Comovement of Newly Added Stocks with National Market Indices: Evidence from around the World

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September 2011

Abstract

We document the prevalence around the world of increased stock price comovement experienced by companies when added to major indices, and shed new light on the causes of this phenomenon. Using newly-constructed and extensive data covering forty developed and emerging markets over the last decade, we document that in most, though not all, countries, when added to a major index, a firm's return experiences a post-inclusion increase in comovement with the rest of the index, reflected in both a higher *beta* (especially if the pre-inclusion *beta* is less than one) and greater explanatory power of the market return (higher R^2). Stock turnover and analyst coverage also typically increase upon inclusion. Using a variety of empirical tests, we find that the demand-based view of comovement (the category/habitat views of Barberis, Shleifer and Wurgler, 2005) provides a good explanation for many of our findings. Some results, though, suggest that information-related factors are also important.

Acknowledgments and Disclaimer. We are very grateful to Zeynep Elif Aksoy and Mohsan Bilal for extensive and excellent research assistance and to Gregorio Impavido for sharing data on institutional investors. We thank Doron Avramov, Andrew Ellul, Eugene Kandel, Luc Laeven, Shiki Levi, Randall Morck, Per Ostberg, seminar participants at the IMF, Korea University, and the University of Alberta, and two anonymous referees for very helpful comments and suggestions. This project was initiated while Yafeh was Resident Scholar at the IMF Research Department which hospitality is gratefully acknowledged. Yafeh also acknowledges financial support from the Krueger Center at the Hebrew University School of Business The views expressed in this paper are those of the authors and should not be attributed to the International Monetary Fund, its Executive Board or its management.

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I. Introduction

Empirical evidence, focused primarily on the US, suggests that inclusion in a major stock market index (e.g., the S&P 500) is typically associated with two phenomena: a positive price response, and increased comovement between newly-added companies and the rest of the index. The first phenomenon – the price effect – has been discussed extensively for over twenty years in the context of a debate on whether or not demand curves for stocks slope downwards.[1] The second phenomenon – the increased post-inclusion comovement – has been studied more recently, but so far only in a few developed financial systems.[2] The reasons for this second phenomenon are still being debated, with various alternative theories being proposed; shedding light on the prevalence of this phenomenon around the world and its causes are the two objectives of this paper.

To do so, we proceed in two steps. First, we construct a new and comprehensive data set on additions to stock market indices in forty countries over a ten year period. While the extent to which index inclusion effects occur has already been documented for the US and, to a lesser extent, the UK, Canada and Japan, the prevalence of this phenomenon is virtually unknown for other countries. We thus contribute to the literature by documenting the degree to which increased post-index inclusion comovement is present in a large sample of developed and emerging markets.

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[1] Some early studies on this phenomenon are Shleifer (1986) and Harris and Gurel (1986). See Eliott et al. (2006) for a survey of this literature.

[2] The two phenomena are probably related; however, we are not aware of any study documenting the extent to which the stock price response to the announcement of inclusion in an index is related to the subsequent increase in comovement. Data constraints (and in particular, unknown announcement dates) for most countries in our sample prevent us from pursuing this direction in the present study.

Second, we use the variation in index inclusion effects, across firms, countries and over time, to shed light on the validity of various explanations proposed for the phenomenon. Specifically, our main empirical tests follow those of Barberis, Shleifer and Wurgler (2005, hence BSW). Their starting point is that, if stock prices are driven by fundamentals only, then comovement in stock returns should not change after a company is added to a major stock market index, provided that inclusion itself is an information-free event.[3] BSW show, however, that stocks added to the S&P 500 index experience increased comovement of returns with the rest of the index. They propose two main, non-fundamentals based explanations for this phenomenon.

According to the first explanation, comovement in stock returns is driven by correlated shocks to investor demand for a particular set of securities. Investors may group assets into categories and, as they move assets between categories, comovement is generated among the assets within a category (BSW call this the "category" view). Another example of a demand-driven view of comovement is what BSW call the "habitat" view, whereby investors, for a variety of reasons, trade only in a subset of assets. As they change their exposure to the securities in the "habitat," comovement is generated among these assets. Index-based investment could fit into either view. Because the "category" and "habitat" views have very similar empirical implications, we follow Greenwood (2008) and treat both as manifestations of a single "demand-based" view.

The second main view proposed by BSW relates the comovement of index-included stocks to "information diffusion." Because stocks included in a major index can

[3] The assumption that index inclusions contain no information is standard in the literature, although studies such as Denis et al. (2003) or Cai (2007) challenge it. Kaul et al. (2000) and Boyer (2011) provide compelling evidence that changes in the structure of stock indices elicit changes in stock prices without conveying new information.

be expected to have lower trading costs and to be more liquid, their prices may reflect aggregate information more quickly than other stocks not included in the index. Consequently, after inclusion, newly added stocks would tend to co-move (more) with the rest of the index.[4]

Both theories can account for the observed increase in post-index inclusion comovement, but they have very different implications. In particular, the demand-based explanation interprets the increased comovement following inclusion in a major index as "excess" comovement, i.e., beyond what is warranted by fundamentals. By contrast, the information diffusion explanation implies that prior to inclusion in an index, some stocks prices do not fully reflect all the available information and co-move "too little," so that the post-inclusion increase in comovement is driven by prices which better reflect information. Empirically, variation in the effects across stocks, countries and time periods can be used to identify which one of the two theories is more important in practice.

In this paper, we investigate the two explanations proposed by BSW using data for forty developed and emerging countries over a period of about ten years. We first document a set of stylized facts on the prevalence and extent of index inclusion effects around the world, providing broad evidence on a phenomenon which has so far been documented only for the US and a few other developed economies. Consistent with the existing literature, we find that in the majority of countries, both developed and emerging, inclusion in a major stock market index is associated with increased comovement between the newly added stock and the rest of the market (reflected in higher *beta* and R^2). This result is difficult to reconcile with the view that stock prices are

[4] This idea is related to earlier work by Pindyck and Rotemberg (1993) who examine if stocks co-move in response to macroeconomic news.

determined by fundamentals only. In addition, included stocks typically experience a significant increase in turnover and analyst coverage.

Next, we analyze differences in post-index inclusion comovement across stocks, countries and time periods to understand better why the index inclusion effect arises. We find three patterns. First, the increase in post-inclusion comovement tends to be more pronounced in countries where the market index is dispersed (i.e., with many firms included). Second, the magnitude of the index-inclusion effect is larger in countries with a greater presence of institutional (and individual) investors. Third, the magnitude of the index-inclusion effect has increased over the last decade. All these findings control for stock market and economic development and are robust to various additional tests.

We argue that, collectively, these results provide more support for the demand-based than for the information-based view. First, the fact that the post-inclusion increase in comovement is more pronounced in countries where the index consists of more stocks is consistent with index-based investment – there is less point in tracking an index when a small number of shares can mimic the index's returns (or when a country's economy is driven by several large firms). Second, the evidence that the inclusion effect is larger in markets where the presence of institutional investors is more pronounced is in line with the demand-based view – considerable anecdotal and some systematic evidence indicates that institutional investors tend to invest in ways which mimic major indices (or are benchmarked against them), thereby generating comovement among the underlying stocks. And third, the fact that the post-inclusion increase in comovement has been increasing over time is consistent with the rising popularity of benchmark-based investment and index-based instruments around the world.

