Do Demand Curves for Small Stocks Slope Down?

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ABSTRACT

Stocks added to the S&P 500 generally experience positive abnormal returns following the announcement. Several competing explanations exist for this reaction, but small sample sizes and other issues make it difficult to distinguish among them. We examine this subject using the small-cap Russell 2000 index, which has a number of advantages over the S&P 500 in this context. Our primary finding is that stocks added to or deleted from the Russell 2000 experience significant changes in stock price and trading volume, but the impact is transitory. The results support the price pressure hypothesis.

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1. Introduction

We examine security returns, trading volume, and institutional ownership for firms that are added to and deleted from the Russell 2000 index over the period 1991-2000. We have two main goals. First, a large body of literature examines stock price reactions for large cap stocks added to the S&P 500 index. In contrast, the Russell 2000 is a small cap index, so this study appears to be one of the first to extensively examine the effect of index listing on smaller stocks. Second, numerous theories have been advanced to explain the positive abnormal returns observed for stocks added to the S&P 500, but limited sample sizes and other issues make it difficult to distinguish among them. In contrast, the Russell 2000 is reformulated on a regular basis with hundreds of changes every year, thereby allowing for much larger samples.

The Russell 2000 index is a subset of the Russell 3000, a value-weighted index of the 3,000 largest U.S. stocks. The Russell 3000 is divided into the Russell 1000, which contains the largest 1,000 stocks, and the Russell 2000, which contains the remaining 2,000 smaller stocks. The way the Russell 2000 is formed is important because a company is added because its market value falls, and it is shifted out of the Russell 1000, or because its market value rises sufficiently. Similarly, a company is deleted from the Russell 2000 if its market cap either rises or falls sufficiently.

In our analyses, we focus primarily on stocks that are truly added to or deleted from the Russell 2000 as opposed to being shifted into or out of the Russell 1000. Based on a sample of 4,321 stocks that are added, we find evidence of significant positive abnormal returns in the period surrounding reconstitution. For the period day -20 to day 0, the cumulative abnormal return is 1.89 percent ($p < .0001$). However, negative abnormal returns are observed post-event, and the overall impact is essentially zero. For 3,092 firms that are deleted, we find a highly significant negative cumulative abnormal return of -3.47 percent ($p < .0001$) over the (-20, +0) window. These negative abnormal returns are offset in the days following the event, and the net effect is both economically and statistically negligible.

Overall, we find little or no evidence of any permanent impact on the values of firms that are added to or deleted from the Russell 2000 index. In light of the relatively large samples we consider and the highly transitory nature of the abnormal returns, our results support the "price-

pressure" hypothesis (Harris and Gurel, 1986). Of the various theories intended to explain stock price reactions to index inclusion or deletion, this is the only one that predicts a purely temporary effect. In essence, index inclusion creates a temporary excess demand for added stocks. The reverse is true for deletions. However, once all portfolio rebalancing is complete, prices return to equilibrium levels.

Our conclusions regarding the transitory nature of the Russell 2000 effect are reinforced by our analysis of abnormal trading volume. For both additions and deletions, there is a clear (and highly significant) spike in trading volume on the reconstitution date. For the additions group, abnormally high volume exists for several days before and after the reconstitution date, reaching a maximum of almost 40 percent above predicted on day 0. In contrast, for deletions, day 0 is the only day with significant positive abnormal volume.

The only potentially permanent effects we find from the reconstitution of the Russell 2000 concern institutional ownership. Firms that are added to the index gain, on average, eight institutional owners, representing an increase of about 20 percent. Percentage ownership by institutions rises by four percent. Both the change in the number of institutional owners and the percentage held by institutions are highly significant. The opposite pattern is observed for firms that are deleted. Thus, there is evidence of a portfolio rebalancing between institutional and non-institutional investors that occurs because of the reconstitution of the Russell 2000 index. However, our conclusions regarding changes in institutional ownership are tempered by the fact that such ownership is probably related to size, at least in terms of the number of owners, and firms are added to, or deleted from, the Russell 2000 based on changes in size.

The structure of this paper is as follows. Section 2 discusses the literature examining the effect of index membership and presents the different hypotheses suggested in previous studies. Section 3 describes sample selection and data sources. Section 4 presents methods and results on abnormal returns. Section 5 presents methods and results for trading volume. Section 6 contains the institutional ownership analysis. The paper concludes in Section 7 with a brief summary of the major results and conclusions.

2. Previous research

Shleifer (1986), Harris and Gurel (1986), Jain (1987), Dhillon and Johnson (1991), Beneish and Whaley (1996, 1997), Lynch and Mendenhall (1997), and Erwin and Miller (1998), among others, find positive, significant abnormal returns associated with the announcement of new additions to the S&P 500 index. A growing number of academic studies analyze reconstitution effects for other indexes. For example, Beneish and Gardner (1995) investigate the effect of changes in the composition of the Dow Jones Industrial Average (DJIA), while Chung and Kryzanowski (1997, 1998), Masse, Hanrahan, Kushner, and Martinelly (2000), and Kaul, Mehrotra, and Morck (2000) examine the impact of changes in the Toronto Stock Exchange (TSE) 300 index.

