On the Changes to the Index Inclusion Effect with Increasing Passive Investment Management

Author:
Cameron Scari
Candidate for Bachelors of Science in Economics from the University of Pennsylvania
Scarica@wharton.upenn.edu

Faculty Advisor:
Dr. Vincent Glode CFA
Assistant Professor of Finance
Vglode@wharton.upenn.edu

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ABSTRACT*

This paper provides an empirical analysis of the index inclusion effect for additions to the S&P 500 index between 1981 and 2015. The analysis finds that between 1990 and 2015 the average excess return for additions from the announcement to effective day was 5.64%. The analysis goes further by exploring the average excess returns due to inclusion in each year. The paper then seeks to determine whether the magnitude of the index inclusion effect is affected by the growth in the passive management industry by regressing a number of different measures of passive holdings against the intra-year inclusion effect averages. Based on past theories, more passively linked funds should create a larger shift in the demand curves for the stocks around inclusion, but the results do not yield such conclusions. The index inclusion effect appears to have peaked in the late 1990s while the passive management industry has continued to grow.

*****Thank you to my advisor Dr. Vincent Glode for your helpful comments and feedback over the past couple of semesters. I really appreciate the time that you gave to me.

INTRODUCTION

The market is split into two types of overarching investment strategies, active management and passive management. Active management relies on the research, forecasts, and judgment of single managers, co-managers, or a team of managers to try to create a portfolio of investments that will outperform some benchmark, such as the S&P 500 index. The fundamental assumption is that the market is not perfectly efficient. Therefore, through the employment of skill and technique it is possible to identify mispriced securities to buy, sell, and hold in such a way to beat the market. On the other hand, passive management uses index funds, which attempt to mirror a market index either through full replication, buying all the securities that make up a certain index in the same weights, or optimization, buying the most representative sample of securities in an index based on correlations, exposure, and risk.[1] For example, the Vanguard 500 Index Fund seeks to exactly match, rather than beat, the S&P 500 index, which allows investors access to a well-diversified portfolio with a very low expense ratio. [2] Jack Bogle, Vanguard's founder, launched the first index mutual fund in August 1976 with assets under management of only $11 million. The same Vanguard 500 Index Fund now has over $225 billion under management.[3] Exchange-traded funds, or ETFs, are a subset of index funds that were launched

[1] See Blume and Edelen (2002) for a discussion on the inflexibility experienced by S&P 500 index funds looking to minimize tracking error.
[2] From Vanguard 500 Index Fund Prospectus: "Security Selection The Fund attempts to track the investment performance of a benchmark index that measures the return of predominantly large-cap stocks. The Fund uses the *replication method* of indexing, meaning that it generally holds the same stocks as its target index and in approximately the same proportions."
[3] Vanguard 500 Index Fund Investor Shares Webpage
URL: https://personal.vanguard.com/us/funds/snapshot?FundId=0040&FundIntExt=INT

in 1993 with the creation of the SPDR S&P 500 ETF, which now has over $185 billion under management.[4] The following discussion will explore whether this growth in the passive management industry and the share of U.S. equities passively managed has affected the way a stock reacts after being added to the most widely tracked index, the S&P 500.

William F. Sharpe, in his paper "The Arithmetic of Active Management," very simply outlined the rationale behind passive management. Passive investors theoretically hold all of the securities in the market in the same proportions that those securities exist in the market, which implies that the overall return to passive investors must equal the market return (Sharpe 1991). Therefore, based on simple arithmetic, the average actively managed dollar return must also equal the market return, which leads Sharpe to consider active management a "zero-sum game" (Sharpe 1991). It follows that because active management is more costly due to the research involved, investing in passive management should always be a better strategy net of costs when comparing the average performance of the two strategies. In light of this analysis, a great deal of academic finance literature sought to explain the seemingly overweight allocation of funds to active management.[5] Judging by the direction of more recent fund flows, investors have begun to believe this arithmetic truism more and more over the past two decades.

This growth in the passive management industry has created a slight abnormal return for stocks around the time that they are added to a popular market index, which is called the index inclusion effect. The index inclusion effect runs counter to typical efficient market hypotheses

[4] SPDR S&P 500 ETF Trust Prospectus on asset allocation: To maintain the correspondence between the composition and weightings of Portfolio Securities and Index Securities, the Trustee adjusts the Portfolio from time to time to conform to periodic changes made by S&P to the identity and/or relative weightings of Index Securities in the Index.

[5] For further discussion, see Gruber (1996) for evidence of active management outperforming but overcharging, Berk and Green (2004) for evidence that funds can outperform but will, in turn, attract capital that makes it more difficult to outperform, Stambaugh (2010) for evidence that money flows out of active management slowly because of slow learning and decreasing returns to scale in the aggregate, Glode (2011) for evidence that actively managed funds tend to do better in bad markets so they serve as a sort of insurance.

and the capital asset pricing model, which posit that a stock's value or price is equal to a company's future expected cash flows discounted by its systematic risk. [6] Based on this theory, demand curves for stocks should be almost perfectly horizontal, and changes in price should be driven only by a change in a stock's fundamental value based on some new information. Supply and demand shocks should not have a noticeable effect on the price of a stock.

In 1986, Shleifer hypothesized that demand curves for stocks actually slope downward by studying the abnormal return on the day following announcement of inclusion in the index, which occurs after the close of trading (Shleifer 1986). He found that between 1976 and 1983 the average abnormal return was 2.79% with very high statistical significance (Shleifer 1986). The S&P did not begin making announcements public until 1976, the same year that index funds began. Before 1989, the announcement day and the effective day of inclusion were the same. His analysis also found that the premium around the inclusion persisted for at least a month following the change. Shleifer (1986) and Schultz (2008) argued that inclusion in the index in and of itself does not provide extra information about a company's fundamental value so this price jump must be consistent with the hypothesis of long-run downward sloping demand curves for stocks rather than the information hypothesis. Due to index funds' being required to buy these stocks after inclusion, the demand curve for the stock shifts right, creating this price effect. This paper led to a growing strand of literature studying the index inclusion effect through different time periods.

Consistent with the hypothesis of downward sloping demand curves, between 1990 and 1995, Lynch and Mendenhall (1997) found that the abnormal return around the announcement date was 3.158% and 3.807% between the announcement date and the close of the day on which

[6] See Sharpe (1964) for a discussion of the Capital Asset Pricing Model and its driving assumptions

the change takes place (which occurs after the market closes). The analyses that study post-1989 inclusion effects are fundamentally different because of the lag between the announcement date and the inclusion date. Index fund managers with the objective of minimizing tracking error are incentivized to buy the stock as close to the inclusion time as possible, despite the possibility of paying a premium. Lynch and Mendenhall (1997) found that the trading volume on the day when the change occurs was three times that of the volume on the day the change is announced. Between 1976 and 1989 and between 1990 and 2000, Chen, Noronha, and Singal (2004) found an abnormal return for additions around the announcement day of 3.17% and 5.45%, respectively. Furthermore, the abnormal return between 1990 and 2000 for the time period between the announcement date and the effective date was 8.90% (Chen et al. 2004). Elliot, Van Ness, Walker, and Warr (2006) find evidence of announcement day abnormal returns of 5.67% between 1993 and 2001. They hypothesize, similarly to Chen et al. that the reason is a mix of increased investor awareness and price pressure (short-term downward sloping demand curves). Finally, Petajisto (2011) finds a market-adjusted price impact on additions to the S&P 500 of 8.8% between 1990 and 2005 and further finds evidence for price elasticity of demand that is consistent with downward sloping demand curves. Based on these arguments, the magnitude of the price increase should be positively correlated with the percentage of equities passively managed because the shift in the demand curve upon inclusion should be greater.

