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STOCK RETURN COMOVEMENT WHEN INVESTORS ARE DISTRACTED: MORE, AND MORE HOMOGENEOUS

Abstract

This paper tests whether fluctuations in investors' attention affect stock return comovement with national and global markets, and which stocks are most affected. We measure fluctuations in investor attention using 59 high-profile soccer matches played during stock market trading hours at the three editions of the FIFA World Cup between 2010 and 2018. Using intraday data for more than 750 firms in 19 countries, we find that distracted investors shift attention away from firm-specific and from global news. When movements in global stock markets are large, the pricing of global news reverts back to normal, but firm-specific news keep being priced less, leading to increased comovement of stock returns with the national stock market. This increase is economically large, and particularly strong for those stocks that typically comove little with the national market, thereby leading to a convergence in betas across stocks.

JEL Classification: G12, G15, G41

Keywords: investor attention, Stock returns, comovement

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1. Introduction

Starting with Roll (1988), the literature on stock return comovement has focused on the explanatory value of fundamentals, in particular that of firm-specific, industry-specific, or market-wide factors. A consistent finding in this literature has been that economic fundamentals cannot fully explain observed comovement patterns, as comovement is typically larger than warranted by fundamentals (Pindyck and Rotemberg, 1993; Vijh, 1994; Barberis et al., 2005; Greenwood, 2008). One explanation for the excess comovement that is not related to economic fundamentals has been fluctuations in investors' attention.[1]

Several theoretical models show that investor inattention tends to increase return comovements across individual stocks. For instance, Veldkamp (2006) models a situation of costly information, where investors only buy information about a subset of assets. Because of the fixed costs of information production, information that is demanded less will be sold at higher prices than information that is in high demand. This, in turn, makes investors want to purchase the low-cost information, i.e. the same information that others are purchasing. When investors price assets using a common subset of information, news about one asset affects the other assets' prices, leading asset prices to comove. In a similar vein, Mondria (2010) models investors who are subject to an information flow constraint, and prefer to observe a private signal about a linear combination of asset payoffs rather than obtaining information about each asset payoff. Such signals will trigger asset price comovement, as updates in information about different assets, and thus the changes in their prices, will be correlated. Peng and Xiong (2006) employ a third modeling strategy by assuming that investors are less attentive to information that is relatively less salient. Accordingly, these investors are more inclined to process market and sector-wide rather than firm-specific information, leading to increasing comovement.

These three hypotheses have found empirical support: In the presence of reduced investor attention, individual stock returns comove more with the returns on the national market. Huang, Huang, and Lin (2019) show this for large jackpots in Taiwanese nationwide lotteries, Schmidt (2013) using Google searches on sports, and Peng, Xiong and Bollerslev (2007) in response to the arrival of market-wide macroeconomic shocks.[2]

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[1] This work on investor attention builds on earlier insights from psychology, such as Kahneman (1973). Empirical work in this field includes Barber and Odean (2008), Hirshleifer, Lim, and Teoh (2009), DellaVigna and Pollet (2009), and Peress and Schmidt (2020).

[2] Inattention to economic fundamentals has also been shown using a different identification strategy, namely via the names of companies. Cooper et al. (2001) show that firms which changed to a dot.com name during the dot.com bubble earned abnormal returns, even in the absence of changes in their business strategies. Similarly,

Our paper adds to the literature on stock return comovement by providing high-frequency evidence on how distracted investors re-allocate attention. Our contribution to the literature is threefold. First, we use a different identification scheme to study variations in investor attention. Second, we broaden the analysis to comovement with the global stock market (whereas the existing literature has focused on comovement with the national stock market). Third, we provide a disaggregated analysis as to which stocks are more prone to see their comovement patterns change if investor attention fluctuates.

Our identification rests on two ideas. First, we study market dynamics during high-profile sporting events, as prior evidence indicates that investors are strongly distracted by these types of events. For instance, Schmidt (2013) finds that trading weakens when Google search activity for sports terms on Google intensifies. In addition, Drake, Gee, and Thornock (2016) find that the price reaction to earnings news is muted during the NCAA basketball tournament. As in Ehrmann and Jansen (2017), we will focus on soccer matches during the FIFA World Cup. Given the evidence that trading activity can strongly decline during FIFA World Cup matches, these events provide us with a plausible and strong measure of variations to investor attention. We use national team soccer matches that were played during three recent editions of the FIFA World Cup. These are the 2010 tournament in South Africa, the 2014 tournament in Brazil, and the 2018 tournament in Russia. Our data set, based on Bloomberg, has minute-by-minute information on stock prices and traded volumes.

Second, our identification distinguishes between regular and salient movements in global stock markets during these soccer matches. The reasoning is as follows. Even if trading activity is lower and return comovement is different during matches, this could be driven by a reduction in news flow. If firms' press officers and journalists were also distracted by soccer matches, this would result in less firm-specific news being generated during matches, which in turn would lead to reduced trading and changing comovement patterns (less idiosyncratic news would imply higher comovement).[3] In our regressions, we will therefore condition on movements in global stock markets, which should not be driven by firm-specific news flow during national soccer matches. We argue that when global stock markets move a lot, this will be salient information to market participants, even during distracting soccer matches. This conditioning variable does therefore allow us to study different scenarios. The first

Bae and Wang (2012) provide evidence that US-listed Chinese firms with the word "China" in their company names significantly outperformed other US-listed Chinese firms during the 2007 China stock market boom, independent of firm characteristics, risk, or liquidity.

[3] Ideally, we would like to capture directly whether or not news flow is also lower during matches. However, such news flow data is not readily available at minute-by-minute frequency.

scenario is one when matches are on and movements in global stock returns remain muted. In this situation, we expect that investors are inattentive to global stock markets, leading them to price global news less, thus triggering a reduced comovement between national and global stock returns compared to normal times. The second scenario is one where a match is being played and global markets move a lot, implying that investors pay attention to global news, but presumably still are distracted and therefore do not price firm-specific news as they would in regular times. Comovement with the global market would therefore likely return to normal levels, but comovement with the national market should increase.

This paper first provides empirical evidence that inattention impacts stock return comovements. We find that during matches of the national team – a point in time at which national investors are disproportionately distracted – the prices of individual stocks comove more with the national stock market, in particular when there are large movements in global stock returns. This finding, which is in line with the earlier evidence, supports the notion of Peng and Xiong (2006) that markets keep pricing national news, but divert their attention away from asset-specific information. In addition, we find that stock prices comove *less* with the global market when movements in global stock returns remain muted, suggesting that investors also divert their attention away from information on other economies. These patterns are in line with the idea of costly information acquisition, given that developments in other economies are more difficult to monitor than news "at home", not only because they comprise more economies and therefore require processing of more individual news items, but also because news about the home economy might be easier to understand for an investor than news about other economies. However, once movements in global stock returns are salient, comovement with the global market returns back to normal. Therefore, we conclude that the salience of information is a major factor that determines the attention-allocation of distracted investors.

In a set of additional analyses, we disaggregate our analysis into different types of stocks, for instance by firm size or by sector. Earlier evidence has shown that return comovement is particularly large for stocks with a high concentration of retail investors (Kumar and Lee, 2006), which can be rationalized on the one hand because trading activities of retail investors are correlated (Barber, Odean and Zhu, 2009), and on the other hand because retail investor attention itself comoves (Drake et al., 2017). If we assume that retail investors are particularly distracted by World Cup soccer matches, this should lead to less return comovement among the stocks with a high concentration of retail investors (such as small stocks), even though for the market as a whole, there could still be more comovement.