The information diffusion view seems less capable of accounting for many of our results. It cannot account for the relation between the increase in comovement and the concentration of the index. It cannot easily account for the time trend either – there are no strong reasons to think that the speed at which new information is incorporated has increased for index-included companies more than for other firms. We do find, however, that the lagged *beta* declines following inclusion in an index, in line with one of the predictions of the information diffusion view. There are a few additional findings which are consistent with the information diffusion theory, but the economic magnitudes of their effects tend to be small. We conclude that index inclusion leads to increased comovement largely due to demand-related reasons, although information-related reasons also appear to play a role in some countries.

We also document some patterns which cannot be accounted for by either view. Specifically, in our data set, the increase in comovement is more pronounced for companies with a pre-inclusion *beta* below one, whereas companies with a high pre-inclusion *beta* often experience a post-inclusion decline in their *beta*, suggesting a convergence of *beta* to one. This result, which is not driven by measurement errors, appears to be unrelated to either theory, both of which predict an increase in comovement regardless of its current level.

In addition to BSW, the present study relates to a small number of studies for the US and a few other developed countries documenting increased comovement following inclusion in a major index. Vijh (1994), which predates BSW, documents post-inclusion comovement in the US and develops a methodology to distinguish between “price pressure effects” and increased liquidity. Also for the US, Kaul et al. (2008) find that companies switching from NASDAQ to the NYSE exhibit more comovement with the NYSE (and less comovement with the NASDAQ). Boyer (2011) documents comovement across stocks belonging to the same category (e.g., growth stocks) and presents striking evidence that an exogenous reclassification of a stock into a different category leads to more comovement with the category to which the stock is assigned and less with the category from which the stock is removed.

The much more limited non-US evidence includes Coakley and Kougoulis (2004) and Mase (2008), who present evidence of increased post-inclusion comovement in the UK, and Greenwood and Sosner (2007), who study the Japanese market. Greenwood (2008), who does not focus exclusively on index additions, uses variation in over-weighting of certain stocks in the Nikkei index, and finds support for the demand-based view rather than the information diffusion view. Coakley et al. (2008) document changes in comovement following inclusion in the MSCI Canada index.

Finally, since we relate the index inclusion effects to the presence of investors who may be prone to follow indices or invest in certain categories of stocks, we draw on studies of the preferences of institutional (and other) investors such as Gompers and Metrick (2001), Kumar and Lee (2006), and Zun (2008).

The remainder of the paper is organized as follows. Section II describes the construction of the data base used in the analysis and presents a set of stylized facts on index inclusion effects around the world. In Section III we conduct a series of tests relating the post-inclusion increase to several possible theoretical explanations. Section IV provides series of robustness tests. Section V concludes.

II. The Data Set, Empirical Approach and Basic Statistics

Table 1 describes the data set of inclusions used for this study, which, as far as we know, is the largest of its kind. It includes over 2000 additions to forty national stock market indices over a ten-year period corresponding roughly to the last decade (2001-2010, although for some countries coverage starts later).[5]

In order to focus on additions to major indices, we choose indices corresponding as much as possible to indices tracked by *The Economist* magazine as important and "official" indicators of national stock market performance. In some countries, there are several major indices and it is often hard to tell which one is most "important." We do know, however, for countries where the index inclusion phenomenon has already been studied, that the indices we use are the same as the ones tracked by *The Economist* (e.g., for the US, the UK and Japan, *The Economist* tracks the S&P 500, the FTSE 100, and the Nikkei 225, respectively, which are the indices used in several inclusion studies). Furthermore, to the extent that the index chosen is not the major index in a country (i.e., the index which constitutes the most natural "category" or "habitat" for investors), our tests will be biased against finding significant post-inclusion effects.[6]

[5] Data constraints prevent further broadening of the sample both across countries and over time. For many stock markets, data are not available on index composition, especially in early years. Sometimes, the number of stocks included over the sample period is too small for country analysis. In some countries, stocks appear to be included and excluded multiple times within a short period, so that the calculation of pre- and post-inclusion statistics is impossible.

[6] For example, in India, because of data availability constraints, we use the NIFTY index whereas the largest exchange traded funds (and probably institutional investors) may track the MSCI India index. To the extent that the NIFTY is not the most natural or popular "habitat" for investors in India, our tests would be biased against finding post-inclusion increases in comovement (this is indeed the case for India). We also examine if the weight of an index in total market capitalization is correlated with the increase in post-inclusion comovement, finding no evidence that this is the case, so that there is no systematic bias due to the overall coverage of the index we use. We note here that the popular MSCI indices, published by Morgan Stanley, are not official publications of any stock exchange. Therefore, changes in the composition of these indices are not as widely announced as changes in the composition of "official" indices.

We collect (from Bloomberg) information on the number of firms included in each index and its concentration (specifically, the weight of the largest five firms in the index). Firm-specific information (total assets, leverage, trading volume) is obtained from Datastream and analyst-coverage is from I/B/E/S. Several sources are used to collect country-specific information (e.g., economic and financial system characteristics) and data on the extent of institutional investor involvement in equity markets. The variable definitions, their sources, and basic sample statistics are all presented in Table 2.

Methodologically, we follow BSW and other country-specific studies very closely and calculate the *beta* between each newly included firm's stock returns and the returns of the rest of the index to which it is added (excluding the added firm from the index, so that its weight does not affect the calculated *beta*).[7] Specifically, the pre-inclusion *beta* is calculated using daily data for the twelve months ending 30 days prior to the inclusion date (to avoid contaminating effects of inclusion announcement or rumors about it). Similarly, the post-inclusion *beta* is calculated using daily data for twelve months starting 30 days after the inclusion date. Our two measures of increased co-movement are the changes in *beta* and the corresponding R^2 between the pre-inclusion and post-inclusion periods. Following BSW, we also calculate *betas* and R^2 using weekly data for the year preceding and following the inclusion date, again excluding the 30 days before and after inclusion. Besides allowing for robustness tests, comparing results across different frequencies is also useful in testing some of the implications of theories on the post-

[7] Some studies, including BSW, estimate also a bivariate *beta* between the added firm's stock returns and those of the main index and of non-index stocks (e.g., non-S&P 500 returns in the US). This is not feasible for most countries in our sample (except for the financial centers of the US, UK and Japan) because the "non-index" component of the stock market is typically small and data on non-index returns are often not available. Another feature of some studies is the use of index exclusions (deletions) data; for brevity, this discussion is excluded from the current version but is available in Claessens and Yafeh (2011).

inclusion rise in comovement. In addition to measuring pre- and post-inclusion comovement, we study how the information and trading environments may have changed around the inclusion date. For this purpose, we collect data on stock turnover (defined as the number of shares traded over the number of shares outstanding) for the year before and after the index inclusion and on the number of analysts covering each firm.

