Does Inclusion in a Smaller S&P Index Create Value?

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This study finds overall increases in equity value surrounding addition to the S&P Small-Cap and Mid-Cap indexes from 1996 to 2003 and investigates sources of the value gains. Following addition, there are significant increases in proxy variables for stock liquidity and investor recognition, and changes in these variables are impounded into the permanent component of announcement share price revisions. We also find that changes in capital investment intensity are increasing in changes in stock liquidity, consistent with a reduction in the cost of capital following index addition.

Keywords: Index addition, event study, Standard & Poor's index, S&P 600, S&P 400, stock liquidity, capital expenditure

JEL codes: G11, G14

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1. Introduction

The change in equity value associated with a firm's addition to the Standard & Poor's 500 index is widely investigated in the finance literature. Early work by Harris and Gurel (1986) finds transient price effects, but a large literature since indicates that the price effect persists. Shleifer (1986), Beneish and Whaley (1996), Lynch and Mendenhall (1997), Wurgler and Zhuravskaya (2002), among others, find permanent price effects, which they argue is consistent with downward sloping demand curves. Other studies investigate alternative explanations for permanent price effects and find value-increasing changes in firm characteristics subsequent to index additions. These include improvements in stock liquidity (Hegde and McDermott, 2003), investor awareness (Chen, Noronha, and Singal, 2004; Elliott, Van Ness, Walker, and Warr, 2006), and operating performance (Denis, McConnell, Ovtchinnikov, and Yu, 2003).

In contrast to the established literature on index inclusion effects for the large capitalization S&P 500 index, the literature on index effects for smaller capitalization firms is small. Collins, Wansley, and Robinson (1995) report changes in equity values around the formation of the S&P Mid-Cap index in 1994, and recent studies by Biktimirov, Cowan, and Jordan (2004) and Shankar and Miller (2006) find changes in price, volume, and institutional ownership for the Russell 2000 and S&P 600 indexes, respectively. However, in contrast to studies of the S&P 500, these studies do not investigate whether changes in firm fundamentals vary with index price effects. We expand the literature on smaller capitalization indexes by conducting a comprehensive analysis of theories explaining stock-price changes around index additions using firms added to the S&P Small-Cap and Mid-Cap indexes from 1996-2003. We investigate whether changes in investor recognition, stock liquidity, and operating performance vary with permanent index price effects, controlling for the presence of long-term downward-sloping demand curves. In the process, we re-examine the price effects for S&P 600 index additions, provide new evidence on price effects for additions to the S&P 400 index, and effectively catch the literature up to our current knowledge of large capitalization index inclusion effects.

We focus on additions to the S&P Mid-Cap 400 and Small-Cap 600, collectively known as the S&P 1000, for two reasons. First, as described by Biktimirov, Cowan, and Jordan (2004), additions to the Russell index are based on a known criterion (market value) on a known date, which means index changes can be widely anticipated. In this sense, changes to the Russell index lack a pure announcement date. Although the criteria for addition to a Standard & Poor's index are generally known, the exact algorithm and the dates of index changes are unknown. Therefore, the inclusion effect for S&P changes is concentrated around the announcement date and provides a clearer measure of the market's anticipation of value change due to addition. Second, given that most studies of the economic effects of index additions focus on the S&P 500 index, examining other S&P index additions allows for a more direct comparison with existing evidence, while controlling for any differences in algorithms or selection ability.

Our study is conducted as follows. We first investigate short- and long-term abnormal index addition announcement returns for a sample of 666 firms added to the S&P 1000 from 1996 to 2003. There is an overall mean (median) increase of 2.49% (3.45%) in equity value from announcement day to 60 trading days following index listing. Although returns are larger in absolute value for firms added to the Mid-Cap index, the differences are not statistically significant. This permanent price effect indicates that, on average, investors perceive addition to the smaller capitalization S&P indexes to be a value-enhancing event. We then examine univariate changes in proxy variables for investor recognition, stock liquidity, and analysts' earnings expectations. Overall, S&P 1000 additions experience significant improvement in investor recognition and stock liquidity and marginally significant increases in earnings expectations. The liquidity change is significantly greater for firms added to the Mid-Cap compared to the Small-Cap index, suggesting greater post-addition trading activity for Mid-Cap compared to Small-Cap firms.

We next investigate the relation between the permanent price effect and changes in stock liquidity, investor recognition, and earnings expectations, controlling for the presence of downward-sloping demand. The results indicate that investors capitalize improvements in liquidity, consistent with a liquidity premium in equity returns (Amihud and Mendelson, 1986; Easley and O'Hara, 2004). We also find that changes in investor recognition are impounded into long-term abnormal returns. However, in contrast to the results of Elliott, Van Ness, Walker, and Warr (2006) for the S&P 500, the positive relation between stock liquidity and index returns persists when investor recognition variables are included in the regression.

Our final tests investigate whether changes in liquidity and investor recognition translate into greater capital investment intensity. Becker-Blease and Paul (2006) find a positive relation between changes in stock liquidity and capital investment intensity for S&P 500 index additions. Similarly, we find a positive relation between improved liquidity and changes in industry-adjusted capital expenditures in our sample, which is consistent with a decline in cost of capital as liquidity improves.

Our paper makes several contributions to the literature. First, we provide evidence that inclusion into a smaller capitalization S&P index is associated with a permanent increase in value, similar to evidence for the S&P 500. Second, we show that unlike evidence for the S&P 500 index in Elliott, Van Ness, Walker, and Warr (2006), improvement in liquidity is an important source of value for firms added to smaller capitalization indexes. In particular, the price effects of liquidity improvements persist in the presence of proxy variables for investor recognition. Third, we investigate index effects for Small- and Mid-Cap firms separately, thus allowing an examination of whether these effects vary by index capitalization. Taken together with the literature on addition to the S&P 500 index, our evidence for the smaller capitalization indexes shows that index addition is meaningful and valuable for all firms.

2. Hypotheses

Merton (1987) contends that if investors are aware of only a subset of securities and thus are incompletely diversified, they will demand a premium (shadow cost) for the unique risk in their portfolio. Chen, Noronha, and Singal (2004) argue that if the awareness of a security increases due to its addition to a prominent index, this should reduce the shadow cost and required return for that security. This leads to our first testable hypothesis, the Investor Recognition Hypothesis:

H1:Long-term index announcement returns will be positively related to post-addition improvements in proxies for investor recognition.

Amihud and Mendelson (1986) argue that investors impound anticipated trading costs into the price of an asset in the form of a liquidity premium. If the demand increases for securities added to prominent indexes, the result should be lower search costs and therefore lower liquidity premiums. This will lead to higher valuations of assets in place, as argued by Amihud and Mendelson, and leads to our second hypothesis, the Liquidity Premium Hypothesis:

H2: Long-term index announcement returns will be positively related to post-addition improvements in proxies for stock liquidity.