A number of competing hypotheses have been offered to explain stock market reactions to changes in the S&P 500 index. These hypotheses differ from each other not only in the reason for abnormal returns, but also in their predicted duration. They can be grouped into four basic categories, however, as follows:

1. The *price pressure* hypothesis, advanced by Harris and Gurel (1986), is the only theory that predicts a temporary increase in the price of a newly-added stock. According to this hypothesis, for stocks added to the S&P 500, the inflow of buy orders by large index funds pushes the price of a stock above its equilibrium level. Passive sellers are attracted by the price increases caused by the increased demand. These passive suppliers of liquidity are compensated for their liquidity service when prices retreat to their full-information levels.

2. Under the *imperfect substitutes* (or *downward-sloping demand curve*) hypothesis, formalized by Shleifer (1986), as soon as one of the two similar stocks is added to the index, these stocks are no longer close substitutes for each other. Index funds place excess demand on the stock added to the index, and, assuming downward-sloping demand curves, equilibrium prices rise when demand curves shift to compensate.

3. Under the *cost-reduction* hypotheses, stocks added to the S&P 500 become less expensive for investors to trade, both in terms of bid-ask spreads as liquidity increases (Amihud and Mendelson, 1986) and the costs of acquiring quality information as analyst following grows (Goetzmann and Garry, 1986). These cost reductions lead to increases in value for added stocks.

4. The *information-signaling* hypothesis (e.g., Jain, 1987) is based on the fact that the S&P Index Committee expressly exercises judgment regarding financial soundness in choosing companies to avoid excessive turnover in the index. Assuming that S&P has

superior information and expertise in evaluating companies gained from rating bonds, its selections may reveal new and valuable information to the market.

In each case, the authors of these studies present evidence that is generally consistent with the proposed hypothesis. However, it is difficult to disentangle the competing explanations. Kaul, Mehrotra, and Morck (2000) provide the clearest evidence to date by studying the impact of a preannounced increase in the weights for 31 stocks in Toronto Stock Exchange (TSE) 300 index in 1996. They find evidence of a significant, non-transitory 2.3 percent average excess return during the event week.

Because the changes to the index were known in advance, the event studied by Kaul, Mehrotra, and Morck was free of information effects. Further, because the stocks were already in the index, the potential cost reductions are not likely to be significant, and, in fact, Kaul, Mehrotra, and Morck find no change in spreads. Finally, contrary to the price pressure hypothesis, the gains were not reversed. Thus, the evidence in Kaul, Mehrotra, and Morck supports the imperfect substitutes hypothesis.

While the event studied by Kaul, Mehrotra, and Morck has a number of advantages, there are nonetheless some potential concerns. The sample size is small, the event was a one-time occurrence, and, consequently, the event date is the same for all 31 stocks. All of the stocks had their weights increased, so the impact of a decrease could not be studied. Finally, previous studies have examined the effect of being added to or deleted from an index, as opposed to a shift in weights. Strictly speaking, an addition or deletion is a change in weights (either from or to zero), but it is nonetheless conceivable that market reaction could be different for the two types of changes.

As a means to further discriminate among the competing hypotheses, we consider the Russell 2000. The Russell 2000 small-cap index is widely followed, and it is the standard benchmark for evaluating the performance of small cap mutual funds. It is also the underlying index mimicked by funds such as the Vanguard Small-Cap Index Fund.

The Russell 2000 has a number of advantages over the S&P 500 for research on the effect of index membership. First, additions to the S&P occur irregularly and infrequently. In contrast, the Russell 2000 is reconstituted on an annual basis (since 1990), and about 500 companies are replaced in the index each year. Much larger sample sizes are thus available. Furthermore, most

S&P 500 studies focus on new additions only because the majority of S&P 500 deletions involve companies that reorganize, merge, or go bankrupt.[1] However, many companies that are removed from the Russell 2000 each year stay in business.

A second advantage to the Russell 2000 is that it is formulated by simply ranking all U.S. companies based on their market value on May 31 each year. However, reconstitution of the index does not occur until June 30, a month after the members are determined. Thus, there is no potential announcement effect on the reconstitution day since changes are generally known.[2] Further, if there are liquidity enhancements or decreased information costs for stocks added to the index, prices should adjust well in advance of the official reconstitution date.

The Russell 2000 has a third advantage in that a stock is added either because its relative market cap grew sufficiently or else because its relative market cap shrank, in which case it is shifted out of the Russell 1000 index. Similarly, companies are deleted either because they become too big, and are thus shifted to the Russell 1000, or because they become too small. As a result, it is possible to separately study new listings and delistings, as well as shifts between indexes.

Also, relative to the case of TSE weight adjustments considered by Kaul, Mehrotra, and Morck (2000), the Russell 2000 offers some significant potential benefits. As discussed in the next section, our sample size is considerably larger, and we have multiple event dates. We are able to separately study index shifts as well as true additions and deletions to the index. Finally, the reconstitution of the Russell 2000 is a regularly scheduled event, as opposed to a one-time event, and it is very well known and closely monitored by market participants.

Although there are, to our knowledge, no published studies using the Russell 2000, we have recently become aware of three working papers (Chen, 2002; Madhavan, 2001; and Reed, 2000). While the objectives of these studies are very comparable to ours, we provide a more

[1] Several studies do examine deletions from the S&P 500, including Goetzmann and Garry (1986), Harris and Gurel (1986), and Lynch and Mendenhall (1997). The largest deletions sample among these studies is 15, compared to over 3,000 considered in this study.