After providing some basic statistics, we present our multivariate regressions estimating the relation between changes in comovement following index inclusion and a number of country-specific and firm-specific variables. We use these and a series of additional empirical tests to distinguish between the different theories on the post-inclusion change in comovement.

Basic Statistics on Post-inclusion Comovement across Countries

Table 3 presents the average effects of index inclusion by individual country. For some countries, the results should be interpreted with caution since the number of observations is small. Nevertheless, the four main comovement measures – the increase in *beta* and the change in the explanatory power of market returns (as reflected in the increase in R^2) using both daily and weekly data — all suggest that in most countries inclusion in a major index is associated with increased comovement. In 32 (of the 40) countries, newly included companies experience an increase in their daily *beta* with the rest of the index to which they are added; the weekly *beta* increases in 26 countries. Similarly, the R^2 increases in 35 countries (in both daily and weekly data). In the vast majority of countries there is also an increase in stock turnover and analyst coverage. These cross-country results indicate that the null hypothesis of zero increase in comovement following inclusion in an index can be rejected.[8] As such, the results extend the findings for the US, the UK, Canada and Japan to many other countries.

For many countries (especially where the sample of index inclusions is sufficiently large), Table 3 shows consistent patterns across the comovement measures. For example, in Canada, Australia and Japan, index inclusion is associated with a substantial (and statistically significant) increase in all comovement measures. Among emerging markets, an increase in comovement is also common, with some countries such Brazil, Mexico and Poland exhibiting fairly consistent positive inclusion effects. In others, the effects are weaker and there are some countries with zero or negative comovement effects across the various measures (e.g., Finland, India and Portugal). We now turn to the determinants of this phenomenon and its differing extent across countries.

III. Demand-based vs. Information-based Explanations for Comovement

Absent any real changes in firm behavior and performance in conjunction with inclusion in an index, increased post-inclusion comovement could be due to demand-based pressures along the lines of the category/habitat view; information diffusion and other information-related effects; and other changes associated with inclusion in a major index, such as changes in liquidity, changes in analyst coverage and so forth. We explore the relative validity of these explanations in turn.

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[8] Under the null hypothesis that, following inclusion in an index neither *beta* nor R^2 should change, and assuming that the sign of the change in comovement in the entire sample has a binomial distribution with a "success" probability of ½, the expected number of countries with a positive change in comovement is 20, with a variance (standard deviation) of 10 (3.16). The null hypothesis of no change in comovement is then rejected for the daily *beta* and both the daily and weekly R^2 at a 95% confidence level; for the weekly *beta* the level of confidence is slightly lower. Note that the sample-wide average increase in daily *beta* in our sample (about 0.10) is smaller than the figures documented for Japan (0.60, Greenwood and Sosner, 2007) and the UK (about 0.30, see Coakley and Kougoulis, 2004 and Mase, 2008). The average increase in daily *beta* in our US sample (0.10) is comparable in magnitude to BSW's and Vijh's (1994) figures for the US: they report average increases in daily *beta* of 0.15 and 0.08, respectively.

The Determinants of Changes in Comovement – The Benchmark Regression

We begin with a benchmark (OLS) regression specification designed to explore the main differences in index inclusion effects across countries, firms and time periods. As dependent variables, we use the changes in the daily and weekly *beta* and the changes in the daily and weekly R^2. Existing theories and intuition provide some guidance regarding which country- or firm-specific variables should affect the magnitude of the index inclusion effects. To investigate the effect of attributes of the index to which a firm is added, we include index concentration (the weight of the largest five firms in the index). To explore the extent to which index inclusion effects have changed over the period, we include a time trend. Since effects may depend on the characteristics of the financial system and country, we control for financial (market capitalization to GDP) and economic development (GDP per capita). At the firm level, we include the pre-inclusion *beta* as well as leverage and firm size.

The results, reported in Table 4, indicate consistent patterns, with only minor differences between daily and weekly frequencies, and between regressions based on changes in *beta* (columns 1 and 2) or R^2 (columns 3 and 4). Three results stand out.

First, in the regressions where the dependent variables are changes in *beta*, the inclusion effect is weaker when a firm is added to a concentrated index, i.e., when a small number of firms accounts for a large fraction of index capitalization. These effects are substantial: for example, if the weight of the largest five firms in an index increases by 10 percent, the post-inclusion increase in *beta* declines by 0.025-0.030, a large figure relative to the sample-average increase in (daily) *beta* which is about 0.10 (Table 2). This result is consistent with indexing behavior as a particular manifestation of the demand-view hypothesis – if an index is concentrated, there is no point in mimicking it; it is sufficient to buy the shares of a small number of companies. We interpret the finding that inclusion effects are stronger with more dispersed indices as supporting evidence that, in these markets, index-based investment is more common and therefore being added to such an index results in higher comovement.

Second, in all four regressions, controlling for other factors which may influence post-inclusion comovement, the index inclusion effect increases in magnitude over time.

Third, the effect seems to apply to countries at varying degrees of development, since we do not observe any clear effects of financial or economic development on the extent of post-inclusion comovement in any specification.

As for firm characteristics, size tends to be positively associated with increased comovement in all specifications (although it is only statistically significant in one); this cannot be due to the weight of the firm in the index (because we calculate the comovement between the added firm and the rest of the index excluding the added firm itself).[9] Leverage has no statistically significant effect on the increase in comovement in any of the regressions. The most important firm-specific variable in all four specifications is the pre-inclusion *beta*, whose coefficient is always negative and highly statistically significant, that is, the increase in comovement is larger for firms whose pre-inclusion *beta* is low. We return to this finding, which cannot easily be related to the two explanations for increased comovement, towards the end of the paper.

[9] When added to the regression, relative measures of size such as size deciles in the sample or the post-inclusion index weight have no impact on the index inclusion effect.

Tests of the Demand-Based and Information-Diffusion View of Comovement

So far, two of our findings appear to be consistent with the demand-based view. The tendency of the effects to increase over time is consistent with the rising popularity of index-tracking investment strategies and instruments over the last decade.[10] And the tendency for effects to be stronger for more dispersed indices (those having more firms) is also consistent with the role of index-tracking strategies and instruments as drivers of the inclusion effect. We now conduct more specific tests of the validity of the demand-based and information diffusion views of comovement. These tests are performed using the change in the daily *beta* around the time of inclusion as the dependent variable, but the results are similar when using our other dependent variables. The validity of the demand-based view is explored by testing the relation between the presence of more indexing-prone investors and the post-inclusion change in comovement. The predictions of the information diffusion view of comovement are tested by exploring differences between low and high frequency *betas* and by observing changes in lagged *betas* after inclusion.

