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Country versus Region Effects in International Stock Returns

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Abstract: An empirical regularity in the portfolio diversification literature is the importance of country effects in explaining international return variation. We develop a new decomposition that disaggregates these country effects into region effects and within-region country effects. We find that half the return variation typically attributed to country effects is actually due to region effects, a result robust across developed and emerging markets, with the remaining variation explained by within-region country effects. For the average investor, this means that diversifying across countries within Europe, for example, delivers half the risk reduction possible from diversifying across regions globally.

JEL classification: G11, G15

Key words: diversification; risk; international financial markets; industrial structure

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I. Introduction

One of the most pronounced empirical regularities in the portfolio diversification literature is the importance of country effects in explaining variation in international equity returns. This regularity has been documented at the level of the global stock market, within regions, and within certain asset classes, notably in emerging markets. At the global level, Griffin and Karolyi (1998), for example, show that country effects account for virtually all variation in the country index returns of 25 developed and emerging markets. At a regional level, Heston and Rouwenhorst (1994, 1995) and Rouwenhorst (1999) report that the same holds for the stock indices of 12 Western European countries. In emerging markets, Serra (2000) finds that the importance of country effects in explaining the return variation in 26 emerging market stock indices is comparable to that in developed countries.[1]

Given the importance of country effects in international return variation, it is perhaps surprising that little attention has been devoted to investigating what these effects are actually capturing. This is the focus of this paper. In particular, it examines to what extent country effects are capturing region-specific versus within-region, country-specific variation. To this end, it augments the approach of Heston and Rouwenhorst (1994), a regression model that decomposes the cross-section of international stock returns at a point in time into country and

[1] Cavaglia et al. (2000) and L'Her et al. (2002) find that industry effects have recently surpassed country effects in explaining international return variation. However, Brooks and Del Negro (forthcoming) argue that much of the observed rise in industry effects could be temporary, because it is associated with sectors central to the recent IT stock market bubble. Controlling for such temporary effects, they show that country effects remain more important than industry effects as a source of international return variation.

industry effects, with an additional decomposition that further disaggregates country effects into region effects and within-region country effects. The former capture common variation in country effects within regions. The latter are estimated as the deviations of country effects from the relevant region effect and thus measure within-region return heterogeneity. From the perspective of an international investor, the importance of within-region country effects is a measure of the diversification gains associated with diversifying across country portfolios within the average region, while the importance of region effects captures the incremental diversification gain from diversifying across regions. The importance of within-region country effects relative to that of region effects is thus a measure of how much risk reduction can be achieved from cross-country diversification within regions and how much further risk reduction can be achieved by going the additional step of diversifying across regions.

We estimate our new decomposition using monthly returns data for 9,679 stocks in 42 developed and emerging markets from January 1985 to April 2003. Following the Morgan Stanley Capital International (MSCI) indices, we divide our sample into three broad regions: the Americas, Asia and Europe. We further distinguish between developed and emerging markets within each region, again following MSCI in designating a country as a developed or an emerging market. Our benchmark model thus allows for six regions: Developed Americas, Emerging Americas, Developed Asia, Emerging Asia, Developed Europe and Emerging Europe. This means that we decompose international returns into six region effects and 42 within-region country effects, in contrast to the Heston and Rouwenhorst (1994) regression model, which would in this case have 42 country effects. It is important to note, however, that our decomposition extracts the same amount of variation from returns as the approach of Heston and Rouwenhorst (1994). The difference is that we bundle this variation differently: into region effects and within-region country effects, rather than just country effects. In

common with the existing literature, our approach also controls for differences in industrial structure as a reason for return heterogeneity across countries. Each stock in our sample belongs to one of 40 (Level 4) Datastream Global Market industries. We use this information to control for global industry effects in returns, in the same way as the existing approach.

The point of departure for this paper is the observation that regional shocks account for common variation in the country effects of the Heston and Rouwenhorst (1994) model, which we refer to as the standard model hereafter. For illustration, we estimate the standard model for our sample, decomposing international stock returns into country effects and global industry effects. Starting from September 1993, when all countries have joined the sample, we compute pairwise correlations for all 42 "pure" country effects, so called because they control for differences in industrial composition between individual country portfolios and the global portfolio. Figure 1 plots the median pairwise correlations of these pure country effects, across all countries and within the different regions in our sample. The median correlation coefficient across all 42 country effects (the horizontal line) measures 6.8 percent. Within regions, however, this number is much higher. Grouping developed and emerging markets together, the median correlations in the Americas, Asia and Europe measure 20, 15 and 22 percent, respectively. Differentiating between developed and emerging markets within each region, the median correlation coefficients in the Developed and Emerging Americas are 39 and 30 percent, respectively. In Developed and Emerging Asia, these numbers amount to 20 and 18 percent each. Finally, in Developed and Emerging Europe, the corresponding numbers are 25 and 17 percent. With median correlations within regions uniformly higher than the median correlation across all countries, this is compelling evidence that region effects are embedded within the so-called "pure" country effects. The purpose of this paper is to quantify exactly how important these region effects are.

Our decomposition of country effects into region effects and within-region country effects has several advantages over the standard model. First, it permits an assessment of how much return variation captured by country effects is really due to region effects. From the perspective of equity investors who are diversified across countries within a region, but not across regions, our methodology quantifies the benefit of going the additional step across regions. If the added benefit is large, much of the importance hitherto attributed to country effects is really due to region effects. Second, L'Her et al. (2002) find that country effects have been falling in importance over time. Is this due to region effects becoming less important or due to declining within-region country effects? On the one hand, the emergence of regional trading blocks—the European Union, the North American Free Trade Agreement, and the Association of Southeast Asian Nations—could be associated with region effects becoming more important in all regions. On the other hand, there are pronounced differences across regions in the pace of reforms intended to promote integration. For example, European Monetary Union and the associated rise in the harmonization of government policies are unparalleled in the Americas or Asia. As a result, there may be significant differences across regions in the degree to which within-region country shocks are changing in importance, which our approach can capture.[2] Third, our approach allows us to assess the diversification

[2] Since Adler and Dumas (1983), it is understood that a rise in comovement across markets, and a corresponding decline in the importance of country effects, need not be the result of greater market integration. It could, for example, simply reflect common business cycles shocks. Bekaert and Harvey (2003) re-emphasize this point in a survey of the recent literature on integration in emerging markets. That said, Goetzmann et al. (forthcoming) document that

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potential associated with individual regions, in particular that of developed versus emerging markets. We investigate this issue against the backdrop of a recent paper by Goetzmann et al. (forthcoming) who argue that a rise in the average correlation across major stock markets has reduced diversification opportunities in the developed world, so that risk reduction strategies must rely increasingly on investing in emerging markets. This view matches earlier work on emerging markets, including Harvey (1995) who reports that the correlation between most emerging markets and other stock markets is historically low and Bekaert and Harvey (1995) who find that, despite a recent trend towards the abolition of restrictions and the substantial inflow of foreign capital, some emerging markets have become more segmented. Against this background, we quantify the diversification potential of developed versus emerging markets. Finally, Serra (2000) argues that stock markets are increasingly influenced by the trading activity of institutional investors that treat emerging markets as a single asset class. Our approach allows us to assess the degree to which emerging markets indeed behave as a single asset class. Are the region effects of the Emerging Americas, Emerging Asia and Emerging Europe similar in magnitude, a sign that there is little differentiation across emerging markets in different regions? Moreover, is it the case that within-region country effects in emerging markets are less important than those in developed markets, a sign that within-region return heterogeneity is lower? Relative to Serra (2000), who focuses exclusively on returns within emerging markets, our contribution is to examine emerging market returns in the context of a global sample. Thus we can explore the degree to which emerging markets are segmented

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during the past 150 years the average correlation across global equity markets has been highest during periods of high economic and financial integration.

relative to developed markets, in addition to the degree of segmentation across countries within emerging markets.

We now summarize our results. First, we find that region effects on average account for 52 percent of the return variation associated with country effects in the standard model. Diversifying across countries within the average regional portfolio thus captures about half the risk reduction benefit from diversifying fully across all country portfolios in our sample, with the remainder captured by diversifying across regions. This result is remarkably general. Most surprisingly, it holds both in developed and emerging markets. In the former, region effects on average account for 52 percent of the return variation due to country effects in the standard model. In the latter, this number amounts to 48 percent. In terms of the average importance of region versus within-region country effects, there is thus little difference between developed and emerging markets.

Second, the falling importance of country effects in the standard model, reported in L'Her et al. (2002), is driven in roughly equal measure by region and within-region country effects. In particular, and perhaps counter intuitively, region effects have been falling since the early-1990s, despite a series of "regional" crises that have hit international stock markets, such as the "Tequila," the Asian and the Russian crises. Indeed, we find that the importance of region effects relative to that of within-region country effects has fallen slightly over time. During the first two years of our sample, they capture about 59 percent of the return variation explained by country effects in the standard model. This number falls to 46 percent in the last two years of our sample, a significant decline, which is driven by the growing importance of emerging markets in our sample over time. Two considerations caution against putting too much emphasis on this decline, however. For one thing, there is no similar decline in the relative importance of region effects when we look at developed markets only. For another,

the importance of region versus within-region country effects describes an inverted u-shape over time, rising from the mid-1980s to the early-1990s and falling thereafter. The declining importance of region effects thus has a cyclical element, suggesting that it is at least in part temporary.

Third, we find that the region effects of emerging markets are much larger in absolute magnitude than those of developed markets. However, their small market capitalization share in the global stock market means that their effective diversification potential is substantially smaller than that associated with developed markets. In contrast to Goetzman et al. (forthcoming), our results suggest that developed markets therefore remain important for risk reduction strategies, even with the rise in comovement across markets. Going forward, the role of emerging markets for international diversification strategies will likely rise as their capitalization share increases.

