

What determines fund performance persistence? International evidence

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Abstract

We study performance persistence across a global sample of equity mutual funds from 27 countries. In contrast to the existing U.S.-based evidence, we find that net performance persistence is present in the majority of fund industries, suggesting that fund manager skill is commonplace rather than a rarity. Consistent with the intuition that more competition in the mutual fund industry makes remaining a winner fund less likely but keeping a loser fund at the bottom of the performance ranks more probable, we show that competitiveness explains the cross-sectional variation in performance persistence.

KEYWORDS

fund industry competition, manager skill, mutual fund persistence

JEL CLASSIFICATIONS

G15, G23

1 | INTRODUCTION

Testing for fund manager persistence is important as it not only tells us if past performance information is helpful in predicting future fund performance, which is of value to investors,¹ but it also tells us whether fund managers have skill. Using U.S. fund industry data, several studies test for fund manager performance persistence. For example, Carhart (1997), Fama and French (2010), and Berk and van Binsbergen (2015) find evidence that there is limited performance persistence in actively managed equity mutual funds. In addition, they find that what little persistence is present is concentrated among poor-performing funds.

As the U.S. fund industry is the oldest and by far the largest fund industry (Ferreira, Keswani, Miguel, & Ramos, 2013), it is not clear if the U.S.-based persistence evidence is only applicable to large and developed fund industries or

¹ Knowledge of whether fund performance is persistent or not is only of value to investors if there are funds with both positive and negative performance, if there is a substantial difference in terms of performance across funds and if there are top funds that create value. Our findings show that there are funds with both positive and negative performance. Furthermore they show that there is not only a statistically significant difference in the performance of top and bottom funds but also that top funds create value in most countries.

can be applied universally.² To address this, we test for persistence using a global sample of mutual fund industries from 27 countries. This sample contains many fund industries with characteristics that are very different from those of the U.S. fund industry and therefore allow us to determine if the U.S.-based evidence on performance persistence is valid for other countries. The additional advantage of using a large cross-section of countries to measure persistence is that it permits us to analyze which fund industry characteristics influence industry-level persistence. While there are many studies that test for performance persistence, there are few studies that try to explain what determines persistence.

We employ two methods to measure fund persistence in net performance. The first uses a regression-based approach and involves regressing fund performance in a given year on lagged performance (together with other controls that determine current fund performance) and using the coefficient on lagged performance to measure persistence. The second method, which we label the performance gap approach, involves sorting funds in a given year on lagged performance and calculating whether there is a statistically significant performance gap in this period between previous period winners and losers.³ When we run these tests, we find that statistically significant persistence is present in the majority of countries in our sample. We then investigate if persistence is the result of persistence in the performance of the best managers or the worst managers. To determine this, we change our regression approach by allowing the coefficient on lagged performance to vary if a fund is a winner or a loser in the prior year. We do likewise for our performance gap measure, conditioning it on the level of performance in the prior year. Our results show that persistence around the world is not just due to persistence among poor-performing fund managers, as suggested by the U.S.-based evidence, but is due to the persistence of both the worst and best fund managers.

What factors might explain the differences in the level of persistence observed across fund industries? Two papers shed light on this. Wahal and Wang (2011) show that fund manager performance diminishes as the level of entry of new mutual funds into a sector increases.⁴ A similar point is also made by Hoberg, Kumar, and Prabhala (2018). They show that fund managers who face less competition within their style category are able to generate a more persistent alpha. Competition is therefore a potential determinant of performance persistence, as it affects how the current worst and best performing funds will do in the future.

We would expect persistence among poor-performing funds to increase in the presence of greater competition, as these funds find it more difficult to escape from the bottom tier of performance. In contrast, greater competitive pressures make remaining a top performer more difficult.⁵ Khorana and Servaes (2007) and Khorana, Servaes, and Tufano (2009) highlight the role of industry structure and development as determinants of the level of competition in the fund industry. They argue that older fund industries have had greater exposure to competitive forces and are therefore more competitive. In addition, Khorana and Servaes (2007) show that particularly in less concentrated industries, fund families have less market power and are therefore more competitive. Hence, by using proxies for fund industry development and concentration, we measure fund industry competitiveness. Our results show that persistence among losers is greater when fund industries are more competitive, while persistence among winners decreases with competition. We also show that the documented differences in persistence have an important economic effect for both poor-performing funds and top-performing funds. Thus, what emerges is that fund industry competition is an important determinant of performance persistence.⁶

² The literature has shown that there are economically significant differences in the conduct of mutual funds around the world and that the features of the U.S. fund industry are not necessarily the same as those of other countries. Differences have been found in size and fees (Khorana, Servaes, & Tufano, 2005; Khorana et al., 2009), in the flow-performance sensitivity (Ferreira, Keswani, Miguel, & Ramos, 2012), and in performance (Ferreira et al., 2013).

³ In robustness tests, to measure performance persistence, we also use a third method, namely, the Spearman rank correlation between fund performance measures in adjacent years.

⁴ According to the industrial organization literature (Cabral, 2017), the level of entry into a sector is a proxy for its competitiveness, and, therefore, Wahal and Wang's (2011) paper suggests that competitiveness affects persistence.

⁵ The fact that in the United States, which has the oldest and largest mutual fund industry in the world, performance persistence is largely due to worst performers seems to corroborate our hypothesis (see, e.g., Carhart, 1997).

⁶ Another plausible hypothesis regarding the link between competition and fund performance is that in less competitive markets, we might expect managers to be able to generate positive alphas but also have the power to extract rents from shareholders by charging higher fees. While we do find evidence of a negative correlation between average fees and measures of mutual fund industry competitiveness, this effect is not strong enough to shift positive average

Finally, we document the robustness of our results in various ways. First, as it might be argued that our results are driven by the U.S. dominance of our sample, we show that when we exclude the United States, our results are preserved. Second, when we exclude the countries with the fewest observations, this also leaves our results unchanged. Third, if we use an alternative method—namely, rank correlation—for calculating persistence, our findings remain. Fourth, even when we correct for differences in the ability of our factors to explain returns across countries, our inference remains unchanged. All these findings demonstrate that our results are robust.

Performance persistence has been studied over different horizons, but the majority of studies focus on long-term persistence, as this is more economically relevant for investors who are selecting mutual funds for saving purposes. The evidence on the predictability of fund performance over the long term from past performance focuses on the U.S. fund industry.⁷ Brown and Goetzmann (1995) find that abnormal performance persists but that this is mainly due to funds that underperform. Malkiel (1995) claims that survivorship bias concerns raise doubts about the study by Brown and Goetzmann (1995); using a survivorship bias-free U.S. data set, he finds evidence of performance persistence. Hendricks, Patel, and Zeckhauser (1993) confirm the findings of Malkiel (1995) that there is persistence in U.S. funds and argue that there is a hot-hands phenomenon among fund managers. Carhart (1997) overturns the findings of Hendricks et al. (1993) and Malkiel (1995) by showing that there is momentum in fund returns and that persistence among U.S. winner funds is due to their exposure to the momentum (MOM) factor. After including momentum in his performance model, Carhart (1997) finds that persistence remains only among the worst performing funds. Wermers (1997) also concurs with the findings of Carhart (1997) by arguing that persistence in performance is due to fund managers being exposed to the Jegadeesh and Titman (1993) momentum effect through their holdings. The findings of Carhart (1997) are confirmed by Fama and French (2010) and Berk and van Binsbergen (2015).⁸

Outside the United States, the evidence on long-term performance persistence is stronger. In U.K. mutual funds, Blake and Timmermann (1998) and Otten and Bams (2002) find evidence of performance persistence that is due to the performance of winner funds. Keswani and Stolin (2006) also find evidence of persistence in U.K. mutual fund sectors and show that measures of sector competitiveness can explain this persistence. Overall, the literature on fund persistence suggests the following: (1) there is little persistence in the United States, (2) the U.S. persistence originates from poor-performing funds, and (3) outside the United States, there is evidence of persistence.

Our paper is the first to study performance persistence in an international context and contributes to the mutual fund literature in a number of ways. First, we show that persistence is present in the majority of fund industries, suggesting that investors can use past performance information usefully in most fund industries to make their investment decisions. This is important in the current environment where households increasingly use mutual funds to meet long-term financial objectives, such as saving for their retirement.⁹ Second, we show that persistence is not solely due to poor-performing funds but is due to both top- and bottom-performing funds: this finding is relevant, as existing work suggests that persistence among loser funds is the dominant form of persistence. Finally, we show that the level of competitiveness of fund industries explains the levels of persistence we observe in fund manager performance.

gross return realizations to negative territory once we measure net returns. The absence of evidence suggests that this mechanism is likely to be less important for determining the levels of performance and also persistence we observe in practice.

⁷ Performance persistence has also been studied by using other types of funds, including closed-end funds (Bers & Madura, 2000), international funds (Tsai & Wu, 2015), and socially responsible investment funds (Abdelsalam, Duygun, Matallín-Sáez, & Tortosa-Ausina, 2014).

⁸ While all the existing studies reviewed look at longer-term persistence, Bollen and Busse (2005) have also looked at short-term persistence and find evidence of persistence in short-term mutual fund manager performance.

⁹ In the United States, 91% of mutual fund-owning households indicate that saving for retirement is one of their financial goals, and 74% said it is their primary financial goal (ICI, 2015). In the European Union, mutual funds represent 20% of households' retirement savings (EFAMA, 2015). The use of mutual funds as a savings vehicle for retirement is, however, expected to increase due to the declining generosity of state pension plans (Plantier, 2014).

