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# The Determinants of Mutual Fund Performance: A Cross-Country Study*

MIGUEL A. FERREIRA[1], ANEEL KESWANI[2], ANTÓNIO F. MIGUEL[3], and SOFIA B. RAMOS[3]

[1]*Nova School of Business and Economics,* [2]*Cass Business School, and* [3]*Instituto Universitário de Lisboa (ISCTE-IUL)*

**Abstract.** We use a new data set to study the determinants of the performance of open–end actively managed equity mutual funds in 27 countries. We find that mutual funds underperform the market overall. The results show important differences in the determinants of fund performance in the USA and elsewhere in the world. The US evidence of diminishing returns to scale is not a universal truth as the performance of funds located outside the USA and funds that invest overseas is not negatively affected by scale. Our findings suggest that the adverse scale effects in the USA are related to liquidity constraints faced by funds that, by virtue of their style, have to invest in small and domestic stocks. Country characteristics also explain fund performance. Funds located in countries with liquid stock markets and strong legal institutions display better performance.

*JEL Classification*: G15, G18, G23

## 1. Introduction

Mutual funds have come to play a dramatically increased role in financial markets in recent decades. As of the end of 2007, the world mutual fund industry managed financial assets exceeding $26 trillion (including over $12 trillion in stocks), more than four times the $6 trillion of assets managed at the end of 1996 (Investment Company Institute, 2008). The number of mutual funds has also grown dramatically to more than 66,000 funds worldwide at the end of 2007 (including nearly 27,000 equity funds). Although the growth of the mutual fund industry started in the USA, where the industry plays an extremely important role in financial markets,

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this trend has spread more recently to other countries around the world (Khorana, Servaes, and Tufano, 2005). The share of assets under management outside the USA grew from 38% in 1997 to 54% in 2007.

Investors are increasingly interested in mutual fund selection, demanding detailed mutual fund information, and investment advice. Many authors have tried to explain the performance of mutual funds, which is a critical aspect in investor fund selection. Several fund characteristics have been analyzed as potential determinants of future fund performance, including fund size, age, fees and expenses, loads, turnover, flows, and returns.[1] Most authors conclude that mutual funds underperform the market, but some others find that managers display some skill. In particular, there is evidence of short-term persistence in funds' performance and that money flows to past good performers. Investors display some fund selection ability as they tend to invest in funds with subsequent good performance ("smart money" effect). There is also evidence that fund performance worsens with fund size (Chen *et al.*, 2004) and fees (Gil-Bazo and Ruiz-Verdu, 2009). Although the literature focuses on the US mutual fund industry, several authors study the fund performance in individual countries. Few, however, examine cross-country mutual fund performance.[2]

We study how the performance of equity mutual funds relates to fund characteristics and country characteristics around the world. To the best of our knowledge, we are the first to study the mutual fund performance using a worldwide sample of funds. The sample consists of 16,316 open–end actively managed equity funds in 27 countries over 1997–2007. We focus on the sample of funds that invest in their local market (domestic funds), but we also perform some tests using funds that invest outside their local market or globally (international funds). We use the Carhart (1997) four-factor model to measure risk-adjusted performance, but we also consider several alternatives, including benchmark-adjusted returns, market-adjusted returns, and the market model.

We study fund performance using an extensive list of fund characteristics, including fund and family size, age, fees and expenses, front-end and back-end loads, flows, past returns, management structure, and number of countries where a fund is sold. There are reasons to believe that there are important differences in the determinants of mutual fund performance between the USA and the rest of the world. US funds are much larger than elsewhere in the world, and the US fund industry is older

[1] See, for example, Jensen (1968), Grinblatt and Titman (1989), Ippolito (1989), Hendricks, Patel, and Zeckhauser (1993), Brown and Goetzmann (1995), Malkiel (1995), Gruber (1996), Carhart (1997), Chevalier and Ellison (1997), Sirri and Tufano (1998), and Zheng (1999).

[2] See, for example, studies on Australia by Bird, Chin, and McCrae (1983); France by Dermine and Roller (1992); Italy by Cesari and Panetta (2002); Japan by Cai, Chan, and Yamada (1997); Sweden by Dahlquist, Engström, and Söderlind (2000); or the UK by Blake and Timmermann (1998). Grunbichler and Pleschiutschnig (1999) and Otten and Bams (2002) study European equity mutual funds, but their findings on performance are narrow because of both small number of countries and funds.

and more developed. Our worldwide sample of mutual funds allows us to consider several country characteristics, such as economic development, financial development, quality of legal institutions and law enforcement, and mutual fund industry structure, as potential determinants of performance.

We first document that equity mutual funds around the world underperform on average by 20 basis points per quarter after fees and controlling for the Fama and French (1992) three factors and momentum. We find evidence of important differences in the determinants of mutual fund performance in the USA and elsewhere in the world. The most striking difference is related to the effects of scale. We find that small funds perform better than large only in the case of US funds as large non-US funds perform better than smaller funds. The negative size effect in the USA is economically significant as a one-standard deviation increase in fund size yields a 15 basis point decline in the next quarter's fund return. The positive size effect outside the USA is also sizable. A one-standard deviation increase in fund size is associated with an increase in next quarter's fund net return of 11 basis points. Additionally, fund size does not seem to hurt the performance of funds that invest overseas. We conclude that the US evidence on diseconomies of scale (Chen *et al.*, 2004) is not a universal truth as non-US funds and international funds do not seem to be affected by diminishing returns to scale.

Of course, US funds are much larger on average than funds elsewhere in the world. The average US fund is more than five times larger than the average non-US fund.[3] This fact, however, does not explain the asymmetric effect of scale on performance as US funds of similar size to their non-US counterparts also present a statistically significant negative relation between performance and lagged fund size. Our findings suggest that liquidity constraints play an important role in explaining the lack of scale ability of fund investments as argued by Chen *et al.* (2004), Pollet and Wilson (2008), and Yan (2008). US funds that, by virtue of their style, have to invest in small and illiquid stocks are the most affected by scale, while this is not the case for non-US funds. Moreover, the performance of international funds is not negatively affected by scale even for those funds located in the USA. It is important to note that US international funds' average total net assets (TNA) is similar to the US domestic funds' average TNA. This suggests that the availability of more investment opportunities in funds that invest overseas mitigates the adverse scale effects. In other words, the international funds are not restricted geographically in investment opportunities as a fund grows, while domestic funds are restricted geographically.

These findings are informative about the relevance of the Berk and Green (2004) model around the world. The Berk and Green (2004) model assumes that funds

[3] There are only nine non-US funds among the top 100 domestic equity funds in terms of TNA at the end of 2007 in our sample.

operate in a decreasing return to scale environment, which means that fund flows harm rather than improve subsequent fund performance. Our findings that diminishing returns to scale may not be present outside of the US mutual fund industry suggest that fund flows may not eliminate performance persistence in the manner predicted by the Berk and Green (2004) model.

We also consider the effect of the size of the fund family on fund performance around the world. Many funds belong to large fund families, and some of these families manage funds in several different countries (examples of top fund families are American Funds, Barclays, Fidelity, and UBS). Controlling for fund size, we find that fund performance actually improves with the size of its fund family as large fund families benefit from substantial economies in trading commissions and lending fees. Chen *et al.* (2004) find similar evidence for US funds. We also test the hypothesis that organizational diseconomies, in particular hierarchy costs (Aghion and Tirole, 1997; Stein, 2002), erode fund performance. Large organizations with hierarchies are particularly inefficient in processing soft information, which is pivotal in the case of mutual funds as managers may have a hard time convincing others to implement their ideas. Consistent with this view, we find evidence that solo-managed funds perform better than team-managed funds in a worldwide sample of funds, which is consistent with the US evidence in Chen *et al.* (2004).

Other fund characteristics have a variety of effects on performance. Fund age is negatively related to fund performance in the sample of non-US funds, but this relation is statistically insignificant in the sample of US funds. This indicates that younger funds are better able to detect good investment opportunities outside the USA. We also examine the effects on fund performance of past performance and flows. We find evidence of short-run persistence in fund performance but only in the case of US funds. The evidence on persistence is consistent with the US evidence (e.g., Hendricks, Patel, and Zeckhauser, 1993; Grinblatt and Titman, 1994). Investors outside the USA seem to have some ability to select funds as money flows to funds with good future performance. We find, however, that the "smart money" effect is statistically insignificant in the sample of US funds. This is consistent with the US evidence in Sapp and Tiwari (2004) that the smart money effect is explained by momentum.

A unique feature of our study is that we can investigate the effect of country characteristics on fund performance. We find country characteristics to have predictive power beyond fund characteristics. There is a strong positive relation between the performance of mutual funds and a country's level of financial development. In particular, funds perform better in countries with high trading activity and low trading costs. Finally, we find that funds domiciled in countries of common law tradition perform better. Investor protection and law enforcement have a statistically significant and positive effect on fund performance. Our findings

show that country-level investor protection is a critical determinant of the performance of the mutual fund industry across countries in addition to the size and fees of the industry (Khorana, Servaes, and Tufano, 2005, 2009).

The remainder of the paper is organized as follows. Section 2 describes the data and the performance benchmarks. In Section 3, we present our empirical findings. Section 4 concludes.

## 2. Data and Methodology

In this section, we first describe our sample, then we describe the methods for computing abnormal performance and finally we present fund and country characteristics.

### 2.1 SAMPLE DESCRIPTION

Data on equity mutual funds come from the Lipper Hindsight database, which covers many countries worldwide in 1997–2007 period. The database is survivorship bias-free as it includes data on both active and defunct funds. Although multiple share classes are listed as separate funds in Lipper, they have the same holdings, the same manager, and the same returns before expenses and loads. We eliminate multiple classes of the same fund to avoid multiple counting of returns. We keep the share class that Lipper identifies as the primary one. The initial sample includes 37,910 primary equity funds (both active and dead funds).[4]

We have checked the coverage of funds by Lipper with the aggregate statistics on mutual funds [European Fund and Asset Management Association (EFAMA), 2008]. Total numbers of equity funds reported by Lipper and the EFAMA are, respectively, 26,800 and 26,950 as of December 2007. TNA of equity funds (sum of all share classes) reported by Lipper and EFAMA are, respectively, $10.9 trillion and $12.5 trillion as of December 2007. Thus, our initial sample of equity funds covers 87% of the TNA of worldwide equity funds. There is, however, some variation in coverage across countries. While Canada, Germany, Sweden, the UK, and the USA have coverage above 90%, the coverage in Australia and France is roughly 60% and in Japan only 40%.[5]

[4] The primary fund is typically the class with the highest TNA. The primary class represents more than 80% of the total assets across all share classes.

[5] There are 24,050 equity funds with a TNA of $10.2 trillion in Lipper if we exclude closed-end and funds-of-funds. In this case, our initial sample covers 82% of the TNA of equity funds worldwide. The EFAMA statistics are not entirely consistent across countries whether or not they include these type of funds.

We exclude offshore funds (e.g., funds domiciled in Luxembourg or Dublin), closed-end funds, index-tracking funds, exchange-traded funds, and funds-of-funds. This gives a sample of 25,110 open–end actively managed equity funds from 34 countries. We require mutual funds to have data on TNA, age, total expense ratios, front-end and back-end loads, flows, management team, the number of countries a fund is sold, and monthly total returns. We also require a fund to have at least 2 years of reported returns because we need to estimate fund factor loadings based on past fund returns. The final sample includes 16,316 funds in 27 countries (12,577 active funds and 3,739 dead funds as of December 2007). We believe that this is the most comprehensive data set ever used to study mutual fund performance in terms of both number of funds and number of countries. The data set allows us to investigate the effect of both fund characteristics and country characteristics on performance.

The Lipper database provides information on a fund's country of domicile and geographic investment focus. We use these data to classify funds in terms of their geographic investment style: domestic funds (i.e., funds that invest in their domicile country) and international funds (i.e., funds that invest in countries or regions different from the one where they are domiciled and funds that invest globally). We require a country to have more than 10 funds to be included in the sample. The final sample covers 8,176 domestic funds and 8,140 international funds. Table A1 in the Appendix lists the top three domestic and international funds by TNA in each country as of 2007.

Table I presents the number and TNA of the sample of mutual funds by country as of 2007. TNA is given by the sum of all share classes when there are multiple share classes. There are a total of 12,577 equity funds in the sample in 2007, managing $6.7 trillion of assets. US funds represent 67% of the sample in terms of TNA but only 22% of the total number of funds. Other countries with a large number of funds are Australia and Canada, which account for 17 and 12%, respectively, of the total number of funds.

A country's weight in terms of number of funds is greater than its weight in terms of fund size for all countries except the USA, indicating that on average, non-US mutual funds are much smaller than US funds. The average fund in Europe is five times smaller than the average US fund. This is also the case in Asia, where the average fund is nearly 17 times smaller than in the USA. Overall, non-US funds are more than seven times smaller than US funds.

