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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 benchmark portfolios created based on observable characteristics: market capitalization, book-to-market, prior-year return, growth of total assets, and operating profitability. Benchmark portfolios are created for each stock within each geographical region or country. 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 single 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. Meanwhile, micro-portfolio tests and bootstrap simulation analysis also provide evidence that characteristic-based models perform significantly better than global or regional factor-based models in pricing international stocks.

We further apply our characteristic-based models to the worldwide equity holdings of U.S.-domiciled mutual funds that mainly invest in international stocks. International equity index funds exhibit zero characteristic-based alphas, reinforcing that our characteristic-based model prices international stocks accurately. Further, we find strong evidence that actively managed funds that mainly invest in emerging markets or in international small/mid-cap stocks exhibit positive alphas. Our results indicate that U.S.-domiciled active managers are able to generate alphas in less-efficient sectors of international 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

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Empirical asset pricing literature on U.S. stocks documents that firm-level characteristics have power in explaining the cross-section of stock returns (e.g., Daniel and Titman (1997, 2012), Brennan, Chordia, and Subramanyam (1998), and Chordia, Goyal, and Shanken (2015)). Despite this evidence, extant studies mainly resort to factor-based models to price international stocks (e.g., Griffin (2002), Hou, Karolyi, and Kho (2011), Asness, Moskowitz, and Pedersen (2013), and Fama and French (2012, 2017)). In this paper, we develop characteristic-based asset-pricing models for international stocks. We present evidence that these models have advantages over factor-based models in pricing international stocks and in dissecting international portfolio performance.

Since global financial markets are not fully integrated [1], we construct international characteristic-based models at the regional level and at the country level. All international stocks are grouped into nine regions: Canada, China Region, Europe Emerging, Europe Developed, India, Japan, Latin America, Middle East and Africa, and Pacific Asia. 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).

We mainly employ the micro-portfolio approach proposed in Barras (2018) to explore which characteristic or which combinations of characteristics can better explain the cross-sectional variation in international stock returns. This approach is a good compromise between using diversified portfolios sorted on characteristics and using individual stocks to conduct the asset pricing tests. 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. Micro portfolios preserve large spreads in average returns and maintain relatively low estimation errors. We rely on the performance measure proposed in Barras (2018)- the proportion of portfolios mispriced- to compare various models. This new measure is specifically designed to analyze 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

[1] E.g., 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).

the performance of characteristic-based models. 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 significant improvement brought by regional market returns confirms that global financial markets are not fully integrated and building models at the region or country level is an appropriate approach to price international stocks.

We then check the performance of models created with a single characteristic. 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 candidate characteristics, we first form benchmark portfolios based on the combination of these three characteristics (4x4x4 portfolios). We find that an insignificant number of micro portfolios are mispriced by the three-characteristic benchmarks. And country-level benchmarks exhibit an even lower proportion of mispriced micro portfolios relative to region-level benchmarks. We then 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 country-level three-characteristic benchmarks. Overall, these findings indicate that characteristic-based models 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. However, we find that the proportion of mispriced micro portfolios is much higher. 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. six factors.[2]

In addition to the micro-portfolio approach, we employ additional tests to validate our benchmarks. First, we assess our benchmarks by using the bootstrap analysis. We randomly pick with replacement 10 international stocks and form a portfolio. This procedure is repeated 1000 times to obtain 1000 portfolios. These bootstrapped portfolios, by definition, should exhibit

[2] 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.

minimal abnormal returns. We find that this is the case when their performance is evaluated relative to the three-characteristic benchmarks using size, value, and momentum. However, the abnormal returns of these bootstrapped portfolios relative to Fama and French global factors are quite significant. 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. Finally, we show that U.S. international index equity funds exhibit close to zero abnormal returns relative to our three-characteristic benchmarks.

Beyond their superior performance in the asset pricing tests, characteristic-based models also have advantages over factor-based models in assessing the performance of international portfolios. First, since global financial markets are not fully integrated, to control for the local effect, factor-based models require many factors in the regressions, making the models cumbersome. Yet, characteristic-based models at the region or country level can readily control for the local effect. Meanwhile, through characteristic-based models, we can conveniently decompose returns and hence dissect the sources of investment ability (e.g., stock picking, market timing). Given the wealth devoted by U.S. investors to international investments through professional asset management is mounting, developing appropriate benchmarks to evaluate the performance of international portfolios (e.g., international mutual funds) is of growing importance for investor welfare. We rely on our country-level three-characteristic models and introduce a new set of return decompositions to measure different facets of portfolio manager skills: Characteristic Selectivity (CS), Characteristic Timing (CT), Country Characteristic Timing (CCT), Average Style (AS), and Country Average Return (CAR).