Finally, our evidence on whether emerging market stocks behave as a single asset class is mixed. On the one hand, the region effects of the Emerging Americas, Emerging Asia and Emerging Europe are not significantly different from each other in absolute magnitude, consistent with the view that investors do little to differentiate across different emerging market regions. On the other hand, we find that the balance of return variation explained by region versus within-region country effects in emerging markets is comparable to that in developed markets. In other words, the degree of return heterogeneity within the average emerging market region is comparable to that in the average developed market region, which suggests that investors do differentiate across emerging markets. This suggests that there is little difference between emerging and developed markets in the way investors differentiate investment opportunities.

The paper is organized as follows. Section II describes the dataset and provides key summary statistics for returns and market capitalizations by country, region and industry. Section III discusses our approach to decomposing returns into region and within-region country effects. Section IV presents results on the overall importance of region versus within-region country effects in international stock returns, discusses the implications for portfolio diversification strategies and discusses the robustness of the results. Section V explores the diversification potential associated with individual regions, notably developed and emerging markets, and investigates whether emerging market stock returns behave as a single asset class. Section VI concludes.

II. The Data

The dataset covers monthly total US dollar-denominated stock returns and market capitalizations from January 1985 to April 2003 for 9,679 companies.[3] The data include all constituent firms in the Datastream Global Market Indices for 42 developed and emerging markets as of March 2002 (see http://www.datastream.com/product/investor/index.htm for a description of these indices) and are augmented with a list of active and inactive stocks for each country derived from Worldscope.[4] Each company is assigned to one of 40 (Level 4)

[3] Using US dollar-denominated returns has the effect of lumping nominal currency influences into our within-region country effects and, in some cases, into region effects. We investigate the magnitude of this bias by redoing our estimations using local currency returns and find it to be negligible, consistent with the result in Heston and Rouwenhorst (1994).

[4] Countries covered are the US, the UK, France, Germany, Italy, Japan, Canada, Australia, Austria, Belgium, Denmark, Hong Kong, Ireland, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, Finland, Greece, Portugal, Luxembourg, Malaysia, Singapore,

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Datastream Global Market industries, a set of industry assignments that has been used most recently by Griffin and Stulz (2001). Table 1 in the working paper version of Brooks and Del Negro (forthcoming) lists these industries and shows how they can be aggregated into the broader (Level 3) industry sectors.

We follow Morgan Stanley Capital International (MSCI) in dividing our sample into three broad regions along geographic lines: the Americas, Asia and Europe. We further distinguish between developed and emerging markets within each region, again following MSCI in designating a country as a developed or an emerging market. Our benchmark model therefore allows for six regions: Developed Americas, Emerging Americas, Developed Asia, Emerging Asia, Developed Europe and Emerging Europe.[5] Documentation on the MSCI country index classification can be accessed at http://www.msci.com/equity/index.html.

South Africa, South Korea, Thailand, Philippines, Taiwan, Argentina, Mexico, Turkey, Brazil, Chile, India, Indonesia, Peru, Colombia, Poland, China and Czech Republic.

[5] Developed Europe has 17 countries: the UK, France, Germany, Italy, Austria, Belgium, Denmark, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, Finland, Greece, Portugal, Luxembourg. Emerging Europe has 4 countries: South Africa, Turkey, Poland and Czech Republic. The Developed Americas consist of 2 markets: Canada and the US. The Emerging Americas have 6 markets: Argentina, Brazil, Chile, Colombia, Mexico and Peru. Developed Asia has 5 markets: Australia, Hong Kong, Japan, New Zealand and Singapore. Emerging Asia comprises 8 markets: Malaysia, South Korea, Thailand, Philippines, Taiwan, India, Indonesia and China. See (http://www.msci.com/equity/coverage_matrix.pdf) for more information on the MSCI classification.

Compared to the existing literature, our coverage across and within countries is more comprehensive. For example, Heston and Rouwenhorst (1994) examine data on 829 stocks in 12 European countries. Griffin and Karolyi (1998) collect data on 2,400 firms in 25 developed and emerging markets. Cavaglia et al. (2000) cover 2,645 firms in 21 developed countries. Greater coverage within markets has the advantage that the database comes closer to approximating the true universe of stocks, while the greater coverage of emerging markets permits a quantitative assessment of just how segmented they are relative to other markets.[6] In addition, the number of industries (40) is similar to the number of countries (42), so that—on average—country and industry portfolios are of equal size.[7]

For illustrative purposes, Table 1 provides an overview of the data. It gives the number of firms and the capitalization weights in the sample for each of the G-7 countries, other developed markets and emerging markets. It also breaks out these numbers for the three broad regions in the data (Europe, the Americas and Asia) and for the six more disaggregated regions that are our focus (Developed Americas, Emerging Americas, Developed Asia,

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[6] An important aspect of our data is that it includes firms that become inactive over time, due to bankruptcy or merger for example. Although this phenomenon is significant in numbers, with 1,996 companies in the sample becoming inactive after January 1995, of which 806 companies became inactive after March 2000, it turns out not to have a significant bearing on our results below.

[7] In this respect, the paper follows Griffin and Karolyi (1998) who argue that broad industry classifications (Level 3) bias against finding important industry effects because they result in industry portfolios that are larger and therefore more diversified than country portfolios.

Emerging Asia, Developed Europe and Emerging Europe). Finally, it presents the number of firms and capitalization weights for each of the aggregated Datastream Global Market (Level 3) industry sectors. Table 1 compares the data along these dimensions to the Standard & Poor's Emerging Stock Markets Factbook 2001, to assess the coverage of our data.

In December 2000 our sample contains 8,790 active firms. The overall market capitalization of the sample amounts to $32,428 billion at that point, which is 99 percent of actual market capitalization in the 42 countries at that point, according to the Factbook. The US makes up almost 50 percent of the sample in percent of overall market capitalization, reasonable according the Factbook. The UK and Japan each make up about 10 percent of the sample, again consistent with the Factbook. In contrast, the capitalization weight of emerging stock markets is much smaller, measuring only about five percent, compared with seven percent in the Stock Markets Factbook. In terms of industrial composition, companies in the financial sector are most heavily represented, making up almost 23 percent in capitalization terms, while the information technology sector is the second largest, at just above 15 percent. Two thirds of all companies in this sector are located in the United States, judging by market capitalization. Coverage is relatively stable going back towards the beginning of the sample. In December 1990, for instance, the overall market capitalization of the sample comes to $9,102 billion, about 97 percent of stock market capitalization in the 42 sample countries as measured by the Stock Markets Factbook.

The regional breakdown of the data shows that Europe dominates the sample in terms of the number of firms, while the Americas are substantially more important in capitalization terms. For the three broad regions, our sample comes very close to matching the Factbook in terms of capitalization shares. For the six more disaggregated regions, Table 1 shows that the Developed Americas constitute over half the sample in capitalization terms, consistent with

the Factbook. Among emerging market regions, Emerging Asia is most important, amounting to 2.5 percent in capitalization terms, close to the 4.3 percent in reality.

Finally, Table 1 lists means and standard deviations for each of these portfolio returns (in percent per month). The emerging markets have a higher mean return than developed markets, but are also more volatile on average. Among emerging markets regions, Emerging Americas registers the highest mean return, but also displays the highest volatility.

III. The Model

We begin our discussion by reviewing the Heston and Rouwenhorst (1994, 1995) dummy variable model, referred to here as the standard model, which provides the basis for our decomposition of country effects into region and within-region country effects. They assume that the return on each stock has four components: a common factor (α), global industry factors (β), country factors (γ) and a firm-specific disturbance (e). The return on stock i in industry j and country k is:

$$R_{it} = \alpha_t + \beta_{jt} + \gamma_{kt} + e_{it} \tag{1}$$

They estimate a time-series for the realization of the common factor, the industry factors and the country factors by running the following cross-sectional regression every month:

$$R_i = \alpha + \sum_{j=1}^{J} \beta_j I_{ij} + \sum_{k=1}^{K} \gamma_k C_{ik} + e_i \tag{2}$$

where I_{ij} is a dummy variable that equals one if the stock belongs to industry j and zero otherwise, and C_{ik} is a similar dummy variable that identifies country affiliation. There are J industries and K countries in total.

Equation (2) cannot be estimated in its present form because it is unidentified due to perfect multicollinearity. Intuitively, this is because every company belongs to both an industry and a country, so that industry and country effects can be measured only relative to a

benchmark. To resolve this indeterminacy, they impose the restriction that the weighted sum of industry and country effects equal zero at every point in time, so that the industry and country effects are estimated as deviations from the intercept α:

$$\sum_{j=1}^{J} \beta_j \sum_{i=i}^{N} I_{ij} x_i = \sum_{j=1}^{J} \beta_j w_j = 0 \tag{3}$$

$$\sum_{k=1}^{K} \gamma_k \sum_{i=1}^{N} I_{ik} x_i = \sum_{k=1}^{K} \gamma_k v_k = 0 \tag{4}$$

N is the total number of firms in a given month. Typically, equation (2) is estimated using weighted least squares, with each stock return weighted by its beginning-of-month share of world stock market capitalization x_i. Then w_j corresponds to the market capitalization of industry j as a share of the total, while v_k is the market capitalization share of country k.

There are two ways to modify the standard model for the estimation of region effects. The first replaces the country dummies in equation (2) with region dummies:

$$R_i = \alpha + \sum_{j=1}^{J} \beta_j I_{ij} + \sum_{s=1}^{s} \lambda_s M_{is} + e_i \tag{5}$$

where I_{ij} is the same industry affiliation variable as above and M_{is} is now a dummy variable that identifies regional affiliation. There are S regions in total. To avoid multicollinearity, we impose a restriction analogous to (4):

$$\sum_{s=1}^{s} \lambda_s w_s = 0, \tag{6}$$

where w_s is the capitalization share of region s in the overall sample. This restriction ensures that the region effects are estimated relative to a benchmark portfolio, which is the global market portfolio. One disadvantage of model (5) is that it yields different industry effect estimates than model (2). This is because region dummies are a coarser classification than country dummies. As a result, the industry effect estimates from (5) will absorb some within-

region, country-specific variation that is omitted relative to model (2). For example, to the extent that Swizerland's industry composition is biased toward the banking sector, the banking industry effect will now capture some of the Swiss country factor.[8] A second disadvantage of model (5) is that, while it provides estimates of region effects, it does not provide any estimates of within-region country effects.