2 | SAMPLE AND DATA DESCRIPTION

Our data on equity mutual funds from 27 countries in the period 2001–2010 come from the Lipper survivorship bias-free database. The Lipper database provides data on the returns of each share class after expenses and loads and treats each fund class as if it were a separate fund. To prevent the double counting of funds, to determine the returns of the fund, we use the share class that Lipper identifies as the primary share class.¹⁰ This approach is also adopted in papers that use global mutual fund data, such as those by Cremers, Ferreira, Matos, and Starks (2016), Ferreira, Massa, and Matos (2018), and Ferreira et al. (2013). Indeed, even papers that examine solely U.S. mutual funds such as Elton, Gruber, and Green (2007) sometimes also use this single share-class approach. The total net assets (TNA) of each fund are the sum of the TNA across all share classes, and fees are calculated in a size-weighted way across share classes. Our sample period includes the period between 2003 and 2007 in which the stock market run-up was observed across countries as well as the 2007–2009 global financial crisis period; therefore, as it includes both bull and bear market episodes, it is a representative sample period.

The comprehensive nature of the Lipper database is demonstrated by comparing it with the Investment Company Institute (ICI, 2011) aggregate statistics. At the end of 2010, Lipper reported 26,861 equity funds, which represent 97% of the total of 27,754 funds included in the ICI statistics. On the same date, Lipper and ICI reported the TNA of equity funds as \$9 trillion and \$10.2 trillion, respectively. This means that our sample of equity funds covers 88% of the TNA of worldwide equity funds.

We impose a few filters to construct the final sample. First, the sample is restricted to actively managed domestic equity funds and excludes closed-end and funds-of-funds. Our use of a sample of domestic open-end actively managed equity funds facilitates the comparison of our study with prior work on performance persistence. Second, to ensure that the investors in each of our fund countries are actually from the countries concerned, we exclude funds registered for sale in offshore centers such as Luxembourg, Dublin, and the Cayman Islands.¹¹ If the majority of investors in each of our countries are not from the country concerned, we might need to use global factors rather than local factors to risk-adjust fund performance. Third, in order to ensure that we have sufficient time series observations to calculate the risk-adjusted performance measures, we impose a minimum of 36 continuous monthly observations for each fund. Finally, to make our measures of persistence more meaningful, we also require a minimum of 10 funds at the beginning of each year in each country. This leads to a sample of 8,796 unique equity funds.

Table 1, Panel A, presents the number of unique funds in our sample and the TNA in each country as of December 2010. The United States accounts for 36% of the number of funds in our sample and 75% of the TNA. Australia and Canada represent 16% and 7%, respectively, of the number of funds but only 3% and 6%, respectively, of the TNA, while Japan and the United Kingdom represent 6% of the TNA and the number of funds. There is considerable variation in the number of funds in the mutual fund industries around the world, and the level of development and the general characteristics of the U.S. fund industry are very different from those of the fund industries of other nations. This suggests that the existing findings on the persistence of the U.S. fund industry need not apply to other geographies because the U.S. fund industry is very different from those in other countries.

In order to study fund persistence, we need to estimate fund performance. Fund performance is measured by using risk-adjusted returns in local currency. We use the same approach as Ferreira et al. (2013) and Cremers et al. (2016) to calculate risk factors and alphas. The monthly fund returns represent the returns net of total expenses (annual fees and other expenses) and are based on the assumption that dividends are immediately reinvested. The risk-adjusted

¹⁰ This database has been used by Banegas, Gillen, Timmermann, and Wermers (2013), Ferreira et al. (2013), and Cremers et al. (2016).

¹¹ Although we accept that there may be international investors who might choose to obtain exposure to a given country by buying the mutual funds intended for sale to the citizens of that foreign country, we would expect those investors to more readily gain exposure to that country by buying mutual funds intended for those international investors. Illustrating this with an example, American investors wishing to obtain exposure to India are more likely to do so via mutual funds marketed to American investors that invest in India rather than through Indian mutual funds that invest in Indian securities but that target Indian investors.

TABLE 1 Mutual fund industry sample by country

Country	Number of funds	TNA (\$ millions)	Raw return (% year)	Four-factor alpha (% year)	(% with significant:	
					Positive four-factor alpha	Negative four-factor alpha
Australia	1,383	105,768	2.82	-4.15	30.00	65.00
Austria	14	1,375	16.63	0.01	19.44	33.33
Belgium	32	1,406	10.60	1.91	44.44	27.78
Brazil	321	50,883	15.07	-4.13	16.67	58.33
Canada	643	208,476	8.91	-2.63	16.67	66.67
Denmark	24	3,115	15.72	0.52	27.78	30.56
Finland	30	5,519	15.85	1.93	61.11	27.78
France	350	41,494	2.27	-2.03	30.00	52.50
Germany	73	34,568	8.43	-1.03	22.22	52.78
India	205	33,667	33.04	0.53	43.75	28.13
Indonesia	31	3,963	37.98	1.25	30.00	30.00
Italy	69	4,510	2.42	-0.68	36.11	50.00
Japan	526	34,640	-10.24	0.78	37.50	37.50
Malaysia	164	9,405	12.92	-1.75	21.88	43.75
Netherlands	28	5,968	10.34	-1.51	9.38	34.38
Norway	60	15,708	21.01	1.40	41.67	47.22
Poland	35	6,192	15.11	-0.04	28.13	25.00
Portugal	19	506	6.92	-0.11	33.33	38.89
Singapore	17	2,215	19.43	-0.81	28.13	18.75
South Korea	468	15,888	22.01	8.32	75.00	21.88
Spain	96	2,435	10.02	-1.28	18.75	59.38
Sweden	121	62,464	12.75	-1.03	30.56	52.78

(Continues)

TABLE 1 (Continued)

Panel A: Mutual fund performance across all funds												
Country	Number of funds	TNA (\$ millions)	Raw return (% year)	Four-factor alpha (% year)		Positive four-factor alpha		Negative four-factor alpha		Number of observations		
				Coef.	p-Value	Coef.	p-Value	Coef.	p-Value		Coef.	p-Value
Switzerland	79	20,203	7.28	1.53	(.00)	38.89	(.00)	44.44	(.00)	4,302		
Taiwan	173	10,424	16.62	-1.07	(.06)	33.33	(.01)	54.17	(.00)	79		
Thailand	145	5,245	22.98	0.37	(.00)	43.75	(.00)	40.63	(.00)	160		
UK	509	206,281	9.47	2.23	(.00)	52.78	(.00)	25.00	(.00)	750		
US	3,181	2,608,816	5.88	-0.90	(.07)	37.50	(.00)	52.50	(.00)	2,915		
All countries	8,796	3,501,131	7.83	-0.73	(.02)	34.43	(.00)	40.68	(.00)	140		
Panel B: Mutual fund performance by quintile (% four-factor alpha per year)												
Country	1		2		3		4		5		5-1	
	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value		Difference
Australia	-12.30***	(.00)	-9.50***	(.00)	-4.58***	(.00)	-0.39***	(.00)	7.47***	(.00)	19.77***	(.00)
Austria	-8.10***	(.00)	-0.29	(.89)	2.08	(.64)	4.99*	(.06)	7.85***	(.01)	15.95***	(.00)
Belgium	-4.79***	(.00)	-1.00	(.28)	2.07	(.19)	3.86***	(.00)	9.87***	(.00)	14.66***	(.00)
Brazil	-15.95***	(.00)	-5.96***	(.00)	-2.39***	(.00)	1.15***	(.00)	12.17***	(.00)	28.11***	(.00)
Canada	-13.12***	(.00)	-5.96***	(.00)	-2.99***	(.00)	-0.25*	(.07)	7.39***	(.00)	20.51***	(.00)
Denmark	-5.35***	(.00)	-2.09**	(.02)	0.17	(.85)	2.34**	(.02)	9.56***	(.00)	14.9***	(.00)
Finland	-2.04	(.32)	4.19**	(.02)	6.91**	(.00)	10.15***	(.00)	17.49***	(.00)	19.53***	(.00)
France	-12.55***	(.00)	-6.44***	(.00)	-3.42***	(.00)	0.14	(.34)	8.55***	(.00)	21.1***	(.00)
Germany	-9.01***	(.00)	-5.23***	(.00)	-3.37***	(.00)	-0.72*	(.08)	7.90***	(.00)	16.92***	(.00)
India	-11.9***	(.00)	-6.93***	(.00)	-1.30***	(.00)	4.01***	(.00)	14.87***	(.00)	26.77***	(.00)
Indonesia	-10.84***	(.00)	0.48*	(.09)	8.49***	(.00)	9.67***	(.00)	14.52***	(.00)	25.37***	(.00)
Italy	-3.65***	(.00)	-1.63***	(.00)	-0.54*	(.08)	1.00***	(.01)	4.95***	(.00)	8.60***	(.00)
Japan	-7.57***	(.00)	-2.31***	(.00)	0.25***	(.01)	3.66***	(.00)	13.25***	(.00)	20.82***	(.00)
Malaysia	-10.57***	(.00)	-4.37***	(.00)	-0.85***	(.00)	2.67***	(.00)	9.98***	(.00)	20.55***	(.00)

(Continues)

TABLE 1 (Continued)

