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Working Paper

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CFR Working Paper, No. 20-13

Provided in Cooperation with:
Centre for Financial Research (CFR), University of Cologne

Suggested Citation: Jagannathan, Murali; Jiao, Wei; Wermers, Russ (2020) : International characteristic-based asset pricing, CFR Working Paper, No. 20-13, University of Cologne, Centre for Financial Research (CFR), Cologne

This Version is available at:
https://hdl.handle.net/10419/228695

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International Characteristic-Based Asset Pricing

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Abstract

In this paper, we develop characteristic-based asset-pricing models for international stocks. We price stocks using passive portfolios created based on observable characteristics: market capitalization, book-to-market, prior-year return, growth of total assets, and operating profitability, each separately created for a given geographical region of the world. As such, our approach allows for segmentation in characteristic-based asset pricing among regions. Using a resampling micro-portfolio approach recently introduced by Barras (2018), we find that market capitalization is the most powerful characteristic in pricing international stocks, and that a three-characteristic model based on market capitalization, book-to-market, and prior-year return has the lowest pricing errors. We also show that characteristic-based benchmarks exhibit much lower pricing errors, relative to global factor-based models. We further apply our characteristic models to the equity holdings of U.S. funds that invest in international stocks. International index funds exhibit zero abnormal returns, while active funds that charge higher fees and that mainly invest in emerging markets and small or mid-capitalization stocks exhibit positive and significant abnormal returns. These results indicate that U.S.-domiciled active managers are able to generate abnormal returns in less-efficient sectors of non-U.S. stock markets, when expected returns are measured using characteristic-based pricing.

Keywords: International asset pricing, Characteristic-based asset-pricing models, International mutual funds

JEL Codes: G12, G15, G23

This version: August 2019

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A large literature attempts to explain the cross-section of expected returns of international (i.e., non-U.S.) stocks. Similar to the literature on U.S. stocks, the early models emphasize the importance of market-wide or consumption-based risks in explaining stock returns (Solnik (1974), Stulz (1981)). Subsequently, the literature suggests firm-level characteristics, such as size and book-to-market, as important factors in explaining international stock returns (Fama and French (1998, 2012, 2017), Griffin (2002), Hou, Karolyi, and Kho (2011)). But, even controlling for the predicted returns from the exposure to these factors, studies find that the characteristics themselves have additional power in explaining the returns (Hou, Karolyi, and Kho (2011), Chordia, Goyal, and Shanken (2015)).

In this paper, we explore which firm-level characteristics can better explain the cross-sectional variation in international stock returns and develop characteristic-based asset-pricing models for international stocks. In doing so, we focus on five observable characteristics shown to be powerful in pricing U.S. stocks: market capitalization (size), book-to-market (value), prior-year return (momentum), growth of assets (investment), and operational profitability (profitability). Our sample includes over 44,000 stocks from 79 non-U.S. countries. We also compare our characteristic-based models with global factor-based models. Since the literature on international asset pricing suggests that markets are not integrated, and equity prices are better explained by local rather than global factors (Bekaert and Harvey (1995), Griffin (2002), Karolyi and Stulz (2003), Bekaert et al. (2011), Hou, Karolyi, and Kho (2011), Fama and French (2012), and Karolyi and Wu (2017)), we segment the global market into regions and then create characteristic-based models for each region.

Our approach, in this paper, excludes stocks within the bottom 10 percent free-float market-capitalization of each country from the sample, in order to reduce the impact of illiquid stocks as well as stocks that are likely to have less-accurate accounting information available to public markets. Another concern regarding the construction of benchmarks is that the calculation of book-to-market ratio may suffer from different accounting standards across countries. Thus, when computing the book-to-market ratio, we industry-adjust the ratio within the country (Wermers (2004)). We believe that this adjustment standardizes the differences caused by accounting standards across countries. Momentum is measured as the past one-year stock return. Investment is measured as the growth of total assets. Profitability is measured as the revenues minus cost of

goods sold, minus sales, general, and administrative expenses, minus interest expense, all divided by book equity.

We rely on the existing literature (Hou, Karolyi, and Kho (2011) and Fama and French (2012)) and use some subjectivity in determining geographic regions. We group all international stocks into 9 regions: Canada, China Region, Europe Emerging, Europe Developed, India, Japan, Latin America, Middle East and Africa, and Pacific Asia. Due to the relatively small numbers of stocks available in certain regions, we create benchmark portfolios using quartile cutoffs of size, book-to-market, momentum, investment, and profitability for each region instead of the quintile cutoffs used in widely accepted U.S. characteristic-based models (i.e., Daniel, et al., 1997; DGTW). To the extent that markets may not be integrated even within a region, we also construct benchmarks at the country level.

We mainly employ the micro-portfolio approach proposed in Barras (2018) to explore which characteristic or which combinations of characteristics can explain the cross-sectional variation in international stock returns. This approach is a good compromise between using diversified portfolios sorted on characteristics, such as the Fama-French 25 size-B/M portfolios, and using individual stocks. Standard asset pricing tests typically consist of forming diversified portfolios sorted on characteristics that track average returns. Lewellen, Nagel, and Shanken (2010) and Daniel and Titman (2012) show that this approach lacks statistical power to reject mis-specified asset pricing models. This is because, when we form such portfolios, we diversify away the variations in characteristics within each portfolio. Any proposed factor is likely to produce betas that line up with the expected returns of these portfolios. On the other hand, asset pricing tests using individual stocks cause mispriced stocks not to be detected in the data, since individual stocks' returns are too volatile. As with portfolios sorted on characteristics, micro portfolios maintain large spreads in average returns and relatively low estimation errors. Meanwhile, micro portfolios preserve the variations in characteristics since they significantly expand the number of test assets. The optimal number of stocks to be used in a micro portfolio is based on the tradeoff between diversification gains and independent variation, and as in Barras (2018), we report results with a portfolio size of 10 stocks.

Each micro-portfolio corresponding to a stock consists of the stock itself plus nine other stocks with the closest expected returns predicted by size, value, and momentum from the same region. We rely on the new performance measure proposed in Barras (2018)- the proportion of

portfolios mispriced- to compared various models. This new measure is specifically designed for the analysis of large cross-sections and suits the large sample of micro portfolios of international stocks in our study.

We first check the performance of world market returns and regional market returns in pricing international stocks. Their performance can serve as the baseline from which to evaluate the performance of characteristic-based benchmarks. We find that 29.4% of the micro portfolios are mispriced by world market returns, and 14.9% are mispriced by regional market returns. The big improvement brought by regional market returns also suggests that financial markets are not fully integrated, and local factors/characteristics could play an important role in explaining international stock returns.

We then check the performance of benchmarks created with a single characteristic. We focus on five firm characteristics that are shown to explain the cross-section of expected returns well: size, value, momentum, investment, and profitability. We find that 3.8% of the micro portfolios are mispriced by the regional size benchmarks, 12.0% are mispriced by the regional value benchmarks, 11.9% are mispriced by the regional momentum benchmarks, 14.7% are mispriced by the regional investment benchmarks, and 18.9% are mispriced by the regional profitability benchmarks.

Given that size, value, and momentum are empirically more effective in pricing international stocks among the five characteristics, we form benchmark portfolios based on the combination of these three characteristics (4x4x4 portfolios) at the regional and at the country-level. We find that an insignificant number of micro portfolios are mispriced by the three-characteristic benchmarks. And country-level benchmarks exhibit even lower proportion of mispriced micro portfolios relative to region-level benchmarks. We also form benchmarks with all five characteristics. But the proportion of micro portfolios mispriced by the five-characteristic benchmarks is much higher than the one by three-characteristic country-level benchmarks. Overall, these results indicate characteristic-based benchmarks formed on size, book to market, and momentum, especially when formed at the country-level, provide the best controls for the return commonality of international stocks.

We also use the micro-portfolio approach to evaluate the performance of Fama and French global factor-based models. We find that the proportion of mispriced micro portfolios is much

higher using these models. Specifically, 35.9% of the micro portfolios are mispriced by global ex-U.S. four factors, while 34.0% are mispriced by global ex-U.S. 6 factors.[1]

One important application of our model is to evaluation the performance of institutional investors. But for institutional investors that invest internationally, the assets used in our above tests may not be in their opportunity set. For example, a significant fraction of the stocks in our sample are not held by any U.S. international equity mutual fund. If so, benchmarks based on the whole sample, may not be of significant use in evaluating the performance of institutional investors. Thus, we re-estimate the proportion of mispriced micro portfolios by the different models using only the sample of stocks that are ever invested by a U.S. fund. The results are similar, with the three-characteristic benchmarks using size, value, and momentum performing the best.

In addition to the micro-portfolio approach, we use four other tests to validate our benchmarks. First, we assess our benchmarks by using the bootstrap analysis. We randomly pick with replacement 10 non-U.S. stocks and form a portfolio. This procedure is repeated 1000 times to obtain 1000 portfolios. These bootstrapped portfolios, by definition, should not exhibit significant abnormal returns. We find that this is the case when performance is evaluated relative to the three-characteristic benchmarks using size, value, and momentum. Second, we show that firm-level characteristics have incremental information in explaining expected returns of international stocks beyond what can be explained by factor models. Third, we find that a large proportion of the characteristic-based portfolios (24%) have significant alphas in regressions using Fama and French global ex-U.S. factors, suggesting that the factors do not sufficiently explain the returns, even for passive characteristic portfolios. The mispricing is most dramatic for small-capitalization value stocks but is present for many other categories of characteristics as well. Finally, we show that U.S. international index equity funds exhibit close to zero abnormal returns relative to our three-characteristic benchmarks.

We then evaluate the performance of active U.S. international equity mutual funds relative to the benchmarks. For this purpose, we decompose the non-U.S. equity holding returns to measure different facets of manager skill as in DGTW, but also extend to include timing and selectivity across regions. The first two components of the decomposition are very similar to the Characteristic-Selectivity (CS) measure and the Characteristic-Timing (CT) measure in DGTW.

[1] These results are comparable to the proportion of mispriced micro portfolios reported in Barras (2018) by the Fama and French factor-based models based on U.S. common stocks.

To compute the CS measure, we compare the returns of each non-U.S. stock held by the fund to the corresponding returns of the matching benchmark portfolio formed in the same region based on size, book-to-market, and momentum. We then sum up the differences within the region (using security weights within the region) and then sum up across regions (using the regional weight of the fund's portfolios). In our setting, CT measures whether managers can time the premium of size, book-to-market, and momentum strategies within each region. As with CS, we compute the contribution to performance due to timing the characteristics of the region first and then sum it up across regions.

The remaining parts of the decomposition are unique to the international setting. Fund managers can systematically weight their investments in various regions differently, as well as shifting these weights to improve performance. Thus, we develop the Regional Characteristic Timing (RCT) measure, Regional Style Tilt (RST) measure and Regional Average Return (RAR) measure. The RCT measure detects whether managers can time the premium differences of size, book-to-market, or momentum strategies across different regions. RST reflects whether managers systematically use size, book-to-market, and momentum strategies to boost fund performance. The RAR measure is to check whether managers systematically allocate stocks to regions that exhibit higher market returns.

On average, the raw return of the active funds' non-U.S. equity holdings is 10.32% per year. CS and CT measures are significantly positive. CS is 1.44% per year, and CT is 2.52% per year. RCT is insignificant, suggesting managers may not be shifting their asset allocations across regions to chase the time-varying return premium associated with size, value, or momentum. RST is marginally significant and at 0.72% per year, which indicates managers rely on size, value, or momentum strategies. RAR measure is 5.4% per year, which implies a large proportion of fund returns is due to managers systematically overweighting stocks in regions with higher expected market returns. We also observe similar results when using country-level benchmarks.

Another common way to assess the existence of fund manager skill in the mutual fund literature is to examine the persistence in abnormal returns (e.g., Grinblatt and Titman (1992), Carhart (1997), Daniel and Titman (1997), Bollen and Busse (2005), and Busse, Jiang, and Tang (2014)). We find that abnormal fund performance relative to our regional characteristic-based benchmarks exhibit persistence for at least 12 months following the ranking period; the persistence

lasts up to 24 months after the ranking period when performance is evaluated against country-level benchmarks.

Finally, we categorize funds into different groups based on their fund characteristics. We find that funds that are more active, charge higher fees, or mainly invest in emerging markets and small or mid-capitalization stocks exhibit much stronger CS and CT. Together, these findings of active international equity funds suggest that active managers are able to generate abnormal returns, especially in less-efficient sectors of non-U.S. stock markets, when expected returns are measured using characteristic-based pricing.

It has been long recognized in the literature that a global CAPM, just like domestic CAPM, does not explain the cross-section of returns well, and it has proposed size, value, momentum, profitability, and investment as additional factors to explain returns ((Fama and French (1998), Griffin (2002), Fama and French (2012), Fama and French (2017)). There are also few papers that evaluate international mutual fund performance use variations of the factor models. Dyck, Lins, and Pomorski (2013) analyze pension funds that invest internationally and find active management outperforms passive management in emerging markets. Busse, Goyal, and Wahal (2014) examine international mutual fund performance and do not find evidence of a positive alpha in mutual fund returns. Banegas, Gillen, Timmermann, and Wermers (2013) examine Europe mutual funds, using conditional (time-varying) returns-based models, and find evidence that local country funds outperform Pan-European funds. Characteristic-based benchmarks are widely used to evaluate performance (e.g., Coval and Moskowitz (2001), Ang, Hodrick, Xing, and Zhang (2006)), but nearly all of the papers use it to evaluate the performance of U.S. stock holdings. Titman, Wei, and Xie (2009) may be an exception. They construct benchmark-adjusted returns for Japan and use it to examine the relation between capital investments and returns.

To our knowledge, this paper is the first to construct characteristic-based benchmarks for each region (non-U.S.) of the world, and to apply it to evaluate the performance of international portfolios. We provide evidence that characteristic-based benchmarks provide better control for the return commonality of international stocks. Our benchmarks allow the evaluation of funds that have investment mandates in a single country, in a single geographical region, or in multiple regions. Holdings-based measures derived from our benchmarks also allow for the examination of managers' stock selectivity ability, and characteristic timing ability within and across regions.

1. Data and Summary Statistics

In this section, we describe the data used to construct the characteristic-based benchmarks and present the summary statistics of the benchmarks. DataStream is our source for stock prices and returns. Worldscope is the source for firm accounting information. Stock return data in DataStream starts in 1986, and we obtain it till 2014. All returns, prices, and financial information are denominated in U.S. dollars. World market returns are the returns of MSCI ACWI all-country world index.

To construct the characteristic-sorted benchmark portfolios, we include stocks from all (non-U.S.) countries that have at least 50 publicly traded firms during our sample period. We also only include stocks with information available to compute the characteristics: (i) market capitalization based on free-float shares, (ii) industry-adjusted book to market ratio (Wermers (2004)), and (iii) at least six months of stock returns prior to June 30th of a year. Stocks that are in the lowest decile of free-float market capitalization in each country are deleted from the sample. After these steps, 44,775 unique stocks from 79 countries are left, using which we create the benchmarks. We also calculate regional market returns by using these stocks and value weight each stocks' returns by their free-float market value.

The construction of regional benchmarks first requires a classification of regions. We classify countries in the sample into 9 regions – Middle East and Africa, Canada, Pacific Asia (excluding China Region and Japan), Europe Developed, Europe Emerging, China Region, Latin America, India, and Japan.[2] Then, beginning in 1987, the stocks are sorted into 4 groups based on their size, book-to-market, momentum, investment, and profitability within their corresponding geographic regions, respectively. We also form 64 (4x4x4) characteristic-based portfolios based on quartile cutoffs of size, book-to-market, and momentum for each of these regions as of June 30th of each year. As is customary, for stocks with a fiscal year ending January through May, we use this fiscal year-end book value to form the book-to-market variable. For stocks with a fiscal year ends during June through December, we use previous fiscal year-end book value to define the book-to-market variable. Book-to-market ratio is industry adjusted within each country following Wermers (2004). The preceding 12-month return is calculated through the end of May of the ranking year. Investment is the change in total assets from the fiscal

[2] Countries included in each region are available in the appendix.

year ending in year t-2 to the fiscal year ending in *t*-1 before June 30th of each year, divided by *t*-2 total assets (Fama and French (2015)). Profitability is the revenues minus cost of goods sold, minus selling, general, and administrative expenses, minus interest expense all divided by book equity based on the fiscal year-end values prior to June 30th of each year (Fama and French (2015)).

We require at least five stocks in each characteristics-based portfolio for it to be considered as a benchmark in a given year. This requirement reduces the total number of unique stocks to 44,630. The benchmark portfolio return is the value-weighted return of all stocks in the characteristics-based portfolio, where the weights are based on the stocks' free-float market capitalization. The same methodology is used to form characteristic-based benchmarks at the country level, except that we lower the minimal number of stocks required to just two for each benchmark portfolio. After imposing this requirement, there are 43,379 unique stocks from 56 countries for the construction of country-level benchmarks.

