Price and Volume Effects of Changes in MSCI Indices – Nature and Causes

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ABSTRACT

Using changes in the MSCI Standard Country Indices for 29 countries between 1998 and 2001, we document that stock returns and volumes exhibit "index effects" in international markets similar to those detected by the studies of US stocks. The stocks added to the indices experience a sharp rise in prices after the announcement and a further rise during the period preceding the actual change, though part of the gain is lost after the actual change date. The stocks that are deleted from the indices, on the other hand, witness a steady and marked decline in their prices. Trading volumes increase significantly and remain at high levels after the change date for the added stocks. There are also considerable cross-country variations in these effects. Tests using data on various measures reflecting the different hypotheses fail to turn up any evidence in support of information effects. Our evidence appears to be more supportive of the downward sloping demand curve hypothesis. There is some evidence of price-pressure and mild evidence of liquidity effect, particularly in Japan and UK.

JEL classification: G14, G15

Keywords: Index effects; Downward sloping demand curve; MSCI; Liquidity

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"… much of the loss in Hong Kong was due to an 8.7% plunge by property giant Cheng Kong Holdings, which will be deleted from the MSCI Hong Kong Index. ….. On the winning side was Pacific Century Works Ltd. The Internet company rose more than 5% after MSCI said it will be included in the MSCI Hong Kong index."

The Wall Street Journal, May 19, 2000

I. Introduction

Additions of stocks to major stock indices usually increase their trading volume as well as their returns. Deletions are known to depress returns. This phenomenon has been widely studied in finance (e.g. Shleifer (1986), Harris and Gurel (1986) and Lynch and Mendenhall (1997)). Most studies to date have focused on US stocks, with the S&P 500 being the index of choice. Some recent studies (see Liu (2000) and Hanaeda and Sarita (2001)) have documented similar effects in the Nikkei indices of Japan. Rebalancing activities of fund managers are often thought to be responsible for such effects.

Given the dramatic growth in international portfolio investment in the '90s[1] and in the number of funds benchmarked to different national and regional stock indices

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[1] There are currently 832 mutual funds classified as "International" compared to 361 such funds in 1996. (*The Wall Street Journal*, February 4, 2002)

maintained by global organizations, it is natural to ask whether such effects exist in the international scenario. International portfolio investing has several distinguishing features. Individual stock information is often less easily available to international fund managers. Liquidity concerns are considerably higher, particularly in emerging market countries. Finally, changes in international stock indices presumably affect the international investors and fund managers more directly than their domestic counterparts. Consequently, the effect of changes in *international* indices on constituent stock returns remains an open question and is a matter of interest to academicians and international investors alike.

The present study addressing this issue is also important to the growing literature on index changes. Stepping beyond the confines of a single market, it allows simultaneous and comparative analysis of the several competing hypotheses in the literature about the causes of "index effects". The greater cross-sectional power of the international data allows us to investigate the relative importance of these hypotheses. For instance there is considerable variation in the "float" of the stocks in question for MSCI changes as opposed to S&P 500 changes – a fact that becomes useful in testing the downward sloping demand curve hypothesis. Thus the present analysis should help us develop a better understanding of the drivers of index effects even in a national context.

We document and analyze return and volume reactions to additions and deletions of stocks in Morgan Stanley Capital International (MSCI) country indices for 29 countries using the quarterly rebalancing of these indices. These rebalancing events have several features that make them a natural choice for such an analysis. First, the MSCI indices are perhaps the single most important group of international equity indices

tracked by international fund managers. Over $3 trillion worldwide is benchmarked to these indices, with more than $600 billion of that amount passively managed[2]. Exchange Traded Funds or *iShares*, tracking these indices have also become very popular in recent years. Changes in these indices, therefore, attract considerable attention among investors worldwide. Second, these changes – the quarterly rebalancing – take place at regular and known intervals (in February, May, August and November of each year). The simultaneity of changes in several national indices thus assures the cross-border comparability of our results. Finally, like the S&P 500 after 1989, changes in the MSCI national indices are announced two weeks before the effective date. This announcement window allows us (as in Lynch and Mendenhall (1997)) to interpret our results in terms of the relative efficiency of the different national stock markets considered. We therefore document and analyze the reactions in individual stock returns and trading volumes to 12 such quarterly rebalancing adjustments of MSCI indices for the 29 countries.

We find that the stocks added to the MSCI national indices experience a significantly positive abnormal return of about 3.4% on the day following the announcement. From the next day to the effective date of the change, they experience a further rise of 4.5%, which declines somewhat over the 10 days following the actual change yet remains significantly positive. The total cumulative change from the announcement to 10 days after the change is not only statistically significant, but also economically impressive at almost 5.3%. For deleted companies, the cumulative abnormal return over the entire period is significantly negative and even higher in magnitude at about –7.5%.

[2] *The Wall Street Journal*, February 27, 2002.

We also examine trading volume during this period. Additions experience a surge in abnormal trading volume of about 3.3% on the day following the addition and continue to rise throughout the post-announcement window. The cumulative abnormal volume from the announcement day to 10 days after the change day stands at over 38%. For deletions, the corresponding figures are 1.4%, and 16.5%, respectively, all statistically significant. Even this, however, is an understatement since just prior to the announcement, these stocks trade at vastly reduced volumes compared to their previous levels. Thus, it appears that the announcement of deletion lifts the volume traded from already depressed levels to above normal levels.

There is also considerable variation in these reactions across the different national stock markets. All developed countries in our data set exhibit a significant rise in returns on the day following the announcement, but the emerging markets as a group do not. Returns in UK, Japan, and emerging markets rise in the run-up period (from two days after the announcement till the change day) and experience a permanent rise in stock prices, while US and other developed countries in our sample show no such increase. Volumes rise on addition everywhere except in the US and on deletion in developed countries except the US and UK. Overall, our evidence indicates the presence of *downward sloping demand curve* effect with some liquidity and price-pressure effects.

We carry out additional tests to disentangle the liquidity and information hypotheses from the downward sloping demand curve. Using the "liquidity ratio test" of Amihud et al (1997), we find that there is no increase in liquidity of the stocks added to the indices, though declines appear to reduce liquidity. Using an approach similar to the one suggested by Denis et al (2003), we find that in none of the countries does addition

lead to a significant change in earnings per share. This enables us to conclude that the information effects are minimal in the changes.

The rest of the paper is organized as follows. The following section provides a brief discussion of the relevant literature. Section III provides an introduction to the MSCI indices describing their composition as well as the quarterly rebalancing process. Section IV describes the data used in this paper, while Section V discusses the methodology adopted. Section VI and VII discuss the results and Section VIII concludes the paper with suggestions for future research.

II. Relevant Literature

The literature on effects of index changes on returns and trading volumes of affected stocks is sizeable. Methodologically, with the exception of Goetzmann and Massa (2003), the event-study approach is used in almost all cases. It is well established that the addition of a stock to the S&P 500 index leads to positive abnormal returns of about 5% (see Harris and Gurel (1986), Shleifer (1986) and Dhillon and Johnson (1991)). Deleted stocks, on the other hand, witness a significant, though generally smaller, drop in returns (see Goetzmann and Gary (1986) and Harris and Gurel (1986)).

Several competing hypotheses are proffered as explanations. Harris and Gurel (1986) find that, unlike the permanent volume effect, the price effect is reversed over time. They therefore surmise that these effects are due to *price-pressure* – owing to index fund purchases (or sales). Shleifer (1986), Beneish and Whaley (1996), and Dhillon and Johnson (1991), on the other hand, find more permanent price changes and attribute them to the *downward sloping demand curve* for stocks – the fact that stocks are imperfect

substitutes for one another. Amihud and Mendelson (1986) advocate (and Hegde and McDermott (2003) study) the *liquidity hypothesis* – permanent reduction in trading costs owing to excess demand for the added stocks by fund managers. Finally, Jain (1987) and Dhillon and Johnson (1991) argue that there may be an *information effect* in the inclusion or exclusion of stocks to a major index.

Lynch and Mendenhall (1997) look at S&P 500 changes data in the post-1989 period, with pre-announced changes. They find a large positive impact on returns for added stocks after the announcement day, part of which is reversed in the post-change period – results consistent with both the price-pressure effect as well as the downward sloping demand curves.

Morck and Yang (2001) report higher Tobin's *q* for S&P 500 index members as further evidence of the downward sloping demand curves for stocks. As a next step, Wurgler and Zhuravskaya (2002) demonstrate that stocks with no close substitutes experience a higher rise in returns on inclusion in the S&P 500 index—strong corroborating evidence for the downward sloping demand curve view.