The percentage of total investor capital invested in passively managed products has risen dramatically over the past 35 years, especially with funds flowing into index equity mutual funds and ETFs more recently. In 1980, index equity funds represented just 0.2% of total equity mutual funds' net assets. By 2000, that percentage had grown to 9.5%, and by 2014 the index funds held 20.2% (ICI, Investment Company Factbook 2015) (See Figure 1 for visualization). Furthermore,

between 2007 and 2014, actively managed domestic equity mutual funds experienced net outflows of $659 billion while index domestic equity mutual funds and ETFs experienced $1 trillion in net new cash over the same time period (ICI, Investment Company Factbook 2015). Retail investors, or those who trade in a personal account, and institutional money have increasingly been willing to accept what the market dictates rather than trying, and often failing, to beat the market at a higher cost.

This paper will examine whether this substantial directional shift from active to passive fund flows has had a material effect on the magnitude of the index inclusion effect. The hypothesis before performing the analysis was that the inclusion effect would increase with the percentage of passively managed U.S. equity mutual fund assets due to a larger shift in the downward sloping demand curves for included stocks. Section 2 of this paper describes the selection criteria for the sample and the data used. Section 3 discusses the methodology for the analysis. Section 4 presents the results of the analysis and a discussion of the findings. Section 5 concludes.

DATA

According to the Investment Company Institute, the S&P 500 index is the most widely tracked index, with more than 33% of index mutual fund assets linked to the S&P 500. The percentage of index equity mutual fund assets linked to the S&P 500 is even higher. Therefore, the analysis of the index inclusion effect will focus exclusively on additions to the S&P 500, which we believe

is representative of the broader indexed universe. The abnormal price effect on deletions from the index falls outside the scope of this paper.[7]

S&P 500 Addition and Announcement Rules

The S&P 500 index is designed to be representative of the U.S. equity markets, and, in turn, the U.S. economy. The S&P 500 focuses on the large-cap sector of the market and includes a large portion of the total value of the U.S. equity market. This index is weighted based on float-adjusted market capitalization and is rebalanced annually in June; however, throughout the year the stocks included in the S&P 500 can change due to additions and deletions based on eligibility criteria released by the S&P index selection committee. The eligibility criteria are created in such a way to make inclusion in the S&P 500 somewhat subjective so that additions are not easily predicted. Additions and deletions come in pairs, with additions usually driven by a deletion from the index based on a company breaking one of the eligibility criteria for a sustained period of time.

A brief overview of the eligibility criteria follows: [8]

Market Capitalization: Unadjusted company market capitalization of $5.3 billion or more, a level which is reviewed from time to time

Liquidity: Adequate liquidity and reasonable price – Using composite pricing and volume, the ratio of annual dollar value traded to float-adjusted market cap should be 1.00 or greater

Domicile: U.S. company, which is measured on a number of technical factors

Public Float: Public float of at least 50% of the stock

[7] For discussion of the abnormal returns on deletions and potential asymmetric responses see: Lynch & Mendenhall (1997); Chen, Noronha, & Singal (2004); and Elliott, Van Ness, Walker, & Warr (2006)
[8] For full eligibility criteria see "Eligibility Criteria" section of *S&P U.S. Indices Methodology* at http://us.spindices.com/documents/methodologies/methodology-sp-us-indices.pdf

Sector Classification: Contribution to sector balance maintenance, as measured by a comparison of GICS sector's weight in an index with its weight in the market, in the relevant market cap range

Financial Viability: The sum of the most recent four consecutive quarters' as-reported earnings should be positive as should the most recent quarter. Balance sheet leverage should also be operationally justifiable in the context of both its industry peers and its business model

Treatment of IPOs: IPOs should be seasoned for 6-12 months before being considered for addition to an index

Eligible Securities: Include all U.S. common equities listed on NYSE, NYSE Arca, NYSE MKT, NASDAQ Global Select Market, NASDAQ Select Market, and NASDAQ Capital Market. Business development companies, limited partnerships, master limited partnerships, limited liability companies, OTC bulletin board issues, closed-end funds, ETFs, ETNs, royalty trusts, tracking stocks, preferred and convertible preferred stock, unit trusts, equity warrants, convertible bonds, investment trusts, rights, ADRs, ADSs and MLP IT units are not eligible, but REITs are eligible.

Beginning in 1976, the S&P index committee began announcing changes to the S&P index publicly after the close of trading and the inclusion became effective at the market open the following day. In October of 1989, the S&P changed its policy regarding announcements in an effort to alleviate the pricing pressure from index funds that was beginning to become apparent (Beneish and Whaley 1996). After October 1989 to current day, the S&P pre-announces changes to index membership after the market close anywhere from a day in advance to about a month in advance of the effective inclusion date. The actual change in index composition occurs after the market close on the effective inclusion date. Henceforth, announcement date will

indicate the day on which the S&P made the announcement after the market close and will be referred to as "AD." The effective date will indicate the day on which the actual change occurred after the market close and will be referred to as "ED."

Sample Construction for Composition Changes and Other Data

The sample set started with the exhaustive list of 1,072 additions stock additions to the S&P 500 that have occurred between 1970 and 2015 and their effective dates of inclusion. Public announcements of changes to the index did not begin occurring until 1976, so those first six years were eliminated. Furthermore, the requisite price data prior to 1981 were not available at a sufficient level to compute returns on a meaningful sample size (more than 2 additions in a year). These eliminations brought the sample size from 1,072 additions to 853 additions. The data were then split between changes occurring between 1981 and October 1989 (247) and changes occurring after October 1989 (621) to account for the change in the S&P announcement policy. To find the announcement date for the post-policy change stocks, the S&P Dow Jones Indices news archives was first searched for the initial article announcing the change. If this press release was not readily available from the archives, the date of the first article published that reported the S&P announcement was used, which was tested and found to be a completely reliable proxy. From the greater dataset, companies were removed that had been included in the S&P due to spinoffs, mergers, or major restructurings, had not been trading for at least 20 days prior to the effective date of inclusion, and for which the date of announcement and the data of inclusion were not at least a day apart if the change occurred after October 1989. Furthermore, stocks for which there was not available historical pricing data from Bloomberg were removed. These criteria narrowed the sample to 106 stocks pre-October 1989 and 444 stocks for the period

ending in 2015 (see Table 1 in Exhibit 1 for breakdown by year). Removing stocks without available pricing data may have induced some survivorship bias. However, this bias should not be a significant issue for the analysis because of the difference in time horizons around studying the inclusion effect and the long term survival of a company, which cannot be known at the time of the inclusion.

For the remaining sample, stock prices and S&P 500 index prices were pulled from Bloomberg for the close of the following dates: 30 trading days prior to AD (AD – 30), 20 trading days prior to AD (AD – 20), 1 trading day prior to AD (AD – 1), AD, 1 trading day post AD (AD + 1), 20 trading days post AD (AD + 20), 30 trading days post AD (AD + 30), 30 trading days prior to ED (ED – 30), 20 trading days prior to ED (ED – 20), 1 trading day prior to ED (ED – 1), ED, 1 trading day post ED (ED + 1), 20 trading days post ED (ED + 20), and 30 trading days post ED (ED + 30). Any and all cash dividends that were issued during any given time period were pulled from the CRSP database. Prices were also appropriately adjusted for any stock splits that occurred during the analyzed time frames.

Passively Managed Assets

A number of different measures of passively managed assets and index linked funds were gathered from a variety of data sources. Most of these data display a similar trend in the investment management industry of assets flowing into passively managed products (see Figure 1). The Investment Company Institute data provided total net mutual fund assets, total net equity mutual fund assets, and the percentage of equity mutual fund assets that were indexed from 1980 to 2014. Annual surveys conducted by the S&P Dow Jones Indices, provided data for the total assets mechanically linked (including index equity mutual funds and ETFs) to the S&P 500 from

1981 to 2015. The total market capitalization of the S&P 500 constituents between 1990 and 2015 was taken from Bloomberg. Dr. Kenneth French and Dr. Robert Stambaugh provided estimates of the fraction of U.S. equity owned directly by individuals from 1980 to 2014 as well as the fraction of institutionally owned equity that was actively managed between 1986 and 2006. [9] Martijn Cremers and Antti Petajisto provided their data from 1980 to 2014, for what they consider "active share," or the fraction of actively managed equity mutual fund portfolios that differ from the index to which their performance is benchmarked (2009). See the appendix for visualizations of the above discussed data.