Table 1, Panel A, presents the number of stocks in each region and the time-series average of the quartile cutoff points for the three characteristics constructed at the regional level. Europe Developed region has the greatest number of stocks (11,228), and the Latin America region has the fewest (1,385) number of stocks. Firms in the sample are significantly smaller than NYSE firms. The median firm size using free float shares is about $89 million, which is close to the average cutoff value for the lowest decile using NYSE stocks. Europe Emerging has the lowest average 25th percentile cutoff for market value, $6.76 million, and Japan has the highest average 75th percentile cutoff for market value, $706 million. The country-industry adjusted book-to-market ratio quartile cutoffs across regions are -0.34, 0.45, and 1.20, on average. Canada has the lowest average 25th percentile cutoff, -0.67, and India has the highest average 75th percentile cutoff, 1.59. The average quartile cutoffs for momentum based on the cumulative past 12 month returns across regions are -27%, -2%, and 31%. Middle East and Africa has the lowest average 25th percentile cutoff for the cumulative past 12 month returns, -36%, and India has the highest average 75th percentile cutoff for the cumulative past 12 month returns, 53%. Panel B of Table 1 presents the summary statistics of the characteristic-based benchmarks constructed at the country level.

2. What Characteristics Drive International Stock Returns?

In this section, we describe our attempts to discover which firm-level characteristic or which combinations of characteristics can better explain the cross-sectional variations in international stock returns. We explore the performance of benchmarks constructed based on a single characteristic of size, value, momentum, investment, or profitability, benchmarks constructed based on size, value, and momentum together, and benchmarks constructed based on size, value, momentum, investment, and profitability together. We also report pricing errors from using world market returns and regional market returns as benchmarks for reference purposes.[3] Further, we also compare the pricing performance of characteristic-based benchmarks and the Fama-French global factor models. We concentrate on the characteristics selectivity measure when measuring the abnormal performance of a portfolio, and in the rest of the paper, we will refer to these abnormal returns as C-alphas.

2.1 Micro-Portfolio Approach

2.1.1 Characteristic-based Benchmarks

Barras (2018) documents that micro portfolios (of 10 stocks) are a good compromise solution to the beta correlation problem associated with factor mimicking portfolios and the lack of power associated with tests using individual stocks, in detecting the validity of asset pricing models. With this insight, we first use micro portfolios to test the performance of various characteristic-based benchmarks.

We follow the procedure in Barras (2018) to construct the micro portfolios. For each stock, on June 30th of each year, we find 9 other stocks in the same region with the closest expected returns predicted by size, value, and momentum. The ten stocks are equally weighted to form the micro portfolio. To be considered as a candidate for the construction of the micro portfolio, the stock is required to have at least 36 months of returns. This requirement reduces the number of non-U.S. stocks in this analysis to 38,560. Correspondingly, we form 38,560 micro portfolios. We then equally-weight the monthly abnormal returns calculated relative to the benchmarks of each stock in the micro portfolio to obtain the monthly abnormal returns of the micro portfolio.

[3] Returns of U.S. Treasury bills are obtained from the website of Kenneth French: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

Finally, we compute the average monthly abnormal return of each micro portfolio and the associated t-statistic.

We use the new measure proposed by Barras (2018) to evaluate benchmarks: the proportion of mispriced micro portfolios. This measure builds on the large-scale methodology of Efron (2012) and Storey (2002) and is specifically designed for the analysis of large cross-sections. This measure especially fits our analyses for international stocks, because we have a large number of international stocks and need to conduct the performance tests based on 38,560 micro portfolios. This new measure only requires the t-statistics of micro portfolios' abnormal returns as the inputs. The proportion of micro portfolios mispriced by benchmark k is defined as:

$$\pi_k = 1 - \frac{\frac{1}{M}\sum_{j=1}^{M} 1(t_j^k)}{\Phi_0(I)},$$

where M is the number of micro portfolios and $1(t_j^k)$ is an indicator function equal to 1 if t_j^k falls in the interval I. We follow the choice in Barras (2018) and choose the interval as [-0.4, 0.4].[4] $\Phi_0(I)$ is the probability that standard normal distribution falls in [-0.4, 0.4], which is about 31.1%.

Intuitively, if a benchmark can correctly price most micro portfolios, the t-statistics of micro portfolios should cluster around zero. In the measure, $\frac{1}{M}\sum_{j=1}^{M} 1(t_j^k)$ captures the proportion of micro portfolios with t-statistics that falls in the interval around zero ([-0.4,0.4]) for model k. We know t distribution approaches standard normal distribution as the number of observations increases. Therefore, we can use the standard normal distribution as the reference. By comparing the proportion of micro portfolios with t-statistics that falls in the interval [-0.4,0.4] with the probability that the standard normal distribution falls in the same interval, we can estimate the proportion of mispriced micro portfolios. For example, if 25% of the micro portfolios relative to a benchmark have t-statistics fall in the interval [-0.4, 0.4], then the proportion of mispriced portfolios is 1-(25%/31.1%) =19.6%. If the proportion of micro portfolios with t-statistics that fall in the interval [-0.4,0.4] is larger than the probability that the standard normal distribution falls in the interval [-0.4,0.4], the proportion of mispriced micro portfolios is negative. A negative proportion of mispriced micro portfolios suggests that an insignificant number of micro portfolios is mispriced by the corresponding benchmark.

[4] Barras (2018) shows that the boundary of this interval can be between 0.15 and 0.65. And the proportion of mispriced micro portfolios does not change much.

Barras (2018) also proves that this measure follows a normal distribution and the difference in this measure for two benchmarks also follows a normal distribution. Therefore, we can conduct statistical tests by using the difference in the proportion of mispriced micro portfolios for two benchmarks to compare the performance of the two benchmarks.

Panel A of Table 2 presents the proportion of mispriced micro portfolios. If we adjust international stocks' returns by the world market returns, we find 29.4% of the micro portfolios are mispriced. When we use the market returns of each region as the benchmark, the mispriced proportions drop significantly to 14.9%. And we see bigger drops among regions with mainly emerging countries. Whereas, the difference in the mispriced proportions by world market returns and by regional market returns is not significant for stocks in Canada, Europe Developed, and Japan. The findings are consistent with our expectation that that financial markets of emerging countries are not fully integrated into global markets. And it is critical to incorporate local information in pricing stocks in emerging markets.

We then focus on the performance of single-characteristic benchmarks. 3.8% of the micro portfolios are mispriced by regional size benchmarks, 12.0% of the micro portfolios are mispriced by regional value benchmarks, 11.9% of the micro portfolios are mispriced by regional momentum benchmarks, 14.7% of the micro portfolios are mispriced by regional investment benchmarks, and 18.9% of the micro portfolios are mispriced by regional profitability benchmarks. In Panel B of Table 2, we also conduct formal statistical tests between every two single-characteristic benchmarks.[5] The statistical tests confirm that size is the most powerful single characteristic. Size, value, and momentum perform significantly better than regional market returns. Investment performs similarly to regional market returns and profitability performs even worse than regional market returns.

The region in which stocks are mispriced most by regional size benchmarks is Europe Developed. The region in which stocks are mispriced most by regional value, momentum, or investment benchmarks is China region. The region in which stocks are mispriced most by regional profitability benchmarks is India.

Given that size, value, and momentum are the three best performing characteristics, we construct our three-characteristic benchmarks by using them. The benchmarks are constructed at

[5] We follow the steps in Barras (2018) to compute the z-statistics for the difference in the proportion of mispriced micro portfolios between two paired benchmarks.

the region-level as well as at the country-level. We find the proportions of micro portfolios mispriced by the three-characteristic benchmarks are negative, which suggests that an insignificant proportion of micro portfolios are mispriced. Moreover, the three-characteristic benchmarks perform significantly better than the ones by any single-characteristic benchmarks. In Panel of Table 2, the statistical tests also show that country-level benchmarks perform significantly better than the regional benchmarks.

To examine whether investment and profitability characteristics can decrease the proportion of mispriced micro portfolios further, we construct benchmarks using the five characteristics of size, value, momentum, investment, and profitability. Since using five characteristics significantly increase the number of benchmark portfolios needed for each region, we use 30^{th} and 70^{th} percentiles and construct 3*3*3*3*3 (243) benchmark portfolios for each region. Adding investment and profitability into the characteristic-based benchmarks does not improve the performance of benchmarks much. The proportions of mispriced micro portfolios by the five-characteristic benchmarks are very similar to the one by the three-characteristic benchmarks based on size, value, and momentum.

In addition, we also report the pricing errors exhibited by each benchmark. Pricing errors are the absolute values of C-alphas and are reported in Panel C of Table 2. We also report the pricing errors at the 25^{th} and 75^{th} percentiles. We draw very similar conclusions as the previous paragraph, where we discussed the proportion of micro portfolios that are mispriced.

In Panel D of Table 2, we report the improvement in pricing by the various models over just using regional market returns as the benchmark. We subtract the pricing errors by regional market returns from the pricing errors by characteristic-based benchmarks and report the test statistics about the differences. For the overall sample, this difference is about 0.2% when we use the size benchmark. The differences are much smaller for value or momentum benchmarks and are about 3 basis points per month. Investment benchmark does not significantly reduce pricing errors, and profitability increases errors relative to benchmarking with regional market returns. When we form regional benchmarks with the combination of size, value, momentum, the difference in pricing errors is 0.21% per month. The corresponding difference with five-characteristic benchmarks is 19 basis points per month. The three-characteristic benchmarks using size, value, momentum formed at the country level have the lowest pricing errors, with a difference of about 0.24% relative to regional market returns. Notably, the country-level

benchmarks also help eliminate the impact of exchange rate fluctuations in evaluating international stock returns.

The table also presents the results across different regions. In eight out of the nine regions, size is the most important characteristic in explaining the cross-sectional variation in stock returns. And in six regions, single characteristic benchmarks formed on size, value, or momentum result in significantly lower pricing errors relative to regional market returns as the benchmark. In all nine regions, the three-characteristic benchmarks based on size, value, and momentum perform at least no worse than benchmarks based on single characteristics.

Taken together, the findings in this subsection suggest that local characteristics are important in explaining the cross-sectional variations in international stock returns. Size contributes the most explanatory power among various characteristics for returns. There is a marginal benefit to adding value and momentum into benchmarks. The contribution of investment and profitability to explain returns is negligible. And three-characteristic benchmarks using size, value, and momentum appear most appropriate to evaluate return performance.

2.1.2 Factor-based Models

In Table 2, we also report the performance of Fama-French global factor-based models. We use global ex-U.S. 4 factors, global ex-U.S. 6 factors and global ex-U.S. 4 factors plus 4 regional market factors. The proportion of micro portfolios mispriced by factor-based models is significantly higher than the one by the three-characteristic benchmark using size, value, momentum. 35.9% of the micro portfolios are mispriced by global ex-U.S. 4 factors, and 34.0% of the micro portfolios are mispriced by global ex U.S. 6 factors. Even adding the 4 regional market factors, 25.3% of the micro portfolios are mispriced. There is substantial variation in the mispricing by the factor models across regions, with significant mispriced proportion associated with stocks from China, India, and Latin America.

Since performance benchmarks are most useful in evaluating portfolio managers, and since the U.S. managers do not seem to invest in a large majority of the stock universe, we repeat the tests with only the sample of stocks that are invested by at least one active U.S. international mutual fund. Panel E and F of Table 2 presents the results, and the inferences are very similar to we discussed in the previous subsection for the whole sample. The pricing errors generally decline

for all models, but the three-characteristic benchmarks formed on size, book-to-market, and momentum, continue to have the lowest pricing errors.

One reason for the higher mispriced proportions using the factor models may be due to constraining the loadings on factors to be the same over the sample period. To account for time-varying factor loadings, we replicate the procedure above by using every five non-overlapping sample period. Namely, we compute alphas with 60 monthly returns of micro portfolios. Table 3 presents the proportion of mispriced micro portfolios and pricing error using this procedure. We tabulate results from five-year holding periods.

As one would expect, the proportion of mispriced micro portfolios by the factor models drops significantly when we allow betas to change. The mispriced proportion over five-year holding periods drops from 35.9% to 22.7% when we use the Fama-French Global ex-U.S. 4-factor model. Despite the drop, the proportion mispriced, and especially the pricing errors, continue to be lower by using characteristic-based benchmarks, with errors being even lower when country-level benchmarks are used.

In sum, the results in this subsection reveal that our regional (country-level) characteristic-based benchmarks exhibit significantly stronger power in explaining the cross-sectional variations in international stock returns relative to factor-based models.

2.2 Bootstrap Simulation

In this subsection, we further validate our three-characteristic benchmarks by using the bootstrap simulation analysis. For each year between 1987 and 2014, we randomly draw 10 stocks from our international stock sample to form a portfolio, which is rebalanced each year on June 30th. We repeat the procedure 1000 times and obtain 1000 different portfolios. For the benchmarks to be valid, the abnormal returns of the randomly drawn simulated portfolios relative to our benchmarks (C-alphas) should be close to zero.

Table 4, Panel A, summarizes the C-alphas of 1000 equally-weighted simulated portfolios. We find that the alpha is very small, 3 basis points per month, based on regional benchmarks. The C-alphas based on country-level benchmarks is insignificantly different from zero. When applying regional benchmarks, we find significant pricing errors for Canadian and Indian stocks.

Panel B of Table 4 presents the distribution of C-alphas of the simulated portfolios. We summarize the 1, 5, 10, 50, 90, 95, and 99 percentiles of the standard t-distribution and the

distribution of C-alphas of the 1000 simulated portfolios. We find that overall the distribution based on 1000 simulated closely approximates the t-distribution. And C-alphas based on country-level benchmarks are nearly identical to the t-distribution. Consistent with our analysis in Panel A, the distributions of C-alphas based on Canadian and Indian stocks differ significantly compared to the standard t-distribution. But, in sum, it appears that characteristic-based portfolio returns may be appropriate benchmarks for measuring expected returns.

2.3 Incremental Explanatory Power of Stock Characteristics

The empirical asset pricing literature documents that stock characteristics have additional power in explaining the cross-section of stock returns in the U.S. (Daniel and Titman (1997), Brennan, Chordia, and Subramanyam (1998), and Chordia, Goyal, and Shanken (2015)) as well as in the international context (Hou, Karolyi and Kho (2011)). In this subsection, we test the incremental effects using the stocks in our sample.

We compute the risk-adjusted returns of each international stock by using Fama-French global ex U.S. 4 factors or the corresponding regional 4 factors. We then regress the risk-adjusted returns (alphas) on firm characteristics of size, book-to-market, and momentum by using Fama-Macbeth regressions (Fama and MacBeth (1973)) (similar to the procedures in Brennan, Chordia, and Subramanyam (1998)). Table 5 presents the empirical results. As with the U.S. evidence, the risk-adjusted returns are still significantly negatively related to firm size and positively related to book to market ratio even after controlling for risk factors. When we use regional 4 factors to adjust returns, the risk-adjusted returns are also significantly positively related to past 12-month performance. Overall, the results presented indicate the robustness of the findings in the current literature that characteristics have additional explanatory power to explain the cross section of returns.

2.4 Alphas of Characteristic-Based Portfolios

We had formed the 64 (4x4x4) characteristic-based portfolios based on size, book-to-market, and momentum. Being passive portfolios, if factor models offer sufficient explanatory power for expected returns, we should observe that very few of these portfolios generate significant factor model alphas.

In Table 6, we find this is not the case. We report the proportion of the returns to these passive portfolios with significant alphas from Fama-French factor regressions. Panels A and B correspondingly utilize the Fama-French regional four factors and Fama-French Global ex-U.S. four factors. Amongst the overall 320 portfolios (64 characteristic portfolios for five regions), 77 (24%) of them produce significant alphas (p-values of 0.05 or below) when we use the regional 4-factors. The small size (lowest quartile) portfolio and the high value (largest quartile) portfolio appear to be the most mispriced (46% and 38%, respectively), especially the small size portfolios of Canada, and the small size and high value stocks in Asia ex-Japan. When we use global ex U.S. 4 factors, we obtain very similar results.

3. Performance of International Equity Mutual Funds

In this section, we develop performance measures for international equity mutual funds based on characteristic-based benchmarks and further validate the appropriateness of the benchmarks to measure performance.

3.1 Performance Measures

We extend the framework in DGTW to decompose returns in order to measure managerial skill, using the fund manager's portfolio holdings. The various parts of the decomposition are described in detail below.