The four hypotheses provide different explanations for the observed changes in return and volume in the stocks added to or deleted from the index. Imperfect substitute or downward sloping demand curve (DSDC) implies a permanent price change, whereas the price pressure hypothesis posits a short term downward sloping demand curve therefore suggesting a temporary price effect. As the index funds complete their rebalancing, the stock prices will return to their equilibrium level and hence the gains will be reversed. The information signaling hypothesis interprets the price effect differently from those of DSDC and price pressure, in that it postulates positive effect of price

change for added stocks and negative price effect for deleted stocks are due to the fact the index provider have superior information about the companies involved in the index change. However, DSDC and information hypothesis, both of which produce a permanent price effect, are not mutually exclusive. Finding of information related effect does not necessarily mean that the demand curve for stocks is not downward sloping. It is possible, in fact likely, that more than one of the hypotheses coexist to account for the index effect.

Establishing the dominant source of the "index effect" empirically remains a challenging issue. However recent research has developed several measures of the variables involved in the different hypotheses. Price pressure is more easily differentiable from the others – unlike the other effects it is temporary. Different tests of liquidity including the Liquidity Ratio test of Amihud et al (1997) and Chen et al (2002) and the Change in Proportion of Zero Daily Return developed by Lesmond et al (1999) – the two measures we use – as well as that of Roll (1984) can show if indeed inclusion (deletion) of a stock increases (decreases) its liquidity. Information hypothesis is harder to capture but the methodology developed using analysts' forecasts in Denis et al (2003) can help us find out if the inclusion results in greater expected earnings. Finally, the downward-sloping demand curve, arguably the most elusive of the four effects, can also be captured to some extent using regressions of abnormal return on abnormal volume as in Shleifer (1986) as well as the Arbitrage Risk Measure (ARM) developed by Wurgler and Zhuravskaya (2002). These tests allow us to ascertain if indeed liquidity and/or information improved after an inclusion. An association of the price effect with the ARM would indicate that the downward-sloping demand curve is important. The detection of

individual effects is now possible. However, ascribing the guilt appropriately amongst multiple offenders remains a methodological challenge.[3]

While the S&P 500 has commanded most attention, in recent years, other US indices as well as prominent non-US indices have also been examined --- Russell 2000 index (Petajisto (2003)); Nikkei 500 index (Liu (2000)); Nikkei 225 index (Hanaeda and Sarita (2001)). Kaul et al (2000) study the effects of redefinition of the public float in the Toronto Stock Exchange 300 index and find strong support for the downward sloping demand curve hypothesis.

While these studies have examined various important country level stock indices, none (to our knowledge) has so far examined whether such effects persist in international investing. Would international fund managers, managing an ever-increasing fund of international portfolio investments, react in the same way as domestic investors do to changes in their national indices? Given that international investors are sometimes believed to be at an informational disadvantage compared to local investors (see, for instance Kang and Stulz (1997) and Brennan and Cao (1997)), would the inclusions or deletions have greater "information effect" in the international investment environment? Index-change arbitrage is an increasingly important feature for domestic indices. As Wurgler and Zhuravskaya (2002) show, arbitrageurs have a crucial impact on stock prices

[3] Another branch of the literature, though not directly studying the effect of index changes, also has significant implications for the downward sloping demand curve hypothesis. (See Chan and Lakonishok (1993, 1995), Warther (1995), Zheng (1999), Fridson and Jonsson (1995), Bakshi and Chen (1994), Constantinides et al (1998), and Goetzmann and Massa (2003))

around index changes and their impact depends upon the nature and substitutability of the stocks. It is germane to ask if their role is equally pronounced in the international market.

III. An Introduction to MSCI indices

A. Overview of MSCI index family

MSCI is a leading provider of global indices and related services to investors worldwide with the most widely used benchmarks for non-US stock markets since 1969. Over 90% of international institutional equity assets in the USA and Asia and two-thirds of Continental European funds are benchmarked to MSCI Indices.[4]

Of all the MSCI indices, Standard Country/Regional Indices are the most popular. Among others, MSCI standard indices are the basis for international iShares offerings, formerly known as World Equity Benchmark Shares (WEBS). iShares, featuring both stocks and index funds, are managed by Barclays Global Investors and have been traded on the American Stock Exchange since 1996. The number of iShares is increasing. As of January 20, 2004, there were 25 iShares, 21 of which target MSCI Standard Country Indices with the remaining four targeting the MSCI Standard Regional indices.

B. The Construction of MSCI Standard Country Indices

The MSCI index construction method has evolved over time. The Standard Country Index studied in this paper is constructed in accordance with *MSCI Methodology & Index Policy* as of March 1998. Like the S&P 500 index, MSCI index construction does not carry special informational content on the firm's operating efficiency or on future stock market performance. To offer a proxy for a market, MSCI tracks virtually

[4] Much of the information in this section has been drawn from www.msci.com and www.ishares.com.

every single company in the 51 national markets covered in the MSCI index family. Companies in each country are then sorted by industry group and 60% are selected for inclusion in the Standard Country Index[5]. Size, industry representation, cross-ownership, float (percentage of shares freely tradable), and liquidity as measured by long- and short-term volume are among the major criteria used in the selection process.

Although MSCI generally selects stocks with good liquidity, this has been a relative criterion in the context of country, firm size and industry. Firms in many countries are not fully accessible by the international investors. MSCI uses Market Capitalization Factor (MCF) to address this issue. Companies with low "free float" (the difference between the total number of shares outstanding and shareholdings classified as strategic and shares restricted from trading by international investors[6]) are included in the indices at MCF (40%, 60% or 80%) times their full market capitalization. Since July 2000, all companies with free float of less than 40% are added with a Market Capitalization Factor. MSCI now uses what it terms, "Foreign Inclusion Factors (FIFs)" to reflect the actual percentage of shares available to international investors. For constituents with free float greater than or equal to 15%, the security's Inclusion Factor is equal to its estimated free float, being rounded up to the closest 5%. Securities with free float less than 15% are usually not eligible for inclusion in the indices. For companies that impose foreign ownership limit, if the limit is less than the free float, Foreign

[5] MSCI has instituted certain important changes in the construction of their indices since June 2002, including an increase in coverage to 80% and a full adjustment of free float. These changes, however, do not affect our data.

[6] The free float for the countries involved in our study can be found in the appendix of a previous version of this paper available at SSRN.

Inclusion Factors are equal to foreign ownership limit, rounded to nearest 1%. This system matches the supply of shares on the market to the demand for shares in the portfolios tracking the index.

C. Changes in the constituents of the MSCI indices

The MSCI Equity Indices are regularly maintained to reflect the evolving market change. MSCI classifies index maintenance in two broad categories: index rebalancing and market or corporate event-driven changes.

Regular index rebalancing ensures that the indices continue to accurately reflect an evolving marketplace. The market evolution may be due, for example, to a change in the composition or structure of an industry or to other developments, including regular updates in shareholder information used in the estimation of the free float.

During an index rebalancing, securities may be added to a country index for a variety of reasons, including changes in investors' interests, changes in regulations, changes in industry classification, increase in free float, and availability of new opportunities for inclusion created by privatizations, new issues, or restructurings.

On the other hand, deletion of securities may take place whenever better industry representatives emerge (either a new issue or an existing company). Besides, significant decreases in free float-adjusted market capitalization, significant deterioration in liquidity, and more restrictive foreign ownership limits may also cause certain securities to be deleted from the index.

Finally, in order to keep the coverage within the target coverage of industries and countries, adding new index companies may entail corresponding deletions. Unlike the

S&P 500, however, MSCI indices do not comprise a specified number of securities, so every addition does not automatically imply a deletion. It is worth noting that, as in the case of inclusions, most MSCI rebalancing deletions result from industry evolution and, therefore, do not reflect information about the firm's performance.

Quarterly rebalancing for the MSCI Country Indices generally occurs on four dates throughout the year: close of the last trading day of February, May, August and November with the changes announced two weeks prior to the effective change day. However, MSCI may occasionally decide not to make a quarterly rebalancing during those dates.

In contrast to index rebalancing or so-called structural changes, event-driven changes result from new issues, mergers, acquisitions, bankruptcies, and other similar corporate events. These changes are announced and implemented as they occur; they are not confined to those four dates for the quarterly structural changes. Such event-driven changes are not within the scope of our study.

IV. The Data

Our data includes 12 out of 14 quarterly structural changes occurring between February 1998 and August 2001.[7] Information about these changes, as well as the list of

[7] The twelve changes in our sample occurred in February, May, August, November 1998, February, May, August, November 1999, May, August, November 2000 and May 2001. In February 2001, no changes were made to the standard index while in August 2001 there was only one change for our sample (in the India standard index). Since in the latter case the implementation took place on the eleventh day instead of the usual tenth day after announcement, we excluded that single change in August 2001 from our sample to maintain uniformity in the daily effects.

companies added or deleted in each case, was obtained from Bloomberg. The announcement of the changes is released on the middle of each month,[8] while the implementation of the index change takes place on the tenth trading day after the announcement date, which usually falls on the last trading day of the month.[9] The structural changes include MSCI Standard Country Index, MSCI Small Cap Index, and MSCI Extended Index. However, we focus only on the changes in the Standard Indices as these are the most popular among MSCI indices and also form the basis for international iShares.