METHODOLOGY

To estimate the index inclusion effect a stock's excess return (ER) over the index return was computed during given time spans related to the announcement date and the effective date of the specific inclusion.

$$Excess\ Return = ((S_t + D_{t-1\ to\ t})/S_{t-1} - 1) - (M_t/M_{t-1} - 1) \qquad (1)$$

Where t = the later date, t-1 = the earlier date, S = the stock price, D = any cash dividend paid between the time t-1 and t, M = S&P 500 index price. The logically relevant pairs for additions post October 1989 of t and t-1 are displayed in Table 2a of the appendix. Each stock was also tagged with the year in which the announcement of inclusion took place for later sorting and averaging by year. While a stock's return that is included in the S&P 500 will have an effect on the return of the overall index, this effect was viewed as negligible. Furthermore, traditional abnormal returns, or alpha, using the CAPM were not computed due to the short time spans being considered and the empirical failings of the CAPM. Using Equation 1, excess returns were

[9] Thank you to Professor Robert Stambaugh for providing much of the data used in this section.

calculated for each addition between the relevant dates. Additions in the sample occurring prior to October 1989 were treated separately as the announcement date and effective date were the same. Therefore, only the time pairs outlined in Table 2b were tested. Using a simple arithmetic mean, the global means of the excess returns were computed for each time pair. Again, global means for pre- and post-October 1989 were calculated separately. Standard t-tests with a hypothesized mean of 0 were performed to determine the statistical significance of the signs of the results.

The global means helped inform which dependent variables relating to the index inclusion effect would best show how the shift towards passive investment vehicles has affected the magnitude of the inclusion effect. Exhibit 2 shows clearly the trend that index linked investments have increased over time. To get a general sense of how the index inclusion effect has trended throughout the same period of time, the excess returns using Equation 1 for each addition were then calculated again for the same time spans outlined in Table 2. In this round of analysis, the results for each time span were grouped by year and then averaged using a simple arithmetic mean. Again standard t-tests with a hypothesized mean of 0 were performed to determine the statistical significance of the signs of the excess returns for each year. These means were then saved in order to become dependent variables for the regression analysis using the different measures of passive investment management as explanatory variables.

At this stage, pre-October 1989 results were ignored in order to simplify the analysis and ensure consistent comparisons. Furthermore, total market cap data for the S&P 500 index was not available until 1990. To better test the hypothesis of positive correlation between growth in the passive investment management industry and the magnitude of the index inclusion effect, measures of passive investment management were broken up into two categories: general and

S&P 500 specific (see Exhibits 2 & 3). General explanatory variables were measurements that provided insight into the overall growth of the passive management industry. These variables included the following (see Exhibit 2): ICI Total Net Assets of Index Mutual Funds (AIMF), ICI Total Net Assets of Index Equity Mutual Funds (AIEMF), ICI % of Total Equity Mutual Fund Assets Indexed (%EMFI), and % Passive Share computed as 1-Cremers' Active Share % (%PS). S&P 500 specific variables had a direct link to the magnitude of assets indexed to the S&P 500 (see Exhibit 3). These variables included the following: ICI Total Net Index Mutual Fund Assets Linked to the S&P 500 (IMFSP500), ICI % of Total Index Mutual Fund Assets Linked to S&P 500 (%IMFSP500), % Change YoY of Net Index Mutual Fund Assets Linked to S&P 500 (YoY%SP500), S&P Indices Survey Total Assets (including ETFs) Mechanically Indexed to S&P 500 (SP500-I), % Change YoY of SP500-I (YoY%SP500-I), and % of Total Market Cap of S&P 500 Indexed (%SP500MKT).

Following the analysis of the global means and yearly means, yearly excess returns from AD to AD + 1 and AD to ED were chosen as the dependent variables for which to test whether the size of the passive investment management industry has a material effect on the index inclusion effect. To perform this analysis, simple least-squares Y vs. X regression models were run with the various annual independent variables discussed above against the chosen dependent variables. The sign and significance of the *beta* coefficients of the regression were used to draw conclusions.

RESULTS

Global Means

See Exhibit 5 for the results of the computation of the global means for the excess returns to S&P 500 additions around the announcement and effective dates. The results are consistent with prior literature discussing the index inclusion effect, with an abnormal return for additions between the announcement date and the inclusion date of about 5.64% between October 1989 and the end of 2015. It is interesting to note that the magnitude of the excess return between ED and ED + 1 for additions prior to October 1989 is about the same as the average magnitude of excess returns between AD and AD + 1 for additions after the policy change. Prior to Oct. 1989, that excess return could more easily be attributed to pricing pressure stemming from index fund demand because there was no forewarning of an inclusion. The fact that there is not a statistically significant return for ED-1 to ED pre-Oct. 1989 provides evidence that investors were not able to guess index changes, or else there would likely be evidence of front running. Similarly, the return on the day leading up to the announcement for the post-Oct. 1989 sample is barely statistically significant at the 95% confidence level, with a very small positive excess return.

In that index funds do not typically buy the securities until the effective inclusion, the highly statistically significant excess return of 3.32% between AD and AD + 1 provides evidence of other investors in the market seeking to take advantage of the demand for the stock that index funds will provide at the time of inclusion. These investors are willing to buy the stock at a slightly higher price with the expectation that there will be an easy exit opportunity upon inclusion. However, surprisingly there is still a statistically significant drift from between the close the day after the announcement and the close on the day of inclusion, about 2.3%. One would expect that arbitrageurs in the market would appropriately match the expected inclusion demand brought by indexers by buying at the announcement price in the same quantity, thereby transferring the pricing pressure that used to occur around inclusion to the time around

announcement. In this way the pricing pressure around inclusion should be alleviated because the arbitrageurs are waiting with supply of the stock to unload. Otherwise, there are essentially arbitrage profits that remain on the table as evidenced by this drift. Nevertheless, it appears from this analysis that the pressure from the inclusion effect after October 1989 overshoots the adequate pricing level and, on average, the stocks fall about 2.2% more than the market in the 30 trading days following inclusion. This reversal, however, is not as great in magnitude as the increase. Given that there is not significant fundamental information contained in inclusion, these excess returns provide further evidence of downward sloping demand curves for stocks that runs counter to the efficient market theory.

Yearly Means

See Exhibits 6, 7, and 8 for the mean excess returns around the announcement and the effective inclusion date for the period pre-October 1989 and post-October 1989 broken down by year. These tables also provide number of additions included for each year and the t-statistics associated with the means. The pre-October 1989 data provide little analytical support. The breakdown of the annual means show very clearly without the need for regression models that the index inclusion effect has continued to grow with the passive management industry. In fact the opposite seems to be true, as the S&P 500 inclusion effect peaked in the late 1990s and early 2000s and has dwindled to statistical insignificance since. Since 2010, 2015 was the only year that exhibited a statistically significant positive inclusion effect between the announcement date and the effective date despite the continued growth in the proportion of index equity mutual funds and ETFs. Nevertheless, not a single year between 1990 and 2015 had a negative average excess return between the announcement day and the day following the announcement.

However, it seems that markets have become more efficient, with almost zero or negative drift occurring between the day after announcement and the effective date. Since 2005, only three years have exhibited statistically significant drift. Furthermore, the excess return between announcement and 30 trading days after effective inclusion has been negative in each of the past seven years. These changes to the index inclusion effect potentially indicate that investors, possibly hedge funds or other risk arbitrageurs are increasingly making bets on which stocks will be chosen to be added to the index. Wurgler points out that arbitrageurs can flatten demand curves for stocks, which is a possible explanation for the disappearance of the inclusion effect as the demand curves are no longer as steeply downward sloping (2010). These contradictory results may also lend credence to a number of other explanations for the index inclusion effect that have been offered in the past and often rejected, namely improved investor awareness, improved liquidity, and improved operating performance due to inclusion.