Tests of the Demand-Based View of Comovement

If increased post-inclusion comovement is driven by demand factors, index inclusion effects should be stronger where more investors regard an index as their "habitat." Institutional investors are likely candidates to generate demand for stocks in certain categories. For example, there is considerable evidence that institutional investors tend to invest primarily in large stocks: Gompers and Metrick (2001) find that

[10] For example, global ETF assets have gone up from about $74 billion in 2000 to $1036 billion in 2010 (BlackRock, 2010).

institutional investors in the US tend to favor large stocks; Kang and Stulz (1997) argue that foreign (presumably mostly institutional) investors active in Japan tend to concentrate their investment in large stocks. With large stocks more likely to be included in indices, the strategies of institutional investors would presumably focus on investing in indexes. More specifically with respect to index-related investment strategies, Bhattacharya and Galpin (2011) suggest that institutional investors tend to "value weigh" their portfolios; Zun (2008) finds that institutional investors often hold similar portfolios and constitute a "clientele" for certain stocks, generating comovement between them; Giannetti and Laeven (2009) report that Swedish pension funds are more likely to buy shares of companies included in the OMX 30 (leading) index; and Greenwood (2008) cites reports of Nomura Securities according to which large amounts of institutional funds in Japan are benchmarked to major indices.[11]

We measure the presence of potential index-oriented investors by collecting data on the importance of institutional investors in each market. In particular, we obtain consistent measures across countries on the percent of all assets invested in equity by mutual funds, insurance companies and pension funds (collected by the World Bank from the OECD and country-specific sources, as of 2006). These proxies are inevitably imperfect: none includes all domestic institutional investors or covers foreign institutional investors; and they include equity investments of domestic institutional investors abroad. In addition, we cannot tell to what extent these institutional investors actually follow

[11] Anecdotal evidence from Israel is consistent with this: the meeting protocols of the investment committee of one Israeli institutional investor suggest that a large portion of the assets is allocated to firms in major indices, either directly or through exchange traded funds; the protocols also clearly indicate that the overall investment results are evaluated against benchmark indices. Further anecdotal support comes from when Israel's stock market was reclassified and included in indices of developed (rather than emerging) markets. The shift was extensively covered in the press for its possible effects on changes in demand for Israeli stocks by foreign institutional investors.

index-based investment strategies.[12] Nevertheless, if index inclusion effects are found to be stronger in markets where institutional investors play an important role, then, to the extent that these investor groups proxy for the tendency to invest in an index as a "habitat" or category, the results would be consistent with the demand-based view.

Table 5 presents the results of our multivariate regressions using, in addition to the earlier firm- and country-specific variables, our measures of institutional investor presence. Clearly, the index inclusion effect (measured by the increase in daily *beta*) is positively correlated with the country-specific equity stakes of institutional investors.[13] While we cannot tell from these results that institutional investors actually "cause" the post-inclusion increase in comovement, the close correlation suggests that the demand-based theory is probably one of the drivers of this phenomenon.

Further support for the conjecture that institutional investors behave in accordance with the demand-based view of comovement can be found for individual countries. In the UK, following the Myners report, which questioned the appropriateness of equity investments for pension funds, there was a marked decline in equity investments by these funds (from about 70 percent in 1999 to under 60 percent in 2005, see NAPF, 2007). In our sample, the average increase in *beta* in the UK is indeed smaller in the second half of the sample than in the first half. In Poland, in contrast, new legislation made equity

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[12] Information on the extent of index-based investment is not available even for the most sophisticated markets, largely due to the difficulty in defining index-following. Moreover, even information on the value of all exchange traded funds following a particular index is not available on a consistent basis for all countries and indices. Information on the presence of institutional investors in equity markets is also, surprisingly, incomplete. Ferreira and Matos (2008) generate a worldwide data set of holdings by various types of institutional investors; we do not use their data, however, because their figures for some of our main countries (e.g., Australia, Japan) seem implausible.

[13] The results remain very similar to those reported in Table 5 when using the change in weekly *beta* or the change in daily or weekly R^2 as dependent variables. Bhattacharya and Galpin (2011) derive measures of the prevalence of what they call "value-weighted" investment across countries, although they readily admit that their estimates for countries other than the US are imprecise. When we use their measure, we obtain a positive coefficient but with a lower level of significance.

investment by pension funds more common after 2005 (e.g., *Financial Times*, April 26, 2005) and, indeed, the average increase in *beta* for firms included in the Polish WSE WIG index is much higher in the second half of the sample than in the first.

It is also possible that non-institutional investors are behind the demand-based increase in comovement. Kumar and Lee (2006) argue that retail (rather than institutional) investors are the ones who share a common "sentiment" and their correlated trades then generate comovement across stocks (especially when arbitrage is costly). Countries with a large equity market presence of institutional investors tend to have high rates of equity market participation by individuals as well. The countries with the highest rates of individual participation according to Guiso et al. (2008) are Australia, New Zealand, the UK and Japan, followed closely by the US, Canada and Sweden. These countries also have high participation rates of institutional investors. And, indeed, the correlation between measures of actual institutional and individual investor presence is high in our sample as well. It is therefore quite possible that demand driven increases in *beta* come from index-based strategies of institutional and individual investors.

To further address this possibility, we use the (preliminary) data of Grout et al. (2009) on individual shareholding patterns around the world in 2005-2006 and run a regression similar to the one with the institutional investor data. The result (fourth column of Table 5) shows a positive and statistically significant relation between individual shareholding and the index inclusion effect (the effect is also positive and highly significant when the dependent variable is the change in weekly *beta* or daily and weekly R^2; not reported). We conclude that indexing-prone investors — be they institutional or individual — are associated with the index inclusion effects we observe, probably through the channels identified in the demand-based view.

Tests of the Information-Diffusion View of Comovement

The information diffusion view of comovement makes several predictions which are distinct from those of the demand-based view, in particular with respect to the level and post-inclusion changes in contemporaneous and lagged *beta* at different frequencies (see Table 6). If comovement is driven by a common response of index-included stocks to aggregate information, one would expect the contemporaneous pre-inclusion high-frequency (daily) *beta* to be relatively low, and the lagged daily *beta* (i.e., the correlation between index returns at time t and firm-specific pre-inclusion stock returns at time $t+1$) to be positive and large, but to decline substantially after the stock is added to the index. In addition, the contemporaneous daily *beta* should increase for firms with a large lagged *beta*. The information diffusion view also predicts that the low-frequency (weekly) pre-inclusion *beta* should be high relative to the high-frequency pre-inclusion *beta* (because at low frequencies, the common information is already incorporated in stock prices). Therefore, according to this view, the post-inclusion change in comovement should be more pronounced in daily measures of comovement than in weekly measures.

While we find some support for these conjectures, the overall evidence is mixed. The average pre-inclusion contemporaneous daily *beta* is not so small (0.81, see Table 2), although it is somewhat lower than the average weekly *beta* (0.91).

The second conjecture with respect to lagged *beta* is also only partially borne out – the average one-day lagged *beta* is about 0.11 and it falls to about 0.08 after inclusion (with 24 of the 40 countries in the sample experiencing a decline in lagged *beta*). For lags of two or three days, the pre-inclusion values are already very close to zero (about 0.01 on average for a two day-lagged beta) with not much change after inclusion.