Jain (1987) argues that addition to a Standard & Poor's index is not an information-free event because the opinions of the S&P selection committee are likely formed by both private and public information. In this sense, index inclusion signals future performance improvements that were previously unknown to the investing public. Denis, McConnell, Ovtchinnikov, and Yu (2003) find that analysts' earnings expectations increase relative to benchmark firms following index addition, lending support to the signaling or certification hypothesis. We note, however, that Denis, McConnell, Ovtchinnikov, and Yu suggest that the improved performance could also stem from increased managerial incentives as firms operate in an environment of greater implicit monitoring following index addition. Our testable hypothesis concerning performance is as follows.

H3: Long-term index announcement returns will be positively related to post-addition changes in analysts' earnings expectations.

Both the Liquidity Premium and Investor Recognition Hypotheses imply a reduction in the cost of capital for a firm added to a prominent index. Although cost of capital is not directly observable, corporate actions associated with a decline in cost of capital can be directly observable. Becker-Blease and Paul (2006) argue that if cost of capital declines, it will expand the set of viable investment opportunities and should lead to increased capital expenditures. Although their paper focuses only on liquidity as a source of a lower cost of capital, the argument is also true for investor recognition. This leads to the fourth testable hypothesis, the Investment Opportunities Hypothesis:

H4: Changes in capital investment intensity will be positively related to changes in stock liquidity and investor recognition.

Standard & Poor's reports that the Mid-Cap and Small-Cap indexes account for approximately 7% and 3% of total U.S. equity market capitalization, respectively. In Figure 1, we graph the percentage of shares held by index funds for each index from 1996 through 2003. The graph shows that the Mid-Cap index is more heavily indexed than the Small-Cap index. The S&P 400 has approximately 2% of shares held by institutions in 1996 and grows to 6% in 2003. In contrast, the smaller capitalization S&P 600 index has approximately 0.5% of shares held by indexers in 1996, and grows to 5% in 2003.[1]

If the amount of shares held by indexers is a proxy for aggregate investor interest, then a firm added to the Mid-Cap will likely garner more interest than a firm added to the Small-Cap. The exogenous benefits of index addition, as examined in this paper, generally derive from investor interest. Therefore, it is possible that the benefits from addition to the Small-Cap will be smaller than those from addition to the Mid-Cap. This leads to our final testable hypothesis:

[1] The graph also includes S&P 500 firms for reference and shows approximately 10% of shares held by indexers.

H5: Effects of index addition will be larger for firms added to the Mid-Cap index compared to the Small-Cap index.

3. Sample of S&P 1000 additions

Standard & Poor's has three U.S. equity market indexes. The S&P 500 is more than 80 years old and is the largest and most widely followed index. It is comprised of firms with market capitalization of at least $4 billion and represents approximately 80% of the U.S. equity market. The S&P Mid-Cap 400 was formed in 1991 and is comprised of firms with market capitalization of $1 billion to $4 billion and represents 7% of the market. The S&P Small-Cap 600 was formed in 1994 and is comprised of firms with market capitalization of $300 million to $1 billion and represents 3% of the market. Candidates for index inclusion must have four consecutive quarters of earnings growth, public float of at least 50%, and provide sector representation.[2]

We begin sample selection with all additions to the S&P 1000 index from 1996 to 2003. The sample period begins in 1996 to provide enough time following the creation of the S&P 600 in 1994 for portfolio positions in these firms to emerge. We end the sample in 2003 to provide sufficient post-event data to compute changes in capital expenditures for tests of our fourth hypothesis. We exclude cosmetic additions arising from name changes, firms with insufficient data such as new listings (carve-outs or spin-offs), and firms that were delisted in the same fiscal year they were added. We also exclude firms that do not have the required Compustat variables and any firms that do not have at least one of the investor recognition or liquidity measures. Finally, we exclude firms that are being dropped from a larger-cap S&P index because these are effectively deletions. The

[2] "Criteria for Additions to and Deletions from a U.S. Index." http://www2.standardandpoors.com.

final sample size is 666, consisting of 298 firms added to the S&P 400 and 368 firms added to the S&P 600.[3] Table 1 contains the time series of addition for sample firms. The highest turnover rates occur in 1998, 1999, and 2000. Otherwise, we do not observe a distinct time trend.

4. Abnormal stock returns around index changes

We calculate abnormal returns based on market-adjusted returns, using the S&P 400 (S&P 600) value-weighted index as the market portfolio for estimates of abnormal returns for firms added to the S&P 400 (S&P 600). For estimates of abnormal returns for the combined samples (all additions), we use the value-weighted return on the combined index. We elect to employ market-adjusted returns rather than parameter-based returns from the market model or three-factor model based on evidence in Edmister, Graham, and Pirie (1994) that the estimation window of parameters surrounding index additions significantly influences estimated abnormal returns.[4] We define the announcement date (AD) as the first date that S&P reports the pending index addition, regardless of the time of day that the announcement occurs. The effective date (ED) is the date that the firm is first added to the index. Generally, the dates are based on S&P's first public announcement. In the instances where S&P does not announce the effective date or if the effective date changes, we determine the actual effective date based on a search for subsequent S&P announcements.

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[3] Sample size in the univariate analysis and regression models is often less than 666 because all firms in the sample do not have all of the required proxy variables for investor recognition, liquidity, and investment opportunities.

[4] Results are qualitatively similar when we use the CRSP value-weighted or equal-weighted index as the proxy for the market portfolio. We also obtain qualitatively similar results for different models of expected returns, including the market model and Fama-French three- and four-factor models (with parameters estimated in the post-event period).

Table 2 presents abnormal returns for various windows around the announcement and effective dates. Similar to Collins, Wansley, and Robinson (1995), Lynch and Mendenhall (1997), and Erwin and Miller (1998), we begin our estimation of abnormal returns 10 days prior to the announcement date to capture any run-up associated with the announcement. Similar to Beneish and Whaley (1996), Chen, Noronha, and Singal (2004), Elliott, Van Ness, Walker, and Warr (2006), and Shankar and Miller (2006), we calculate post-addition returns through 60 days following the effective date to allow for the complete dissipation of any temporary price-pressure effects.

Column (1) of Table 2 contains abnormal returns from AD-10 to AD-2 and shows evidence of a small run-up to addition for the overall sample. Column (2) contains abnormal returns for the (-1, +1) day window around the announcement and shows a mean (median) increase in equity value of 4.94% (4.42%) for the sample overall. The upward revision in prices continues through the day following the effective day, with an additional mean (median) return of 1.94% (1.16%) reported in column (3). The post-announcement upward revisions, together with the reversals reported in column (4) during the 60 trading days following the effective date of addition, suggest that initial gains are partially due to price pressure as indexers rebalance portfolios.

Column (5) shows mean (median) cumulative abnormal returns (CARs) of 3.20% (5.01%) for the entire period from 10 days preceding the announcement day (AD) to 60 days following the effective day (ED). Column (6) shows mean (median) CARs of 2.49% (3.45%) for the (AD, ED+60) window. We consider the returns in these columns to represent the permanent component of index addition returns. In later regression analysis, we use the more conservative values from column (6) as the dependent variable, rather than the returns in column (5), because they include a price run-up in the 10 days before the announcement day. However, results are qualitatively similar when we use column (5) returns in the regressions. The window in Column (6) corresponds with the window reported in Shankar and Miller (2006). In the rest of the paper, we use the "term long-term abnormal return" interchangeably with "permanent price effect" to distinguish the long-term price revisions in column (6) from the temporary component of the index announcement return.