This would imply that soccer matches and the ensuing investor distraction trigger a convergence of comovements across different stock types. This is indeed what we find: while there is overall more comovement with the national market, this effect is particularly strong for those stocks that have previously comoved less with the national market.

2. Research Design and Data

The first key element of our research design is to use major sporting events to measure fluctuations in investor attention. Using sports for identification is now a common approach in the behavioral finance literature. For instance, Edmans et al. (2007) use international soccer results as a proxy for investor mood. They find that losing an elimination match leads to a next-day abnormal return of -49 basis points. In addition, Ehrmann and Jansen (2016) show that these loss effects can already materialize during soccer matches, once elimination from the World Cup tournament becomes increasingly likely. Using FIFA World Cup matches also seems a natural way of measuring shifts in attention, as these matches usually draw a large worldwide audience. Estimates indicate that, in 2010, more than 600 million viewers watched the final between Spain and the Netherlands on television. For the 2018 tournament in Russia, FIFA estimates that more than half the world population watched matches, either on TV or out of home.[4] Interest in the World Cup is no longer restricted to the traditionally soccer-oriented nations in Europe and Latin America. In 2010, China had the highest audience reach in the world, and the final in 2014 turned out to be the most watched soccer game in U.S. history.[5] There is already evidence that World Cup matches are distracting to financial market participants. For the 2010 and 2014 tournaments, Ehrmann and Jansen (2017) find that traded volumes on the local stock exchange declined by up to 48% when a national team was playing a match. In this paper, we study market dynamics during soccer matches at the three recent editions of the FIFA World Cup, i.e. those in 2010, 2014, and (in addition to Ehrmann and Jansen (2017)) also the one in 2018. The pattern identified for the 2010 and 2014 editions is also evident in 2018: traded volumes declined by 30%, which is in line with a reduction of 31% in the full sample.

The second distinctive element of the research design is that we rely on intraday data for a large set of listed firms. We study how stocks that are traded in a given country behave during matches played by the respective national team, as these are the matches that attract

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[4] Sources: the 2010 FIFA World Cup *South Africa Television Audience Report* and https://www.fifa.com/worldcup/news/more-than-half-the-world-watched-record-breaking-2018-world-cup
[5] Source: http://www.huffingtonpost.com/2014/07/14/world-cup-final-viewers-record_n_5585861.html

the most attention and lead to the largest fall in trading activity (Ehrmann and Jansen, 2017). We use stock returns on a minute-by-minute basis for all individual stocks constituting a country's major market index, with a total of 757 individual stocks traded in 19 countries in Africa, the Americas and Europe. The data source for the stock returns is Bloomberg. Table 1 gives an overview of the events covered in our sample, i.e. those soccer matches in which a country's national team participates and that are played during stock market trading hours in that country. For the 2010 tournament, we can include a total of 29 own matches, while for 2014 and 2018 we include, respectively, 7 and 23 matches. In terms of continents, we include 28 matches for Latin American countries, 29 for European countries, and 2 for the African continent.

< Table 1 around here >

We want to test the hypothesis that when market participants are distracted, the comovement patterns between the returns of individual stocks and the market change. One possibility is to estimate a factor model and study whether return comovement change. Ehrmann and Jansen (2017) use such an approach at the level of index return and find first indications that local returns decouple from global markets during distracting matches. However, in this setup, changing comovements could be driven by at least two potential factors. On the one hand, market participants might be distracted and process information differently, e.g. by neglecting stock-specific information. This would increase comovement with the national market. On the other hand, there could be less news about individual companies in this country, for instance because local journalists and the press officers of the listed companies might be equally distracted by the soccer matches, leading them to skip, postpone or anticipate the release of news or the reporting thereof. In this case, there would be less stock-specific information to price, and therefore increased comovement of individual stocks with the national market. Both factors do therefore lead to observationally equivalent results.

In order to cleanly identify effects that result from the distraction of market participants, we would therefore want to condition on a constant news arrival, and compare comovement during and outside the matches. We do so by distinguishing between regular and salient movements in global stock markets, which is the third distinctive element in our research design. We assume that movements in global stock markets present news that are typically not driven by news about an individual stock (and, in the limit, not even by news about an individual country).[6] When global stock markets move a lot, this represents news which market participants will have to price for the stocks that they trade. We will call such large movements “salient”, as they will likely not go unnoticed even when market participants are distracted. Focusing on salient movements in global stock markets does therefore allow us to study their effects on local stock markets during and outside soccer matches, thereby varying the degree of attention. In addition, we can also test how stock returns behave when global stock markets are relatively calm (what we label “regular” returns in global stock markets), during and outside the soccer matches. In our baseline estimates, we define regular returns as those between the 20th and 80th percentile (calculated separately for each World Cup edition), while salient returns are those outside that range.

Our analysis of stock return comovement then proceeds as follows.

We start by estimating a baseline international factor model with a global and a national pricing factor, where we closely follow recent empirical work on comovement (e.g. Bekaert et al., 2014). These global and national pricing factors are returns on value-weighted market indexes, such that this factor model potentially embeds two CAPMs. When the coefficients on global returns are zero, the model reverts to a domestic CAPM; when the coefficients for national returns are zero, the model becomes a world CAPM.[7]

The model specification is as follows:

$$R_{i,t} = \mu_{i,0} + \beta_0' F_t + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ denotes excess returns for the stock of firm i in a given minute t. These excess returns are computed by subtracting the 3-month U.S. T-bill rate (adjusted to the minute-by-minute frequency) from the actual returns. Furthermore, $F_t' = [R_t^w, R_t^n]$ is a vector of the two observable pricing factors and $\mu_{i,0}$ is a stock-specific fixed effect. The vectors D_t and H_t capture day-of-the-week and hour-of-the-day effects.[8] As in Bekaert et al. (2009) and Bekaert et al. (2014), we orthogonalize the pricing factors, as this allows interpreting the estimated factor loadings in an intuitive manner. Therefore, the national pricing factor is the residual from a regression of national returns on global returns over the full sample period, i.e. also

[6] This assumption might not be realistic for large countries such as the United States. We do therefore subject our results to a robustness test where we drop all U.S. observations.
[7] For notational ease, we omit an *i*-subscript on the national stock index. Strictly speaking, this subscript would be required, as we calculate the excess return on the national stock index separately for each stock while excluding the respective stock’s return from that index in order to avoid spurious correlations.
[8] All estimations in this paper use the Stata reghdfe routine by Correa (2017), which allows for multiple levels of fixed effects.

including the various soccer matches. We do so separately for each stock. The sample period is 11 June to 07 July 2010, 12 June to 09 July 2014, and 14 June to 11 July 2018. We only use those times of day when matches were being played, yielding around 2 million observations for stock returns. Following Ehrmann and Jansen (2017), we cluster standard errors at the level of the individual soccer matches in the sample.