Regression

To further illustrate the findings from the yearly means described above, the regression outputs are displayed in Exhibit 9. The top table displays the output using the dependent variable AD to AD + 1 and the bottom table displays the output using the dependent variable AD to ED. Most importantly, the tables provide a measure of RSquare, which is the percentage of variance in the dependent variable that can be explained by the independent variable, a measure of the *beta* coefficient, which shows the magnitude of the effect a unit change in the explanatory variable would have on the dependent variable, and a measure of the constant or intercept, which is the level the dependent variable would be at if the explanatory variable were 0. Nearly all of the regression coefficients are statistically significantly negative, indicating that the index inclusion

effect actually seems to decrease in magnitude with an increase in passive fund management. All of the "general" explanatory variables have been trending upwards while the S&P index inclusion effect has been trending downwards. However, the major confounding factor is the growing market understanding of the index inclusion effect that occurs with the passage of time. This allows for arbitrageurs to more accurately trade on inclusion information or even predict inclusions, which decreases the level of abnormal returns. These results also show that there is definitely not a causal link between strictly the level of assets passively managed and the magnitude of the S&P 500 index inclusion effect. However, the regression with the most explanatory power, or the highest RSquare value (52.71%), while directly contradicting the initial hypothesis of a growing index inclusion effect, actually supports the reasoning behind the initial hypothesis. The explanatory variable %IMFSP500 is a measurement of percentage of total index mutual fund assets linked to the S&P 500. This variable has been steadily declining as has the index inclusion effect as passive funds have been allocated elsewhere. Hence the *beta* is highly statistically significant and positive as both measures have declined in tune. The S&P 500 index used to be by far the most common index to link passive funds to. However, in recent years, it seems that despite growth in S&P 500 index linked assets, other indexes are benefiting in greater proportion, such as world equity indexes and hybrid bond indexes. Therefore, the shift in the demand curve for S&P 500 additions from mechanical buying from index funds may have lessened in magnitude.

CONCLUSION

This paper provides an updated analysis of the index inclusion effect for the S&P 500 index and an analysis of whether the growth in the passive management industry witnessed over the past 25

years has had a material impact on this effect. From 1990 to 2015 the excess return for additions to the S&P 500 averaged 5.64% between the announcement date and the effective date of inclusion and 3.32% between the announcement date and the following day. Looking at the excess returns broken down by year, the index inclusion effect appears to have peaked in the late 1990s and early 2000s with excess returns in the teens and has since withered. While the passive management industry was still growing at that time, there is not strong evidence that this growth was a driving factor in the magnitude of the index inclusion effect as was the initial hypothesis. In recent years the trends have been going in opposite directions. This may be due to markets becoming more efficient, thereby flattening the demand curves for stocks, or the downward sloping demand curve theory may have been wrong. Neoclassical asset pricing theory assumes that changes to a stock's price should be a result of some new information about the corporation's value to its shareholders (Belasco, Finke, Nanigian 2012, Kyle 1985). Following the neoclassical pricing theory, the increase in valuation due to inclusion in the S&P 500 could be attributed to either greater intrinsic value due to increased liquidity or increased informational accuracy from greater analyst coverage following inclusion in a major index (Belasco, *et. al* 2012).

No matter the cause, the analysis in this paper that shows the decline in the index inclusion effect is welcome news to indexers who over the past 20 years have been forced to buy stocks upon inclusion at inflated prices. This created index turnover costs that decreased total returns. The effect was exacerbated when the price increase in the days leading up to inclusion reversed after inclusion. This begs the question of whether the S&P 500 should pre-announce inclusions at all, which clearly in the past has allowed arbitrageurs to buy the stocks at announcement and sell to indexers at inclusion. However, it may be better to make the process

even more transparent. One area for further study is how the amount of time between the announcement and the effective date affects the post inclusion reversal that could be seen in the often negative returns between ED + 1 and ED + 30. Another area for further study is how the index inclusion effect differs based on the size of the firm being included.

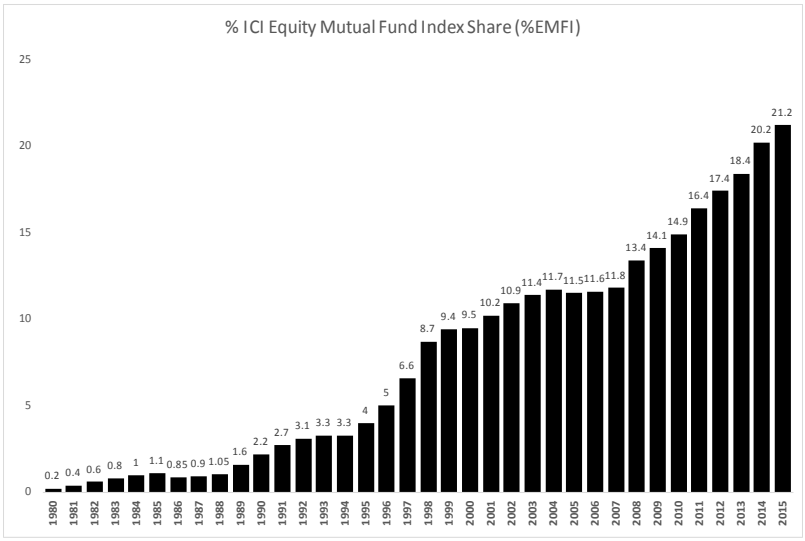
EXHIBITS

Table 1 -- Sample Broken Down By Year

Pre Policy Change			Post Policy Change		
Year	**Initial Sample**	**Final Sample**	**Year**	**Initial Sample**	**Final Sample**
1981	21	6	1990	15	7
1982	28	11	1991	13	6
1983	19	6	1992	7	4
1984	30	14	1993	12	4
1985	28	16	1994	16	11
1986	28	15	1995	31	16
1987	27	10	1996	22	12
1988	25	14	1997	26	19
1989	26	14	1998	39	26
Total	**232**	**106**	1999	42	33
			2000	54	33
			2001	30	22
			2002	23	18
			2003	9	7
			2004	19	13
			2005	18	14
			2006	31	24
			2007	40	34
			2008	38	33
			2009	25	22
			2010	16	12
			2011	19	13
			2012	18	13
			2013	18	15
			2014	16	14
			2015	24	19
			Total	**621**	**444**

Exhibit 1: This table displays the changes to the initial sample to arrive at the final data sample.

Panel A



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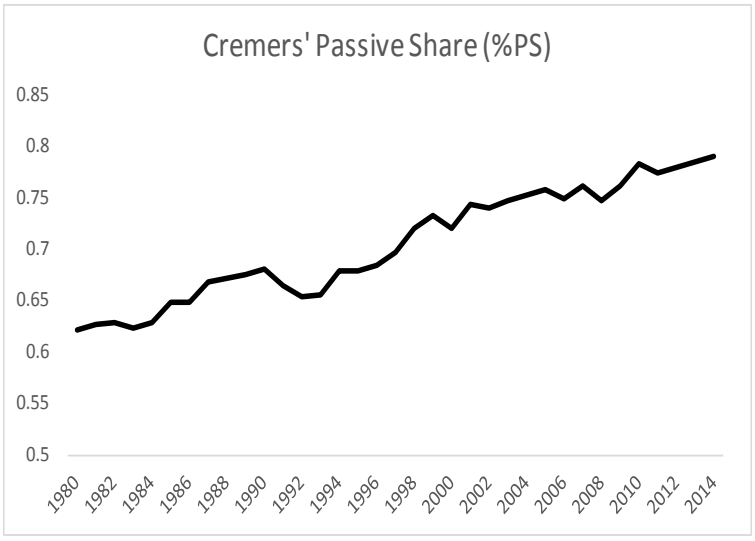