The 12 announcements include as many as 46 countries. If a company was deleted from one index and was added to another,[10] we discard the change from our sample. Finally, after accounting for missing data on some countries and companies, we have 455 additions or deletions from 29 countries. The number of changes considered for volume analysis is slightly less than that for return analysis since the volume analysis also requires past data for the relevant companies.

[8] The announcement dates were February 12, May 15, August 17, November 16, 1998, February 12, May 17, August 17, November 16, 1999, May 17, August 17, November 16, 2000, and May 17, 2001 respectively.

[9] The corresponding effective dates were February 27, May 29, August 31, November 30, 1998, February 26, May 31, August 31, November 30, 1999, May 31, August 31, November 30, 2000, and May 31, 2001 respectively.

[10] For example, AGIV in Germany was deleted from MSCI standard index and was added to MSCI small index on November 30, 2000.

Table 1 shows the country-wise breakdown of our sample. The US, with 23 additions and 45 deletions, and Japan, with 30 additions and 38 deletions, top the list while the UK, with 18 additions and 19 deletions, follows.

We compute the daily return for the stocks involved using the return index (with dividend reinvested) obtained from Datastream. The Datastream country return index is used to calculate the proxy for daily market returns. Daily volume data is also obtained from Datastream. All returns are in local currency.

V. Methodology

The methodology broadly follows that in Lynch and Mendenhall (1997). As in their data for post-1989 changes in the S&P 500, our data also provides us with two distinct event dates – the announcement date and the change date. Because our data is international, we have to consider the time-zone effects in deciding on our dates. Since the announcements are made in terms of Central European Time when markets in Asia, particularly Japan, have already closed for the day, we, like Lynch and Mendenhall (1997), expect to see the effects, if any, on the day *following* the announcement day (AD+1) or the change day (CD+1). For a particular stock i from a country c, the abnormal return on a day τ, $AR_{i,c}(\tau)$, is defined as the excess of the stock's raw return over that of the market. The relevant "market" for a stock is represented by a stock index of its country – the national stock index computed by Datastream. This assures cross-country uniformity market portfolio computations, as well as independence between the respective market portfolios and the indices under examination, namely, the MSCI indices. Sample mean abnormal return $MAR_c(\tau)$ for the country c on day τ is obtained by

averaging across $AR_{i,c}(\tau)$ for stocks in a particular country for a given day τ. The overall sample mean abnormal return, $MAR(\tau)$, is the weighted average of the different country mean abnormal returns, the weights being proportional to the number of observations in each country. The cumulative abnormal return between two days, τ_1 and τ_2, $CAR_{i,c}(\tau_1,\tau_2)$, is the sum of abnormal returns during that period. The country and the overall averages of $CAR_{i,c}(\tau_1,\tau_2)$ – mean cumulative abnormal return $MCAR_c(\tau_1,\tau_2)$ (country averages) and $MCAR(\tau_1,\tau_2)$ (overall average) – are obtained in a manner analogous to that of $MAR_c(\tau)$ and $MAR(\tau)$, respectively.

For abnormal volume, we follow Lynch and Mendenhall (1997) to first define the measure of volume $\upsilon_i(\tau)$ as follows:

$$\upsilon_i(\tau) = \log[1+V_i(\tau)]/\log[1+E_i(\tau)], \quad (1)$$

where $V_i(\tau)$ is the local currency traded volume on day τ for stock *I* and $E_i(\tau)$ is the local currency value of the outstanding shares of the stock on that day.

Next we regress the $\upsilon_i(\tau)$ for a stock on the analogous measure of "country" volume, $\upsilon_c(\tau)$:

$$\upsilon_i(\tau) = \phi_{0,i} + \phi_{1,i}\, \upsilon_c(\tau) + e_i(\tau) \quad \text{for } \tau = \text{AD} - 258,\ldots, \text{AD} - 109. \quad (2)$$

To account for possible AR(1) effect in the residuals and to achieve an efficient estimation, we use an estimated generalized least squares (EGLS) procedure as detailed in Lynch and Mendenhall (1997) to estimate the regression coefficients, $\phi_{0,I}$ and $\phi_{1,i}$. As before, the $\upsilon_c(\tau)$ figures are obtained from the Datastream computed local currency

national stock market volumes. This regression provides us with the estimates for the coefficients $\phi_{0,i}$ and $\phi_{1,i}$ for the stock *i* in question. Using these estimates and plugging in the values of $\upsilon_c(\tau)$ for the relevant date τ, we can obtain the "normal" or "expected" volume for stock *i* on day τ. The abnormal volume for stock *i* on day τ, $AV_{i,c}(\tau)$, is then defined as the difference between the actual volume and this "normal" volume:

$$AV_{i,c}(\tau) = \upsilon_i(\tau) - [\phi_{0,i} + \phi_{1,i}\, \upsilon_c(\tau)] \quad (3)$$

The different averages for this abnormal volume, MAV and MCAV are obtained in a manner analogous to the abnormal returns calculation.

Given the similarities in time interval for announcement and actual change between S&P 500 index examined in Lynch and Mendenhall (1997) and MSCI standard indices in our study, our time window selection resembles theirs, aiding the comparability of the results of the two studies. The *pre-announcement window* runs from 10 days before the announcement (AD-10) through the day before the announcement (AD-1), the *run-up window* runs from two days after the announcement day (AD+2) through the change day (CD), the *post-AD permanent effect window* begins with the run-up window and ends 10 trading days after the change day (CD+10), and the *total permanent effect window* runs from the announcement day (AD) until (CD+10). We report abnormal returns and volumes for AD and AD+1 separately. Values of and movements in the abnormal returns and abnormal volumes on AD and AD+1 will give us an idea of the "announcement effect" that may be present, while those during the *run-up window* may reflect the effect of portfolio rebalancing by funds. The *post-AD permanent effect windows* will help us

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find out whether these effects are permanent or temporary. The total permanent effect window measures the total magnitude of CAR associated with being added to or deleted from the index.

We differ from Lynch and Mendenhall (1997) in reporting AD and AD+1 separately. As MSCI change announcements are from Geneva and are often spread over the entire day, markets in a country may or may not be open at the time of the announcement depending upon its location and the announcement time. In particular, countries in the Far East, including Japan, certainly finish trading for the day when the announcement is made, while the US, on the other hand, always has a few hours of trading remaining regardless of when in the day the announcement is made. It is therefore difficult to know *a priori* the date at which the announcement effect will be perceptible in a country, AD or AD+1. We therefore report the results for these two days separately to find out when exactly the announcement effect takes place.

VI. Results

A. Returns

i) Effect of Additions to Stock Index

Table 2 presents the daily average market-adjusted abnormal returns, MAR (τ), for stocks added to or deleted from the respective MSCI Standard Country Indices around the announcement date, effective dates, and four different windows defined in the previous section. Figure 1 Panel A shows daily abnormal returns on stocks added to the MSCI Standard Country Index for the total sample. As Figure 1 and Table 2 indicate, the

announcement-day abnormal return (AD+1) for additions is positive and significant. The abnormal return for the full sample is 3.35 %, with a t-statistic of 9.54.

The US, Japan and the UK are among the world leaders in international transactions and portfolio flows[11].Our sample of changes also has a relatively large number of firms from these three countries. Therefore, for expositional convenience, in the rest of the paper, we break our sample into five sub-samples – US, UK, Japan, Developed Countries, and Developing Countries.[12] While any such country grouping is somewhat arbitrary, we believe we should separate the developed countries from the developing ones in view of their greater openness to international investment and the stability of their financial markets. With the exception of developing countries, abnormal returns for AD+1 are positive and significant everywhere, ranging from 1.81% in the US to 8.40% in Japan. In the case of developing countries, abnormal return on AD+1 is positive but only marginally significant at the 10% level. This finding is consistent with the argument that the developing countries face lower "indexing demand" than other countries.

There are a few curious features of the return and volume effects. For instance, the US stock markets are open around the time of index change announcements

[11]For the period in our study (1998-2001), international equity portfolio inflows were largest for the US ($ 469.18 billion), followed by UK ($ 384.29 billion) and Japan (157.81 billion $). [International Financial Statistics, IMF, October 2002].

[12] Developed Countries sub sample include Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Netherlands, New Zealand, Norway, Singapore, Sweden, and Switzerland. The Developing Countries sub sample includes Brazil, China, India, Indonesia, Malaysia, Philippines, South Africa, South Korea, Taiwan, Thailand, Turkey, and Venezuela.

and yet its MAR for AD is insignificant but for AD+1 highly significant. Our explanation for this apparently incongruous result is that it is the *international* investors who are affected by these changes, likely to be in Europe and Asia, who act after the US markets close. Also MCARs in Japan and UK are considerably higher than in the USA. As we shall see in the next sections these countries appear to have steeper downward sloping demand curves for stocks as well as some liquidity effect. The existence of Exchange Traded Funds or *iShares* in these countries based on the MSCI indices probably contributes to this effect. Japan, UK and Germany are the countries with the three largest *iShare* Net Asset Values with Japan being the leader by far.[13] However, the negative MCAR for developing countries on AD remains a puzzling feature. Resolving these questions and verifying our hypotheses requires more work in the area.