3.1.1 Characteristic Selectivity (CS)

CS is designed to capture a manager's stock-picking ability beyond passively choosing stocks based on their characteristics. To measure it, each stock held by the manager during the quarter is matched to the corresponding regional characteristic-based benchmark portfolio formed on size, book-to-market, and momentum. We then calculate the difference between the stock`s return and the benchmark return for the month to obtain the abnormal returns over the benchmark. The difference is then multiplied with the weights placed on the stock by the fund as a fraction of the investment in the region and summed up for all the securities in the region to get the regional CS for the overall portfolio. We repeat this measure for each region and get the overall CS measure by weighting each regional CS measure by the fraction invested by the fund in the region.

The month *t* component of the CS measure is defined as

$$CS_t = \sum_{\gamma=1}^{\Gamma} \widetilde{W}_{\gamma,t-1} \sum_{j=1}^{N} \widetilde{w}_{\gamma,j,t-1} \left(\tilde{R}_{j,t} - \tilde{R}_t^{b_{\gamma,j,t-1}} \right)$$

where $\widetilde{W}_{\gamma,t-1}$ is the portfolio weight on all stocks of region γ at the end of month t-1, $\widetilde{w}_{\gamma,j,t-1}$ is the portfolio weight on stock j within its region γ at the end of month t-1, $\tilde{R}_{j,t}$ is the month *t* return of stock *j*, and $\tilde{R}_t^{b_{\gamma,j,t-1}}$ is the month *t* return of the characteristic-based benchmark of region γ corresponding to stock *j* during month t-1. The time-series average, over all months that a fund exists, gives the CS measure for that fund. In estimating the portfolio weight for a given month, we use the most recent portfolio holdings available for a fund.

3.1.2 Characteristic Timing (CT)

CT attempts to measure the ability of fund managers to time the performance of size, value, or momentum strategies within each region. The returns to these three portfolios may be time-varying, and managers could time them by altering their portfolio weights. The benchmark portfolio return is computed as the return the fund would have earned in the current month if the manager had kept the portfolio weights 12 months ago. To capture the characteristic timing ability within each region, we fix funds` portfolio weights on each region and only consider the changes of weights within the region. As with the CS measure, we compute abnormal returns based on weights in the region and then sum up across regions. Note that there is no overlap with the CS measure since we only focus on the portfolio weight changes of a stock within its region in the past 12 months and fix the portfolio weight of all stocks from the same region.

The month *t* component of this measure is

$$CT_t = \sum_{\gamma=1}^{\Gamma} \widetilde{W}_{\gamma,t-1} \sum_{j=1}^{N} (\widetilde{w}_{\gamma,j,t-1} \tilde{R}_t^{b_{\gamma,j,t-1}} - \widetilde{w}_{\gamma,j,t-13} \tilde{R}_t^{b_{\gamma,j,t-13}}),$$

where $\widetilde{W}_{\gamma,t-1}$ is the portfolio weight on all stocks of region γ at the end of month t-1, $\widetilde{w}_{\gamma,j,t-1}$ is the portfolio weight on stock j within its region γ at the end of month t-1, $\widetilde{w}_{\gamma,j,t-13}$ is the portfolio weight on stock j within its region γ at the end of month t-13. $\tilde{R}_t^{b_{\gamma,j,t-1}}$ and $\tilde{R}_t^{b_{\gamma,j,t-13}}$ are month t returns of characteristic-based benchmarks in region γ corresponding to stock j during month t-1

and t-13, respectively. The time-series average, over all months that a fund exists, gives the CT measure for that fund.

3.1.3 Regional Characteristic Timing (RCT)

RCT is defined to detect the fund manager's ability to time the performance of size, book-to-market, or momentum strategies across different regions. It is measured as the returns to the characteristic portfolio due to a change in fund's investment weights in the region from last year to now. To obtain the returns attributable to regional characteristic timing that is independent of CT, we assume that the within region weights remain the same from last year.

The month *t* component of this measure is

$$RCT_t = \left[\sum_{\gamma=1}^{\Gamma} \widetilde{W}_{\gamma,t-1} - \sum_{\gamma=1}^{\Gamma} \widetilde{W}_{\gamma,t-1}\ \right] \sum_{j=1}^{N} \widetilde{w}_{\gamma,j,t-13} \tilde{R}_t^{b_{\gamma,j,t-13}},$$

where $\widetilde{W}_{\gamma,t-1}$ ($\widetilde{W}_{\gamma,t-13}$) is the portfolio weight on all stocks of region γ at the end of month t-1 (t-13), $\widetilde{w}_{\gamma,j,t-13}$ is the portfolio weight on stock j within its region γ at the end of month t-13, and $\tilde{R}_t^{b_{\gamma,j,t-13}}$ is month t return of the characteristic-based benchmark of region γ assigning to stock j during month t-13. The time-series average, over all months that a fund exists, gives the RCT measure for that fund.

3.1.4 Style Tilt (RST)

We define this measure to reflect managers` tendency to hold stocks with certain characteristics. For example, if a fund systematically holds high book-to-market stocks to boost its portfolio return (without trying to time the effect), this fund will exhibit a high RST return. For each stock, we test whether the returns implied by its size, book-to-market, or momentum styles outperform the value-weighted return of its region. We then aggregate to fund level. The month *t* component of this measure is

$$RST_t = \sum_{\gamma=1}^{\Gamma} \widetilde{W}_{\gamma,t-13} \sum_{j=1}^{N} \widetilde{w}_{\gamma,j,t-13} (\tilde{R}_t^{b_{\gamma,j,t-13}} - \tilde{R}_t^{Region_{\gamma,j,t-1}}),$$

where $\widetilde{W}_{\gamma,t-13}$ is the portfolio weight on all stocks of region γ at the end of month t-13, $\widetilde{w}_{\gamma,j,t-13}$ is the portfolio weight on stock j within its region γ at the end of month t-13, $\tilde{R}_t^{b_{\gamma,j,t-13}}$ is month

t return of the characteristic-based benchmark of region γ assigning to stock j during month t-13, and $\tilde{R}_t^{Region_{\gamma,j,t-1}}$ is the month t value-weighted return of all stocks in region γ assigning to stock j during month t-1. The time-series average, over all months that a find exists, gives the RST measure for that fund.

3.1.5 Regional Average Return (RAR)

The Regional Average Return measure is the residual after subtracting out the four components described earlier. It reflects portfolio managers' tendency to invest in stocks from certain regions. If a fund systematically holds stocks in regions that generally outperform other regions (without trying to time the performance of each region), then this fund will exhibit a high RAR return.

The month *t* component of this measure is

$$RAR_t = \sum_{\gamma=1}^{\Gamma} \widetilde{W}_{\gamma,t-13} \sum_{j=1}^{N} \widetilde{w}_{\gamma,j,t-13} \tilde{R}_t^{Region_{\gamma,j,t-1}},$$

where $\widetilde{W}_{\gamma,t-13}$ is the portfolio weight on all stocks of region γ at the end of month t-13, $\widetilde{w}_{\gamma,j,t-13}$ is the portfolio weight on stock j within its region γ at the end of month t-13, and $\tilde{R}_t^{Region_{\gamma,j,t-1}}$ is the month t value-weighted return of all stocks in region γ assigning to stock j during month t-1. The time-series average, over all months that a fund exists, gives the RAR measure for that fund.

3.2 Performance of Index Funds

We start with an analysis of U.S. international index fund performance relative to the characteristic-based benchmarks. All information regarding the index funds are obtained from Morningstar. We use Morningstar's identifier to first identify index funds. We then clean the sample by manually checking whether the fund name indicates that it is an index fund.

Index funds, by definition, should not exhibit abnormal performance. For the characteristic-based benchmarks to have merit, we expect to generally observe that each of CS, CT, RCT, and RST measures are all close to zero. Table 7 presents the results. All the above measures based on regional characteristics benchmarks are insignificantly different from zero. Furthermore, these results hold for different fund groups and across different time periods. The

findings are similar when we apply country-level benchmarks. This is another piece of evidence that characteristic-based benchmarks can serve as appropriate controls for the returns of international stocks.

In unreported tables, we find factor-based models also perform well for index funds in our sample. Regressing the returns of non-U.S. holdings of index funds on Fama and French's (2012, 2017) global ex U.S. three- and five-factor models plus a momentum factor, we find that alphas of index funds based on factor-based models are all insignificant and close to zero.

3.3 Performance of Active U.S. International Equity Mutual Funds

3.3.1 Active U.S. International mutual funds – Data and Summary Statistics

Information on active U.S. international equity mutual funds is also from Morningstar. Morningstar also classifies active funds into the following categories: World Stock, Foreign Large Blend, Foreign Large Growth, Foreign Large Value, Foreign Small/Mid Blend, Foreign Small/Mid Growth, Foreign Small/Mid Value, Diversified Emerging Markets, Diversified Pacific/Asia, Pacific/Asia excluding Japan stocks, China Region, India Equity, Japan Stock, Europe Stock, and Latin America Stock. Unless specified, all of the data presented below is based on this sample.

Even though the primary objective of the U.S. based international equity mutual funds is to invest outside the United States, they still hold a significant amount of their assets in U.S. equities. Figure 1 plots the asset composition over time, split into amounts invested in non-U.S. equities, U.S. equities, Cash, and Other assets. Morningstar considers borrowings as negative cash, which might explain the low percentage (1.1%) held in cash. On average, as the percentages of total assets, mutual funds invest 77.2% in non-U.S. equities, 12.8% in U.S. equities, hold 1.1% in Cash, and leave 9.8% invested in other non-equity assets.

There are some noticeable trends in the sample. In the early part of the sample, funds seem to invest a larger fraction of their total assets in U.S. equities, but it has been mostly steady since the mid-1990s. There seems to be a growth in the "other assets" category in the later part of the sample. Cash appears to be noticeable only in the late 1990s and early 2000s. Overall, the significant amount of non-international equity assets suggests that using fund-level returns may

not be appropriate to evaluate fund managers` skills to pick non-U.S. stocks. And, the rest of the paper focuses on the performance of funds` non-U.S. equity holdings.

We merge the fund holdings from Morningstar with stock information from DataStream and Worldscope. Table 8 summarizes the characteristics of non-U.S. equity holdings based on fund-quarter observations. Each stock held by the mutual funds in a year is assigned a quartile value (1 to 4) based on market capitalization, book-to-market, or momentum. For each fund, the value-weighted portfolio average is computed each year for each characteristic. The table presents the median size, book-to-market, and momentum quartiles of the stocks held by the funds and some additional information regarding the number of funds, number of countries, regions, and industries that funds invest in.

We first aggregate reported variables to each quarter level and then report the time-series averages across different quarters in Panel A of Table 8. The standard deviation of each variable reflects the variations across different time periods. Overall, the average size quartile value is 3.8, suggesting that U.S. international equity mutual funds primarily hold the largest stocks in each country. Even the funds with an objective to invest in small/mid-cap stocks invest mainly in the largest firms in each country. The median industry-country-adjusted book-to-market ratio of stocks held by the mutual funds is 2.4, suggesting no particular preference for investing in value or growth stocks. Funds in "Foreign Large Value" category have the highest adjusted book-to-market ratio, consistent with the investment objective of the category. The mean momentum quartile is close to 2.7, with funds in Foreign Small/Mid Growth having the highest momentum rank and funds in Foreign Large Value having the lowest momentum rank.

Foreign Large Blend category has the largest average number of funds, whereas India Equity category has the fewest number of funds. There is wide variation in the number of stocks held by the mutual funds. It appears that funds with an objective to invest in smaller/growth stocks invest in more stocks, possibly suggesting the limits of investing large dollar amounts in few stocks. On average, funds in our sample hold about 71 stocks in their portfolios, but funds in Foreign Small/Mid Value category hold about 250 stocks on average. On average, mutual funds in the sample invest in 11.4 different countries and 4 different regions. Funds in Foreign Small/Mid Value category invest in the largest number of countries and regions. And, equity holdings of funds in our sample are on average denominated with 9.6 different currencies. In

terms of industry allocations, funds on average, allocate their assets to 19.5 different industries based on the 40 industries classification of DataStream.

In Panel B, we report the cross-sectional averages across different funds, with the values first aggregated at the fund level. The standard deviation of each variable reflects the variations across funds. In general, we observe relatively larger variations in reported variables across different funds compared to the variations across different quarters.

3.3.2 Performance relative to Characteristics-Based Benchmarks

In this subsection, we present the performance of active international mutual funds equity returns relative to characteristic-based benchmarks. We compare the returns on the non-U.S. equity holdings against both the regional and country-level benchmarks. Table 9 presents the various performance measures in columns (2) to (6). The column labeled "Raw Return" shows the average pre-expense non-US equity portfolio returns of mutual funds. All the performance measures shown are time-series monthly averages.

Panel A of Table 9 summarizes the measures for the entire U.S. based international equity mutual fund sample based on regional benchmarks. The average raw return of non-U.S. equity holdings is 10.32% per year. The average CS is 1.44% per year, suggesting that fund managers are able to pick stocks that beat the characteristic-based benchmarks for its corresponding region. The average CT is 2.52% per year, indicative of fund managers' ability to time the performance of size, book-to-market, or momentum strategies within a region. RCT, which measures the ability to time the performance of size, book-to-market, or momentum strategies across regions, is not significantly different from zero. The RST measure is marginally significant and on average is 0.72% per year. This result implies that fund managers use size, book-to-market, or momentum strategies to boost fund performance. Finally, the RAR measure is as high as 5.4% per year, which shows that fund managers systematically allocate their assets to regions with higher expected returns. Further, when we subdivide the sample into two equal periods, we find that the significance of CS and CT measures is primarily driven by the early period. When performing the analyses by focusing on global funds, we find very similar results on all the performance measures.

The conclusions remain similar when the fund performance is evaluated relative to country-level characteristic-based benchmarks. In Panel B, the CS measure is about 1.2% per year. The CT measure is 3.48% per year. The RAR measure is 5.64% per year.

3.3.3 Fund Characteristics and Performance

If international mutual funds exhibit abnormal performance, it should be more pronounced for funds that mainly invest in the stocks whose prices are less efficient, that charge higher fees, and that trade more actively. Such a finding would also validate the benchmarks developed in this paper. We use the country-level benchmarks based on size, value, and momentum for the tests in this subsection.

We first test whether funds that mainly invest in small/Mid-cap stocks exhibit stronger stock-picking skills. The small/Mid-cap stocks in foreign countries tend to have less efficient prices than large-cap stocks. This gives portfolio managers more room to generate abnormal returns. Funds that mainly invest in foreign small-cap stocks include funds in the following Morningstar categories: Foreign Small/Mid Blend, Foreign Small/Mid Growth, Foreign Small/Mid Value. Funds that mainly invest in foreign large-cap stocks include funds in categories: Foreign Large Blend, Foreign Large Growth, and Foreign Large Value. Consistent with the above hypothesis, in Table 10, funds that mainly invest in foreign small/Mid-cap stocks have CS measure 2.28% per year and CT measure 3.96% per year, suggestive of strategies that do not solely rely on size, value, or momentum. In contrast, funds that mainly invest in large-cap stocks exhibit insignificant CS measures. The CT measure is also smaller, 2.76% per year. These funds appear to invest more passively in characteristic-based portfolios.

Related to the previous tests, we examine the performance of funds that mainly invest in emerging markets. The stocks in emerging markets also tend to have less efficient prices than stocks in developed countries. We include the funds in the category: Diversified Emerging Markets. We find that these funds that mainly invest in emerging markets exhibit much higher CS and CT than the average funds in our sample.

One long-standing question of interest is whether funds that charge higher fees perform better. The evidence in general (See Fama and French (2010)) for U.S. domestic funds suggest that the after-fee alphas are significantly negative. With the holdings data, we are able to check whether this is also true with the international holdings in our sample. We split the funds into two

groups based on the median annual expense ratio. The CS measure of funds with above median expense ratio is 2.52% per year and highly significant. Given the annual expense ratio of funds with above median expense ratio is on average about 1.83%, managers of these funds seem to be able to justify the fees they charge by their stock-picking skills. However, the CS measure of funds with below median expense ratio is insignificant.

Relatedly, we test whether the performance of funds with above-median active share (Cremers and Petajisto (2009)) are significantly higher relative to the characteristic-based benchmarks. We find that the funds that are more active, as measured by active share, have higher CS and CT returns. The CS measure of funds with above-median active share is 2.4% per year and highly significant; whereas the CS measure of funds with below-median active share is only 0.96% per year and marginally significant. Overall, the lack of surprises in the findings in this subsection can be thought of as a validation of our benchmarks.

3.3.4 Persistence of Mutual Fund Performance

To assess the existence of fund manager skill, the mutual fund literature often examines the persistence in abnormal returns (e.g., Grinblatt and Titman (1992), Carhart (1997), Daniel and Titman (1997), Bollen and Busse (2005), and Busse, Jiang, and Tang (2014)). But, as Berk and Green (2004) point out, persistence in performance is hard to achieve if there are negative returns to scale. As well-performing funds attract more funds, opportunities to outperform will decline. But, it is possible that they last a few periods. Superior benchmarks should be able to remove the exposures to stock characteristics and isolate the performance attributable to manager skill.