In a second step, we introduce the conditioning on the nature of global stock returns. We extend the model in equation (1) to:

$$R_{i,t} = \mu_{i,0} + \beta_t' F_t + \alpha Salient_t + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \quad (2)$$

$$\beta_t' = \beta_0 + \beta_1 Salient_t \quad (3)$$

where *Salient* denotes a binary dummy that captures periods with large movements in global stock market returns, i.e. those returns below the 20th and above the 80th percentile. This specification allows us to study whether comovement of individual stock returns with global and national markets depends on the nature of global stock market developments. If the salience of global returns is relevant for return comovement, the $\beta_1$coefficients would differ significantly from zero. For instance, comovement between a given stock and the global stock market could be smaller than otherwise if there are large shocks to the global economy, and it takes investors some time to understand how these news affect the individual stock. Also, comovement between individual stocks and the national market could be larger than otherwise if large shocks to the global economy lead markets to focus more on country-specific characteristics (which is what Bekaert et al. (2014) call domestic contagion).

In a third step, we introduce the idea that FIFA World Cup soccer matches will be distracting to investors. We further extend the factor model by introducing additional interactions terms. The model specification is:

$$R_{i,t} = \mu_{i,0} + \beta_t' F_t + \alpha Salient_t + \delta_t Match_{i,t} + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \quad (4)$$

$$\beta_t' = \beta_0 + \beta_1 Salient_t + \gamma_t Match_{i,t} \quad (5)$$

$$\gamma_t = \gamma_0 + \gamma_1 Salient_t \quad (6)$$

$$\delta_t = \delta_0 + \delta_1 Salient_t \quad (7)$$

where *Match* is a binary dummy equal to one during those periods when the national team played a soccer match. Based on this version of the factor model, we can address the main research question using the estimates for the γ coefficients. If distraction from soccer affects comovement as long as global stock returns are regular, we would expect significant coefficients for γ_0. A positive coefficient would denote stronger comovements, while a negative coefficient would denote a decoupling from either global or national markets. If the salience of global returns is relevant, we would additionally expect significant estimates for the γ_1 coefficients. These are the key parameters of interest, as they allow testing whether news flow from global stock markets is priced differently during times of distraction.

Our hypotheses are as follows: when market participants are distracted, they will focus more on national news and less on firm-specific, or even international news, as these are relatively less salient. Accordingly, we would expect γ_0<0 for the global pricing factor, and $\gamma_0 > 0$ for the national pricing factor. However, when global stock markets move by large amounts, this makes global news salient, and we would expect that some of the attention shifts back to pricing global news. This leads us to the hypothesis that $\gamma_1 > 0$ for the global pricing factor (we would assume that $|\gamma_1| \leq |\gamma_0|$, i.e. that the effect of soccer matches is muted or eliminated, but that markets at most return to normal). At the same time, given limited attention, markets are less likely to price firm-specific news in such circumstances, leading us to expect that $\gamma_1 > 0$ also for the national pricing factor.

After these baseline analyses, we turn to a range of additional tests and robustness checks. For instance, we consider alternative definitions of salience, we consider a model with only a national pricing factor, and we present results that take the persistence of salient returns into account. For presentational reasons, we revert back to a simplified version of the factor model by estimating separate models for times with regular and salient global returns. This means we no longer have an explicit three-way interaction in the model, which makes the interpretation of the results more straightforward. Therefore, we use models that take the following form:

$$R_{i,t} = \mu_{i,0} + \beta_t' F_{t-j} + \delta_0 Match_{i,t} + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \quad (8)$$

$$\beta_t' = \beta_0 + \gamma_0 Match_{i,t} \quad (9)$$

Having these simplified versions is especially helpful, because as a last step in the analysis, we also take stock types into account, which already brings us back to three-way interactions. The models in this case are as follows:

$$R_{i,t} = \mu_{i,0} + \beta'_{i,t} F_{t-j} + \delta_i Match_{i,t} + \boldsymbol{\omega}'_D \boldsymbol{D}_t + \boldsymbol{\omega}'_H \boldsymbol{H}_t + \varepsilon_{i,t} \quad (10)$$

$$\beta'_{i,t} = \beta_0 + \beta_1 S_i + \gamma_i Match_{i,t} \quad (11)$$

$$\gamma_i = \gamma_0 + \gamma_1 S_i \quad (12)$$

$$\delta_i = \delta_0 + \delta_1 S_i \quad (13)$$

where S denotes the various stock characteristics. In terms of stock characteristics, we will inter alia differentiate between high and low beta stocks and also look at effects of firm size.

Before we report the results, it is important to discuss what the normal comovement (i.e. β_0) captures. As noted, we only include stocks from countries that participated in the respective editions of the World Cup. Also, the sample only comprises times when some soccer matches were being played during stock market trading hours, by the own national team or by other teams. Our benchmark for comparison is therefore how the comovement of stock returns in a given country changes when that country's team is playing a match as opposed to when other countries' teams are playing a match.

Comparing matches of the national team to other matches and only studying participant countries provides us with the cleanest comparison. Interest in the World Cup is likely to be systematically lower in non-participant than in participant countries, such that we prefer to keep the comparison clean by not including non-participants.[9] Also, we cannot exclude that global stock markets behave differently during the World Cup, such that a different comovement of national stock returns with global stock returns could come about because of a change in global stock returns (which is a factor that we would not want to capture here), or because of a change in stock returns in the respective country (which is what we want to isolate). Accordingly, it is important to restrict the comparison to the time of the World Cup. Still, we will provide a robustness test where we compare return comovement in a given country when its team is playing a match with the comovement outside the times of the World Cup.

3. Comovement Patterns When Market Participants are Distracted

Table 2 presents estimation results for the first three versions of the factor model. Column 1 focuses on the baseline CAPM version containing the global and the national pricing factor.

[9] In fact, Ehrmann and Jansen (2017) find no significant effects on trading activity in three non-participating countries (Canada, Peru, and New Zealand) during matches at the 2014 World Cup.

Column 2 adds the dummy that captures salient returns of the global pricing factor, while column 3 also incorporates information on the timing of national team soccer matches. The table reports a range of coefficients measuring (changes in) comovements. The β_0 coefficients measure normal comovements, i.e. those occurring during World Cup matches in which the national team is *not* participating. The β_1 coefficients measure changes in these comovements during salient movements in global markets. The γ_0 coefficients measure changes in comovements during distracting soccer matches, while the γ_1 coefficients measure changes in comovements when salient movements in global markets occur during national team soccer matches.

< Table 2 around here >

Starting with the basic version of the international factor model, we find evidence that both global and national markets are relevant pricing factors for the 757 firms in the sample. We estimate the coefficient for the global factor to be 0.57 and that for the national factor to be 0.27. Both these coefficients are significantly different from zero at the 1% level (Table 2, column 1). When we separate out global movements outside the 20th and 80th percentile, we find that conditioning on the salience of global returns is already important (column 2). For comovements with the global market, the coefficient is significantly lower (by 0.07) when global returns are salient. In contrast, the comovement with the national market is significantly higher (by 0.08) in those cases with salient global returns. While these results are not at the core of this paper, they indicate that large movements in global stock returns are priced differently than more regular movements. The decreased comovement with the global pricing factor can for instance be explained if it takes markets longer to assess the pricing implications of large shocks for individual stocks. The increased comovement with the national market is in line with the findings of “domestic contagion” in Bekaert et al. (2014), whereby markets price national factors more strongly in response to large global shocks, leading to an increased comovement of stocks with the national pricing factor.