To address these deficiencies, we pursue a second approach, which augments the standard regression model in (2) with region dummies:

$$R_i = \alpha + \sum_{j=1}^{J} \beta_j I_{ij} + \sum_{s=1}^{s} \lambda_s M_{is} + \sum_{s=1}^{S} \sum_{k_s=1}^{K_s} \pi_{k_s} C_{ik_s} + e_i \qquad (7)$$

where I_{ij} and M_{is} denote industry and region affiliation of stock i, respectively. C_{ik_s} identifies country affiliation within a given region, there being k_s countries within region s. In order to estimate the region effects as deviations from the capitalization-weighted mean return across all stocks, we again impose restriction (6). Furthermore, we impose the restriction in (3) such that the industry effects are estimated as deviations from the global stock market return α. Still, these restrictions are not enough to avoid perfect multicollinearity. Intuitively, this is because every stock now belongs to both a region and a country, so that country effects can be measured only relative to a benchmark. As a result, we must impose a restriction on the π_{k_s} parameters, such that they are estimated as deviations from the relevant region effect:

$$\sum_{k_s=1}^{K_s} \pi_{k_s} w_{k_s}^s = 0 \qquad (8)$$

[8] From a mathematical point of view, the region dummies in model (5)—being coarser—only span a sub-space of the space spanned by the country dummies in (2). An implication of this is that the OLS estimates of the industry effects will differ across the two models.

To motivate this restriction, we write the capitalization-weighted mean return $\overline{R}^s$ in region *s* as:

$$\overline{R}^s = \sum_{i=1}^{n_s} w_i^s R_i = \alpha + \lambda_s + \sum_{i=1}^{n_s} w_i^s \sum_{j=1}^{J} \beta_j I_{ij} + \sum_{i=1}^{n_s} w_i^s \sum_{k_s=1}^{K_s} \pi_{k_s} C_{ik_s} \qquad (9)$$

where w_i^s is the capitalization share for each stock in region *s* and n_s is the number of stocks within that region. Expression (9) follows from $\sum_{i=1}^{n_s} w_i^s = 1$ and can be simplified to:

$$\overline{R}^s = \alpha + \lambda_s + \sum_{j=1}^{J} \beta_j w_j^s + \sum_{k_s=1}^{K_s} \pi_{k_s} w_{k_s}^s \qquad (10)$$

where w_j^s is the capitalization weight for industry *j* in region *s* and $w_{k_s}^s$ is the capitalization weight for country *k* in region *s*. Equation (10) shows that the capitalization-weighted mean return in region *s* has four components: the global factor α, a region-specific effect λ_s, a composite industry effect and a composite country effect. The composite industry effect, the term $\sum_{j=1}^{J} \beta_j w_j^s$, measures the bias in industrial composition of region *s* relative to the global market. If region *s* had the same capitalization weights on the various industries as the global portfolio, that term would disappear. Restriction (8) therefore implies that for such a region the excess return relative to the market, $\overline{R}^s - \alpha$, is exactly equal to the region effect λ_s. In this sense λ_s measures the "pure" region effect.

Estimating equation (7) subject to the restrictions in (3), (6), and (8) extracts the same variation from international returns as the original Heston and Rouwenhorst model in (2). This is because the region effects in our second approach are the capitalization-weighted means of the "pure" country effects of the standard model within each region. The within-region country effects are simply deviations of the "pure" country effects within each region

from the respective region effect. In other words, the second approach decomposes exactly the "pure" country effects in the standard model into region and within-region country shocks. It can also be shown that model (7) delivers the same estimates for the industry effects as model (2).[9]

In some of the results below, we follow Rouwenhorst (1999) in using mean absolute deviations (MADs) to measure the importance of region and within-region country effects. For illustration, in the case of the model with only country and industry effects, this measure weights the absolute values of the country and industry effects by their respective market capitalizations. Country and industry MADs in a given month are:

$$MAD_{Ct} = \sum_{k=1}^{K} v_{kt} \left| \gamma_{kt} \right| \tag{11}$$

$$MAD_{It} = \sum_{j=1}^{J} w_{jt} \left| \beta_{tj} \right| \tag{12}$$

where w_{jt} and v_{kt} are the capitalization weights at the beginning of period t. The country MAD can be interpreted as the capitalization weighted average tracking error for returns on industry-neutral country portfolios relative to returns on the benchmark portfolio. Similarly, we use MADs to characterize the importance of our region and within-region country effects. In particular, we present our results in terms of region MADs and composite within-region country MADs. These are given by:

$$MAD_{st}^{R} = \left| \lambda_{st} \right| \tag{13}$$

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[9] Since region dummies are simply a linear combination of country dummies, the space spanned by the region and country dummies in model (7) is the same as that spanned by the country dummies in model (2).

$$MAD_{st}^{WR} = \sum_{k_s=1}^{K_s} w_{k_s t}^{s} \left| \pi_{k_s t} \right| \tag{14}$$

where MAD^{R}_{st} is the region MAD for the region s in period t and MAD^{WR}_{st} is the composite within-region country MAD for the same region.

IV. How Important Are Region and Within-Region Country Effects?

This section examines the relative importance of region and within-region country effects embedded within the "pure" country effects of the Heston and Rouwenhorst (1994) model. It interprets the results in terms of portfolio diversification strategies. In particular, it explores how much of the risk reduction benefit due to diversifying across our 42 country portfolios can be achieved by diversifying across regions, relative to diversifying across countries within a region. Finally, it reports on several robustness tests.

Figure 2 explores the relative importance of region and within-region country effects in international return variation, based on capitalization-weighted regressions for US dollar-denominated total returns. The "Country and Industry Effects" line plots a two-year lagged moving average for the R-squared of the original Heston and Rouwenhorst (1994) regression model, which we estimate monthly for the cross-section of international returns. It shows that the combined explanatory power of country and industry effects has deteriorated gradually over the sample. During the first two years, the R-squared is 34 percent on average. This number is 23 percent during the last two-year window. The "Country Effects" line focuses on the explanatory power of the "pure" country effects only. It is constructed by dropping the industry effects from the monthly computation of the R-squared, essentially setting these coefficients to zero, so that the "Country Effects" line captures only the explanatory power of the "pure" country effects. It shows that the decline in explanatory power is even more pronounced for country effects, as noted by L'Her et al. (2002). For the first two years of the

sample, the R-squared of the "pure" country effects measures 23 percent. In the last two years, this number is down to 11 percent.

How much of this decline is due to region and within-region country effects? The "Region Effects (1)" line shows the R-squared of "pure" region effects, which is computed by estimating the regression model in equation (5), subject to the restrictions (3) and (6), and computing the R-squared associated with region effects only, by setting to zero the industry effect estimates. The "Region Effects (2)" line comes from estimating the regression model in equation (7), subject to constraints (3), (6) and (8), and calculating the R-squared associated with region effects only, by setting to zero both the within-region country and industry effect estimates. Figure 2 shows that the difference between the two measures of the R-squared for region effects is negligible, implying that our conclusions are robust to the approach chosen. Because of the disadvantages of the first approach, discussed above, we use the second approach, estimating (7) subject to (3), (6) and (8), in our subsequent discussion of region versus within-region country effects.

Figure 2 points out two important features of the data. First, although country effects have declined in importance over our sample period, this decline is not monotonic: country effects increased in importance from the mid-1980s to the early-1990s and only subsequently declined. Second, it shows that this decline is due in roughly equal measure to region and within-region country effects. While it would be tempting to conclude from this decline that both across as well as within-region integration has increased, we refrain from such a conclusion. The non-monotonicity of the decline in country effects an important reason for our skepticism, because there is little evidence that regulatory and other changes that could be associated with greater market integration were reversed over our sample period. It is thus difficult to interpret the inverted U-Shape in Figure 2 in terms of market integration. More

generally, since Adler and Dumas (1983), it is understood that a rise in comovement across markets, and a corresponding decline in the importance of country effects, need not be the result of greater market integration. Indeed, it could simply reflect common business cycles shocks. Nonetheless, it is interesting to observe that in spite of a series of "regional" crises that have hit international stock markets since the mid-1990s (the "Tequila", the Asian and Russian crises), region effects have been declining fairly steadily throughout this period. The only exception is the Asian crisis, during which the importance of both region and within-region country effects rose somewhat. Bekaert et al. (2002) provide a variety of exogenous (based on events like official liberalizations, ADRs introductions or launchings of country funds) and endogenous (data driven) dates for financial market integration in emerging markets. While these dates vary from country to country, Bekaert et al. (2002) find April 1993 to be a watershed around which a number of endogenous liberalization dates (as well as ADR launchings) are clustered.[10] Consistent with this evidence, Figure 2 shows that the fall in the importance of region effects begins after 1993.

Against this background, how important are region and within-region country effects? Figures 3 explores this question. It plots the two-year lagged moving average for the ratio of the R-squared from region effects only (setting to zero coefficient estimates for within-region country effects and global industry effects) to the R-squared from region plus within-region country effects (setting to zero the global industry effect estimates), along with error bands that measure two standard deviations either side of this ratio.[11] Based on estimating equation

[10] See Bekaert et al. (2002), page 40.