CS measures a manager's stock-picking ability beyond passively choosing stocks based on their characteristics. CT measures the ability of a manager to time the performance of size, value, or momentum strategies within each country. CCT reflects a managers' ability to move assets across countries to time the performance size, value, or momentum strategies. AS indicates whether a manager tends to hold stocks with certain characteristics to boost fund performance. CAR captures whether a manager systematically allocates assets to countries that exhibit higher market returns than the world stock market returns. The sum of these five components, plus the world stock market returns, is the overall fund equity holding returns.

When applying our decomposition to assess the performance of active U.S. international equity funds, we find that CS is 8 basis points per month, CT is 13 basis points per month, CCT is -12 basis points per month, AS is 11 basis points per month, and CAR is minimal and insignificant. Results also indicate that CS and CT decline over time. We then further categorize active U.S. international equity funds into different groups based on their characteristics. We find that funds that charge higher fees, have a higher active share, have narrower investment objectives, or mainly invest in emerging markets or small/mid-cap stocks exhibit much higher CS. When dissecting fund performance in each of the nine geographic regions, we show that active U.S. international equity funds generate non-negative CS in all the nine regions. We observe positive and at least marginally significant CS in China Region, Europe Developed, and Middle East and Africa. Together, these findings suggest that active U.S. international equity funds can generate abnormal returns, especially in less-efficient sectors of international 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 relationship between capital investments and returns.

To our knowledge, this paper is the first to construct characteristic-based benchmarks for all the international stocks, 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 countries.

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 of 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 the 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 require stocks with information available to compute the characteristics: market capitalization based on free-float shares, country-industry-adjusted book to market ratio, past 12-month return, growth of assets, and operational profitability. We exclude 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, we industry adjust the book-to-market ratio by subtracting the country-industry average book-to-market ratio from each individual firm's ratio. 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.[3] 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 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 characteristic-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

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

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.[4] Further, we also compare the pricing performance of characteristic-based benchmarks and the Fama-French global factor models.

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.

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

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. 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].[5] $\Phi_0(I)$ 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

[5] 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.

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.

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.[6] The statistical tests confirm that size is the most powerful

[6] 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.

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 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.[7] In Panel B 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 abnormal returns 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.

[7] Micro portfolios include 10 stocks with similar returns predicted by size, value, and momentum, and three-characteristic benchmarks are built based on size, value, momentum. To avoid that our results are driven by micro portfolios including the same sets of stocks in the benchmark portfolios, we randomly choose half of our stock sample and reconstruct micro portfolios based on the half of our sample. The results in the appendix show that our main findings remain similar.

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. In the appendix, we present the proportion of mispriced micro portfolios and pricing errors using this procedure.

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 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 characteristic-based 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 the benchmarks should be close to zero.

In Table 3, we find that the average abnormal returns of the 1000 simulated portfolios are minimal, 5 basis points per month based on regional benchmarks and 4 basis points per month based on country-level benchmarks. In contrast, the average abnormal returns based on Fama-French global factors are about ten times larger, 34 basis points per month based on the 4-factor model and 40 basis points per month based on the 6-factor model. We then generate 1000 simulated portfolios for each of the nine regions. When applying the country-level benchmarks, only portfolios in Canada, India, and Middle East and Africa exhibit significant average abnormal 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 4 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.

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 various aspects of portfolio manager skills.

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 a fund during a quarter is matched to the corresponding country 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 return over the benchmark. Each stock's abnormal return is multiplied with the weights placed on the stock by the fund as a fraction of the investment in the country and sum up for all the stocks' abnormal returns in the country held by the fund. We then repeat this process for each country and get the overall CS measure by weighting the abnormal returns of each country by the fraction invested by the fund in the country.

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

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

where $\widetilde{W}_{c,t-1}$ is the portfolio weight on all stocks of country c at the end of month t-1, $\widetilde{w}_{c,i,t-1}$ is the portfolio weight on stock *i* within its country *c* at the end of month t-1, $\tilde{R}_{i,t}$ is the month *t* return of stock *i*, and $\tilde{R}_t^{b_{c,i,t-1}}$ is the month *t* return of the characteristic-based benchmark of

country *c* corresponding to stock *i* 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 country. 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 country, we fix funds' portfolio weights on each country and only consider the changes of weights within the country.