Panel B: Mutual fund performance by quintile (% four-factor alpha per year)													
Country	1		2		3		4		5		5-1		Number of observations
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Difference	p-Value	
Netherlands	-8.23***	(.00)	-4.47***	(.00)	-2.88***	(.00)	0.06	(.94)	10.49***	(.00)	18.71***	(.00)	144
Norway	-7.98***	(.00)	-3.53***	(.00)	-1.03	(.13)	2.03***	(.00)	9.14***	(.00)	17.12***	(.00)	435
Poland	-11.99***	(.00)	-5.24**	(.02)	-0.69	(.78)	3.58**	(.00)	12.35***	(.00)	24.34**	(.02)	162
Portugal	-4.66***	(.00)	-1.12	(.33)	1.18	(.36)	3.17***	(.01)	5.36***	(.00)	10.02***	(.00)	142
Singapore	-8.30***	(.00)	-3.30***	(.00)	-0.40	(.96)	2.06*	(.07)	7.59***	(.00)	15.89***	(.00)	94
South Korea	-0.71	(.12)	5.33***	(.00)	8.22***	(.00)	11.33***	(.00)	18.04***	(.00)	18.75***	(.00)	1,514
Spain	-7.14***	(.00)	-3.50***	(.00)	-1.86***	(.00)	-0.13	(.69)	4.73***	(.00)	11.87***	(.00)	548
Sweden	-9.01***	(.00)	-5.15***	(.00)	-2.89***	(.00)	0.31*	(.08)	8.88***	(.00)	17.89***	(.00)	819
Switzerland	-6.74***	(.00)	-3.29***	(.00)	-1.15***	(.00)	2.54**	(.00)	7.67***	(.00)	14.41***	(.00)	417
Taiwan	-10.8***	(.00)	-3.16***	(.00)	1.93***	(.00)	6.57***	(.00)	15.51***	(.00)	26.32***	(.00)	905
Thailand	-5.26***	(.00)	-1.05***	(.00)	0.99***	(.00)	3.69***	(.00)	9.87***	(.00)	15.13***	(.00)	727
UK	-6.30***	(.00)	-1.85***	(.00)	0.99***	(.00)	4.72***	(.00)	14.35***	(.00)	20.64***	(.00)	2,735
US	-12.2***	(.00)	-3.62***	(.00)	0.94**	(.00)	5.95***	(.00)	15.93***	(.00)	28.13***	(.00)	18,717
All countries	-11.61***	(.00)	-3.85***	(.00)	0.03***	(.00)	4.09***	(.00)	12.84***	(.00)	24.45***	(.00)	42,285
Panel C: Additional mutual fund characteristics by country													
Country	Size (\$ million)	Family size (\$ million)	Flows (% year)	Age (years)	Expense ratio (%)	Loads (%)							
Australia	91	6,352	1.56	8.42	1.64	2.21							
Austria	106	1,661	18.23	13.09	1.58	4.22							
Belgium	99	5,935	-7.33	13.37	1.07	2.38							
Brazil	149	4,419	-2.51	8.68	2.05	0.35							

(Continues)

TABLE 1 (Continued)

Panel C: Additional mutual fund characteristics by country							
Country	Size (\$ million)	Family size (\$ million)	Flows (% year)	Age (years)	Expense ratio (%)	Loads (%)	
Canada	354	11,538	7.08	13.01	2.37	6.26	
Denmark	144	1,716	14.46	13.19	1.40	2.14	
Finland	154	2,279	10.53	10.81	1.63	1.99	
France	209	4,305	3.30	13.43	1.72	3.07	
Germany	529	12,416	0.71	20.15	1.33	4.53	
India	127	1,747	11.74	8.28	1.31	0.89	
Indonesia	116	272	29.03	9.13	1.83	2.63	
Italy	239	3,294	-2.26	10.84	1.92	2.75	
Japan	77	8,840	-7.73	9.94	1.47	2.39	
Malaysia	46	655	-2.89	11.14	1.63	5.76	
Netherlands	279	2,766	0.21	14.49	1.03	1.26	
Norway	159	1,970	14.27	12.47	1.56	2.73	
Poland	206	466	71.46	8.16	3.48	4.39	
Portugal	50	339	-0.79	10.91	1.87	2.34	
Singapore	89	879	15.93	11.22	1.37	3.95	
South Korea	43	2,102	-31.86	6.51	1.55	0.08	
Spain	79	1,320	-2.50	11.59	2.00	0.69	
Sweden	450	12,371	5.36	13.35	1.36	0.77	
Switzerland	308	9,413	6.20	12.53	1.19	4.50	
Taiwan	59	743	4.72	10.53	2.96	2.93	
Thailand	21	347	-7.89	8.89	1.43	1.14	
UK	584	9,780	4.21	17.52	1.42	4.10	
US	1,243	51,670	7.37	13.83	1.34	1.80	
All countries	671	26,317	3.76	12.54	1.56	2.44	

(Continues)

TABLE 1 (Continued)

Panel D: Pairwise correlations among fund characteristics											
	1	2	3	4	5	6	7	8	9	10	11
Raw return	1										
Four-factor alpha	0.23	1									
Size	0.01	0.01	1								
Family size	0.02	0.03	0.32	1							
Flows	0.07	0.09	0.01	0.02	1						
Age	-0.02	0.00	0.26	0.15	-0.06	1					
Expense ratio	0.01	-0.07	-0.13	-0.16	-0.02	-0.11	1				
Loads	-0.02	-0.04	-0.02	-0.07	0.01	0.10	0.33	1			
SMB	0.04	0.05	-0.04	-0.02	0.04	-0.05	0.12	0.06	1		
HML	0.10	-0.19	0.00	-0.01	0.06	-0.02	-0.06	-0.01	-0.08	1	
Adj- R^2 (4f)	0.02	0.02	0.04	-0.06	-0.04	0.09	-0.11	-0.01	-0.11	-0.05	1

Note. This table presents, in Panel A, the number of unique funds in our sample, total net assets (TNA) under management (sum of all share classes in millions of U.S. dollars at the end of 2010), means of fund performance including raw returns and four-factor alpha, and the fraction of statistically significant positive and negative four-factor alphas calculated for each country-year, reported by country where the funds are legally domiciled. In Panel B, we first rank funds into quintiles based on their prior-year four-factor alpha in their fund industry, we calculate the average prior-year four-factor alpha for each quintile, and for each country, we calculate the difference between the average past-year four-factor alphas for top- and bottom-performance quintiles. In Panel B, we also run a t-test, testing whether this difference is statistically significant. ***, **, * indicate statistical significance at the .01, .05 and .10 level, respectively. Panel C presents means of additional fund characteristics by country. At the bottom of Panels A, B, and C, means are presented for all countries. Panel D presents pairwise correlations for all fund characteristics. The sample is restricted to open-end and actively managed domestic equity funds drawn from the Lipper database. The sample period is 2001–2010. See Appendix A for variable definitions.

performance is calculated using the Fama-French factors plus the MOM factor of Carhart (1997), the so-called four-factor model. Using all stocks included in the Datastream/Worldscope database, we construct monthly benchmark factors for each individual country. The market return is computed by using the value-weighted average return in local currency of all stocks in each country in each month. To form the size, the book-to-market and the MOM portfolios and factors for each country in each month, we follow the procedure described in Fama and French (1992). Table IA1 in the online Appendix¹² contains the number of stocks used, the average returns for each factor, and the average absolute *t*-statistic for the four factors for each country: in Appendix A, we explain in detail how we calculate these factors.

Each quarter's alpha (months $t - 3$ to $t - 1$) is calculated as follows. We first regress the previous 36 months of fund excess returns ($t - 39$ to $t - 4$) on the local (as given by the fund domicile) factors and store the estimated betas.¹³ We then calculate the quarterly alpha as the difference between excess returns in months $t - 3$ through $t - 1$ and the predicted return based on factor realizations in $t - 3$ through $t - 1$ and factor loadings from the $t - 39$ to $t - 4$ regressions.

It is well known that the four-factor model works well in explaining the variation in U.S. fund performance. Table 2 sheds light on whether we should use the four-factor alpha model to explain returns on mutual funds in other countries. The table contains the average of factor loadings and absolute *t*-statistics for each country and shows that in 18 out of 27 countries, two out of the three factors used in addition to the market for the four-factor model are statistically significant. In addition, the table presents the goodness of fit of the four-factor model versus the one-factor model and shows that in all the countries in our sample, this goodness-of-fit difference is statistically significant in favor of the four-factor model. These statistics reassure us that the four-factor model is an appropriate way to capture fund performance in our worldwide sample.¹⁴

Performance persistence can be examined at different frequencies. Most authors examine persistence at yearly frequency (e.g., Carhart, 1997; Elton, Gruber, & Blake, 2012) because investors and fund boards of directors usually evaluate performance persistence at this frequency. We therefore focus on annual performance persistence by aggregating the quarterly alphas within each year.

In our analysis, we control for several fund characteristics that are important determinants of fund performance. These include fund size, fund family size, fund flows, fund age, and measures of fund fees, all lagged. These are presented in Table 1, Panel C. Shown in Table 1, Panel D, the pairwise correlations between these variables suggest that using these fund-level variables together in our tests to explain fund performance is unlikely to lead to a problem of multicollinearity.

For our sample, Table 3, Panel A, presents statistics on the characteristics of fund industries across countries, and Panel B presents the correlation between these country characteristics. An examination of the concentration of fund families across fund industries shows that there are clearly large differences across countries. For example, the market share of the top five fund management companies in each country across our sample varies from 24% to 93%. In addition, fund industry development levels are clearly different across countries. For example, if we use the age of the fund industry as a proxy for its development, the fund industry development level varies from 14 years to 86 years. We conclude that there are fundamental differences in the overall nature of fund industries across countries.

¹² Available at <https://financialreview.pooe.ncsu.edu>

¹³ To calculate excess returns, we use as risk-free rates of return the interbank middle interest rates for each country, with the exception of the United States, for which we use Treasury bill rates from the U.S. Federal Reserve. The data on interbank middle interest rates are drawn from Datastream.

¹⁴ Closer scrutiny of the data reveals that the loading on the high-minus-low (HML) factor is not always positive across countries and that in addition, in most countries, the loading on the MOM factor is frequently negative. This contrasts with U.S. findings, which demonstrate that mutual funds in that country load positively on both HML and MOM.