MCAR for the *run-up window* (AD+2 to CD) in Table 2 is 4.51% for the total sample and is statistically significant at the 1% level (t-statistic of 5.75). Furthermore, the run-up effects are significant in all subsamples except for the US (marginally significant at about 10% level) and Developed Countries. There is also a partial to complete reversal in the abnormal returns following the change day. For Japan, the overall effect in the post-AD permanent window is insignificant. For the Developed Countries subsample, MCAR in the post-AD permanent window is actually significantly negative. When we look at the total permanent effect (AD to CD+10), however, it is significantly positive everywhere except in the case of the US and Developed countries subsamples. For the total sample, the MCAR over the total permanent window stands at 5.28% with a t-statistic of 4.92. Furthermore, the fraction of companies having a positive

[13] see www.ishares.com.

cumulative abnormal return over the total permanent window is 63% — significantly (at the 1% level) greater than 50%. The evidence so far points to the permanent effect of index addition, despite the substantial price reversals.

If price pressure drives positive market-adjusted abnormal return on the announcement day, we should expect the cumulative abnormal return to be insignificant over the total permanent window. On the other hand, if the cumulative abnormal return in the permanent window is positive and significant, i.e., the index effect is permanent- , it may provide evidence in support of the downward sloping demand curve hypothesis. The results thus far are consistent with both the price-pressure and downward sloping demand hypotheses. However, the significant MCAR in the total permanent window could also be interpreted as supporting the information or liquidity hypotheses. The MCAR during the post-AD permanent window (AD+2 to CD+10) is a measure of lower bound on the permanent price effect predicted by downward sloping demand curve hypothesis. The fact that there is a reversal of at least part of the run-up gains in the post-CD period points out that some price-pressure effect is present in all non-US countries (or country groups) in our study. To the extent that the total permanent effect remains significantly positive for the total sample, the UK, Japan, and developing countries, the results are also consistent with a downward sloping demand curve (though not *only* with that hypothesis).

It is interesting to note from Table 2 that UK has the highest MCAR of nearly 19% over the total permanent window. Japan, with a MCAR of 11.15%, follows. It is reasonable to expect cross-country variation in the effects of changes of the MSCI country indices. To the extent that index-tracking institutional investors (mostly

international fund managers) cause these effects, we should expect a greater impact in countries with a greater proportion of international investors, like the UK and Japan. Thus, there may be what we can term a "country effect." By contrast, the statistically insignificant MCAR for the US may be explained by the lack of index tracking on the MSCI US country index.[14]

ii) Effect of Deletions from Stock Index

The cumulative abnormal returns, MCAR (τ_1,τ_2), for the different windows for stocks deleted from the MSCI indices are reported in Table 2 (right panel). For the total sample, the stocks deleted sustain a price loss in the announcement window and the loss continues over the *run-up* window and most of the post-CD period. Figure 1 Panel B shows daily abnormal returns on stocks deleted from the MSCI Standard Country Index for the total sample. For the total sample, the deleted stocks experience clear and statistically significant negative abnormal returns on AD+1 (-2.59%) and during the run-up window (-5.14%) as well as beyond it. There is no reversal of the announcement effect in the post-CD period. In fact, the negative impact on the abnormal returns exceeds the positive impact of additions. US stocks experience a negative MCAR of 4.22% during the run-up window and exhibit a permanent negative impact of 5.77%. All other subsamples experience a steep decline on AD+1, with the most dramatic being Japan (-7.24%). The run-up effect is significantly negative for all subsamples except in the case of the developing countries subsample, (marginally significant (negative) at the

[14] For example, MSCI US standard country index is not one of the 25 existing iShares that invest in the MSCI country/regional indices.

10% level). There is partial reversal in the post-CD period for all subsamples except for the US and Japan. However, the total permanent window MCAR for deletions is significantly negative in every subsample.

Similar to additions, the partial reversal of the trend in the post-CD period indicates some price-pressure effects, while the significance of the total permanent effect in every sub-sample is again consistent with the downward sloping demand curve hypothesis. As in Lynch and Mendenhall (1997), deletions present stronger support for the latter hypothesis than additions. However liquidity and information effects cannot be ruled out. We will address this issue in section VII.

B. Volume

i) Effects of Additions to Stock Index

Table 3 presents the cumulative average abnormal volumes, MAV (τ), for stocks added to or deleted from the respective MSCI Country Indices around the announcement, effective dates, and around different event windows. For the total sample, the daily trading volume increases significantly on AD+1. Figure 1 Panel C shows the daily abnormal volume MAV for the same windows for stocks added.

As is evident from Figure 1 Panel C and Table 3, for the total sample, additions exhibit statistically significant positive abnormal volume of 3.33% on the day following the announcement and a further cumulative abnormal volume of over 20% during the run-up window. The rise in volume is clearly permanent and over the entire window (AD through CD+10), the cumulative abnormal volume exceeds 38%.

Once again there is considerable cross-country variation. There is no noticeable volume effect on US stocks – consistent with the lack of international institutional investors tracking the MSCI US country index. However all non-US stocks exhibit the same overall pattern though the strength of the effect on AD+1 ranges from 2.58% in developing countries to 4.70% in Japan and 4.90% in developed countries. During the run-up window, too, the effect is always significant and permanent for all non-US countries, with an average cumulative abnormal volume of around 20% in all countries over the period. The permanence of the volume effect of additions for all non-US countries appears to further support the downward sloping demand curve view.

ii) Effects of Deletions from Stock Index

Figure 1 Panel D shows the daily abnormal volume MAV for the stocks deleted, while the right panel of Table 3 presents the cumulative abnormal volumes, MCAV (τ_1,τ_2), for different windows as previously defined. As in the case of additions Table 3 shows that the largest abnormal volume occurs on CD, consistent with index funds rebalancing most of their portfolios on the change day to minimize tracking errors.

Table 3 and Figure 1 Panel D suggest that the deleted stocks experience slightly different effects on volume as compared to the cases of addition. The first notable feature here is that in the overall sample, the stocks experience significantly negative abnormal volume in the pre-AD window and on AD. In all subsequent windows, the abnormal volume is significantly positive. Thus, deletions lift traded volumes considerably higher from their "normal" volume levels, which, as may be recalled, reflect the situation six months prior to the deletions.

Once again, US stocks show no volume effect of deletions – in fact, abnormal volume is significantly *negative* on the day following the announcements. For all non-US countries (and country groups except developing countries), however, there is an overall pattern of positive abnormal volume following the announcement. Japan shows, the strongest effects with a significantly positive abnormal volume of 5.71% on the day following the announcement and a cumulative rise of over 51% during the total permanent window (AD through CD+10). What makes these results even more pronounced is the fact that in the pre-AD window, these Japanese stocks experience a significantly negative abnormal volume in the case of index deletion of about -14.85%. The rise in volume is permanent for the total sample, Japan and developed countries.

As in the case of additions, volume changes resulting from deletions are also consistent with the downward sloping demand curve in the overall sample and in all non-US sub-samples with the exception of US, UK and developing countries, where there appears to be a less permanent price-pressure effect.

C. The relationship between abnormal volume and abnormal return

The relationship between abnormal returns and abnormal volumes can shed some additional light on the plausibility of the downward sloping demand curve hypothesis. In cases where high abnormal returns are associated with high abnormal volumes, we can surmise that new demand (or supply in case of deletions) is behind the observed abnormal returns— important support for the downward sloping demand curve hypothesis. Abnormal volume (AV) also proxies for liquidity. A negative relation between AV and AR is consistent with the liquidity interpretation, while a positive

relation is supportive of DSDC. On the other hand, lack of such a result would leave us in the dark about what actually drives these abnormal returns—information, liquidity, or downward sloping demand curves.

We follow Shleifer (1986) and regress abnormal returns on abnormal volumes for AD+1 and for the run-up window separately for additions. For additions, the coefficient of abnormal volume is significantly positive in both cases, supporting the downward sloping demand curve hypothesis. For deletions, the slope coefficient is negative and significant only for AD+1[15].

VII. Tests of the alternative hypotheses

While the evidence so far has suggested that there are reasons to trust the downward sloping demand curve view, it is difficult to rule out the possibility that information or liquidity is driving our results. In this subsection, we carry out further tests that will evince more information about these three competing hypotheses.