Turning to the distractions generated by World Cup matches (column 3), we find evidence that events on the soccer pitch have an impact on stock return comovements. To begin with, our first key finding is that local stock returns decouple from global price formation during national team matches when global stock markets developments are regular, as is indicated by the γ_0 coefficient of -0.15 for the global factor. This negative coefficient, which is statistically significant at the 5% level, is in line with Ehrmann and Jansen (2017) and suggests that the inattention due to the national team's soccer match implies that global news gets priced less, i.e. local stock prices are less responsive to global price formation. It should be noted that we would expect the opposite if during matches there was less news about domestic stocks, for instance because press officers and national journalists were also distracted by the soccer match. In that case, we would expect stock returns to be less idiosyncratic, and hence to comove more with national and global stock markets. For the national factor, we do indeed estimate an increase in comovement during national team matches, but this is small and statistically insignificant. However, as discussed previously, in this case, we cannot cleanly identify effects of market inattention from possibly reduced news flow. For this reason, the remaining key parameters of interest are the γ_1 coefficients, which indicate how comovement patterns change in the presence of salient global market developments.

Our second key finding is that the coefficient on the global pricing factor is statistically significant, positive, and exactly offsets the coefficient γ_1. This suggests that when the global market shows regular movements, distracted market participants price less of these movements, but they go “back to normal” when global stock markets are characterized by more salient movements.

The interesting question is now what happens to comovement with the national pricing factor. We know that market participants are distracted by the soccer match and that they are already devoting attention to pricing the implications of global stock market developments for the stocks that they trade. In these circumstances, stocks comove considerable more with the national market. The normal comovement (with a beta of 0.23) is slightly elevated in the presence of salient global developments (to 0.31), but then rises substantially more, by another 60% (to 0.50, the sum of β_0, γ_0 and γ_1, i.e. 0.23+0.08+0.19). This is our third key finding and provides clear evidence that the shift towards global pricing factors comes at the cost of attention towards firm-specific news.

To summarize, the findings so far suggest that when global stock markets show normal patterns and market participants are distracted, local stock developments decouple from global stock markets because global news get priced less. At the same time, when the global developments become salient, the pricing of these salient news reverts back to normal – but at the same time, there is less attention to firm-specific news, which in turn makes stocks comove more with the national stock market.

The latter finding is in line with the theoretical predictions by, e.g., Peng and Xiong (2006): once investors become less attentive, they are more inclined to process market and sector-wide rather than firm-specific information. The decreasing comovement with global stock markets suggests that this finding is even more broadly applicable – not only is there less attention to firm-specific and sectoral information, investors also shift attention away from information about other economies. This is an intuitive finding, since it is likely that local investors are better placed to understand information related to their own country rather than global developments. First, global market movements are driven by developments in many economies, increasing the amount of news that needs to be processed in order to appropriately assess the pricing implications. Second, news about the home economy likely is easier to understand for an investor than news about other economies (Dumas, Lewis, and Osambele, 2017). Third, acquiring information is costly, and agents may decide to ignore even readily-available information on foreign economies (Van Nieuwerburgh and Veldkamp, 2009). Finally, and more broadly, people follow national news more closely than international news (Mitchell et al., 2018). In all of this, salience plays an important role – once global news events become relatively more salient, these get priced in a normal way.

4. Further results

We now turn to a range of additional analyses to consider the robustness of the finding that comovement with national markets increases. As noted, for presentational reasons, we now revert back to a simplified version of the factor model, and separately estimate models for times with regular and salient global returns. Table 3 has results for analyses based on times with salient global stock returns, while table 4 focuses on times with regular global stock returns. Both in Table 3 and 4, column 1 presents a benchmark model with a global and national pricing factor (note that the coefficient β_0 in Table 3 is equivalent to $\beta_0 + \beta_1$ in Table 2, and the coefficient γ_0 in Table 3 is equivalent to $\gamma_0 + \gamma_1$ in Table 2). Column (1) of Table 3 replicates two of our key findings, namely that there is no change in comovement with the global pricing factor during matches when global stock market developments are salient, but that there is an increased comovement with the national pricing factor. The third key finding, that there is a decoupling from global markets when matches are being played and global market developments are regular, is replicated in Table 4 (note that the coefficients β_0 and γ_0 in Tables 4 and 2 are equivalent).

< Tables 3 and 4 around here >

The other 15 columns in Tables 3 and 4 present results for a broad range of additional analyses.

First, we show that our findings are robust to using different definitions of salience. In columns (2), we define salience as global returns below the 10th and above the 90th percentile, while in columns (3), we use a less strict cut-off by using the 25th and the 75th percentile. In column (4), we revert to using the 20/80 range, but calculate salient returns based on the entire dataset including all three editions of the World Cup instead of calculating them separately for each World cup edition. For all these three alternatives, we continue to find that in the presence of salient global market movements there is no decoupling from global markets, while there is a significant increase in comovement with the national pricing factor. The point estimates for the γ_0 coefficients with the national pricing factor are between 0.20 and 0.24 (Table 3). As before, we find no evidence of changing comovement with the national market when global market movements are regular, whereas there is a decoupling from global markets. The decoupling from global markets is no longer statistically significant for the 10/90 cutoff, suggesting that market movements become salient and get priced regularly already earlier (Table 4). Based on these results, we continue with the 20/80 cutoff.

Second, we consider a model that does not include the United States, as our identification assumption rests on the idea that global stock market movements are exogenous to the individual stocks that we analyze. Given the global importance of the U.S. stock market, this assumption might be questionable for U.S. stocks. However, as can be seen from columns (5) in Tables 3 and 4, all our results remain.

Third, we test to what extent our results are driven by the orthogonalization of the two pricing factors. To do so, we first estimate results that only include the national factor, and second define the global factor as the residual of a regression that explains global returns with national returns (i.e. we orthogonalize the factors the other way). We find that the main results continue to hold. The alternative orthogonalization yields larger comovements with the national factor, and smaller comovements with the global factor, implying that the orthogonalization removes – as expected and intended – correlation across global and national returns. The only difference in results is that under the alternative orthogonalization there is evidence for a decoupling from global markets even in the presence of salient global market developments.

Fourth, we find that adding lagged terms in the factor model leaves the conclusions on comovement unchanged. Columns (8) of Tables 3 and 4 report results for regressions that use one lag of the dependent variable and the two pricing factors. The reported coefficients are the sum of contemporaneous and lagged coefficients. The β_0 coefficients become somewhat larger when we allow for lagged effects, but importantly, the point estimates for the γ_0 coefficients barely change. In unreported results (available upon request), we find similar results when using 2 or 3 lags in the factor model.

In a fifth step, we study whether the increased comovement is a general phenomenon or whether it is specific to a particular part of the sample. Columns (9) and (10) provide results for regressions that use either the 2010 sample or the 2018 sample.[10] For both sub-samples, we find that our key results are replicated, but the key coefficients lose their statistical significance in the 2018 sample, possibly because of the smaller number of observations (there are fewer matches and fewer stocks in 2018, with the overall sample size being 60% of the sample in 2010).

Sixth, we look further into the definition of salient global returns. In the baseline, we defined salience based on individual observations. It stands to reason that salient global returns will be noticeable even more if they occur in sequence. Therefore, we split the data into a subsample when salient returns are not persistent (columns 11) and one where they are (columns 12), where we define persistently salient movements as movements that are outside the $20^{th}/80^{th}$ percentile for at least three consecutive minutes. Such persistent moves are not infrequent, they represent 29% of the salient observations. We find especially strong and significant increases in comovement with national markets in case of persistently salient global returns.