The information diffusion view of comovement also predicts that changes in high-frequency *betas* following index inclusion should exceed changes in low-frequency *betas* because the information contained in the prices of index-included stocks is incorporated in the low-frequency contemporaneous *beta* of firms not previously included in the index (whereas in high-frequency data, firms outside the index respond only with a lag). Although this is the case for some countries (e.g., Australia, Brazil and Canada; see Table 3), we do not find this for the full sample (the average increase in daily and weekly *betas* is roughly equal, see Table 2). Overall, it is not clear whether countries for which the increase in the daily *beta* is higher than the increase in the weekly *beta* have any common features. In addition, it is not clear that the prediction that high-frequency *betas* should increase more than low-frequency *betas* can distinguish the information-based from the demand-based view: at sufficiently low frequencies, arbitrage across non-fundamentals-based stock prices will push *beta* closer to its fundamental value even if the demand-based view prevails. Hence one would expect the increase in low-frequency *betas* to be higher than that of high-frequency *betas* according to the demand-based view as well.[14]

As yet another test of the information diffusion view, we add one day lagged *beta* as another control variable to the basic regression specification of Table 4, column 1 (where the dependent variable is the change in contemporaneous daily *beta*). We find its

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[14] BSW write that both the demand-based and information-based views "predict that the shifts in *beta* after inclusion should become weaker at sufficiently low frequencies. Since we expect noise trader sentiment to revert eventually, and even slowly diffusing information to be incorporated eventually, lower-frequency returns, and therefore also lower frequency patterns of comovement, will be more closely tied to fundamentals" (p. 296).

coefficient to be positive and statistically significant (see Table 6; the other coefficients are unchanged and not reported) suggesting, in line with the prediction of the information diffusion view, that the increase in daily *beta* upon inclusion is larger for firms with relatively large lagged *betas*. In addition, we find the changes in contemporaneous and lagged *betas* to be negatively correlated (i.e., the lagged *beta* tends to fall when the contemporaneous *beta* increases), although the correlation is low (-0.08, see Table 6).

It is possible that other information-related theories are behind the post-inclusion increase in comovement. Morck et al. (2000) argue that in less developed financial systems, firm-specific information is scarcer, and stock prices therefore respond mainly to aggregate information and move jointly. It is possible that in markets with such high synchronicity, the added stock begins to respond, like other stocks in the index, primarily to macroeconomic news, thus increasing its comovement with the rest of the index. We therefore examine the relation between the post-inclusion increase in comovement and the market-wide stock price synchronicity measure of Morck et al. (2000) and find that high (above the sample median) stock price synchronicity is associated with a somewhat larger post-inclusion increase in daily and weekly *beta*, but not in R^2: the average increase in daily *beta* is about 0.11 for high synchronicity countries versus 0.09 for low synchronicity countries. However, this result is not very robust (e.g., when added to the benchmark regression, the measure of synchronicity is positive but not significant).

Overall, although some of the tests reported here (and summarized in Table 6) are consistent with the predictions of the information-diffusion view of comovement, the magnitudes of the effects seem small enough to suggest that this theory is unlikely to be the sole driver of post-inclusion comovement around the world.

IV. Robustness Tests and Extensions

Other Possible Determinants of Post-Inclusion Increased Comovement

Analyst Coverage

Inclusion in a major index is typically associated with an increase in analyst coverage for the added company. To the extent that analysts generate market-wide rather than firm-specific information and such information is more quickly incorporated in stock prices after inclusion, comovement (or synchronicity) may increase (Chan and Hameed, 2006, claim that this is the case in emerging markets). Data on the number of analysts covering firms in our sample (that is, those publishing earnings forecasts) is incomplete (it is available for only about half the firms). For these firms, a median of eight analysts cover a firm before inclusion compared to ten afterwards (Table 2). For those firms where the number of analysts increases with inclusion, the increase in (daily) *beta* is about 0.09 vs. 0.04 for those firms whose coverage does not increase, in line with the results of Chan and Hameed (2006).[15]

The data so far suggest that both analyst coverage and *beta* increase upon inclusion. They do not, however, tell whether increased coverage "causes" the increase in comovement. To further study this, we include analyst coverage in a regression specification similar to the previous ones, to see whether any of our results are affected. Although coverage is possibly affected by index inclusion as well, the main regression results supporting the demand-based view (i.e., the time trend, the effect of institutional investor presence, etc.) hold even when the post-inclusion change in the number of analysts covering the firm (column 1 of Table 7) or the absolute number of analysts

[15] The average change in daily *beta* in the sub-sample for which data on analyst coverage is available is 0.07, somewhat lower than in the full sample.

covering the firm are included. Since the other effects largely remain unchanged, we conclude that the increase in analyst coverage upon inclusion is not the sole reason for the increased comovement.

Changes in Liquidity

Inclusion in a major index is typically associated with increased liquidity (e.g., Hegde and McDermott, 2003). In our sample, about two thirds of the firms experience an increase in stock turnover following index inclusion. US-focused studies, especially Vijh (1994), but also BSW, attempt to distinguish between the effect of added liquidity on stock price comovement following index inclusion and added comovement due to "price pressures" by index-oriented investors. While comovement due to price pressures may imply inefficient markets (i.e., prices co-move beyond the comovement of fundamentals), increased liquidity may be welfare improving if stocks which are thinly traded before inclusion (and therefore have less informative prices) become more liquid after inclusion, and move more together with other stocks, presumably in response to aggregate news.

Detailed turnover data are difficult to obtain for our sample. For those stocks for which we have data, the increase in *beta* is much larger when turnover increases as well – an average increase in daily *beta* of about 0.13 when turnover increases, compared to a much smaller change (less than 0.01 on average) when turnover declines. To some extent, this also holds within-countries. For example, in Canada (where the sample is sufficiently large), the average increase in daily *beta* for firms with a positive increase in turnover is 0.20 vs. 0.05 for firms with no turnover increase.[16]

[16] Interestingly, institutional investors and indexing may generate comovement not only through the channels of the demand-based view but also by generating added liquidity: Kamara et al. (2008) find that

The positive correlation between changes in liquidity and changes in *beta* could, much like increased analyst coverage, mean that the increase in *beta* is due to the greater liquidity. Nevertheless, when we include in the benchmark regression the change in turnover (column 2 of Table 7) or the level of turnover (not reported), we find that all the effects (of the time trend, index concentration, institutional investor presence) remain the same. Since these results remain unchanged, we conclude that any increase in liquidity upon inclusion is not the sole reason for the observed increase in comovement.[17]

Post-inclusion Convergence of Beta to One

In addition to documenting effects driving comovement, our results point to another comovement-related phenomenon, the convergence of the added firm's *beta* to one. Specifically, for firms whose pre-inclusion *beta* is below one, the average increase in the daily *beta* is large and positive (0.18 on average) whereas for firms whose pre-inclusion daily *beta* is above one, the change in *beta* is actually negative (-0.09 on average). The results are qualitatively similar when using changes in weekly *beta* or R^2. This post-inclusion convergence of *beta* to one (and possibly of R^2 to some norm) is not addressed in the standard theories of comovement, all of which predict a post-inclusion

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institutional investors increase what they call the "liquidity *beta*" (i.e., when institutional investors are present, firm-specific liquidity tends to co-move with average liquidity). Calculating liquidity *betas* for our sample using the formulae of Kamara et al. (2008), we find that in most countries (25 out of 40), changes in firm level liquidity are more correlated with changes in index liquidity following inclusion (for the entire sample the average "liquidity *beta*" goes up from about 0.10 to about 0.20). As in other calculations, we exclude the added firm from the index to avoid a mechanical increase in *beta*. This result is, however, based on fewer observations (twelve monthly data points on liquidity before and after inclusion for each firm); and there is no similar increase in the "liquidity R^2" (which actually goes down from 0.19 to 0.16).