A. The Liquidity Hypothesis

Inclusion of a stock in an index can affect its liquidity through several channels. Often an added stock gains in popularity and analyst following leading to greater information release about the stock. Greater trading by liquidity traders can also lead to a rise in liquidity. On the other hand, given that index fund managers scoop up a part of the total supply of the stock following its addition to the index, it may be argued that liquidity

[15] Results are not reported for space considerations. They are available upon request.

may actually diminish on addition owing to the reduction in free float. The effect of deletions is perhaps less ambiguously negative.

i) The Liquidity Ratio Test

One way to test for the "liquidity effect" is to use the Amihud et al (1997) and Chen et al (2002) approach of comparing the "liquidity ratio" before and after the event, i.e. before and after addition/deletion in the MSCI index. The liquidity ratio is defined as:

$$LR_i = \frac{\sum V_{jt}}{\sum |R_{jt}|} \times \frac{\sum |R_{mt}|}{\sum V_{mt}}$$

where V_{jt} and R_{jt} are the volume (value of stocks traded) and return for stock j on day t and V_{mt} and R_{mt} are the volume and return for the relevant national market on day t. The ratio used here follows Chen et al (2002) in correcting for the market liquidity but uses volume (as in Amihud et al (1997)) instead of turnover. The liquidity ratio is estimated over a 60-day period preceding the announcement and also over a 60-day period beginning 60 days after the change date. The statistic of interest here is the difference in the liquidity ratios — $\Delta LR_j = LR_{j,\text{post-change}} - LR_{j,\text{pre-change}}$.

Table 4, Panel A presents the results of the liquidity ratio test. In none of the countries or country groups in our sample do we find an increase in liquidity following addition of a stock to the MSCI index. In fact, for developing countries, there is a significant *decline* in liquidity following addition. In case of deletion both US and developing countries exhibit significant decline in liquidity. This clearly indicates that the

positive abnormal returns associated with additions are not driven by a rise in liquidity though expected drop in liquidity may have a role to play in the case of deletions.[16]

ii) Relative Frequency of Zero Daily Returns

As an alternative way of looking at the liquidity, we now measure the liquidity of a stock by the relative frequency of zero daily returns as used in Lesmond *et al* (1999).[17] Assuming that a zero return is observed if the transaction cost of a stock exceeds the expected return of the transaction, we expect that more zero daily returns are observed in a less liquid stock than in a more liquid stock. Indeed, Lesmond *et al* (1999) report that the proportion of zero daily returns is closely related with the specialist bid-ask spread in the US stock market. Bekaert *et al* (2003) use this measure to examine the impact of liquidity on expected returns in 19 emerging equity markets. Lesmond (2002) also uses this measure to study the liquidity of 31 emerging markets. Both of these studies on emerging markets document that the proportion of zero daily returns is highly correlated with the bid-ask spread in the emerging markets where the data on the bid-ask spread are available.

[16] There are, of course, other ways of testing for liquidity effects. Hegde and McDermott (2003) use transaction data to show that the inclusion of a stock in the S&P 500 index leads to a permanent improvement in its liquidity. Specifically, they document that the median quotes and effective spreads decrease and the median quoted depth, trading volume, and trade frequencies increase over the three months following the inclusion of stock in the S&P 500 index. Similar data is not available to us.

[17] We also used Roll's (1984) spread measure to examine the changes in liquidity around the event. There is no evidence that Roll's spread measure changes significantly after the event.

To measure the changes in liquidity around the event, we compute the difference in the proportions of zero daily returns between the one-year period before and after the event. For the proportion of zero daily returns before the event, we calculate the proportions of zero daily returns for the one-year period ending in 10 trading days before the announcement date. For the proportion of zero daily returns after the event, we compute the proportions of zero daily returns for the one-year period starting 20 trading days after the change date. An increase (decrease) in the proportion of zero daily returns, or a positive (negative) sign of our CZDR variable therefore, signifies a *decrease* (increase) in liquidity.

The result of the test is reported in Table 4 panel B. In the sample as a whole we find that additions result in insignificant liquidity change. However, liquidity improves significantly for the UK (close to 6%) and Japan (about 5%) and declines for the developing nations.[18] Deletions, however, result in substantial declines in the whole sample. The decline in liquidity is more evident for the US and developing countries than for other countries. These results corroborate the results of the Liquidity Ratio test in the previous subsection and suggest that perhaps there is an element of liquidity improvement in UK and Japan that escaped detection in the Liquidity Ratio test.

B. The Information Hypothesis

[18] The decline in liquidity in developing countries may seem surprising at a first glance but note that liquidity can, in principle, move in either direction following addition to the index. It may increase because of greater trading interest or decline if the index trackers suck up most of the available supply.

For a direct test of the information hypothesis, we take an approach similar to that of Denis *et al* (2003). For each added company, we take analysts' current-year earnings forecasts from Institutional Brokers' Estimate System International, Inc. (I/B/E/S) before and after the addition and compute the changes in the earnings forecasts.

To control for the possibility that the number of analysts who followed the company changed after the addition, we only include the EPS forecasts by the analysts who issued EPS forecasts both before and after the addition. For each analyst, we take the last EPS forecast before the addition and the most recent EPS forecast after the addition. To ensure that the EPS forecasts reflect the current condition of the company, the forecast before (after) the addition should have been issued within a four-month period before (after) the addition. Since firms in our sample differ in size and are from different counties, we standardize the changes in EPS forecast by the last EPS forecast before the addition. We compute the median EPS forecasts for the firm as the consensus EPS forecasts before and after the addition, respectively. Then we compute the difference in the median EPS forecasts between before and after the addition.

As a benchmark, we also compute changes in the median EPS forecasts for *all other companies* in the same country for which analysts issued EPS forecasts for the same period. To capture the information effect of the addition, we compute the difference in the mean between the changes in the median EPS forecasts for the added companies and those for the benchmark companies.

The tests of the information hypothesis are summarized in the Table 5. In none of the countries does addition lead to a significant change in current-year EPS forecasts. For the firms in the entire sample, the average median EPS forecast practically stays

unchanged. Therefore it appears that in our sample there is no significant information effect of addition to the MSCI index.

Another possible indicator of the importance of the information hypothesis involves the changes in MSCI *Small Cap* indices. If the information hypothesis were valid, we would expect to find significant positive announcement effects for the stocks added to the small cap index. Using data for 354 additions from 14 developed countries (including 126, 81 and 37 additions from the USA, Japan and the UK respectively), we find that abnormal returns for the total sample are statistically insignificant for all four windows as well as for AD+1. [19,20] Furthermore, we do not observe any significantly positive announcement effect (AD+1) in *any* of the sub-samples. Thus, once again, there appears to be no evidence of an information effect.

C. A Comparative Analysis of the three Hypotheses

For a final "horse-race" for the three competing hypotheses, we now carry out a regression analysis using variables capturing the three competing hypotheses. The dependent variable is the cumulative abnormal returns from AD through CD while the independent variables, described below, capture the different effects. It is important to note that though we use the tool of regression, we are not assuming that there is a linear relationship between the dependent and the independent variables. In other words, we do not claim that the regression is well specified. We use it simply as an agnostic tool to

[19] The 14 countries are Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, Norway, Singapore, Sweden, Switzerland, UK and US.

[20] We do not report the figures. They are available on request.

capture the relative importance of the different variables in affecting the abnormal returns.

It is difficult to obtain direct measures of the downward sloping demand curve hypothesis. While data on investment flows for funds tracking the MSCI indices would perhaps be ideal, as a second best we examine the *free float* on the relevant stocks. In May 2001, MSCI released provisional index constituents with weights adjusted by "Foreign Inclusion Factors" (FIFs) in an effort to assist investors in understanding the changes that would occur if the free float adjustment were immediately implemented in the MSCI Standard Index. We collect data on these FIFs from the provisional index constituents for the sample countries and call it "Free Float".[21] We argue that controlling for market capitalization, which may partially proxy for the strength of demand, the stocks added to the index with lower free float would face higher demand pressure given its limited supply. In other words, for stocks with lower free float, the supply of shares on the market does not match the demand for shares in the (especially passively managed) index fund portfolios[22]. If we observe that the price effect is greater for stocks added with low free float, it would be consistent with the downward sloping demand hypothesis. Note that the argument that low free float poxies for low liquidity would imply in contrast a negative relation between ARs and free float.

[21] While it is conceivable that these FIFs may have changed between the actual inclusion date of a stock and May 2001, when it was recorded, such changes are rather infrequent and are not likely to affect our analysis.

[22] The analysis would undoubtedly be more complete and convincing if we could use the index weights of the individual stocks in the regression as well. Unfortunately, that information was not available to us.

Next, following Wurgler and Zhuravskaya (2002), we include "arbitrage risk measures (ARM)" in our regression analysis. Higher arbitrage risk indicates greater difficulty in replicating the returns of a stock using other securities – in other words, it is more difficult to "substitute" the stock. Wurgler and Zhuravskaya examine the S&P index additions for the period 1976 to 1989 and report that stocks with higher arbitrage risks showed higher excess returns than stocks with lower arbitrage risks. Their results suggest that arbitrage risk prevents arbitrageurs from flattening demand curves for stocks. Arbitrage risk measures (ARM) may, therefore, be used as a measure of the slope of the demand curve (or non-substitutability) for a stock. We compute the arbitrage risk measure for a stock by regressing the daily returns of the stock on the daily market returns for the one-year period ending in 10 trading days before the announcement date.[23] Then we compute the residuals of the regression and define the standard deviation of the residuals over the period as the arbitrage risk of the stock.[24] Finally we also include Abnormal Volume since its association with abnormal returns can also suggest downward sloping demand curve effect.