To conduct the performance persistence tests, we first rank active U.S. international equity mutual funds at the beginning of each month into quintiles based on their previous 3-year abnormal returns of the non-U.S. holdings. We then report the abnormal returns of each quintile in the subsequent three 12-month periods (+1 to +12 months, +13 to +24 months, +25 to +36 months) after the ranking month, respectively. We also report the performance persistence from Fama and French global ex U.S. 4 factor and global ex U.S. 6 factor models.

For Fama and French global ex U.S. 4 factor model, we do not observe any performance persistence in the first 12 months after the ranking month in Table 11. We even observe reversals during the second and third 12-month period after the ranking month. Especially, during the +25 to +36 months after the ranking month, funds in the best past performance quintile underperform

funds in the worse past performance quintile by surprisingly large 5.76% per year. In addition, we also observe reversals in the performance persistence by using Fama and French global ex U.S. 6 factors. These results question the ability of Fama-French factor models to capture risk exposures well in international markets.

In contrast, CS estimated based on characteristic-based benchmarks exhibit short-term persistence. With regional benchmarks, CS persists during the 12-month period after the ranking month. Funds in the best past performance quintile outperform funds in the worse past performance quintile by 1.08% per year. With country-level benchmarks, CS persists longer. Even during the second 12-month period after the ranking, funds in the best past performance quintile outperform funds in the worse past performance quintile by a surprisingly large 2.16% per year.

In sum, findings in this subsection indicate that characteristic-based benchmarks may be useful to control for returns beyond factor models. If so, certain portfolio managers of active U.S. international equity mutual funds exhibit performance persistence, suggestive of skill in managing their portfolios.

3.3.5 Fund Performance Over Time

In the past three decades, assets under management of U.S. based international equity mutual funds have increased more than 400 times and reach $2.16 trillion by the end of 2016. It is plausible to assume that decreasing returns to scale exist in this industry. As with the evidence in U.S. domestic equity mutual funds (Berk and Green (2004) and Pástor, Stambaugh, and Taylor (2015)), fund managers` ability to outperform passive benchmarks should decline as the size of U.S. based international equity mutual fund industry increases.

Empirical tests in this subsection are built upon the above premise. We compare factor-based models with characteristic-based benchmarks based on the expectation that fund performance should decline over time. We split our sample into two periods: 1987 to 2000 and 2001 to 2014. We find that CS is positive and significant in the early period but insignificant in the late period. And, the patterns hold for regional benchmarks and country-level benchmarks. On the contrary, alphas estimated from Fama and French global ex U.S. 4 factors or 6 factors (Table 12) are insignificant in the early period but positive and highly significant in the late period. If we admit the existence of decreasing returns to scale among U.S. based international equity

mutual funds, evidence in this subsection suggests that characteristic-based benchmarks are far better than factor-based models in controlling the expected returns of international stocks.

4. Conclusion

Figuring out the appropriate benchmark to evaluate performance is the focus of the asset pricing literature. There are a large number of factor-based models available to price securities, but a common finding is that firm-level characteristics explain a significant part of the variation in stock returns that are left unexplained by the factor models. With U.S. equities, many papers use the DGTW framework to attenuate this problem. In this article, we turn to global markets and explore the power of firm-level characteristics in explaining the cross-sectional variations in international stock returns.

In the spirit of DGTW, we construct benchmark portfolios using quartile cutoffs of size, book-to-market, momentum, investment, or profitability for each region or country. Using a resampling micro-portfolio approach recently introduced by Barras (2018), we find that size is the most powerful single characteristic to price international stocks. Three-characteristic benchmarks based on size, value, and momentum perform better than five-characteristic benchmarks and provide lower pricing errors. We also show that characteristic-based benchmarks perform significantly better than global factor-based models. In addition, bootstrap analyses support the validation of our benchmarks. The simulated portfolios from bootstrap have close to zero abnormal returns relative to our benchmarks. Finally, international index equity funds also exhibit close to zero abnormal returns relative to our benchmarks.

When applying the characteristic-based benchmarks to active U.S. based international equity mutual funds, we find that these funds exhibit significant stock selectivity ability and can time their portfolio weightings within regions on stock characteristics. In addition, funds that are more active, charge higher fees, or mainly investing in emerging markets and small or mid-cap stocks exhibit stronger stock selectivity ability. Since the superior performance is most expected amongst these funds, these findings further validate the use of our characteristics-based benchmarks to evaluate the performance of international mutual funds.

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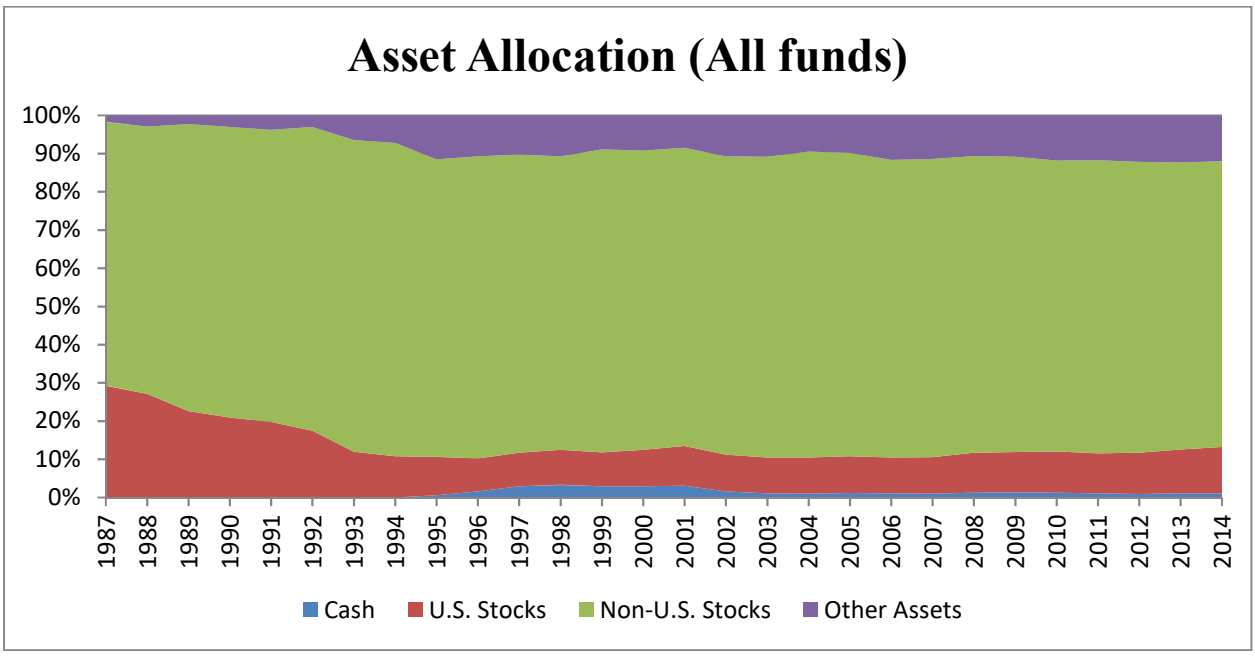
Figure 1
Asset Allocation

This figure shows the percentage of assets invested by U.S. international equity mutual funds in U.S. stocks, Non-U.S. stocks, cash, and other assets from 1987 to 2014. Cash is as reported in Morningstar, which considers leverage as negative cash.



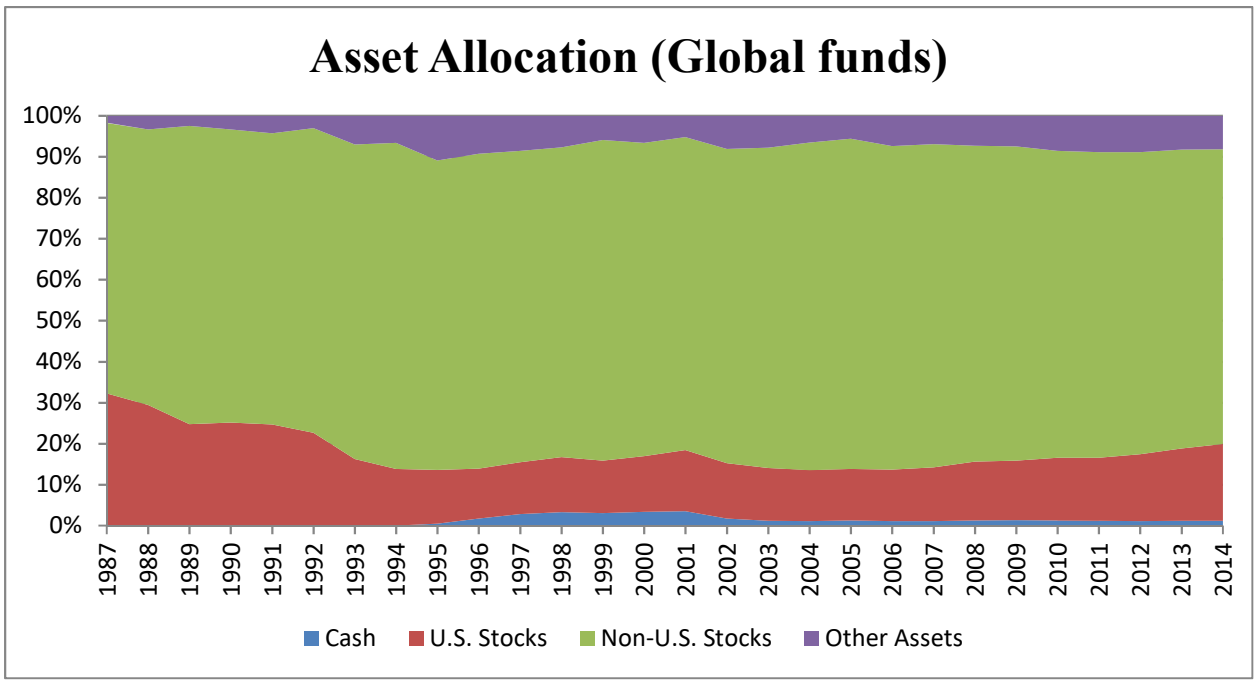


Table 1
Summary Statistics of Characteristic-Based Benchmarks

This table presents a summary of the stocks used to construct the characteristic-based benchmarks. We report the number of stocks included in the benchmarks, and the average 25th, 50th, and 75th cutoffs for size, book-to-market, and momentum. Size is the free-float market capitalization of a firm in $million. Book-to-market is the country-industry-adjusted book to market ratio. Momentum is measured as the cumulative return of a stock from July 1st of the previous year to May 31st of the ranking year. Annual observations are used in the calculations. Panel A reports the summary of regional characteristic-based benchmarks. Panel B reports the summary of country-level characteristic-based benchmarks.

Panel A: Characteristics by region

Region	Number of stocks	Size ($m) 25th percentile	Size ($m) 50th percentile	Size ($m) 75th percentile	Book-to-market 25th percentile	Book-to-market 50th percentile	Book-to-market 75th percentile	Momentum 25th percentile	Momentum 50th percentile	Momentum 75th percentile
Canada	4,291	16.49	64.82	239.04	-0.67	0.43	1.43	-0.35	-0.07	0.34
China Region	6,098	53.42	145.55	342.03	-0.38	0.40	1.17	-0.30	-0.05	0.30
Europe Emerging	1,686	6.76	26.62	118.51	-0.38	0.39	1.10	-0.27	0.04	0.37
Europe Developed	11,228	17.80	64.17	296.82	-0.50	0.28	0.98	-0.26	-0.01	0.26
India	2,770	5.65	23.68	100.13	0.41	0.96	1.59	-0.18	0.10	0.53
Japan	4,645	95.94	230.03	705.84	-0.31	0.46	1.10	-0.19	0.01	0.22
Latin America	1,385	12.36	67.64	370.00	-0.33	0.37	1.08	-0.19	0.01	0.24
Middle East and Africa	2,793	11.55	49.03	219.64	-0.36	0.43	1.13	-0.36	-0.10	0.26
Pacific Asia	9,734	16.49	64.82	239.04	-0.34	0.44	1.21	-0.31	-0.04	0.30
All	44,630	30.32	89.13	308.06	-0.34	0.45	1.20	-0.27	-0.02	0.31

Panel B: Characteristics by country

Country	Number of stocks	Size ($m) 25th percentile	Size ($m) 50th percentile	Size ($m) 75th percentile	Book-to-market 25th percentile	Book-to-market 50th percentile	Book-to-market 75th percentile	Momentum 25th percentile	Momentum 50th percentile	Momentum 75th percentile
Argentina	31	12.24	38.11	185.15	-0.26	0.51	0.99	-0.29	-0.17	0.06
Australia	2486	17.96	52.67	227.34	-0.22	0.67	1.68	-0.31	-0.05	0.27
Austria	126	19.73	75.04	360.57	-0.13	0.54	1.06	-0.14	0.00	0.18
Belgium	225	21.74	103.66	448.60	-0.55	0.05	0.71	-0.16	0.03	0.20
Bulgaria	148	0.95	4.55	23.47	-0.13	0.57	1.29	-0.10	0.20	0.45
Bosnia and Herzegovina	4	7.34	14.80	43.75	-0.23	-0.10	0.90	-0.26	-0.13	-0.07
Brazil	449	16.90	114.08	495.79	-0.29	0.33	0.90	-0.22	0.03	0.44
Canada	4296	17.77	67.69	245.20	-0.67	0.42	1.42	-0.33	-0.04	0.34
Switzerland	435	48.66	164.10	671.33	-0.32	0.46	1.14	-0.13	0.03	0.21
Chile	233	9.13	41.55	244.43	-0.39	0.33	1.17	-0.11	0.02	0.17
China	2739	121.83	196.75	370.80	-0.49	0.17	0.75	-0.10	0.06	0.25
Colombia	14	19.53	104.97	896.74	0.08	0.92	1.65	-0.07	-0.02	0.15
Cyprus	92	6.66	15.74	45.02	-0.50	0.22	0.85	-0.22	-0.01	0.18
Germany	1461	16.57	60.83	281.28	-0.26	0.45	1.12	-0.19	-0.01	0.18
Denmark	340	14.48	48.59	185.07	-0.23	0.36	0.99	-0.16	0.07	0.37
Egypt	129	17.77	51.32	227.41	-0.33	0.39	0.86	-0.10	0.07	0.58
Spain	269	50.06	213.44	872.28	-0.29	0.36	0.98	-0.17	-0.02	0.23
Finland	200	30.79	105.35	474.68	-0.42	0.35	0.99	-0.14	0.09	0.30
France	1474	20.90	72.15	280.08	-0.60	0.21	0.96	-0.15	0.06	0.40
United Kingdom	3737	15.07	54.13	275.07	-0.59	0.21	0.94	-0.31	-0.04	0.28
Greece	415	17.86	43.42	125.52	-0.43	0.50	1.11	-0.22	0.01	0.31
Hong Kong	1471	30.02	72.22	230.63	-0.46	0.40	1.48	-0.29	-0.09	0.23
Croatia	95	5.48	15.34	39.27	-0.28	0.28	0.95	-0.27	-0.16	-0.02
Indonesia	492	13.68	56.83	217.17	-0.19	0.38	1.04	-0.22	-0.01	0.22
India	2776	6.81	29.81	110.14	0.21	0.80	1.47	-0.19	0.08	0.54
Israel	542	11.36	36.48	107.02	-0.45	0.37	1.05	-0.29	-0.04	0.32
Italy	581	40.57	124.46	512.47	-0.51	0.24	1.02	-0.17	0.02	0.21
Jordan	158	3.86	8.00	18.55	-0.38	0.52	1.04	-0.27	-0.09	0.18