The month *t* component of this measure is

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

where $\widetilde{W}_{c,t-1}$ is the portfolio weight on all stocks of country *c* at the end of month t-1, $\widetilde{w}_{c,i,t-1}$ is the portfolio weight on stock *i* within its country *c* at the end of month t-1, $\widetilde{w}_{c,i,t-13}$ is the portfolio weight on stock *i* within its country *c* at the end of month t-13. $\tilde{R}_t^{b_{c,i,t-1}}$ and $\tilde{R}_t^{b_{c,i,t-13}}$ are month t returns of characteristic-based benchmarks in country *c* 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 Country Characteristic Timing (CCT)

CCT is defined to detect the fund manager's ability to time the performance of size, book-to-market, or momentum strategies across different countries. To obtain the returns attributable to country characteristic timing that is independent of CT, we assume that the within-country stock weights remain the same from last year.

The month *t* component of this measure is

$$CCT_t = \left[\sum_{c=1}^{C} \widetilde{W}_{c,t-1} - \sum_{c=1}^{C} \widetilde{W}_{c,t-13}\right] \sum_{i=1}^{N} \widetilde{w}_{c,i,t-13} \tilde{R}_t^{b_{c,i,t-13}},$$

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

3.1.4 Average Style (AS)

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 AS 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 country. We then aggregate to the fund level. The month *t* component of this measure is

$$AS_t = \sum_{c=1}^{C} \widetilde{W}_{c,t-13} \sum_{i=1}^{N} \widetilde{w}_{c,i,t-13} (\tilde{R}_t^{b_{c,i,t-1}} - \tilde{R}_t^{Country_{c,i}}),$$

where $\widetilde{W}_{c,t-13}$ is the portfolio weight on all stocks of country *c* at the end of month t-13, $\widetilde{w}_{c,i,t-13}$ is the portfolio weight on stock *i* within its country *c* at the end of month t-13, $\tilde{R}_t^{b_{c,i,t-13}}$ is month t return of the characteristic-based benchmark of country *c* assigning to stock *i* during month t-13, and $\tilde{R}_t^{Country_{c,i}}$ is the month t value-weighted market return of country *c* assigning to stock *i*. The time-series average, over all months that a find exists, gives the AS measure for that fund.

3.1.5 Country Average Return (CAR)

The Country Average Return reflects whether a manager systematically allocates assets to countries that exhibit higher market returns than the world stock market returns. The month *t* component of this measure is

$$CAR_t = \sum_{c=1}^{C} \widetilde{W}_{c,t-13} \sum_{i=1}^{N} \widetilde{w}_{c,i,t-13} (\tilde{R}_t^{Country_{c,i}} - \tilde{R}_t^{World}),$$

where $\widetilde{W}_{c,t-13}$ is the portfolio weight on all stocks of country *c* at the end of month t-13, $\widetilde{w}_{c,i,t-13}$ is the portfolio weight on stock *i* within its country *c* at the end of month t-13, and $\tilde{R}_t^{Country_{c,i}}$ is

the month t value-weighted market return of country c assigning to stock i, and $\tilde{R}_t^{World}$ is the month t value-weighted world market return. The time-series average, over all months that a fund exists, gives the CAR measure for that fund. Together, the sum of these five components plus the world stock market returns is the overall fund equity holding returns.

3.2 Performance of Index Funds

We start with an analysis of U.S. international equity index fund performance relative to the characteristic-based benchmarks. All information regarding the index funds is obtained from Morningstar. We use Morningstar's identifier to identify index funds and then clean the sample by manually checking whether the fund name indicates that it is an index fund. The sample period is from 2005 to 2014.

Index funds, by definition, should not exhibit abnormal performance. For the characteristic-based benchmarks to have merit, we expect to observe that our performance measures are all close to zero. In Table 5, we confirm that CS, CT, CCT, and AS measures for U.S. international equity funds are all insignificantly different from zero. Only CAR measure is negative and marginally significant.

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 6 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 6. 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 country-level characteristic-based benchmarks. Table 7 presents the various performance measures based on fund entire equity holdings. The column labeled "Raw Return" shows the pre-expense fund equity returns. We also report the CS for only non-U.S. equity holdings. All the performance measures shown are time-series monthly averages.

