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THE EFFECT OF MARKET DISTRESS ON MUTUAL FUND PERFORMANCE – INTERNATIONAL EVIDENCE

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ABSTRACT

In this paper, we use a comprehensive sample of equity mutual funds from 34 countries around the world during the 1999-2015 period to study the impact of market distress on mutual fund performance. Our results show that in periods of market distress mutual funds perform worse in more competitive countries. This is because, in these countries, investors are more sophisticated and, therefore, react more to market downturns by heavily withdrawing their money. As a result, mutual fund managers are forced to rebalance their portfolios selling assets immediately, particularly those with higher risk-taking positions, at distressed or "*fire sale*" prices and therefore experiencing severe losses. Coval and Stafford (2007) show that "*fire sales*" in mutual funds that experience large outflows lead to a negative stock price pressure. "*Fire sales*" are therefore expected to more greatly affect fund performance in countries with more active investors.

JEL code: G01, G15, G23.

Keywords: Mutual Funds; Financial Markets Distress, Mutual Fund Performance; International Financial Markets.

O EFEITO DA INSTABILIDADE DE MERCADO NA *PERFORMANCE* DOS FUNDOS DE INVESTIMENTO – EVIDÊNCIA INTERNACIONAL

RESUMO

Neste trabalho, usamos uma amostra abrangente de fundos mútuos de ações provenientes de 34 países do mundo durante o período de 1999 a 2015, de forma a estudar o impacto da instabilidade de mercado na *performance* dos fundos de investimento. Os nossos resultados mostram que, em períodos de instabilidade de mercado, os fundos de investimento apresentam um desempenho inferior nos países mais competitivos. Isto acontece porque, nestes países, os investidores são mais sofisticados e, portanto, reagem mais às recessões de mercado, retirando intensamente o seu dinheiro. Como resultado, os gestores dos fundos mútuos são forçados a reequilibrar os seus portfólios vendendo imediatamente os ativos, particularmente aqueles com posições de risco mais elevadas, a preços de venda menores ("*distressed or fire sale prices"*) e, portanto, sofrendo perdas severas. Coval e Stafford (2007) mostram que as "*fire sales*" em fundos mútuos que experimentam grandes fluxos de saída levam a uma pressão negativa nos preços das ações. Portanto, espera-se que as "*fire sales*" afetem mais o desempenho dos fundos nos países com investidores mais ativos.

Palavras-Chave: Fundos de Investimento; Instabilidade do Mercado Financeiro; *Performance* dos Fundos de Investimento; Mercados Financeiros Internacionais.

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MAIN ABBREVIATIONS USED

ARM	− Average Return Market
B/M	− Book-To-Market
CAPM	− Capital Asset Pricing Model
CBOE	− Chicago Board Options Exchange
EFAMA	− European Fund and Asset Management Association
GDP	− Gross Domestic Product
HML	− High Book-To-Market Equity Minus Low Book-To-Market Equity
MFI	− Mutual Fund Industry
MOM	− Momentum
NBER	− National Bureau of Economic Research
NON-U.S.	− Out of the United States
S&P	− Standard & Poor's 500 Index
SMB	− Small Market Equity Minus Big Market Equity
TNA	− Total Net Assets
TSC	− Total Shareholder Cost
U.S.	− United States
UK	− United Kingdom
VIX	− Volatility Index

1. INTRODUCTION

The main goal of an investor is to maximize the return and minimize the risk of his portfolios. Therefore, mutual funds are seen as a great investment alternative, particularly to small investors, because they are managed by a specialist who invests the money from several investors in different securities such as stocks, bonds or other assets. This allows investors to easily diversify their portfolios because they do not have to look for different companies in particular, but just to look for a mutual fund that ensures the appropriate return to the level of risk intended. Thus, this financial instrument has developed in recent years in different regions. More specifically, the number of open-end mutual funds around the world has increased as The Statistic Portal (2017)[1] shows: In 2016, there were 53,483 funds in Europe, 25,898 in the Americas, 29,370 in Asia and Pacific and 520 in South Africa (see Appendix 1). According to the EFAMA (2017), this global growth has continued significantly and in the first quarter of 2017 reached 43.19 trillion euros in regulated open-ended fund assets, which means an increase approximately of 4.6% (see Appendix 2). Besides that, there was an increase of about 56% in the net cash flow of all funds, reaching 605 billion euros in the first quarter of 2017 (EFAMA, 2017)