[2] Since 1989, S&P has had a policy of announcing changes at least five days in advance, when possible, so the Russell 2000 is not unique in this regard. Unlike the S&P 500, however, additions and deletions occur on regularly scheduled dates, and the companies added or eliminated can be predicated with relatively high precision even before the announcement date.

comprehensive analysis in several ways. First, as discussed in a subsequent section, we use a more sophisticated event-study method (Madhavan uses raw returns; Chen and Reed use simple market-adjusted returns). Second, two of these papers (Madhavan and Reed) do not distinguish between "shifts" and "pure" additions or deletions. Results below suggest that the difference is important. Finally, we also examine daily trading volume (only Reed does this) and changes in institutional ownership (only Chen examines this issue).

3. Data sources and sample selection

This study covers the ten-year period 1991 through 2000. Stocks that are added to or deleted from the Russell 2000 are placed into four groups as follows:

1. "Pure additions" are stocks added to the Russell 2000 index that were not previously in the Russell 1000.

2. "Pure deletions" are stocks deleted from the Russell 2000 index that are not shifted to the Russell 1000.

3. "Upward shifts" are stocks that were shifted from the Russell 2000 to the Russell 1000.

4. "Downward shifts" are stocks that were shifted from the Russell 1000 to the Russell 2000.

In each year of the 1991-2000 period, we examine every addition to and deletion from the Russell 2000 index and classify each into one of the four groups. For a company to be included in the sample, it must be possible for us to determine unambiguously whether or not the stock was a member of the Russell 1000 before it was added to or after it was deleted from the Russell 2000. Cases in which it is unclear because of events such as mergers, name changes, and delistings are discarded.

Because many companies are added to and deleted from the Russell 2000 each year, our sample sizes are large. For "pure additions" and "pure deletions," we have 4,321 and 3,092 observations, respectively. The corresponding numbers for "upward shifts" and "downward shifts" are 861 and 875, respectively. The reason we have many more pure additions than pure deletions is that deletions are frequently due to events such as mergers and bankruptcies, in which cases the necessary data are not available.

In our empirical analyses, we present results for all four groups in all cases. However, in terms of the competing hypotheses we discussed previously, it is not clear what is predicted for the "upward shifts" and "downward shifts" groups since stocks are simply moved from one index to another. For this reason, we will focus primarily on the "pure" additions and deletions groups in our discussions.

4. Abnormal return analyses

We study returns behavior in the period surrounding reconstitution of the Russell 2000 index. Because of the way the index is formed, a standard event study approach using a pre-event estimation period to estimate market model parameters is problematic. Specifically, for the "pure additions" and the "upward shift" groups, stocks in the samples are more likely to have experienced a recent run-up in value than stocks in the overall population. The reverse is true for the "pure deletions" and "downward shifts" groups.[3]

Beyond this, a pre-event estimation period decreases the sample size for "pure additions" because many of them are recent IPOs. A post-event estimation period introduces a survivorship bias for deletions from the index and decreases the sample size for deletions. Finally, the usage of simple market-adjusted returns does not produce powerful tests.

To address these problems, we follow Hillion and Vermaelen (2001) by combining the Ibbotson (1975) "returns across time and securities" (*RATS*) approach with the Fama-French (1993) time-series model of the evolution of security returns. To do this, we run the following cross-sectional regression on each day in event time:

$$R_{jt} - R_{ft} = \alpha_t + \beta_t (R_{mt} - R_{ft}) + s_t SMB_t + h_t HML_t + \varepsilon_{jt}. \quad (1)$$

For day t, R_{jt} is the rate of return of the j^{th} stock, R_{ft} is the one-month Treasury bill rate, and R_{mt} is the CRSP value-weighted return on all NYSE, AMEX, and Nasdaq stocks. The Fama-French market-wide factors SMB and HML are constructed using six value-weighted stock portfolios formed on size and book-to-market, respectively. SMB ("Small Minus Big") is the average return on the three small-stock portfolios minus the average return on the three big-stock portfolios. HML ("High Minus Low") is the average return on the two value-stock portfolios

[3] We thank an anonymous referee for pointing out this possible bias.

minus the average return on the two growth-stock portfolios (Fama and French, 1993 provide greater detail on the construction of the factors). The estimate of the intercept α_t represents the average abnormal return for day *t*.

The *RATS* approach with Fama-French factors has several advantages:

1. It does not require a separate estimation period, thereby reducing the impact of any run-up or run-down bias.

2. It controls for size and book-to-market effects.

3. It provides a large sample size compared to most other estimation methods.

Controlling for size and book-to-market effects may be particularly important in studies of the Russell 2000 index simply because the stocks examined are small and may have book-to-market characteristics that differ from the population as well. For example, stocks that fall from the Russell 1000 to the Russell 2000 have suffered declines in market cap and may thus have relatively low market-to-book ratios.

Table 1 contains the results of the event study analysis for all four groups. Day 0 is the reconstitution day. The average abnormal returns (AR_t) are in Panel A, and the cumulative abnormal returns ($CAR_{t1,t2}$) are in Panel B. Examining the results for the pure additions group, there is a clear clustering of positive abnormal returns in the period surrounding reconstitution. As shown in Panel A, these firms gain, on average, an abnormal 0.92 percent (t = 4.36) on the reconstitution day. From Panel B, the cumulative abnormal return over the 21-day period running from day -20 to day 0 is 1.89 percent (t = 4.45).