Similar to Elliott, Van Ness, Walker, and Warr (2006) for the S&P 500 and Shankar and Miller (2006) for the S&P 600, we formally test for price reversals. We do this by regressing returns from AD-1 to ED+1 on returns from ED+2 to ED+60. The slope of the regression is -0.174, p-value of 0.095, and R^2 of 2.7%. This slope coefficient is quite similar to Elliott, Van Ness, Walker, and Warr although we use a longer observation window for abnormal returns to more fully capture any price reversals. Full price reversal would imply that the coefficient in close to negative one. Thus, the evidence from the regression supports evidence in Table 2 that there is only partial price reversal, and there is a permanent component of index announcement returns.

In the next two rows of Table 2, we present a separate analysis of index announcement returns for the 298 Mid-Cap firms and 368 Small-Cap firms. Results for these subsamples mirror the overall pattern for the full sample of additions although we do not find evidence of the run-up in column (1). There are significant positive abnormal returns from one day before the announcement day through one day following the effective day and evidence of partial reversals in the (+2, +60)-day window following the effective day. The mean long-term announcement return in column (6) from announcement day to effective day plus 60 is 1.96% (3.14%) for Small-Cap (Mid-Cap) additions. The mean return of 1.96% for Small-Cap additions is very similar to Shankar and Miller (2006), who find a mean market-adjusted return of 1.91% for firms added to the S&P 600 over a similar period.

Finally, Table 2 shows *p*-values from test statistics for differences between Mid-Cap and Small-Cap additions. The returns for Mid-Cap additions are larger compared to Small-Cap returns. However, we find no evidence of statistically significant differences between the indexes in the permanent component of abnormal index returns.

Based on the construction of our sample, firms added to the Small-Cap are new to any S&P index. However, firms added to the Mid-Cap are comprised of two subsamples of firms that are new to any S&P index (190 new additions) and firms that were previously listed on the Small-Cap index (108 upward migrations). It is possible that the economic impact of index inclusion is mitigated for firms previously included in another S&P index. We investigate this in rows (3) and (4) by separately reporting abnormal returns for the new Mid-Cap additions and Mid-Cap migrations. The results in Columns (5) and (6) do not indicate significantly higher long-run returns for firms new to the Mid-Cap compared to firms migrating to the Mid-Cap from the Small-Cap.

Overall, the evidence in Table 2 indicates that inclusion in the S&P 1000 index is associated with a permanent increase in stock prices. This is consistent with evidence for the S&P 500 provided in studies such as Arnott and Vincent (1986), Lynch and Mendenhall (1997), Beneish and Whaley (1996, 1997, and 2002), Hegde and McDermott (2003), and Chen, Noronha, and Singal (2004).

Similar to Shankar and Miller (2006), we also investigate announcement returns from parameter-based models including the market model and Fama-French three-factor models. We estimate the coefficients based on a pre-event estimation window of AD-240 to AD-61 and ED+81 to ED+260. Our results are consistent with those of Edmister, Graham, and Pirie (1994) who find that the pre-event estimation window yields evidence of valuation decline following index addition (-2% to -5%), and the post-event estimation window yields results of value increase (+4% to +6%). We believe that the post-event estimation period is more accurate for two reasons. First, most firms selected to S&P indexes are firms that are performing well, which can lead to a run-up bias during the pre-addition period.[5] Second, cost of capital likely changes as a result of index addition because of changes in stock liquidity and investor recognition. If markets capitalize this effect efficiently, post-event returns are the more appropriate source for post-event parameter estimates.

5. Sources of stock-price effects of index additions

In this section we present univariate changes in stock liquidity, investor recognition, and earnings expectations following index addition. We then test whether the changes are impounded into the permanent price effects reported in Column (6) of Table 2 by estimating OLS regressions. All changes in liquidity and investor recognition are index-adjusted by subtracting the median change in the relevant S&P index during the event period. Earnings expectations are measured relative to the universe of Institutional Brokers Estimate System (IBES) firms.

[5] This problem is also discussed in Mase (2007), who uses a post-event estimation period in his analysis of index effects for the FTSE 100, following the approach in Cowan, Nayar, and Singh (1990).

5.1 Changes in investor awareness

We hypothesize that index addition is valuable because it is associated with greater investor recognition, which Merton (1987) hypothesizes to be a priced factor in equity returns. For a sample of S&P 500 index additions, Chen, Noronha, and Singal (2004) find that changes in Merton's shadow cost and number of shareholders are impounded into abnormal index announcement returns. As proxies for investor awareness, we use number of shareholders and shadow cost as in Chen, Noronha, and Singal, and also add number of analysts providing earnings estimates as an additional proxy for investor interest. Analyst coverage is also used in tests for the S&P 500 in Elliott, Van Ness, Walker, and Warr (2006).

We construct the proxy variable for shadow cost from CRSP and Compustat data as follows:

$$\textbf{Shadow Cost} = \frac{\textbf{Residual Standard Deviation}}{\textbf{S\&P Value Weighted Index}} \times \frac{\textbf{Firm Size}}{\textbf{Number of Shareholders}} \qquad (1)$$

We compute two measures of shadow cost for each firm, one based on its own index (S&P 400 or S&P 600) and one based on the aggregated S&P 1000 index. In regressions where we have a combined sample, we use the shadow cost based on the S&P 1000; and in regressions where we estimate coefficients within each index, we use the corresponding index to calculate the shadow cost.

In equation (1), firm size is the market value of equity, and both firm size and the market capitalization of the relevant S&P Value Weighted Index are measured on the day preceding the index addition announcement. In the pre-addition period, number of shareholders is measured as close as possible to the announcement date; and for the post-addition period, number of shareholders is measured at least nine months after the effective date to provide sufficient time for investors to change their portfolios. Residual return is the difference between the firm's return and the relevant value weighted return in the 252-day period before the index addition announcement for the pre-period, and residual standard deviation is the standard deviation of the residual return. The post-addition measurement of residual standard deviation is based on returns for the 252-day period following the effective date.

Table 3 contains pre-addition levels, raw changes, and post-addition percentage changes in the proxy variables for investor awareness in the year following addition compared to the year before addition. Raw changes provide insight into the magnitude of the change while percentage changes give a sense of the relative importance. The results suggest a significant increase in investor awareness for firms added to the S&P 1000, with a median percent increase of 1.42% and 16.67% in number of shareholders and number of analysts, respectively, and a median percent decrease of -5.01% for shadow cost. The percent change in shadow cost is generally insignificant for most subsamples, except for firms migrating to the Mid-Cap from the Small-Cap index. However, raw changes indicate a more consistent decline for subsamples.