[17] The results remain very similar to those reported in Table 7 when using the change in weekly *beta* as the dependent variable or the change in daily or weekly R^2. Vijh (1994) divides his sample of additions to the S&P 500 into four categories according to the expected effects of changes in liquidity on changes in *beta*, with the division being based on the firm's liquidity relative to the average liquidity of firms included in the index before and after inclusion. In Claessens and Yafeh (2011) we reproduce this exercise and conclude that, while changes in liquidity seem to play a role in changes in comovement, they are not the only force.

increase in comovement regardless of its current level. One possible interpretation of the convergence of *beta* to one is that this is due to measurement errors – under plausible assumptions on the distribution of the measurement errors, firms with an "unusually" low (high) *beta* in the first measurement (before inclusion) would tend to have a higher (lower) *beta* when measured again (after inclusion). However, the increase in *beta* in our sample is statistically significant (i.e., the post-inclusion *beta* is outside the 95% confidence interval for the pre-inclusion *beta*); moreover, our regression results remain unchanged when the variance of the estimated pre- and post-inclusion *betas* are included in the regression. We conclude that measurement errors are unlikely to be the sole reason for the convergence of *beta* to one upon inclusion in an index.[18]

V. Concluding Remarks

Using a new and extensive dataset on company inclusions in stock market indices around the world, we show that the post-inclusion increase in return comovement is a global phenomenon. Thus, the findings of BSW and others on the existence of a similar phenomenon in a small number of developed markets can be generalized to a large number of countries, both developed and emerging. Moreover, this phenomenon has increased in magnitude over the last decade.

We investigate several explanations for the post-inclusion rise in comovement. Many of our findings are consistent with the predictions of BSW's demand-based view according to which increased post-inclusion comovement relates to the tendency of certain investors to invest by category/habitat. Specifically, the increase in comovement

[18] An early study by Blume (1975) proposes possible mechanical reasons for the convergence of *beta* to one over time, not necessarily in the context of inclusion in an index.

over the period and the findings that the post-index inclusion increase in comovement is more pronounced in countries where the index is more dispersed and where there is a greater presence of investors prone to index-based investment are all consistent with the demand-based view. These findings hold controlling for various country and firm characteristics.

We also find some support for the information diffusion view of comovement, although the magnitudes of the supporting effects appear to be small. In addition, although we find that post-inclusion comovement is also related to increases in post-inclusion analyst coverage and liquidity, controlling for these effects does not alter the main conclusions on the importance of factors such as the degree to which the index is concentrated or the presence of indexing-prone investors.

We conclude that the phenomenon of higher comovement following index inclusion is widespread and rising. While probably driven by a combination of factors rather than one specific theory, the support we find in the data for the demand-based view has some implications. One of them is that in many financial markets around the world there is more stock price comovement than what is warranted by fundamentals. This in turn implies that there are limited diversification opportunities for investors and possibly also too little production of stock-specific information, all of which may result in a less than perfectly efficient allocation of capital. These are, however, issues that deserve further research before drawing any firm conclusions.

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Table 1: Sample Composition

Country	Index Name	Year of 1st Inclusion	Number of Inclusions
Argentina	MERVAL	2002	20
Australia	S&P/ASX 200	2002	147
Austria	TRADED ATX	2001	14
Belgium	BEL20	2001	10
Brazil	BOVESPA	2001	38
Canada	S&P/TSX COMPOSITE	2001	200
Colombia	IGBC GENERAL	2003	32
Egypt	EGX 30	2006	13
Finland	OMX HELSINKI	2001	45
France	CAC 40	2001	14
Germany	DAX	2001	12
Greece	ATHENS COMPOSITE	2001	60
Hong Kong	HANG SENG INDEX	2001	28
Hungary	BUDAPEST STOCK EXCHANGE INDEX	2004	11
India	NSE S&P CNX NIFTY	2002	77
Ireland	IRISH OVERALL INDEX	2005	7
Israel	Tel Aviv 100	2001	103
Italy	MILAN MIB30	2003	20
Japan	NIKKEI 225	2001	50
Korea	KOSPI	2002	31
Latvia	OMX RIGA	2005	14
Malaysia	KUALA LUMPUR COMPOSITE	2001	66
Mexico	MEXICO BOLSA IPC	2002	27
Netherlands	AMSTERDAM AEX	2002	17
New Zealand	NZX 50 FF GROSS	2003	23
Norway	OSE ALL SHARE	2002	11
Pakistan	KARACHI 100	2006	38
Peru	PERU LIMA GENERAL	2003	38
Philippines	PSEi - PHILIPPINE SE	2005	17
Poland	WSE WIG	2002	157
Portugal	PSI GENERAL	2002	53
Russia	RUSSIAN RTS $	2002	42
S. Africa	FTSE/JSE AFRICA ALL SHR	2002	86
Spain	SPAIN MA MADRID	2002	37
Sweden	OMX STOCKHOLM	2002	34
Taiwan	TAIWAN TAIEX	2002	185
Thailand	THAI INDEX	2002	43
Turkey	ISE NATIONAL 100	2004	56
UK	FTSE100	2001	41
USA	S&P 500	2002	190

Table 2: Variable Definitions and Sample Statistics

Panel A: Firm-specific Variables

Variable	Definition/Source	Mean	Std	25%	Median	75%	Obs
Pre-inclusion daily β	*Beta* calculated using daily data for the 12 months ending 30 days prior to the inclusion date/Bloomberg	0.81	0.42	0.53	0.78	1.05	2107
Post-inclusion daily β	*Beta* calculated using daily data for the 12 months starting 30 days after the inclusion date/Bloomberg	0.91	0.42	0.65	0.87	1.11	2107
Pre-inclusion weekly β	*Beta* calculated using weekly data for the 52 weeks ending 30 days prior to the inclusion date/Bloomberg	0.92	0.56	0.58	0.86	1.21	2080
Post-inclusion weekly β	*Beta* calculated using weekly data for the 52 weeks starting 30 days after the inclusion date/Bloomberg	1.00	0.50	0.68	0.94	1.28	2080
Pre-inclusion daily R^2	R^2 from the regression in which pre-inclusion *beta* is estimated using daily data/Bloomberg	0.20	0.16	0.07	0.17	0.30	2107
Post-inclusion daily R^2	R^2 from the regression in which post-inclusion *beta* is estimated using daily data/ Bloomberg	0.27	0.18	0.13	0.24	0.38	2107
Pre-inclusion weekly R^2	R^2 from the regression in which pre-inclusion *beta* is estimated using weekly data/Bloomberg	0.25	0.18	0.10	0.22	0.37	2080
Post-inclusion weekly R^2	R^2 from the regression in which post-inclusion *beta* is estimated using daily data/Bloomberg	0.32	0.19	0.17	0.31	0.45	2080
Turnover_ Pre	Number of shares traded divided by the number of shares outstanding in the year before inclusion/Bloomberg	1.00	2.07	0.13	0.41	1.05	1825
Turnover_ Post	Number of shares traded divided by the number of shares outstanding in the year after inclusion/Bloomberg	1.24	2.37	0.25	0.63	1.44	1670
Analyst_pre	Number of analysts covering the firm in the year before inclusion/IBES	11.5	11.1	3	8	17	1128
Analyst_post	Number of analysts covering the firm in the year after inclusion/IBES	12.9	11.9	4	10	19	1297
Total Assets	Total firm assets in billion US dollars, FY before inclusion/Datastream	7.395	53.184	0.05	0.267	1.802	2128
Leverage	Liabilities to assets, FY before inclusion/ Datastream	0.21	0.21	0.01	0.18	0.33	2128