TABLE 2 Mutual fund factor loadings and goodness of fit

Country	Four-factor alpha		RM		SMB		HML		MOM		Adj-R ² (4f)	Adj-R ² (1f)	Ho: Adj-R ² (4f) = Adj-R ² (1f) (p-value)
	Mean	(t-Stat)	Mean	(t-Stat)	Mean	(t-Stat)	Mean	(t-Stat)	Mean	(t-Stat)			
Australia	-1.49*	(1.66)	0.94**	(15.43)	-0.03	(1.56)	0.13**	(2.57)	-0.05*	(1.66)	0.83	0.78	(.00)
Austria	0.003	(.85)	1.12***	(11.68)	0.05	(1.02)	-0.01	(1.38)	-0.02	(1.38)	0.86	0.83	(.00)
Belgium	0.56*	(1.73)	0.91***	(13.24)	0.04	(1.38)	0.07	(1.51)	-0.05	(1.55)	0.87	0.80	(.00)
Brazil	-1.19*	(1.75)	1.01**	(10.04)	0.11	(1.18)	0.05	(1.03)	0.01	(1.31)	0.91	0.87	(.00)
Canada	-0.88	(1.16)	0.89**	(11.44)	0.05*	(1.88)	0.02*	(1.94)	-0.02	(1.49)	0.83	0.78	(.00)
Denmark	0.11	(1.07)	1.04**	(19.47)	0.01	(1.30)	0.03	(1.55)	0.01	(1.34)	0.92	0.90	(.00)
Finland	0.51*	(1.77)	0.79**	(8.93)	0.15*	(1.92)	0.19**	(2.18)	-0.10**	(1.98)	0.85	0.72	(.00)
France	-0.59*	(1.70)	1.01**	(13.95)	0.25**	(2.50)	-0.04*	(1.67)	-0.08*	(1.65)	0.85	0.79	(.00)
Germany	-0.26	(1.21)	1.08**	(14.51)	0.10*	(1.71)	0.05	(1.47)	-0.09**	(2.24)	0.91	0.88	(.00)
India	0.09	(1.03)	0.85***	(16.57)	0.10*	(1.89)	0.002	(1.12)	0.01*	(1.71)	0.91	0.85	(.00)
Indonesia	0.37**	(1.97)	1.01**	(11.26)	-0.004	(.87)	0.02	(1.30)	-0.02*	(1.66)	0.94	0.87	(.00)
Italy	-0.28*	(1.68)	0.90**	(30.43)	0.06*	(1.85)	0.001	(1.32)	-0.03*	(1.76)	0.96	0.94	(.00)
Japan	0.37	(.79)	1.05***	(19.66)	0.10*	(1.95)	-0.12*	(1.76)	0.04	(1.45)	0.91	0.87	(.00)
Malaysia	-0.58*	(1.72)	0.86**	(14.20)	0.03	(1.43)	0.03	(1.43)	0.02	(1.61)	0.87	0.78	(.00)
Netherlands	-0.29*	(1.68)	1.00**	(16.70)	0.13**	(2.12)	-0.07*	(1.77)	-0.05	(1.42)	0.87	0.81	(.00)
Norway	0.73*	(1.72)	1.05***	(15.04)	0.13**	(2.00)	0.03	(1.23)	-0.08**	(1.99)	0.91	0.88	(.00)
Poland	-0.31	(.94)	0.78**	(15.03)	0.11**	(1.99)	0.001	(.78)	-0.07	(1.58)	0.86	0.80	(.00)
Portugal	-0.04	(.84)	1.02**	(17.68)	0.05*	(1.78)	0.03*	(1.69)	-0.03*	(1.95)	0.92	0.89	(.00)
Singapore	-0.41	(.89)	0.95***	(17.90)	0.01	(1.40)	0.01	(1.25)	0.05	(1.53)	0.91	0.89	(.00)
South Korea	2.79**	(2.27)	0.72**	(10.90)	-0.10	(1.57)	-0.21**	(2.02)	0.04	(1.52)	0.79	0.76	(.00)
Spain	-0.50*	(1.86)	1.00**	(24.85)	-0.01*	(1.78)	0.02	(1.40)	-0.02*	(1.66)	0.95	0.92	(.00)
Sweden	-0.35	(1.11)	0.92***	(18.60)	0.07*	(1.66)	0.05*	(1.83)	-0.03*	(1.69)	0.92	0.90	(.00)

(Continues)

TABLE 2 (Continued)

Country	Four-factor alpha		RM		SMB		HML		MOM		Adj-R ² (4f)	Adj-R ² (1f)	Ho: Adj-R ² (4f) = Adj-R ² (1f) (p-value)
	Mean	(t-Stat)	Mean	(t-Stat)	Mean	(t-Stat)	Mean	(t-Stat)	Mean	(t-Stat)			
Switzerland	0.25**	(2.01)	1.02***	(26.35)	0.11**	(2.24)	-0.02	(1.55)	-0.04*	(1.82)	0.90	0.86	(.00)
Taiwan	-0.28	(.86)	1.13***	(12.48)	0.34***	(2.61)	-0.27**	(2.53)	0.2**	(2.01)	0.83	0.79	(.00)
Thailand	0.05	(.76)	0.87***	(15.27)	-0.19***	(3.00)	-0.09	(1.58)	0.06*	(1.73)	0.94	0.91	(.00)
UK	0.84	(1.14)	1.00**	(13.96)	0.19***	(2.67)	-0.08*	(1.80)	-0.02*	(1.69)	0.87	0.81	(.00)
US	-0.20	(1.04)	1.01***	(11.69)	0.11**	(2.05)	0.01**	(2.16)	0.04*	(1.77)	0.81	0.74	(.00)

Note. This table reports the average of quarterly four-factor alpha, factor loadings and goodness-of-fit statistics for domestic actively managed mutual funds in each country. Factor loadings are estimated using returns measured in local currency with 3 years of monthly fund returns. RM is the excess return on the domestic market, SMB is the return difference between the small and large stock portfolio, HML is the return difference between the high and low book-to-market portfolio, and MOM is the difference in return between last year's winner and loser portfolios all measured in the country concerned. Adj-R² (4f) is the adjusted R-squared of fund four-factor alpha regressions and adj-R² (1f) is the adjusted R-squared of fund one-factor alpha regressions. Absolute t-statistics across all funds in the country are in parentheses. The last column presents p-values testing the difference between the adjusted R-squared of fund four-factor alphas regressions and fund one-factor alphas regressions.

***, **, * indicate statistical significance at the .01, .05 and .10 level, respectively.

TABLE 3 Country characteristics

<i>Panel A: Country characteristics by country</i>					
Country	Fund industry Herfindahl	Fund industry top five shares (%)	Fund industry number of funds	Fund industry age as of 2010 (years)	Fund industry equity size (% mkt cap)
Australia	0.04	36.41	4,210	45	38.97
Austria	0.13	67.20	419	54	24.98
Belgium	0.31	89.17	588	63	27.48
Brazil	0.11	59.15	916	53	5.26
Canada	0.05	38.81	2,041	78	13.95
Denmark	0.10	60.58	239	48	16.85
Finland	0.16	75.68	215	23	12.44
France	0.06	42.25	1,754	46	23.43
Germany	0.16	79.01	549	61	10.67
India	0.09	57.93	303	46	2.43
Indonesia	0.24	84.33	58	14	1.60
Italy	0.09	54.16	364	27	12.71
Japan	0.08	54.55	1,383	45	14.86
Malaysia	0.22	69.00	259	51	3.71
Netherlands	0.13	72.02	175	81	7.84
Norway	0.17	81.03	188	17	13.67
Poland	0.11	63.94	105	18	4.69
Portugal	0.18	87.45	67	24	3.32
Singapore	0.06	45.35	289	51	6.42
South Korea	0.14	64.82	723	41	7.24
Spain	0.09	60.11	496	52	8.76
Sweden	0.16	72.96	328	52	22.96
Switzerland	0.21	80.68	341	72	5.57
Taiwan	0.06	44.79	291	26	2.69
Thailand	0.11	65.94	202	15	2.16
UK	0.03	25.33	1,791	76	15.34
US	0.05	40.93	4,359	86	29.22
All countries	0.07	45.68	2,850	61.40	22.47
<i>Panel B: Pairwise correlations among country characteristics</i>					
	1	2	3	4	
Fund industry Herfindahl	1	1			
Fund industry top five shares	2	0.89	1		
Fund industry number of funds	3	-0.49	-0.62	1	
Fund industry age	4	-0.16	-0.32	0.50	1
Fund industry equity size (% mkt cap)	5	-0.13	-0.24	0.59	0.35

Note. This table reports, in Panel A, means of country characteristics by country for the period 2001–2010. At the bottom of the table, means are presented for all countries. Panel B presents pairwise correlations for these variables. See Appendix B for variable definitions.

3 | EVIDENCE ON PERFORMANCE PERSISTENCE ACROSS COUNTRIES

We use two methods to measure fund persistence.¹⁵ The first method is a regression-based approach calculated by regressing current fund performance on lagged fund performance and using the coefficient on lagged performance as our measure of persistence. The second method computes the performance gap this year between prior-year winner and loser funds.