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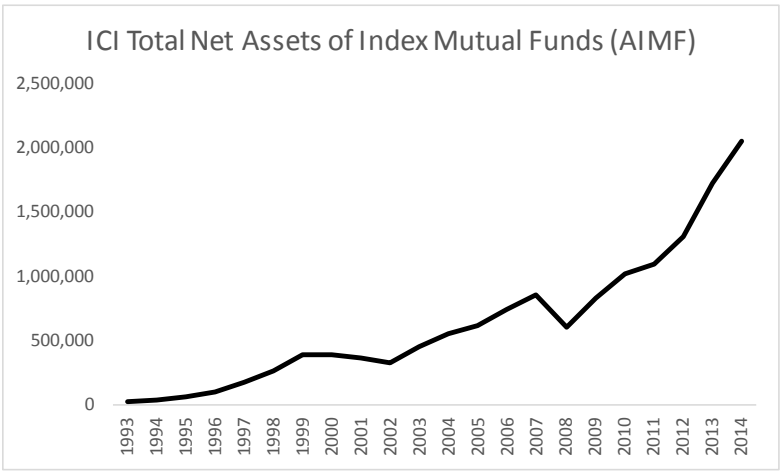


Panel D

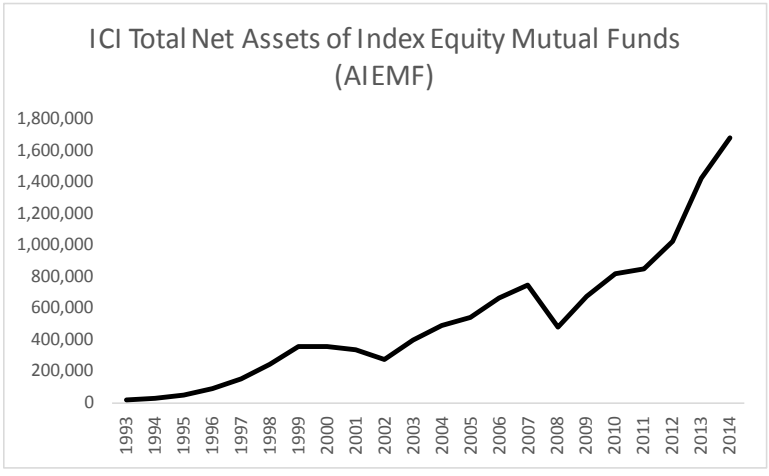
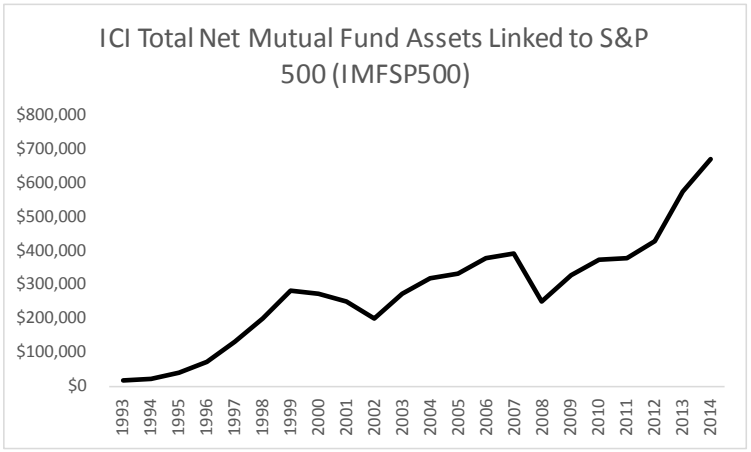


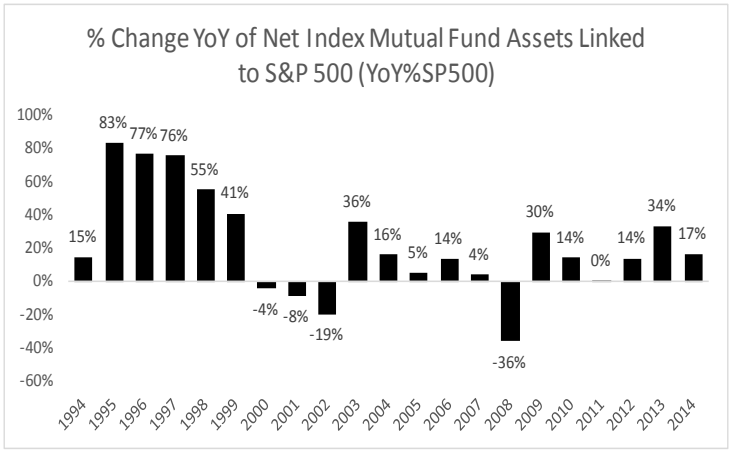
Exhibit 2: These are the four general explanatory variables that show the trend of growth in the passive investment management industry. Panel A shows the percentage of Total Equity Mutual Assets that are invested in Index Equity Mutual Funds, Panel B shows the percentage of actively managed equity funds that mimic the benchmark their performance is measured against as measured by Cremers (2009), Panel C shows the Total Net Assets invested in Index Mutual

Funds, and Panel D shows the Total Net Assets invested in Index Equity Mutual Funds. All of the Panels display the upward trends that led to the hypothesis of an increased index inclusion effect.