Table 1 about here

For the pure additions group, Panel B of Table 1 also shows cumulative abnormal returns are generally negative following reconstitution. In fact, for the 20-day period extending from day +1 to day +20, the cumulative abnormal return is -1.63 percent (t = -3.96). Thus, the positive abnormal returns observed for the (-20, 0) window are almost precisely offset in the (+1, +20) window. The cumulative abnormal return over the (-20, +20) window is an insignificant 0.26 percent (t = .44).

Turning to the pure deletions group, negative abnormal returns are generally observed on the days preceding reconstitution. On the reconstitution day alone, however, the average abnormal return is an insignificant -0.11 percent (t = -0.35). Panel B shows that the cumulative abnormal returns for this group are generally positive following reconstitution, and, as with the pure additions group, the pre-event abnormal returns tend to be offset in the post-event period.

The abnormal returns for the two "pure" groups are plotted in Figure 1 for the (-20,+20) window. As shown, in both cases, it is relatively clear that reconstitution has an impact, but, as indicated by our analysis in Table 1, it is equally clear that the impact is transitory. In light of the large sample sizes, the almost complete absence of a permanent impact constitutes strong evidence in favor of the price pressure hypothesis.

Figure 1 about here

As previously discussed, we have no particular predictions for firms that are shifted between the Russell 1000 and 2000 because these firms merely exchange one index affiliation for another. We therefore simply report the results for these groups for the sake of completeness. Table 1 shows that the "upward shifts" group experiences relatively small negative abnormal returns pre-event and similarly small positive returns post-event. There is some evidence of a modest, permanent increase in value. For example, the *CAR* over the relatively long (-40,+40)-day window is 2.59 percent (t = 1.87). Similarly, the "downward shifts" group appears to experience a small, non-transitory decrease in value. The *CAR* over the (-40,+40)-day window is -2.82 percent (t = -2.16).

The results for the two "shifts" groups provide weak evidence for permanent impacts. Why this occurs is a matter of conjecture given the existing literature. More importantly for us, the fact that the "pure" groups and the "shift" groups have somewhat different behavior means that it is important to separate them, particularly for the "pure additions" and the "downward shift" groups.

5. Trading volume analysis

We analyze trading volume around the reconstitution date using procedures similar to those in Campbell and Wasley (1996). Our primary purpose is to determine if abnormal volume

is associated with the abnormal returns found in our previous section. A brief description of our methods for calculating abnormal volume follows.

First, we calculate the log-transformed percentage of shares outstanding:[4]

$$V_{i,t} = \ln(\frac{100n_{i,t}}{S_{i,t}} + 0.000255), \quad (2)$$

where $n_{i,t}$ is the number of shares traded for security i on day t, and $S_{i,t}$ is the number of shares outstanding on day t.

Next, we estimate market model abnormal trading volume as:[5]

$$AV_{i,t} = V_{i,t} - (\alpha_i + \beta_i V_{m,t}), \quad (3)$$

where α_i and β_i are computed via ordinary least squares. The market model volume for day t is calculated by using all Nasdaq stocks excluding American Depository Receipts (ADRs):

$$V_{m,t} = \frac{1}{N_t}\sum_{i=1}^{N_t} V_{i,t}, \quad (4)$$

where N_t is the number of Nasdaq stocks excluding ADRs on day t.

As a robustness check we use different test statistics, estimation periods, and proxies for the market. For example, we use both a traditional parametric t-test and a non-parametric rank test. We report only the rank test statistic because Campbell and Wasley (1996) find that the nonparametric test statistic is always more powerful in detecting abnormal trading volume than the parametric test statistic. In addition to the pre-event estimation period, we also investigated a post-event estimation period starting 280 days after the reconstitution day. As for the proxy for market trading volume, we also use the combined volume of Nasdaq, NYSE, and ASE stocks. Neither the estimation period nor the choice of overall market volume affects the general results. To save space, the main results, which are reported in Table 2, use the pre-event estimation period and Nasdaq stocks in the calculation of the market trading volume.[6]

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[4] Ajinkya and Jain (1989) and Cready and Ramanan (1991) show the importance of log transformation of the volume data to approximate a normal distribution. As in Cready and Ramanan, we add 0.000255 to the daily percentage of shares outstanding to accommodate zero volume.

[5] The estimation period runs for 200 days from -479 to -280 days before the reconstitution day, and abnormal volumes are calculated for the 81 days centered on the reconstitution day.

[6] The reason we consider multiple definitions of market volume is the well-known issue concerning the tabulation of NYSE versus Nasdaq volume due to the "double counting" of trades that involve a market maker/specialist.

Table 2 about here

As shown in Table 2, all four groups exhibit significant increases in trading volume on the reconstitution day. The change in trading volume ranges from the smallest significant increase of 12.66 percent (r = 3.10) for the pure deletions group to the largest significant increase of 38.43 percent (r = 5.52) for the pure additions group. The pure additions group experiences significant positive abnormal volume (at the 5 percent level or better) every day from -3 to +4. In contrast, the pure deletions group has positive abnormal volume only on the event day. On every other day, abnormal volume is insignificantly negative.

Table 2 also shows that stocks that are shifted to the Russell 1000 experience significant positive abnormal volume for several days surrounding the event day, and abnormal volume is positive on every day we examine. Stocks that shift downward experience a very brief period of abnormal positive volume; otherwise, they generally display insignificantly negative values.