Panel A of Table 7 summarizes the measures for all active U.S. based international equity mutual fund sample. The average raw return of non-U.S. equity holdings is 81 basis points per month. CS is 8 basis points per month, suggesting that fund managers are able to pick stocks that beat the characteristic-based benchmarks for its corresponding country. CT is 13 basis points per month, indicative of fund managers' ability to time the performance of size, book-to-market, or momentum strategies within a region. CCT is -12 basis points per month, which indicates that managers do not wisely move assets across countries to time the performance of size, book-to-

market, or momentum strategies. The AS measure is 11 basis points per month. This result implies that fund managers use size, book-to-market, or momentum strategies to boost fund performance. Finally, the CAR measure is minimal and insignificant, which shows that fund managers do not systematically allocate their assets to countries with higher expected returns. When we focus on fund non-U.S. equity holdings, we find CS is at 10 basis points per month. This finding suggests that fund managers of active U.S. international equity funds are better at selecting international stocks.

Further, we subdivide the sample into two periods (1987-2000 and 2001-2014). We find that the significance of CS and CT measures is primarily driven by the early period. In the recent period, however, fund managers rely on passive investment strategies to boost fund performance. The AS measure for the recent period is at 21 basis points per month.

3.3.3 Fund Characteristics and Performance

In the above subsection, we present the average performance of all active U.S. international equity funds. In this subsection, we study how fund characteristics affect fund performance. We use the country-level benchmarks based on size, value, and momentum for the tests in this subsection and present the results in Panel B of Table 7.

We first examine whether fees charged by funds are related to fund performance. We split the funds into two groups based on category median annual expense ratio. The CS measure of funds with above-median expense ratio is 11 basis points per month and statistically significant. Whereas, the CS of funds with below-median expense ratio is only 4 basis points per month and insignificant. And we do not observe material differences in other performance measures between these two groups of funds. These findings suggest that fees are related to fund performance and the impact mainly reflects in stock selection.

We then test whether funds that are more active performance better. We split the funds into two groups based on category median active share (Cremers and Petajisto (2009)). The CS measure of funds with above-median active share is 10 basis points per month and statistically significant. But, the CS of funds with below-median expense ratio is only 4 basis points per month and insignificant. We do not observe material differences in other performance measures between these two groups of funds.

In addition, we test whether funds that mainly invest in small/mid-cap stocks exhibit stronger stock-picking skills than funds mainly invest in large-cap stocks. The small/Mid-cap stocks in foreign countries tend to have less efficient prices than large-cap stocks, which 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, funds that mainly invest in foreign small/Mid-cap stocks have CS measure at 17 basis points per month. In contrast, funds that mainly invest in large-cap stocks exhibit insignificant CS measures. Another salient difference between these two groups of funds is at the AS measure. Funds that mainly invest in foreign small/Mid-cap stocks exhibit minimal AS measure, whereas funds that mainly invest in large-cap stocks exhibit have the AS measure at 12 basis points per month. This finding indicates that funds that mainly invest in large-cap stocks exhibit rely on passive strategies to boost fund performance.

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 the CS measure of funds that mainly invest in emerging markets is 12 basis points per month.

Finally, we test whether the scope of the investment mandate affects fund performance. We find that funds focusing on specific regions or countries perform much better in stock selection than funds with a global investment mandate. The CS measure of the regional funds is 17 basis points per month, but the CS measure of the global funds is only 6 basis points per month.

3.3.4 Performance in Nine Regions

After examining the relationship between fund characteristics and fund performance, in this subsection, we further dissect fund performance in each of the nine geographic regions. In Table 8, we find that over the entire sample period, active U.S. international equity funds are able to generate non-negative CS in all the nine regions. The magnitude of CS in India is the highest at 27 basis points per month, but statistically insignificant. The magnitude of CS in Japan is the

lowest at 6 basis points per month and statistically insignificant. And we observe at least marginally significant CS in China Region, Europe Developed, and Middle East and Africa.

We then split the sample of each region into the early period and the recent period. In general, the magnitude of CS in the early period is higher than the magnitude of CS in the recent period. In the early period, funds can generate positive and significant CS in China Region, India, Middle East and Africa. In the recent period, funds can generate positive significant CS only in Europe Emerging. And Europe Emerging is also the only region with relatively higher CS in the recent period than in the early period.

3.3.5 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 models, we do not observe any performance persistence in the first 12 months after the ranking month in Table 9. 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 48 basis points per month. 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 persistence. Funds in the best past performance quintile outperform funds in the worse past performance quintile by 6 basis points per month in the first 12 months after the ranking month. 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 5 basis points per month. But, we do not observe a significant performance difference between funds in the best past performance quintile and funds in the worse past performance quintile in the third 12-month period after the ranking.

In sum, findings in this subsection suggest that certain portfolio managers of active U.S. international equity mutual funds exhibit performance persistence, suggestive of skills in managing their international portfolios.