5.2 Changes in stock liquidity

The second hypothesized source of value in index addition is improvement in the trading environment of the firm's stock. For the S&P 500, Hegde and McDermott (2003) show that improvements in stock liquidity are impounded into abnormal announcement returns, and Becker-Blease and Paul (2006) show that the improved stock liquidity is associated with better investment opportunities. Thus, for the smaller capitalization indexes examined in our study, we anticipate improvements in liquidity that will be positively related to the stock price revisions around index addition.

We use CRSP data to construct three proxies for stock liquidity: the *illiquidity ratio*, dollar volume, and share turnover. The *illiquidity ratio* is first used in Amihud (2002) as a proxy for the price impact of trade and is measured as the average of the ratio of daily absolute return to the daily volume in dollars:

$$ILLIQ_i = \frac{1}{D_i} \sum_{d=1}^{D_i} \frac{|R_{id}|}{VOLD_{id}} \tag{2}$$

R_{id} is the return on stock *i* on day *d*, $VOLD_{id}$ is daily volume in dollars, and D_i is the number of days with data available for stock *i* during the 12 months pre- and post-addition. Dollar volume is the natural log of the average of daily number of shares traded times closing price, and turnover is monthly number of shares traded divided by the number of shares outstanding.

Table 4 presents 12-month average pre-addition levels, raw changes, and post-addition percentage changes in stock liquidity. Following Chen, Noronha, and Singal (2004), measurement of post-addition liquidity begins 61 days after the effective date. This ensures that any temporary upward bias induced by index fund and arbitrage trading does not influence our measurement of long-term shifts in liquidity. Results in the first row for the full sample of S&P 1000 additions show an overall improvement in stock liquidity following addition for all three liquidity proxies. The results are consistent with evidence in studies of the S&P 500 that stock liquidity improves following index addition. The subsample analysis in the next two rows shows that compared to Small-Cap firms, firms added to the Mid-Cap index have better pre-addition stock liquidity and experience significantly larger post-addition improvement in liquidity. Similarly, in untabulated results, we find that the median abnormal turnover on both the announcement date and effective date are, on average, higher for S&P 400 firms (114% and 923%) than for Small-Cap additions (113% and 667%) though only the effective day turnover is significant at traditional levels (p=0.000). Thus, the liquidity benefit of index addition is likely greater for firms added to the Mid-Cap index due to greater interest and trading activity by investors in the relatively larger capitalization firms.

5.3 Changes in analysts' earnings expectations

Denis, McConnell, Ovtchinnikov, and Yu (2003) argue that if index addition is associated with improved operating performance, this should be reflected in analysts' forecasts. Consistent with this argument, they find that the post-addition revision in analysts' earnings expectations is higher for index additions compared to benchmark firms in the IBES universe for firms added to the large capitalization S&P 500 index. They suggest that the anticipated improvement in performance stems from increased monitoring as the added firm's visibility improves, although it is also consistent with the signaling or certification hypothesis.

Following the approach in Denis, McConnell, Ovtchinnikov, and Yu (2003), which is also used in Elliott, Van Ness, Walker, and Warr (2006), we measure the change in current-year median earnings forecasts following index listing, relative to the same measure for the universe of IBES firms. The change in the forecast is standardized by actual EPS. Table 5 contains the pre-addition forecast, raw changes, and the percentage change in the current-year forecast. The results show that firms added to the S&P Mid-Cap index have higher median post-addition earnings expectations relative to their benchmark. Thus, for the Mid-Cap sample, there appears to be an expectation of improved operating performance following index addition.

5.4 Regression analysis of stock-price effects of index additions

We investigate whether the changes in investor recognition, stock liquidity, and earnings expectations explain permanent index price effects by estimating OLS regressions of returns on raw changes in the proxy variables.[6] The dependent variable is the abnormal stock return from announcement day to effective day plus 60 (reported in Column (6) of Table 2). We include firm size as a control variable because it is possible that firm size varies directly with investor recognition effects that are not captured in our proxy variables. In addition, there is evidence that growth opportunities increase following index addition (Becker-Blease and Paul, 2006). Thus, we include market-to-book value of equity to control for the effect of pre-existing growth opportunities on investor perception of the economic benefit of index inclusion. The remaining control variables consist of dummy variables for trading venue, index capitalization (S&P 400 dummy), and whether a Mid-Cap firm is new to the S&P. The trading venue dummy is included to control for any residual impact of trading venue on liquidity that is not captured by our proxy variable for liquidity, and the sub-index dummies are included for tests of our hypothesis of differences in index effects between Small- and Mid-Cap firms.

For consistency with a recent study of S&P 500 index effects by Elliott, Van Ness, Walker, and Warr (2006), we also include the measure of arbitrage risk (A1) from

[6] The regression reports results using only dollar volume as the liquidity proxy, but results are robust to use of either the illiquidity ratio or turnover. We do not include the three liquidity proxies jointly in the regression because they are highly correlated. In contrast, the correlation between analysts and shadow cost is close to zero, indicating that they capture different aspects of investor interest, and thus, we include both of these variables in the regression. In addition, results are generally consistent if we use percent (rather than raw) change in the proxy variables for investor recognition, liquidity, and EPS.

Wurgler and Zhuravskaya (2002) and the measure of index fund demand, PctShock. A1 is the variance of the residuals of the stock's excess return on the market's excess return over the T-bill rate and is computed using returns for the 250 days preceding the announcement date. The S&P 1000, S&P 600, or S&P 400 value-weighted index is used as a proxy for the market return, depending on the sample used in the analysis. PctShock is the percentage of the firm's shares estimated to be held by index funds, using data provided by Standard & Poor's for yearly percentage of shares held by indexers.

Results are reported in Table 6. Column (1) contains coefficient estimates for the combined samples with available data. Consistent with prior research, we find a significantly positive relation between stock liquidity and index announcement returns. We also find a significant negative coefficient on shadow cost. A lower value for shadow cost indicates better investor recognition, so this result indicates that permanent price effects are increasing in investor recognition. In contrast, analyst coverage and EPS forecasts have insignificant coefficients. Thus, we find that improved stock liquidity and better investor recognition are sources of value, but changes in analyst coverage and anticipated improvements in operating performance are not.

We next investigate whether the effects of liquidity and investor recognition differ by index. Column (2) reports estimates for the 325 Small-Cap additions, column (3) reports estimates for the 270 Mid-Cap additions, and column (4) reports estimates for the combined sample with interactions to test differences between the subsamples in coefficients on the proxy variables of interest. The results are similar to column (1), indicating that improvement in liquidity and investor recognition (shadow cost) is an important source of value gains for both Mid-Cap and Small-Cap firms.