Method one is based on Busse, Goyal, and Wahal (2010), which involves estimating the regression:

$$\alpha_t = \lambda + \kappa\alpha_{t-1} + \theta X_{t-1} + \varepsilon_t, \quad (1)$$

where α_t is fund performance measured using a four-factor alpha in a given year and X_{t-1} is a set of lagged control variables that have a bearing on how funds perform in the future. If the coefficient κ is positive and significant, this indicates that fund performance persists. If κ is negative and significant, this indicates that performance tends to revert. We include the same control variables to explain future fund performance as Busse et al. (2010) use in their persistence study—namely, fund size, fund family size, and fund percentage flow, all lagged by 1 year. We also include lagged fund age, annual fees, and loads. The regressions also include year fixed effects. When we run the regressions separately for individual countries or when we pool the countries, the standard errors are clustered at the fund or at the country level, respectively. Pooled regressions also include country fixed effects. The second performance gap method that we use is based on Hendricks et al. (1993) and Bollen and Busse (2005) and involves sorting funds based on prior-year four-factor alpha into quintiles and then calculating the performance gap between last year's top quintile and bottom quintile funds.¹⁶

Table 4, Panel A, presents the results of our regression-based persistence tests. The first column shows that in 15 out of 27 countries, there is statistically significant performance persistence. Table 4, Panel B, presents the results of our performance gap-based persistence tests. There are 19 countries with statistically significant performance persistence. At the bottom of both panels, we also calculate whether there is performance persistence when we pool funds from all countries together. When we do this, we find that there is statistically significant performance persistence across the sample of all countries as well, which is consistent with the persistence we find in the majority of individual countries in our sample. To validate our results, we compare the results of our persistence tests between the two persistence measures. Our results show that for 19 out of 27 countries, there is consistency across the persistence measures regarding whether there is persistence or not.

The differences in the level of persistence across countries are not only statistically significant but also economically significant. For example, for the case of the regression-based approach, the country with the highest significant persistence is Indonesia, with a coefficient on lagged four-factor alpha of 0.376. The country with the lowest significant persistence is the United States, with a coefficient on lagged four-factor alpha of 0.048. This means that more than one-third of past performance in a given year carries over to the next year in Indonesia, while less than one-twentieth of past performance carries over to the next year in the United States.

Having shown that performance persistence is pervasive in the majority of fund industries in our sample, it is now important to examine if the persistence we find is due to bottom- or top-performing funds. To this end, we redo our persistence tests. For our regression-based approach, this involves allowing the coefficients on the lagged four-factor alpha to be different if a fund's lagged alpha is in the bottom 20%, the mid-60%, and the top 20% of funds in the prior year; we do this by using indicator variables for the mid-60% and the top 20% of funds.¹⁷ Table 5 presents the results of

¹⁵ In robustness tests, we use a third method, the Spearman rank correlation between fund performance measures in adjacent years, to measure performance persistence (see Elton et al., 2012).

¹⁶ The advantage of using the regression-based approach over the performance gap approach is that it controls for other variables that might influence the level of fund performance in the current period such as fund size. However, the regression-based approach is prey to fund performance outliers, by which the performance gap-based approach is less affected.

¹⁷ The coefficients presented in Table 5 represent the total level of persistence present for the bottom 20%, the mid-60%, and the top 20% of funds.

TABLE 4 Fund performance persistence around the world

Country	Performance t – 1		Adjusted R-squared	Number of observations
	Coefficient	t-Stat		
Australia	0.067***	(3.35)	0.307	4,302
Austria	0.250*	(1.76)	0.684	79
Belgium	0.137	(1.47)	0.619	160
Brazil	0.133**	(2.45)	0.164	750
Canada	0.122***	(3.66)	0.256	2,915
Denmark	0.248**	(2.40)	0.514	140
Finland	-0.134	(-1.31)	0.690	200
France	0.162***	(4.38)	0.197	2,065
Germany	0.096	(1.31)	0.432	505
India	0.062*	(1.76)	0.280	879
Indonesia	0.376**	(2.36)	0.467	99
Italy	0.129**	(2.14)	0.413	387
Japan	0.124	(1.34)	0.239	1,588
Malaysia	0.134***	(3.29)	0.183	857
Netherlands	0.209*	(1.67)	0.343	144
Norway	-0.035	(-0.64)	0.594	435
Poland	0.277**	(2.20)	0.440	162
Portugal	0.077	(.78)	0.659	142
Singapore	0.188	(1.63)	0.167	94
South Korea	0.050	(1.16)	0.645	1,514
Spain	0.153**	(2.13)	0.312	548
Sweden	0.129***	(2.72)	0.205	819
Switzerland	-0.066	(-0.91)	0.435	417

(Continues)

TABLE 4 (Continued)

Panel A: Regression-based persistence tests										
Country	Performance $t - 1$			Adjusted R-squared	Number of observations					
	Coefficient	t-Stat								
Taiwan	-0.007	(-20)		0.347	905					
Thailand	0.036	(75)		0.143	727					
UK	0.046	(1.57)		0.336	2,735					
US	0.048***	(5.07)		0.102	18,717					
All countries	0.057**	(2.38)		0.118	42,285					

Panel B: Performance gap-based persistence tests—This year's average four-factor alpha based on last year's performance quintiles											
Country	1		2		3		4		5		Number of observations
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	
Australia	-8.23***	(.00)	-4.31***	(.00)	-3.28***	(.00)	-2.27***	(.00)	-2.68***	(.00)	4,302
Austria	-2.79	(.26)	1.77	(.46)	-0.97	(.67)	1.74	(.13)	0.28	(.91)	79
Belgium	0.62	(.42)	1.28	(.21)	2.08**	(.04)	2.49*	(.06)	3.05	(.13)	160
Brazil	-6.98**	(.00)	-4.08**	(.00)	-4.67**	(.00)	-3.99**	(.00)	-0.90**	(.00)	750
Canada	-5.22***	(.00)	-3.47***	(.00)	-2.32***	(.00)	-2.36***	(.00)	0.27**	(.02)	2,915
Denmark	-0.81	(.19)	-0.45	(.71)	-0.65	(.38)	0.09	(.93)	4.39***	(.00)	140
Finland	0.96	(.25)	0.83	(.20)	1.40***	(.00)	3.00***	(.00)	3.44*	(.06)	200
France	-3.39***	(.00)	-3.74***	(.00)	-2.86***	(.00)	-1.73***	(.00)	1.62***	(.00)	2,065
Germany	-1.95***	(.00)	-2.41***	(.00)	-2.64***	(.00)	-0.66	(.24)	2.50***	(.00)	505
India	-1.90**	(.00)	0.16	(.79)	1.73***	(.00)	1.11**	(.05)	1.59**	(.02)	879
Indonesia	-3.50***	(.00)	-2.08	(.88)	1.63	(.46)	4.77***	(.00)	5.41**	(.04)	99
Italy	-0.87**	(.01)	-1.24***	(.00)	-1.29***	(.00)	-0.76***	(.00)	0.74**	(.03)	387
Japan	1.64***	(.00)	-0.48**	(.00)	-0.33***	(.01)	0.19*	(.03)	2.89***	(.00)	1,588
Malaysia	-3.8***	(.00)	-2.78***	(.00)	-1.91**	(.00)	-0.33	(.14)	0.14	(.64)	857
Netherlands	-3.11***	(.00)	-4.74***	(.00)	-3.37***	(.00)	-2.63***	(.01)	6.27***	(.00)	144

(Continues)

TABLE 4 (Continued)

Panel B: Performance gap-based persistence tests—This year's average four-factor alpha based on last year's performance quintiles

Country	1		2		3		4		5		5-1		Number of observations
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Difference	p-Value	
Norway	0.36	(.65)	1.19	(.17)	2.46***	(.00)	1.16	(.15)	1.87**	(.03)	1.51	(.32)	435
Poland	-2.10*	(.03)	-1.68	(.81)	-0.26	(.50)	0.69	(.13)	3.14	(.52)	5.23**	(.02)	162
Portugal	-0.70	(.57)	-0.72	(.53)	0.17	(.88)	0.67	(.53)	0.04	(.98)	0.75	(.73)	142
Singapore	-1.14	(.19)	-2.53**	(.01)	-0.60	(.90)	-1.06	(.40)	1.29	(.31)	2.42	(.26)	94
South Korea	7.81***	(.00)	7.82***	(.00)	8.23***	(.00)	7.84***	(.00)	9.90***	(.00)	2.09**	(.05)	1,514
Spain	-1.98**	(.00)	-1.47***	(.00)	-1.68**	(.00)	-1.27***	(.00)	0.09	(.74)	2.07**	(.02)	548
Sweden	-1.62***	(.00)	-1.93***	(.00)	-2.17***	(.00)	-0.86***	(.00)	1.50***	(.00)	3.12***	(.00)	819
Switzerland	3.42***	(.00)	1.58***	(.01)	0.66	(.15)	0.17	(.59)	1.78***	(.00)	-1.64	(.28)	417
Taiwan	-1.56***	(.00)	-0.92**	(.05)	-0.79*	(.06)	-0.004	(.99)	-2.06***	(.00)	-0.50	(.67)	905
Thailand	-0.16	(.62)	0.70**	(.04)	-0.04	(.89)	-0.27	(.31)	1.66***	(.00)	1.81**	(.03)	727
UK	0.86***	(.00)	0.92***	(.00)	0.74***	(.00)	2.26***	(.00)	6.42***	(.00)	5.56***	(.00)	2,735
US	-2.56***	(.00)	-1.26***	(.00)	-0.50***	(.00)	-0.07	(.06)	-0.09**	(.04)	2.47***	(.00)	18,717
All countries	-2.82***	(.00)	-1.07	(.82)	-0.47***	(.00)	0.01**	(.00)	0.76***	(.00)	3.57***	(.00)	42,285

Note. This table presents the results from regression-based persistence tests, in Panel A, and performance gap-based persistence tests, in Panel B, measuring the persistence in each of the 27 worldwide countries in our sample. Results for all countries are also presented at the bottom of each panel. In Panel A, fund-level four-factor alpha in a given year is regressed on prior-year four-factor alpha and control variables (see Equation [1]). The lagged fund-level control variables (not reported) include fund size, fund family size, flows, age, expense ratio, loads, and fund style, measured as the loadings of the fund's return on the country-specific size (SMB) and value (HML) factors. Regressions also include time fixed effects, and country fixed effects when we pool the countries. Robust t-statistics clustered by fund (or by country when we pool the data) are reported in parentheses. In Panel B, we first rank funds based on their prior-year four-factor alpha in their fund industry. The performance gap in the next year is then calculated between the prior year's quintile 5 and quintile 1 funds. We also run a t-test, testing whether this difference is significantly different from zero. p-Values are reported in parentheses.