3.3.6 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. On the contrary, alphas estimated from Fama and French global ex U.S. 4 factors or 6 factors (Table 10) 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 active U.S. based international equity mutual funds, evidence in this subsection suggests that characteristic-based benchmarks are 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.

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 countries on stock characteristics. In addition, funds that are more active, charge higher fees, or mainly invest in emerging markets or small/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 portfolios.

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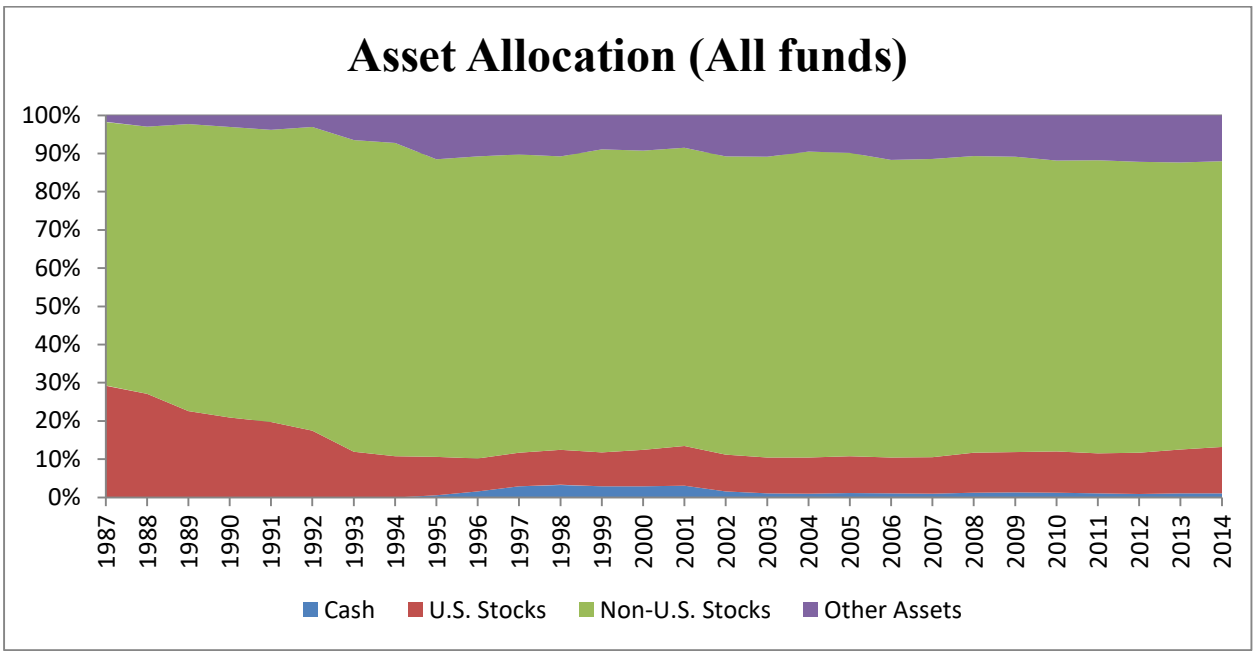
Figure 1
Asset Allocation

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.