6. Institutional ownership

In this section, we examine changes in institutional ownership for firms that are added to or deleted from the Russell 2000 index. For the most part, our methods are an extension of those used by Pruitt and Wei (1989) in their analysis of the S&P 500. We collect data on institutional holdings from S&P's *Security Owner's Stock Guide*. Because this data must be hand-collected, an analysis of our full sample of over 9,000 company-events would be very time-consuming to prepare. To create a more manageable experiment, we randomly selected 30 companies for each group each year during the 1991-2000 period, giving us a relatively large sample of 1,200 companies, with 300 in each of the four groups.

For the institutional holdings analyses, we calculate the average of both institutional share holdings and the number of institutional investors in the April and May preceding reconstitution. We calculate the same averages in July and August following reconstitution. We then test for significant differences. Specifically, the percentage of shares held by institutional investors before reconstitution, $PNHOL_{i,pre}$, and subsequent to reconstitution, $PNHOL_{i,post}$, are calculated for each firm i as follows:

$$PNHOL_{i,pre} = \frac{INSHOL_{i,pre}}{SHROUT_{i,pre}} \text{ and } PNHOL_{i,post} = \frac{INSHOL_{i,post}}{SHROUT_{i,post}},$$

where $INSHOL_{i,pre}$ and $SHROUT_{i,pre}$, and $INSHOL_{i,post}$ and $SHROUT_{i,post}$, are the institutional holdings and total shares outstanding for the pre- and post-reconstitution periods, respectively.

To get a sense of the extent of institutional holdings, Table 3 presents some descriptive statistics for the percentages of institutional share holdings and numbers of institutional investors before and after reconstitution for the four groups for the two pre-reconstitution months, April and May, and two post-reconstitution months, July and August. The percentages of institutional share holdings are in Panel A, and the numbers of institutional investors are in Panel B.

Table 3 about here

As shown in Table 3, the largest changes occur for the pure additions group. Average institutional ownership in these companies rises from 27 percent to 32 percent (Panel A), and the average number of institutions grows from 36 to 48 (Panel B). The pure deletions group experiences a decline in both quantities. Percentage ownership falls from 32 to 30, and the number of institutions drops from 44 to 40.

Table 3 also highlights a noticeable difference between the "pure" and "shift" groups. Firms in the shift groups have roughly three to four times as many institutional owners, presumably because of their greater size. Percentage ownership by institutions is roughly 50 percent greater as well. Firms that are shifted to the Russell 1000 gain in institutional ownership, while firms that shift to the Russell 2000 experience a decrease.

To evaluate the significance of the changes illustrated in Table 3, we calculate the difference between the percentage of institutional holdings before reconstitution (using the April/May period) and the percentage held after reconstitution (using the July/August period). This difference is calculated for each firm in the sample and then averaged across all firms within a group. Standard *t*-tests and sign tests are used to evaluate differences in the mean between the pre- and post-reconstitution periods. The same analyses are performed using the number of institutional owners. The results are reported in Table 4.

Table 4 about here

For the pure additions group, Table 4 reports that the mean increase in the percentage of institutional investors, 3.89 percent, is highly significant (t = 8.38), and a similarly significant 71.33 percent of the firms in this group register an increase (z = 7.39). The mean number of institutional investors rises by 8.37, and 78.33 percent of the sample registers an increase, both of which are significant at any conventional level.

In broader terms, Table 4 shows that every change examined is highly significant. Taken together, the results in Tables 3 and 4 show that institutional holdings tend to change around index reconstitution. Pure additions and upward shifts gain institutional investors, while pure deletions and downward shifts lose them.

A partial explanation for these findings may have to do with changes in firm size. One consistent result in Table 4 is that firms that increase in value and thereby either enter the Russell 2000 or move to the Russell 1000 also experience increased institutional ownership. The reverse is true for firms that decrease in value. It is very plausible that the number of institutional owners would vary directly with firm size; however, it is less clear that the percentage of the stock owned would also behave this way. Furthermore, the changes in institutional ownership in Table 4 occur over a relatively short time (April/May to July/August), and most of the firms in our sample will not have experienced a particularly dramatic shift in size over that interval.

7. Summary and conclusions

A significant body of research documents that stocks added to the S&P 500 index generally experience positive abnormal returns following the announcement. Various hypotheses have been advanced to explain this reaction, but, to date, small sample sizes and other issues make it difficult to distinguish among them.

In an effort to disentangle the competing explanations, we investigate security returns, trading volume, and institutional ownership for firms added to or deleted from the small-cap Russell 2000 index. This index has a number of advantages over the S&P 500 in this context. First, additions to the S&P occur irregularly and infrequently, but the Russell 2000 is reconstituted on an annual basis (since 1990), and about 500 companies are replaced in the index each year. Furthermore, most S&P 500 studies focus on new additions only because deletions

usually involve companies that reorganize, merge, or go bankrupt. However, a large number of companies that stay in business are removed from the Russell 2000.

A second advantage to Russell 2000 is that it is formulated by simply ranking all U.S. companies based on their market value on May 31 each year. However, reconstitution of the index does not actually occur until June 30, a month after the members are determined. Thus, there is no potential announcement effect on the reconstitution day since changes are generally known. Further, if there is enhanced liquidity or decreased information cost for stocks added to the index, prices should adjust well in advance of the official reconstitution date.