We include the difference in the proportions of zero daily returns between the one-year period before and after the event (*CZDR*) as discussed before to capture the changes in liquidity around the event. We expect the coefficient of this variable is

[23] Wurgler and Zhuravskaya (2002) use a slightly different technique but mention that the results of the two techniques are very similar.

[24] We also gathered data on the constraints on short selling in different countries from Bris, Goetzmann, and Zhu (2003). A "short sale" dummy is motivated by the fact that the short sale constraint might weaken the ability of arbitrageurs to flatten the demand for stocks. However the dummy turned out to be highly correlated with a few other variables and hence we did not include it in our regression analysis.

negative if the liquidity hypothesis holds in our sample. We also include the proportion of zero daily returns before the event in order to capture the liquidity condition of countries at the time of the inclusion to the index.

The variable *iShare* takes the value of unity if there was an iShare for the country at the time of the index change and zero otherwise. This variable reflects the importance of index funds. If the role of arbitrageurs and the importance of index funds are positively related, then we can expect that the abnormal returns would be higher on inclusion to the index in countries with iShares.

Since international investors probably know more about larger stocks in a country than the smaller ones, we also include the firm size variable in our regressions. Therefore, if the information hypothesis holds (notwithstanding our previous negative results), the coefficient of the size variable should be negative.[25]

We report the results of this regression in the column "Model 1" in Table 6. The significance of the variable CZDR and *iShare* indicates some liquidity effect as well as some "downward sloping demand curve" effect.[26]

Since these variables are likely to have different effects based on the countries in question, we next introduce four dummy variables – US, UK, Japan and Developing –

[25] For non-US stocks we also tried an alternative proxy for information – the existence of an ADR on the stock at the time of its inclusion/deletion. The reasoning was that stocks with ADR are likely to be better known to international (US) investors and hence the information effect of the index change is likely to be less. However, it turned out to be insignificant in all our tests and we have not reported it.

[26] When we replace CZDR with ΔLR, the other measure of liquidity, we do not find any liquidity effect. This is not surprising though, since in our previous tests too, CZDR appeared to detect liquidity more frequently than ΔLR.

each taking a value of unity for the stock that trades in the respective country (or country group) and zero otherwise. We include the interaction of these four dummy variables with ARM to capture the possibly different country-specific effects of these two variables.

We report these results in the column "Model 2" in Table 6. We observe that the interaction term of ARM with UK and Japan are significantly positive signaling that the downward sloping demand curve effects are perhaps more pronounced in these countries. However, the Free Float variable is highly significant in this regression as opposed to the iShare variable in Model 1. Both of these relate to the downward sloping demand curve. The coefficient of abnormal volume is significant at the ten percent level. Abnormal Volume is marginally significant in "Model 2", its strength reduced from the univariate regressions, presumably by the presence of other indicators of downward sloping demand curve. While the effects of these alternative measures appear to be sensitive to the model specification, together they reflect the presence of some downward sloping demand effect.

On the whole then, these regressions seem to suggest the presence of a downward sloping demand curve effect and some indication of liquidity effect. The former seems to be particularly marked in Japan and UK. It is important to note here that in addition to pointing to the downward sloping demand curve effect, our use of the arbitrage risk measure of Wurgler and Zhuravskaya (2002) underlines the important role that index-change arbitrageurs play in the international investment scenario. Clearly in the UK and Japan, index-change arbitrageurs have an impact on prices. Their role in other markets is perhaps relatively less pronounced.

A few caveats may be in order at this point. We are aware that a *failure to reject* a zero coefficient is not tantamount to *accepting* the same. Besides, the variables in the regression are, at best, instrumental variables, with all their associated problems. The results of these regressions should, therefore, be interpreted with caution. Similar to previous studies, e.g., Shleifer (1986) and Harris and Gurel (1987), which refute the information hypothesis using indirect arguments, our results do not *rule out* the presence of information effects, but rather shows that, under certain reasonable assumptions, these effects do not appear to be very strong, while the downward sloping demand curve effect seem to be stronger.

VII. Conclusions

We document the effect of changes in a widely used set of country equity indices – the MSCI country indices – on the returns and trading volumes of stocks added to or removed from these indices around the event dates. There is clear evidence of an impact on returns, as well as on trading volumes, on these stocks for the non-US countries under study. The stocks added to the indices experience a sharp rise in prices after the announcement and a further rise during the period preceding the actual change, though part of the gain is lost after the actual change date. The deleted stocks, on the other hand, witness a steady and marked decline in their prices. Volumes traded go up significantly for both sets of stocks relative to their normal relationship with the respective markets.

Among the four competing views held in the literature—information effect, liquidity effect, price-pressure and downward sloping demand curve view—our evidence appears to favor the downward sloping demand curve view although there is some

evidence of price-pressure and mild evidence of liquidity effect as well. Both liquidity and downward sloping demand curve effects appear to be most pronounced in Japan and UK. Using data on a series of variables reflecting the different "effects", we do not find any evidence in support of the information hypothesis. Thus, our results are broadly similar to those that Lynch and Mendenhall (1997) found in the US context.

While extending the previous empirical literature on "index effect" to the international context, these results also contribute to the literature in international finance in another distinct way. Given the popularity of the MSCI family of indices among international fund managers, they demonstrate the importance of international portfolio investments in different countries. The fact that inclusion in or deletion from an international index can cause significant permanent changes in returns and volumes of stocks in different countries around the world demonstrate the impact international institutional investors can have in non-US markets.

The country-specific results in this paper prohibit sweeping generalizations. They may well reflect the role and importance of international investors in the various national markets. In future, these cross-country variations need to be analyzed with different features of these markets including breadth, depth, and rules concerning foreign investors in order to better understand the reasons for these effects and confirm the conclusion that it is indeed international institutional investors that cause the movements detected in this paper. International fund flow data can also be used to further analyze these results. Comparison of the effects found here with the effects of changes in the IFC country indices, another popular index family, could provide further information about the relative importance of these indices in international institutional investments as well.

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Table 1: Country-wise breakdown of MSCI changes included in our data

Country	Return Data		Volume Data	
	Number of Additions	Number of Deletions	Number of Additions	Number of Deletions
Australia	8	1	8	1
Brazil	NA	6	NA	5
Canada	13	13	13	13
China	1	NA	1	NA
Denmark	2	5	2	5
Finland	7	NA	5	NA
France	1	4	1	4
Germany	5	2	5	2
Hong Kong	4	6	4	6
India	19	15	19	13
Indonesia	6	13	6	13
Italy	8	4	7	3
Japan	30	38	28	38
Malaysia	10	7	10	5
Netherlands	2	NA	2	NA
New Zealand	1	1	1	NA
Norway	8	4	8	4
Philippines	2	12	2	12
Singapore	4	7	4	7
South Africa	7	4	3	3
South Korea	10	25	10	25
Sweden	7	2	7	2
Switzerland	1	NA	1	NA
Taiwan	3	10	3	10
Thailand	3	NA	3	NA
Turkey	1	4	1	4
U.K	18	19	16	19
USA.	23	45	23	45
Venezuela	1	3	1	3
Total	205	250	194	242

Table 2: Statistics for Market-Adjusted Mean Cumulative Abnormal Returns (MCAR) for different event windows. (AD = Announcement Day, CD = Change Day, Pre_AD = from AD –10 to AD–1, Run_up = from AD+2 to CD, Post-AD Permanent = from AD+2 to CD+10, Total Permanent = from AD to CD+10)