Table I also divides funds by geographic investment style. Domestic funds represent about half of the sample in terms of the number of funds and 63% in terms of TNA. Domestic funds are, on average, 1.6 times larger than international funds. The US mutual fund industry is heavily weighted toward domestic funds as they account for more than 80% of the number of the funds and more than 70% of the TNA in the USA. International funds, however, are dominant in other countries like

*Table I.* Number and size of mutual funds by country

This table presents number of funds and TNA under management (sum of all share classes in US dollars millions) of the sample of funds by country at the end of 2007. The sample includes open–end actively managed equity funds.

| | All funds | | Domestic funds | | International funds | |
|---|---|---|---|---|---|---|
| Country | Number of funds | TNA ($ million) | Number of funds | TNA ($ million) | Number of funds | TNA ($ million) |
| Australia | 2,164 | 210,866 | 1,174 | 128,034 | 990 | 82,832 |
| Austria | 162 | 19,824 | 12 | 1,652 | 150 | 18,171 |
| Belgium | 184 | 28,917 | 19 | 3,170 | 165 | 25,746 |
| Canada | 1,491 | 410,546 | 594 | 237,924 | 897 | 172,623 |
| Denmark | 192 | 36,030 | 20 | 4,108 | 172 | 31,922 |
| Finland | 150 | 24,102 | 26 | 5,087 | 124 | 19,015 |
| France | 973 | 262,511 | 237 | 79,475 | 736 | 183,036 |
| Germany | 364 | 150,438 | 61 | 44,037 | 303 | 106,401 |
| India | 145 | 28,674 | 145 | 28,674 | | |
| Indonesia | 21 | 2,742 | 21 | 2,742 | | |
| Ireland | 79 | 21,606 | | | 79 | 21,606 |
| Italy | 274 | 75,783 | 51 | 14,049 | 223 | 61,734 |
| Japan | 662 | 69,676 | 430 | 41,586 | 232 | 28,090 |
| Malaysia | 158 | 6,177 | 158 | 6,177 | | |
| Netherlands | 151 | 62,133 | 25 | 10,277 | 126 | 51,856 |
| Norway | 126 | 29,412 | 48 | 9,700 | 78 | 19,712 |
| Poland | 20 | 10,542 | 20 | 10,542 | | |
| Portugal | 58 | 4,786 | 17 | 1,575 | 41 | 3,210 |
| Singapore | 210 | 17,474 | 12 | 1,513 | 198 | 15,961 |
| South Korea | 205 | 30,465 | 205 | 30,465 | | |
| Spain | 339 | 31,658 | 91 | 9,371 | 248 | 22,287 |
| Sweden | 242 | 110,093 | 99 | 56,107 | 143 | 53,985 |
| Switzerland | 190 | 44,443 | 58 | 20,234 | 132 | 24,209 |
| Taiwan | 217 | 16,487 | 161 | 11,852 | 56 | 4,635 |
| Thailand | 125 | 3,035 | 125 | 3,035 | | |
| UK | 934 | 519,649 | 384 | 277,166 | 550 | 242,484 |
| USA | 2,741 | 4,533,223 | 2,216 | 3,216,470 | 525 | 1,316,753 |
| Total | 12,577 | 6,761,290 | 6,409 | 4,255,022 | 6,168 | 2,506,268 |
| Total ex-USA | 9,836 | 2,228,067 | 4,193 | 1,038,553 | 5,643 | 1,189,515 |

Australia, Canada, France, Germany, and the UK. For example, international funds in Australia, Canada, and France represent, respectively, 46, 60, and 76% of the number of funds and 39, 42, and 70% of the TNA. We conclude that US investors prefer mutual funds that invest mainly in domestic stocks, while non-US investors exhibit less home bias as they invest a significant part of their stock portfolio in international funds.

### 2.2 MEASURING FUND PERFORMANCE

We estimate the mutual funds (risk-adjusted) performance using several benchmark models. Fama and French (1992) propose a three-factor model that improves average Capital Asset Pricing Model pricing errors by including size and book-to-market

factors. Carhart (1997) proposes adding a factor that captures the Jegadeesh and Titman (1993) momentum anomaly. The four-factor model regression is given by:

$$R_{it} = \alpha_i + \beta_{0i}\mathrm{RM}_t + \beta_{1i}\mathrm{SMB}_t + \beta_{2i}\mathrm{HML}_t + \beta_{3i}\,\mathrm{MOM}_t + \varepsilon_{it}, \qquad (1)$$

where $R_{it}$ is the return in US dollars of fund $i$ in excess of the 1 month US Treasury bill in month $t$; $\mathrm{RM}_t$ is the excess return in US dollars on the market; $\mathrm{SMB}_t$ (small minus big) is the average return on the small capitalization portfolio minus the average return on the large capitalization portfolio; $\mathrm{HML}_t$ (high minus low) is the difference in return between the portfolio with high book-to-market stocks and the portfolio with low book-to-market stocks; and $\mathrm{MOM}_t$ (momentum) is the difference in return between the portfolio with the past 12-month winners and the portfolio with the past 12-month losers.

The benchmark model in Equation (1) nests several alternative benchmark models. The market model assumes $\beta_{1i} = \beta_{2i} = \beta_{3i} = 0$ and market-adjusted returns further assume that $\beta_{0i} = 1$ We also use benchmark-adjusted returns by taking the difference between the fund return and its benchmark return as listed on Lipper. We present results using these alternatives in the robustness section.

We construct the monthly benchmark factors for each individual country using all stocks included in the Datastream/Worldscope database. The market return RM is computed using the value-weighted average return in US dollars of all stocks in each country in each month. To form the size and book-to-market equity portfolios, we follow the procedure described in Fama and French (1992). Table A2 in the Appendix presents summary statistics of performance benchmarks by country.

We use monthly fund returns (net of expenses) denominated in US dollars from July 1997 through December 2007 to estimate the factor models.[6] We also present results using gross returns in the robustness analysis. First, we estimate the time series regression of the monthly fund excess returns on the factor portfolios' returns using the previous 36 months of data, every quarter (we require a minimum of 24 months of return data).[7] We then subtract the expected return from the realized fund return to estimate the fund abnormal return in each quarter, or alpha, which is measured as a sum of an intercept of the model and the residual as in Carhart (1997). Alpha measures the manager's contribution to performance due to stock selection or market timing. A positive (negative) alpha indicates that the fund overperforms (underperforms) the benchmark. Since we use 3 years of return data to estimate the factor model, our first estimate of a fund's alpha is for the first quarter of 2000.

Table II presents the average factor loadings for domestic funds by country and the associated $R^2$ statistics from these regressions. We see that US funds, on

[6] Our primary findings are not affected when we use fund returns in local currency.

[7] There is look-ahead bias in our sample due to the exclusion of new funds that do not have enough history for the regression analysis (see Brown *et al.*, 1992).

*Table II.* Mutual fund factor loadings and $R^2$

This table reports means of quarterly factor loadings and $R^2$ statistics from the Carhart four-factor model estimated with 3 years of monthly fund returns (denominated in US dollars). The sample includes open–end actively managed domestic equity funds. The sample period is from 2000 to 2007. RM is the excess return on the domestic market, SMB is the difference in return between the small and big portfolios, HML is the difference in return between the high and the low book-to-market portfolios, and MOM is the difference in return between last year's winner and loser portfolios. Standard deviations across all funds are in parentheses.

| Country | RM | SMB | HML | MOM | $R^2$ |
|---|---|---|---|---|---|
| Australia | 0.95 | 0.05 | 0.11 | 0.02 | 0.86 |
| Austria | 1.07 | 0.03 | 0.05 | −0.05 | 0.83 |
| Belgium | 0.97 | 0.10 | 0.00 | −0.05 | 0.90 |
| Canada | 0.93 | 0.13 | 0.05 | −0.03 | 0.89 |
| Denmark | 0.89 | 0.14 | 0.02 | −0.04 | 0.86 |
| Finland | 1.03 | 0.59 | 0.47 | 0.00 | 0.83 |
| France | 1.00 | 0.36 | 0.05 | −0.03 | 0.85 |
| Germany | 0.98 | 0.05 | 0.04 | −0.05 | 0.92 |
| India | 0.90 | 0.31 | −0.02 | −0.03 | 0.86 |
| Indonesia | 0.76 | −0.13 | 0.03 | −0.01 | 0.78 |
| Italy | 1.07 | 0.10 | 0.03 | 0.02 | 0.96 |
| Japan | 1.00 | 0.15 | −0.10 | 0.01 | 0.89 |
| Malaysia | 0.81 | 0.20 | 0.12 | 0.05 | 0.85 |
| Netherlands | 0.97 | 0.13 | −0.01 | −0.04 | 0.86 |
| Norway | 1.00 | 0.25 | −0.01 | −0.09 | 0.88 |
| Poland | 0.83 | 0.15 | 0.03 | 0.01 | 0.89 |
| Portugal | 0.95 | 0.02 | 0.00 | −0.03 | 0.92 |
| Singapore | 0.96 | 0.08 | −0.01 | 0.02 | 0.89 |
| South Korea | 0.89 | 0.18 | 0.06 | 0.08 | 0.86 |
| Spain | 0.96 | −0.05 | 0.03 | −0.01 | 0.92 |
| Sweden | 0.88 | 0.08 | 0.03 | −0.04 | 0.92 |
| Switzerland | 1.08 | 0.24 | 0.14 | −0.02 | 0.91 |
| Taiwan | 1.03 | 0.87 | −0.41 | 0.06 | 0.74 |
| Thailand | 0.94 | 0.12 | −0.03 | 0.05 | 0.94 |
| UK | 0.97 | 0.26 | −0.04 | −0.02 | 0.88 |
| USA | 1.00 | 0.33 | 0.09 | 0.06 | 0.85 |
| Total | 0.98 (0.46) | 0.26 (0.43) | 0.05 (0.38) | 0.03 (1.06) | 0.87 (0.12) |
| Total ex-USA | 0.96 (0.19) | 0.19 (0.33) | 0.01 (0.25) | 0.00 (0.14) | 0.88 (0.10) |

average, load more on SMB, HML, and MOM than non-US funds. So, US funds play more small, value, and momentum stocks than non-US funds.[8] It is well known that the four-factor model works well in explaining the variation in US mutual fund performance and our finding of an average $R^2$ statistic for US funds of 85% bears this out. Even though the four-factor model was developed on US data, its $R^2$ outside the USA is even higher, at 88%. This reassures us that the four-factor

[8] The comparatively high loading on SMB for US mutual funds might be explained by the historically poor performance of the size factor outside the USA. Indeed, across the countries in our sample, the average fund loadings on SMB across countries appear to line up with the magnitude of the average size premia.

*Table III.* Mutual fund characteristics

This table reports means of fund characteristics. The sample includes open–end actively managed domestic equity funds. The sample period is from 2000 to 2007. See Table A3 in the Appendix for variable definitions. Standard deviations across all funds are in parentheses.

| Country | Observed | Return (% quarter) | Alpha Carhart model (% quarter) | TNA ($ million) | Family TNA ($ million) | Age (years) | Expense ratio (% year) | Total load (%) | Flow (% quarter) | Number of countries sold | Management team |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 2,619 | 2.41 | −1.29 | 123 | 22,400 | 6.2 | 1.37 | 2.00 | 5.17 | 1.02 | 0.76 |
| Austria | 214 | 6.54 | −0.31 | 58 | 8,190 | 11.3 | 1.52 | 4.21 | 0.18 | 2.54 | 0.38 |
| Belgium | 546 | 4.92 | 0.75 | 89 | 8,290 | 11.6 | 1.05 | 2.49 | −1.38 | 2.32 | 0.92 |
| Canada | 5,453 | 4.61 | −0.58 | 265 | 19,700 | 10.6 | 1.52 | 5.33 | 0.87 | 1.01 | 0.74 |
| Denmark | 410 | 5.82 | 1.36 | 138 | 5,350 | 11.3 | 1.26 | 2.14 | 1.18 | 1.41 | 0.72 |
| Finland | 486 | 6.19 | 0.43 | 112 | 7,990 | 8.5 | 1.58 | 1.97 | 2.78 | 1.40 | 0.58 |
| France | 7,305 | 2.08 | −1.36 | 158 | 9,590 | 11.1 | 1.70 | 3.09 | 0.97 | 1.07 | 0.85 |
| Germany | 1,733 | 3.46 | −0.07 | 418 | 23,000 | 17.5 | 1.24 | 4.45 | −0.89 | 1.88 | 0.50 |
| India | 2,101 | 12.24 | 0.57 | 38 | 13,800 | 6.2 | 1.24 | 2.72 | 1.64 | 1.44 | 0.10 |
| Indonesia | 209 | 10.58 | 0.01 | 40 | 5,710 | 7.6 | 1.78 | 2.86 | 13.40 | 1.05 | 0.05 |
| Italy | 1,722 | 2.30 | −0.20 | 282 | 17,400 | 8.7 | 1.86 | 3.01 | −1.20 | 1.00 | 0.92 |
| Japan | 10,491 | 2.35 | 0.22 | 78 | 23,200 | 7.9 | 1.38 | 2.32 | −3.02 | 1.00 | 1.00 |
| Malaysia | 2,633 | 4.72 | 0.34 | 40 | 2,290 | 9.1 | 1.53 | 6.24 | −2.02 | 1.06 | 0.61 |
| Netherlands | 474 | 3.93 | −0.46 | 267 | 10,100 | 11.3 | 1.08 | 2.03 | −0.52 | 1.03 | 0.74 |
| Norway | 1,181 | 6.94 | −0.74 | 97 | 5,710 | 9.8 | 1.61 | 2.85 | −0.46 | 1.27 | 0.86 |
| Poland | 414 | 6.74 | 0.48 | 135 | 23,200 | 5.4 | 3.25 | 4.25 | 12.77 | 1.00 | 0.78 |
| Portugal | 366 | 5.70 | 0.90 | 54 | 4,400 | 7.1 | 1.93 | 2.53 | −0.40 | 1.11 | 1.00 |
| Singapore | 270 | 5.57 | 0.11 | 45 | 6,890 | 9.1 | 1.40 | 3.94 | 3.18 | 1.19 | 1.00 |
| South Korea | 6,011 | 6.45 | 0.76 | 21 | 8,520 | 4.5 | 2.68 | 0.05 | −11.27 | 1.00 | 0.91 |
| Spain | 1,979 | 5.31 | −0.58 | 88 | 6,300 | 9.3 | 1.97 | 0.77 | 0.00 | 1.01 | 0.81 |
| Sweden | 2,358 | 4.62 | −0.08 | 354 | 11,500 | 11.0 | 1.33 | 0.79 | 1.41 | 1.08 | 0.77 |
| Switzerland | 1,172 | 3.74 | −0.29 | 271 | 12,500 | 10.8 | 1.26 | 4.37 | −1.22 | 1.63 | 0.51 |
| Taiwan | 984 | 5.38 | −0.34 | 52 | 22,700 | 8.8 | 1.55 | 2.72 | 6.42 | 1.00 | 0.00 |
| Thailand | 1,989 | 7.32 | 0.92 | 11 | 968 | 8.3 | 1.37 | 1.20 | −2.51 | 1.00 | 0.76 |
| UK | 6,156 | 2.86 | 0.23 | 471 | 31,000 | 16.0 | 1.46 | 4.21 | 0.27 | 1.75 | 0.23 |
| USA | 58,957 | 1.80 | −0.30 | 949 | 44,900 | 12.6 | 1.31 | 2.45 | 2.00 | 1.04 | 0.63 |
| Total | 118,233 | 3.01 | −0.20 | 558 | 30,400 | 11.1 | 1.46 | 2.65 | 0.44 | 1.11 | 0.68 |
| | | (9.93) | (4.18) | (2780) | (90,600) | (10.60) | (0.61) | (2.63) | (17.87) | (0.61) | (0.47) |
| Total ex-USA | 59,276 | 4.21 | −0.10 | 170 | 15,900 | 9.6 | 1.62 | 2.85 | −1.11 | 1.18 | 0.72 |
| | | (10.49) | (4.27) | (514) | (54,600) | (8.01) | (0.68) | (2.52) | (17.89) | (0.83) | (0.45) |