Japan	4645	96.11	230.51	708.95	-0.31	0.46	1.10	-0.19	0.00	0.23
South Korea	2097	31.96	66.69	149.44	-0.65	0.14	0.87	-0.19	0.03	0.23
Kuwait	128	32.61	69.07	152.19	-0.34	0.39	0.97	-0.26	-0.08	0.16
Sri Lanka	232	5.36	12.35	34.36	-0.39	0.27	1.00	-0.09	0.12	0.49
Mexico	283	51.07	227.30	940.44	-0.30	0.52	1.32	-0.09	-0.02	0.08
Malaysia	1235	32.87	75.32	172.64	-0.31	0.39	1.03	-0.12	0.11	0.43
Nigeria	27	21.94	187.92	580.24	0.01	0.53	0.93	0.00	0.19	0.28
Netherlands	272	40.03	209.35	1001.58	-0.55	0.12	0.82	-0.19	0.07	0.32
Norway	424	29.48	82.98	263.05	-0.65	0.09	0.82	-0.21	0.04	0.29
New Zealand	170	10.92	50.05	188.17	-0.90	-0.02	0.86	-0.36	-0.08	0.29
Oman	24	3.14	13.43	49.17	-0.52	0.27	1.20	-0.04	0.02	0.05
Pakistan	207	13.06	35.47	124.18	-0.01	0.65	1.31	-0.06	0.19	0.51
Peru	190	1.74	9.25	59.10	-0.32	0.38	1.12	-0.11	0.00	0.15
Philippines	294	7.86	33.57	219.78	-0.25	0.48	1.13	-0.21	-0.01	0.22
Poland	579	7.46	23.81	88.22	-0.38	0.48	1.15	-0.20	0.15	0.50
Portugal	85	5.23	31.02	121.77	-0.15	0.33	1.06	-0.09	0.02	0.40
Romania	144	3.79	10.09	33.76	-0.37	0.40	0.99	-0.18	0.06	0.55
Russia	428	12.51	81.26	566.07	-0.54	0.16	1.10	-0.26	0.09	0.56
Saudi Arabia	151	159.62	344.18	1188.83	-1.01	-0.16	0.56	-0.18	0.04	0.30
Singapore	966	23.09	56.30	166.93	-0.35	0.34	0.93	-0.23	-0.01	0.26
Serbia	85	3.19	10.22	30.89	-0.19	0.38	1.07	-0.22	-0.07	0.14
Sweden	786	16.83	62.76	310.34	-0.67	0.21	0.85	-0.27	-0.02	0.26
Thailand	1147	22.37	63.92	210.81	-0.16	0.55	1.10	-0.14	-0.01	0.21
Turkey	373	29.60	80.33	246.04	-0.48	0.52	1.19	-0.19	0.00	0.33
Taiwan	1887	73.82	154.39	351.73	-0.13	0.51	1.11	-0.22	-0.02	0.21
Ukraine	69	29.95	83.69	273.55	-0.18	0.75	1.15	-0.31	-0.01	0.21
Viet Nam	238	2.58	6.23	19.54	-0.65	-0.25	0.33	-0.08	0.00	0.00
South Africa	795	24.83	108.36	497.93	-0.19	0.51	1.21	-0.28	-0.01	0.32
All	43,379	27.84	87.00	334.14	-0.38	0.37	1.07	-0.19	0.01	0.28

Table 2
Micro Portfolios

This table presents the analyses of characteristic-based benchmarks and factor-based models by using micro-portfolio approach. We follow the procedure in Barras (2018) to construct a micro portfolio corresponding to each stock in the sample. Each micro portfolio consists of 10 stocks (including the stock itself and other 9 unique stocks) each year. We require stocks have at least 36 months of returns available in order to be included in the analysis of this table. In Panel A, we report the proportion of mispriced portfolios of various benchmarks. We rely on the procedures proposed in Barras (2018) to compute the proportion of mispriced portfolios. We first report the results using world market returns or regional market returns as the benchmarks. World market returns are the returns of MSCI ACWI all-country world index. Characteristic-based benchmarks include our regional and country-level benchmarks based on Size, Value, Momentum, Investment, and Profitability. For regional benchmarks, we also report the regional benchmarks by only using one characteristic. For factor-based models, we include Fama and French Global ex U.S. 4-factor model, Fama and French Global ex U.S. 6-factor model, and Fama and French Global ex U.S. 4-factor model plus regional market factors of North America, Europe, Pacific Asia, and Japan. We present the analysis for non-U.S. stocks in all the regions and the analysis for each specific region. In Panel B, we report the statistical tests for the differences in the proportions of mispriced micro portfolios. The tests are based on the differences in the proportions of mispriced micro portfolios between one model in the first column and the paired model in the top row. Z-statistics are in parentheses. In Panel C, we report the estimated pricing errors of each benchmark. Pricing errors are the absolute values of estimated portfolio alphas. We report the median and the distribution quantiles at 0.25 and 0.75 (on the rows below). In Panel D, we show the pricing error comparison with regional market returns as the baseline. We report the differences between the pricing errors of various benchmarks and the ones based on regional market returns. We cluster standard errors by country for the tests using stocks in all regions. We use robust standard errors for tests using stocks in each region. T-statistics are in parentheses. In Panel E, we focus on the stocks that are invested by any U.S. international equity funds and report the proportion of micro portfolios that are mispriced by various benchmarks. In Panel F, we focus on the stocks that are invested by any U.S. international equity funds and report the estimated pricing errors of each benchmark. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

Panel A: Proportions of mispriced micro portfolios

	Proportions of Mispriced Micro Portfolios									
	All regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
No. of stocks	38,560	3,449	5,406	1,440	9,572	2,554	4,246	1,245	2,441	8,207
World market return	29.4%	32.8%	72.5%	25.9%	8.5%	46.2%	-29.6%	52.5%	33.9%	44.8%
Regional market return	14.9%	25.4%	35.3%	-4.5%	8.1%	17.5%	3.4%	6.2%	10.0%	16.2%
Regional Size	3.8%	1.8%	3.6%	11.6%	12.7%	10.6%	-12.1%	1.1%	0.4%	0.4%
Regional Value	12.0%	19.8%	33.7%	-4.5%	5.2%	21.9%	-3.2%	-0.7%	6.7%	13.3%
Regional Momentum	11.9%	24.0%	32.7%	2.6%	4.9%	12.5%	-0.6%	-4.9%	3.4%	14.4%
Regional Investment	14.7%	23.2%	34.8%	-0.9%	6.5%	23.5%	5.4%	-1.8%	5.4%	17.6%
Regional Profitability	18.9%	35.3%	34.6%	2.4%	6.2%	35.5%	3.4%	7.5%	12.5%	25.7%
Regional Size*Value*Mom	-0.7%	-0.9%	6.9%	6.2%	0.7%	5.6%	-14.4%	0.8%	1.6%	-4.4%
Country Size*Value*MOM	-3.2%		-1.2%	-3.8%	0.4%			0.8%	-4.5%	-4.8%
Regional Size*Value*Mom*Inv*Prof	-0.6%	1.3%	-1.6%	-2.0%	0.5%	7.6%	-13.3%	3.7%	1.7%	0.6%
4 factor	35.9%	29.7%	79.8%	9.1%	10.5%	76.0%	-13.7%	60.5%	37.2%	53.1%
6 factor	34.0%	40.1%	86.0%	8.0%	9.2%	60.0%	-31.2%	62.3%	27.3%	54.1%
4 factor + 4 regional market factor	25.3%	17.5%	58.9%	8.9%	10.5%	73.3%	2.9%	47.1%	21.5%	20.9%

Panel B: Comparison tests of proportions of mispriced micro portfolios

	Benchmarks with a single characteristic				
	Regional market return	Regional Size	Regional Value	Regional Momentum	Regional Investment
Regional market return					
Regional Size	-11.1%***				
	(-12.72)				
Regional Value	-2.9%***	8.2%***			
	(-6.21)	(9.35)			
Regional Momentum	-2.9%***	8.2%***	0.1%		
	(-5.26)	(9.03)	(-0.03)		
Regional Investment	-0.2%	10.9%***	2.7%***	2.8%***	
	(-0.38)	(12.33)	(5.15)	(4.66)	
Regional Profitability	4.0%***	15.1%***	6.9%***	6.9%***	4.2%***
	(7.02)	(16.98)	(10.95)	(10.10)	(6.89)

	Benchmarks with multiple characteristics and factor-based models				
	Regional Size*Value*Mom	Country Size*Value*MOM	Regional Size*Value*Mom*Inv*Prof	4 factor	6 factor
Regional Size*Value*Mom					
Country Size*Value*MOM	-2.5%***				
	(-2.93)				
Regional Size*Value*Mom*Inv*Prof	0.1%	2.57%***			
	(0.08)	(2.68)			
4 factor	36.6%***	39.2%***	36.6%***		
	(37.88)	(39.93)	(37.84)		
6 factor	36.6%***	37.2%***	34.6%***	-1.9***	
	(35.65)	(37.69)	(35.53)	(-2.76)	
4 factor + 4 regional market factor	26.0%***	28.5%***	25.9%***	-10.7***	-8.7***
	(26.45)	(28.43)	(26.38)	(-13.67)	(-10.34)
Regional size	4.5%***	7.0%***	4.4%***	-32.2***	-30.2***
	(5.91)	(7.72)	(4.90)	(-33.60)	(-31.34)

Panel C: Pricing Errors

	Pricing Errors									
	All regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
No. of stocks	38,560	3,449	5,406	1,440	9,572	2,554	4,246	1,245	2,441	8,207
World market return	0.60%	0.97%	0.98%	0.86%	0.34%	1.13%	0.25%	0.78%	0.59%	0.75%
(0.25 quantile)	0.26%	0.42%	0.62%	0.38%	0.16%	0.63%	0.12%	0.39%	0.29%	0.37%
(0.75 quantile)	1.12%	1.91%	1.38%	1.41%	0.62%	1.73%	0.45%	1.25%	0.99%	1.24%
Regional market return	0.40%	0.79%	0.51%	0.54%	0.31%	0.59%	0.24%	0.33%	0.39%	0.44%
(0.25 quantile)	0.18%	0.33%	0.25%	0.25%	0.14%	0.29%	0.11%	0.15%	0.19%	0.20%
(0.75 quantile)	0.76%	1.61%	0.86%	0.94%	0.57%	1.05%	0.43%	0.65%	0.73%	0.81%
Regional Size	0.31%	0.51%	0.30%	0.49%	0.29%	0.41%	0.17%	0.28%	0.33%	0.34%
(0.25 quantile)	0.14%	0.23%	0.14%	0.23%	0.13%	0.19%	0.07%	0.13%	0.15%	0.16%
(0.75 quantile)	0.59%	0.96%	0.55%	0.86%	0.53%	0.74%	0.30%	0.53%	0.60%	0.63%
Regional Value	0.39%	0.72%	0.50%	0.53%	0.31%	0.59%	0.22%	0.32%	0.38%	0.42%
(0.25 quantile)	0.17%	0.29%	0.24%	0.24%	0.14%	0.27%	0.10%	0.15%	0.18%	0.19%
(0.75 quantile)	0.74%	1.48%	0.85%	0.95%	0.56%	1.04%	0.40%	0.64%	0.69%	0.77%
Regional Momentum	0.39%	0.75%	0.49%	0.52%	0.30%	0.55%	0.23%	0.33%	0.38%	0.42%
(0.25 quantile)	0.17%	0.30%	0.24%	0.26%	0.14%	0.25%	0.11%	0.14%	0.18%	0.19%
(0.75 quantile)	0.73%	1.56%	0.84%	0.94%	0.54%	0.98%	0.41%	0.62%	0.70%	0.79%
Regional Investment	0.39%	0.72%	0.49%	0.52%	0.31%	0.62%	0.23%	0.31%	0.38%	0.44%
(0.25 quantile)	0.18%	0.29%	0.24%	0.24%	0.14%	0.29%	0.11%	0.15%	0.18%	0.20%
(0.75 quantile)	0.75%	1.53%	0.84%	0.95%	0.56%	1.10%	0.41%	0.63%	0.71%	0.82%
Regional Profitability	0.41%	0.85%	0.49%	0.54%	0.31%	0.69%	0.23%	0.33%	0.42%	0.47%
(0.25 quantile)	0.19%	0.35%	0.24%	0.26%	0.14%	0.33%	0.11%	0.16%	0.20%	0.22%

(0.75 quantile)	0.78%	1.79%	0.82%	0.98%	0.57%	1.24%	0.41%	0.66%	0.76%	0.88%
Regional Size*Value*Mom	0.29%	0.47%	0.29%	0.46%	0.25%	0.38%	0.15%	0.28%	0.32%	0.33%
(0.25 quantile)	0.13%	0.21%	0.14%	0.21%	0.11%	0.18%	0.07%	0.12%	0.14%	0.15%
(0.75 quantile)	0.55%	0.93%	0.52%	0.83%	0.46%	0.68%	0.28%	0.49%	0.56%	0.61%
Country Size*Value*Mom	0.26%		0.24%	0.48%	0.23%			0.24%	0.28%	0.30%
(0.25 quantile)	0.12%		0.11%	0.20%	0.10%			0.11%	0.13%	0.14%
(0.75 quantile)	0.50%		0.44%	0.86%	0.42%			0.44%	0.52%	0.54%
Regional Size*Value*Mom*Inv*Prof	0.29%	0.49%	0.29%	0.42%	0.25%	0.40%	0.15%	0.27%	0.31%	0.34%
(0.25 quantile)	0.13%	0.20%	0.13%	0.19%	0.11%	0.18%	0.07%	0.12%	0.15%	0.15%
(0.75 quantile)	0.55%	1.02%	0.51%	0.74%	0.46%	0.73%	0.27%	0.49%	0.56%	0.63%
4 factor	0.64%	0.88%	1.17%	0.66%	0.33%	1.49%	0.25%	0.82%	0.64%	0.83%
(0.25 quantile)	0.28%	0.41%	0.79%	0.31%	0.16%	0.99%	0.12%	0.44%	0.32%	0.45%
(0.75 quantile)	1.20%	1.74%	1.65%	1.15%	0.60%	2.04%	0.44%	1.29%	1.08%	1.29%
6 factor	0.69%	1.09%	1.47%	0.71%	0.35%	1.40%	0.21%	0.91%	0.61%	0.89%
(0.25 quantile)	0.28%	0.48%	1.00%	0.32%	0.16%	0.83%	0.10%	0.51%	0.29%	0.48%
(0.75 quantile)	1.33%	2.11%	2.15%	1.18%	0.64%	2.03%	0.40%	1.38%	1.06%	1.38%
4 factor + 4 regional market factor	0.53%	0.81%	0.91%	0.71%	0.33%	1.48%	0.25%	0.71%	0.54%	0.55%
(0.25 quantile)	0.23%	0.33%	0.53%	0.33%	0.16%	0.99%	0.11%	0.35%	0.26%	0.26%
(0.75 quantile)	1.00%	1.69%	1.40%	1.26%	0.59%	2.05%	0.43%	1.17%	0.96%	0.99%

Panel D: Pricing errors of various benchmarks compared to pricing errors of regional market returns

All Regions

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
	Regional Benchmarks							Country-Level Benchmarks
Difference in pricing errors	-0.0020*** (-4.33)	-0.0003*** (-4.61)	-0.0003*** (-5.06)	-0.0001 (-0.83)	0.0007*** (3.13)	-0.0021*** (-4.36)	-0.0019*** (-4.11)	-0.0024*** (-4.59)
Observations	38,560	38,560	38,560	38,560	38,560	38,560	38,560	38,560

Canada

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	
	Regional Benchmarks							
Difference in pricing errors	-0.0050*** (-35.71)	-0.0007*** (-17.93)	-0.0007*** (-21.44)	-0.0003*** (-4.21)	0.0025*** (44.56)	-0.0053*** (-34.23)	-0.0048*** (-25.47)	
Observations	3,449	3,449	3,449	3,449	3,449	3,449	3,449	

China Region

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
	Regional Benchmarks							Country-Level Benchmarks
Difference in pricing errors	-0.0037*** (-90.40)	-0.0002*** (-20.57)	-0.0002*** (-14.42)	-0.0002*** (-17.01)	-0.0004*** (-17.93)	-0.0038*** (-79.47)	-0.0036*** (-65.32)	-0.0045*** (-49.02)
Observations	5,406	5,406	5,406	5,406	5,406	5,406	5,406	5,406

Europe Emerging

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
	Regional Benchmarks							Country-Level Benchmarks
Difference in pricing errors	-0.0004*** (-4.08)	-0.0003*** (-4.36)	0.0004*** (5.41)	0.0000 (0.62)	0.0012*** (12.50)	-0.0004*** (-2.73)	-0.0003 (-1.19)	-0.0001 (-0.29)
Observations	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440

Europe Developed

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
	Regional Benchmarks							Country-Level Benchmarks
Difference in pricing errors	0.0009*** (49.37)	-0.0001*** (-19.15)	-0.0002*** (-14.24)	-0.0002*** (-38.37)	0.0006*** (86.88)	0.0009*** (29.95)	0.0010*** (28.66)	0.0007*** (11.09)
Observations	9,572	9,572	9,572	9,572	9,572	9,572	9,572	9,572

India

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	
				Regional Benchmarks				
Difference in pricing errors	-0.0040*** (-52.17)	0.0001 (1.49)	-0.0007*** (-18.08)	0.0006*** (28.80)	0.0021*** (41.41)	-0.0041*** (-42.83)	-0.0042*** (-29.64)	
Observations	2,554	2,554	2,554	2,554	2,554	2,554	2,554	

Japan

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	
				Regional Benchmarks				
Difference in pricing errors	-0.0015*** (-53.02)	-0.0003*** (-23.56)	-0.0003*** (-24.72)	-0.0000*** (-5.96)	-0.0002*** (-17.13)	-0.0017*** (-49.10)	-0.0017*** (-44.46)	
Observations	4,246	4,246	4,246	4,246	4,246	4,246	4,246	