Next, we change the comparison group. Rather than studying how stock markets behave during national team matches relative to times of the World Cup with matches of other teams, we now compare dynamics during national team matches to those in the time period outside the World Cup. To do so, we extend the data set to a period of three months (May - July) around the World Cup. Again, we find an increase in comovement with the national market. Though the coefficient is now somewhat smaller than in the baseline, it is still significant at the 5% level.

Columns (14) and (15) of Table 3 reports results from two experiments, where we first randomly reshuffle all match observations across countries, and secondly move all

[10] We do not separately analyze the 2014 sample, as it has a very small sample with only seven national team matches.

matches by 4 weeks into May/June, i.e. outside the World Cup. In both experiments, as would be expected, none of the various γ_0 coefficients is statistically significant.

The last columns in Tables 3 and 4 describe an extension of the analysis to one match that took place during the 2016 UEFA European Football Championship. The match that we study was that between Wales and England. It took place on 23 June and ended in a 2-1 victory for England.[11] Using once again the factor model, we analyze the comovements during and outside of this match for all constituents of the FTSE100. For this particular match, there is no clear evidence of a changing comovement with the global pricing factor. However, there is a strong increase for the comovement with the domestic (i.e. U.K.) pricing factor, regardless of whether global returns were salient or not. That we find this for both situations might have to do with the fact that global stock markets were considerable more volatile during the 2016 tournament than during any of the other tournaments – the standard deviation of the global pricing factor in our 2016 sample is 0.056, which is nearly double the standard deviation during the three World Cup editions and still 55% larger than the standard deviation in 2010, which is the highest of the three editions. In other words, stock market developments during our small sample in 2016 might have been of a nature that even what we define to be "regular" movements could have been "salient" for market participants, therefore demanding their attention. This is also in line with the finding that there is no decoupling from global markets for "regular" movements.

5. Convergence in Comovement

Our baseline estimates indicate changing comovement patterns when market participants are distracted. In particular, when soccer matches are on and global stock markets require the attention of market participants, firm-specific information gets priced less, leading to an increased comovement of stocks with the national market. We will now study whether this result masks interesting heterogeneity across different types of stocks. Our hypothesis is that stocks which typically show relatively little comovement with the national market, i.e. stocks where relatively more firm-specific information gets priced normally, will show an increasing comovement, as for them the inattention to firm-specific information will have a relatively larger impact.

[11] This was also the day of the U.K.'s referendum on membership of the European Union. However, the match ended well before the announcement of the results of the referendum.

The most direct way to get at this question is to classify stocks into low-beta and high-beta categories and to test whether these are affected by the investor inattention differently. To do so, we first calculate the beta of each stock with the national market when there is no national team match. Then, we use the bottom two quintiles as a measure of low-beta firms. We present estimation results in two tables; while our focus is on times when global markets show salient movements (Table 5), for completeness we also report results for non-salient global market dynamics in Table 6.

< Tables 5 and 6 around here >

We find that distinguishing between stock betas matters. By construction, low-beta stocks are found to comove less with the national markets, while we find they also are less responsive to global market movements. During times with salient global returns, the comovement with global markets is 0.44 lower for low-beta stocks, the comovement with the national market is 0.85 lower, as follows from the estimates for the β_1 coefficients in column 1 of Table 5. Similar numbers are obtained during times with regular global movements (Table 6, β_1 estimates in column 1).

Turning to what happens during distracting matches, we find evidence for a convergence in betas, in particular concerning comovement with the national pricing factor during periods with salient global returns. The relevant coefficients in this case are the γ_0 and γ_1 coefficients. During times with salient global returns, we find that γ_0 (i.e. the effect of matches on medium- and high-beta stocks) for the national pricing factor is small and statistically insignificant, while γ_1 (the effect of low-beta stocks) is positive, large and significant. In other words, while the comovement of high-beta stocks does not change, that of low-beta stock increases, such that betas become more similar. We formally test this as follows: first, we estimate the ratio of betas, for our benchmark times and for the times of the national matches. The first ratio, $\theta_0 = \frac{\beta_0+\beta_1}{\beta_0}$, is close to 0, and statistically significantly different from 1 (Table 5, column 1). During matches, we find that $\theta_m = \frac{\beta_0+\gamma_0+\beta_0+\gamma_1}{\beta_0+\gamma_0}$, is 0.16. The ratio of betas has thus moved closer to one, as also shown by the results for our test statistic $\Delta = |\theta_0 - 1| - |\theta_m - 1|$, which is estimated to be statistically significant at the 5% level. This clearly shows that betas converge during matches – stocks where a lot of firm-specific information is usually priced see an increased comovement, whereas the other stocks are not affected.

Of course, one would like to understand better which types of stocks are implicated. We start with firm size, where we define stocks to be large if they are in the top two quintiles of the national size distribution based on market capitalization. Our hypothesis comes from the findings by Barber et al. (2009) that trading activities of retail investors are correlated, and the results of Drake et al. (2017), who show that investor attention also comoves. In the light of these findings, we would expect larger betas for smaller stocks, as these have a high retail investor concentration (Kumar and Lee, 2006). If retail investors drop out of the market temporarily during national team matches, we should expect to see a relative convergence of betas. The estimation results in column (2) of Table 5 suggest that firm size does indeed matter. In line with the earlier evidence by Kumar and Lee (2006), we find that large firms comove more strongly with the global factor than small firms do, as indicated by the β_1 estimates of 0.07 during times with salient returns (Table 5, column 2) and 0.21 during normal times (Table 6, column 2). Also in line with the previous literature, smaller stocks have a larger beta with the national factor: the comovement for large firms is lower by as much as 0.49, compared to a level of 0.60 (during times with salient returns) for small and medium-sized firms. Note that our sample comprises the largest stocks in each country, so *a priori* it was not clear whether we would be able to confirm this result.

Looking at the effects of soccer matches, we find evidence for increased comovement with the national factor for large stocks during times with salient global returns. For stocks of small and medium-sized firms, there is generally only a small, and statistically insignificant change in comovement, in contrast to a substantial and statistically significant increase for large stocks of 0.28 (the estimate for γ_1 in Table 5). In this particular case we also find a convergence of comovement across firm size during soccer matches: the ratio of betas of large relative to small- and medium sized stocks increases from 0.17 to 0.67, i.e. it moves closer to one, and does so significantly – even if the estimate for θ_m remains different from one also during matches).