Another important aspect of the Russell 2000 is that a stock is added either because its relative market cap grew sufficiently or else because its relative market cap shrank, in which case it is shifted out of the large-cap Russell 1000 index. Similarly, companies are deleted either because they become too big, and are thus shifted to the Russell 1000, or because they become too small. Thus, we are able to study two different types of additions and deletions.

Our primary finding is that significant changes in prices, trading volume, and institutional ownership occur for stocks added to or deleted from the Russell 2000. The impact depends on whether a stock is a "pure" addition or deletion as opposed to being shifted into or out of the Russell 1000. In large samples of pure additions (n = 4,321) and pure deletions (n = 3,092), we find clear evidence of a significant price and volume reaction. Pure additions gain value around the reconstitution date on abnormally high volume and also experience a significant increase in institutional ownership. Similarly, pure deletions lose value, also on abnormally high volume. However, both the price effects and volume effects are short-lived and transitory. This result strongly supports the "price pressure" hypothesis, indicating that the impact of index inclusion or deletion is simply a temporary event with no permanent valuation effect.

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Table 1
Abnormal returns for four groups around the Russell 2000 index reconstitution date in the 1991-2000 period.

Panel A: Average ($\overline{AR_t}$) percentage abnormal returns.

Trading Day	Pure additions to the Russell 2000 (N = 4321)		Pure deletions from the Russell 2000 (N = 3092)		Upward shifts from the Russell 2000 to the Russell 1000 index (N = 861)		Downward shifts from the Russell 1000 to the Russell 2000 index (N = 875)	
	$\overline{AR_t}$	$t(\overline{AR_t})$	$\overline{AR_t}$	$t(\overline{AR_t})$	$\overline{AR_t}$	$t(\overline{AR_t})$	$\overline{AR_t}$	$t(\overline{AR_t})$
-40	0.09	0.73	-0.10	-0.86	0.30	2.14*	0.41	2.81**
-30	0.00	0.00	-0.11	-1.07	0.51	4.24**	-0.05	-0.50
-20	-0.02	-0.18	-0.63	-4.19**	0.44	3.07**	-0.09	-0.62
-15	-0.04	-0.55	-0.12	-1.17	-0.08	-0.65	-0.03	-0.28
-10	-0.11	-1.47	-0.28	-2.60**	-0.31	-1.94	-0.12	-0.93
-9	-0.10	-1.40	-0.15	-1.33	0.03	0.23	-0.12	-1.02
-8	-0.05	-0.47	-0.32	-1.84	-0.19	-1.03	-0.45	-2.51*
-7	0.27	3.71**	-0.25	-2.27*	-0.21	-1.73	-0.17	-1.65
-6	0.08	0.99	-0.28	-2.29*	0.26	1.57	-0.11	-0.85
-5	-0.44	-3.76**	0.07	0.39	-0.21	-0.93	-0.39	-1.91
-4	0.26	3.91**	-0.22	-1.85	-0.32	-2.60**	-0.43	-3.32**
-3	0.22	2.93**	-0.22	-1.70	-0.18	-1.15	0.10	0.75
-2	0.34	3.97**	-0.20	-1.56	-0.25	-1.69	0.12	0.97
-1	0.63	6.94**	-0.51	-3.28**	0.06	0.39	0.64	4.48**
0	0.92	4.36**	-0.11	-0.35	1.41	4.32**	0.47	1.24
1	-0.51	-3.51**	0.83	2.75**	0.59	2.30*	-0.43	-1.81
2	0.02	0.27	0.57	4.64**	-0.23	-1.65	-0.05	-0.41
3	-0.07	-0.72	0.27	2.00*	0.16	1.16	-0.44	-3.29**
4	-0.03	-0.44	-0.18	-1.54	-0.32	-2.20*	-0.12	-1.23
5	0.03	0.31	-0.12	-0.84	0.43	3.07**	0.00	0.01
6	-0.10	-0.84	0.16	0.81	0.65	2.54*	-0.32	-1.63
7	0.02	0.26	0.08	0.58	0.04	0.32	-0.07	-0.53
8	-0.01	-0.06	0.18	1.04	0.40	1.75	0.42	2.34*
9	0.23	1.79	0.07	0.34	0.54	2.78**	0.00	0.02
10	-0.42	-5.19**	-0.08	-0.53	-0.51	-3.79**	0.28	1.97*
15	-0.38	-5.62**	0.06	0.56	-0.02	-0.21	-0.15	-1.31
20	0.03	0.38	-0.01	-0.06	0.05	0.28	-0.10	-0.76
30	-0.01	-0.13	0.05	0.46	0.27	2.31*	-0.14	-1.20
40	0.00	-0.06	0.11	0.79	-0.14	-1.22	0.03	0.26

Table 1 - continued.

Panel B: Cumulative average ($\overline{CAR}_{t1,t2}$) percentage abnormal returns.