***, **, * indicate statistical significance at the .01, .05 and .10 level, respectively. See Appendix B for variable definitions.

TABLE 5 Fund performance persistence around the world conditioning on past performance

Country	Bottom performance $t - 1$		Mid-performance $t - 1$		Top performance $t - 1$		Adjusted R-squared	Number of observations
	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat		
Australia	0.320***	(11.57)	0.120***	(3.19)	-0.499***	(-9.68)	0.362	4,302
Austria	0.515***	(3.31)	0.059	(.33)	-0.001	(-.01)	0.717	79
Belgium	0.197	(1.17)	0.231*	(1.71)	0.182	(1.50)	0.595	160
Brazil	0.233***	(3.03)	0.013	(.12)	0.050	(.46)	0.171	750
Canada	0.240***	(5.30)	0.189***	(3.59)	-0.048	(-.95)	0.267	2,915
Denmark	0.255	(1.45)	0.318*	(1.69)	0.234**	(2.15)	0.511	140
Finland	-0.196	(-.97)	-0.102	(-.81)	-0.113	(-1.40)	0.689	200
France	0.109*	(1.83)	0.297***	(5.00)	0.202***	(3.20)	0.196	2,065
Germany	0.062	(.56)	0.135	(1.12)	0.121	(1.06)	0.431	505
India	0.101*	(1.80)	0.074	(.88)	0.011	(.21)	0.282	879
Indonesia	0.364	(1.11)	0.289	(1.13)	0.415***	(3.02)	0.463	99
Italy	-0.093	(-1.04)	-0.021	(-.22)	0.259***	(3.77)	0.433	387
Japan	0.080	(.63)	0.194	(1.51)	0.055	(.60)	0.247	1,588
Malaysia	0.142**	(2.42)	0.197**	(2.43)	0.118*	(1.75)	0.181	857
Netherlands	0.202	(.86)	0.173	(.72)	0.216	(1.64)	0.330	144
Norway	0.043	(.48)	-0.024	(-.29)	-0.085	(-1.16)	0.591	435
Poland	0.215	(1.20)	0.291*	(1.67)	0.376***	(3.06)	0.431	162
Portugal	0.102	(.64)	0.042	(.37)	-0.002	(-.02)	0.664	142
Singapore	-0.072	(-.57)	-0.044	(-.20)	0.543**	(2.13)	0.225	94
South Korea	-0.019	(-.17)	-0.006	(-.11)	0.058	(1.46)	0.646	1,514
Spain	0.119	(1.25)	0.065	(.56)	0.221*	(1.89)	0.311	548
Sweden	0.015	(.18)	0.221**	(2.30)	0.182***	(2.58)	0.216	819
Switzerland	-0.133	(-1.10)	-0.062	(-.89)	-0.182	(-.71)	0.438	417
Taiwan	0.035	(.61)	-0.016	(-.24)	-0.028	(-.66)	0.345	905
Thailand	0.044	(.53)	0.096	(.89)	0.027	(.48)	0.136	727
UK	0.058	(.95)	0.055	(1.03)	0.040	(1.13)	0.336	2,735
US	0.211***	(13.52)	0.117***	(6.38)	-0.06***	(-4.45)	0.119	18,717
All countries	0.213***	(5.01)	0.03	(.37)	-0.054**	(-2.20)	0.131	42,285

Note. This table presents the results from regression-based persistence tests, measuring the persistence in each of the 27 worldwide countries in our sample, for the bottom, the mid-, and the top levels of the performance scale. Results for all countries are also presented at the bottom. Fund-level four-factor alpha in a given year is regressed on prior-year four-factor alpha and control variables. To allow past performance to influence future performance differently, depending on how well a fund has done in the past, we allow the coefficients on the lagged four-factor alpha to be different for the bottom 20%, the mid-60%, and the top 20% of funds in the prior year, and we do so by using indicator variables for the mid-60% and the top 20% of funds. The lagged fund-level control variables (not reported) include fund size, fund family size, flows, age, expense ratio, loads, and fund style, measured as the loadings of the fund's return on the country-specific size (SMB) and value (HML) factors. Regressions also include time fixed effects, and country fixed effects when we pool the countries. Robust t -statistics clustered by fund (or by country, when we pool the data) are reported in parentheses.

***, **, * indicate statistical significance at the .01, .05 and .10 level, respectively. See Appendix B for variable definitions.

our regression-based approach. We find that of the 15 countries with statistically significant persistence, six countries have statistically significant persistence at the top of the performance distribution alone, four countries have significant persistence at the bottom of the distribution alone and four countries have persistence at both the top and the bottom of the distribution.

When we use the performance gap method to tell us whether overall persistence is due to the persistence of past winner or loser funds, we use the following method. To determine if there is performance persistence among winners, we calculate whether the current performance of past winner funds is significantly positive across countries; to determine if there is performance persistence at the bottom of the performance scale, we calculate whether the current performance of past loser funds across countries is significantly negative. These numbers are presented in Table 4, Panel B, and show that in countries around the world, there is widespread persistence at both the top and the bottom of the performance scale.¹⁸

Overall, therefore, using both methodologies, we show that there is persistence in the majority of countries around the world.¹⁹ In addition, we find that persistence originates from both the bottom and the top of the performance distribution. These findings contrast with the existing U.S. literature that shows that fund persistence is limited and is mainly due to bottom performers (e.g., Carhart, 1997).

4 | EXPLAINING PERFORMANCE PERSISTENCE ACROSS COUNTRIES

In this section, we examine why there are differences in performance persistence across countries. We hypothesize that the competitiveness of a fund industry plays a role in determining its level of persistence. We would expect that if there is greater competition in a given fund industry, it would make it more difficult for a fund manager to escape the bottom of the performance scale and would therefore increase the level of persistence we observe in poor performance. In contrast, if there is greater competition in a given fund industry, then we would expect that managers would find it more difficult to remain top-performing managers in consecutive years, which should reduce persistence at the top of the performance scale (e.g., Hoberg et al., 2018).

What variables might we expect to explain the competitiveness of fund industries? Using two sets of variables, we proxy for fund industry competitiveness. The first set is based on measures of industry development. We would expect that in more developed fund industries, the easier ways to generate alpha have already been exploited. This should then make generating persistent alpha more difficult. Using the age of the fund industry and its size relative to the equity market concerned, we measure fund industry development. The second set of measures we use for industry competitiveness are based on industry concentration and are as follows: the Herfindahl index of fund family concentration, the top five fund families' market share in an industry, and the number of funds in an industry.²⁰

Using the regression approach to implement these ideas, we regress fund performance in a given year on lagged performance in the prior year and regress lagged fund performance interacted with our proxies for the level of competitiveness in the fund industry to allow persistence to be influenced directly by the level of competition. As our hypothesis is that competitiveness affects persistence differently at the bottom and the top of the performance distribution, as shown in Table 5, we partition past-year fund performance into bottom and top prior-year performance, and we interact our competition proxies with performance in these ranges. We also include the same fund-level control variables as shown in Table 5. In each regression, we also separately include the country-level variables to ensure that our estimates of the role of these variables in determining performance persistence are not driven by their contribution

¹⁸ In robustness tests, using both methods—the regression-based approach and the sorting-based approach—we show that our results are preserved when we use terciles instead of quintiles.

¹⁹ In robustness tests, we redo our tests by using terciles, and (in unreported results) we also cut the sample of funds in each country into above-the-median and below-the-median funds. The results show that this balance between performance persistence in top funds versus bottom funds is preserved.

²⁰ Our proxies for competition have been extensively used in the mutual fund literature (e.g., Cremers et al., 2016; Ferreira et al., 2012, 2013; Khorana et al., 2005, 2009).

to the level of performance in the country concerned. To address the concern that our findings may be influenced by measurement error in fund alphas, we include the average R-squared from the fund-level four-factor alpha regressions in each country as a control variable.²¹

Fund industry competitiveness is positively related to our development measures including fund industry age and the size of the fund industry relative to the stock market size. Regarding our measures of fund industry concentration, the number of funds is also positively related to competitiveness, while both the Herfindahl index of fund family concentration and the top five fund families' share are negatively related to competitiveness. We therefore expect to find a positive (negative) coefficient on the interaction between bottom performance and the country-level variables that are positively (negatively) related to competitiveness. For the interactions at the top of the performance distribution, in turn, we expect to find a positive (negative) coefficient on the interaction between top performance and the country-level variables that are negatively (positively) related to competitiveness.

Table 6, Panel A, presents the results of our regression-based approach. They show that as competitiveness goes up, the level of persistence in bottom-performing funds goes up and the level of persistence in top-performing funds goes down, which is consistent with our predictions.