Another way of splitting up stocks is to see how their underlying trading activity changes during soccer matches. As shown in Ehrmann and Jansen (2017), trading activity overall declines substantially, but presumably this aggregate drop in activity also masks heterogeneity across stocks. We therefore classify "reactive stocks" as stocks where the trading volume declines by more than the median. Under the assumption that retail investors will be more easily distracted by soccer events, the reactive stocks can be seen as a proxy for the importance of retail investors in stock trading. Turning to estimation results, we find that the reactive stocks have a considerably lower beta (the difference amounts to 0.33 during times with salient global returns), and that this beta rises relatively to the non-reactive stocks during national team matches. As a matter of fact, the ratio of betas increases from 0.38 to 0.85, and is in this latter case no longer significantly different from 1. The Δ test statistic shows that there is convergence in betas. This provides supportive evidence that the trading behavior of retail investors leads to increased comovement when these are present in the market, and that this increased comovement disappears in times when retail investors are distracted and less likely to be trading in the stock market. The results of a similar analysis are reported in columns (4) of Table 5 and 6, where we classify stocks based on the country in which these are traded, and how responsive overall trading activity in a given country is to the distractions during a soccer match. Based on the results in Ehrmann and Jansen (2017), we classify Argentina, Brazil, Chile, France, Germany, Mexico, Portugal and South Africa as responsive countries, as these countries showed relatively large declines in trading activity during matches. As for responsive individual stocks, we find that betas are somewhat lower to start with in the responsive countries, but that these increase relatively more during matches, leading to a convergence in betas.

In a final analysis, we study whether effects differ across sectors in which firms operate. Peng and Xiong (2006) argue that for sectors with a higher information-processing efficiency, investors will tend to allocate more attention to firm-specific information instead of treating the sector as a category, leading to lower comovement of stocks in that sector with the national factor. This is in line with Morck et al. (2000) and Durnev et al. (2003), who find that stock returns are more informative about changes in future earnings in industries or countries with less correlated stock returns. They differentiate sectors by regressing excess returns on market returns. A sector with a low R^2 in such a regression is then seen as a proxy for a sector with a higher information-processing efficiency. Our hypothesis related to the effect of soccer matches is therefore that investors allocate less attention to firm-specific information, also for the sectors with a higher information-processing efficiency. In turn, comovement should become more similar across sectors. This is indeed what we find: stocks in low-R^2 sectors (the 5 sectors among the 11 sectors of the Global Industry Classification Standard with the lowest R^2) have a lower comovement with the national market to start with, as can be seen by the negative estimates for β_1 in Tables 5 and 6. However, these stocks in low R^2 sectors increase their comovement with the national market by relatively more during matches, bringing the ratio of betas closer to 1. We observe this convergence both during times with salient and normal global returns.

6. Conclusions

This paper exploits the distractions related to high-profile soccer matches to study how investor inattention affects return comovement across individual stocks. Our analysis uses high-frequency stock returns during 59 soccer matches played at three recent editions of the FIFA World Cup. To address the concern that news flow may change during national team matches, we condition on the salience of global market returns, which should not be driven by events during national soccer matches.

We report four key findings. First, at times when global stock returns are not salient but market participants are distracted by soccer, local stock developments decouple from global stock markets because global news get priced less. Second, when global market developments become salient, the pricing of global news reverts back to normal. Third, at the same time, there is less attention to firm-specific news, which in turn makes stocks comove more with the national stock market. Fourth, we provide evidence that soccer matches and the ensuing investor distraction trigger a convergence of comovements across different stock types: while there is overall more comovement with the national market, this effect is particularly strong for those stocks that have previously comoved less with the national market.

These findings are in line with the notion that investor inattention impacts stock market comovement, and in particular support the notion of Peng and Xiong (2006) that markets divert their attention away from stock-specific information – the more such information is typically priced, the stronger is the effect of inattention, leading to our convergence finding. The magnitude of our coefficients (comovement with the national market increasing from 0.30 to 0.54 during matches when global market movements are salient, and comovement with the global market dropping from 0.65 to 0.50 during matches when global market movements are regular) furthermore suggests that these effects are important quantitatively.

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Table 1. Number of Distracting Events per Country

Country	**Number of distracting events**			
	2010	*2014*	*2018*	*Total*
<u>Africa</u>				
South Africa	2			2
<u>Americas</u>				
Argentina	1	2	2	5
Brazil	4		4	8
Chile	3	2		5
Mexico	3	2	2	7
United States	2	1		3
<u>Europe</u>				
Belgium			1	1
Denmark	1		2	3
England	1			1
France	1		3	4
Germany	1		1	2
Italy	1			1
Netherlands	3			3
Poland			1	1
Portugal	3		1	4
Russia			2	2
Spain	1			1
Sweden			3	3
Switzerland	2		1	3
Total	29	7	23	59

Notes: This table lists the number of events that this paper uses to identify shifts in investor attention. The events are taken from three editions of the FIFA World Cup soccer, namely the tournaments in South Africa (2010), Brazil (2014), and Russia (2018). A distracting event is a soccer match in which a country's national team participates and that is played during stock market trading hours in that country. The national teams are from 19 countries in Africa, the Americas and Europe.

Table 2. Baseline Estimates for Changing Return Comovements

Comovement with		(1) CAPM		(2) With dummy for salient global returns		(3) With dummy for distracting soccer matches	
Global factor	β_0	0.57	***	0.64	***	0.65	***
		0.01		*0.03*		*0.02*	
	β_1	--		-0.07	**	-0.08	***
				0.03		*0.03*	
	γ_0	--		--		-0.15	**
						0.06	
	γ_1	--		--		0.15	***
						0.05	
National factor	β_0	0.27	***	0.23	***	0.23	***
		0.03		*0.02*		*0.02*	
	β_1	--		0.08	**	0.08	**
				0.04		*0.03*	
	γ_0	--		--		0.04	
						0.10	
	γ_1	--		--		0.19	**
						0.08	

Notes: Selected panel estimation results for three versions of an international factor model specified as:

$$R_{i,t} = \mu_{i,0} + \beta_t' F_t + \alpha Salient_t + \delta_t Match_{i,t} + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \quad (4)$$

$$\beta_t' = \beta_0 + \beta_1 Salient_t + \gamma_t Match_{i,t} \quad (5)$$

$$\gamma_t = \gamma_0 + \gamma_1 Salient_t \quad (6)$$

$$\delta_t = \delta_0 + \delta_1 Salient_t \quad (7)$$

The dependent variables are excess stock returns measured at the minute-by-minute frequency for 757 firms located in 19 countries. The global pricing factor is the return on the MSCI World Index; the national factor is based on the return for the national stock index. *Salient* is a binary dummy denoting times when global stock returns are below the 20th and above the 80th percentile. *Match* is a binary dummy denoting times when national soccer teams play a match at the FIFA World Cup soccer. Column 1 provides estimates for a version without the *salient* and *match* dummies, which are subsequently added in columns 2 and 3. The sample covers the periods of the three FIFA World Cup editions between 2010 and 2018. Standard errors (clustered at the soccer match level) are in italics. For all three models, n = 2,056,291 and the R-squared is 0.04. */**/*** denotes statistical significance at the 10%/5%/1% level, respectively.