Event time interval	Pure additions to the Russell 2000 (N = 4321)		Pure deletions from the Russell 2000 (N = 3092)		Upward shifts from the Russell 2000 to the Russell 1000 (N = 861)		Downward shifts from the Russell 1000 to the Russell 2000 (N = 875)	
	$\overline{CAR}_{t_1,t_2}$	$t(\overline{CAR}_{t_1,t_2})$	$\overline{CAR}_{t_1,t_2}$	$t(\overline{CAR}_{t_1,t_2})$	$\overline{CAR}_{t_1,t_2}$	$t(\overline{CAR}_{t_1,t_2})$	$\overline{CAR}_{t_1,t_2}$	$t(\overline{CAR}_{t_1,t_2})$
-10,-1	1.10	4.06**	-2.35	-5.48**	-1.32	-2.59**	-0.92	-2.04*
-10,0	2.02	5.88**	-2.46	-4.59**	0.09	0.15	-0.45	-0.77
0,+10	0.09	0.23	1.66	2.59**	3.18	4.77**	-0.25	-0.39
+1,+10	-0.83	-2.59**	1.77	3.20**	1.77	3.04**	-0.72	-1.41
-10,+10	1.19	2.52*	-0.69	-0.89	1.86	2.21*	-1.17	-1.50
-20,-1	0.97	2.63**	-3.35	-5.87**	-2.25	-3.31**	-1.29	-2.06*
-20,0	1.89	4.45**	-3.47	-5.28**	-0.84	-1.11	-0.82	-1.12
0,+20	-0.71	-1.53	2.55	3.36**	2.65	3.20**	-1.26	-1.65
+1,+20	-1.63	-3.96**	2.66	3.87**	1.23	1.63	-1.73	-2.61**
-20,+20	0.26	0.44	-0.80	-0.85	0.40	0.37	-2.56	-2.58**
-40,-1	1.70	3.19**	-4.19	-4.96**	-0.83	-0.89	-1.42	-1.61
-40,0	2.62	4.57**	-4.30	-4.76**	0.58	0.59	-0.95	-0.99
0,+40	-1.13	-1.94	3.95	4.09**	3.42	3.34**	-1.40	-1.46
+1,+40	-2.06	-3.78**	4.06	4.46**	2.01	2.07*	-1.87	-2.13*
-40,+40	0.56	0.71	-0.24	-0.19	2.59	1.87	-2.82	-2.16*

This table reports abnormal and cumulative abnormal returns, expressed as percentage. We follow Hillion and Vermaelen (2001) by combining the Ibbotson (1975) "returns across time and securities" (*RATS*) approach with the Fama-French (1993) time-series model of the evolution of security returns. We run the following cross-sectional regression on each day in event time:

$$R_{jt} - R_{ft} = \alpha_t + \beta_t (R_{mt} - R_{ft}) + s_t SMB_t + h_t HML_t + \varepsilon_{jt}. \quad (1)$$

For day t, R_{jt} is the rate of return of the j^{th} stock, R_{ft} is the one-month Treasury bill rate, and R_{mt} is the CRSP value-weighted return on all NYSE, AMEX, and Nasdaq stocks. The Fama-French market-wide factors SMB and HML are constructed using six value-weighted stock portfolios formed on size and book-to-market. SMB ("Small Minus Big") is the average return on the three small-stock portfolios minus the average return on the three big-stock portfolios. HML ("High Minus Low") is the average return on the two value-stock portfolios minus the average return on the two growth-stock portfolios (Fama and French (1993) provide greater detail on the construction of the factors). The estimate of the intercept α_t represents the average abnormal return for day t.

* Significance at the 5% level.

** Significance at the 1% level.

Table 2

Average percentage abnormal trading volume ($\overline{AV_t}$) and rank test for four groups around the Russell 2000 index reconstitution date in the 1991-2000 period.

Trading day	Pure additions to the Russell 2000 (N = 2016)		Pure deletions from the Russell 2000 (N = 3012)		Upward shifts from the Russell 2000 to the Russell 1000 (N = 831)		Downward shifts from the Russell 1000 to the Russell 2000 (N = 861)	
	$\overline{AV_t}$	$r(\overline{AV_t})$	$\overline{AV_t}$	$r(\overline{AV_t})$	$\overline{AV_t}$	$r(\overline{AV_t})$	$\overline{AV_t}$	$r(\overline{AV_t})$
-40	12.96	1.19	-8.16	-1.51	10.25	1.78	1.40	0.74
-30	7.73	0.55	-9.39	-1.81	3.74	0.13	-4.36	-1.48
-20	13.79	1.50	-7.98	-1.46	10.39	1.59	-1.36	-0.47
-15	11.96	1.30	-9.22	-1.56	5.54	0.49	-3.67	-1.28
-10	9.73	1.22	-7.55	-0.82	9.10	1.22	-1.41	-0.08
-9	13.02	1.56	-8.53	-1.10	11.25	1.67	-3.63	-0.77
-8	13.19	1.59	-7.54	-0.95	11.44	1.93	-1.11	0.03
-7	15.42	1.94	-6.01	-0.80	9.78	1.67	-1.01	0.31
-6	14.82	1.72	-7.90	-0.68	12.04	1.93	-1.59	-0.07
-5	13.03	1.49	-4.92	-0.44	9.70	1.47	-1.79	0.16
-4	14.05	1.91	-5.48	-0.46	9.58	1.51	-1.62	-0.10
-3	14.52	2.17*	-3.42	0.41	10.18	1.90	-1.04	0.38
-2	15.55	2.52*	-5.41	-0.12	12.99	2.56*	-0.50	0.81
-1	18.04	2.83**	-2.04	0.90	14.34	3.06**	0.53	2.06*
0	38.43	5.52**	12.66	3.10**	26.89	5.27**	16.41	6.50**
1	17.62	3.18**	-4.31	0.27	9.58	2.19*	-0.55	1.38
2	13.41	2.00*	-7.71	-0.50	10.24	1.90	-3.06	0.10
3	13.51	1.98*	-8.39	-0.95	9.45	1.68	-3.32	-0.25
4	15.02	2.27*	-8.12	-0.64	9.61	1.68	-3.88	-0.60
5	13.22	1.74	-9.78	-1.22	10.63	1.95	-2.61	-0.65
6	12.18	1.42	-9.93	-1.42	11.11	1.66	-2.56	-0.43
7	12.87	1.54	-9.05	-1.37	9.62	1.39	-2.53	-0.94
8	13.60	1.49	-10.25	-1.55	12.15	1.57	-3.09	-1.15
9	12.99	1.36	-9.70	-1.73	9.76	1.02	-1.59	-0.83
10	13.43	1.37	-9.38	-1.54	8.17	1.17	-1.89	-0.89
15	11.18	1.26	-10.79	-1.84	8.30	1.17	-4.27	-1.59
20	10.75	1.22	-10.27	-1.74	8.93	1.37	-2.39	-0.39
30	7.83	0.73	-11.49	-1.92	5.17	0.74	-5.60	-1.75
40	9.99	0.96	-10.71	-1.93	2.95	-0.12	-5.03	-2.07*