These results are consistent with evidence in Chordia (2002) and Hegde and McDermott (2003) for the relation between stock liquidity and index returns but inconsistent with Elliott, Van Ness, Walker, and Warr (2006) who find that investor recognition is the only significant source of value for additions to the S&P 500. We do note, however, that Hegde and McDermott and Chordia do not include shareholder recognition measures in their regression models. Because S&P 500 firms are very liquid even before addition to the index (e.g., Becker-Blease and Paul, 2006), it is likely that the direct impact of improved liquidity on long-term abnormal returns is subsumed by the improvement in investor recognition. In contrast, the smaller capitalization Mid- and Small-Cap firms enjoy greater direct benefit from the improved liquidity.[7]

As evidenced in Figure 1, the index fund holdings of S&P 1000 firms increased significantly during our sample period. Thus, it is possible that the effects we find are clustered in a specific period. We investigate this possibility by forming a dummy variable that equals one for firms added from 1996-1999 (early sample) and zero for those added from 2000-2003 (late sample). We then repeat the analysis in Table 4 but add interaction terms for the early sample dummy on the investor recognition, liquidity, and operating performance proxy variables. The analysis (not tabulated) shows that the effect of liquidity on permanent price effects is not constrained to either the early or late period. In contrast, changes in shadow cost appear to be impounded into announcement returns primarily in the early period. This suggests that index fund demand is not a significant determinant of whether index inclusion effects are capitalized into stock returns.

[7] We repeat the analyses in Table 4 using both the pre- and post-addition parameter estimates of the market model and Fama-French three-factor model. Our results are generally robust to both models and both estimation periods. In no instance is the evidence of a significant relation between liquidity and value subsumed by the presence of investor recognition.

6. Capital investment intensity

We now extend our analysis to an additional implication of index addition. Amihud and Mendelson (1986) argue that as stock liquidity improves, the liquidity premium in stock returns will decrease and thus lower the cost of capital. In addition, Merton (1987) presents theoretical arguments that investor recognition, or the *shadow cost* of incomplete information, is a priced factor in required returns. Becker-Blease and Paul (2006) test implications of the liquidity hypothesis for a sample of S&P 500 index additions and find that post-addition changes in investment opportunities are positively related to changes in stock liquidity. They argue that this evidence is consistent with a decline in cost of capital as liquidity increases, but they do not explore whether similar effects on capital investments are present for changes in investor awareness following index addition.

Similar to Becker-Blease and Paul (1997) and Lin and Smith (2007), we use capital expenditures as a proxy for investment opportunities and examine the impact of changes in both liquidity and investor recognition on change in capital investments. For each sample firm, we compute the industry-adjusted change in capital expenditures based on the median change within the same Fama-French (1997) industry during a given period. The change in industry-adjusted capital expenditures is measured from the last full fiscal year preceding addition to the first full fiscal year following addition. Table 7 contains univariate changes in capital expenditures following index addition. The table shows an overall increase in capital expenditures for all firms, except for the subsample of Mid-Cap firms migrating from the Small-Cap.

In Table 8, we report OLS coefficient estimates for a regression model of change in capital expenditures. The regression contains the control variables from Table 6 and additional variables to capture access to financing (cash, leverage, and change in operating performance). The first column of the table contains coefficient estimates for the full sample of S&P 1000 firms, and shows that liquidity changes are strong predictors of changes in investment behavior in the sample overall. We also show in columns (2) and (3) of the table that the positive coefficient on liquidity obtains for both Mid-Cap and Small-Cap firms.

In untabulated analysis, we also investigate whether the effects presented in Table 8 cluster in the early (1996-1999) or late (2000-2003) sample periods, identified in Section 5, for the long-term announcement return regression. The interaction terms on the early sample indicator variable are all insignificant, and the liquidity variable retains its significance. This suggests that there is no distinct time trend, perhaps due to growing index fund demand, in the effect of liquidity on capital expenditures in our sample.

Table 8 also shows that, for Mid-Cap firms, improvement in shadow cost and greater analyst coverage are associated with greater capital investment. Similar to liquidity, we find no evidence of a time trend. Overall, the results for Mid-Cap firms support the contention in Merton (1987) that shareholder recognition is a priced factor in equity returns, in the sense that cost of capital decreases, thereby increasing the pool of profitable investment opportunities.

In total, the results in Table 8 provide additional evidence of the source of value in index addition, in that improvements in stock liquidity and, to a lesser extent, investor recognition, translate into greater capital investment intensity. We interpret this as evidence that these factors are priced in equity returns, and as they improve, cost of capital decreases and firms invest more.

7. Conclusion

We investigate the stock-price effects of additions to the S&P 1000 Index, which is comprised of the Mid-Cap 400 index and the Small-Cap 600 index. We first investigate short- and long-term abnormal stock returns and show that addition to the index is associated with permanent value creation. Stocks added to the Mid-Cap have mean (median) long-term increases in equity value of 3.14% (3.82%), and stocks added to the Small-Cap have mean (median) permanent price revisions of 1.96% (3.01%). This indicates that index addition is associated with long-term increases in value for firms added to both indexes.

We test various theoretical explanations for the stock-price effects. We find that the primary source of value is increased stock liquidity. We find that the primary source of value in index addition is increased stock liquidity. Firms added to the index experience a significant improvement in liquidity that is positively related to long-term abnormal index returns. Further analysis of the implications of better stock liquidity indicates that capital investment intensity is increasing in improvements in change in liquidity, consistent with an increase in the investment opportunity set as cost of capital declines.

We provide mixed evidence on the value of improved shareholder recognition. Permanent price effects are positively related to improvements in investor recognition for both S&P 400 (Mid-Cap) and S&P 600 (Small-Cap) firms. However, our results suggest that Mid-Cap and Small-Cap firms are quite different in the way changes in shareholder recognition influence capital investments. For Mid-Cap firms, improved shareholder recognition is positively related to increased capital investment intensity, suggesting that shareholder recognition is priced in equity returns, consistent with Merton (1987). Thus, as shareholder recognition improves, cost of capital declines, and the firm's pool of profitable investments expands. We do not find that changes in shareholder recognition have any impact on capital investments for Small-Cap firms.

This paper contributes to several aspects of the index addition literature. First, to the best of our knowledge, we are the first to provide a comprehensive analysis of the price, liquidity, and investor recognition effects of addition to the S&P 1000. In this sense, we update the literature on the S&P 1000 with our existing knowledge of index effects for the S&P 500. Second, we separately examine changes in equity values and post-addition changes in liquidity, investor recognition, and earnings expectations for S&P Mid-Cap 400 firms and S&P Small-Cap 600 firms. In so doing, we highlight the importance of considering the full universe of S&P Index firms when examining index effects. Finally, we show that changes in liquidity and investor recognition are significantly related to changes in capital investment intensity. Overall, our results indicate that index addition is a beneficial event for the added firm and that the added value is associated with observable and economically meaningful ex-post changes in firm characteristics.

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Table 1
Distribution of index additions by year
The following table reports the number of firms added to the S&P 600 and S&P 400 indexes each year from 1996 to 2003. The sample excludes firms that came from larger capitalization indexes. The number of firms that were not previously included in a smaller capitalization index is in parentheses.