[11] The variance of the R-squared ratio is calculated every month using the Delta method, which is described in Green (1993). The variances are then averaged over time along with the

(continued)

(7) subject to (3), (6) and (8) for the full sample, Figure 3 plots this ratio for the full sample, the "All Countries" line, and for a sub-set of the data that drops stocks in the Developed Americas region, the "Non Dev. Ame. Regions" line. On average over the full sample period, region effects account for 52 percent of the international return variation explained by the "pure" country effects in the Heston and Rouwenhorst (1994) model. Diversifying across countries within the average regional portfolio thus captures half the risk reduction benefit from diversifying across all country portfolios in our sample, with the remainder captured by diversifying across regions. However, the "All Countries" line shows that the importance of region effects has declined somewhat over time. During the first two years of data, this ratio measures 59 percent. At the beginning of the sample, the bigger part of the return variation attributed to "pure" country effects in the standard model is thus really due to region effects. However, this ratio falls to about 46 percent in the last two years of the sample. The t-ratio associated with this decline measures 2.52, suggesting that, for the sample as a whole, the balance of variation explained by "pure" country effects in the standard model has shifted significantly in favor of within-region country-specific shocks.[12]

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point estimates for the R-squared ratio to construct the error bands around the moving average. This procedure assumes no serial correlation in the residuals of equation (7).

[12] If x_1 is the initial two-year average of the R-squared ratio and x_2 is the end-of-sample two-year average of the same ratio, we use the test statistic $t=(x_2-x_1)/(\text{sqrt}(\text{var}(x_1)+\text{var}(x_2))$, which is asymptotically distributed as a $N(0,1)$, to test if the initial and terminal ratios are significantly different.

Our main finding—that half the return variation attributed to country effects by the Heston and Rouwenhorst (1994) model is really due to region effects—is surprisingly robust to different cuts of the data. One particular concern relates to the fact that the Developed Americas region is dominated by the US, which has an average capitalization share within the region of 93 percent, with the remainder due to Canada. This raises the possibility that the Developed Americas region effect is really just a US country effect. To test the robustness of our results to this possibility, the "Non Dev. Ame. Regions" line plots the R-squared ratio for a sub-set of the data that excludes stocks in the Developed Americas region, based on the full sample regression results. For this sub-set of the data, the R-squared ratio averages 48 percent over our sample period, marginally below that for the full sample. As a result, our main finding is not driven by the possibility that the Developed Americas region effect is largely a US country effect. Moreover, for this sub-set of the data, it is still the case that the importance of region effects declines significantly over time. During the first two years of the sample, the R-squared ratio averages 54 percent, compared with 42 percent during the last two years of data. The t-ratio associated with this decline measures 2.14, suggesting that, for this subset of the data, it is still the case that the balance of variation explained by "pure" country effects in the standard model has shifted significantly in favor of within-region country-specific shocks.

Figure 4 explores the robustness of our result along a different dimension. Based on the full sample regression results, it plots the R-squared ratio for two sub-sets of the data: one that only includes stocks in developed regions, the "Dev. Countries" line, and another that includes only stocks in emerging markets, the "Emg. Markets" line. The R-squared ratio averages 52 percent for the developed regions sub-set, virtually unchanged from the full sample. However, for this sub-set of the data, there is no evidence of a significant decline in

the importance of region effects over time. During the first two years of the sample, the R-squared ratio averages 56 percent, compared with 50 percent during the last two years of data. The t-ratio associated with this decline measures 1.17, suggesting that the balance of variation explained by region versus within-region country effects has been broadly stable in developed markets. In the emerging markets sub-set of the data, the full sample average of the R-squared ratio measures 48 percent, only slightly below the 52 percent in developed markets. Surprisingly, there appears to be little difference between developed and emerging markets in terms of the relative importance of region and within-region country effects: region effects in emerging markets still account for almost half the return variation attributed to country effects by the standard model. Neither is there evidence that the importance of region relative to within-region country effects has fallen significantly over time in emerging markets. During the two year period to December 1993, a period that includes the Bekaert et al. (2002) watershed date of April 1993, the R-squared ratio averages 57 percent, compared with 36 percent during the last two years of data. Although this decline is much larger in absolute magnitude than for developed markets, the associated t-ratio measures 0.71, suggesting that, even for the emerging markets sub-set of the data, there is no evidence of a significant change in the relative importance of region versus within-region country effects.[13]

[13] The initially wide error bands of the R-squared ratio for the emerging markets sub-sample reflects the relatively small number of emerging markets at the beginning of our sample. These error bands narrow quickly as coverage of emerging markets improves. During the first two years of the sample, the R-squared ratio measures 79 percent. Due to the wide error bands, however, the decline in this ratio to the end of the sample is still not significant.

On balance, we conclude that the decline in the relative importance of region effects for the full sample reflects both permanent and temporary factors. Among the former is the growing importance of emerging markets over time, combined with evidence that the relative importance of region effects is somewhat lower in emerging than developed markets. Among the latter is the fact that the R-squared ratios for the full sample, for developed market sub-sample and for the emerging markets sub-sample describe an inverted u-shape over time, rising from the mid-1980s to the early-1990s and falling thereafter. The declining importance of region effects thus has a cyclical element, suggesting that it is at least in part temporary.

What does all this mean in terms of portfolio diversification strategies? How much of the risk reduction benefit from diversifying internationally can be obtained by diversifying across countries within regions? And what is the incremental risk reduction benefit of going the additional step of diversifying across regions? Figure 5 addresses these questions, using the graphical representation in Heston and Rouwenhorst (1994) and Solnik (1975) to evaluate diversification gains along different dimensions. It gives the average portfolio variance as the number of stocks in a given portfolio increases from 1 to 40, expressed as a percentage of the average variance of all individual stocks in our sample. The "global portfolio" line shows the diversification benefit obtained from holding a value-weighted portfolio across all stocks in our sample. This portfolio has a variance of 10 percent relative to the average stock. The "within country (across industries)" line is the average variance across value-weighted country portfolios that diversify across industries within a given country. Such portfolios—not surprisingly—achieve a more modest risk reduction than the "global portfolio" line: the average variance of the "within country (across industries)" portfolio amounts to 20 percent of the average stock. The difference between these two numbers can be interpreted as the additional risk reduction from diversifying across countries. The "within regions (across

countries and industries)" line depicts the average variance of value-weighted regional portfolios that diversify across countries and industries within a given region. By construction, this line lies between the "within country (across industries)" and the "global portfolio" lines: the average variance of the regional portfolio is 15 percent of the average stock. How does this graphical representation map into our regression results? The vertical distance between the "within country (across industries)" and the "within regions (across countries and industries)" lines captures the additional diversification benefit—above and beyond diversifying within countries across industries—from diversifying across countries within the average region portfolio, assuming that the industrial structure of the average region portfolio is little different from that of its constituent countries. It thus captures the risk reduction benefit from diversifying away within-region country shocks. The vertical distance between the "within regions (across countries and industries)" and the "global portfolio" lines captures the additional diversification benefit—beyond diversifying within regions—from diversifying across regions. It therefore describes the risk reduction potential associated with regional shocks in international stock returns, again assuming that industrial composition is little different across the average regional and the global portfolios. The fact that the "within regions (across countries and industries)" line lies roughly halfway between the "within country (across industries)" and the "global portfolio" lines is visual confirmation of the regression results: region and within-region country effects in international stock returns are of roughly equal importance.[14]

[14] Figure 5 is constructed using portfolio variances for the full sample period and thus captures the average importance of region versus within-region country effects over time.

Our results so far have been based on capitalization-weighted regressions that use US dollar-denominated returns. Capitalization-weighting, which we call value-weighting below, may overstate the importance of region relative to within-region country effects, because it collapses a region towards the most important constituent in market capitalization terms. We test for this possibility by running equal-weighted regressions instead. In these regressions, each stock enters the estimation with equal weight, rather a capitalization-based weight. It will still be the case that large countries will dominate certain regions, because countries like the US are large both in terms of market capitalization and in terms of the number of stocks listed, but this effect will be less pronounced. In addition, it is possible that using US dollar-denominated returns, rather than local currency returns, is affecting the relative importance of region versus within-region country effects. We test for this possibility by running equal-weighted regressions, using local currency returns instead of US dollar-denominated returns.

Figure 6 reports the results from this final round of robustness tests. As a reference point, it plots the moving average of the R-squared ratio for the full sample, based on the value-weighted regressions that use US dollar-denominated returns. This series is denoted "USD VW." Figure 6 plots the same ratio based on equal-weighted regressions that use the same US dollar-denominated returns, the "USD EW" line. For this specification, the R-squared ratio averages 36 percent over the full sample, compared to 52 percent using the value-weighted regressions. While the relative importance of region effects thus depends on value- versus equal-weighting, it is still the case that region effects explain a substantial amount of the variation attributed to country effects in the standard model. Moreover, there is no longer any evidence that the relative importance of region effects falls significantly over the sample period. During the first two years of the sample, the ratio averages 41 percent. It averages 35 percent in the last two years of data. The associated t-ratio is 1.22, suggesting

that the balance of region versus within-region country effects is stable over time. Finally, Figure 6 plots the R-squared ratio based on equal-weighted regressions that use local currency returns, denoted the "LC EW" line. For this specification, the R-squared ratio averages 31 percent over the full sample, which suggests that using US dollar-denominated returns rather than local currency returns has only a minor effect on the relative importance of region effects. Furthermore, according to this specification, the relative importance of region effects actually increases over the sample period, though not significantly so. The R-squared ratio averages 30 percent during the first two years of data, while this number is 33 percent during the last two years of the sample. The associated t-ratio is 0.60.

Overall, this final round of robustness tests helps confirm our two main points. First, region effects explain a substantial amount of the variation that is attributed to country effects in the Heston and Rouwenhorst (1994) model, not matter whether regressions are value- or equal-weighted or whether returns are US dollar-denominated or measured in local currency. Second, the balance of international return variation explained by region versus within-region country effects has been broadly stable over time.

V. A Regional Perspective on Diversification Strategies

While the previous section investigates the overall importance of region and within-region country effects, this section explores their importance by region. First, this allows us to assess the diversification potential associated with individual regions, by comparing the absolute magnitude of their region effects. For example, are emerging market region effects larger in absolute terms than those of developed markets? If this is the case, emerging market regions have more diversification potential than developed market regions, consistent with Goetzman et al. (forthcoming) who argue that portfolio diversification strategies must rely increasingly on emerging markets to be effective. In addition, a comparison across regions of

the overall magnitude of within-region country effects provides a look at the diversification potential of the average country portfolio within each region. Second, this allows us to investigate the extent to which emerging market stocks behave as a single asset class, by comparing the Emerging Americas, Emerging Asia and Emerging Europe region effects. Are these region effects similar in magnitude? If so, this would support the notion that emerging market stocks behave as a single asset class.