Latin America

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
				Regional Benchmarks				Country-Level Benchmarks
Difference in pricing errors	-0.0012*** (-17.79)	-0.0005*** (-13.03)	-0.0002*** (-3.30)	-0.0008*** (-28.01)	0.0001*** (2.60)	-0.0013*** (-11.47)	-0.0012*** (-7.05)	-0.0018*** (-5.94)
Observations	1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245

Mideast and Africa

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
	Regional Benchmarks							Country-Level Benchmarks
Difference in pricing errors	-0.0016*** (-25.74)	-0.0001*** (-3.30)	-0.0002*** (-4.97)	-0.0002*** (-6.99)	0.0009*** (37.39)	-0.0015*** (-16.80)	-0.0015*** (-10.78)	-0.0017*** (-9.53)
Observations	2,441	2,441	2,441	2,441	2,441	2,441	2,441	2,441

Pacific Asia

	Size	Value	Mom	Inv	Prof	Size*Value *Mom	Size*Value *Mom *Inv*Prof	Size*Value *Mom
	Regional Benchmarks							Country-Level Benchmarks
Difference in pricing errors	-0.0029*** (-101.26)	-0.0004*** (-51.32)	-0.0002*** (-18.52)	0.0002*** (28.66)	0.0008*** (79.25)	-0.0032*** (-84.19)	-0.0029*** (-61.46)	-0.0036*** (-38.85)
Observations	8,207	8,207	8,207	8,207	8,207	8,207	8,207	8,207

Panel E: Proportions of mispriced micro portfolios, investable stocks

	Proportions of Mispriced Micro Portfolios									
	All regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
No. of investable stocks	15,519	927	2,024	363	3,900	786	2,760	447	822	3,490
Regional Size*Value*Mom	-2.0%	-3.4%	4.8%	-9.8%	2.5%	4.3%	-12.5%	0.0%	4.9%	-4.9%
Country Size*Value*MOM	-5.5%		-0.9%	-9.8%	-6.9%			7.2%	-6.0%	-4.1%
4 factor	32.2%	26.8%	83.5%	15.0%	12.9%	72.6%	-12.0%	59.7%	46.8%	46.0%
6 factor	28.4%	36.2%	90.8%	7.0%	10.5%	50.9%	-33.4%	58.3%	35.1%	50.5%
4 factor + 4 regional market factor	19.3%	1.8%	58.4%	17.6%	10.4%	73.0%	4.1%	38.1%	19.4%	8.7%

Panel F: Pricing Errors, investable stocks

	Pricing Errors									
	All regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
No. of investable stocks	15,519	927	2,024	363	3,900	786	2,760	447	822	3,490
Regional Size*Value*Mom	0.23%	0.31%	0.26%	0.38%	0.22%	0.31%	0.14%	0.23%	0.26%	0.27%
(0.25 quantile)	0.10%	0.14%	0.13%	0.17%	0.10%	0.14%	0.07%	0.11%	0.12%	0.13%
(0.75 quantile)	0.43%	0.59%	0.45%	0.67%	0.40%	0.55%	0.25%	0.41%	0.45%	0.49%
Country Size*Value*Mom	0.22%			0.41%	0.20%			0.25%	0.24%	0.26%
(0.25 quantile)	0.09%			0.17%	0.09%			0.12%	0.11%	0.12%
(0.75 quantile)	0.41%			0.72%	0.38%			0.44%	0.42%	0.45%
4 factor	0.49%	0.58%	1.08%	0.62%	0.29%	1.26%	0.23%	0.66%	0.63%	0.67%
(0.25 quantile)	0.22%	0.29%	0.74%	0.31%	0.14%	0.85%	0.11%	0.37%	0.32%	0.35%
(0.75 quantile)	0.94%	0.97%	1.46%	1.07%	0.52%	1.78%	0.39%	1.08%	0.99%	1.05%
6 factor	0.51%	0.63%	1.37%	0.73%	0.31%	1.09%	0.19%	0.76%	0.57%	0.72%
(0.25 quantile)	0.21%	0.34%	0.97%	0.29%	0.14%	0.62%	0.09%	0.43%	0.28%	0.38%
(0.75 quantile)	1.03%	1.14%	1.87%	1.09%	0.56%	1.67%	0.36%	1.14%	0.95%	1.12%
4 factor + 4 regional market factor	0.39%	0.43%	0.77%	0.63%	0.28%	1.26%	0.23%	0.53%	0.47%	0.42%
(0.25 quantile)	0.17%	0.18%	0.45%	0.33%	0.14%	0.85%	0.10%	0.25%	0.22%	0.19%
(0.75 quantile)	0.75%	0.86%	1.18%	1.21%	0.50%	1.81%	0.39%	0.90%	0.81%	0.73%

Table 3
Micro Portfolios - 5-year holding periods

This table presents the analyses of characteristic-based benchmarks and factor-based models by using micro-portfolio approach. This table is similar to Table 2, except that the micro-portfolios are formed, with non-overlapping years, to have a holding period of five years. For each micro portfolio, we compute alphas by using factor models or characteristic-based benchmarks based on every 60 months` returns. 10 stocks in each micro portfolio are from the same region. All other definitions are the same as described in Table 2.

	Proportions of Mispriced Portfolios									
	All Regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
No. of stocks	38,560	3,449	5,406	1,440	9,572	2,554	4,246	1,245	2,441	8,207
4 factor	22.7%	28.6%	61.2%	10.6%	7.7%	39.8%	-8.5%	41.2%	19.6%	34.4%
6 factor	27.7%	31.1%	67.5%	7.6%	10.5%	34.1%	9.7%	46.8%	19.9%	37.2%
4 factor + 4 regional market factor	13.1%	12.1%	38.0%	4.3%	12.5%	28.0%	0.8%	23.1%	12.0%	3.5%
Regional Size*Value*Mom	-0.3%	-1.1%	7.2%	-1.3%	2.6%	3.0%	-10.5%	-0.4%	4.3%	-2.8%
Country Size*Value*Mom	-2.1%		-1.0%	1.1%	2.0%			1.8%	0.3%	-4.5%

	Pricing Errors									
	All Regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
No. of stocks	38,560	3,449	5,406	1,440	9,572	2,554	4,246	1,245	2,441	8,207
4 factor	0.73%	1.05%	1.59%	0.90%	0.46%	1.57%	0.41%	1.07%	0.74%	0.97%
(0.25 quantile)	0.32%	0.50%	0.87%	0.42%	0.21%	0.78%	0.19%	0.49%	0.33%	0.47%
(0.75 quantile)	1.42%	1.94%	2.46%	1.49%	0.81%	2.48%	0.69%	1.77%	1.41%	1.60%
6 factor	0.84%	1.16%	2.01%	0.94%	0.51%	1.54%	0.51%	1.27%	0.77%	1.09%
(0.25 quantile)	0.38%	0.56%	1.15%	0.44%	0.23%	0.80%	0.24%	0.60%	0.35%	0.54%
(0.75 quantile)	1.63%	2.30%	2.82%	1.65%	0.89%	2.45%	0.88%	1.98%	1.51%	1.78%
4 factor + 4 regional market factor	0.66%	0.92%	1.12%	0.89%	0.51%	1.41%	0.40%	0.85%	0.73%	0.70%
(0.25 quantile)	0.30%	0.43%	0.58%	0.45%	0.24%	0.72%	0.19%	0.41%	0.33%	0.33%
(0.75 quantile)	1.23%	1.80%	1.71%	1.62%	0.89%	2.32%	0.68%	1.39%	1.43%	1.26%
Regional Size*Value*Mom	0.40%	0.57%	0.43%	0.54%	0.38%	0.49%	0.27%	0.39%	0.42%	0.48%
(0.25 quantile)	0.18%	0.26%	0.20%	0.25%	0.18%	0.23%	0.13%	0.17%	0.20%	0.22%
(0.75 quantile)	0.72%	1.10%	0.73%	0.97%	0.66%	0.86%	0.47%	0.70%	0.75%	0.84%
Regional Size*Value*Mom	0.37%	0.57%	0.35%	0.56%	0.35%	0.49%	0.27%	0.33%	0.39%	0.43%
(0.25 quantile)	0.17%	0.27%	0.16%	0.24%	0.16%	0.23%	0.13%	0.16%	0.19%	0.20%
(0.75 quantile)	0.66%	1.09%	0.61%	1.01%	0.61%	0.88%	0.47%	0.60%	0.70%	0.75%

Table 4
Bootstrapped Portfolio Returns Relative to Characteristic-Based Benchmarks

This table presents results from a bootstrap analysis of characteristic-based benchmark-adjusted returns. For each year between 1987 and 2014, we randomly pick with replacement 10 non-U.S. stocks and form a portfolio. This procedure is repeated 1000 times to obtain 1000 portfolios. We then compute the abnormal returns (C-alpha) relative to characteristic-based benchmarks for these 1,000 portfolios and report the corresponding t-statistics. In Panel A, we report the alpha when we equally weight the monthly returns of the 1,000 portfolios. Panel B reports the distribution of the 1,000 t statistics at the 1, 5, 50, 90, 95, and 99 percentiles.

Panel A: Abnormal returns

	Region-Level Benchmarks	**Country-Level Benchmarks**									
C-Alpha	All Regions	All Regions	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Mideast and Africa	Pacific Asia
Constant	0.0003**	0.0002	0.0015***	0.0001	0.0004	0.0000	0.0011***	0.0001	0.0001	0.0004**	0.0001
	(2.58)	(1.50)	(4.49)	(0.65)	(0.55)	(0.11)	(2.86)	(0.40)	(0.29)	(2.06)	(0.91)
Observations	324	324	324	300	168	324	276	324	240	276	300

Panel B: Distribution of t-statistics

Percentile	**99%**	**95%**	**90%**	**50%**	**10%**	**5%**	**1%**
Student t distribution	2.58	1.96	1.65	0.00	-1.65	-1.96	-2.58
Regional Benchmarks							
All Regions	2.28	1.62	1.35	0.16	-1.02	-1.33	-1.96
Country-Level Benchmarks							
All Regions	2.20	1.64	1.34	0.05	-1.13	-1.57	-2.20
Canada	2.57	1.91	1.58	0.44	-0.76	-1.12	-1.73
China Region	2.36	1.56	1.27	0.05	-1.19	-1.49	-2.42
Europe Emerging	2.34	1.66	1.23	0.11	-1.19	-1.56	-2.11
Europe Developed	2.37	1.67	1.36	-0.05	-1.31	-1.61	-2.61
India	2.62	1.95	1.56	0.34	-0.82	-1.20	-1.90
Japan	2.13	1.50	1.18	0.05	-1.08	-1.32	-1.95
Latin America	2.16	1.65	1.30	-0.02	-1.27	-1.57	-2.17
Mideast and Africa	2.32	1.68	1.37	0.22	-1.09	-1.39	-2.15
Pacific Asia	2.27	1.53	1.23	0.04	-1.16	-1.53	-2.04

Table 5
Comparison of Factors and Characteristics

This table presents results from regressions of abnormal returns from factor models on firm characteristics. The tests are in the spirit of Brennan, Chordia, and Subrahmanyam (1998). Dependent variables are excess returns, Alphas using global ex US 4 factors, and Alphas using regional 4 factors. Excess returns are the monthly U.S. dollar-denominated returns minus the U.S. Treasury bill returns. Alphas using global ex U.S 4 factors are estimated from regression excess returns on Fama and French global ex U.S. 4 factors. Alphas using global ex US 4 factors are estimated from regression excess returns of each stock on its corresponding Fama and French regional ex U.S 4 factors. We include the following regions for regional factors: Europe Developed, Europe Emerging, Canada, Japan, and Asia Pacific ex Japan. Independent variables are computed at the end of June each year. Free float market value is the market value of each stock based on its free float shares available. Book to market ratio of each stock is the book value per share divided by market price. P 12-month return is the cumulative past 12-month returns. T-statistics are based on Newey-West adjusted standard errors lagged by 12 periods. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

	Fama-Macbeth regressions Newey-west adjusted standard errors lagged 12 periods		
	Excess returns	Alphas using Global ex-US 4 factors	Alphas using regional 4 factors
Log (Free float market value)	-0.0014***	-0.0013***	-0.0011***
	(-4.74)	(-5.17)	(-4.64)
Log (Book to market ratio)	0.0032***	0.0023***	0.0021***
	(5.31)	(4.49)	(5.37)
Past 12-month return	0.0008	0.0008	0.0019**
	(0.54)	(0.70)	(2.47)
Intercept	0.0140***	0.0102***	0.0077***
	(3.19)	(5.54)	(5.00)
Number of Months	284	284	284
R-squared	0.0131	0.0099	0.0055

Table 6
Alphas of Characteristic-Based Portfolios

This table summarizes the proportion of passive portfolios formed on the characteristics of size, book to market, and momentum that generate significant alphas from factor models. We report the total number of portfolios with significant alphas, and with (significant) positive alphas, by region. We consider the alphas are significant if the associated p-value<0.05. We report the results for regions with corresponding Fama and French regional factors. The regions include Canada, Europe Developed, Europe Emerging, Japan, Asia Pacific ex Japan. In Panel A, we regress the monthly returns of characteristic-based benchmark portfolios on Fama and French regional 4-factor returns. In Panels B, we regress the monthly returns of characteristic-based benchmark portfolios correspondingly on Fama and French Global ex U.S. 4-factors.

Panel A: Alphas from regressions of characteristic-portfolio returns on regional 4 factors

	All Regions					Europe Developed				
Portfolios	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas
All	320	77	24%	60	19%	64	21	33%	12	19%
Size 1	80	37	46%	36	45%	16	6	38%	5	31%
Size 2	80	15	19%	10	13%	16	6	38%	2	13%
Size 3	80	16	20%	6	8%	16	6	38%	2	13%
Size 4	80	9	11%	8	10%	16	3	19%	3	19%
Value 1	80	15	19%	6	8%	16	6	38%	1	6%
Value 2	80	15	19%	8	10%	16	5	31%	1	6%
Value 3	80	17	21%	16	20%	16	3	19%	3	19%
Value 4	80	30	38%	30	38%	16	7	44%	7	44%
Momentum 1	80	23	29%	15	19%	16	7	44%	3	19%
Momentum 2	80	22	28%	15	19%	16	6	38%	2	13%
Momentum 3	80	14	18%	13	16%	16	3	19%	2	13%
Momentum 4	80	18	23%	17	21%	16	5	31%	5	31%

	Europe Emerging					Japan				
All	64	3	5%	1	2%	64	12	19%	11	17%
Size 1	16	1	6%	1	6%	16	4	25%	4	25%
Size 2	16	1	6%	0	0%	16	4	25%	4	25%
Size 3	16	1	6%	0	0%	16	1	6%	0	0%
Size 4	16	0	0%	0	0%	16	3	19%	3	19%
Value 1	16	1	6%	0	0%	16	1	6%	0	0%
Value 2	16	1	6%	0	0%	16	1	6%	1	6%
Value 3	16	0	0%	0	0%	16	3	19%	3	19%
Value 4	16	1	6%	1	6%	16	7	44%	7	44%
Momentum 1	16	1	6%	1	6%	16	6	38%	5	31%
Momentum 2	16	1	6%	0	0%	16	4	25%	4	25%
Momentum 3	16	0	0%	0	0%	16	1	6%	1	6%
Momentum 4	16	1	6%	0	0%	16	1	6%	1	6%

	Canada					Asia Pacific ex Japan				
Portfolios	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas
All	64	17	27%	12	19%	64	24	38%	24	38%
Size 1	16	12	75%	12	75%	16	14	88%	14	88%
Size 2	16	4	25%	0	0%	16	4	25%	4	25%
Size 3	16	0	0%	0	0%	16	4	25%	4	25%
Size 4	16	1	6%	0	0%	16	2	13%	2	13%
Value 1	16	5	31%	3	19%	16	2	13%	2	13%
Value 2	16	4	25%	2	13%	16	4	25%	4	25%
Value 3	16	5	31%	4	25%	16	6	38%	6	38%
Value 4	16	3	19%	3	19%	16	12	75%	12	75%
Momentum 1	16	5	31%	2	13%	16	4	25%	4	25%
Momentum 2	16	6	38%	4	25%	16	5	31%	5	31%
Momentum 3	16	2	13%	2	13%	16	8	50%	8	50%
Momentum 4	16	4	25%	4	25%	16	7	44%	7	44%

Panel B: Alphas from regressions of characteristic portfolio returns on Global ex U.S. 4 factors