model is an appropriate way to evaluate fund performance for our worldwide sample.

### 2.3 FUND CHARACTERISTICS

Table III reports averages of mutual fund returns and alphas for domestic funds by country. We winsorize returns and alphas at the bottom and top 1% level. The average fund return is 3.01% per quarter. We report average Carhart four-factor alphas. The fund alphas are negative for about half of the countries. The countries with the best performance are Denmark, Thailand, and Portugal, while the countries with the worst performance are Norway, Australia, and France. US funds are in the middle of the pack with an average alpha of −0.30% per quarter, which is consistent with the average alpha in Chen *et al.* (2004) for US funds. Thus, there is evidence of underperformance in the worldwide mutual fund industry. The average alpha is −0.20% per quarter with a standard deviation of 4.18%. Overall, the figures here are consistent with other studies that find that fund managers do not have the ability to beat the market (or stay even with it) after fees (e.g., Malkiel, 1995; Gruber, 1996).

Table III also presents average fund characteristics by country. We winsorize the expense ratio, total loads, and flows at the bottom and top 1% level. Panel A of Table A3 in the Appendix defines fund-level variables.

Fund size is measured by TNA in US dollars. The USA, the UK, and Germany have the largest funds, while Thailand and South Korea have the smallest funds. US funds have an average TNA of $949 million, followed by the UK with $471 million and Germany with $418 million. Overall, the average TNA in our sample of funds is $558 million. Outside the USA, the average TNA of funds is only $170 million.

We also examine the effect on performance of the size of a fund's family. Family size is measured as the sum of all equity funds under management by a particular company. We use the parent management company to calculate total equity assets under management. In the case of transnational fund companies, we use the sum of all equity assets worldwide. Funds domiciled in the USA, the UK, Japan, Germany, Australia, and Canada are managed by the largest fund families. Interestingly, the average family fund size of funds domiciled in Poland and Taiwan is also quite high, despite low individual fund size. This happens because funds in these two countries are part of large global fund families.

We use a host of other fund characteristics in our analysis of performance. The 1st characteristic is fund age as given by the fund launch date. The average fund age is about 11 years. Funds domiciled in Germany, Switzerland, the UK, and the USA tend to be among the older ones. US funds have an average age of 12.6 years.

The 2nd characteristic is the total expense ratio, defined as total annual expenses as a fraction of TNA. In some countries where the expense ratio is not available, we use the management fee. The average expense ratio is 1.46%. Expenses vary considerably across countries despite the global nature of the mutual fund industry. For example, average expense ratios are the lowest in Belgium (1.05%) and the Netherlands (1.08%), while they reach maximums of 3.25% in Poland and 2.68% in South Korea. US funds present an average expense ratio of 1.30%, which is slightly higher than the ratio reported in other studies. The 3rd characteristic is total loads defined as the sum of front-end and back-end loads. The average total load is 2.65%. Loads vary considerably across countries, US funds present total loads similar to the overall average.

The 4th characteristic of interest is flows defined as the percentage growth in total assets under management (in local currency) between the beginning and the end of quarter $t$, net of internal growth (assuming reinvestment of dividends and distributions):

$$\text{Flow}_{it} = \frac{\text{TNA}_{it} - \text{TNA}_{i,t-1}(1 + R_{it})}{\text{TNA}_{i,t-1}}, \tag{2}$$

where $\text{TNA}_i$ is the TNA in local currency of fund $i$, and $R_t$ is fund $i$ return in local currency. Funds have an average flow of 0.44% per quarter. The flows are positive in the majority of the countries (exceptions include, e.g., Germany, Italy, Japan, and Switzerland).

The 5th characteristic is the number of countries where a fund is sold. This variable tells us where fund investors are located. While in some countries like the USA, the funds are distributed only locally, in Europe, it is common for a fund to be sold in more than one country. The average number of countries where a fund is sold is 1.1 for domestic funds, but we can find some countries where it is common that a fund is sold in several countries (e.g., Austria, Belgium, Germany, Sweden, and the UK).

Finally, we consider management structure as a potential determinant of fund performance. Lipper provides a field listing names of managers in charge of a fund. We use a dummy variable (management team) that takes a value of 1 if the number of managers is greater than one or the fund is listed as team-managed or by the name of the management company, and zero if the fund is managed by a single manager. This variable identifies the organizational structure influencing the decision-making process of the fund, and it may help to explain fund performance. Funds tend to be managed by teams in countries such as Australia, Canada, France, and Japan. Management by teams is less common in Germany and the UK. In the USA, 63% of the funds are managed by teams (or more than one person), which is

*Table IV.* Country characteristics

This table reports means of country characteristics. The sample period is from 2000 to 2007. See Table A3 in the Appendix for variable definitions. Standard deviations across all funds are in parentheses.

| Country | GDP per capita ($) | Internet (%) | Share turnover (%) | Trading costs (bp) | Common law | Antidirector | Securities regulation | Mutual fund industry age (years) | Mutual fund industry Herfindahl | Mutual fund equity/market capitalization |
|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 34,672 | 69.8 | 78.0 | 32.3 | 1 | 4 | 2 | 42 | 0.05 | 0.33 |
| Austria | 33,882 | 46.8 | 36.1 | 30.6 | 0 | 3 | 1 | 49 | 0.07 | 0.21 |
| Belgium | 31,868 | 41.0 | 49.7 | 30.0 | 0 | 3 | 1 | 57 | 0.17 | 0.29 |
| Canada | 34,848 | 54.2 | 63.5 | 32.4 | 1 | 4 | 3 | 74 | 0.04 | 0.17 |
| Denmark | 34,319 | 50.3 | 82.2 | 34.0 | 0 | 4 | 2 | 43 | 0.09 | 0.14 |
| Finland | 33,187 | 51.9 | 128.6 | 42.2 | 0 | 4 | 1 | 18 | 0.09 | 0.07 |
| France | 29,412 | 35.7 | 83.1 | 28.4 | 0 | 4 | 2 | 40 | 0.04 | 0.21 |
| Germany | 29,006 | 41.1 | 137.0 | 27.1 | 0 | 4 | 1 | 55 | 0.13 | 0.11 |
| India | 3,523 | 4.4 | 110.5 | 65.6 | 1 | 5 | 2 | 41 | 0.08 | 0.02 |
| Indonesia | 4,315 | 7.0 | 46.6 | 71.7 | 0 | 4 | 2 | 10 | 0.26 | |
| Ireland | 42,644 | 27.8 | 53.3 | 84.6 | 1 | 5 | 1 | 32 | 0.06 | |
| Italy | 28,410 | 41.3 | 121.8 | 32.2 | 0 | 2 | 1 | 21 | 0.05 | 0.13 |
| Japan | 30,222 | 56.3 | 100.6 | 20.8 | 0 | 5 | 1 | 39 | 0.10 | 0.08 |
| Malaysia | 11,006 | 40.3 | 30.2 | 55.7 | 1 | 5 | 2 | 46 | 0.16 | |
| Netherlands | 33,405 | 64.7 | 116.8 | 27.7 | 0 | 3 | 2 | 76 | 0.13 | 0.08 |
| Norway | 41,178 | 54.5 | 103.7 | 32.5 | 0 | 4 | 1 | 11 | 0.16 | 0.11 |
| Poland | 13,593 | 23.0 | 37.3 | | 0 | 2 | | 12 | 0.11 | 0.03 |
| Portugal | 21,183 | 26.5 | 53.1 | 33.2 | 0 | 3 | 2 | 19 | 0.19 | 0.04 |
| Singapore | 29,636 | 55.3 | 59.1 | 40.3 | 1 | 5 | 3 | 46 | 0.08 | |
| South Korea | 21,417 | 64.0 | 216.1 | 57.3 | 0 | 5 | 2 | 35 | 0.09 | 0.04 |
| Spain | 26,473 | 29.8 | 167.0 | 32.2 | 0 | 5 | 1 | 46 | 0.09 | 0.10 |
| Sweden | 31,772 | 69.7 | 115.4 | 30.9 | 0 | 4 | 1 | 46 | 0.15 | 0.21 |
| Switzerland | 35,685 | 46.6 | 92.9 | 29.7 | 0 | 3 | 1 | 66 | 0.14 | 0.05 |
| Taiwan | 31,889 | | 132.6 | 47.9 | 0 | 3 | 2 | 23 | 0.07 | |
| Thailand | 8,445 | 10.1 | 85.2 | 59.6 | 1 | 4 | 2 | 10 | 0.11 | |
| UK | 32,730 | 44.9 | 129.8 | 50.8 | 1 | 5 | 2 | 70 | 0.02 | 0.13 |
| USA | 39,605 | 58.0 | 150.6 | 24.8 | 1 | 3 | 3 | 80 | 0.05 | 0.28 |
| Total | 27,716 | 42.9 | 95.6 | 40.6 | 0 | 4 | 2 | 41 | 0.10 | 0.13 |

consistent with figure reported in Massa, Reuter, and Zitzewitz (2010). Overall, 68% of the funds are managed by teams (or more than one person).

### 2.4 COUNTRY CHARACTERISTICS

Our sample of equity mutual funds includes 27 countries. This large cross-section of countries allows us to examine the role of the fund's domicile country characteristics in explaining fund performance. To our knowledge, this feature is unique to our study of mutual fund performance around the world. We use several country-level variables as explanatory variables that are classified into five groups: economic development, financial development, investor protection and quality of legal institutions, mutual fund industry development, and concentration. Table IV reports averages for the country-level variables. Panel B of Table A3 in the Appendix presents the country-level variables definitions.

We use gross domestic product per capita (GDP per capita) in US dollars from the World Development Indicators (WDI) database as a measure of economic development. An additional measure of economic development is the ratio between the number of internet users and the population of a particular country, taken from WDI. The intensity of internet usage is likely to be higher in countries with better-informed investors and more sophisticated investors.

We use two proxies for level of stock market development and liquidity. First, the share turnover ratio, defined as the ratio of total value of stocks traded to market capitalization. This variable is from the WDI database. The 2nd variable is country-level trading costs in basis points. We use the annual average transaction cost (including commissions, fees, and price impact) from the Global Universe Data-ElkinsMcSherry database. Countries with less developed markets are countries with higher trading costs (Malaysia, India, Thailand, South Korea, and Taiwan), while more developed markets like the USA and Japan have lower trading costs.

We consider three variables to proxy for investor protection and quality of legal institutions. The 1st proxy for investor protection is a dummy variable that equals one if the legal origin is common law and zero if the legal origin is civil law. Common law systems provide better legal protection to investors than civil law systems (see La Porta *et al.*, 1997). In our sample, we have nine countries with common law legal origin (Australia, Canada, India, Ireland, Malaysia, Singapore, Thailand, the UK, and the USA). The 2nd proxy is an index of minority shareholder protection (antidirector rights) from Djankov *et al.* (2008). The final variable is securities regulation, the combination of disclosure requirements, liability standards, and public enforcement from La Porta, Lopez-de-Silanes, and Shleifer (2006).