	Overall (S&P 1000) index	S&P 400 (Mid-Cap) index	S&P 600 (Small-Cap) index
1996	65 (57)	22 (14)	43 (43)
1997	82 (69)	34 (21)	48 (48)
1998	100 (84)	51 (35)	49 (49)
1999	121 (106)	55 (40)	66 (66)
2000	138 (111)	65 (38)	73 (73)
2001	76 (61)	40 (25)	36 (36)
2002	53 (44)	19 (10)	34 (34)
2003	31 (26)	12 (7)	19 (19)
Total	666 (558)	298 (190)	368 (368)

Table 2

Abnormal stock returns for S&P 1000 additions

The following table shows market-adjusted Cumulative Abnormal Returns for S&P 400 and S&P 600 index additions from 1996 through 2003. Announcement Date (AD) is the first public announcement of the firm's addition, and Effective Date (ED) is the date the firm is added to the index. Cumulative abnormal returns are market-adjusted returns based on the S&P 1000, S&P 600, and S&P 400 indexes for abnormal returns to the full index, the Small-Cap index, and the Mid-Cap index, respectively. Mean (median) values are reported and tests of significance from zero are from t-tests (means) and Wilcoxon tests (medians).

	N	(1) AD-10 to AD-2	(2) AD-1 to AD+1	(3) AD+2 to ED+1	(4) ED+2 to ED+60	(5) AD-10 to ED+60	(6) AD to ED+60
All additions	666	0.622*	4.937***	1.935***	-4.377***	3.197***	2.487**
		(0.658)**	(4.420)***	(1.163)***	(-2.952)***	(5.008)***	(3.445)***
(1) Small-Cap 600	368	0.546	5.227***	1.609***	-5.029***	2.516*	1.959*
		(0.704)	(4.783)***	(0.876)***	(-2.989)***	(5.378)**	(3.009)**
(2) Mid-Cap 400	298	0.716	4.580***	2.336***	-3.572***	4.037***	3.139**
		(0.640)	(4.044)***	(1.541)***	(-2.952)***	(4.948)***	(3.818)***
(3) New to Mid-Cap	190	0.503	5.666***	2.963***	-5.242***	3.843**	3.206**
		(0.475)	(4.775)***	(2.037)***	(-4.675)***	(4.473)***	(3.766)**
(4) Mid- from Small-Cap	108	1.092	2.669***	1.252*	-0.633	4.380*	3.021
		(1.378)	(2.651)***	(0.351)*	(-0.113)	(5.940)**	(4.206)*
p-value for (1) vs. (2)		0.815	0.229	0.197	0.447	0.470	0.546
		(0.941)	(0.160)	(0.087)*	(0.542)	(0.666)	(0.645)
p-value for (3) vs. (4)		0.571	0.000***	0.047**	0.089*	0.854	0.948
		(0.643)	(0.000)***	(0.005)***	(0.057)*	(0.940)	(0.917)
p-value for (1) vs. (3)		0.957	0.482	0.041	0.918	0.569	0.585
		(0.872)	(0.564)	(0.006)***	(0.804)	(0.675)	(0.637)

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

Table 3

Changes in investor recognition

The following table shows mean (median) levels, changes, and percent changes in investor recognition following addition to the S&P 1000 index. Number of shareholders is Compustat data item #100. Shadow cost is the product of the ratio of the residual standard deviation and the market capitalization of the S&P 500 index (on the index addition date) and the ratio of firm market capitalization (measured on the index addition date) and the number of shareholders. Number analysts is the number of earnings estimates made one month prior to the actual earnings announcement as reported by IBES. Post-addition abnormal change is relative to the median change in the overall S&P 1000, S&P 600, or S&P 400 indexes during the same period for each measure. Changes are winsorized at 1% (5% for Shadow cost). [a]Units are 10^9.

	Pre-addition levels			Raw changes			Percent changes		
	Number shareholders	Shadow cost[a]	Number analysts	Δ Number shareholders	Δ Shadow cost	ΔNumber analysts	%Δ Number shareholders	%Δ Shadow cost	%Δ Number analysts
All Additions	5.969	0.665	7.110	0.623***	-0.089***	1.174***	18.085***	-0.927	29.361***
	(1.520)	(0.138)	(6.000)	(0.010)***	(-0.003)***	(1.000)***	(1.416)***	(-5.011)*	(16.667)***
(1) Small-Cap 600	3.030	0.505	5.532	0.295**	-0.048	0.814***	18.271***	-1.543	32.822***
	(1.050)	(0.103)	(5.000)	(0.001)**	(-0.003)***	(1.000)***	(0.665)***	(-4.793)	(16.667)***
(2) Mid-Cap 400	9.568	0.860	9.044	1.020*	-0.138	1.616***	17.861***	-0.182	25.109***
	(2.100)	(0.175)	(8.000)	(0.014)***	(-0.002)**	(1.000)***	(1.747)***	(-5.210)	(16.667)***
(3) New to Mid-Cap	11.798	0.912	8.753	0.709	-0.173	1.511***	17.217***	3.312	23.526***
	(2.670)	(0.123)	(8.000)	(0.005)	(-0.001)	(1.000)***	(0.332)**	(-0.890)	(16.667)***
(4) Mid-Cap from Small Cap	5.345	0.762	9.556	1.610**	-0.071	1.813***	19.081***	-6.798*	27.919***
	(1.620)	(0.313)	(9.000)	(0.050)***	(-0.012)**	(2.000)***	(4.903)***	(-11.570)**	(17.123)***
p-value for (1) vs. (2)	0.008***	0.005***	0.000***	0.019**	0.331	0.001***	0.918	0.669	0.204
	(0.000)***	(0.008)***	(0.000)***	(0.341)	(0.991)	(0.001)***	(0.395)	(0.570)	(0.344)
p-value for (3) vs. (4)	0.077***	0.495	0.139	0.387	0.477	0.420	0.751	0.035**	0.532
	(0.491)	(0.182)	(0.071)*	(0.053)	(0.382)	(0.500)	(0.220)	(0.031)**	(0.517)
p-value for (1) vs. (3)	0.014**	0.013**	0.000***	0.449	0.228	0.007***	0.818	0.181	0.162
	(0.000)***	(0.110)	(0.000)***	(0.840)	(0.580)	(0.008)***	(0.824)	(0.139)	(0.642)
N	601	601	662	601	601	662	601	601	662

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

Table 4

Changes in stock liquidity

The following table shows mean (median) levels, changes, and percent changes in stock liquidity following addition to the S&P 1000 index. Dollar volume is the product of monthly trading volume and monthly closing price scaled by shares outstanding averaged over the 12-month period prior to addition. Illiquidity ratio is the logarithm of the average of the absolute value of the daily return divided by the daily volume in dollars. Turnover is the 12-month average ratio of number of shares traded to the number of shares outstanding. Post-addition abnormal change is relative to the median change in the overall S&P 1000, S&P 600, or S&P 400 indexes during the same period for each measure. Changes are winsorized at 1%. [a]Units are 10^9