Figure 7 investigates the diversification potential associated with each region, using the benchmark model based on value-weighted regressions and US dollar-denominated returns. It plots the sample mean of the MADs of each region effect, the "Region MAD" bars, for each region in our data: Developed Europe, Developed Americas, Developed Asia, Emerging Asia, Emerging Europe and Emerging Americas. These MADs are the average absolute excess return, relative to the global portfolio and adjusting for differences in industrial structure, of each region and thus provide an assessment of the diversification potential associated with each region. Figure 7 also lists the capitalization-weighted average MADs of these region effects, the "Cap-Weighted Region MAD" bars, which provide an assessment of the risk reduction benefit from the perspective of a well-diversified investor. These values are calculated by multiplying each region MAD by its capitalization share in the global portfolio, calculating the sample mean for each region, and then scaling these numbers up by six (the number of regions). Finally, the horizontal line in Figure 7 is the capitalization-weighted average across region MADs, a measure of the diversification potential of the average region portfolio.

Figure 7 illustrates that the diversification potential associated with emerging market region portfolios is greater than for developed market regions, consistent with Goetzman et al. (forthcoming) who argue that emerging markets are critical to successful diversification

strategies. In Emerging Asia, the region MAD averages 4.68 percent, compared with a capitalization-weighted average of 2.53 percent across regions. Meanwhile, the region MADs for Emerging Europe and Emerging Americas average 5.20 and 5.86 percent over the sample. From the perspective of an investor who is well-diversified across regions, the cap-weighted region MADs show that the risk reduction benefit associated with emerging market regions is much less, however, a reflection of their historically small market capitalizations. In contrast to Goetzman et al. (forthcoming), our results suggest that developed markets remain important for risk reduction strategies, even with the rise in comovement across markets. Going forward, the role of emerging markets for international diversification strategies will likely rise as their capitalization share increases.

Figure 8 examines the diversification potential associated with the average country portfolio within each region. The "Within-Region Country MAD" bars are a capitalization-weighted composite of the within-region country MADs for each region. The greater are these numbers, the more acute return heterogeneity within regions. The "Cap-Weighted Within-Region Country MAD" bars are constructed analogously to the "Cap-Weighted Region MAD" bars in Figure 7. They measure the effective risk reduction associated with the average country portfolio within a given region, from the perspective of an investor who is well-diversified across regions. Finally, the horizontal line in Figure 8 is the capitalization-weighted average across regions of the composite within-region country MAD. This number gives the average diversification potential associated with the average country portfolio in the average region portfolio.

The within-region country MADs show that within-region return heterogeneity is much greater within emerging market regions that in developed markets. The composite within-region country MAD for Emerging Asia averages 5.65 percent, compared with 1.55

percent for the capitalization-weighted average across regions. The composite within-region country MADs for Emerging Europe and the Emerging Americas are 2.42 and 4.89 percent, respectively. From the perspective of a well-diversified investor, the picture is again quite different, however. In capitalization-adjusted terms, there is much les scope for risk reduction from investing in the average country portfolio in emerging market regions than in developed market regions. One notable exception to this is the Developed Americas region, where the fact that the US has an average capitalization share of 93 percent means that within-region country heterogeneity is extremely small.

Finally, our evidence on whether emerging market stocks behave as a single asset class is mixed. On the one hand, none of the emerging market region effects in Figure 7 are significantly different from each other, which is consistent with the view, articulated by Serra (2000), that investors do not differentiate between emerging markets and treat them as a single asset class. On the other hand, our earlier results suggest that the balance of return variation explained by region versus within-region country effects in emerging markets is comparable to that in developed markets. In other words, the degree of return heterogeneity within the average emerging market region is comparable to that in the average developed market region, which suggests that investors do differentiate across emerging markets. This suggests that there is little difference between emerging and developed markets in the way investors differentiate investment opportunities.

VI. Conclusion

In this paper we investigate the relative importance of region and within-region country effects in international return variation. We augment the Heston and Rouwenhorst (1994) model, which is widely used to assess the importance of pure country and global industry effects in international stock returns, with a new decomposition that further

disaggregates pure country effects into region and within-region country effects. Using returns data from January 1985 to April 2003 for 9,679 stocks in 42 countries, we follow the MSCI country indices in dividing our sample into six regions: Developed Europe, Emerging Europe, Developed Americas, Emerging Americas, Developed Asia and Emerging Asia.

We find that, embedded within the pure country effects of the prevailing approach, region effects are an important source of return variation, explaining half the return variation accounted for by pure country effects. For a Dutch investor deciding whether to diversify within Europe, or whether to diversify globally, these results suggest that diversifying within Europe gets her half the risk reduction benefit associated with diversifying globally. We find that this relation is remarkably robust. In particular, it holds in equal measure in developed and emerging markets.

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Table 1. Summary Statistics for the Data by Country, Region and Industry

	December 2000				January 1985 - April 2003	
	Number of Firms	Market Capitalization Weight (%)	Standard & Poor's Emerging Markets Factbook 2001 (Number of Firms)	Standard & Poor's Emerging Markets Factbook 2001 (Market Capitalization Weight in %)	Mean USD Return (in % per month)	Standard Deviation of USD Return (in % per month)
United States	1284	48.72	7524	47.42	1.34	4.76
United Kingdom	965	9.34	1904	8.09	1.26	5.32
France	353	5.08	808	4.54	1.46	6.06
Germany	398	3.68	1022	3.99	1.12	5.89
Italy	216	2.40	291	2.41	1.21	7.12
Japan	1183	9.97	2561	9.91	0.79	6.83
Canada	409	2.40	3977	2.64	1.11	4.89
Other Developed Markets	2057	13.57	5877	13.81	1.35	5.06
Emerging Markets	1925	4.84	13224	7.18	1.52	7.12
Mean	977	11.11	4132	11.11	1.24	5.89
Median	965	5.08	2561	7.64	1.25	5.89
Europe	3729	31.62	8518	30.17	1.32	4.91
Americas	2231	52.16	12880	51.94	1.34	4.87
Asia	2830	16.22	15790	17.89	1.00	6.07
Mean	2930	33.33	12396	33.33	1.22	5.28
Median	2830	31.62	12880	30.17	1.32	4.91
Developed Europe	3354	30.26	7231	29.18	1.32	4.96
Emerging Europe	375	1.35	1287	0.99	1.21	7.27
Developed Americas	1693	51.12	11501	50.06	1.32	4.71
Emerging Americas	538	1.04	1379	1.88	1.37	10.53
Developed Asia	1818	13.77	5232	13.58	0.92	6.32
Emerging Asia	1012	2.45	10558	4.31	1.22	6.96
Mean	1465	16.67	6198	16.67	1.23	6.79
Median	1353	8.11	6232	8.94	1.27	6.64
Basic Industries	1039	3.94			1.07	5.13
General Industries	1119	8.85			1.08	5.34
Cyclical Consumer Goods	452	2.78			1.12	5.09
Non-Cyclical Consumer Goods	972	14.37			1.40	3.94
Cyclical Services	1432	11.71			1.26	4.61
Non-Cyclical Services	366	10.83			1.20	5.03
Utilities	341	3.51			1.09	4.00
Information Technology	796	15.42			1.32	8.01
Financials	1879	22.61			1.32	5.04
Resources	394	5.97			1.16	4.87
Mean	879	10.00			1.20	5.11
Median	884	9.84			1.18	5.03
Total	8790	100.00	37188	100.00	1.25	4.36

Notes: The data cover monthly total US dollar-denominated stock returns and market caps for 9,769 stocks in 42 countries from January 1985 to April 2003. A total of 8,969 firms are active in December 2000. Other developed markets are given by Australia, Austria, Belgium, Denmark, Finland, Greece, Hong Kong, Ireland, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden and Switzerland. Emerging markets consist of Argentina, Brazil, Chile, China, Colombia, Czech Republic, India, Indonesia, Korea, Mexico, Peru, Philippines, Poland, South Africa, Taiwan, Thailand and Turkey. We follow Morgan Stanley Capital International (http://www.msci.com/equity/index.html) in assigning each country to one of three regions (Europe, Americas, Asia) and in determining whether it is a developed or an emerging market. The means are simple averages. The paper uses more disaggregated Level 4 Datastream Global Market industries, of which there are 40, for the empirical analysis. The mean and standard deviations of the monthly returns are for value-weighted country and industry portfolios.

Figure 1 shows that region effects are quantitatively important. It plots the median correlations of country effects within different regions and across all markets. Country effects are estimated using the dummy variable model of Heston and Rouwenhorst (1994), which decomposes international stock returns into country and industry effects. From September 1993, when all countries have joined the data, we then compute pairwise correlations for all country effects in the sample, which covers monthly US dollar-denominated stock returns for 9,679 stocks in 42 developed and emerging markets from January 1985 to April 2003.