	Additions				Deletions			
Windows	N	MCAR	t_{MCAR}	%CAR > 0[#]	N	MCAR	t_{MCAR}	%CAR > 0 [#]
All								
Pre_AD	205	-0.46%	-0.59	49%	250	-0.58%	-0.93	48%
AD	205	-0.40%	-1.64	44%	250	-1.19%	-4.34**	36%**
AD +1	205	3.35%	9.54**	79%**	250	-2.59%	-7.55**	28%**
CD	205	1.80%	6.26**	71%**	250	-1.83%	-4.89**	33%**
Run_up	205	4.51%	5.75**	73%**	250	-5.14%	-4.90**	28%**
Post-AD Permanent	205	2.33%	2.28*	54%	250	-3.73%	-3.07**	36%**
Total Permanent	205	5.28%	4.92**	63%**	250	-7.50%	-6.62**	31%**
US								
Pre_AD	23	-0.49%	-0.28	48%	45	-2.41%	-2.46*	42%
AD	23	0.19%	0.30	43%	45	-0.12%	-0.31	40%
AD +1	23	1.81%	2.90**	70%	45	-0.51%	-1.77	36%
Run_up	23	2.51%	1.67	61%	45	-4.22%	-2.88**	20%**
Post-AD Permanent	23	2.91%	1.29	70%	45	-5.14%	-1.88	33%*
Total Permanent	23	4.91%	1.63	65%	45	-5.77%	-2.14*	31%*
UK								
Pre_AD	18	7.90%	3.35**	72%	19	-2.30%	-1.03	42%
AD	18	-0.11%	-0.18	56%	19	-0.52%	-1.05	16%**
AD +1	18	5.13%	3.54**	89%**	19	-1.97%	-3.86**	21%*
Run_up	18	10.50%	6.44**	94%**	19	-9.30%	-5.95**	0%**
Post-AD Permanent	18	13.81%	4.59**	83%**	19	-6.67%	-2.56*	16%**
Total Permanent	18	18.83%	5.33**	89%**	19	-9.16%	-3.05**	11%**
Japan								
Pre_AD	30	-0.79%	-0.53	37%	38	-0.12%	-0.16	50%
AD	30	-0.33%	-0.57	37%	38	-1.70%	-5.08**	21%**
AD +1	30	8.40%	11.86**	100%**	38	-7.24%	-15.26**	3%**
Run_up	30	8.51%	6.32**	97%**	38	-3.87%	-3.79**	24%**
Post-AD Permanent	30	3.09%	1.02	47%	38	-7.52%	-4.92**	8%**
Total Permanent	30	11.15%	3.70**	67%	38	-16.46%	-9.12**	5%**

*: Significant at the 5% level; **: Significant at the 1% level

Table 2(contd.): Statistics for Market-Adjusted Mean Cumulative Abnormal Returns for different event windows. (AD = Announcement Day, CD = Change Day, Pre_AD = from AD –10 to AD–1, Run_up = from AD+2 to CD, Post-AD Permanent = from AD+2 to CD+10, Total Permanent = from AD to CD+10)

	Additions				**Deletions**			
Windows	N	MCAR	t_{MCAR}	%CAR > 0[#]	N	MCAR	t_{MCAR}	%CAR > 0[#]
Developed Countries[1]								
Pre_AD	71	-3.26%	-2.53*	38%*	49	0.38%	0.26	51%
AD	71	0.43%	1.24	52%	49	-0.20%	-0.42	53%
AD +1	71	3.29%	6.54**	80%**	49	-4.51%	-3.57**	20%**
Run_up	71	1.67%	1.08	61%	49	-8.33%	-2.63*	35%*
Post-AD Permanent	71	-3.09%	-2.11*	42%	49	-1.84%	-0.61	55%
Total Permanent	71	0.64%	0.41	58%	49	-6.55%	-2.99**	39%
Developing Countries[2]								
Pre_AD	63	0.48%	0.30	60%	99	-0.07%	-0.05	49%
AD	63	-1.67%	-3.14**	37%*	99	-2.11%	-3.55**	34%**
AD +1	63	1.06%	1.76	67%**	99	-0.91%	-2.33*	40%
Run_up	63	4.84%	3.27**	73%**	99	-3.66%	-1.88	36%**
Post-AD Permanent	63	4.57%	2.34*	56%	99	-2.00%	-0.89	43%
Total Permanent	63	3.96%	2.11*	60%	99	-5.01%	-2.38*	41%

*: Significant at the 5% level; **: Significant at the 1% level

1. Developed countries: Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland
2. Developing countries: Brazil, China, India, Indonesia, Malaysia, Philippines, South Africa, South Korea, Taiwan, Thailand, Turkey, Venezuela

The fraction of companies having a positive abnormal return. * (**) indicates that % > 0 is significantly different from 50 percent based on a binomial test with a 5% (1%) cutoff.

Table 3: Statistics for Market-Adjusted Mean Cumulative Abnormal Volumes (MCAV) for different event windows(AD = Announcement Day, CD = Change Day, Pre_AD = from AD – 10 to AD – 1, Run_up = from AD+2 to CD, Post-AD Permanent = from AD+2 to CD+10, Total Permanent = from AD to CD+10)

	Additions				**Deletions**			
Windows	N	MCAV	t_{MCAV}	%CAV >0[#]	N	MCAV	t_{MCAV}	%CAV > 0 [#]
All								
Pre_AD	194	1.21%	0.40	48%	239	-12.74%	-4.47**	33%**
AD	192	0.14%	0.33	47%	226	-2.02%	-4.29**	33%**
AD +1	182	3.33%	8.43**	77%**	219	1.41%	2.75**	53%
CD	189	5.17%	10.32**	84%**	233	4.33%	7.68**	73%**
Run_up	194	20.30%	6.32**	76%**	242	14.24%	4.19**	60%**
Post-AD Permanent	194	35.29%	5.22**	70%**	242	17.10%	2.69**	55%
Total Permanent	194	38.55%	5.29**	70%**	242	16.49%	2.44*	53%
US								
Pre_AD	23	-6.49%	-1.33	26%*	43	-7.05%	-1.91	33%*
AD	22	-0.80%	-1.73	27%*	43	-0.56%	-1.22	42%
AD +1	22	-0.80%	-1.33	36%	43	-0.92%	-2.07*	33%*
Run_up	23	-0.67%	-0.20	52%	45	0.54%	0.17	49%
Post-AD Permanent	23	-2.92%	-0.47	52%	45	-4.92%	-0.77	38%
Total Permanent	23	-4.45%	-0.67	48%	45	-6.35%	-0.92	38%
UK								
Pre_AD	16	8.31%	1.04	50%	19	-4.25%	-0.48	37%
AD	16	-0.79%	-0.76	50%	19	-2.16%	-2.03	42%
AD +1	15	2.62%	3.48**	73%	19	0.52%	0.42	68%
Run_up	16	25.66%	4.26**	94%**	19	27.28%	2.32*	95%**
Post-AD Permanent	16	52.99%	4.29**	88%**	19	23.47%	0.91	89%**
Total Permanent	16	54.66%	4.15**	88%**	19	21.82%	0.81	89%**
Japan								
Pre_AD	28	1.91%	0.45	64%	38	-14.85%	-5.55**	21%**
AD	28	-0.15%	-0.26	50%	38	-2.09%	-3.58**	29%**
AD +1	28	4.70%	8.60**	93%**	38	5.71%	11.52**	92%**
Run_up	28	25.17%	5.45**	93%**	38	39.58%	9.12**	89%**
Post-AD Permanent	28	35.61%	4.29**	79%**	38	47.66%	6.20**	82%**
Total Permanent	28	40.16%	4.53**	82%**	38	51.28%	6.12**	79%**

*: Significant at the 5% level; **: Significant at the 1% level

Table 3(contd.): Statistics for Mean Cumulative Market-Adjusted Abnormal Volumes (MCAV) for different event windows(AD = Announcement Day, CD = Change Day, Pre_AD = from AD – 10 to AD – 1, Run_up = from AD+2 to CD, Post-AD Permanent = from AD+2 to CD+10, Total Permanent = from AD to CD+10)

	Additions				Deletions			
Windows	N	MCAV	t_{MCAV}	%CAV >0[#]	N	MCAV	t_{MCAV}	%CAV > 0 [#]
Developed Countries[1]								
Pre_AD	68	-0.63%	-0.11	49%	47	-12.92%	-1.53	38%
AD	68	-0.05%	-0.05	51%	44	-1.59%	-1.31	41%
AD +1	65	4.90%	7.54**	89%**	44	4.87%	3.75**	73%**
Run_up	68	24.33%	4.84**	85%**	47	45.45%	5.23**	79%**
Post-AD Permanent	68	38.29%	3.85**	82%**	47	71.21%	4.39**	79%**
Total Permanent	68	42.94%	3.90**	82%**	47	74.29%	4.13**	77%**
Developing Countries[2]								
Pre_AD	59	4.06%	0.65	49%	92	-16.20%	-3.01**	34%**
AD	58	1.10%	1.35	48%	82	-2.96%	-2.86**	24%**
AD +1	52	2.58%	2.80**	73%**	75	-1.24%	-1.19	31%**
Run_up	59	20.06%	2.46*	63%	93	-7.92%	-1.36	37%**
Post-AD Permanent	59	41.76%	2.32*	54%	93	-13.38%	-1.17	34%**
Total Permanent	59	45.12%	2.35*	54%	93	-16.99%	-1.44	30%**

*: Significant at the 5% level; **: Significant at the 1% level

1. Developed countries: Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland
2. Developing countries: Brazil, China, India, Indonesia, Malaysia, Philippines, South Africa, South Korea, Taiwan, Thailand, Turkey, Venezuela

The fraction of companies having a positive abnormal return. * (**) indicates that % > 0 is significantly different from 50 percent based on a binomial test with a 5% (1%) cutoff.