To investigate the role of competitiveness on persistence using the performance gap approach, we use a double sorts methodology. Using our proxies for industry competitiveness, we first sort countries into those countries with below-median competitiveness and above-median competitiveness. We then sort funds in each of these groups into quintiles. If our prior assumptions are correct, we would expect that the performance of bottom quintile funds in those fund industries where there is more competitiveness would be much worse than that of the bottom quintile funds in fund industries where there is less competitiveness. In addition, we would expect that the performance of top quintile funds in those fund industries where there is less competitiveness would be higher, and we would expect their performance to be lower in more competitive fund industries. Table 6, Panel B, presents the results of our performance gap-based approach. The table confirms our prior assumptions, as at the bottom of the performance scale, the funds from more competitive fund industries perform worse and at the top of the performance scale, the funds from less competitive fund industries perform better. Overall, therefore, whether we use the regression-based or performance gap-based approaches, we find that the level of competition in fund industries explains the variation we observe in the level of persistence across countries.²²

While we have shown that competitiveness has a statistically significant effect on persistence, it is interesting to consider whether this effect is economically significant. Table 6 sheds light on this. For simplicity, we focus on the regression-based method, although the results of the performance gap-based method are qualitatively similar. Using the example of fund family concentration and its effect on persistence, Panel A of Table 6 shows that if we increase the Herfindahl index from the below-the-median country level to the above-the-median country level, the persistence at the bottom falls by 0.283. To put this in perspective, Table 5 shows that the interquartile range for persistence at the bottom across countries is 0.174. For winners, Panel A of Table 6 shows that if we increase the Herfindahl index from the below-the-median country level to the above-the-median country level, the persistence at the top rises by 0.488. Table 5 shows that the interquartile range of persistence at the top across countries is 0.224. These findings suggest that changes in fund family concentration have a substantial effect on persistence among loser and winner funds. We find comparable economic significance when we use our other competition proxies.

²¹ Because our sample includes many countries with financial markets with different dimensions and at different stages of development, it could be argued that the quality of the factors we use to estimate the four-factor alpha varies across countries and that this might affect our results. Our robustness section includes further tests to deal with this concern.

²² It might be argued that performance smoothing by mutual funds in less liquid markets could be the cause of the variations in the level of persistence observed across markets. To test for this, we obtain fund-level data on the Amihud (2002) illiquidity ratio from Ferreira et al. (2018). These data are available for nearly 70% of our fund-level observations. In unreported results, we rerun our Table 6, Panel A, analysis except that we now allow persistence to depend on levels of fund illiquidity as well as by interacting past performance with the Amihud (2002) illiquidity ratio. Our results show that fund illiquidity has no effect on the levels of persistence observed and that even after controlling for fund illiquidity, measures of mutual fund industry competition still explain persistence levels across countries.

TABLE 6 Explaining performance persistence across countries

<i>Panel A: Regression-based persistence tests</i>					
	(1)	(2)	(3)	(4)	(5)
Bottom performance $t - 1$	0.267*** (7.25)	0.270*** (7.29)	0.059 (.94)	0.017 (.20)	0.084 (1.25)
Bottom performance $t - 1 \times$ Herfindahl index	-0.283*** (-2.63)				
Bottom performance $t - 1 \times$ Fund industry top five shares		-0.378*** (-2.93)			
Bottom performance $t - 1 \times$ Fund industry number of funds			0.215** (2.48)		
Bottom performance $t - 1 \times$ Fund industry age				0.277** (2.44)	
Bottom performance $t - 1 \times$ Fund industry equity size/Mcap					0.188** (2.22)
Mid-performance $t - 1$	-0.126** (-2.67)	-0.127** (-2.78)	-0.059 (-.87)	0.071 (1.11)	-0.048 (-.63)
Mid-performance $t - 1 \times$ Herfindahl index	0.207** (2.49)				
Mid-performance $t - 1 \times$ Fund industry top five shares		0.286*** (3.05)			
Mid-performance $t - 1 \times$ Fund industry number of funds			-0.062 (-.81)		
Mid-performance $t - 1 \times$ Fund industry age				-0.204** (-2.30)	
Mid-performance $t - 1 \times$ Fund industry equity size/Mcap					-0.078 (-1.05)

(Continues)

TABLE 6 (Continued)

Panel A: Regression-based persistence tests					
	(1)	(2)	(3)	(4)	(5)
Top performance $t - 1$	-0.324*** (-5.91)	-0.327*** (-6.13)	0.034 (.53)	0.076 (.80)	-0.013 (-.15)
Top performance $t - 1 \times$ Herfindahl index	0.488** (6.04)				
Top performance $t - 1 \times$ Fund industry top five shares		0.598*** (5.79)			
Top performance $t - 1 \times$ Fund industry number of funds			-0.362*** (-3.78)		
Top performance $t - 1 \times$ Fund industry age				-0.421*** (-2.96)	
Top performance $t - 1 \times$ Fund industry equity size/Mcap					-0.317*** (-3.24)
Herfindahl index	15.257 (1.09)				
Fund industry top five shares		5.913 (1.00)			
Fund industry number of funds			-1.302* (-1.71)		
Fund industry age				-0.407 (-.31)	
Fund industry equity size/Mcap					-8.320 (-1.31)
Adjusted R-squared	0.101	0.103	0.103	0.096	0.100
Number of observations	42,285	42,285	42,285	42,285	42,285

(Continues)

TABLE 6 (Continued)

Panel B: Performance gap-based persistence tests													
	1		2		3		4		5		5-1		
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	
Herfindahl index													
Less competitive	-0.01	(1.00)	0.76	(.28)	0.72	(.27)	1.8**	(.01)	3.11***	(.00)	3.12***	(.00)	6,848
More competitive	-2.16***	(.00)	-1.49***	(.00)	-0.91**	(.02)	-0.52	(.28)	1.31*	(.05)	3.47***	(.00)	35,437
More minus less competitive	-2.14**	(.05)	-2.25**	(.01)	-1.63**	(.04)	-2.32***	(.01)	-1.80*	(.09)			
Fund industry top five shares													
Less competitive	0.21	(.80)	0.87	(.24)	0.79	(.22)	1.78***	(.01)	3.04***	(.00)	2.83**	(.01)	6,260
More competitive	-2.44***	(.00)	-1.65***	(.00)	-1.00**	(.01)	-0.52	(.29)	1.36*	(.05)	3.80***	(.00)	36,025
More minus less competitive	-2.65**	(.01)	-2.52***	(.00)	-1.79**	(.03)	-2.3***	(.01)	-1.68*	(.09)			
Fund industry number of funds													
Less competitive	-0.20	(.80)	0.40	(.58)	0.88	(.17)	1.56**	(.03)	3.22***	(.00)	3.42***	(.00)	5,603
More competitive	-1.82**	(.01)	-0.96*	(.05)	-1.00**	(.03)	-0.13	(.78)	1.26**	(.05)	3.08**	(.00)	36,682
More minus less competitive	-1.61	(.13)	-1.36	(.13)	-1.88**	(.02)	-1.69**	(.05)	-1.96**	(.04)			
Fund industry age													
Less competitive	0.21	(.80)	0.95	(.22)	1.27*	(.06)	1.91***	(.01)	3.25***	(.00)	3.04**	(.01)	13,405
More competitive	-2.06***	(.00)	-1.36***	(.01)	-1.20***	(.01)	-0.30	(.51)	1.32**	(.04)	3.38***	(.00)	28,880

(Continues)

TABLE 6 (Continued)

Panel B: Performance gap-based persistence tests												
	1		2		3		4		5		5-1	
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value
More minus less competitive	-2.27*	(.03)	-2.31***	(.01)	-2.47**	(.00)	-2.21***	(.01)	-1.93*	(.06)		
Fund industry equity size/Mcap												
Less competitive	-0.21	(.78)	0.25	(.70)	0.40	(.49)	1.23**	(.05)	2.59***	(.00)	2.80***	(.01)
More competitive	-2.00***	(.01)	-0.94	(.10)	-0.56	(.29)	0.12	(.83)	1.89**	(.02)	3.90***	(.00)
More minus less competitive	-1.79*	(.10)	-1.19	(.19)	-0.96	(.24)	-1.11	(.20)	-0.69	(.52)		

Note. This table presents the results from panel regressions in Panel A and performance gap-based persistence tests in Panel B, examining the impact of a set of country-level variables that proxy for competitiveness in the mutual fund industry on performance persistence across the 27 worldwide countries in our sample. Proxies for competitiveness include measures of mutual fund industry concentration (the Herfindahl index of fund family concentration in the mutual fund industry, the top five shares of fund families, and the number of funds in the mutual fund industry) and measures of mutual fund industry development (the age of the mutual fund industry and the size of the mutual fund equity industry as a percentage of the stock market capitalization). In Panel A, we follow the same method as in Table 5 except that we interact our proxies for competitiveness with bottom, mid-, and top performance. We also include the proxies for industry competitiveness by themselves and the average R -squared from the fund-level four-factor regressions in each country. In Panel B, we first sort fund industries into industries that have below or above median levels of competitiveness, and for these two groups, we sort funds into performance quintiles based on prior-year four-factor alpha. We then calculate the average four-factor alpha for these quintiles for both above- and below-median competitiveness countries for the current year and run a t -test, testing whether this average is significantly different from zero. p -Values are reported in parentheses. See Appendix B for variable definitions.

***, **, * indicate statistical significance at the .01, .05 and .10 level, respectively.

5 | ROBUSTNESS TESTS

5.1 | Using fund terciles

As there are certain countries with fewer funds, there may be concerns about the power of our tests when we divide up the sample of funds in each country into quintiles. Therefore, using terciles, we redo our main tests for persistence and for the role of competition in affecting persistence. The results presented in Table IA2 in the online Appendix for both our main methods of calculating persistence show that our results change little when we use terciles.