Table 3. Robustness Checks for Changing Comovements During Times with Salient Global Returns

		(1) **Bench-mark**	(2) **Salience (10/90 p)**	(3) **Salience (25/75 p)**	(4) **Salience (20/80 & full sample)**	(5) **Without US**	(6) **Only national factor**	(7) **Altern. orthogo-nali-zation**	(8) **1 lag**	(9) **2010 sample**	(10) **2018 sample**	(11) **Salience (not per-sistent)**	(12) **Salience (per-sistent)**	(13) **Outside World Cup**	(14) **Placebo**	(15) **Re-shuffled**	(16) **UEFA 2016**
Global	β_0	0.57 ***	0.56 ***	0.57 ***	0.57 ***	0.54 ***	--	0.37 ***	0.69 ***	0.59 ***	0.50 ***	0.55 ***	0.61 ***	0.70 ***	0.73 ***	0.57 ***	0.39 ***
		0.02	*0.02*	*0.02*	*0.01*	*0.02*		*0.02*	*0.02*	*0.01*	*0.05*	*0.02*	*0.01*	*0.00*	*0.00*	*0.02*	*0.05*
	γ_0	0.00	0.01	0.00	0.00	0.02	--	-0.16 ***	0.00	-0.03	0.09	-0.01	0.01	-0.06 *	-0.04	-0.12	0.04
		0.03	*0.04*	*0.03*	*0.03*	*0.04*		*0.05*	*0.03*	*0.04*	*0.06*	*0.04*	*0.05*	*0.03*	*0.04*	*0.17*	*0.07*
National	β_0	0.30 ***	0.31 ***	0.30 ***	0.36 ***	0.28 ***	0.42 ***	0.38 ***	0.48 ***	0.34 ***	0.47 ***	0.32 ***	0.25 ***	0.40 ***	0.47 ***	0.30 ***	0.74 ***
		0.04	*0.06*	*0.04*	*0.02*	*0.05*	*0.05*	*0.04*	*0.03*	*0.03*	*0.04*	*0.04*	*0.07*	*0.00*	*0.03*	*0.05*	*0.08*
	γ_0	0.24***	0.24 ***	0.23 ***	0.20 ***	0.25 ***	0.22 ***	0.21 ***	0.26 ***	0.22 ***	0.13	0.17 *	0.36 ***	0.14 **	0.08	-0.24	0.18 *
		0.08	*0.08*	*0.08*	*0.06*	*0.09*	*0.08*	*0.07*	*0.09*	*0.08*	*0.13*	*0.09*	*0.10*	*0.07*	*0.07*	*0.26*	*0.10*
Observations		825,685	413,879	1,030,963	879,763	770,257	825,685	825,685	802,520	470,462	277,562	588,446	237,231	2,794,273	902,215	749,651	1,802
R-squared		0.06	0.09	0.06	0.07	0.06	0.05	0.06	0.09	0.11	0.05	0.07	0.07	0.12	0.14	0.06	0.31

Notes: Selected estimation results for several robustness checks based on an international factor pricing model of the form:

$$R_{i,t} = \mu_{i,0} + \beta_t' F_{t-j} + \delta_0 Match_{i,t} + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \qquad (8)$$

$$\beta_t' = \beta_0 + \gamma_0 Match_{i,t} \qquad (9)$$

These estimations use sample periods with salient returns in global stock markets, defined as those outside the 20/80 percentile range. The first column reports a benchmark regression. Columns 2 - 4 consider alternative definitions of salience. Column 5 present results without including the United States. Column 6 uses a model with only a national pricing factor, column 7 relies on an alternative orthogonalization of the pricing factors. Column 8 uses models with one lag, while columns 9 and 10 focus on, respectively, the 2010 and 2018 subsample. Columns 11 and 12 consider the difference between periods with persistent salient global returns and non-persistence in these returns. Column 13 presents results when using an alternative control group, namely three months (May - July) around but excluding the World Cup. Columns 14 and 15 present results for tests where all match observations are reshuffled across countries or moved by 4 weeks into May/June, i.e. outside the World Cup. Column 16 present results for a soccer match played during the 2016 UEFA European Cup. Standard errors (clustered at the match level) in italics. */**/*** denotes statistical significance at the 10%/5%/1% level, respectively.

Table 4. Robustness Checks for Changing Comovements During Times with Regular Global Returns

		(1) **Bench-mark**	(2) **Salience (10/90 p)**	(3) **Salience (25/75 p)**	(4) **Salience (20/80 & full sample)**	(5) **Without US**	(6) **Only national factor**	(7) **Altern. orthogo-nali-zation**	(8) **1 lag**	(9) **2010 sample**	(10) **2018 sample**	(11) **Salience (not per-sistent)**	(12) **Salience (per-sistent)**	(13) **Outside World Cup**	(14) **Placebo**	(15) **Re-shuffled**	(16) **UEFA 2016**
Global	β_0	0.65 ***	0.62 ***	0.70 ***	0.75 ***	0.62 ***	--	0.50 ***	0.78 ***	0.62 ***	0.84 **	0.65 ***	0.61 ***	0.74 ***	0.92 ***	0.65 ***	0.47 ***
		0.02	*0.02*	*0.03*	*0.02*	*0.03*		*0.03*	*0.03*	*0.02*	*0.06*	*0.02*	*0.01*	*0.00*	*0.03*	*0.02*	*0.06*
	γ_0	-0.15 **	-0.08	-0.21 ***	-0.21 ***	-0.14 **	--	-0.18 **	-0.16 **	-0.13 **	-0.21	-0.15 **	0.01	-0.20 ***	-0.20	0.24	-0.04
		0.06	*0.05*	*0.08*	*0.08*	*0.06*		*0.08*	*0.06*	*0.05*	*0.22*	*0.06*	*0.05*	*0.07*	*0.14*	*0.33*	*0.11*
National	β_0	0.23 ***	0.24 ***	0.22 ***	0.19 ***	0.21 ***	0.24 ***	0.33 ***	0.38 ***	0.24 ***	0.38 ***	0.23 ***	0.25 ***	0.29 ***	0.31 ***	0.23 ***	0.81 ***
		0.02	*0.02*	*0.02*	*0.03*	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.04*	*0.02*	*0.07*	*0.00*	*0.02*	*0.02*	*0.06*
	γ_0	0.04	0.09	0.02	0.07	0.05	0.04	0.00	0.01	0.16	-0.01	0.04	0.36 ***	-0.03	0.07	-0.02	0.25 ***
		0.10	*0.10*	*0.10*	*0.12*	*0.10*	*0.10*	*0.09*	*0.11*	*0.09*	*0.12*	*0.10*	*0.10*	*0.10*	*0.10*	*0.19*	*0.08*
Observations		1,230,600	1,642,405	1,025,323	1,176,520	1,157,341	1,230,600	1,230,600	1,197,772	706,138	417,933	1,230,600	237,231	4,139,733	1,344,438	1,137,169	7,261
R-squared		0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.04	0.02	0.02	0.01	0.07	0.02	0.03	0.01	0.16

Notes: Selected estimation results for several robustness checks based on an international factor pricing model of the form:

$$R_{i,t} = \mu_{i,0} + \beta_t' F_{t-j} + \delta_0 Match_{i,t} + \boldsymbol{\omega}_D' \boldsymbol{D}_t + \boldsymbol{\omega}_H' \boldsymbol{H}_t + \varepsilon_{i,t} \quad (8)$$

$$\beta_t' = \beta_0 + \gamma_0 Match_{i,t} \quad (9)$$

These estimations use sample periods with regular returns in global stock markets, defined as those inside the 20/80 percentile range. The first column reports a benchmark regression that uses a global and national pricing factor. For details on columns 2 - 16, see notes to Table 3. Standard errors (clustered at the match level) in italics. */**/*** denotes statistical significance at the 10%/5%/1% level, respectively.