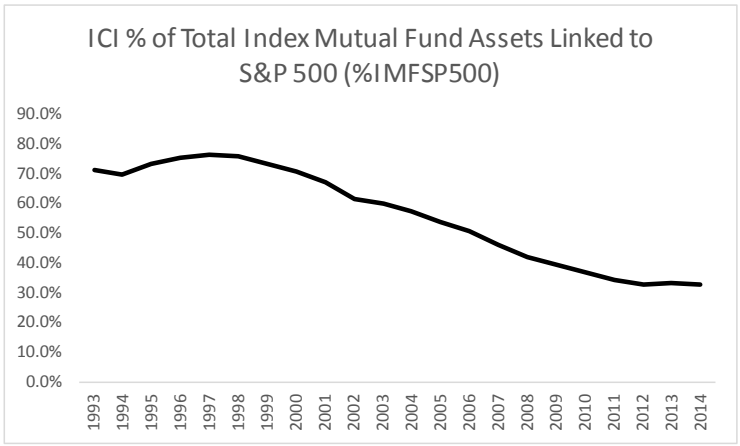
Panel A



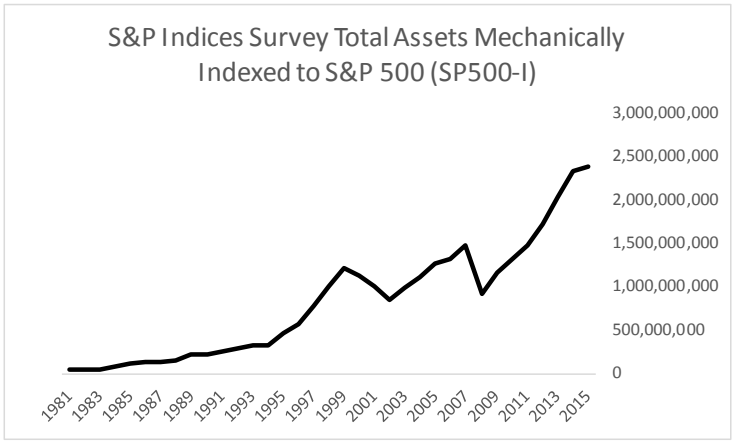
Panel B



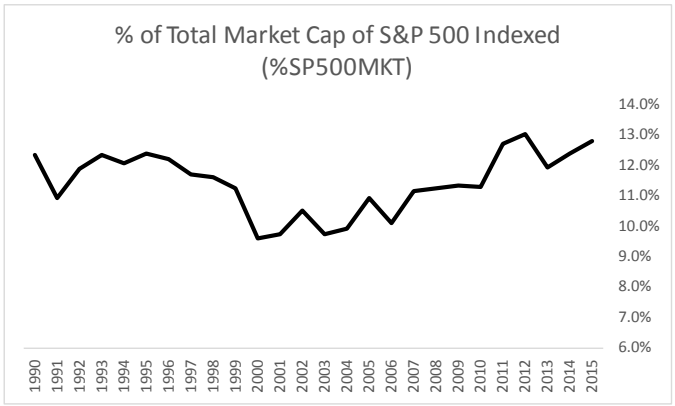
Panel C



Panel D



Panel E



Panel F

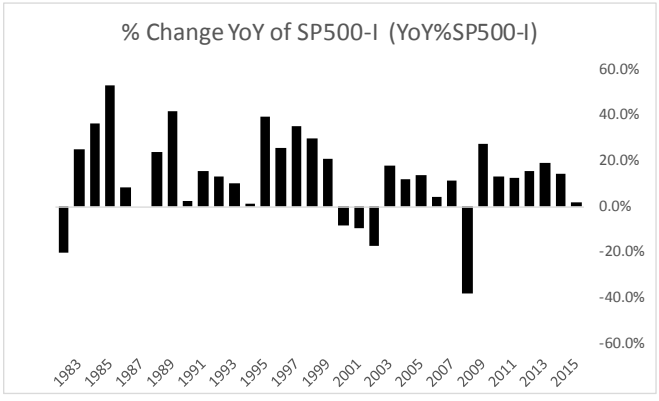


Exhibit 3: These are the five S&P 500 specific variables, which display somewhat contradictory trends to the general variables in Exhibit 1. While the total assets directly linked to the S&P 500 still appear to be increasing (Panel A & Panel D), this growth is being outpaced by the overall growth in Index Mutual Funds as Panel C shows a decline in the % of Index Mutual Fund Assets

linked to the S&P 500. Furthermore, Panel E shows that the total Market Capitalization of the S&P 500 is growing at about the same rate as S&P 500 linked assets, with the trend line relatively flat.

Table 2a: Time Spans Tested Post Oct. 1989

t -1	t	Reason
AD - 1	AD	Test Predictability of Announcement
AD	AD + 1	Test Magnitude of Early Buying
AD	ED	Test Magnitude of Inclusion Effect
AD + 1	ED	Test Magnitude of Drift
ED	ED + 1	Test Magnitude of Mechanical Buying
AD	ED + 20	Test Persistence of Inclusion Effect
AD	ED + 30	Test Persistence of Inclusion Effect
ED + 1	ED + 20	Test Persistence of Inclusion Effect
ED + 1	ED + 30	Test Persistence of Inclusion Effect

Table 2b: Time Spans Tested Pre Oct. 1989

t -1	t	Reason
ED - 1	ED	Test Predictability of Announcement
ED	ED + 1	Test Magnitude of Mechanical Buying
ED + 1	ED + 20	Test Persistence of Inclusion Effect
ED + 1	ED + 30	Test Persistence of Inclusion Effect

Exhibit 4: These tables display the beginning and end dates for the different periods of analysis for index additions with "AD" referring to the announcement date and "ED" referring to the effective date of inclusion. Table 2b has fewer time periods to test because prior to October 1989, the announcement date and effective date were one in the same.

Global Means Pre October 1989					
Time Span					
t -1	t	N	Mean	t-stat	Significant
ED - 1	ED	108	0.06%	(0.3179)	
ED	ED + 1	108	3.21%	(12.7041)	**
ED + 1	ED + 20	108	1.81%	(1.8024)	**
ED + 1	ED + 30	108	1.03%	(1.0941)	

** Significant at 95% Level

Global Means Post October 1989					
Time Span					
t -1	t	N	Mean	t-stat	Significant
AD - 1	AD	444	0.29%	(1.9061)	**
AD	AD + 1	444	3.32%	(16.4184)	**
AD	ED	444	5.64%	(9.9189)	**
AD + 1	ED	444	2.27%	(4.3689)	**
ED	ED + 1	444	-0.87%	(-3.8306)	**
AD	ED + 20	444	-0.39%	(-1.5844)	
AD	ED + 30	444	-0.49%	(-1.6876)	**
ED + 1	ED + 20	444	-0.17%	(-0.2714)	
ED + 1	ED + 30	444	-2.18%	(-3.9392)	**

** Significant at 95% Level

Exhibit 5: The above tables show the global means for each of the time spans of analysis. The results are an average of the all of the excess returns for additions that were generated between t-1 and t. For example, the average excess return for all 444 additions post October 1989 between the announcement date and the day after the announcement date was 3.32%.

Yearly Means Pre October 1989					
Year	**N**	**ED -1 to ED Pre Change**	**ED to ED + 1 Pre Change**	**ED + 1 to ED + 20 Pre Change**	**ED + 1 to ED + 30 Pre Change**
1981	6	-0.47%	3.30%	-2.23%	-3.38%
		(-0.7657)	(10.5488)**	(-0.9635)	(-0.7941)
1982	11	0.21%	2.24%	1.16%	4.74%
		(0.237)	(2.596)**	(0.4813)	(1.582)
1983	6	-0.22%	2.19%	-3.44%	-4.60%
		(-0.2971)	(1.6229)	(-0.8213)	(-1.0222)
1984	14	-0.38%	2.25%	-0.24%	2.65%
		(-0.5122)	(3.7674)**	(-0.1154)	(1.2614)
1985	16	0.26%	1.76%	0.10%	-0.41%
		(0.5)	(7.6738)	(0.0329)	(-0.1365)
1986	15	0.22%	4.43%	3.07%	2.39%
		(0.6737)	(8.9955)	(1.8885)**	(1.0304)
1987	10	0.01%	4.87%	5.32%	5.99%
		(0.0193)	(4.1027)**	(3.033)**	(2.4025)**
1988	14	0.17%	4.50%	6.36%	-0.33%
		(0.2991)	(5.8891)	(1.763)	(-0.1235)
1989	14	0.30%	3.38%	2.65%	-0.82%
		(0.7935)	(4.8528)**	(0.6401)	(-0.3098)

Exhibit 6: This table displays the average excess returns for a given year over a given time span in relation to the announcement date and inclusion date. The table also provides data on the sample size for each given year and the t-values of the means after performing a standard t-test to test the sign of the average.

