open. D_i *Style* refers to the fund's style which is decomposed into four categories GARP (growth at a reasonable price), neutral and constant. The coefficients of the full model for each price impact measure as well as the Adjusted R^2 measure are reported below. The reported F-stat statistics and the significance levels are based on running the regression with robust standard errors to account for heteroskedasticity.

	Purchases		Sales	
	Total	**VWAP**	**Total**	**VWAP**
Constant	7.65	2.68	6.33 ***	-4.78
Explicit Cost	0.17 ***	0.03 **	0.11 ***	0.01
Mcap	-0.11 **	-0.12	-0.22 ***	0.28 *
1/P	0.23 ***	0.09	0.19 *	0.04
TrComp	-0.09 ***	-0.01	-0.03	-0.01
Volatility	-3.81	-3.69	52.78 ***	-0.23
Duration	0.16 **	0.25 ***	0.53 ***	-0.08
Brokers	0.37 ***	0.14 **	-0.48 **	-0.18
Fund Size	-0.36 ***	-0.03	-0.16 **	-0.04
Fund Status	0.03	0.20	-0.30 **	-0.16 *
GARP	0.40 *	0.01	-0.07	0.05
Neutral	0.69 **	-0.67 **	0.02	0.51 ***
Value	-0.42 *	-0.19	-0.57 **	-0.07
***F*-statistic**	26.47 ***	3.02 ***	19.89 ***	5.06 ***
Adj. R^2	0.053	0.01	0.099	0.01

***, **, and * indicates significance at the 1%, 5% and 10% level, respectively.