Abnormal trading volume is estimated using an equally-weighted market index with all Nasdaq stocks excluding ADRs as proxy for the market trading volume and the 200 trading days estimation period covering day t_{-479} to day t_{-280}.

* Significance at the 5% level. ** Significance at the 1% level.

Table 3
Descriptive statistics for percentage of institutional share holdings and number of institutional investors before and after the reconstitution of the Russell 2000 index for four groups in the 1991-2000 period.

Panel A: Percentage of institutional share holdings.

Group	Month	Parameter				
		Average	Median	Maximum	Minimum	Standard deviation
Pure additions to the Russell 2000 index (N = 300)	April	27	24	87	0.0	20
	May	29	26	85	0.0	20
	July	31	28	91	0.0	20
	August	32	29	88	0.3	21
Pure deletions from the Russell 2000 index (N = 300)	April	32	28	94	0.9	20
	May	31	27	87	0.9	20
	July	30	27	86	0.9	20
	August	30	27	90	0.9	19
Upward shifts from the Russell 2000 to the Russell 1000 index (N = 300)	April	55	56	98	5.9	23
	May	55	56	99	6.4	22
	July	57	59	100	6.1	22
	August	57	59	99	6.3	22
Downward shifts from the Russell 1000 to the Russell 2000 index (N = 300)	April	49	52	97	0.4	23
	May	49	50	96	0.4	23
	July	47	50	96	0.4	23
	August	47	49	95	0.4	22

Table 3 – continued

Panel B: Number of institutional investors.

Group	Month	Parameter				
		Average	Median	Maximum	Minimum	Standard deviation
Pure additions to the Russell 2000 index (N = 300)	April	36	33	120	0	24
	May	40	36	125	0	25
	July	45	39	181	0	28
	August	48	41	190	3	28
Pure deletions from the Russell 2000 index (N = 300)	April	44	39	179	4	28
	May	43	40	160	4	25
	July	42	39	161	4	25
	August	40	37	129	4	22
Upward shifts from the Russell 2000 to the Russell 1000 index (N = 300)	April	147	139	423	23	70
	May	154	144	460	27	72
	July	166	158	483	30	75
	August	169	160	484	32	74
Downward shifts from the Russell 1000 to the Russell 2000 index (N = 300)	April	154	142	501	7	84
	May	150	138	439	7	79
	July	149	137	435	9	79
	August	141	133	338	9	69

Table 4

Mean differences of institutional ownership changes following the Russell 2000 index reconstitution date for four groups in the 1991-2000 period.

Group	Parameter	Mean difference	*t*-Statistic (*t*)	Percentage of firms registering increase	*Sign*-statistic (*z*)
Pure additions to the Russell 2000 index (N = 300)	Percentage of institutional holdings	3.89	8.38**	71.33	7.39**
	Number of institutional investors	8.37	10.97**	78.33	9.81**
Pure deletions from the Russell 2000 index (N = 300)	Percentage of institutional holdings	-1.26	-4.81**	35.00	-5.20**
	Number of institutional investors	-2.75	-6.12**	32.33	-6.12**
Upward shifts from the Russell 2000 to the Russell 1000 index (N = 300)	Percentage of institutional holdings	1.85	4.68**	67.33	6.00**
	Number of institutional investors	16.74	19.35**	90.67	14.09**
Downward shifts from the Russell 1000 to the Russell 2000 index (N = 300)	Percentage of institutional holdings	-1.79	-5.56**	36.67	-4.62**
	Number of institutional investors	-7.24	-6.92**	35.33	-5.08**

Institutional ownership (percentage of institutional holdings or number of institutional investors) difference is defined as the stock's average institutional ownership in the two-month pre-reconstitution period (April and May) subtracted from the average institutional ownership of the stock during the two-month post-reconstitution period (July and August).

* Significant at the .05 level.

** Significant at the .01 level.

Figure 1
Cumulative average abnormal returns for "pure" additions and deletions around the Russell 2000 index reconstitution date in the 1991-2000 period. Firms that are shifted into or out of the Russell 1000 are excluded.