Yearly Means Post October 1989										
Year	**N**	**AD - 1 to AD**	**AD to AD +1**	**AD to ED**	**AD + 1 to ED**	**ED to ED + 1**	**AD to ED + 20**	**AD to ED + 30**	**ED + 1 to ED + 20**	**ED + 1 to ED + 30**
1990	7	-0.85%	1.78%	5.63%	3.72%	-1.30%	1.13%	1.25%	1.07%	0.47%
		(-2.13)**	(1.423)	(2.4357)**	(2.6613)**	(-1.7249)	(0.9962)	(0.7451)	(0.5071)	(0.1387)
1991	6	-0.33%	2.38%	6.10%	3.50%	-3.79%	-2.27%	-3.77%	8.35%	4.74%
		(-0.7451)	(2.7252)**	(1.6468)	(1.0837)	(-1.4935)	(-1.2385)	(-1.6327)	(1.6236)	(1.163)
1992	4	-1.58%	5.76%	4.92%	-0.82%	1.11%	-2.32%	-1.88%	5.39%	5.68%
		(-1.5815)	(5.0816)**	(1.5036)	(-0.2443)	(0.4625)	(-1.9345)	(-1.388)	(1.1361)	(0.9928)
1993	4	-0.19%	3.82%	7.22%	3.31%	-0.32%	-0.61%	-0.41%	-0.57%	3.07%
		(-0.5904)	(2.8798)**	(4.072)**	(1.4193)	(-0.681)	(-0.8255)	(-0.7156)	(-0.2481)	(0.5748)
1994	11	-0.25%	2.67%	0.31%	-2.34%	-0.55%	1.02%	0.59%	-3.63%	-3.26%
		(-0.4452)	(4.0372)**	(0.0635)	(-0.5075)	(-1.374)	(1.4912)	(0.6372)	(-1.6433)	(-1.3535)
1995	16	-0.20%	3.16%	5.89%	2.60%	-0.78%	-2.53%	-3.29%	-0.72%	-2.13%
		(-0.5699)	(4.3273)**	(4.1124)**	(2.489)**	(-1.4108)	(-4.2236)**	(-4.4123)**	(-0.2985)	(-0.8373)
1996	12	0.54%	4.74%	11.76%	6.65%	-1.55%	-3.00%	-4.23%	-3.92%	-6.24%
		(0.7177)	(5.7809)**	(4.9904)**	(3.6505)**	(-2.1554)**	(-4.3626)**	(-4.8746)**	(-1.4229)	(-2.1041)**
1997	19	-0.47%	8.65%	16.34%	7.45%	-3.27%	-1.69%	-3.77%	0.72%	-3.78%
		(-0.6787)	(5.8539)	(3.3261)**	(1.4524)	(-1.2412)	(-1.8247)**	(-3.4058)**	(0.1402)	(-1.9068)**
1998	26	0.93%	5.27%	12.85%	7.55%	-2.12%	-3.24%	-4.64%	-2.95%	-6.01%
		(0.9673)	(5.4974)	(4.4637)**	(2.3662)**	(-1.4566)	(-2.9859)**	(-3.4577)**	(-0.9427)	(-2.544)**
1999	33	0.26%	6.30%	9.56%	3.19%	-0.77%	-2.04%	-2.06%	-1.62%	-3.09%
		(0.5405)	(8.0745)	(3.4678)**	(1.2409)	(-1.6482)	(-2.5024)**	(-2.4167)**	(-0.7306)	(-1.2544)
2000	33	1.92%	4.19%	8.57%	4.36%	-2.39%	0.73%	0.32%	2.74%	1.64%
		(1.7841)**	(3.1994)**	(2.527)**	(1.4474)	(-2.1754)**	(1.0607)	(0.5278)	(1.0147)	(0.5845)
2001	22	-0.54%	2.09%	5.14%	2.87%	-0.57%	1.47%	3.60%	3.23%	1.56%
		(-0.682)	(1.739)**	(1.9451)**	(1.3538)	(-0.7633)	(1.3093)	(2.2938)**	(1.2226)	(0.5648)
2002	18	0.41%	2.88%	6.31%	3.55%	-0.50%	1.36%	3.42%	3.16%	-0.47%
		(0.8429)	(3.7422)**	(3.4278)**	(2.4471)**	(-0.9225)	(1.0227)	(3.032)**	(0.4767)	(-0.2259)
2003	7	0.29%	2.26%	0.83%	-1.42%	0.32%	-3.05%	-4.84%	-0.74%	-2.96%
		(0.3453)	(1.8805)	(0.556)	(-2.0197)**	(0.3606)	(-2.3408)**	(-3.6735)**	(-0.3603)	(-1.1215)
2004	13	0.36%	1.65%	4.71%	3.02%	-0.05%	0.33%	0.35%	-1.80%	-1.81%
		(0.8397)	(3.238)**	(5.3218)**	(3.3058)**	(-0.2535)	(0.3678)	(0.3209)	(-1.2532)	(-1.1645)
2005	14	0.65%	1.32%	2.18%	0.86%	-0.15%	-0.25%	-0.30%	-0.28%	-2.94%
		(1.7965)**	(2.5305)**	(2.935)**	(1.5535)	(-0.3312)	(-0.4689)	(-0.4499)	(-0.197)	(-1.4685)
2006	24	1.61%	2.77%	3.81%	1.02%	-0.67%	-0.86%	-0.77%	-2.58%	-3.78%
		(2.4872)**	(4.391)**	(4.6292)**	(1.8178)**	(-2.0202)**	(-3.3792)**	(-1.9486)**	(-1.8326)**	(-2.5284)**
2007	34	-0.38%	2.26%	5.80%	3.46%	-1.51%	0.93%	0.96%	4.72%	0.03%
		(-0.7662)	(6.2682)	(1.9652)**	(1.1978)	(-1.0069)	(1.1745)	(1.2112)	(1.2188)	(0.0159)
2008	33	0.49%	3.76%	4.83%	1.04%	-0.76%	7.17%	8.91%	-5.37%	-8.41%
		(0.756)	(7.7555)	(5.312)	(1.3427)	(-1.1208)	(4.5599)	(5.4041)	(-2.9865)**	(-2.8894)**
2009	22	-0.31%	2.55%	1.83%	-0.69%	0.20%	-3.02%	-4.37%	-0.49%	-4.64%
		(-0.6394)	(5.4393)	(2.0734)**	(-0.8617)	(0.3732)	(-2.6849)**	(-3.2455)**	(-0.2413)	(-1.9813)**
2010	12	0.53%	2.36%	-0.16%	-2.44%	-0.58%	-3.41%	-4.95%	-2.01%	-4.69%
		(0.7478)	(2.8407)**	(-0.1449)	(-3.403)**	(-2.2392)**	(-3.4645)**	(-4.2346)**	(-0.9798)	(-1.5616)
2011	13	0.58%	0.45%	0.24%	-0.26%	0.59%	-3.40%	-2.60%	-0.39%	0.44%
		(1.0802)	(0.4911)	(0.1536)	(-0.2501)	(1.6782)	(-3.5334)**	(-1.8807)**	(-0.245)	(0.1863)
2012	13	0.13%	1.82%	0.40%	-1.41%	0.42%	-1.76%	-2.15%	-0.08%	-2.94%
		(0.3552)	(2.7951)**	(0.3608)	(-1.9698)**	(0.7768)	(-2.114)**	(-1.667)	(-0.0327)	(-0.7009)
2013	15	-0.15%	2.16%	1.61%	-0.60%	0.98%	-2.15%	-1.69%	-1.43%	-2.35%
		(-0.6097)	(3.5992)**	(1.3558)	(-0.8039)	(1.1508)	(-3.4723)**	(-2.3357)**	(-1.1988)	(-1.8915)**
2014	14	0.01%	1.37%	0.75%	-0.62%	-0.95%	-0.40%	-1.41%	1.78%	1.66%
		(0.0108)	(2.164)**	(0.8297)	(-1.1663)	(-1.9549)**	(-0.5068)	(-3.4226)**	(0.8493)	(0.584)
2015	19	-0.27%	1.99%	2.34%	0.32%	0.21%	-0.14%	-0.02%	-0.49%	0.82%
		(-0.8112)	(2.5403)**	(2.6852)**	(1.131)	(0.732)	(-0.1558)	(-0.0225)	(-0.2795)	(0.384)

Exhibit 7: This table displays the average excess returns for a given year over a given time span in relation to the announcement date and inclusion date from 1990 to 2015. The table also provides data on the sample size for each given year and the t-values of the means after performing a standard t-test to test the sign of the average.