Panel B: Country Characteristics

Variable	Definition/ Source	Mean	Std	25%	Median	75%	Observations/ (No. of countries)
Index concentration	Weight of the largest five firms in the index	0.397	0.18	0.23	0.39	0.55	2142 (40)
Legal Origin	Dummy for common law countries/Djankov et al. (2007)	0.50	0.50	0	1	1	2142 (40)
GDP per capita in 2003	Thousand US $/Djankov et al. (2007)	15.66	11.84	3.78	13.72	23.93	2142 (40)
Market capitalization to GDP in 2003	Djankov et al. (2007)	0.85	0.56	0.38	0.91	10.6	2142 (40)
Equity mutual funds	Fraction of all mutual fund assets invested in equity in 2006/Data collected at the World Bank from various sources	0.45	0.19	0.28	0.53	0.56	1259 (21)
Life insurance equity	Percent of all life insurance assets invested in equity in 2006/ Data collected at the World Bank from various sources	0.22	0.17	0.11	0.18	0.37	1276 (23)
Pension fund equity	Percent of all pension fund assets invested in equity in 2006/ Data collected at the World Bank from various sources	0.49	0.25	0.33	0.52	0.68	1329 (25)
Direct Individual Shareholding	Percent of the population holding shares directly in 2005-2006/ Grout et al. (2008)	0.16	0.14	0.03	0.08	0.28	1852 (34)
Comovement	Country-specific R-squared (synchronicity of stock prices) / Morck et al. (2000)	0.21	0.16	0.06	0.18	0.29	1888 (34)

Table 3: Index Inclusion Effects – Univariate Regressions

The table summarizes the average post index inclusion change in β, R^2, turnover and analyst coverage by country. For changes in β and R^2, estimates are from firm-specific regressions using daily data for the 12-month period before and after inclusion in the index, excluding the 30 days immediately prior and immediately after the inclusion date. Weekly data are similarly calculated using the 52 week period preceding inclusion and the 52 week period after inclusion. The estimated equation is:

$$R_{jt} = \alpha_j + \beta_j \text{Country\_Index}_t + v_{jt}$$

where j denotes firms and t denotes time. The country-specific indices and number of observations are described in Table 1. The table also presents the change in turnover, defined as number of shares traded divided by total number of shares outstanding in the year before inclusion and the year after inclusion, and the change in analyst coverage, defined as the change in the absolute number of analysts per firm in the year before and the year after inclusion. Statistical significance of a one-sided test of a positive change at the 1, 5 and 10 percent levels are denoted by ***, **, and *, respectively.

	(1) Average change in daily β	(2) Average change in weekly β	(3) Average change in daily R^2	(4) Average change in weekly R^2	(5) Average change in turnover	(6) Average change in analyst coverage
Argentina	0.08	0.21***	0.12***	0.19***	0.26***	1
Australia	0.15***	0.10**	0.09***	0.05***	0.40***	4.5***
Austria	0.16	0.23	0.08*	0.11*	0.36**	2**
Belgium	0.05	-0.09	0.03	0.06*	0.17***	1.5
Brazil	0.12***	0.08**	0.16***	0.16***	0.61***	4.2**
Canada	0.15***	0.08**	0.07***	0.11***	0.36***	2.8***
Colombia	0.17***	0.06	0.12***	0.01	0.10**	0
Egypt	-0.04	-0.06	0.10***	0.12**	1.3**	-0.7
Finland	-0.02	-0.06	-0.01	-0.04	0.14**	2.3***
France	0.08	0.04	0.05**	0.05	0.73	-1.8
Germany	0.02	0.16*	0.06**	0.09*	-0.00	5.7
Greece	-0.01	0.04	0.02	0.05*	-0.06	3.9***
HK	0.09*	-0.08	0.17***	0.11***	0.45***	0.7
Hungary	0.02	-0.04	0.05*	-0.02	0.45	-2.2
India	-0.05	-0.07	-0.07	-0.02	-0.22	5.3***
Ireland	-0.23	-0.30	-0.01	-0.02	-0.14	3
Israel	0.11***	0.02	0.04**	0.03**	0.99	N/A
Italy	0.10*	-0.13	0.13***	0.01	1.21***	-0.7
Japan	0.12***	0.10**	0.11***	0.11***	0.21**	2
Korea	0.06*	0.10*	0.05*	0.08**	-0.81	2.8
Latvia	-0.13	0.15	-0.03	0.13***	N/A	N/A
Malaysia	0.06	-0.01	0.06***	0.07***	0.12**	1.7
Mexico	0.09**	0.10*	0.09***	0.14***	-1.05	2.9**
Netherlands	0.13*	0.22**	0.11***	0.17***	0.57***	1.5

	(1) Average change in daily β	(2) Average change in weekly β	(3) Average change in daily R^2	(4) Average change in weekly R^2	(5) Average change in turnover	(6) Average change in analyst coverage
New Zealand	0.01	0.06	0.07**	0.05*	0.01	2.1**
Norway	-0.01	-0.06	0.06	0.02	0.93*	-1.1
Pakistan	0.16**	0.33***	0.05***	0.11***	-0.02	10.25**
Peru	0.16**	0.09	0.11***	0.15***	0.16	1.5*
Philippines	0.04	0.12	0.05*	0.10*	0.19***	0.6
Poland	0.27***	0.26***	0.11***	0.06***	-0.58	N/A
Portugal	-0.18	-0.07	-0.06	-0.01	-0.13	-0.3
S. Africa	0.02	0.04	0.05***	0.05***	0.23**	-1.5
Spain	0.27***	0.31***	0.06***	0.07***	0.84***	3.5
Sweden	0.08*	-0.04	0.09***	0.02	0.17	0
Taiwan	0.07***	0.13***	0.01	0.04***	0.77***	2.9**
Thailand	0.34***	0.23*	0.05***	0.09***	-0.23	-2.6
Turkey	0.04**	-0.01	0.07***	0.08***	1.45***	3.2***
UK	0.11**	-0.07	0.15***	0.07**	0.25*	1.9
US	0.10***	0.04	0.11***	0.09***	1.24***	-0.5

Table 4: Index Inclusion Effects – Benchmark Multivariate Regressions

The dependent variables are the change in firm-specific *beta* or the change in R^2 (daily or weekly). Explanatory variables include pre-inclusion *beta* (daily or weekly), a time trend, per capita GDP (2003), the ratio of market capitalization to GDP (2003), index concentration (weight of the largest five firms in the index), firm-specific leverage (debt to asset) and total assets (see Table 2 for variable definitions). Regressions are OLS with standard errors clustered by country in parentheses. ***, ** and * denote coefficients significant at the 1, 5 and 10 percent, respectively. The coefficient on per capita GDP is multiplied by 1000; the coefficient on total assets is multiplied by 1,000,000.