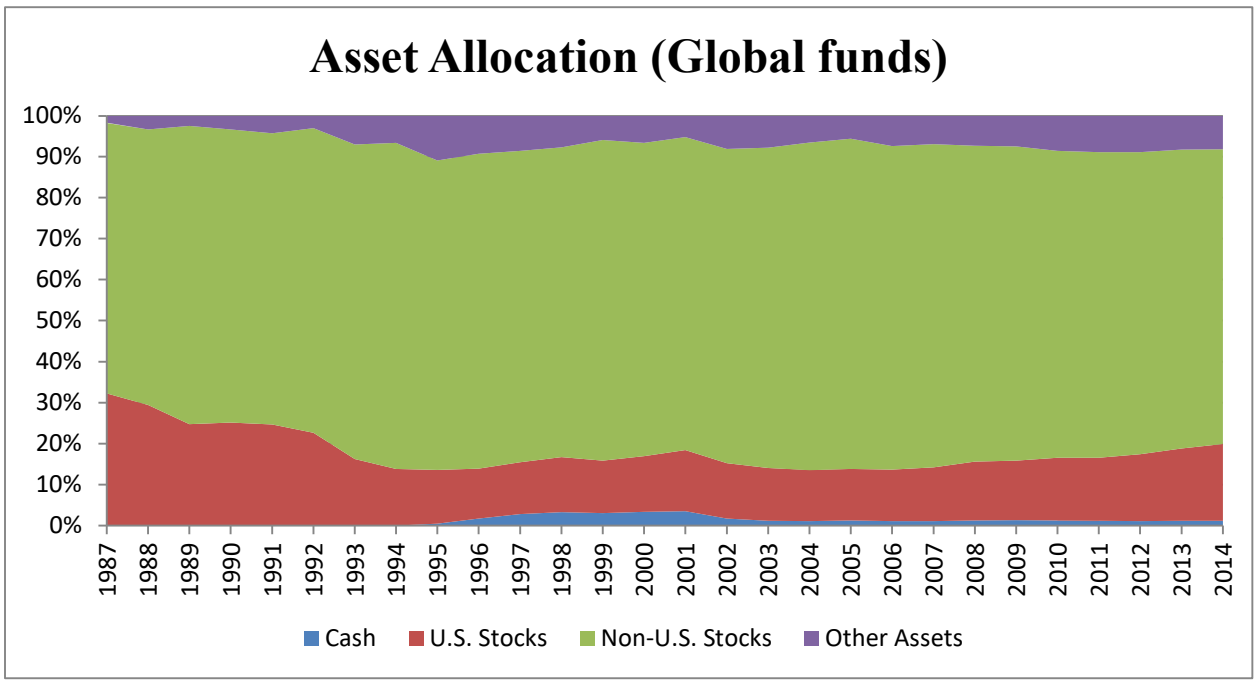


Table 1
Summary Statistics of Characteristic-Based Benchmarks

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

Middle East 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
Bootstrapped Portfolio Returns Relative to Characteristic-Based Benchmarks

This table presents results from a bootstrap analysis. 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 relative to characteristic-based benchmarks and Fama and French Global ex U.S. factors for these 1,000 portfolios. We report the alpha when we equally weight the monthly returns of the 1,000 portfolios. We also repeat the process for each region and report the abnormal returns relative to country-level benchmarks. For abnormal returns relative characteristic-based benchmarks, t-statistics are based on Newey-West (1987) lags of order 6. For abnormal returns relative to Fama and French factors, we report robust t-statistics. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

	All Regions			
	Region-Level Benchmarks	Country-Level Benchmarks	4 Factor	6 Factor
Alpha	0.0005***	0.0004***	0.0034***	0.0040***
	(2.88)	(2.69)	(3.53)	(3.88)
Observations	330	330	290	290

	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
	Country-Level Benchmarks								
Alpha	0.0018***	0.0004	0.0006	0.0002	0.0008*	0.0003	0.0002	0.0012***	0.0003
	(4.98)	(1.62)	(0.92)	(0.87)	(1.80)	(1.41)	(0.68)	(3.67)	(1.00)
Observations	330	234	126	330	258	330	186	258	270

Table 4
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. Past 12-month return is the cumulative past 12-month returns. T-statistics are based on Newey-West adjusted standard errors. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

	Fama-Macbeth regressions		
	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 5
Performance of U.S. International Equity Index Funds

This table presents the performance of U.S. international equity index funds relative to country-level characteristic-based benchmarks. We report the raw return, characteristic selectivity (CS) performance, characteristic timing (CT) performance, country characteristic timing (CCT) performance, average style (AS) performance, and country average return (CAR) performance. All returns are in U.S. dollars. Raw return is the fund equity holding return. 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 6.

		All holdings					Non-U.S. holdings
	Raw Return	CS	CT	CCT	AS	CAR	CS
	0.0057	-0.0003	-0.0000	-0.0004	0.0014	-0.0013*	-0.0006
	(0.92)	(-0.95)	(-0.00)	(-1.15)	(0.96)	(-1.69)	(-1.38)
Observations	114	114	102	102	102	102	114

Table 6
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 7
Performance of Active U.S. International Equity Mutual Funds

This table presents the performance of active U.S. international equity funds based on country-level characteristic-based benchmarks. We report the raw return, characteristic selectivity (CS) performance, characteristic timing (CT) performance, country characteristic timing (CCT) performance, average style (AS) performance, and country average return (CAR) performance. All returns are U.S. dollar-denominated. Raw return is the fund equity holding return. In Panel A, we report the results based on all the active U.S. international equity funds in our sample. We also report CS for only non-U.S. stock holdings separately. In Panel B, we categorize funds into different groups based on their fund-level characteristics and report the results for each group. We report the performance of funds with above or below category median expense ratios or active share, respectively. Global funds include funds with global investment mandates. Regional funds are funds with regional investment mandates. Funds focusing on small/mid-cap stocks include funds in categories: Foreign Small/Mid Blend, Foreign Small/Mid Growth, Foreign Small/Mid Value. Funds focusing on large-cap stocks include funds in categories: Foreign Large Blend, Foreign Large Growth, and Foreign Large Value. Funds focus on emerging markets include funds in the category: Diversified Emerging Mkts. 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 6.