Figure 1. Median Pairwise Correlation of Pure Country Effects
(September 1993 - April 2003)

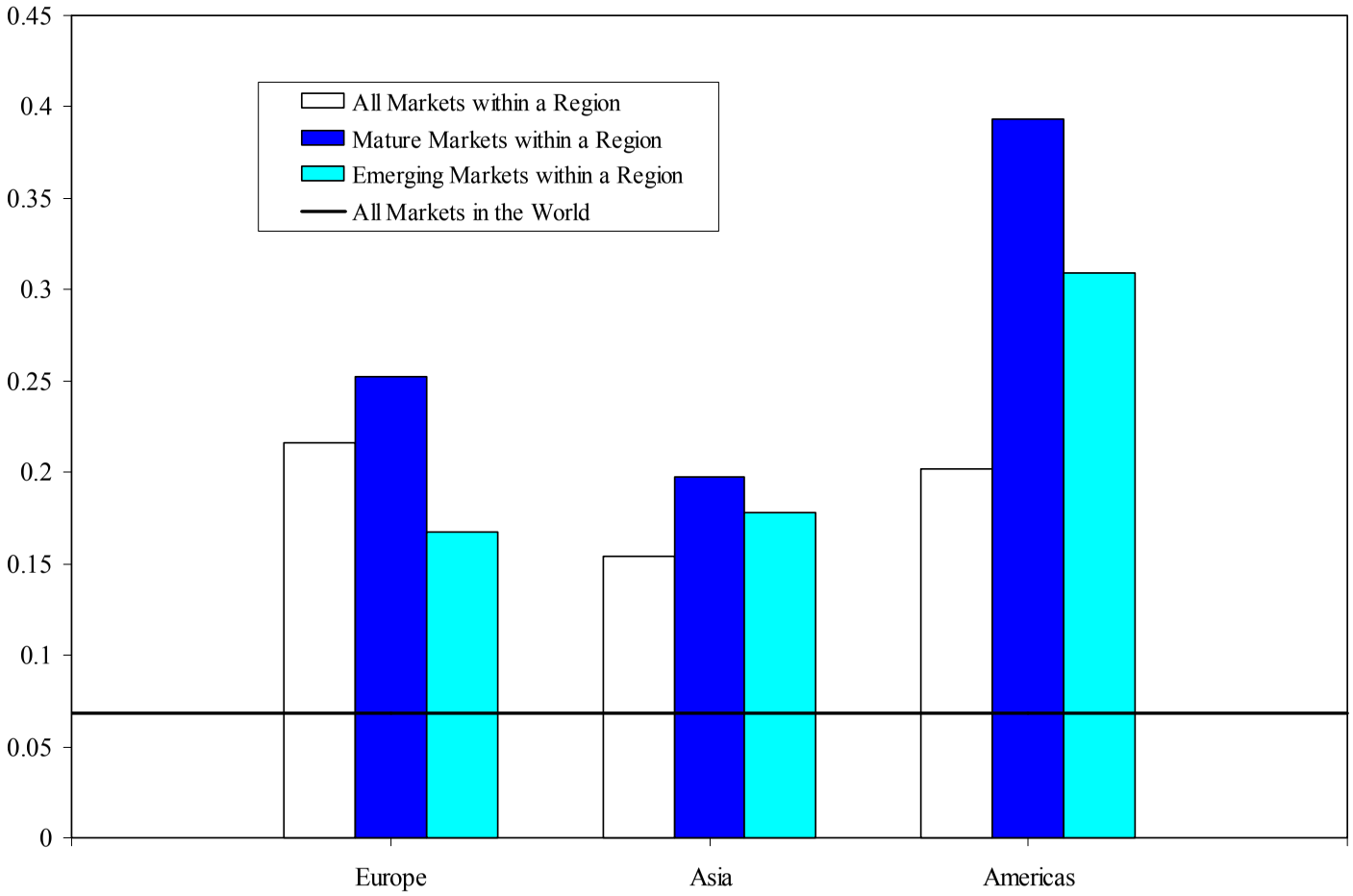

Figure 2 explores the relative importance of region and within-region country effects for the full sample. The "Country and Industry Effects" line is a moving average for the R-squared of the Heston and Rouwenhorst (1994) regression model. The "Country Effects" line shows the R-squared of the country effects only from that regression. The "Region Effects (1)" line shows the R-squared of pure region effects, estimated using equation (5). The "Region Effects (2)" shows the R-squared of region effects estimated using (7).

Figure 2. The Relative Importance of Region versus Within-Region Country Effects
(2-Year Lagged Moving Average of the R-Squared in %)

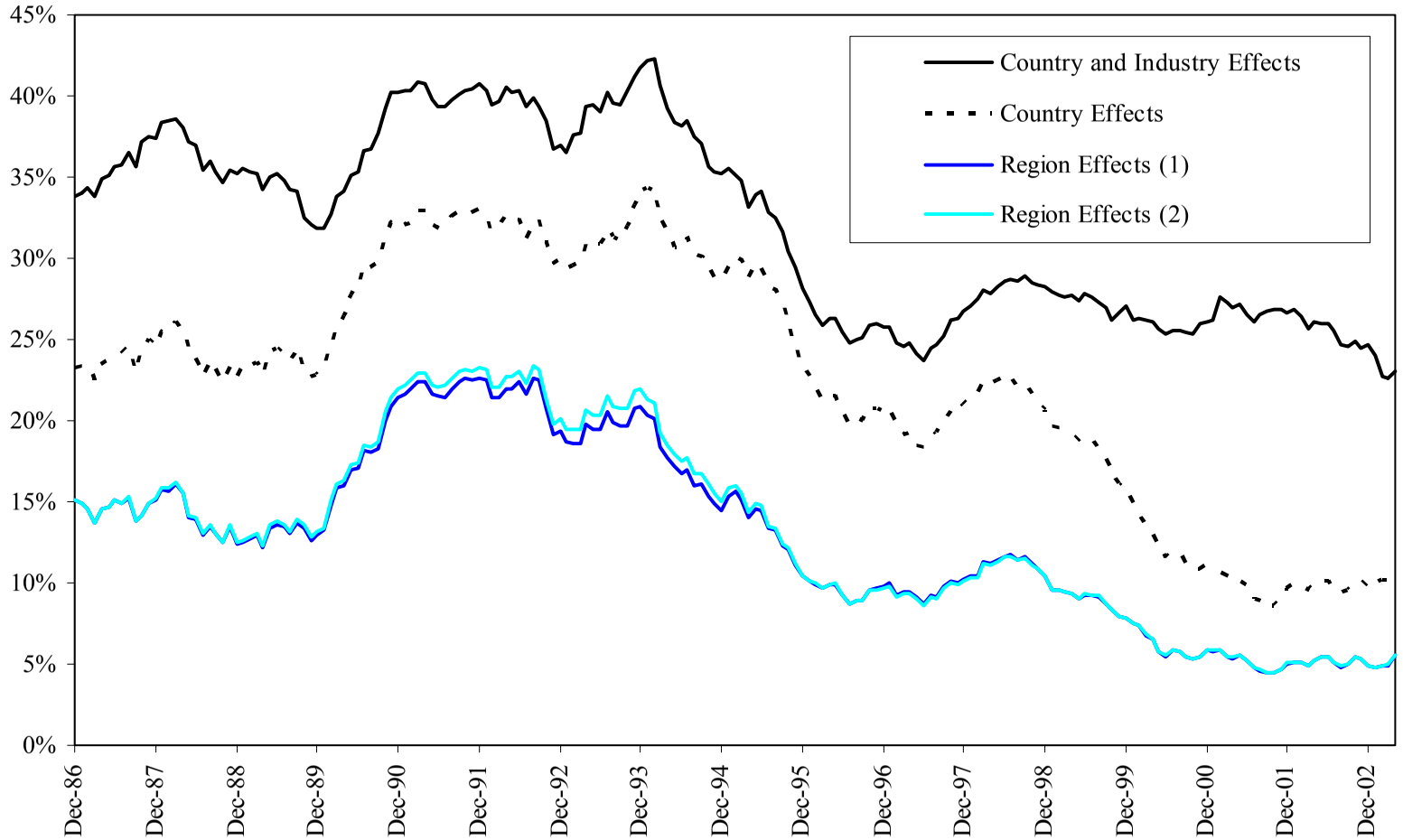

Figure 3 shows—for the full sample (All Countries) and the full sample excluding the Developed Americas region (Non Dev. Ame. Regions)—the ratio of the R-squared of region effects only (setting to zero coefficient estimates for within-region country effects and global industry effects) to the R-squared of region plus within-region country effects (setting to zero the global industry effect estimates), along with error bands that measure two standard deviations either side of this ratio. Error bands are constructed using the Delta method and assume no serial correlation in the residuals of equation (7).

Figure 3. Percent of R-squared of Heston and Rouwenhorst (1994) country effects explained by region effects: the full sample (All Countries) and the full sample without the Developed Americas region (Non Dev. Ame. Regions)