	Pre-addition Levels			Raw changes			Percent changes		
	Dollar volume[a]	Illiquidity ratio	Turnover	ΔDollar volume[a]	ΔIlliquidity ratio	ΔTurnover	%Δ Dollar volume	%Δ Illiquidity ratio	%Δ Turnover
All additions	2.7507 (1.3785)	0.0099 (0.0041)	6.4743 (3.5048)	0.151*** (0.035)***	-0.001*** (-0.001)***	1.443*** (0.409)***	28.225*** (6.526)***	-2.920 (-32.665)***	23.870*** (13.768)***
(1) Small-Cap 600	1.4025 (0.8490)	0.0148 (0.0077)	5.5505 (3.4334)	0.039* (0.009)***	-0.001*** (-0.001)***	0.519 (0.036)	24.687*** (0.974)	-12.684* (-26.955)*	18.363*** (7.235)***
(2) Mid-Cap 400	4.4155 (2.4605)	0.0037 (0.0021)	7.6276 (3.8840)	0.289*** (0.092)***	-0.001*** (-0.001)***	2.590*** (0.859)***	32.593*** (11.047)***	-20.153*** (-39.748)***	29.952*** (20.318)***
(3) New to Mid-Cap	4.2273 (2.0553)	0.0045 (0.0023)	7.1272 (3.2084)	0.236*** (0.079)***	-0.001*** (-0.001)***	2.868*** (0.859)***	41.943*** (15.348)***	-12.995** (-34.494)***	32.852*** (23.676)***
(4) Mid-Cap from Small Cap	4.7466 (3.4023)	0.0024 (0.0017)	8.4708 (4.8541)	0.381*** (0.140)***	-0.001*** (-0.001)***	2.121** (0.833)***	16.143** (0.966)	-31.767*** (-48.630)***	25.248*** (18.283)***
p-value for (1) vs. (2)	0.000*** (0.000)***	0.001*** (0.000)***	0.004*** (0.038)**	0.000*** (0.000)***	0.166 (0.124)	0.003*** (0.000)***	0.316 (0.040)**	0.000*** (0.006)***	0.019** (0.000)***
p-value for (3) vs. (4)	0.483 (0.003)***	0.056* (0.007)***	0.305 (0.036)**	0.203 (0.067)	0.421 (0.815)	0.514 (0.731)	0.018** (0.033)**	0.016** (0.037)**	0.251 (0.302)
p-value for (1) vs. (3)	0.000*** (0.000)***	0.002*** (0.000)***	0.080* (0.461)	0.002*** (0.000)***	0.228 (0.162)	0.003*** (0.000)***	0.071* (0.007)***	0.002*** (0.116)	0.012** (0.001)***
N	666	666	650	666	666	650	666	666	650

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

Table 5

Changes in earnings per share forecasts

The following table shows mean (median) levels, changes, and percent changes in analysts' earnings expectations following addition to the S&P 1000 index. Analysts' forecasts are EPS forecasts based on the change in the current-year forecast relative to the universe of IBES firms, following the method in Denis, McConnell, Ovtchinnikov, and Yu (2003). Post-addition abnormal change is relative to the median change in the overall S&P 1000, S&P 600, or S&P 400 indexes during the same period for each measure. Changes are winsorized at 1%.

	Pre-addition EPS forecast level	Δ EPS forecast	%Δ EPS forecast
All additions	1.104	1.443	1.392
	(0.988)	(0.409)	(0.001)
(1) Small-Cap 600	1.162	-0.014	1.220
	(0.991)	(0.000)	(0.001)
(2) Mid-Cap 400	1.033	0.006	1.599
	(0.985)	(0.001)**	(0.002)**
(3) New to Mid-Cap	1.081	-0.030	-0.003
	(0.984)	(0.000)	(0.002)*
(4) Mid-Cap from Small Cap	0.945	0.068*	4.959*
	(0.985)	(0.000)**	(0.001)*
p-value for (1) vs. (2)	0.388	0.603	0.970
	(0.275)	(0.381)	(0.186)
p-value for (3) vs. (4)	0.678	0.054*	0.170
	(0.983)	(0.054)*	(0.732)
p-value for (1) vs. (3)	0.482	0.713	0.873
	(0.364)	(0.653)	(0.341)
N	666	666	666

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

Table 6

OLS analysis of announcement returns

The dependent variable is the market-adjusted cumulative abnormal returns from announcement date to 60 trading days following the effective date. All control and test variables are industry-adjusted. Liquidity, Investor recognition, and EPS measures are defined in Tables 3, 4, and 5. A1 is the variance of the residuals of the stock's excess return on the market's excess return over the T-bill rate for the 250 days preceding the announcement date. PctShock is the percentage of the firm's shares held by index funds, using data from Standard & Poor's. Market-to-book is the difference in the ratio of book value of equity, plus balance sheet deferred taxes, minus book value of preferred stock, to market value of equity in the fiscal year preceding index addition. Total assets is Compustat data item #6. NYSE/Amex is an indicator variable equal to 1 if the firm is listed on either NYSE or Amex. New to index is an indicator variable equal to 1 if the firm was not previously listed on an S&P index. Standard errors, reported in parentheses, are from a cluster analysis to correct for heteroskedasticity.

	(1)	(2)	(3)	(4)
	Full sample	Small-Cap	Mid-Cap	Full sample
Δ Dollar volume	0.0116***	0.0081**	0.0138***	0.0101**
	(0.0023)	(0.0040)	(0.0024)	(0.0050)
Δ Shadow cost	-0.0430**	-0.0624**	-0.0431*	-0.0428*
	(0.0197)	(0.0311)	(0.0242)	(0.0231)
Δ Number of analysts	0.0028	0.0097	0.0004	0.0098*
	(0.0033)	(0.0054)	(0.0040)	(0.0051)
Δ Current EPS forecast	-0.0066	-0.0112	0.0037	-0.0138
	(0.0188)	(0.0242)	(0.0291)	(0.0229)
A1	-0.0207	-0.1258	-0.0451	-0.1241
	(0.0542)	(0.0774)	(0.0796)	(0.0892)
PctShock	0.1396	1.2801***	0.0056	1.4778***
	(0.1578)	(0.4106)	(0.1621)	(0.3642)
Market-to-book	0.0317***	0.0521***	0.0224**	0.0360***
	(0.0079)	(0.0123)	(0.0112)	(0.0086)
Log total assets	0.0291**	0.0665***	0.0319*	0.0494***
	(0.0116)	(0.0225)	(0.0184)	(0.0145)
NYSE/Amex dummy	0.0098	-0.0156	0.0126	-0.0042
	(0.0225)	(0.0316)	(0.0307)	(0.0221)
New to index dummy	0.0605**		0.0109	0.0120
	(0.0281)		(0.0277)	(0.0294)
S&P 400 dummy				-0.0319
				(0.0413)
Δ Dollar volume * S&P400				0.0026
				(0.0055)
Δ Shadow cost * S&P400				-0.0080
				(0.0116)
Δ Number of analysts * S&P400				-0.0094
				(0.0066)
Δ Current EPS forecast * S&P400				0.0183
				(0.0385)
A1 * S&P400				0.0611
				(0.0962)
PctShock * S&P400				-1.5458***
				(0.3847)
N	595	325	270	595
F-Stat	12.26***	8.32***	9.56***	10.01***
Adjusted R^2	16.62	22.16	24.06	21.33

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

Table 7

Changes in capital expenditures

The following table shows levels and changes in industry-adjusted change in capital expenditures scaled by sales from the fiscal year preceding the first full fiscal year subsequent to index addition.