	(1) **Absolute change in daily *β***	(2) **Absolute change in weekly *β***	(3) **Absolute change in daily R^2**	(4) **Absolute change in weekly R^2**
Index concentration	-0.25*** (0.11)	-0.29** (0.13)	0.04 (0.05)	-0.06 (0.06)
Time trend	0.021*** (0.005)	0.017*** (0.006)	0.018*** (0.003)	0.015*** (0.003)
Per capita GDP (2003)	1.81 (1.51)	1.00 (1.89)	1.67** (0.70)	0.49 (0.69)
Market Cap / GDP (2003)	-0.04 (0.05)	-0.05 (0.05)	0.01 (0.02)	-0.00 (0.02)
Pre-inclusion *beta*	-0.48*** (0.03)	-0.61*** (0.03)	-0.06*** (0.02)	-0.08*** (0.02)
Firm leverage (year before inclusion)	-0.06 (0.07)	-0.08 (0.09)	-0.02 (0.02)	0.00 (0.02)
Firm total assets (year before inclusion)	0.298** (0.119)	0.143 (0.200)	0.150 (0.110)	0.143 (0.88)
Observations	2,093	2,066	2,093	2,066
R-squared	0.27	0.36	0.11	0.08

Table 5: Post Inclusion Change in Firm-specific Daily *Beta* and the Presence of (Index-Prone) Institutional and Individual Investors

The dependent variable is the change in firm-specific daily *beta*. The explanatory variables are the same as in Table 4, supplemented by measures of presence of institutional investors – the fraction of all assets held by mutual funds, pension funds and insurance companies invested in equity (from the World Bank, 2008), and a measure of stock market participation by individual investors (as a fraction of market capitalization) drawn from Grout et al. (2009). Regressions are OLS with standard errors clustered by country in parentheses. ***, ** and * denote coefficients significant at the 1, 5 and 10 percent, respectively. The coefficient on per capita GDP is multiplied by 1000; the coefficient on total assets is multiplied by 1,000,000.

	(1)	(2)	(3)	(4)
Index concentration	-0.60*** (0.10)	-0.48*** (0.16)	-0.38*** (0.12)	-0.17* (0.09)
Time trend	0.017** (0.006)	0.017** (0.007)	0.022*** (0.008)	0.019*** (0.06)
Per capita GDP (2003)	-3.42*** (1.11)	0.11 (2.10)	-4.28** (1.63)	0.44 (1.15)
Market Cap / GDP (2003)	-0.15*** (0.03)	-0.10 (0.06)	-0.01 (0.04)	-0.02 (0.04)
Pre-inclusion β	-0.46*** (0.04)	-0.44*** (0.03)	-0.48*** (0.04)	-0.49*** (0.03)
Firm leverage (year before inclusion)	-0.09 (0.10)	-0.13 (0.10)	-0.12 (0.010)	-0.07 (0.08)
Firm total assets (year before inclusion)	0.179 (0.138)	0.282 (0.167)	0.287* (0.148)	0.269** (0.102)
Equity mutual funds	0.34*** (0.12)			
Insurance fund equity		0.17 (0.10)		
Pension fund equity			0.20*** (0.006)	
Direct Individual Shareholding				0.33*** (0.09)
Observations	1275	1282	1344	1852
R^2	0.27	0.23	0.25	0.27

Table 6: Summary of Tests of the Information-Diffusion View of Comovement

Prediction	Results	Consistent with the theory?
Contemporaneous pre-inclusion low frequency *beta* > contemporaneous pre-inclusion high frequency *beta*	The sample averages are 0.92 for the pre-inclusion weekly *beta* and 0.81 for pre-inclusion daily *beta*. The difference is statistically significant	Yes
Lagged pre-inclusion high-frequency *beta* should be positive and high	The sample average for pre-inclusion one-day lagged *beta* is 0.11	Yes, but the magnitude is small?
Lagged pre-inclusion high-frequency *beta* should decline after inclusion	The sample average for post-inclusion one-day lagged *beta* is 0.08, a decline of about 0.03	Yes, but the magnitude is small?
Post-inclusion increase in high-frequency *beta* > Post-inclusion increase in low-frequency *beta*	The sample average for the increase in daily *beta* is 0.10 vs. 0.08 for weekly *beta*. The difference is not statistically significant	No
The coefficient on lagged *beta* when added to the benchmark regression (Table 4, column 1) should be positive (i.e., upon inclusion, the *beta* of firms with a large lagged *beta* increases by more)	The coefficient on one day-lagged *beta* is 0.22 (std error, 0.06), positive and statistically significant as predicted	Yes, but the magnitude is small?
Changes in contemporaneous and lagged *betas* should be negatively correlated	The correlation coefficient between changes in contemporaneous and one day-lagged *betas* is -0.08	Yes, but the magnitude is small?

Table 7: Post Inclusion Change in Firm-specific Daily *Beta*, Analyst Coverage and Changes in Liquidity

The dependent variable is the change in firm-specific daily *beta*. Explanatory variables are the variables included in Table 4, and in addition, a measure of presence of pension funds in equity markets (from Table 5), the change in the log of the number of analysts covering the firm after inclusion (column 1) and the change in stock turnover after inclusion (column 2). Regressions are OLS with standard errors clustered by country in parentheses. ***, ** and * denote coefficients significant at the 1, 5 and 10 percent, respectively. The coefficient on per capita GDP is multiplied by 1000; the coefficient on total assets is multiplied by 1,000,000.

	(1)	(2)
Index concentration	-0.36***	-0.41***
	(0.11)	(0.12)
Time trend	0.019***	0.031***
	(0.007)	(0.011)
Per capita GDP (2003)	-1.78	-4.54***
	(1.68)	(1.57)
Market Cap / GDP (2003)	0.01	-0.01
	(0.03)	(0.04)
Pre-inclusion β	-0.46***	-0.50***
	(0.03)	(0.03)
Firm leverage (year before inclusion)	-0.11	-0.18
	(0.19)	(0.13)
Firm total assets (year before inclusion)	0.413	0.319
	(0.272)	(0.260)
Pension fund equity	0.16**	0.25***
	(0.06)	(0.06)
Change in log(number of analysts covering the firm)	0.05**	
	(0.02)	
Change in Turnover		0.021***
		(0.007)
Observations	746	1009
R^2	0.28	0.27