Finally, we use variables to proxy for the level of a country's mutual fund industry development and concentration. The level of development of the mutual

fund industry is proxied by the age of industry measured in number of years since the first open–end fund was sold in the country as reported in Khorana, Servaes, and Tufano (2005). To measure industry concentration, we use the Herfindahl index, defined as the sum of the squared market shares of portfolio management companies for equity funds in each country. The Herfindahl index is a common indicator of the level of concentration within an industry. Higher values of the Herfindahl index indicate higher industry concentration. Concentration is higher in Indonesia, Portugal, and Belgium and lower in the UK, Australia, Canada, France, and the USA. We also use the relative mutual fund industry size as proxied by equity assets under management scaled by stock market capitalization (mutual fund equity/market capitalization) per country as an additional explanatory variable. The data on equity assets under management are obtained from EFAMA and stock market capitalizations are obtained from WDI.

## 3. Determinants of Fund Performance

We investigate the determinants of equity mutual fund performance. Following the large majority of the mutual fund literature, we focus the analysis on domestic mutual funds, but we also use international funds in some tests. We run separate regressions using US and non-US funds that allow us to compare the determinants of the performance of funds in the USA versus the rest of the world. All the regressions include time-fixed effects (quarter dummies) to account for cross-sectional dependence, and *t*-statistics are clustered at the fund level to account for autocorrelation in fund performance. All explanatory variables are lagged one-quarter.

### 3.1 FUND CHARACTERISTICS

Table V reports the results of performance regressions using the Carhart four-factor model alphas as a measure of risk-adjusted performance. Later, we use alternative measures of performance. Column (1) presents estimates for US funds. Column (2) presents estimates for non-US funds using fund characteristics and country dummies as regressors. Columns (3)–(6) present estimates for non-US funds using fund and country characteristics as regressors. We first discuss the effects of fund characteristics and then of country characteristics.

#### *3.1.a. Fund size*

Mutual fund size has been one of the most studied variables in mutual fund research, and the relation between fund size and performance still puzzles academics

*Table V.* Regression of mutual fund performance

This table reports panel regressions of the performance of open–end actively managed domestic equity funds in 2000–07. The dependent variable is the quarterly Carhart model alpha (percentage per quarter) estimated using monthly fund returns in US dollars. Explanatory variables include fund characteristics, time dummies, and country dummies or country characteristics. See Table A3 in the Appendix for variables definition. Robust *t*-statistics corrected for fund-level clustering are in parentheses.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | US funds | Non-US funds | | | | |
| TNA (log) | −0.0675 | 0.0517 | 0.0221 | 0.0332 | 0.0230 | 0.0344 |
| | (−4.99) | (4.58) | (2.06) | (2.90) | (2.01) | (3.04) |
| Family TNA (log) | 0.0303 | 0.0275 | 0.0384 | 0.0360 | 0.0400 | 0.0388 |
| | (3.00) | (2.64) | (3.41) | (3.19) | (3.49) | (3.45) |
| Age (log) | −0.0020 | −0.0825 | −0.0531 | −0.0677 | −0.0550 | −0.0742 |
| | (−0.06) | (−2.64) | (−1.62) | (−2.08) | (−1.65) | (−2.29) |
| Expense ratio | −0.1347 | −0.0489 | −0.0698 | −0.0879 | −0.1420 | −0.1004 |
| | (−1.59) | (−1.41) | (−2.23) | (−2.81) | (−4.53) | (−3.37) |
| Total load | −0.0101 | 0.0120 | 0.0095 | 0.0284 | 0.0233 | 0.0177 |
| | (−1.25) | (1.34) | (1.10) | (3.25) | (2.70) | (2.06) |
| Flow | 0.0012 | 0.0111 | 0.0100 | 0.0103 | 0.0103 | 0.0101 |
| | (1.06) | (9.76) | (8.54) | (8.78) | (8.69) | (8.47) |
| Alpha | 0.0655 | 0.0105 | 0.0289 | 0.0295 | 0.0295 | 0.0279 |
| | (9.07) | (1.58) | (4.10) | (4.21) | (4.19) | (3.95) |
| Management team | −0.1373 | −0.1027 | 0.0149 | −0.0755 | −0.0689 | 0.0222 |
| | (−3.40) | (−2.36) | (0.32) | (−1.62) | (−1.46) | (0.47) |
| Number of countries sold | 0.1636 | 0.0080 | 0.0486 | 0.0573 | 0.0622 | 0.0403 |
| | (1.80) | (0.39) | (1.95) | (2.27) | (2.44) | (1.66) |
| GDP per capita (log) | | | −0.2825 | −0.4619 | −0.4603 | −0.1586 |
| | | | (−3.52) | (−6.15) | (−5.92) | (−1.73) |
| Internet | | | 0.0123 | 0.0154 | 0.0157 | 0.0152 |
| | | | (6.19) | (7.71) | (7.65) | (7.42) |
| Share turnover | | | 0.0055 | 0.0043 | 0.0056 | |
| | | | (9.98) | (7.54) | (9.18) | |
| Trading costs | | | | | | −0.0201 |
| | | | | | | (−7.90) |

*Continued*

*Table V.* Continued

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | US funds | Non-US funds | | | | |
| Common law | | | 0.5790 | | | |
| | | | (7.45) | | | |
| Antidirector rights | | | | 0.1558 | | 0.2032 |
| | | | | (4.86) | | (6.49) |
| Securities regulation | | | | | 0.1293 | |
| | | | | | (1.98) | |
| Mutual fund industry age (log) | | | −0.0412 | 0.0466 | 0.1551 | 0.0297 |
| | | | (−0.55) | (0.68) | (2.32) | (0.40) |
| Mutual fund industry Herfindahl | | | 5.2334 | 3.0447 | 3.1003 | 4.9513 |
| | | | (6.33) | (4.26) | (3.40) | (6.39) |
| Mutual fund equity/Market capitalization | | | −4.1843 | −3.6300 | −3.9263 | −3.8257 |
| | | | (−11.71) | (−10.00) | (−10.73) | (−11.11) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | No | Yes | No | No | No | No |
| Observations | 58,957 | 59,276 | 53,191 | 53,191 | 52,777 | 52,777 |
| $R^2$ | 0.103 | 0.048 | 0.050 | 0.049 | 0.049 | 0.049 |

and practitioners. Several studies try to answer questions such as: does fund size affect investors' fund selection ability? Is management skill more pronounced when a fund is small?

Large mutual funds present several advantages over small ones. First, larger funds are able to spread fixed expenses over a larger asset base and have more resources for research. Managers of large funds can benefit from investment opportunities not available to smaller funds. Large funds are able to negotiate better spreads as they have larger positions and trading volumes. Furthermore, brokerage commissions decline with the size of transactions (Brennan and Hughes, 1991).

Large funds, however, face some problems and management challenges, and the scale ability of investments is a determinant of performance persistence (Gruber, 1996; Berk and Green, 2004). While small funds can concentrate on a few investment positions, when funds become large, managers must continue to find good investment opportunities, and the effect of managerial skill becomes diluted implying diseconomies of scale. Cremers and Petajisto (2009) show that small funds are more active, while a significant fraction of large active funds are close to index funds. Moreover, larger mutual fund managers must necessarily trade larger volumes of stock, attracting the attention of other market participants and therefore suffering higher price impact costs. Chen *et al.* (2004) name this effect the liquidity constraints hypothesis.

Grinblatt and Titman (1989, 1994) find mixed evidence on the relationship between fund returns and fund size. More recently, Chen *et al.* (2004) find that fund returns decline with lagged fund size. The results are most pronounced among funds that invest in small and illiquid stocks, suggesting that adverse scale effects are related to liquidity. They also suggest that in addition to liquidity, fund size erodes performance because of organizational diseconomies. Pollet and Wilson (2008) find that the cause of diminishing returns to scale for mutual funds is the inability to scale an investment strategy related to liquidity constraints as the fund grows. They find that when a fund receives inflows, it tends to scale up its positions instead of diversifying into new assets. Edelen, Evans, and Kadlec (2007) and Yan (2008) point out trading costs and liquidity as the primary source of diseconomies of scale for US funds. Outside the USA, Dahlquist, Engström, and Söderlind (2000) find that larger equity funds tend to perform more poorly than smaller equity funds in Sweden. Overall, evidence on the size–performance relation is not unanimous, but recent work seems to support the presence of diseconomies of scale.

Column (1) of Table V shows that fund size (TNA) is negatively related to fund performance in the sample of US funds. The TNA coefficient is negative and statistically significant for US funds, −0.0675 with a *t*-statistic of −4.99. Thus, US smaller funds perform better than larger funds. Since the standard deviation of log of TNA is 2.20, a one-standard deviation increase to fund size is associated

with a decline in performance of 15 basis points per quarter. These effects are economically significant if we take into consideration the average fund performance is near zero. This estimate of the diseconomies of scale to US funds is very close to the one reported in Chen *et al.* (2004).

There are reasons to believe that the result might be different outside the USA because of the difference in size between US and non-US funds. Indeed, the average fund is much bigger in the USA than outside the USA, as we have documented earlier. The results in Column (2) support a very different relation between performance and TNA for non-US funds. Fund size has a positive and statistically significant effect (the coefficient is 0.0517 with a *t*-statistic of 4.58) on performance in the sample of non-US funds. A one-standard deviation increase in fund size is associated with an increase in abnormal performance of 11 basis points per quarter. Larger non-US funds seem to have better risk-adjusted performance than smaller funds. We further explore the reasons behind this asymmetry on the relation between fund performance and size in the next subsection. In particular, we test the hypothesis that economies of scale are exhausted after a fund approaches a certain size in fund assets as US funds are much bigger than non-US funds.

### *3.1.b. Fund family size*

Economies of scale and scope can exist at the fund family level. Expenses like research and administrative expenses can be shared among funds. Larger fund families can use the same economic data and experts to interpret data across many funds, leading to economies of scope and higher returns. Large fund families also benefit from economies of scale from trading commissions and lending fees (Chen *et al.*, 2004). Khorana and Servaes (1999) in studying mutual fund starts find that large families and families that have more experience in opening funds in the past are more likely to open new funds. This is likely to happen because the cost of generating a new fund is lower for large companies as they can benefit from economies of scale and scope. Chen *et al.* (2004) find that fund family size has a positive and statistically significant effect on performance, which they ascribe to family size capturing economies of scale.[9]

We find that fund family size has a positive and statistically significant effect on performance in the USA and elsewhere in the world (see Table V). Funds that perform better are more likely to be managed by a larger company as family size has a positive effect on fund abnormal performance. The effect of family size is

[9] Others suggest that larger families transfer performance from low-fee funds to high-fee funds, and they are committed to create stars that generate inflows to the fund itself and to other funds in the family at the expense of more poorly performing funds (Nanda, Wang, and Zheng, 2004; Gaspar, Massa, and Matos, 2006).

statistically and economically significant and it is of similar magnitude in the USA and outside the USA. Since the standard deviation of log of family TNA is 2.51, a one-standard deviation increase in family size is associated with an improvement in performance of 8 basis points per quarter. This estimate of the economies of scale in fund families is similar to the one reported in Chen *et al.* (2004) for US funds. We conclude that the positive effect of family size on performance is pervasive around the world.

### *3.1.c. Age*

Fund age provides a measure of a fund's longevity and its manager's ability. The effect of age on performance can run in both directions. One might argue that younger mutual funds will be more agile and committed to achieve better performance to survive. On the other hand, youth may be a disadvantage; newer funds usually face higher costs and suffer from lack of experience during the start-up period. Because of their small size, newer mutual funds' returns and ratings are also more vulnerable to manipulation. We find no relation between age and performance of US mutual funds in Column (1), which is consistent with the evidence in Chen *et al.* (2004) and others. In contrast, we find that newer funds seem to perform better than older funds outside the USA. Using the point estimate in Column (2), a one-standard deviation increase in fund age (log) is associated with a drop in performance of 6 basis points per quarter of non-US funds.

### *3.1.d. Expenses*

The relation between mutual fund returns and expenses (including management fees) provides a test of the value of active management. Mutual fund fees can be seen as the price that uninformed investors pay to managers to invest their money. Expenses vary considerably around the world. Khorana, Servaes, and Tufano (2009) find that large funds and families charge lower fees, while funds distributed in more countries charge higher fees. Furthermore, they find that fees are negatively related to investor protection. Empirical evidence on the relation between mutual fund performance and fees is mixed. In a sample of US mutual funds, some authors find a negative relation of fees with net-fee performance (Carhart, 1997) and even before-fee performance (Gil-Bazo and Ruiz-Verdu, 2009), while others find no relationship between fees and performance (Chen *et al.*, 2004). Evidence for European funds also seems to support a negative relation between fees and performance (Dahlquist, Engström, and Söderlind, 2000; Otten and Bams, 2002). We find a negative relation between the expense ratio and net-of-fees performance. This relation, however, is statistically insignificant

for US funds and only significant in some specifications for non-US funds. Thus, there is not consistent evidence of a statistically significant negative relation between fees and performance.