Table 5. Beta Convergence During Times with Salient Global Returns

		(1) Low beta	(2) Large	(3) Responsive trading activity	(4) Responsive country	(5) Low R^2 sector
Global	β_0	0.64 ***	0.54 ***	0.60 ***	0.62 ***	0.59 ***
		0.01	*0.01*	*0.01*	*0.01*	*0.01*
	β_1	-0.44 ***	0.07 ***	-0.08 ***	-0.12 ***	-0.06 ***
		0.02	*0.02*	*0.01*	*0.02*	*0.02*
	γ_0	0.01	0.00	0.01	-0.01	0.00
		0.02	*0.03*	*0.03*	*0.03*	*0.03*
	γ_1	0.03	0.00	0.01	0.03	0.01
		0.05	*0.03*	*0.05*	*0.06*	*0.03*
	θ_0	0.30 ***	1.12 ***	0.86 ***	0.80 ***	0.90 ***
		0.03	*0.05*	*0.02*	*0.04*	*0.03*
	θ_m	0.36 ***	1.13 **	0.87 *	0.85 *	0.92 *
		0.07	*0.05*	*0.07*	*0.08*	*0.05*
	Δ	0.06	0.00	0.01	0.05	0.02
		0.07	*0.06*	*0.08*	*0.10*	*0.06*
National	β_0	0.78 ***	0.60 ***	0.53 ***	0.69 ***	0.64 ***
		0.01	*0.01*	*0.02*	*0.02*	*0.01*
	β_1	-0.85 ***	-0.49 ***	-0.33 ***	-0.46 ***	-0.53 ***
		0.04	*0.05*	*0.06*	*0.06*	*0.05*
	γ_0	-0.03	0.04	0.06	-0.04	0.06
		0.04	*0.05*	*0.07*	*0.05*	*0.05*
	γ_1	0.22 **	0.28 ***	0.24 **	0.30 **	0.20 **
		0.09	*0.10*	*0.11*	*0.13*	*0.09*
	θ_0	-0.09 ***	0.17 ***	0.38 ***	0.32 ***	0.16 ***
		0.04	*0.08*	*0.09*	*0.08*	*0.07*
	θ_m	0.16 ***	0.67 **	0.85	0.75	0.52 ***
		0.11	*0.14*	*0.15*	*0.17*	*0.12*
	Δ	0.24 **	0.49 ***	0.46 **	0.43 **	0.36 ***
		0.11	*0.16*	*0.18*	*0.19*	*0.14*
Observations		825,685	825,685	825,685	825,685	825,685
R-squared		0.10	0.08	0.07	0.07	0.08

Notes: Selected estimation results for an international factor pricing model of the form:

$$R_{i,t} = \mu_{i,0} + \beta'_{i,t}F_{t-j} + \delta_i Match_{i,t} + \boldsymbol{\omega}'_D \boldsymbol{D}_t + \boldsymbol{\omega}'_H \boldsymbol{H}_t + \varepsilon_{i,t} \quad (10)$$

$$\beta'_{i,t} = \beta_0 + \beta_1 S_i + \gamma_i Match_{i,t} \quad (11)$$

$$\gamma_i = \gamma_0 + \gamma_1 S_i \quad (12)$$

$$\delta_i = \delta_0 + \delta_1 S_i \quad (13)$$

where S denotes various stock characteristics. Low beta stocks are stocks in the bottom two quintiles of the distribution of betas with the national factor outside the national team matches. Large stocks are stocks in the top two quintiles of the national size distribution based on market capitalization. Stocks with responsive trading activity are those where the trading volume during national team matches declines by more than the median. Responsive countries are Argentina, Brazil, Chile, France, Germany, Mexico, Portugal and South Africa, based on Ehrmann and Jansen (2017). Low R^2 sectors are the 5 GICS sectors with the lowest R^2 when regressing excess returns on national returns. $\theta_0 = \frac{\beta_0+\beta_1}{\beta_0}$. $\theta_m = \frac{\beta_0+\gamma_0+\beta_0+\gamma_1}{\beta_0+\gamma_0}$. $\Delta = |\theta_0 - 1| - |\theta_m - 1|$. Standard errors (clustered at the match level) in italics.*/**/*** denotes statistical significance at the 10%/5%/1% level, respectively; for θ_0 and θ_m, statistical significance is estimated relative to a value of one.

Table 6. Beta Convergence During Times with Non-Salient Global Returns

		(1) Low beta		(2) Large		(3) Responsive trading activity		(4) Responsive country		(5) Low R^2 sector	
Global	β_0	0.66	***	0.55	***	0.69	***	0.68	***	0.64	***
		0.02		0.02		0.03		0.02		0.02	
	β_1	-0.42	***	0.21	***	-0.12	***	-0.11	***	-0.03	
		0.03		0.05		0.03		0.03		0.03	
	γ_0	-0.09		-0.07		-0.11		-0.08		-0.11	**
		0.06		0.06		0.08		0.06		0.05	
	γ_1	0.07		-0.17	*	-0.03		-0.06		-0.03	
		0.11		0.10		0.10		0.10		0.12	
	θ_0	0.36	***	1.38	***	0.83	***	0.83	***	0.95	
		0.03		0.10		0.03		0.04		0.04	
	θ_m	0.38	***	1.08		0.75	*	0.71	*	0.89	
		0.16		0.19		0.15		0.15		0.21	
	Δ	0.02		0.30		-0.08		-0.12		-0.06	
		0.16		0.21		0.14		0.15		0.22	
National	β_0	0.68	***	0.49	***	0.38	***	0.55	***	0.52	***
		0.03		0.03		0.02		0.02		0.03	
	β_1	-0.80	***	-0.44	***	-0.21	***	-0.36	***	-0.46	***
		0.04		0.04		0.03		0.03		0.04	
	γ_0	-0.09		-0.04		0.00		-0.04		-0.05	
		0.09		0.07		0.09		0.06		0.07	
	γ_1	0.14		0.11		0.06		0.09		0.11	
		0.10		0.12		0.12		0.13		0.12	
	θ_0	-0.18	***	0.10	***	0.46	***	0.34	***	0.12	***
		0.02		0.05		0.07		0.05		0.05	
	θ_m	-0.13	***	0.25	***	0.62		0.46	**	0.26	***
		0.11		0.25		0.29		0.21		0.23	
	Δ	0.05		0.15		0.16		0.12		0.15	
		0.11		0.25		0.30		0.23		0.24	
Observations		1,230,600		1,230,600		1,230,600		1,230,600		1,230,600	
R-squared		0.04		0.02		0.01		0.02		0.02	

Notes: Selected estimation results for an international factor pricing model of the form:

$$R_{i,t} = \mu_{i,0} + \beta'_{i,t}F_{t-j} + \delta_i Match_{i,t} + \boldsymbol{\omega}'_D \boldsymbol{D}_t + \boldsymbol{\omega}'_H \boldsymbol{H}_t + \varepsilon_{i,t} \quad (10)$$

$$\beta'_{i,t} = \beta_0 + \beta_1 S_i + \gamma_i Match_{i,t} \quad (11)$$

$$\gamma_i = \gamma_0 + \gamma_1 S_i \quad (12)$$

$$\delta_i = \delta_0 + \delta_1 S_i \quad (13)$$

where S denotes various stock characteristics. For details, see notes to Table 5. Standard errors (clustered at the match level) in italics.*/**/*** denotes statistical significance at the 10%/5%/1% level, respectively; for θ_0 and θ_m, statistical significance is estimated relative to a value of one.