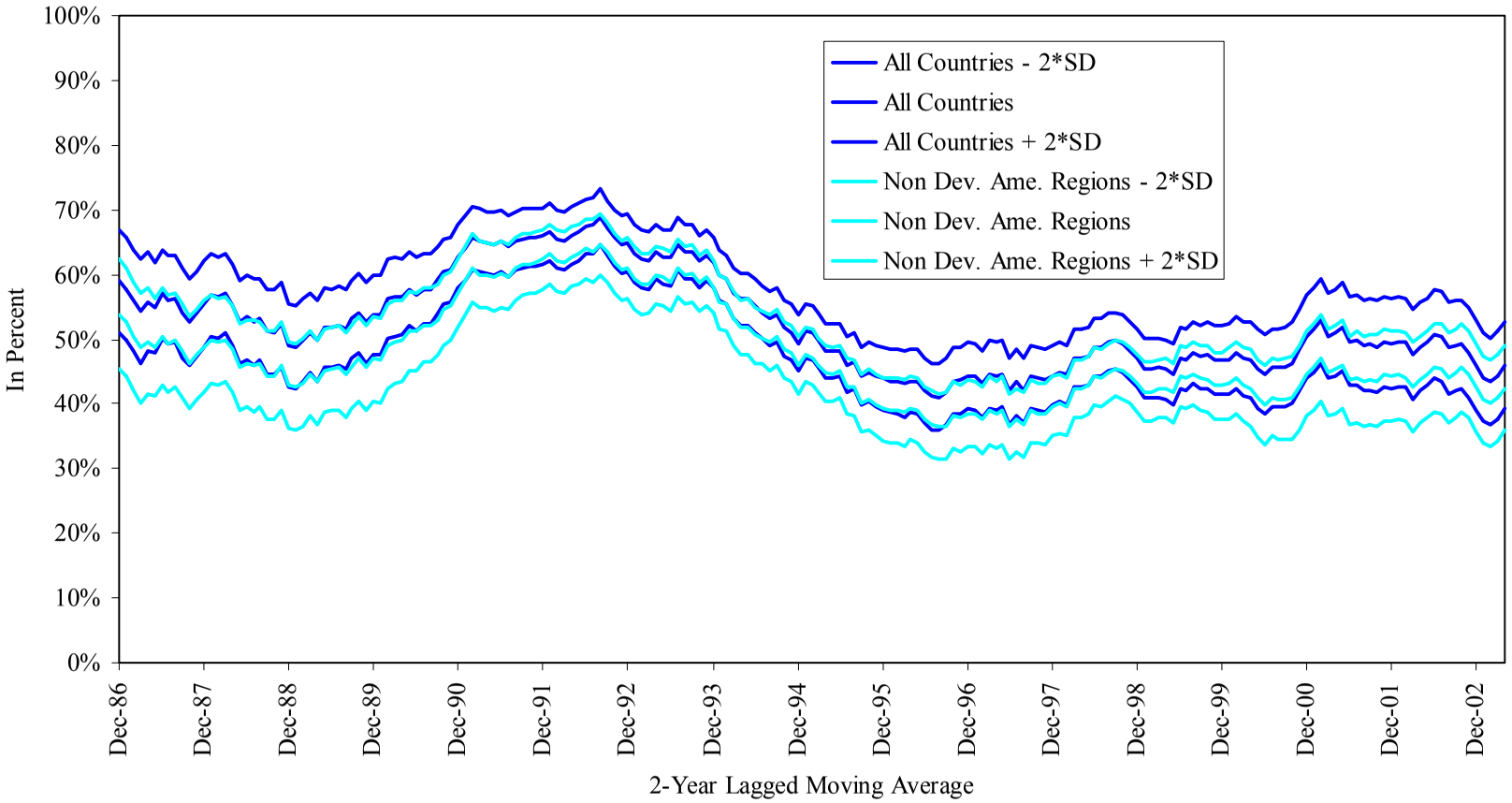

Figure 4 shows—for developed (Dev. Countries) and emerging markets (Emg. Markets)—the ratio of the R-squared of region effects only (setting to zero coefficient estimates for within-region country effects and global industry effects) to the R-squared of region plus within-region country effects (setting to zero the global industry effect estimates), along with error bands that measure two standard deviations either side of this ratio. Error bands are constructed using the Delta method and assume no serial correlation in the residuals of equation (7).

Figure 4. Percent of R-squared of Heston and Rouwenhorst (1994) country effects explained by region effects: developed (Dev. Countries) versus emerging markets (Emg. Markets)

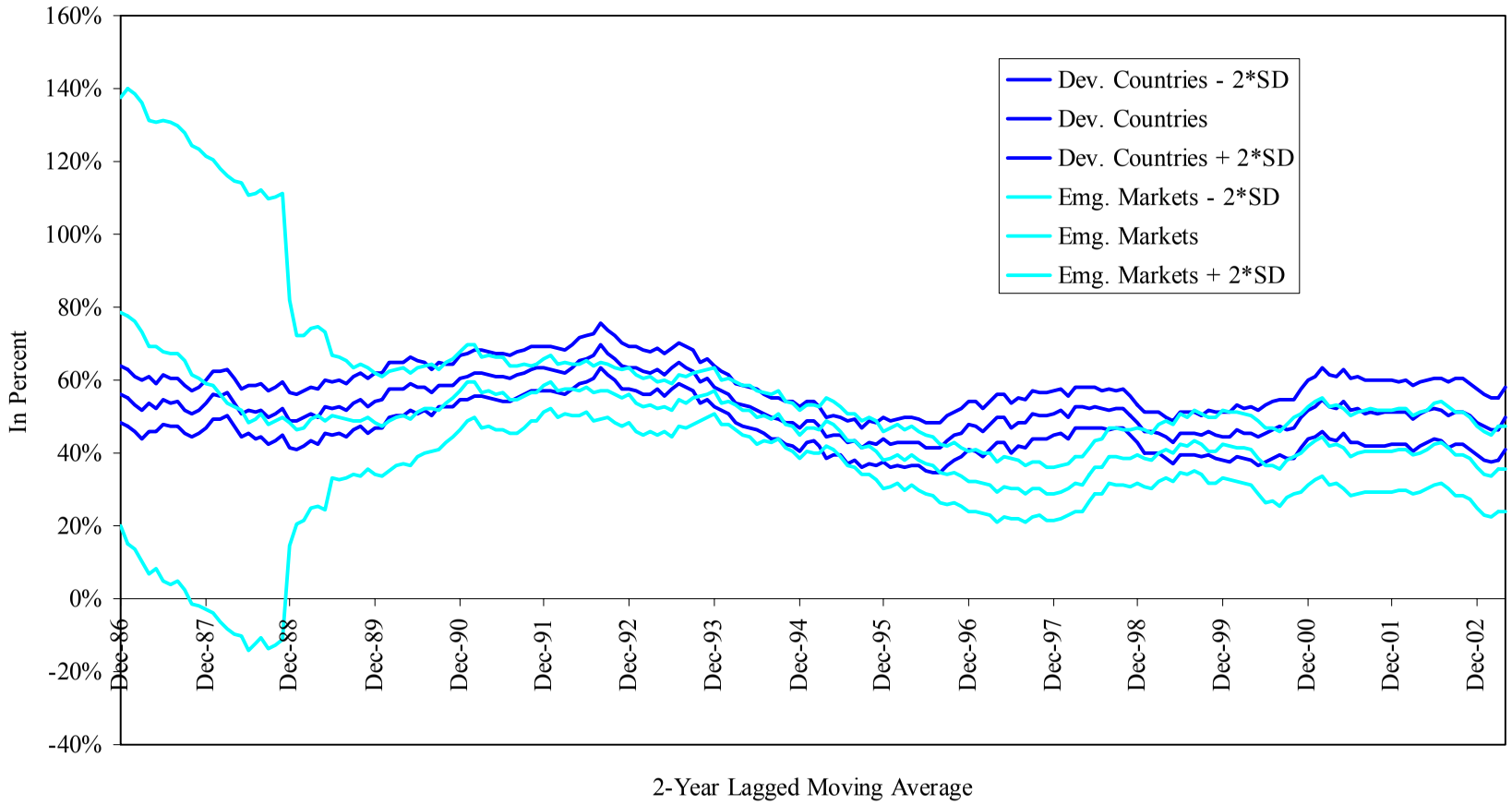

Figure 5 shows average portfolio variance as the number of stocks increases, in percent of the average stock. The "within country" line is the variance of a portfolio that diversifies across industries, averaged across countries. The "global portfolio" line diversifies across all stocks in the sample and represents the maximum risk reduction possible. The "within regions" line depicts the average variance of a portfolio that diversifies across industries and countries within regions, averaged across regions.

Figure 5. Risk Reduction from Diversifying Across Value-Weighted Country, Region and Global Portfolios

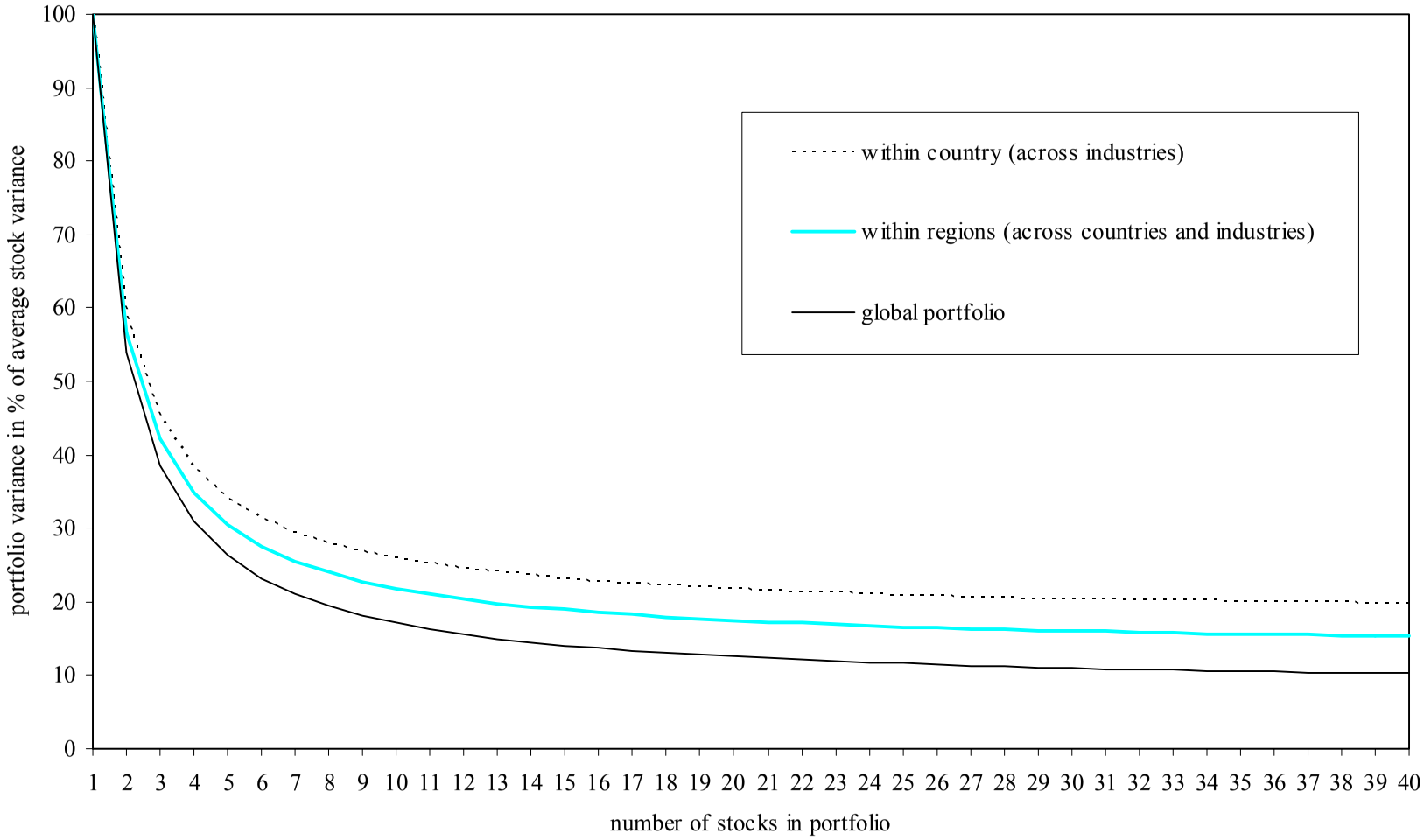

Figure 6 shows—for capitalization-weighted US dollar returns (USD VW), equal-weighted US dollar returns (USD EW) and equal-weighted local currency returns (LC VW) for the full sample—the ratio of the R-squared of region effects only (setting to zero coefficient estimates for within-region country effects and global industry effects) to the R-squared of region plus within-region country effects (setting to zero the global industry effect estimates), along with error bands that measure two standard deviations either side of this ratio. Error bands are constructed using the Delta method and assume no serial correlation in the residuals of equation (7).