### *3.1.e. Loads*

Besides the expense ratio, funds commonly charge a load when investors purchase (front-end load) or sell (back-end load) shares of the fund. The main goal of the back-end load is to discourage redemptions. By making redemptions expensive, a mutual fund dissuades investors from redeeming shares, and it is able to invest in a more risky portfolio to enhance performance. The empirical evidence confirms that loads do dissuade redemptions in open-ended funds and that funds hold more cash when there is uncertainty about redemptions (Chordia, 1996). Authors find no relation between performance and loads (Chen *et al.*, 2004) or a negative relation (Carhart, 1997; Pollet and Wilson, 2008). We do not find a statistically significant relation between performance and loads in our sample of US and non-US funds.

### *3.1.f. Flows*

According to the smart money hypothesis of Gruber (1996), investors can detect skilled managers and direct their money to them. Therefore, fund flows should have a positive correlation with future returns. Gruber (1996) and Zheng (1999) show that funds experiencing net inflows (in the last 3 months) perform significantly better than funds that experience outflows. However, Sapp and Tiwari (2004) argue that the smart money effect is explained by momentum. We find no evidence of a statistically significant relation between flows and subsequent performance in the sample of US funds. Since we are using the Carhart (1997) model to measure performance, this is consistent with the Sapp and Tiwari (2004) argument. In contrast, we find that non-US funds that receive more new money perform better subsequently than those that receive less new money. Flows of the previous period have a positive and statistically significant coefficient, indicating a smart money effect. Using the specification in Column (2), a one-standard deviation increase in flows is associated with an improvement in subsequent performance of 20 basis points per quarter. The evidence here supports the idea that investors are able to detect skilled fund managers outside the USA.

How robust are our smart money findings outside the USA? First, it should be recognized that as our performance measures are momentum adjusted in our smart money regressions that these results are not attributable to stock-level momentum. Second, it might be argued that serial correlation in flows might inflate our *t*-statistics on lagged flows thereby biasing us toward accepting the existence of

smart money outside the USA. Ferson, Sarkissian, and Simin (2003) show that autocorrelation in independent variables in return regressions may lead to spurious inference when levels of first-order autocorrelation in the independent variables are above 90% and when the $R^2$ statistics in the regressions are less than 1%. For our non-US sample of funds, the average first-order autocorrelation of flows across funds is 0.25. In addition, the goodness of fit statistics for our non-US performance regressions in Table V are approximately 5%. Adding these findings to the fact that the *t*-statistics on lagged flows in our performance regressions are extremely high (between 8.5 and 10), this suggests that the incorrect inference problem suggested by Ferson, Sarkissian, and Simin (2003) may not be a problem in our data set. Our subsequent smart money results using the Fama–MacBeth approach for the non-US sample below also add credence to this. As the time dimension is essentially removed when using this technique, our findings that we still have a smart money effect outside the USA when using this approach suggest that our smart money findings are not due to the persistence of flows. Third, as we are controlling for lagged performance in these smart money regressions, differences in performance persistence across countries do not account for our findings.

### *3.1.g. Past performance*

There is ample evidence of performance persistence in US mutual funds (Hendricks, Patel, and Zeckhauser, 1993; Grinblatt and Titman, 1994; Brown and Goetzmann, 1995; Carhart, 1997). This persistence seems to be stronger among the most poorly performing funds. Outside the USA, Dahlquist, Engström, and Söderlind (2000) do not find performance persistence for a sample of Swedish funds, and Otten and Bams (2002) find performance persistence only for UK funds. We find evidence of persistence in US funds. The effect of past performance on future performance of US funds is economically meaningful. A one-standard deviation increase in past performance is associated with an increase in subsequent performance of 27 basis points per quarter in the sample of US funds. Outside the USA, persistence seems to be much weaker or even inexistent (the coefficient is statistically insignificant in Column (2) when the regression includes country dummies).

### *3.1.h. Management structure*

While individual managers are free from group politics difficulties, teams of decision makers have more resources and connections, which can help to boost performance. Accordingly, funds managed by a team might perform better than funds managed by an individual manager. On the other hand, small funds can easily be run by a single manager, while a large fund usually cannot. Chen *et al.* (2004)

suggest that larger funds experience organizational diseconomies, especially hierarchy costs, as funds deal mainly in soft information. When a fund is co-managed, there is more competition to implement an idea and managers may end up expending too much effort to convince others to implement their ideas than they would if they controlled their own funds (Aghion and Tirole, 1997; Stein, 2002). Chen *et al.* (2004) provide some evidence that size erodes fund performance because of the interaction of liquidity and organizational diseconomies of scale. While team management may have become increasingly popular in the mutual fund industry, US evidence shows that team-managed funds perform either no differently from (Bliss, Potter, and Schwarz, 2008) or more poorly (Chen *et al.*, 2004; Massa, Reuter, and Zitzewitz, 2010) than funds managed by a single manager. We find that funds managed by teams (or more than one individual) show significantly worse performance than funds managed by a single person. The difference in performance is also economically significant at roughly 14 basis points for US funds and 11 basis points for non-US funds using the specification in Column (2).

#### *3.1.i. Number of countries where a fund is sold*

We also analyze whether the number of countries where a fund is sold helps to predict performance. There are two main reasons why the number of countries where a fund is distributed can affect performance. First, selling a fund in several countries should make the fund less sensitive to shocks in domestic flows. If investors' flows from different countries are not perfectly correlated, distributing the fund in several countries makes the fund less cash flow volatile, reducing the cash position, and enhancing performance. Second, it is well known that top-performing funds can originate a substantial amount of inflows for a fund family (Nanda, Wang, and Zheng, 2004). Therefore, fund families are likely to make star funds available in more countries in order to gain market share and increase revenues. We find that the coefficient of number of countries where a fund is sold is statistically insignificant for US and non-US funds (the effect is only significant when we include country-level variables as regressors instead of country dummies). Thus, there is weak evidence that funds distributed in several countries display better performance.

### 3.2 COUNTRY CHARACTERISTICS

We do not know of any study so far that documents the effects of country characteristics on fund performance. Our sample covering a large cross-section of countries allows estimation of the specifications using country-level variables [Table V, Columns (3)–(6)]. We do not include US funds in these regressions as they would

represent a large fraction of the sample, but we obtain similar results when we include them.

### *3.2.a. Economic development*

Economic development is associated with higher per capita income and better education and skills, as well as with more developed industries and more incentives for innovation and for new investments. Better financially educated and more sophisticated investors are likely to evaluate fund performance and follow it more closely, exerting some pressure on management for performance. Furthermore, managers are likely to be more skilled in more developed countries as populations are better educated and have access to more learning opportunities. Developed countries also tend to attract high human capital individuals. Christoffersen and Sarkissian (2009) find that managers located in financial centers in the USA display better performance. Therefore, a country's level of economic development might influence the performance of the mutual fund industry. We find no evidence that a country's level of economic development as measured by GDP per capita is positively linked to fund performance. The relation is even negative and statistically significant sometimes. We conclude that broad economic development is not positively associated with the performance of domestic mutual funds once we control for other aspects of a country's level of development. In contrast, we find that the intensity of Internet usage has a positive and statistically significant coefficient. This finding is consistent with the idea that funds display better performance in countries where investors are better informed and better educated and money managers have better skills and greater access to learning opportunities.

### *3.2.b. Financial development*

A more developed financial market can have some advantages for fund performance because of higher liquidity and lower transaction costs. Trading costs are important in evaluating fund performance as they provide valuable information about the extent of deterioration in performance from active trading. Clearly, actively managed funds involve substantially higher trading costs (Keim and Madhavan, 1997), and trading costs are also related to fund size. As funds become larger, they will necessarily trade larger volumes. Khorana, Servaes, and Tufano (2005) find that trading costs have a negative impact on the development of the mutual funds industry. We find strong evidence of a positive relation between trading activity and fund performance and a negative relation between trading costs and fund performance. A one-standard deviation increase in share turnover is associated with an improvement in performance of 38 basis points per quarter, while

a one-standard deviation reduction in trading costs is associated with an improvement in performance of 26 basis points per quarter. Thus, the evidence indicates that the liquidity of the local stock market plays a prominent role in improving the performance of funds that invest in local stocks.

### *3.2.c. Investor protection and quality of legal institutions*

Differences in laws and regulations can affect investor behavior. Investors will be reluctant to invest in markets where their rights are not properly protected. La Porta *et al.* (1997) note that countries with poor investor protection have significantly smaller debt and equity markets. They also observe that the quality of the legal system is important for the enforcement of contracts and also captures the government's general attitude toward business. Accordingly, we expect to find that mutual fund performance is positively related to investor protection and the quality of a country's legal institutions. We use three different variables to proxy for investor protection and the quality of legal institutions. We first use a country's legal origin, which has been linked to the quality of legal institutions and investor protection. The common law dummy variable has a positive and statistically significant coefficient in Column (3). Thus, there is evidence that domestic mutual funds perform better when investor protection is stronger. The effect of legal origin is economically strong. Funds domiciled in countries with a common law legal origin outperform funds domiciled in countries with civil legal origin by 63 basis points per quarter. In Columns (4)–(6), we use the antidirector rights index and the securities regulation index to capture other aspects of a country's legal environment such as protection of minority shareholder interests and the quality of securities market regulations. In every case, we find evidence of a positive effect on fund performance. For example, an increase in the number of shareholder protection mechanisms from three to five enhances fund performance by approximately 60 basis points per quarter.

### *3.2.d. Mutual fund industry development and concentration*

Mutual funds have been one of the fastest growing types of financial intermediary. This is a relatively recent trend in a significant number of countries vis-à-vis the USA. The older the industry, the greater the investors' experience, and the more investment there will be in mutual funds (Khorana, Servaes, and Tufano, 2005). Mutual fund managers will also be more experienced. We hypothesize that the older the industry, the more efficient the fund industry will be, and this may lead to better performance. We do not find empirical support for the hypothesis that older industries display better performance. In a competitive industry, mutual fund

firms might feel pressure for their funds to perform well. One might also argue that in a more competitive industry, it is harder to achieve abnormal performance. We find a positive relation between mutual fund industry concentration and the performance of domestic funds. Overall, we do not find evidence that industry development and lack of concentration enhance the performance of domestic funds.

Finally, we take into account the size of the equity mutual fund industry relative to the pool of underlying assets (proxied by equity assets under management scaled by stock market capitalization per country). The coefficient on the relative mutual fund industry size (mutual fund equity/market capitalization) is negative and statistically significant. This is consistent with the notion that in countries where the relative equity mutual fund industry size is greater, there are fewer unexploited arbitrage opportunities. It is worth noting that the coefficient on lagged fund TNA remains positive and statistically significant for non-US funds after controlling for relative equity mutual fund industry size. This indicates that a less competitive capital allocation in the mutual fund industry is not responsible for the lack of diminishing returns to scale outside of the USA.

What do these findings tell us about how fund growth affects fund performance outside the USA? When funds increase in size, the impact of that growth on their performance depends on a fund-level and an industry-level effect. If funds grow at the expense of their rivals so that relative industry size is unchanged, we need only to worry about the fund-level effect. The coefficient on individual fund size tells us that growth is likely to lead to improved performance for small funds and unlikely to do so for larger ones. However, if funds grow by bringing new money into the fund sector, thus increasing relative fund industry size, then the industry-level effect will also come into play. In this case, the impact of their growth on performance will depend on the relative magnitudes of the diminished arbitrage opportunities (the industry-level effect) versus the potential cost reductions from being a larger fund (the fund-level effect).

In summary, our research suggests that mutual fund performance is related to both fund and country characteristics. There is evidence that funds from larger fund families and solo-managed funds have higher risk-adjusted returns around the world. These findings are consistent with the evidence for US funds. There are, however, important distinctions between the determinants of performance in the USA and elsewhere in the world. There is evidence of diseconomies of scale only in the USA, while there is evidence of economies of scale outside the USA. We find that the smart money effect is only present outside the USA, while performance persistence is a characteristic specific of the US fund industry. In terms of country characteristics, local stock market liquidity, investor protection and law enforcement, and industry concentration have a positive effect on the performance of funds that invest in local stocks.

### 3.3 WHY ARE THERE DISECONOMIES OF SCALE IN THE US MUTUAL FUND INDUSTRY?

We have documented the existence of diseconomies of scale in the US mutual fund industry, while there is evidence of economies of scale outside the USA. In this section, we aim to understand the reasons behind this asymmetry. We leave other differences in terms of return persistence and smart money effect for future research.

We test two main hypotheses to explain the asymmetry in the relation between performance and size between US and non-US domestic funds. A 1st hypothesis comes from the fact that US funds are much larger than elsewhere in the world (the average US domestic fund is more than five times larger than the average non-US domestic fund in our sample; see Table III). The difference in size between US and non-US domiciled funds is striking if we look at the top 100 funds in terms of TNA at the end of 2007. There are only nine non-US funds among the top 100 domestic funds. The largest fund in our sample is the American Growth Fund of America with a TNA of $194 billion, while the largest non-US fund is the Invesco Perpetual High Income with a TNA of $19 billion and a rank of 26th.