	All Regions					Europe Developed				
Portfolios	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas
All	320	77	24%	71	22%	64	17	27%	14	22%
Size 1	80	38	48%	37	46%	16	7	44%	6	38%
Size 2	80	17	21%	15	19%	16	3	19%	2	13%
Size 3	80	12	15%	9	11%	16	4	25%	3	19%
Size 4	80	10	13%	10	13%	16	3	19%	3	19%
Value 1	80	12	15%	9	11%	16	2	13%	1	6%
Value 2	80	16	20%	13	16%	16	5	31%	3	19%
Value 3	80	18	23%	18	23%	16	3	19%	3	19%
Value 4	80	31	39%	31	39%	16	7	44%	7	44%
Momentum 1	80	13	16%	12	15%	16	2	13%	1	6%
Momentum 2	80	17	21%	13	16%	16	3	19%	1	6%
Momentum 3	80	19	24%	19	24%	16	2	13%	2	13%
Momentum 4	80	28	35%	27	34%	16	10	63%	10	63%

	Europe Emerging					Japan				
All	64	3	5%	1	2%	64	0	0%	0	0%
Size 1	16	1	6%	1	6%	16	0	0%	0	0%
Size 2	16	1	6%	0	0%	16	0	0%	0	0%
Size 3	16	1	6%	0	0%	16	0	0%	0	0%
Size 4	16	0	0%	0	0%	16	0	0%	0	0%
Value 1	16	1	6%	0	0%	16	0	0%	0	0%
Value 2	16	1	6%	0	0%	16	0	0%	0	0%
Value 3	16	0	0%	0	0%	16	0	0%	0	0%
Value 4	16	1	6%	1	6%	16	0	0%	0	0%
Momentum 1	16	1	6%	1	6%	16	0	0%	0	0%
Momentum 2	16	1	6%	0	0%	16	0	0%	0	0%
Momentum 3	16	0	0%	0	0%	16	0	0%	0	0%
Momentum 4	16	1	6%	0	0%	16	0	0%	0	0%

	Canada					Asia Pacific ex Japan				
Portfolios	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas	No. of portfolios	No. of portfolios with significant alphas	% of portfolios with significant alphas	No. of portfolios with significant >0 alphas	% of portfolios with significant >0 alphas
All	64	27	42%	26	41%	64	30	47%	30	47%
Size 1	16	16	100%	16	100%	16	14	88%	14	88%
Size 2	16	6	38%	6	38%	16	7	44%	7	44%
Size 3	16	2	13%	1	6%	16	5	31%	5	31%
Size 4	16	3	19%	3	19%	16	4	25%	4	25%
Value 1	16	7	44%	6	38%	16	2	13%	2	13%
Value 2	16	5	31%	5	31%	16	5	31%	5	31%
Value 3	16	6	38%	6	38%	16	9	56%	9	56%
Value 4	16	9	56%	9	56%	16	14	88%	14	88%
Momentum 1	16	5	31%	5	31%	16	5	31%	5	31%
Momentum 2	16	6	38%	5	31%	16	7	44%	7	44%
Momentum 3	16	8	50%	8	50%	16	9	56%	9	56%
Momentum 4	16	8	50%	8	50%	16	9	56%	9	56%

Table 7
Performance of U.S. International Equity Index Funds

This table presents the performance of U.S. international equity index funds relative to characteristic-based benchmarks or factor-based models. Performance is measured based on the non-US equity holdings. In Panel A and B, we report the raw return, and various measures based on characteristic-based benchmarks: characteristic selectivity (CS), characteristic timing (CT), regional characteristic timing (RCT) performance, Style Tilt (RST), and regional average return (RAR) performance. We compute the measures at the fund level using value weights of each stock relative to the total non-US equity holdings of the fund. We then aggregate to month level by equally weighting each fund. The time-series averages across all months are reported in the tables. Panel A reports the results based on regional characteristic-based benchmarks. Panel B reports the results based on country-level characteristic-based benchmarks. All returns are in U.S. dollars. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively. Standard errors are adjusted for autocorrelation using Newey-West (1987) lags of order 12.

Panel A: Regional benchmarks

All funds (1987-2014)

		(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
		0.0059*	0.0001	0.0007	0.0004	-0.0001	0.0047
		(1.69)	(0.20)	(0.74)	(1.59)	(-0.29)	(1.74)
	Obs	276	276	258	258	258	258
Years 1987 – 2000							
		0.0056	0.0010	0.0006	0.0012*	-0.0000	0.0037
		(1.34)	(1.47)	(0.50)	(1.93)	(-0.02)	(0.94)
	Obs	114	114	96	96	96	96
Years 2001 – 2014							
		0.0060	-0.0006	0.0007	-0.0000	-0.0001	0.0054
		(1.22)	(-1.63)	(0.58)	(-0.01)	(-0.53)	(1.49)
	Obs	162	162	162	162	162	162

Global funds (1987-2014)

		0.0062	-0.0001	0.0006	0.0001	-0.0002	0.0050
		(1.48)	(-0.22)	(0.61)	(0.62)	(-0.73)	(1.51)
	Obs	213	213	195	195	195	195
Years 1987 – 2000							
	`	0.0077	0.0014	0.0010	0.0012	-0.0006	0.0041
		(1.39)	(1.16)	(0.56)	(1.57)	(-0.87)	(0.68)
	Obs	51	51	33	33	33	33
Years 2001 – 2014							
		0.0057	-0.0006	0.0006	-0.0001	-0.0001	0.0052
		(1.13)	(-1.42)	(0.48)	(-0.45)	(-0.40)	(1.40)
	Obs	162	162	162	162	162	162

Panel B: Country-level benchmarks

All funds (1987-2014)

		(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
		0.0057	0.0001	0.0010	0.0003	-0.0001	0.0050
		(1.65)	(0.19)	(1.08)	(0.85)	(-0.68)	(1.81)
	Obs	276	276	258	258	258	258
Years 1987 – 2000							
		0.0052	0.0007	0.0009	0.0010	0.0000	0.0044
		(1.22)	(1.45)	(0.63)	(1.41)	(0.11)	(1.09)
	Obs	114	114	96	96	96	96
Years 2001 – 2014							
		0.0061	-0.0004	0.0010	-0.0002	-0.0002	0.0053
		(1.23)	(-1.34)	(0.90)	(-1.36)	(-1.06)	(1.47)
	Obs	162	162	162	162	162	162

Global funds (1987-2014)

		0.0060	-0.0003	0.0009	-0.0000	-0.0003	0.0051
		(1.46)	(-0.89)	(0.90)	(-0.13)	(-1.18)	(1.56)
	Obs	243	243	228	228	228	228
Years 1987 – 2000							
	`	0.0072	0.0001	0.0018	0.0012	-0.0008	0.0053
		(1.31)	(0.10)	(1.22)	(1.37)	(-0.98)	(0.90)
	Obs	51	51	33	33	33	33
Years 2001 – 2014							
		0.0057	-0.0004	0.0008	-0.0003*	-0.0002	0.0051
		(1.13)	(-1.25)	(0.64)	(-1.73)	(-0.83)	(1.39)
	Obs	162	162	162	162	162	162

Table 8
Active U.S. International Equity Mutual Funds - Summary Statistics

The table below summarizes the characteristics of active U.S. international equity mutual funds and their holdings. Size, book-to-market and momentum quartile are calculated based on regional-level characteristic-based benchmarks. Number of funds is the number of unique funds. Number of stocks is the number of stocks a fund invests in. Number of countries is the number of countries a fund invests in. Number of regions is the number of regions a fund invests in. Number of currencies is the number of non-U.S. dollar currencies a fund holds. Number of industries is the number of industries a fund invests in. Industries are classified based on the 40 industries classification of DataStream In Panel A, we first aggregate to fund-quarter level and then to category-quarter level by equally weighting each fund in the same category. The values reported are the time-series average of a category across quarters. In Panel B, we first calculate the time-series average for each fund and the values reported are the cross-sectional average of the funds within a category. Standard deviations are shown after the "/".
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Panel A: Time-series averages

Morningstar Category	Size Quartile	Book-to-market Quartile	Momentum Quartile	Number of funds	Number of stocks	Number of countries	Number of regions	Number of currencies	Number of industries
Global Funds									
World Stock	3.8/0.2	2.4/0.2	2.6/0.3	82/69	40/20	10.7/3.5	4.9/1.1	9.4/2.7	15.4/3.8
Foreign Large Blend	3.9/0.1	2.4/0.1	2.6/0.3	83/61	96/60	14.1/4.5	5.4/1.2	12/2.8	23.2/3.8
Foreign Large Growth	3.9/0.1	2.3/0.2	2.7/0.3	42/29	53/19	13.5/4	5.7/1.3	11.8/2.7	20.9/3.7
Foreign Large Value	3.9/0.2	2.7/0.2	2.5/0.3	37/30	108/66	14.8/3.7	5.7/0.6	12.5/2.2	24/4.1
Foreign Small/Mid Blend	3.6/0.4	2.4/0.2	2.7/0.2	11/8	133/86	16.9/4.3	5.8/0.9	12.9/2.3	22.7/4.6
Foreign Small/Mid Growth	3.6/0.4	2.1/0.2	2.9/0.2	15/10	62/25	17.1/3.5	6.3/1.1	14.6/2.4	20.2/4.1
Foreign Small/Mid Value	3.7/0.2	2.5/0.3	2.6/0.3	11/6	250/202	18.5/5.6	6.4/1.1	14.7/2.8	24.2/5.9
Regional Funds									
Diversified Emerging Mkts	3.9/0.1	2.3/0.1	2.7/0.3	63/47	86/60	13.8/2.6	5.7/1	14/2.6	19.9/4.2
Diversified Pacific/Asia	3.8/0.2	2.4/0.3	2.7/0.3	7/4	59/25	7.6/2.7	3.2/0.8	8.1/3	21.1/4.9
Pacific/Asia ex-Japan Stk	3.9/0.1	2.2/0.3	2.7/0.3	14/9	52/31	7.4/2.4	2.6/0.6	7.8/2.5	17.3/5.6
China Region	3.8/0.1	2.3/0.2	2.7/0.4	12/8	32/11	3.3/0.7	1.6/0.3	3.6/0.9	15.5/4.4
India Equity	3.9/0.2	1.9/0.3	2.6/0.4	3/2	23/12	1.4/0.6	1.3/0.3	2.0/0.7	12.3/4.4
Japan Stock	3.7/0.3	2.3/0.2	2.7/0.3	8/5	114/96	1.4/0.8	1.1/0.2	1.8/0.9	20.2/3.5
Europe Stock	3.9/0.1	2.4/0.2	2.7/0.3	17/11	52/30	9.8/2.6	2.7/0.5	7.5/1.4	18.2/4.0
Latin America Stock	3.9/0.1	2.2/0.3	2.7/0.4	6/3	14/8	3/0.8	1.3/0.3	3.4/1	9.1/3.9
All Funds	3.8/0.1	2.4/0.2	2.7/0.2	374/295	71/43	11.4/4.1	4/1.2	9.6/2.8	19.5/4.2

Panel B: Cross-sectional averages

Morningstar Category	Size Quartile	Book-to-market Quartile	Momentum Quartile	Number of stocks	Number of countries	Number of regions	Number of currencies	Number of industries
Global Funds								
World Stock	3.9/0.1	2.4/0.3	2.6/0.3	60/149	12.5/6.6	5.5/1.8	9.9/4.9	16.3/8.5
Foreign Large Blend	3.9/0.2	2.4/0.2	2.5/0.2	139/310	16.8/7.3	6/1.6	12.9/5	24.9/8.1
Foreign Large Growth	3.9/0.1	2.2/0.2	2.7/0.2	65/57	15.4/5.4	6.3/1.6	12.3/3.7	22.1/6.9
Foreign Large Value	3.9/0.1	2.6/0.2	2.5/0.2	162/365	17.5/5.5	6.1/1.1	12.7/3.5	26.5/7.3
Foreign Small/Mid Blend	3.8/0.2	2.3/0.2	2.7/0.3	172/416	20/6	6.6/1.5	14/4.2	24.4/7.2
Foreign Small/Mid Growth	3.8/0.1	2.1/0.2	2.9/0.3	79/90	17.9/5.7	6.7/1.5	13.8/3.8	21.8/6.5
Foreign Small/Mid Value	3.8/0.2	2.6/0.3	2.6/0.3	326/672	20.5/6.6	6.7/1.3	15/4.2	26.7/7.2
Regional Funds								
Diversified Emerging Mkts	3.9/0.1	2.2/0.2	2.6/0.3	108/248	14.9/5.4	6/1.4	14.8/5.1	21.6/7.1
Diversified Pacific/Asia	3.9/0.1	2.2/0.2	2.7/0.3	57/34	8/2.1	3.4/0.5	8.5/2.2	21/5.0
Pacific/Asia ex-Japan Stk	3.9/0.1	2.1/0.2	2.7/0.2	54/77	8.2/3.1	2.7/0.9	8.7/3.1	18.9/5.9
China Region	3.8/0.4	2.3/0.2	2.6/0.4	37/15	3.1/1.2	1.54/0.5	3.4/1.3	17.6/4.5
India Equity	3.9/0.1	1.9/0.4	2.6/0.2	37/13	1.12/2.2	1.15/0.3	2/0.2	16/3.1
Japan Stock	3.8/0.3	2.3/0.3	2.6/0.2	85/169	1.6/2.7	1.16/0.6	2.1/1.8	19.4/5.0
Europe Stock	3.9/0.1	2.3/0.2	2.6/0.3	46/84	10.1/3.1	2.8/0.8	7.8/1.9	17.7/6.2
Latin America Stock	3.9/0.1	2.2/0.3	2.6/0.3	15/8	2.8/1.1	1.26/0.3	3.3/1.3	9.5/4.1
All Funds	3.9/0.1	2.3/0.3	2.6/0.3	100/256	13.7/6.9	4.7/1.8	13.7/6.9	21.6/8.6

Table 9
Performance Relative to Characteristic-Based Benchmarks

This table presents the analysis of fund returns based on regional and country-level characteristic-based benchmarks. For the non-US equity holdings, we report the raw return, characteristic selectivity (CS) performance, characteristic timing (CT) performance, regional characteristic timing (RCT) performance, style tilt (RST) performance, and regional average return (RAR) performance. For each measure, we first aggregate to fund-month level by value weighting each stock`s observation by its dollar holdings to the total dollar holdings of all non-U.S. stocks held by the fund. We then aggregate to month level by equally weighting each fund`s observations. Finally, we report the time-series average across all months. Panel A shows the results based on regional benchmarks. Panel B shows the results based on country-level benchmarks. All returns are U.S. dollar-denominated. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively. Standard errors are adjusted for autocorrelation using Newey-West (1987) lags of order 12.

Panel A: Regional benchmarks

All funds (1987-2014)

		(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
		0.0086***	0.0012**	0.0021**	0.0000	0.0006*	0.0045
		(2.61)	(2.01)	(1.97)	(0.13)	(1.87)	(2.15)
	Observations	324	324	312	312	312	312
Years 1987 – 2000							
		0.0089**	0.0021**	0.0021	0.0002	0.0007	0.0031
		(2.42)	(2.17)	(1.54)	(0.52)	(1.24)	(1.40)
	Observations	162	162	150	150	162	150
Years 2001 – 2014							
		0.0084	0.0003	0.0020	-0.0002	0.0004**	0.0084
		(1.58)	(0.46)	(1.33)	(-0.99)	(2.29)	(1.58)
	Observations	162	162	162	162	162	162

Global funds (1987-2014)

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0083***	0.0010*	0.0020**	0.0000	0.0005**	0.0045
	(2.61)	(1.83)	(1.99)	(0.02)	(2.01)	(2.14)
Observations	324	324	312	312	312	312
Years 1987 – 2000						
`	0.0092***	0.0020**	0.0024*	0.0003	0.0008	0.0034
	(2.79)	(2.09)	(1.78)	(0.51)	(1.53)	(1.67)
Observations	162	162	150	150	150	150
Years 2001 – 2014						
	0.0074	0.0001	0.0016	-0.0002	0.0003*	0.0055
	(1.41)	(0.17)	(1.12)	(-1.32)	(1.84)	(1.58)
Observations	162	162	162	162	162	162

Panel B: Country-level benchmarks
All funds (1987-2014)

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0089***	0.0010***	0.0029**	-0.0004	0.0007**	0.0047
	(2.67)	(2.68)	(2.22)	(-1.53)	(2.15)	(2.26)
Observations	324	324	312	312	312	312
Years 1987 – 2000						
	0.0094**	0.0018***	0.0039**	-0.0002	0.0010	0.0033
	(2.48)	(3.00)	(2.22)	(-0.43)	(1.57)	(1.47)
Observations	162	162	150	150	162	150
Years 2001 – 2014						
	0.0084	0.0002	0.0021	-0.0006**	0.0005*	0.0060
	(1.58)	(0.68)	(1.11)	(-2.46)	(1.93)	(1.81)
Observations	162	162	162	162	162	162

Global funds (1987-2014)

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0085***	0.0010***	0.0027**	-0.0004	0.0006*	0.0046
	(2.67)	(2.62)	(2.16)	(-1.44)	(1.84)	(2.25)
Observations	324	324	312	312	312	312

Years 1987 – 2000

`	0.0097***	0.0019***	0.0036**	-0.0001	0.0009	0.0037
	(2.84)	(3.34)	(2.16)	(-0.22)	(1.38)	(1.80)
Observations	162	162	150	150	150	150

Years 2001 – 2014

	0.0073	0.0001	0.0018	-0.0007***	0.0004*	0.0055
	(1.40)	(0.24)	(1.03)	(-2.74)	(1.66)	(1.63)
Observations	162	162	162	162	162	162

Table 10
Fund Characteristics and Performance

This table presents the analysis of fund returns based fund characteristics. For the non-US equity holdings, we report the raw return, characteristic selectivity (CS) performance, characteristic timing (CT) performance, regional characteristic timing (RCT) performance, style tile (RST) performance, and regional average return (RAR) performance. Country level benchmarks are used for the analysis. In Panel A, we report the performance analyses for funds mainly invest in foreign small/mid cap stocks and funds mainly invest in foreign large cap stocks, respectively. Funds mainly invest in foreign small cap stocks include funds in categories: Foreign Small/Mid Blend, Foreign Small/Mid Growth, Foreign Small/Mid Value. Funds mainly invest in foreign large cap stocks include funds in categories: Foreign Large Blend, Foreign Large Growth, and Foreign Large Value. In Panel B, we report the performance of funds focus on emerging markets, which include funds in the category: Diversified Emerging Mkts. In Panel C, we report the performance of funds with above or below median expense ratios at the beginning of each quarter, respectively. In Panel D, we report results for funds with above or below median active share (Cremers and Petajisto (2009)) at the beginning of each quarter, respectively. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively. Standard errors are adjusted for autocorrelation using Newey-West (1987) lags of order 12.