Table 4: Tests of Liquidity Hypothesis

Panel A: Liquidity Ratio test

The panel shows the estimates for change in the average liquidity ratio of stocks added to or deleted from the MSCI index, $\overline{\Delta LR} = \frac{1}{n}\sum_{j=1}^{n} \Delta LR_j$.

	Additions				**Deletions**			
Windows	N	$\overline{\Delta LR}$	t-value	%LR >0 #	N	$\overline{\Delta LR}$	t-value	%LR >0 #
Total Sample	188	-0.557	-1.58	42.0**	242	-0.415	-2.69**	34.7**
US	23	0.002	0.34	30.4	44	-0.002	-4.44**	6.8**
UK	17	-0.000	-0.67	41.2	17	-0.001	-2.00	29.4
Japan	30	0.666	0.96	50.0	38	-0.005	-0.22	39.5
Developed countries[1]	68	0.019	0.17	45.6	48	0.172	0.85	45.8
Developing countries[2]	50	-2.522	-2.07*	38	95	-1.142	-3.10**	41

* significant at the 5% level
** significant at the1% level

1. Developed countries: Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland

2. Developing countries: Brazil, China, India, Indonesia, Malaysia, Philippines, South Africa, South Korea, Taiwan, Thailand, Turkey, Venezuela

The fraction of companies having a positive abnormal return. * (**) indicates that % > 0 is significantly different from 50 percent based on a binomial test with a 5% (1%) cutoff.

Table 4 (contd): Tests of Liquidity Hypothesis

Panel B: Proportion of Zero Daily Returns

The liquidity of a stock is measured by the relative frequency of zero daily returns. This measure of liquidity is developed by Lesmond, Ogden, and Trzcinka (1999). To measure the changes in liquidity around the event, we compute the difference in the proportions of zero daily returns between the one-year period before and after the event. For the proportion of zero daily returns before the event, we calculate the proportions of zero daily returns for the one-year period ending in 10 trading days before the announcement date. For the proportion of zero daily returns after the event, we calculate the proportions of zero daily returns for the one-year period starting 20 trading days after the change date.

	Additions				**Deletions**			
Windows	N	CZDR	t-value	%CZDR<0 #	N	CZDR	t-value	%CZDR <0 #
Total Sample	201	-0.006	-0.98	59.2**	249	0.037	4.29**	35.3**
US	23	0.001	0.15	52.2	45	0.013	2.15*	33.3*
UK	18	-0.058	-2.97**	94.4**	19	0.108	1.90	57.7
Japan	30	-0.047	-4.53**	86.7**	38	0.010	1.23	44.7
Developed countries[1]	67	-0.014	-1.01	61.2	49	0.017	0.92	38.8
Developing countries[2]	63	0.034	3.42**	36.5*	98	0.053	3.51**	27.6**

* significant at the 5% level
** significant at the 1% level

3. Developed countries: Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland
4. Developing countries: Brazil, China, India, Indonesia, Malaysia, Philippines, South Africa, South Korea, Taiwan, Thailand, Turkey, Venezuela

The fraction of companies having a positive abnormal return. * (**) indicates that % > 0 is significantly different from 50 percent based on a binomial test with a 5% (1%) cutoff.

Table 5: Test of Information Hypothesis

Changes in Current-Year EPS forecasts for Firms Added to the MSCI Standard Index

For each added company, we take analysts' current-year earnings forecasts from Institutional Brokers' Estimate System International, Inc. (I/B/E/S) before and after the addition and compute the changes in the earnings forecasts. We only include the EPS forecasts by the analysts who issued EPS forecasts both before and after the addition. For each analyst, we take the last EPS forecast before the addition and the most recent EPS forecast after the addition. We only include forecasts issued within four-month period before (after) the addition. The changes in EPS forecast are standardized by the last EPS forecast before the addition. The median EPS forecasts for the firm are computed as the consensus EPS forecasts before and after the addition, respectively. Then the difference in the median EPS forecasts between before and after the addition is computed. As a benchmark, we compute changes in the median EPS forecasts for all other companies in the same country, for which analysts issued EPS forecasts for the same period. We compute the difference in the mean between the changes in the median EPS forecasts both for the added companies and for benchmark companies. The numbers in the parentheses are t-statistics.

Sample	Sample size	Mean Changes in Current-Year EPS Forecasts for Sample Firms (A)	Mean Changes in Current-Year EPS Forecasts for All Other Firms (B)	Difference (A – B)
All	127	-0.0%	-2.0%	2.0% (0.39)
US	17	4.5%	0.0%	4.5% (1.78)
UK	9	-16.0%	-0.7%	-15.3% (-1.62)
Japan	18	-25.6%	0.8%	-26.3% (-1.16)
Developed Countries	48	4.5%	-5.5%	10.0% (1.54)
Developing Countries	35	8.9%	0.1%	8.8% (0.82)

* significant at the 5% level
** significant at the 1% level

Table 6: Simultaneous Test of Alternative Hypotheses

The table shows regression results for regressing CAR over the period AD through CD on variables capturing the various effects. The dependent variable is the Cumulative Abnormal Returns for the period from AD through CD. The independent variables are as follows. Firm size is the average market value during the period. CZDR is the difference in the proportions of zero daily returns between before (1 year period ending 10 days before AD) and after (1 year period starting 20 days after CD) the event. We compute the arbitrage risk measure (ARM) for a stock by regressing the daily returns of the stock on the daily market returns for the one-year period ending in 10 trading days before the announcement date. The ARM of the stock is defined as the standard deviation of the residuals from the regression. *iShare* is a dummy variable, which takes the value of one if there was an *iShare* for the country at the time of the index change and zero otherwise. Free float ($\in (0,1)$) is a measure of the relative quantity of stocks available to international investors. Abnormal Volume (AV) is the Cumulative Abnormal Volumes (CAVs) for the period from AD through CD. Japan, UK, US, and Developing are dummy variables taking the value of one if the stock is traded in the respective country and zero otherwise. The numbers in the parentheses are t-statistics.

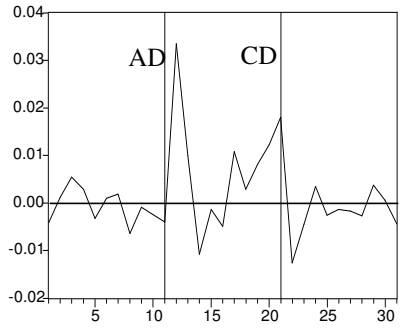
Dependent Variable: CAR from AD through CD

Variable	Hypothesis	Expected Sign (Under Hypothesis)	Model 1	Model 2
Intercept			0.086 (1.43)	0.079 (1.25)
ln(Firm Size)	Information	--ve	0.000 (0.05)	0.002 (0.33)
Changes in the Proportions of Zero Daily Returns Between Before and After Additions (CZDR)	Liquidity	--ve	-0.468 (-2.33)*	-0.243 (-1.23)
Arbitrage Risk Measure (ARM)	Downward Sloping Dd	+ve	-0.019 (-0.03)	0.196 (0.24)
iShare	Downward Sloping Dd	+ve	0.042 (2.04)*	0.029 (1.19)
Proportions of Zero Daily Returns Before Additions			-0.052 (-0.51)	-0.061 (-0.62)
Free Float	Downward Sloping Dd	--ve	-0.056 (-1.24)	-0.096 (-2.17)*
Abnormal Volume (AV)	Downward Sloping Dd	+ve	0.028 (1.39)	0.037 (1.90)†
Japan * ARM		+ve		2.723 (2.19)*
UK * ARM		+ve		3.719 (2.65)**
US * ARM		+ve		1.517 (1.61)
Developing * ARM		+ve		-0.519 (-0.77)
N			158	158
F-value			2.58*	3.83**
R^2			0.108	0.224

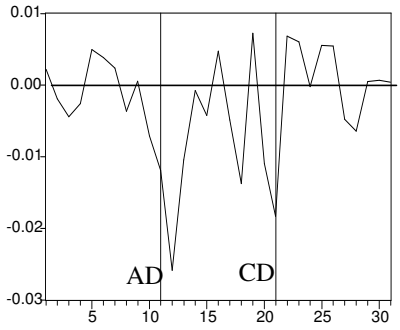
† significant at the 10% level; * significant at the 5% level; ** significant at the 1% level

Fig. 1: Daily Abnormal Returns and Volumes

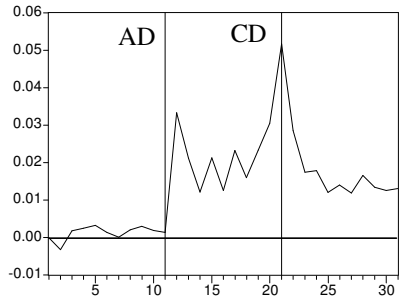
Panel A:
Daily MAR for Additions



Panel B:
Daily MAR for Deletions



Panel C:
Daily MAV for Additions



Panel D:
Daily MAV for Deletions