We sort mutual funds in each quarter based on the quintile rankings of their TNA. We perform the sort not only for domestic funds but also for international funds as we use these funds in this section to better understand the asymmetry between the USA and the rest of the world in terms of the relation between fund performance and size. Table VI presents the number of funds and mean TNA for each fund size quintile separately for domestic funds (Panel A) and international funds (Panel B) and within each of these groups separately for US and non-US funds. Notice that the size quintile rankings are solely based on funds within each subgroup (e.g., US domestic funds). In each quarter, there are on average about 400 US and non-US domestic funds in each fund size quintile. There is a substantial spread in TNA between the bottom and top size quintiles. Domestic funds in the bottom quintile have an average TNA of $13 million in the USA, whereas the ones in the top quintile have an average TNA of over $4 billion. There is also a significant spread for non-US domestic funds. Funds in the bottom quintile have an average TNA of $2 million and in the top quintile $726 million. We can also see that there is a dramatic difference between the average TNA of US and non-US funds across all quintiles. The US fund size quintiles have an average TNA more than five times larger than the corresponding non-US fund size quintiles. The fund size quintiles of international funds in Panel B show no significant differences between the average TNAs of domestic and international funds in the USA as well as outside the USA. Thus, domestic and international funds have comparable scale of operations.

A 2nd hypothesis suggests that liquidity constraints play an important role in explaining the lack of scale ability of fund investments in the US mutual fund

*Table VI.* Distribution of mutual fund size

This table reports the number of funds and the mean TNA under management in millions of US dollars in each fund size quintile. Fund size quintile 1 (5) has the smallest (largest) funds in each quarter. Panel A reports the distribution of fund size for domestic funds and Panel B reports the distribution of fund size for international funds. The sample period is from 2000 to 2007. Standard deviations are in parentheses.

| | Fund size quintile | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Panel A: domestic funds | | | | | |
| US funds | | | | | |
| Number of funds | 392 | 393 | 393 | 393 | 393 |
| TNA | 13 | 57 | 152 | 436 | 4102 |
| ($ millions) | (9) | (20) | (51) | (168) | (7920) |
| Non-US funds | | | | | |
| Number of funds | 395 | 395 | 395 | 395 | 396 |
| TNA | 2 | 11 | 32 | 96 | 726 |
| ($ millions) | (2) | (6) | (15) | (47) | (1010) |
| Panel B: international funds | | | | | |
| US funds | | | | | |
| Number of funds | 95 | 96 | 96 | 96 | 96 |
| TNA | 18 | 66 | 176 | 495 | 4,304 |
| ($ millions) | (14) | (35) | (101) | (302) | (7,580) |
| Non-US Funds | | | | | |
| Number of funds | 649 | 649 | 649 | 649 | 650 |
| TNA | 4 | 17 | 44 | 110 | 615 |
| ($ millions) | (3) | (7) | (16) | (41) | (789) |

industry (Chen *et al.*, 2004; Pollet and Wilson, 2008). This hypothesis is supported by the fact that large US domestic funds that have to invest, by virtue of their style, in small and illiquid stocks are the most affected by scale, and the inability to scale an investment strategy as the fund grows due liquidity constraints. This hypothesis is consistent with the arguments of Berk and Green (2004) that small funds can concentrate on a few investment positions, but when funds become large, managers must continue to find good investment opportunities and the effect of managerial skill becomes diluted. We have documented that US domestic funds play more small and illiquid stock than funds located elsewhere in the world (see Table II). This could contribute to hurt performance as the scale of the fund increases. Thus, liquidity constraints are put forward as a plausible explanation to the different relation between fund performance and size in the USA and outside the USA.

Table VII presents the results of the regression tests similar to the ones in Table V but designed to test our hypotheses. We focus the analysis on the fund size coefficient, but the regressions in Table VII include the explanatory variables (coefficients not shown) used in Table V. In Columns (1)–(5), we test the hypothesis that the asymmetry is explained by the fact that US funds are much larger than non-US funds. In Columns (6) and (7), we test the liquidity constraints hypothesis.

*Table VII.* Regression of mutual fund performance: role of fund size and liquidity

This table reports panel regressions of the performance of open–end actively managed equity funds in 2000–07. The dependent variable is the quarterly Carhart model alpha (percentage per quarter) estimated using monthly fund returns in US dollars. Explanatory variables include fund characteristics, time dummies, and country dummies. Regressions include the same fund characteristics (coefficients not shown) used in Table V. Columns (1) and (2) use a sample of US and non-US domestic funds that exclude the funds in the bottom fund size quintile (Q1). Column (3) uses a sample of US domestic funds that excludes the funds in the top fund size quintile. Column (4) uses a sample of US domestic funds that excludes the funds in the top fund size quintile with the size breakpoint given by non-US funds. Column (5) uses a sample of US domestic funds that excludes the funds with size above the largest non-US funds in each quarter. Columns (6) and (7) use a sample of US and non-US domestic funds and include an interaction term between the fund size (TNA) and a dummy variable that takes the value of 1 if a fund is below the median SMB factor loading in each quarter and zero otherwise. Columns (8) and (9) use a sample of US and non-US international funds. See Table A3 in the Appendix for variables definition. Robust *t*-statistics corrected for fund-level clustering are in parentheses.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Sample excludes Q1 | | Sample excludes largest US funds | | | Large cap funds | | International funds | |
| | US funds | Non-US funds | Excludes Q5 | Excludes Q5 non-US | Excludes Maximum TNA non-US | US funds | Non-US funds | US funds | Non-US funds |
| TNA (log) | −0.1071 | 0.0044 | −0.1047 | −0.0697 | −0.0732 | −0.0967 | 0.0384 | 0.0187 | −0.0030 |
| | (−6.12) | (0.30) | (−5.34) | (−3.39) | (−5.15) | (−3.69) | (1.63) | (0.72) | (−0.25) |
| Family TNA (log) | 0.0309 | 0.0073 | 0.0274 | 0.0345 | 0.0294 | 0.0358 | 0.0370 | 0.0411 | 0.0226 |
| | (2.72) | (0.68) | (2.53) | (2.90) | (2.87) | (1.81) | (2.19) | (1.53) | (2.03) |
| Large cap fund | | | | | | −0.3174 | 0.0720 | | |
| | | | | | | (−0.52) | (0.14) | | |
| TNA (log) × Large cap fund | | | | | | 0.0500 | 0.0218 | | |
| | | | | | | (2.02) | (0.83) | | |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | No | Yes | No | No | No | No | Yes | No | Yes |
| Observations | 47,188 | 47,434 | 47,153 | 32,322 | 57,288 | 58,957 | 59,276 | 14,390 | 97,421 |
| $R^2$ | 0.113 | 0.046 | 0.096 | 0.099 | 0.099 | 0.103 | 0.049 | 0.07 | 0.03 |

Finally, in Columns (8) and (9), we use the sample of international funds as an experimental ground to test the hypotheses.

Columns (1) and (2) present the results for the samples of US and non-US domestic funds excluding funds in the bottom fund size quintile. Therefore, we focus the analysis in the subsamples of funds in fund size quintiles two through five. This subsample addresses the concern that there is a systematic upward bias in the reported returns of small funds (e.g., Elton, Gruber, and Blake, 2001). This bias is potentially problematic for the analysis of the relation between size and performance, especially given the US evidence of diseconomies of scale. In Column (1), the coefficient on TNA is negative and statistically significant in the sample of US

funds, which is consistent with the evidence for the sample of all funds. In Column (2), we can see that the positive relation between fund performance and size outside the USA is explained by the funds in the bottom fund size quintile. Indeed, there is a statistically insignificant relation between fund performance and size when we exclude the non-US funds in the bottom size quintile. It is important to note that even in this case, we do not find evidence of diminishing returns to scale outside the USA.

Columns (3)–(5) present the results for the sample of US domestic funds excluding the largest funds. The goal is to evaluate the relation between performance and size for a sample of US funds that is comparable with non-US funds in terms of size. We perform this test using three alternative procedures. In Column (3), we estimate the performance regression using a subsample that excludes the funds in the top fund size quintile (i.e., subsample of funds in size quintiles one through four). In Column (4), we estimate the performance regression using a subsample that excludes funds in the top fund size quintile but with the TNA breakpoint given by non-US funds (i.e., subsample of funds with TNA below the TNA of the non-US funds in the top fund quintile). In Column (5), we restrict the sample of US funds to only contain funds with TNA below the TNA of the largest non-US fund in each quarter. The results in Columns (3)–(5) still show evidence of diseconomies of scale in the US fund industry. Thus, the evidence does not support the hypothesis that diseconomies of scale are driven by the fact that US funds are much larger than their non-US counterparts.

In Columns (6) and (7), we directly test the liquidity constraints hypothesis. We identify funds in our sample that invest more in large stocks (large cap fund) and funds that invest more in small stocks (small-cap funds). We define a large cap fund dummy that takes the value of 1 if a fund is below the median SMB factor loading and takes the value of 0 if a fund is above the median SMB factor loading in each quarter. We define this dummy separately for US and non-US funds. We augment the regressions specification by including the large cap fund dummy and an interaction term (TNA $\times$ Large cap fund) that measures the difference between large cap and small-cap funds in terms of the relation between performance and TNA. The liquidity hypothesis predicts the sign of the interaction term to be positive since in large cap funds, there should be less of an adverse effect of fund size on performance than in small-cap funds. The results in Column (6) for US funds support this hypothesis as the interaction term is positive and statistically significant. The TNA coefficient, which registers the effect of size on performance for small-cap funds, is negative and statistically significant. In Column (7), we can see that there is not similar evidence in the sample of non-US funds. The interaction term is statistically insignificant for non-US funds as they load less in small stocks, and therefore, they are not as much affected by liquidity constraints when they grow. We conclude that

the evidence from our worldwide sample of funds supports the liquidity constraints hypothesis, which is consistent with the US evidence in Chen *et al.* (2004).

It could be argued that the liquidity of US small stocks might not be that low particularly when compared to the liquidity of the average stock from less liquid stock markets. How does the liquidity of US small stocks compare to average stock liquidity across the countries in our sample? We address this question using two commonly used measures of liquidity namely effective spreads and share turnover.

The Securities and Exchange Commission (2001) (SEC) stock exchange liquidity report presents effective trading spreads for small-cap stocks that trade on the NYSE and Nasdaq (defined to have a market capitalization of less than $200 million) using data from June 2000 (the start of our sample period).[10] The study reports that small-cap stocks have effective trading spreads of 0.85% for NYSE stocks and 1.67% for Nasdaq stocks. Jain (2003) presents statistics on effective trading spreads on stock markets around the world estimated at approximately the same time in 2000. Based on these figures, in our sample of countries, 15 countries have lower average effective trading spreads than US small stocks traded on the NYSE and 26 countries have average effective trading spreads lower than US small stocks traded on the Nasdaq. The countries with the higher average liquidity than US small-cap stocks also turn out to be the countries with the largest fund management industries. Even if we take the NYSE alone as our US small stock liquidity benchmark, it turns out that 88% of fund assets under management (based on Table I) outside the USA come from countries where average liquidity is higher than US small stock liquidity, which is explained by the fact that the largest fund industries outside the USA are also the most liquid.

As a cross-check, we also compare the share turnover per country used in our regressions with the share turnover of US small stocks. We again define "a small stock" as having a market capitalization of less than $200 million following the SEC definition above. Using Center for Research in Security Prices share volume data, the average share turnover for US small stocks during our sample period (2000–07) is 94% per year. Comparing this figure with our share turnover figures for other countries in Table IV, we find that 12 countries have average share turnover that is higher than that of US small stocks and that these 12 countries manage the majority of assets under management outside the USA based on the TNA data presented in Table I.

These liquidity comparisons suggest that a substantial number of countries in our sample have higher liquidity than US small stocks. These countries account for

[10] Effective trading spreads are often argued to be more relevant than liquidity measures calculated from quotes as they measure liquidity by calculating how far away transaction prices are from quoted midpoint prices.

the lion's share of assets under management of the non-US mutual fund industry. Although there are some countries with lower liquidity than US small stocks, these countries are the ones with the smallest mutual fund industries.

We next test the hypotheses using as a laboratory international funds. These funds face a diverse trading environment and investor clientele. In particular, liquidity constraints, which seem to be the reason for diminishing returns to scale observed in US domestic funds, are likely to be less severe for international funds that can invest in a broader geographic region (or even anywhere in the world in the case of global funds). One particular acute liquidity constraint that can negatively affect fund performance is the lack of new investment opportunities. When current investment opportunities have been fully exploited, fund managers need to "go down their list" to the next-best stock (Pollet and Wilson, 2008). We argue that this constraint is less severe in international funds. Thus, we expect to find weaker evidence of diseconomies of scale (or even no relation between fund performance and size) in the sample of international funds. Furthermore, international funds can provide new insights about the hypothesis that US funds are too large. US international funds' average TNA is similar to the average US domestic funds' TNA, and this is also true across all fund size quintiles (see Table VI). If the reason behind the diminishing returns to scale in US domestic funds is that they are too big, then we should also find evidence of diminishing returns to scale in US international funds.