Panel A:
Foreign Small/Mid Cap Funds

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0109***	0.0019**	0.0033**	-0.0004	0.0001	0.0049
	(2.64)	(2.09)	(2.38)	(-0.95)	(0.09)	(2.05)
Observations	285	285	258	258	258	258

Foreign Large Cap Funds

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0077**	0.0002	0.0023**	-0.0004	0.0007**	0.0046
	(2.48)	(0.61)	(2.12)	(-1.34)	(2.03)	(2.17)
Observations	324	324	312	312	324	312

Panel B: Funds focusing on Emerging Markets

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0119**	0.0014**	0.0035	-0.0003	0.0005	0.0052*
	(2.19)	(1.99)	(1.08)	(-0.49)	(0.84)	(1.97)
Observations	273	273	258	258	258	258

Panel C:
Foreign with Above Median Expense Ratio

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0100***	0.0021***	0.0046**	-0.00037	0.00011	0.0035
	(2.79)	(2.93)	(2.20)	(-0.97)	(0.38)	(2.18)
Observations	285	285	258	258	258	258

Foreign with Below Median Expense Ratio

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0088***	0.0005	0.0049**	-0.00070**	0.00061	0.0030
	(2.70)	(1.04)	(2.44)	(-2.18)	(1.53)	(2.02)
Observations	324	324	312	312	324	312

Panel D:
Foreign with Above Median Active Share

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0099***	0.0020***	0.0045**	-0.0001	0.0014***	0.0022
	(2.90)	(3.84)	(2.28)	(-0.39)	(2.83)	(1.62)
Observations	324	324	312	312	324	312

Foreign with Below Median Active Share

	(1) Raw Return	(2) CS	(3) CT	(4) RCT	(5) RST	(6) RAR
	0.0074**	0.0008*	0.0039*	-0.0001	0.0004	0.0021
	(2.27)	(1.67)	(1.96)	(-0.52)	(0.93)	(1.50)
Observations	324	324	309	309	309	309

Table 11
Persistence of Fund Performance

This table presents the performance of non-U.S. holdings of U.S. international equity mutual funds sorted by prior performance. We rank funds based on their previous 3-year performance and assign them to quintiles. For ranks based on factor-based models, we regress the previous 3-year monthly returns of non-U.S. holdings before the ranking month on Fama-French factors, and rank funds based on the alphas. For ranks based on characteristic-based benchmarks, we rank funds based on the average monthly CS over the previous 3 years before the ranking month. We then report the corresponding performance measure the subsequent three 12-month periods (+1 to +12 months, +13 to +24 months, +25 to +36 months) following the ranking month, respectively. For ranks based on factor-based models, the post ranking alphas are calculated by first computing the average monthly returns of funds in each rank, and then regress the average monthly returns on Fama-French factors. For ranks based on characteristic-based benchmarks, the post ranking CS is calculated by first finding the average monthly CS of funds in each rank, and then compute the average CS across different months. "Best" ("Worst") is the quintile with the highest (lowest) previous 36-month performance. Panel A reports the results for all funds. Panel B reports the results for global funds. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

Panel A: All funds

4-Factor Alpha

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0020***	0.0006*	0.0007*	0.0011**	0.0014*	-0.0006
	(3.09)	(1.75)	(1.91)	(2.51)	(1.94)	(-0.62)
+13 to +24 months	0.0025***	0.0006*	0.0004	0.0006	0.0006	-0.0019**
	(4.88)	(1.82)	(1.18)	(1.32)	(0.87)	(-2.29)
+25 to +36 months	0.0039***	0.0008*	0.0006	0.0002	-0.0009	-0.0048***
	(5.73)	(1.86)	(1.55)	(0.38)	(-1.33)	(-4.98)

6-Factor Alpha

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	-0.0001	0.0004	0.0011**	0.0016***	0.0012	0.0014
	(-0.10)	(0.87)	(2.41)	(2.64)	(1.36)	(0.79)
+13 to +24 months	0.0032***	0.0011**	0.0005	0.0009	0.0008	-0.0024**
	(4.71)	(2.46)	(1.24)	(1.62)	(1.08)	(-2.38)
+25 to +36 months	0.0020**	-0.0001	0.0006	0.0010	-0.0005	-0.0025**
	(2.48)	(-0.24)	(1.41)	(1.29)	(-0.66)	(-2.25)

CS – Regional Benchmark

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0012**	0.0008	0.0010**	0.0009	0.0020***	0.0009**
	(2.20)	(1.50)	(2.57)	(1.59)	(2.83)	(2.27)
+13 to +24 months	0.0013**	0.0008*	0.0012***	0.0009*	0.0019***	0.0006
	(2.49)	(1.67)	(2.67)	(1.75)	(2.67)	(1.63)
+25 to +36 months	0.0014***	0.0008*	0.0010**	0.0011**	0.0016**	0.0002
	(5.90)	(1.66)	(2.20)	(2.28)	(2.38)	(0.53)

CS – Country-Level Benchmark

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0004	0.0007*	0.0006*	0.0006*	0.0030***	0.0025***
	(1.54)	(1.77)	(1.89)	(1.76)	(2.66)	(4.66)
+13 to +24 months	0.0009**	0.0008***	0.0007**	0.0007*	0.0027**	0.0018***
	(2.59)	(2.80)	(2.26)	(1.91)	(2.26)	(3.24)
+25 to +36 months	0.0011***	0.0010***	0.0007***	0.0008**	0.0010**	-0.0001
	(3.07)	(2.89)	(2.62)	(2.19)	(2.39)	(-0.50)

Panel B: Global funds

4-Factor Alpha

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0013***	0.0006*	0.0007**	0.0010***	0.0020***	0.0007
	(2.75)	(1.85)	(2.10)	(2.63)	(4.02)	(1.02)
+13 to +24 months	0.0010***	0.0003	0.0004	0.0009**	0.0027***	0.0016***
	(2.93)	(1.28)	(1.37)	(2.24)	(5.80)	(2.78)
+25 to +36 months	0.0016***	0.0003	0.0005	0.0009**	0.0012***	-0.0005
	(3.35)	(0.71)	(1.31)	(2.25)	(2.89)	(-0.72)

6-Factor Alpha

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	-0.0009	-0.0001	0.0011**	0.0014***	0.0021***	0.0030*
	(-0.65)	(-0.14)	(2.15)	(3.20)	(3.20)	(1.95)
+13 to +24 months	0.0018***	0.0006	0.0003	0.0012***	0.0015***	-0.0004
	(3.84)	(1.34)	(0.70)	(2.62)	(2.90)	(-0.55)
+25 to +36 months	0.0001	-0.0007*	-0.0001	0.0019**	0.0005	0.0004
	(0.23)	(-1.96)	(-0.22)	(2.42)	(0.84)	(0.52)

CS – Regional Benchmark

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0008*	0.0005	0.0008*	0.0008	0.0017**	0.0009**
	(1.83)	(1.01)	(1.91)	(1.40)	(2.43)	(2.50)
+13 to +24 months	0.0011**	0.0005	0.0009**	0.0012**	0.0017**	0.0006
	(2.10)	(1.09)	(2.05)	(2.23)	(2.12)	(1.53)
+25 to +36 months	0.0011***	0.0007	0.0009**	0.0008	0.0014*	0.0003
	(4.95)	(1.52)	(1.98)	(1.64)	(1.95)	(0.70)

CS – Country-Level Benchmark

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0002	0.0005	0.0006**	0.0006	0.0032**	0.0030***
	(0.53)	(1.30)	(2.15)	(1.61)	(2.50)	(4.85)
+13 to +24 months	0.0007**	0.0004	0.0007**	0.0007*	0.0030**	0.0023***
	(2.27)	(1.49)	(2.14)	(1.81)	(2.30)	(3.79)
+25 to +36 months	0.0008**	0.0007**	0.0005**	0.0005	0.0012**	0.0003
	(2.48)	(2.05)	(2.05)	(1.56)	(2.46)	(1.08)

Table 12
Fund Performance over Time

This table presents the performance of the non-U.S. holdings of actively managed U.S. international equity mutual funds across different periods. We report Characteristic Selectivity (CS) and factor-model adjusted performance. We use Fama and French Global ex U.S. Market, SMB, HML, MOM, RMW, and CMA factors to adjust non-U.S. equity holdings' excess returns. We report the results of CS based on region benchmark and country-level benchmarks. We report the performance measures for period 1987 to 2000 and period 2001 to 2014, respectively. Panel A reports the results for all funds. Panel B reports the results for global funds. Robust t-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

Panel A: All funds

	1987-2000				2001-2014			
	Non-U.S. Holdings Return - R_f	Non-U.S. Holdings Return - R_f	CS based on Regional Benchmark	CS based on Country-Level Benchmarks	Non-U.S. Holdings Return - R_f	Non-U.S. Holdings Return - R_f	CS based on Regional Benchmark	CS based on Country-Level Benchmarks
F_Mkt-RF	1.0349***	1.0479***			1.0555***	1.0275***		
	(16.74)	(19.27)			(60.48)	(53.09)		
F_SMB	0.1680**	0.1760**			0.0720	0.0491		
	(2.03)	(2.50)			(1.59)	(1.04)		
F_HML	0.0042	0.1798			-0.1263***	-0.0500		
	(0.04)	(1.60)			(-2.75)	(-1.03)		
F_MOM	0.1064	-0.0234			-0.0500**	-0.0132		
	(1.54)	(-0.37)			(-2.12)	(-0.48)		
F_RMW		0.1044				-0.0839		
		(0.74)				(-0.98)		
F_CMA		-0.5164***				-0.2015***		
		(-3.30)				(-3.31)		
Alpha	0.0020	0.0016	0.0027**	0.0018**	0.0026***	0.0031***	0.0003	0.0002
	(1.07)	(0.89)	(2.53)	(2.16)	(2.99)	(3.44)	(0.49)	(0.78)
Observations	122	122	122	122	162	162	162	162
R-squared	0.8500	0.8782			0.9664	0.9679		

Panel B: Global funds

	1987-2000				2001-2014			
	Non-U.S. Holdings Return - R_f	Non-U.S. Holdings Return - R_f	CS based on Regional Benchmark	CS based on Country-Level Benchmarks	Non-U.S. Holdings Return - R_f	Non-U.S. Holdings Return - R_f	CS based on Regional Benchmark	CS based on Country-Level Benchmarks
F_Mkt-RF	1.0086***	1.0378***			1.0386***	1.0230***		
	(22.64)	(25.21)			(87.70)	(75.47)		
F_SMB	0.0621	0.0857*			-0.0097	-0.0220		
	(1.01)	(1.66)			(-0.32)	(-0.69)		
F_HML	0.0548	0.1899***			-0.0839***	-0.0471		
	(0.67)	(3.20)			(-2.78)	(-1.35)		
F_MOM	0.1392***	0.0246			-0.0102	0.0101		
	(2.71)	(0.53)			(-0.69)	(0.57)		
F_RMW		0.1850*				-0.0586		
		(1.68)				(-1.07)		
F_CMA		-0.3759***				-0.1046**		
		(-3.84)				(-2.41)		
Alpha	0.0022	0.0014	0.0026**	0.0018**	0.0013**	0.0016***	0.0001	0.0001
	(1.60)	(1.12)	(2.31)	(2.03)	(2.30)	(2.70)	(0.18)	(0.28)
Observations	122	122	122	122	162	162	162	162
R-squared	0.9114	0.9337			0.9857	0.9862		

Appendix

Table A1
Region-Country List

This table presents the 79 countries included in each of the nine regions in the sample: Middle East and Africa, Canada, Pacific Asia (excluding China Region and Japan), Europe Developed, Europe Emerging, China Region, Latin America, India, and Japan. We report the names of countries and the ISO Alpha-3 codes of countries. The ISO country codes are internationally recognized codes that designate for each country.

Region	Country	ISO Code
Middle East and Africa	Morocco	MAR
Middle East and Africa	Nigeria	NGA
Middle East and Africa	South Africa	ZAF
Middle East and Africa	Ghana	GHA
Middle East and Africa	Kenya	KEN
Middle East and Africa	Tunisia	TUN
Middle East and Africa	Cyprus	CYP
Middle East and Africa	Egypt	EGY
Middle East and Africa	Israel	ISR
Middle East and Africa	Jordan	JOR
Middle East and Africa	Kuwait	KWT
Middle East and Africa	Oman	OMN
Middle East and Africa	Saudi Arabia	SAU
Middle East and Africa	Turkey	TUR
Middle East and Africa	Bahrain	BHR
Middle East and Africa	Qatar	QAT
Canada	Canada	CAN
Pacific Asia	Australia	AUS
Pacific Asia	New Zealand	NZL
Pacific Asia	Bangladesh	BGD
Pacific Asia	Indonesia	IDN
Pacific Asia	Malaysia	MYS
Pacific Asia	Mauritius	MUS
Pacific Asia	Pakistan	PAK
Pacific Asia	Philippines	PHL
Pacific Asia	Singapore	SGP
Pacific Asia	South Korea	KOR
Pacific Asia	Sri Lanka	LKA
Pacific Asia	Thailand	THA
Pacific Asia	Vietnam	VNM
Pacific Asia	Kazakhstan	KAZ
Europe Developed	Austria	AUT
Europe Developed	Belgium	BEL
Europe Developed	Denmark	DNK
Europe Developed	Finland	FIN
Europe Developed	France	FRA
Europe Developed	Germany	DEU
Europe Developed	Greece	GRC
Europe Developed	Ireland	IRL
Europe Developed	Italy	ITA
Europe Developed	Luxembourg	LUX
Europe Developed	Netherlands	NLD
Europe Developed	Norway	NOR

Europe Developed	Portugal	PRT
Europe Developed	Romania	ROU
Europe Developed	Spain	ESP
Europe Developed	Sweden	SWE
Europe Developed	Switzerland	CHE
Europe Developed	Iceland	ISL
Europe Developed	United Kingdom	GBR
Europe Emerging	Bosnia and Herzegovina	BIH
Europe Emerging	Bulgaria	BGR
Europe Emerging	Croatia	HRV
Europe Emerging	Czech Republic	CZE
Europe Emerging	Hungary	HUN
Europe Emerging	Latvia	LVA
Europe Emerging	Lithuania	LTU
Europe Emerging	Montenegro	MNE
Europe Emerging	Poland	POL
Europe Emerging	Russia	RUS
Europe Emerging	Serbia	SRB
Europe Emerging	Slovakia	SVK
Europe Emerging	Slovenia	SVN
Europe Emerging	Ukraine	UKR
Europe Emerging	Estonia	EST
Europe Emerging	Macedonia	MKD
China Region	China	CHN
China Region	Hong Kong (China)	HKG
China Region	Taiwan	TWN
Latin America	Argentina	ARG
Latin America	Brazil	BRA
Latin America	Chile	CHL
Latin America	Colombia	COL
Latin America	Mexico	MEX
Latin America	Peru	PER
Latin America	Venezuela	VEN
Latin America	Ecuador	ECU
India	India	IND
Japan	Japan	JPN

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