Selected Yearly Means Post October 1989					
Year	**AD to AD +1**	**AD to ED**	**AD + 1 to ED**	**ED to ED + 1**	**ED + 1 to ED + 30**
1990	1.78%	5.63%	3.72%	-1.30%	0.47%
1991	2.38%	6.10%	3.50%	-3.79%	4.74%
1992	5.76%	4.92%	-0.82%	1.11%	5.68%
1993	3.82%	7.22%	3.31%	-0.32%	3.07%
1994	2.67%	0.31%	-2.34%	-0.55%	-3.26%
1995	3.16%	5.89%	2.60%	-0.78%	-2.13%
1996	4.74%	11.76%	6.65%	-1.55%	-6.24%
1997	8.65%	16.34%	7.45%	-3.27%	-3.78%
1998	5.27%	12.85%	7.55%	-2.12%	-6.01%
1999	6.30%	9.56%	3.19%	-0.77%	-3.09%
2000	4.19%	8.57%	4.36%	-2.39%	1.64%
2001	2.09%	5.14%	2.87%	-0.57%	1.56%
2002	2.88%	6.31%	3.55%	-0.50%	-0.47%
2003	2.26%	0.83%	-1.42%	0.32%	-2.96%
2004	1.65%	4.71%	3.02%	-0.05%	-1.81%
2005	1.32%	2.18%	0.86%	-0.15%	-2.94%
2006	2.77%	3.81%	1.02%	-0.67%	-3.78%
2007	2.26%	5.80%	3.46%	-1.51%	0.03%
2008	3.76%	4.83%	1.04%	-0.76%	-8.41%
2009	2.55%	1.83%	-0.69%	0.20%	-4.64%
2010	2.36%	-0.16%	-2.44%	-0.58%	-4.69%
2011	0.45%	0.24%	-0.26%	0.59%	0.44%
2012	1.82%	0.40%	-1.41%	0.42%	-2.94%
2013	2.16%	1.61%	-0.60%	0.98%	-2.35%
2014	1.37%	0.75%	-0.62%	-0.95%	1.66%
2015	1.99%	2.34%	0.32%	0.21%	0.82%

Exhibit 8: This table displays the average excess returns for a given year over a given time span in relation to the announcement date and inclusion date from 1990 to 2015. This table is simply a cleaner version of the table above with only the most salient periods included for analyzing the index inclusion effect. Furthermore, the number of observations and the t-tests have been purposely omitted for ease of reading the data.

AD to AD + 1							
Variable	**Observations**	**Rsquare**	**Constant**	**Constant t ratio**	**Beta**	**Beta t Ratio**	**P-Value**
AIMF	22	21.09%	4.10%	6.4	-0.000000018	-2.31	0.0315
AIEMF	22	21.06%	4.16%	6.31	-0.000000022	-2.31	0.0317
%EMFI	26	16.91%	4.54%	5.64	-0.150256363	-2.21	0.0369
%PS	25	22.69%	19.75%	3.06	-0.229504720	-2.6	0.0161
IMFSP500	22	20.48%	4.59%	5.56	-0.000000058	-2.27	0.0345
%IMFSP500	22	35.06%	-1.32%	-0.97	0.076292275	3.29	0.0037
YoY%SP500	21	24.52%	2.17%	4.2	0.034094113	2.48	0.0225
SP500-I	26	12.05%	4.23%	5.31	0.000000000	-1.81	0.0823
YoY%SP500-I	26	4.58%	2.68%	5.54	0.026610387	1.07	0.2938
%SP500MKT	26	0.06%	2.42%	0.51	0.047608707	0.12	0.9087

AD to ED							
Variable	**Observations**	**Rsquare**	**Constant**	**Constant t ratio**	**Beta**	**Beta t Ratio**	**P-Value**
AIMF	22	31.36%	7.98%	5.99	-0.000000049	-3.02	0.0067
AIEMF	22	30.21%	8.06%	5.84	-0.000000059	-2.94	0.0081
%EMFI	26	25.26%	8.97%	5.51	-0.391669995	-2.85	0.0089
%PS	25	25.92%	43.05%	3.2	-0.521925107	-2.84	0.0093
IMFSP500	22	24.86%	8.88%	4.96	-0.000000142	-2.57	0.0182
%IMFSP500	22	52.71%	-6.82%	-2.64	0.208445809	4.72	0.0001
YoY%SP500	21	23.42%	3.14%	2.71	0.074094791	2.41	0.0262
SP500-I	26	15.75%	7.95%	4.78	0.000000000	-2.12	0.0447
YoY%SP500-I	26	4.59%	4.24%	4.12	0.056833489	1.08	0.293
%SP500MKT	26	0.63%	8.75%	0.87	-0.339847686	-0.39	0.7006

Exhibit 9: These tables show the regression outputs of the 10 different explanatory variables outlined above against the average excess returns for each year between the announcement date and the day after the announcement date and the 10 different explanatory variables against the average excess returns for each year between the announcement date and the effective date of inclusion. The table also includes the number of observations used in constructing the model and the slope and intercept of the resulting model.

REFERENCES

Belasco, Eric, Michael Finke, and David Nanigian. 2012. The impact of passive investing on corporate valuations. *Managerial Finance* 38 (11): 1067-84.

Beneish, Messod D., and Robert E. Whaley. 1996. An anatomy of the "S & P game": The effects of changing the rules. *The Journal of Finance* 51 (5): 1909-30.

Berk, Jonathan B, and Richard C Green. 2004. Mutual fund flows and performance in rational markets. *Journal of Political Economy* 112 (6): 1269-95.

Blume, ME, and RM Edelen. 2004. S&P 500 indexers, tracking error, and liquidity - A complex answer to profiting. *Journal of Portfolio Management* 30 (3): 37; 37,46; 46.

Chen, Honghui, Gregory Noronha, and Vijay Singal. 2004. The price response to S&P 500 index additions and deletions: Evidence of asymmetry and a new explanation. *The Journal of Finance* 59 (4) (Aug 2004): 1901-29.

Cremers, K. J. M., and Antti Petajisto. 2009. How active is your fund manager? A new measure that predicts performance. *Review of Financial Studies* 22 (9) (09): 3329-65.

Ehsani, Sina, and Donald Lien. 2015. Effects of passive intensity on aggregate price dynamics. *Financial Review* 50 (3) (08): 363-91.

Elliott, William B., Bonnie F. Van Ness, Mark D. Walker, and Richard S. Warr. 2006. What drives the S&P 500 inclusion effect? an analytical survey. *Financial Management (Wiley-Blackwell)* 35 (4) (Winter2006): 31-48.

FAMA, EUGENE F. 1970. Efficient capital markets: A review of theory and empirical work. *Journal of Finance* 25 (2) (05): 383-417.

French, Kenneth R. 2008. Presidential address: The cost of active investing. *The Journal of Finance* 63 (4) (Aug 2008): 1537.

Glode, Vincent. 2011. Why mutual funds "underperform". *Journal of Financial Economics* 99 (3) (Mar 2011): 546.

Grossman, Sanford J., and Joseph E. Stiglitz. 1980. On the impossibility of informationally efficient markets. *The American Economic Review* 70 (3) (Jun 1980): 393.

Gruber, Martin J. 1996. Another puzzle: The growth in actively managed mutual funds. *The Journal of Finance* 51 (3) (Jul 1996): 783-810.

Lynch, Anthony W., and Richard R. Mendenhall. 1997. New evidence on stock price effects associated with changes in the S&P 500 index. *Journal of Business* 70 (3) (07): 351.

Pastor, Lubos, and Robert F. Stambaugh. 2010. *On the size of the active management industry*. Cambridge, United States, Cambridge: National Bureau of Economic Research, Inc.

Petajisto, Antti. 2011. The index premium and its hidden cost for index funds. *Journal of Empirical Finance* 18 (2) (3): 271-88.

Schultz, Paul. 2008. Downward-sloping demand curves, the supply of shares, and the collapse of internet stock prices. *Journal of Finance* 63 (1) (02): 351-78.

Sharpe, William F. 1991. The arithmetic of active management. *Financial Analysts Journal* 47 (1) (Jan): 7-9.

———. 1964. Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance* 19 (3): 425-42.

Shleifer, Andrei. 1986. Do demand curves for stocks slope down? *Journal of Finance* 41 (3) (07): 579-90.

Stambaugh, Robert F. 2014. Presidential address: Investment noise and trends. *The Journal of Finance* 69 (4) (Aug 2014): 1415.

Wurgler, Jeffrey. 2010. *On the economic consequences of index-linked investing*. Vol. w16376National Bureau of Economic Research, Inc, NBER Working Papers: 16376.