Columns (8) and (9) present the results of the international funds performance regressions for US-domiciled funds and non-US -domiciled funds. To examine the determinants of the performance of funds that invest overseas, we use both domestic and foreign benchmarks (Griffin, 2002). Thus, we expand the four-factor Carhart (1997) model to include foreign SMB, HML, and MOM factors. The foreign factors are value-weighted averages of all countries' factors excluding the fund domicile country.[11]

We find that fund size is insignificantly related to performance in the sample of international US funds. In the sample of non-US funds, fund size is also insignificantly related to performance. This is an interesting finding since US international funds size quintiles are also similar to the ones of US domestic funds (see Table VI). Furthermore, there are some countries where international funds are as large as domestic funds or even larger on average (e.g., the Netherlands). We therefore again

[11] Alternatives to an international benchmark model include world factor model (factors are aggregated across all countries), regional factors model (factors are aggregated by geographic regions), or only foreign factors model. We obtain consistent results using these variations to adjust performance for risk.

conclude that the hypothesis that diminishing returns to scale is due to the fact that US domestic funds are too big is not supported by the data. US international fund are as big as their domestic counterparts and they do not face diminishing returns to scale. Our findings suggest that US international funds seem to face less severe liquidity constraints as managers have more investment opportunities available as they can invest anywhere in the world. US domestic funds by contrast seem to face more severe liquidity constraints as they can invest only in domestic stocks. The different relation between fund size and performance for funds with different geographic style supports the idea that liquidity constraints play an important role in explaining the diseconomies of scale in US domestic mutual funds.

Our empirical findings are informative about the relevance of the Berk and Green (2004) model around the world. The central mechanism in their model is the negative feedback loop between past and future fund performance. Past performance affects fund flows as investors chase performance, which affects fund size. This change in fund size then adversely affects subsequent performance as the model assumes decreasing returns to scale. As we find that US funds have decreasing returns to scale, we might expect the Berk and Green (2004) mechanism to be relevant in the US context.

As regards the relevance of the model outside the USA, our results demonstrate that whether the Berk and Green (2004) mechanism fails or not depends on the origins of inflows resulting from past fund performance. If inflows are the result of money being moved out of other funds, then funds will get larger individually but (relative) industry size will be unaffected. In this case, fund performance will not decline following flows and may even improve meaning that the Berk and Green (2004) mechanism will fail to work; favorable past fund performance will not adversely affect subsequent performance. However, if funds grow by bringing new money into the fund sector increasing relative fund industry size, then the impact of this on their performance will depend on the impact of fewer arbitrage opportunities (the industry-level effect) versus the potential cost reductions from being a larger fund (the fund-level effect). In this case, the relative magnitudes of these effects will determine if there are decreasing returns to scale and whether the Berk and Green (2004) mechanism will fail to work or not.

### 3.4 ROBUSTNESS CHECKS

We provide several robustness checks of our main findings. Table VIII reports the results of robustness checks of the domestic funds performance regressions in Table V. Columns (1)–(5) present the results for US funds and Columns (6)–(11) present the results for non-US funds. We first consider several alternative models to

*Table VIII.* Robustness of regression of mutual fund performance

This table reports panel regressions of the performance of open–end actively managed domestic equity funds in 2000–07. The dependent variable is the quarterly Carhart model alpha (percentage per quarter) estimated using monthly fund returns in US dollars. Explanatory variables include fund characteristics, country dummies, and time dummies. Columns (1) and (6) use benchmark-adjusted returns. Columns (2) and (7) use market model alphas. Columns (3) and (8) use gross returns. Columns (4) and (9) use Fama–MacBeth cross-sectional regressions. Columns (5) and (10) include two lags of flows and performance as explanatory variables. Column (11) presents standard errors adjusted for country-level clustering. See Table A3 in Appendix for variables definition. Robust *t*-statistics corrected for fund-level or country-level clustering [in column (11)] are in parentheses.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | US funds | | | | | Non-US funds | | | | | |
| | Benchmark-adjusted | Market model | Gross return | Fama–MacBeth | Lags | Benchmark-adjusted | Market model | Gross returns | Fama–MacBeth | Lags | Cluster by country |
| TNA (log) | −0.0750 | −0.1285 | −0.0734 | −0.0685 | −0.0607 | 0.0171 | 0.0191 | 0.0517 | 0.0805 | 0.0767 | 0.0517 |
| | (−5.11) | (−7.15) | (−5.99) | (−2.42) | (−4.77) | (1.57) | (1.63) | (4.58) | (2.46) | (6.14) | (2.46) |
| Family TNA (log) | 0.0242 | 0.0351 | 0.0226 | 0.0281 | 0.0186 | 0.0156 | 0.0246 | 0.0273 | 0.0286 | 0.0224 | 0.0275 |
| | (2.21) | (2.56) | (2.40) | (1.59) | (2.00) | (1.48) | (2.05) | (2.62) | (1.68) | (2.09) | (1.91) |
| Age (log) | 0.0103 | 0.0735 | 0.0514 | 0.0050 | 0.0365 | −0.0648 | −0.0670 | −0.0819 | −0.1123 | −0.1490 | −0.0825 |
| | (0.25) | (1.63) | (1.64) | (0.10) | (1.13) | (−2.19) | (−2.04) | (−2.62) | (−1.39) | (−4.41) | (−1.93) |
| Expense ratio | −0.3755 | −0.3108 | 0.2484 | −0.0978 | −0.2034 | −0.0891 | −0.1183 | 0.2031 | −0.0390 | −0.0367 | −0.0489 |
| | (−4.27) | (−3.25) | (3.69) | (−0.72) | (−2.60) | (−2.32) | (−3.02) | (5.82) | (−0.52) | (−0.96) | (−0.77) |
| Total load | −0.0059 | −0.0145 | −0.0166 | −0.0152 | −0.0072 | 0.0059 | 0.0151 | 0.0117 | 0.0135 | 0.0109 | 0.0120 |
| | (−0.65) | (−1.31) | (−2.25) | (−1.35) | (−0.98) | (0.63) | (1.54) | (1.30) | (1.12) | (1.11) | (0.96) |
| $Flow_{t-1}$ | 0.0020 | −0.0023 | 0.0021 | 0.0012 | −0.0016 | −0.0001 | −0.0002 | 0.0111 | 0.0063 | 0.0072 | 0.0111 |
| | (1.66) | (−1.91) | (2.04) | (0.52) | (−1.29) | (−0.10) | (−0.17) | (9.76) | (1.79) | (5.62) | (2.17) |
| $Flow_{t-2}$ | | | | | 0.0030 | | | | | −0.0021 | |
| | | | | | (2.73) | | | | | (−1.77) | |
| $Alpha_{t-1}$ | 0.0603 | 0.1248 | 0.0650 | 0.0817 | 0.0599 | 0.0447 | 0.0004 | 0.0105 | 0.0853 | 0.0276 | 0.0105 |
| | (7.87) | (21.19) | (7.64) | (2.39) | (8.12) | (6.73) | (0.07) | (1.58) | (2.43) | (3.71) | (0.46) |
| $Alpha_{t-2}$ | | | | | 0.0568 | | | | | 0.0068 | |
| | | | | | (8.23) | | | | | (0.99) | |
| Number of countries sold | 0.2436 | 0.2741 | 0.1848 | 0.1515 | 0.1086 | 0.0618 | 0.0609 | 0.0079 | 0.0776 | 0.0067 | 0.0080 |
| | (2.73) | (2.04) | (2.06) | (1.93) | (1.41) | (3.40) | (3.30) | (0.38) | (1.02) | (0.32) | (0.29) |
| Management team | −0.0346 | −0.0896 | −0.1631 | −0.1423 | −0.1181 | −0.1239 | −0.1304 | −0.1048 | −0.1246 | −0.1368 | −0.1027 |
| | (−0.75) | (−1.55) | (−4.16) | (−3.16) | (−3.21) | (−2.48) | (−2.51) | (−2.41) | (−1.52) | (−2.88) | (−1.20) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 57,747 | 58,957 | 58,957 | 58,957 | 53,783 | 58,337 | 59,276 | 59,276 | 59,276 | 47,937 | 59,276 |
| $R^2$ | 0.092 | 0.137 | 0.103 | 0.055 | 0.066 | 0.039 | 0.076 | 0.051 | 0.307 | 0.053 | 0.048 |

estimate abnormal performance in Columns (1) and (2) and Columns (6) and (7). Here, we use benchmark-adjusted returns, and alphas estimated using the market model.[12] The results are consistent with the results using the Carhart four-factor model except for the smart money effect in non-US funds that is no longer statistically significant. There is evidence of diseconomies of scale in US funds, while the performance of non-US funds does not deteriorate with the size of the fund. Family size, past performance, and number of countries sold are positively related to performance. Management by teams negatively affects fund performance.

Columns (3) and (8) report the results of tests using before-fee performance (gross returns) rather than after-fee performance. Monthly gross fund returns are calculated by adding back expenses to net fund returns; we take the annual expense ratio and divide it by 12 and add it to monthly returns during the year. The results are consistent with our primary findings except for one notable difference. The relation between fees and before-fee performance is now positive and statistically significant, while the relation between fees and after-fee performance is negative. This suggests that higher priced management, as measured by the expense ratio, can generate higher gross returns, but returns are not high enough to cover the fees. Our finding indicates that funds with higher fees are expected to have superior performance. Thus, we do not confirm the evidence in Gil-Bazo and Ruiz-Verdu (2009) for US funds using a worldwide sample of domestic funds.

Columns (4) and (9) report the results using the Fama–MacBeth estimation procedure to further address concerns on cross-sectional dependence. Columns (5) and (10) present the estimates including two lags of quarterly fund flows and performance as explanatory variables to address concerns that performance and flows persistence could bias the coefficients. Finally, Column (11) presents the estimates with *t*-statistics clustered by country to address concerns that residuals are correlated within a country. Overall, the results confirm an asymmetric relation between fund size and performance between the USA and elsewhere in the world. There is also consistent evidence concerning return persistence and team-managed funds, while there is no evidence of a statistically significant negative effect of fees on performance. Moreover, there is evidence of a smart money effect in non-US funds, while this is not the case in US funds. In particular, differences in performance and flows persistence between the US and elsewhere in the world do not explain the differences in the smart money effect.

[12] Results (untabulated) using market-adjusted returns are similar to those using market model alphas.

## 4. Conclusion

This study investigates the determinants of mutual fund performance around the world using a large sample of open–end actively managed equity funds in 27 countries over 1997–2007 period. We find that equity mutual funds around the world underperform the market. There are common determinants of the performance of mutual funds in the USA and elsewhere in the world, but there are also some important differences.

The US evidence of diminishing returns to scale is not an universal truth. We find that fund size is negatively related to fund performance only in the sample of US funds; for non-US funds, we find that fund size is associated with better performance. The asymmetry in the fund performance–size relation between US and non-US funds is not explained by the fact that US funds are too big vis-à-vis non-US funds. The evidence supports the hypothesis that liquidity constraints explain why US domestic funds are affected by diminishing returns to scale. Indeed, US funds that invest in small and illiquid stocks are the most negatively affected by scale, while this is not the case with non-US funds. Moreover, the performance of international funds does not deteriorate with scale, although the scale of operations of these funds is similar to the one of domestic funds. We argue that international funds are less affected by a lack of new investment opportunities as the fund grows as they are not restricted to invest in their local market. We conclude that diminishing returns to scale in the US mutual fund industry are related to liquidity constraints faced by funds that, by virtue of their style, have to invest in small and domestic stocks.

Other fund characteristics are also important in explaining performance. The effects of the organization of the mutual fund industry on performance are pervasive around the world. Mutual funds managed by large fund families display superior performance, and therefore, scale is not necessarily bad for performance. Solo-managed mutual funds tend to perform better, which indicates that the possible benefits associated with team-managed funds are exceeded by the costs, in particular hierarchy costs associated with processing soft information. Additionally, we find evidence of short-run persistence in fund performance but only in the sample of US funds. Investors outside the USA seem to have some ability to select funds as money flows to funds with good future performance, but this does not hold true in the sample of US funds.

Country characteristics are able to explain mutual fund performance beyond fund characteristics. There is a positive relation between mutual fund performance and a country's level of financial development, especially stock market liquidity. Furthermore, domestic funds located in countries with stronger legal institutions, better investor protection, and more rigorous law enforcement tend to perform better. We conclude that the home trading environment and the legal environment are important in explaining mutual fund performance across countries.