Panel A: All Sample

Years 1987-2014

		All Equity Holdings					Non-U.S. Equity Holdings
	Raw Return	CS	CT	CCT	AS	CAR	CS
	0.0081***	0.0008*	0.0013***	-0.0012**	0.0011**	0.0001	0.0010**
	(2.67)	(1.82)	(2.66)	(-2.26)	(2.14)	(0.14)	(2.45)
Observations	330	330	318	318	318	318	330
Years 1987 – 2000							
	0.0091***	0.0015*	0.0025***	-0.0014	0.0000	-0.0003	0.0018**
	(2.86)	(1.85)	(3.06)	(-1.33)	(0.06)	(-0.22)	(2.50)
Observations	162	162	150	150	150	150	162
Years 2001 – 2014							
	0.0072	0.0001	0.0003	-0.0011**	0.0021**	0.0005	0.0002
	(1.41)	(0.39)	(0.61)	(-2.28)	(2.59)	(0.85)	(0.68)
Observations	168	168	168	168	168	168	168

Panel B: Fund Characteristics and Performance

Foreign with Above Median Expense Ratio

	Raw Return	CS	CT	CCT	AS	CAR
	0.0084***	0.0011**	0.0012**	-0.0013*	0.0010**	0.0003
	(2.68)	(2.28)	(2.02)	(-1.95)	(1.98)	(0.40)
Observations	330	330	318	318	318	318

Foreign with Below Median Expense Ratio

	Raw Return	CS	CT	CCT	AS	CAR
	0.0078**	0.0004	0.0013***	-0.0009*	0.0009*	0.0002
	(2.58)	(0.82)	(2.86)	(-1.95)	(1.77)	(0.20)
Observations	330	330	318	318	318	318

Foreign with Above Median Active Share

	Raw Return	CS	CT	CCT	AS	CAR
	0.0085***	0.0010**	0.0014**	-0.0014**	0.0013**	0.0008
	(2.74)	(2.01)	(2.53)	(-2.42)	(2.31)	(1.04)
Observations	330	330	318	318	318	318

Foreign with Below Median Active Share

	Raw Return	CS	CT	CCT	AS	CAR
	0.0075**	0.0004	0.0011**	-0.0009*	0.0008*	-0.0002
	(2.46)	(0.94)	(2.07)	(-1.70)	(1.66)	(-0.26)
Observations	330	330	318	318	318	318

Global funds

	Raw Return	CS	CT	CCT	AS	CAR
	0.0078***	0.0006	0.0012***	-0.0010**	0.0009*	0.0001
	(2.69)	(1.42)	(2.76)	(-2.15)	(1.77)	(0.20)
Observations	330	330	318	318	318	318

Regional funds

	Raw Return	CS	CT	CCT	AS	CAR
	0.0097***	0.0017**	0.0014	-0.0017*	0.0020***	-0.0010
	(2.62)	(1.98)	(1.47)	(-1.72)	(2.94)	(-0.50)
Observations	330	330	309	309	309	309

Funds focusing on Small/Mid Cap Funds

	Raw Return	CS	CT	CCT	AS	CAR
	0.0099**	0.0017**	0.0019***	-0.0010	0.0001	-0.0009
	(2.46)	(2.00)	(2.65)	(-1.39)	(0.15)	(-0.81)
Observations	291	291	264	264	264	264

Funds focusing on Large Cap Funds

	Raw Return	CS	CT	CCT	AS	CAR
	0.0070**	0.0005	0.0013**	-0.0012*	0.0012**	-0.0009
	(2.38)	(0.99)	(2.26)	(-1.89)	(2.30)	(-1.04)
Observations	330	330	318	318	318	318

Funds focusing on Emerging Markets

	Raw Return	CS	CT	CCT	AS	CAR
	0.0106**	0.0012*	0.0014	-0.0020	0.0026***	-0.0006
	(2.12)	(1.74)	(0.72)	(-1.02)	(3.04)	(-0.17)
Observations	279	279	261	261	261	261

Table 8
Performance of Active U.S. International Equity Mutual Funds in Each Region

This table presents the performance of active U.S. international equity funds in each region. We categorize fund non-U.S. equity holdings into nine regions: Canada, China Region, Europe Emerging, Europe Developed, India, Japan, Latin America, Middle East and Africa, and Pacific Asia. We report characteristic selectivity (CS) based on country-level characteristic-based benchmarks for each region, respectively. Since different regions have a different time span in our sample, we categorize the time-series into early and recent periods for each region and report the results for both early and recent periods. 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 6.