5.2 | Correcting for the U.S. dominance of the sample

A total of 3,181 of the 8,796 funds in our sample are based in the United States, which means that the United States is responsible for approximately 36% of the funds (see Table I, Panel A). It might be argued that the U.S. dominance of our sample might be driving our results. We test this idea in two ways. First, we redo the analysis in Table 6, Panel A, except that we now use a weighted least squares method where we weight our observations by the inverse of the number of funds in each country-year. This gives less weight to the United States (and also to those countries with a higher number of funds) in our results. The results are presented in Table IA3 in the online Appendix and show that competition still drives persistence exactly as before.²³ Second, excluding the United States from our sample, we redo the Table 6, Panel A, analysis. Table IA4 in the online Appendix shows that our results are similar if we exclude the United States from our sample and that competitiveness still affects persistence in the same way as observed in the prior section.

5.3 | Excluding smaller fund industries

A concern might be that certain fund industries with fewer funds are driving our results and that this is a problem because an inference drawn based on smaller fund industries is less reliable. We therefore test whether our results are robust when we include only fund industries with 200 or more observations. Table IA5 in the online Appendix shows that our results remain as before and that competition still explains the cross-section of cross-country persistence results when we include only the fund industries that have larger fund populations.

5.4 | Factor quality variation across countries

It might be argued that the quality of factors across countries may vary because of the different number of stocks used to calculate factors across countries and that this could lead to cross-sectional variation in our ability to explain fund returns, which may explain our persistence results. We have already addressed this concern by including the average goodness of fit of our fund alphas regressions in each country as a control variable in our main cross-sectional tests of whether fund industry competition affects persistence (see Table 6, Panel A). To further address this concern and better equalize factor quality across countries, using weighted least squares, we first redo the regressions of Panel A of Table 6. We weight our observations by the average *R*-squared from the fund-level four-factor alpha regressions in each country. The purpose is to give more weight to those fund industries with a better factor quality—that is, with a higher *R*-squared. These results are presented in Table IA6 in the online Appendix.

Additionally, using factors for funds based on their investment region rather than based on a single country, we also redo our persistence tests.²⁴ The results are presented in Table IA7 in the online Appendix. Table IA7, Panel A, in the online Appendix presents our tests for unconditional persistence, and the tests conditionally allowing performance to

²³ Because there are also substantial differences in TNA across countries (see Table 1, Panel A), in unreported results we also use weighted least squares weighting by the inverse of the average TNA in each country-year, and the results remain similar.

²⁴ The investment regions include Asia, Europe, North America, and the emerging markets.

vary depending on whether the prior-year fund performance was at the bottom or the top of the performance scale are shown in Panel B. For the determinants of persistence, our tests, in which the fund alphas are calculated by using investment region factors, are presented in Panel C. We find that our results remain robust when we use regional factors. Across countries, there is still widespread persistence that is due to both persistence at the top and bottom of the performance scale, and competition explains the variation observed in the level of persistence.

5.5 | Using rank correlation to test for persistence

We test whether our results are robust when we use an additional third method to calculate performance persistence based on Elton et al. (2012). In order to conduct this approach, we first rank funds based on their four-factor alpha in their fund industry in a given year and then rank funds on their prior-year four-factor alpha in their fund industry. After doing this, we calculate the Spearman rank correlation between these two sets of fund ranks. The results of our tests for measuring the persistence in each of the countries in our sample are presented in Table IA8, Panel A, in the online Appendix. Using the Spearman correlation method, our findings regarding which countries have persistence correspond to our findings regarding the regression-based method for 20 out of 27 countries.

To determine whether overall persistence is the result of persistence at the bottom or the top of the performance distribution, Table IA8, Panel B, in the online Appendix presents the results of redoing our calculations of persistence by using the rank correlation approach and controlling for where funds are in the performance distribution in their prior year. Using this approach, we find that of the 18 countries that have statistically significant persistence, two countries have persistence at the bottom of the distribution, four countries have persistence at the top, and four countries have persistence at both the bottom and at the top.

Finally, we examine whether the rank correlation method also shows that competition affects fund persistence. To do this, we use a sorting-based approach, where we start by sorting fund industries that are described as more or less competitive in the tables into industries that have below- or above-median levels of competitiveness. We then calculate the rank correlation of funds for countries that have below-median levels of competitiveness and separately calculate the rank correlation of funds that are from countries with above-median levels of competitiveness. Last, we calculate the difference in persistence between the above-median competitiveness group of countries and the below-median competitiveness group of countries for both the top and the bottom of the performance distribution. Consistent with our regression-based approach, as fund industries become more competitive, we would expect to see less persistence at the top of the performance distribution and more persistence at the bottom of the performance distribution. This means that the persistence in the above-median competitiveness group of fund industries minus the persistence in the below-median competitiveness group of fund industries should be negative at the top of the fund distribution and positive at the bottom of the fund distribution. This is exactly what we see in Panel C of Table IA8 in the online Appendix and is consistent with our findings, detailed in the main section of the paper, which show that competition drives persistence.

6 | CONCLUSION

Mutual fund persistence has been tested primarily by examining funds in the U.S. fund industry. However, the U.S. fund industry is much larger and older than other fund industries, characteristics that are important determinants of the level of competitiveness in fund industries. This suggests that the U.S.-based results may not translate to other fund industries at different stages of development. In this paper, we study mutual fund persistence across a global sample of mutual funds from 27 countries. In contrast to the existing U.S.-based evidence, our results show that there is statistically significant persistence for the majority of countries in our sample.

We find considerable variation in persistence levels across countries. We conjecture that in countries where fund industries are more competitive, it will be easier for bottom-performing funds to remain at the bottom but more

difficult for top-performing funds to remain at the top. We therefore use various proxies for mutual fund industry competitiveness and test whether they affect persistence as predicted.

In short, we provide evidence supporting three main conclusions. First, there is persistence in the majority of countries in our global sample of funds. Second, contrary to what the U.S.-based evidence suggests, persistence is not exclusively due to poor-performing fund managers, and there is a balance between persistence in top-performing funds versus bottom-performing funds. Finally, we show that fund industry competitiveness explains cross-sectional variation in the level of persistence across countries.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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APPENDIX A: CALCULATION OF FACTORS FOR THE RISK ADJUSTMENT OF FUND PERFORMANCE

We construct the monthly benchmark factors for each individual country, except the United States, using all stocks included in the Datastream/Worldscope database. For the United States, we use the factors constructed by Fama and French (1992).²⁵

The local market return is computed using the value-weighted average return in local currency 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). For each country, we calculate the small-minus-big (SMB) and HML factors from July of year t through June of year $t + 1$ using six value-weighted portfolios formed at the end of June of year t on the intersection of two size portfolios (market equity capitalization [ME]) and three book-to-market equity (BE/ME) portfolios. The size breakpoint is the median market capitalization of each country as of the end of June of year t . Half of the firms are classified as small market capitalization, and the other half as big market capitalization. For the BE/ME classification, the breakpoints are the 30th and 70th percentiles of BE/ME in each country for the fiscal year-end in $t - 1$. The bottom 30% is designated as the value portfolio, the middle 40% as neutral, and the highest 30% as growth.

The SMB factor is the monthly average return of the three small portfolios minus the average return of the three big portfolios:

$$\text{SMB} = (\text{Small Value} + \text{Small Neutral} + \text{Small Growth} \\ - \text{Big Value} - \text{Big Neutral} - \text{Big Growth})/3.$$

The HML factor is the monthly average return of the two value portfolios minus the monthly average return of the two growth portfolios:

$$\text{HML} = (\text{Small Value} + \text{Big Value} - \text{Small Growth} - \text{Big Growth})/2.$$

The MOM factor for month t is calculated using six value-weighted portfolios formed at the end of month $t - 1$, as a result of the intersections of two portfolios formed on size (ME) and three portfolios formed on prior (2-12) month returns. The ME breakpoint is the median market equity in each country as of the end of month $t - 1$. For the return classification, the 30th and 70th percentiles of the prior returns (2-12) in each country are the breakpoints. The bottom 30% are designated as the down-month prior return portfolio, the middle 40% as medium and the highest 30% as up. The MOM factor is the monthly average return in local currency on the two high-prior return portfolios minus the monthly average return on the two low-prior return portfolios:

$$\text{MOM} = (\text{Small High} + \text{Big High} - \text{Small Low} - \text{Big Low})/2.$$

²⁵ The U.S. factors are drawn from French's website: <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/>

APPENDIX B: VARIABLE DEFINITIONS

Variable	Definition
Panel A: Fund characteristics	
Raw return	Fund net return in local currency (percentage per year) (Lipper)
Four-factor alpha	Net four-factor alpha (percentage per year) estimated, using local factors (fund domicile), with 3 years of past monthly fund excess returns in local currency
TNA	Total net assets in millions of U.S. dollars (Lipper)
TNA family	Family total net assets in millions of U.S. dollars of other equity funds in the same management company excluding the own fund TNA (Lipper)
Age	Number of years since the fund launch date (Lipper)
Fees	Total shareholder charges estimated as total expense ratio plus one-fifth of loads (Lipper)
Flow	Percentage growth in TNA (in local currency) in a quarter, net of internal growth (assuming reinvestment of dividends and distributions)
RM	The excess return on the domestic market
SMB	Loadings on the small-minus-big size factor (SMB) from four-factor alpha regressions
HML	Loadings on the high-minus-low factor (HML) from four-factor alpha regressions
Adj- R^2	Adjusted R -squared from alpha regressions
Panel B: Country characteristics	
Fund industry Herfindahl index	Sum of squared market shares of fund management companies for mutual funds in the fund's country (computed using Lipper data)
Fund industry top five shares	Market share (percentage of TNA sum) of the top five management companies (equity funds) in each country (computed using Lipper data)
Fund industry number of funds	The number of funds in the mutual fund industry (ICI)
Fund industry age	The age of the mutual fund industry, in years, as of 2010 (Khorana et al., 2005)
MF equity size (% mkt cap)	The size of the mutual fund equity industry (from ICI) as a percentage of the stock market capitalization (from World Development Indicators)