## Appendix

*Table A1.* Top three domestic and international equity funds by country

This table lists the top three open–end actively managed domestic and international equity funds by country. Funds are ranked by TNA (sum of all share classes in US dollars millions) as of December 2007.

| | Domestic funds | | International funds | |
|---|---|---|---|---|
| Country | Fund name | TNA ($ million) | Fund name | TNA ($ million) |
| Australia | Perpetual's W Industrial | 4,525 | Platinum Trust—Platinum International | 8,035 |
| | Vanguard idx Fd-Vanguard Australian Shares | 3,325 | AXA—Wholesale Global Equity—Value | 4,358 |
| | FirstChoice WI—CFS Wholesale Imputation | 2,947 | Vanguard idx Fd-Vanguard International Shares | 4,291 |
| Austria | Pioneer Funds Austria—Austria Stock | 623 | Raiffeisen-Eurasien-Aktien Fonds | 1,997 |
| | ESPA STOCK VIENNA EUR | 249 | Raiffeisen-Osteuropa-Aktien Fonds | 1,923 |
| | 3 Banken Oesterreich-Fonds | 199 | Raiffeisen-Europa-Aktien | 873 |
| Belgium | Degroof Eq Belgium Active Benelux | 517 | Privileged Portfolio Equity Acc | 2,242 |
| | Fortis B Equity Belgium | 504 | Petercam Equities Europe Dividend Cap | 1,694 |
| | Dexia Equities B Belgium Cap | 391 | Degroof Equities EMU Behavioral Benelux | 1,389 |
| Canada | RBC Canadian Dividend | 9,723 | Mac Cundill Value Series | 7,576 |
| | CIBC Monthly Income | 7,130 | Fidelity Global Series | 4,503 |
| | CI Canadian Investment | 6,594 | Templeton Growth Ltd | 4,452 |
| Denmark | Danske Invest Danmark | 699 | Sparinvest Value Aktier | 4,697 |
| | Nordea Invest Danmark | 556 | Carnegie WorldWide/Globale Aktier | 1,503 |
| | BankInvest Danske Aktier | 498 | Jyske Invest Favorit Aktier | 1,369 |
| Finland | OP-Delta | 1,119 | Nordea Pro Stable Return Kasvu | 835 |
| | Danske Suomi Osake Tuotto | 363 | Nordea Maailma Kasvu | 755 |
| | Aktia Capital | 336 | OP-Eurooppa Osake | 684 |
| France | Atout France Cap | 6,582 | BNP Paribas Actions Euroland Dis | 5,798 |
| | Tricolore Rendement Cap | 5,987 | Atout Euroland | 5,032 |
| | Ecureuil Investissements | 4,737 | Magellan Cap/Dis | 3,885 |
| Germany | DekaFonds | 7,066 | DWS Vermoegensbildungsfonds | 8,189 |
| | DWS Investa | 5,211 | UniGlobal | 6,495 |
| | UniFonds | 4,594 | AriDeka | 5,797 |
| India | Reliance Growth Fund Growth Plan | 1,618 | | |
| | Reliance Diversified Power Sector Fund-Growth | 1,511 | | |
| | HDFC Equity Fund-Growth | 1,393 | | |

*Continued*

*Table AI.* Continued

| | Domestic funds | | International funds | |
|---|---|---|---|---|
| Country | Fund name | TNA ($ million) | Fund name | TNA ($ million) |
| Indonesia | Schroder Dana Prestasi Plus | 1,009 | | |
| | Fortis Ekuitas | 627 | | |
| | Manulife Dana Saham | 319 | | |
| Ireland | | | First State China Growth | 3,237 |
| | | | Coutts Equator UK Equity Index Prgm | 3,110 |
| | | | First State Asian Equity Plus I | 1,402 |
| Italy | Sanpaolo Azioni Italia | 1,365 | Ducato Geo Europa | 2,659 |
| | Arca Azioni Italia | 1,178 | Anima Fondo Trading | 1,704 |
| | Allianz Azioni Italia | 980 | Sanpaolo Europe | 1,464 |
| Japan | Fidelity Japan Growth Equity Fund | 3511 | Nomura Global High Income Stock Fund | 2,550 |
| | Sawakami Fund | 2,231 | Nikko CS Global High Yield Stock Fund M Div | 1,968 |
| | Nomura Japan Equity Strategy | 2,211 | HSBC India Open | 1,722 |
| Malaysia | PRUlink Equity | 755 | | |
| | Public Ittikal | 459 | | |
| | Public Regular Savings | 315 | | |
| Netherlands | Centraal Beheer Achmea Nederland fonds | 1,502 | Fortis OBAM NV | 7,791 |
| | ING Dutch | 1,134 | AEGON Equity Fund | 7,225 |
| | ABN AMRO Netherlands NV | 1,068 | AEGON Equity Europe Fund | 5,254 |
| Norway | Skagen Vekst | 2,132 | Skagen Global | 5,257 |
| | Pareto Aksje Norge | 1,064 | Skagen Kon-Tiki | 3,661 |
| | Odin Norge | 1,014 | Odin Norden | 1,941 |
| Poland | Arka BZ WBK Akcji FIO | 2,209 | | |
| | Pioneer Akcji Polskich FIO | 1,935 | | |
| | Legg Mason Akcji FIO | 1,020 | | |
| Portugal | Santander Accoes Portugal | 368 | Millennium Eurocarteira | 465 |
| | Millennium Accoes Portugal | 237 | BPI Reestructuracoes | 371 |
| | Caixagest Accoes Portugal | 215 | BPI Europa Valor | 319 |
| Singapore | Schroder Singapore Trust Class | 380 | PRU Dragon Peacock | 1,001 |
| | DWS Singapore Equity | 232 | PruLink China-India | 860 |
| | ML Golden Singapore Growth | 168 | PruLink Asian Equity | 811 |
| South Korea | Korea Samsung Group Install Savings Equity | 3,513 | | |
| | Mirae Asset 300mil Target Good Comp Equity | 2,680 | | |
| | Mirae Asset Solomon Equity | 2,651 | | |

*Continued*

*Table AI.* Continued

| | Domestic funds | | International funds | |
|---|---|---|---|---|
| Country | Fund name | TNA ($ million) | Fund name | TNA ($ million) |
| Spain | Banif Acciones Espanolas, FI | 589 | Bestinfond, FI | 1,966 |
| | BBVA Bolsa, FI | 540 | Santander Dividendo Europa, FI | 1,962 |
| | Sabadell BS Espana Dividendo, FI | 507 | Bestinver Internacional, FI | 1,495 |
| Sweden | Swedbank Robur Kapitalinvest | 4,927 | East Capital Russian | 2,355 |
| | Swedbank Robur Aktiefond Pension | 3,052 | SEB Aktiesparfond | 2,204 |
| | Nordea Allemansfond Alfa | 2,740 | East Capital Eastern European | 1,886 |
| Switzerland | UBS (CH) Equity Fund—Switzerland | 2,578 | UBS (CH) Equity Fund - European Opportunity | 1,093 |
| | Credit Suisse Equity Swiss Blue Chips | 1,822 | UBS (CH) Equity Fund - Emerging Asia | 927 |
| | UBS (CH) Inst Fd—Eq Switzerland | 1,554 | Swisscanto (CH) Eq Fd Continental Europe | 612 |
| Taiwan | Capital Marathon Fund | 595 | JF (Taiwan) China Concept Fund | 635 |
| | Capital High Technology Fund | 429 | PCA India Fund | 509 |
| | Cathay Greater China Fund | 416 | JF (Taiwan) Asia Fund | 445 |
| Thailand | SCB Dividend Stock 70/30 Long Term Equity | 280 | | |
| | K Equity LTF | 156 | | |
| | Aberdeen Growth | 134 | | |
| UK | Invesco Perpetual High Income Inc | 18,994 | Fidelity European Acc | 9,519 |
| | Invesco Perpetual Income Inc. | 13,417 | M and G Global Basics | 5,992 |
| | Jupiter Income | 7,957 | Standard Life Inv International Trust Acc | 4,414 |
| USA | American Growth Fund of America | 193,453 | American EuroPacific Growth Fund | 124,010 |
| | American Investment Company of America | 89,250 | American Capital World Growth and Income Fund | 113,908 |
| | American Washington Mutual Investors Fund | 82,424 | American New Perspective Fund | 61,218 |

*Table A2.* Summary statistics of performance benchmarks

This table reports mean and standard deviation of monthly factor returns (percentage per month) in US dollars of the Carhart model in 1997–2007. RM is the excess return on the domestic market, SMB is the difference in return between the small and big portfolios, HML is the difference in return between the high and low book-to-market portfolios, and MOM is the difference in return between last year's winner and loser portfolios.

| | RM | | SMB | | HML | | MOM | |
|---|---|---|---|---|---|---|---|---|
| Country | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation | Mean | Standard deviation |
| Australia | 0.98 | 5.16 | 0.36 | 4.22 | 0.72 | 3.65 | 1.23 | 5.29 |
| Austria | 0.97 | 4.72 | −0.44 | 3.47 | 1.49 | 4.07 | 1.43 | 4.42 |
| Belgium | 0.81 | 4.82 | −0.26 | 2.64 | 0.70 | 2.75 | 0.50 | 5.09 |
| Canada | 1.06 | 5.42 | 0.53 | 4.05 | 0.49 | 4.84 | 2.16 | 5.95 |
| Denmark | 1.05 | 4.94 | −0.27 | 3.68 | 0.64 | 4.54 | 0.51 | 4.81 |
| Finland | 1.63 | 8.95 | −0.42 | 4.27 | −0.31 | 7.18 | 0.98 | 6.56 |
| France | 0.94 | 5.18 | −0.07 | 3.61 | 0.75 | 4.63 | 1.20 | 6.12 |
| Germany | 0.77 | 5.71 | −0.39 | 3.89 | 0.76 | 4.59 | 1.45 | 7.11 |
| India | 1.85 | 8.55 | 0.57 | 5.16 | 0.80 | 7.84 | 1.48 | 7.17 |
| Indonesia | 0.76 | 14.52 | −0.37 | 7.37 | −2.13 | 8.98 | −2.44 | 13.58 |
| Ireland | 0.78 | 5.25 | −0.10 | 5.93 | 0.56 | 7.69 | 0.56 | 8.44 |
| Italy | 0.97 | 5.88 | −0.15 | 3.52 | 0.70 | 3.40 | 0.75 | 4.91 |
| Japan | 0.03 | 5.69 | −0.05 | 3.25 | 0.44 | 3.19 | 0.29 | 5.49 |
| Malaysia | 0.37 | 10.20 | −0.58 | 5.03 | 1.05 | 5.53 | −0.35 | 8.51 |
| Netherlands | 0.67 | 5.06 | 0.15 | 3.62 | 0.48 | 4.12 | 1.02 | 6.91 |
| Norway | 1.16 | 6.50 | −0.19 | 3.99 | 0.24 | 4.81 | 1.43 | 6.47 |
| Poland | 1.18 | 9.30 | −0.37 | 7.19 | 1.10 | 6.95 | 0.39 | 5.61 |
| Portugal | 0.93 | 5.56 | −0.53 | 5.56 | 1.30 | 8.23 | 1.06 | 6.85 |
| Singapore | 0.59 | 7.30 | −0.22 | 5.32 | 1.39 | 5.44 | −0.44 | 7.58 |
| South Korea | 1.67 | 13.05 | −0.32 | 4.89 | 1.06 | 5.75 | −0.10 | 8.57 |
| Spain | 1.03 | 5.47 | 0.25 | 3.51 | 0.44 | 3.70 | 0.30 | 5.20 |
| Sweden | 0.92 | 6.97 | −0.29 | 4.19 | 0.16 | 5.60 | 1.11 | 7.92 |
| Switzerland | 0.70 | 4.53 | 0.14 | 3.32 | 0.19 | 2.44 | 0.28 | 5.57 |
| Taiwan | 0.29 | 8.64 | 0.13 | 4.16 | 0.24 | 8.53 | −0.04 | 2.71 |
| Thailand | 0.56 | 12.24 | 0.87 | 8.76 | 2.43 | 12.18 | −0.54 | 6.38 |
| UK | 0.55 | 3.91 | 0.16 | 5.09 | 1.07 | 7.99 | 1.10 | 4.94 |
| USA | 0.49 | 4.43 | 0.22 | 4.18 | 0.40 | 3.78 | 0.86 | 5.56 |
| Total | 0.63 | 4.15 | 0.11 | 2.63 | 0.54 | 2.72 | 0.81 | 4.30 |

*Table A3.* Variables definitions

| Variable | Definition |
|---|---|
| Panel A: fund characteristics | |
| Alpha | Alpha (percentage per quarter) estimated with 3 years of past monthly fund returns in US dollars with several factor models (Lipper). |
| TNA | TNA in US dollars millions of the fund primary share class (Lipper). |
| Family TNA | TNA in US dollars millions of the fund family (parent management company) equity funds to which the fund belongs (Lipper). |
| Fund age | Number of years since the fund launch date (Lipper). |
| Expense ratio | Total annual expenses as a fraction of TNA (Lipper). |
| Total load | Sum of front-end and back-end loads (Lipper). |
| Flow | Percentage growth in TNA (in local currency) in a quarter, net of internal growth (assuming reinvestment of dividends and distributions). |
| Number of countries sold | Number of countries where the fund is sold (Lipper). |
| Management team | Dummy variable that equals one when the fund is managed by more than one person or by a team, and zero otherwise (Lipper). |
| Large cap fund | Dummy that equals one if a fund TNA is below the median SMB factor loading, and zero otherwise (Lipper). |
| Panel B: country characteristics | |
| GDP per capita | GDP per capita in US dollars (WDI). |
| Internet | Ratio of number of internet users to population (WDI). |
| Share turnover | Ratio of total value of stocks traded to stock market capitalization (WDI). |
| Trading costs | Trading costs in basis points (Global Universe Data-ElkinsMcSherry). |
| Common law | Dummy variable that equals one when a country's legal origin is common law, and zero otherwise (La Porta *et al.*, 1997). |
| Antidirector rights | Index of minority shareholder protection (Djankov *et al.*, 2008). |
| Securities regulation | Sum of the disclosure requirements, liability standards, and public enforcement indices (La Porta *et al.*, 2006). |
| Mutual fund industry age | Mutual fund industry age in years (Khorana *et al.*, 2005). |
| Mutual fund industry Herfindahl | Sum of squared market shares of parent management companies for equity funds in each country (Lipper). |
| Mutual fund equity/market capitalization | Assets under management of equity mutual funds divided by market capitalization (EFAMA and WDI). |

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