	Pre-addition capital expenditures	Δ in capital expenditures
All additions	9.000	1.095**
	(5.013)	0.229***
(1) Small-Cap 600	8.997	0.492**
	(4.654)	(0.183)
(2) Mid-Cap 400	9.004	1.876*
	(5.575)	(0.264)**
(3) New to Mid-Cap	8.100	2.107*
	(5.516)	(0.182)*
(4) Mid-Cap from Small Cap	10.618	1.470
	(5.596)	(0.353)
p-value for (1) vs. (2)	0.995	0.273
	(0.169)	(0.485)
p-value for (3) vs. (4)	0.124	0.683
	(0.364)	(0.793)
p-value for (1) vs. (3)	0.459	0.327
	(0.402)	(0.606)
N	589	589

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

Table 8

OLS analysis of changes in capital expenditures

The dependent variable is the industry-adjusted change in capital expenditures reported in Table 7. Dollar volume, Shadow cost, analysts, EPS forecasts, A1, PctShock, total assets, market-to-book, and the interaction terms are as defined in Tables 3 through 6. Log (Cash) is the difference in the log of Compustat item #1 for the fiscal year preceding index addition. Change in ROA is the difference in the ratio of Compustat data #13 to data #6 between the year subsequent to addition and the year prior to addition. Clustered standard errors are in parentheses.

	(1) Full sample	(2) Small-Cap	(3) Mid-Cap	(4) Full sample
Δ Dollar volume	0.0052***	0.0074***	0.0049***	0.0054***
	(0.0007)	(0.0016)	(0.0008)	(0.0009)
Δ Shadow cost	-0.0012	0.0090	-0.0126*	0.0013
	(0.0062)	(0.0092)	(0.0073)	(0.0069)
Δ Number of analysts	0.0011	-0.0010	0.0027*	0.0007
	(0.0011)	(0.0016)	(0.0015)	(0.0013)
Δ Current EPS forecast	0.0020	0.0049	-0.0040	0.0059
	(0.0056)	(0.0069)	(0.0100)	(0.0071)
A1	-0.0181	-0.0233	-0.0348	-0.0158
	(0.0171)	(0.0016)	(0.0294)	(0.0222)
PctShock	0.0239	0.1769	-0.0239	0.1469
	(0.0498)	(0.1223)	(0.0604)	(0.1143)
Log total assets	-0.0047	-0.0132*	-0.0001	-0.0051
	(0.0046)	(0.0077)	(0.0084)	(0.0056)
Market-to-book of equity	-0.0042	-0.0079*	-0.0023	-0.0051*
	(0.0026)	(0.0041)	(0.0042)	(0.0029)
Log cash	-0.0054*	-0.0057*	-0.0045	-0.0056**
	(0.0025)	(0.0033)	(0.0040)	(0.0025)
Leverage	-0.0063	-0.0123	0.0134	-0.0052
	(0.0233)	(0.0323)	(0.0353)	(0.0236)
Change in ROA	0.0384*	0.0482	0.0221	0.0359*
	(0.0219)	(0.0312)	(0.0326)	(0.0200)
NYSE/Amex dummy	0.0033	0.0022	0.0032	0.0025
	(0.0075)	(0.0098)	(0.0122)	(0.0076)
New to Index dummy	0.0007		-0.0036	0.0002
	(0.0090)		(0.0102)	(0.0100)
S&P 400 dummy				0.0105
				(0.0140)
Δ Dollar volume * S&P 400				0.0007
				(0.0042)
Δ Shadow cost * S&P 400				-0.0207*
				(0.0120)
Δ Analysts * S&P 400				0.0071
				(0.0092)
Δ EPS forecast * S&P400				-0.0096
				(0.0119)
A1 * S&P400				-0.0228
				(0.0334)
PctShock * S&P400				-0.1552
				(0.1186)
N	533	304	229	533
F-Stat	6.34***	2.98***	4.33***	4.44***
Adj-R^2	12.04	7.26	16.63	11.96

***Indicates statistical significance at the 0.01 level.
**Indicates statistical significance at the 0.05 level.
*Indicates statistical significance at the 0.10 level.

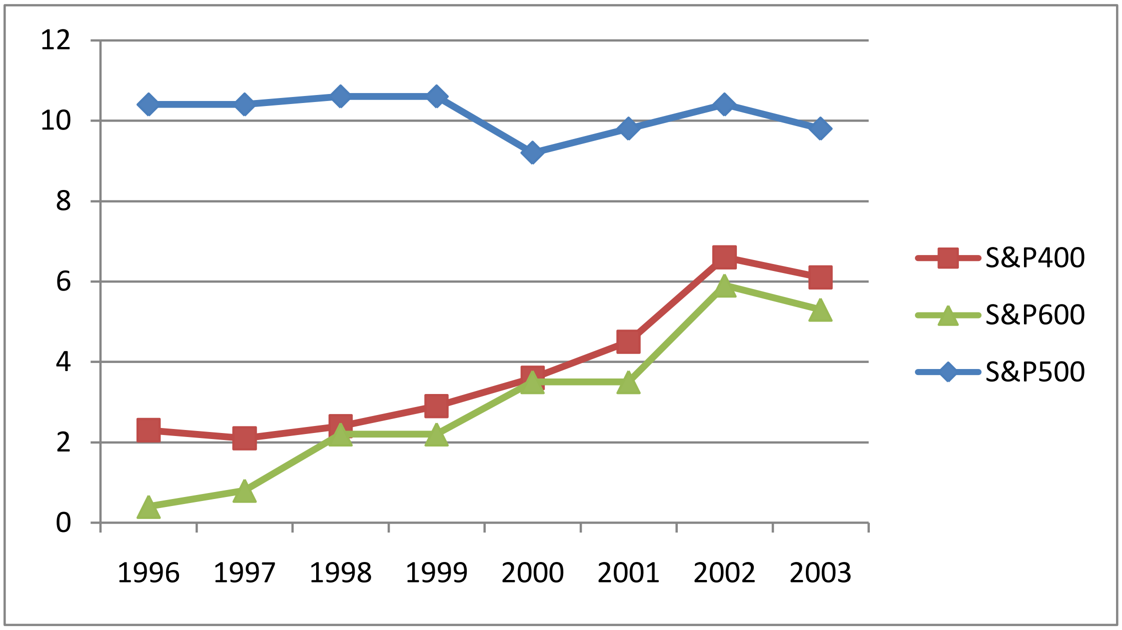

Figure 1
Percentage of shares held by index funds from 1996-2003