	Canada	China Region	Europe Emerging	Europe Developed	India	Japan	Latin America	Middle East and Africa	Pacific Asia
1987-2014									
	0.0016	0.0014**	0.0015	0.0008*	0.0027	0.0006	0.0022	0.0024*	0.0007
	(1.41)	(2.04)	(1.49)	(1.67)	(1.45)	(0.65)	(1.31)	(1.80)	(1.03)
Observations	330	246	126	330	255	330	198	249	270
Early Period									
	0.0026	0.0035***	-0.0005	0.0013	0.0071**	0.0014	0.0035	0.0048*	0.0010
	(1.25)	(3.70)	(-0.50)	(1.40)	(2.20)	(0.85)	(1.06)	(1.78)	(0.82)
Observations	162	126	54	162	123	162	90	117	126
Recent Period									
	0.0007	-0.0008	0.0030*	0.0004	-0.0014	-0.0002	0.0011	0.0004	0.0003
	(0.68)	(-1.10)	(1.85)	(0.98)	(-0.88)	(-0.43)	(0.89)	(0.63)	(0.70)
Observations	168	120	72	168	132	168	108	132	144

Table 9
Persistence of Fund Performance

This table analyzes the persistence of active U.S. international equity mutual fund performance. We focus on non-U.S. equity holdings. We rank funds based on their previous 36-month performance and assign them to quintiles. For ranks based on factor-based models, we regress the previous 36-month returns till the ranking month on Fama-French factors, and rank funds based on the alphas. For ranks based on country-level characteristic-based benchmarks, we rank funds based on the average monthly CS over the previous 36 months till the ranking month. We then report the corresponding performance in 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 in a month, 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 in a month, and then compute the average CS across different months. "Best" ("Worst") is the quintile with the highest (lowest) previous 36-month performance. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

CS

Quintile	(1) Worst	(2)	(3)	(4)	(5) Best	(5) - (1)
+1 to +12 months	0.0005	0.0008***	0.0008***	0.0008***	0.0010**	0.0006**
	(1.37)	(2.65)	(3.00)	(2.78)	(2.39)	(2.03)
+13 to +24 months	0.0009***	0.0007**	0.0009***	0.0008**	0.0015***	0.0005*
	(2.60)	(2.21)	(2.94)	(2.51)	(3.24)	(1.91)
+25 to +36 months	0.0008**	0.0008***	0.0007**	0.0005	0.0010***	0.0002
	(2.19)	(2.60)	(1.98)	(1.63)	(2.70)	(0.88)

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)

Table 10
Fund Performance over Time

This table presents the performance of the non-U.S. holdings of active 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. CS is based on country-level benchmarks. We report the performance measures for period 1987 to 2000 and period 2001 to 2014, respectively. For abnormal returns relative characteristic-based benchmarks, t-statistics are based on Newey-West (1987) lags of order 6. For abnormal returns relative to Fama and French factors, we report robust t-statistics. T-statistics are in parentheses. *, **, ***, corresponds to significance to the 10%, 5%, and 1% levels, respectively.

	1987-2000			2001-2014		
	4 Factors	6 Factors	CS	4 Factors	6 Factors	CS
Alpha	0.0017	0.0013	0.0018**	0.0024***	0.0028***	0.0002
	(1.07)	(0.84)	(2.50)	(2.86)	(3.34)	(0.68)
F_Mkt-RF	1.0173***	1.0306***		1.0281***	0.9986***	
	(18.64)	(22.10)		(59.24)	(53.75)	
F_SMB	0.1464*	0.1557**		0.0957**	0.0706	
	(1.92)	(2.34)		(2.16)	(1.58)	
F_HML	-0.0527	0.0768		-0.1211**	-0.0323	
	(-0.50)	(0.71)		(-2.18)	(-0.58)	
F_MOM	0.0578	-0.0408		-0.0396*	-0.0001	
	(0.94)	(-0.63)		(-1.69)	(-0.00)	
F_RMW		0.0974			-0.0732	
		(0.80)			(-0.87)	
F_CMA		-0.3766**			-0.2247***	
		(-2.58)			(-3.80)	
Observations	122	122	162	168	168	168
R-squared	0.8766	0.8934		0.9659	0.9680	

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