Figure 6. Percent of R-squared of Heston and Rouwenhorst (1994) country effects due to region effects: value- (USD VW) and equal-weighted (USD EW) US dollar returns and equal-weighted local currency returns (LC EW).

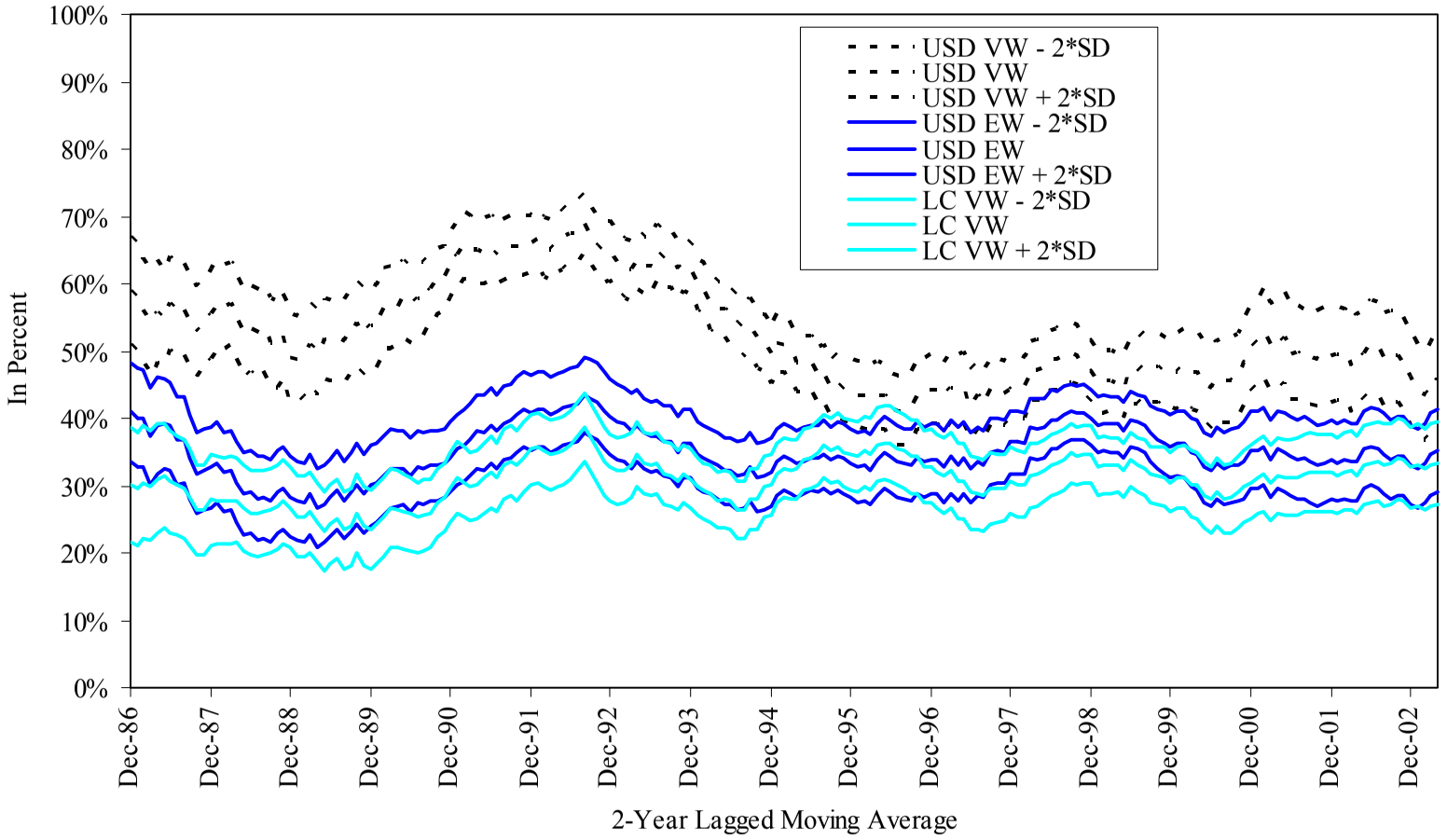

Figure 7 plots the mean absolute deviation of each region effect (Region MAD) averaged over the full sample period, a measure of the diversification potential associated with each region. It also plots the capitalization-weighted analogue of this measure (Cap-Weighted Region MAD), a measure of their risk reduction benefit in a well-diversified portfolio. The horizontal line plots the capitalization-weighted average of the region MADs across regions (Cap-Weighted Average).

Figure 7. Diversification Potential Across Regions

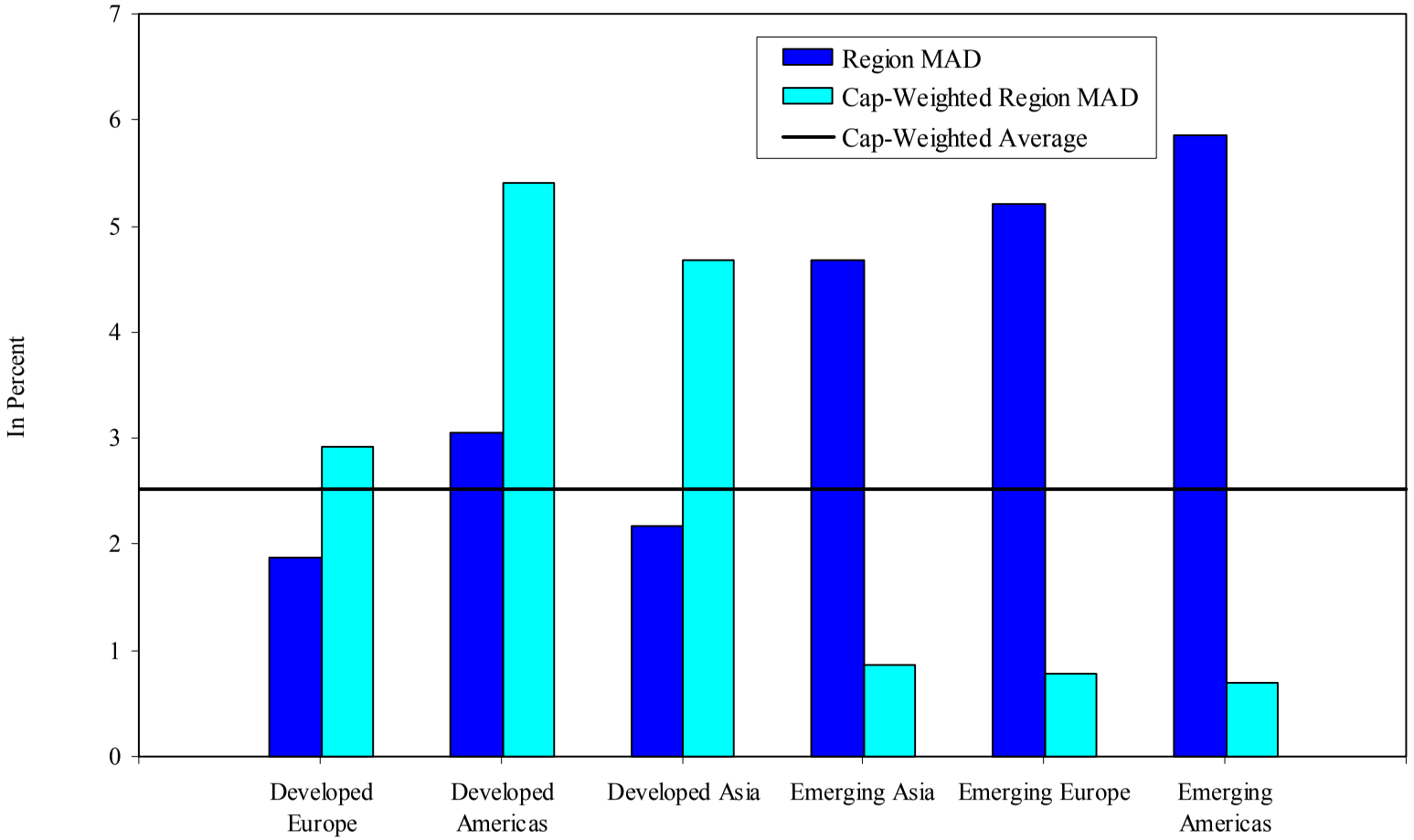

Figure 8 plots the capitalization-weighted composite over the mean absolute deviations of within-region country effects within each region (Within-Region Country MAD), averaged over the full sample period, a measure of the diversification potential associated with the average country portfolio within each region. It also plots the capitalization-weighted analogue of this measure (Cap-Weighted Within-Region County MAD), a measure of the risk reduction benefit associated with the average country portfolio within a well-diversified global portfolio. The horizontal line plots the capitalization-weighted average across regions of the composite within-region country MADs (Cap-Weighted Average).

Figure 8. Diversification Potential Within Regions