One of the main challenges faced by investors is to identify mutual funds that outperform. However, the performance of the vast majority of mutual funds does not persist (see, e.g., Carhart, 1997). According to the Morningstar (2017)[2], 1,000 euros invested in a mutual fund is not worth the same over the years, nor is their growth predictable[3]. Therefore, one of the main challenges of current research is to identify the main variables that affect mutual fund performance. Determinants of mutual fund performance include fund characteristics, e.g. size, age, and flows (see, e.g., Sirri and Tufano, 1998) or country characteristics, e.g. economic development and financial development (Ferreira *et al.*, 2013).

Apart from mutual fund and country characteristics, it is also important to take into account that periods of market distress affect companies, consumers, countries and its taxpayers, but also investors' returns. Thus, it is relevant to study the impact of market

[1] Data available on https://www.statista.com/statistics/630620/number-of-regulated-open-end-funds-worldwide-by-region/
[2] Available on http://www.morningstar.pt/pt/funds/snapshot/snapshot.aspx?id=F0GBR05A1E
[3] See the example of Santander Ações Portugal FIMA in Appendix 3 and Appendix 4.

distress on mutual fund performance, not only to take steps to prevent large fluctuations in investors' returns, but also to understand the impact that can be expected on funds with specific characteristics and domiciled in different countries.

In this paper, we investigate the role of market distress on fund performance, using open-end equity mutual funds from countries around the world.

Our main objective is to test whether the impact of market distress on mutual fund performance is different for funds from countries with mutual fund industries with different levels of competition. To do that, we use a large sample of equity mutual funds domiciled in 34 countries over the period of 1999 to 2015. Our sample includes funds that invest in domestic, foreign, regional and international stocks. Our methodology follows the literature (see, e.g. Ferreira *et al*., 2013, and Fink *et al.*, 2015) and we use four-factor alpha (Carhart, 1997) for measuring risk-adjusted mutual fund performance. Additionally, we create two different variables to proxy for market distress: Cboe Volatility Index (VIX) and Average Return Market (ARM). VIX, which measures the volatility of the financial markets, is one when the Cboe volatility index is above the 75^{th} percentile of distribution, and zero otherwise; whereas ARM is a dummy variable that equals one when the country average return market is below the 25^{th} percentile of distribution, and zero otherwise. We also include in our regressions an extensive list of fund-level variables and our proxies for competition in the mutual fund industry including different country-level variables.

We start by studying the effect of market distress on mutual fund performance. We find that periods of market distress decrease significantly the performance of U.S. funds, the most competitive mutual fund industry in the world, but not the performance of mutual funds outside the U.S.. We move on and interact fund variables with market distress variables, VIX or ARM, for measuring the impact of market distress variables together with fund characteristics on fund performance and we find that fund characteristics also have a bearing on how mutual fund performance reacts to markets distress.

Finally, we test our main hypothesis: countries with more competitive mutual fund industries are expected to present lower performance during recession periods. This is because in more competitive countries, investors are more sophisticated and react more to poor performance (see Ferreira *et al.*, 2013) by selling more heavily their investments. As a consequence, mutual fund managers are led to rebalance their portfolios by selling assets, particularly those with higher risk-taking positions, at distressed or "*fire sale*"

prices and therefore experience severe losses. Coval and Stafford (2007) and Wu (2017) show that "*fire sales*" in mutual funds that experience large outflows lead to a negative stock price pressure: "*…selling by financially distressed mutual funds leads to transaction prices below fundamental value*" (Coval and Stafford, 2007: 510). Also, Massa and Zhang (2012: 1) show that, during the 2007-2009 financial crisis there was a "*…significant jump for both stock illiquidity and fire-sale pressure of foreign stocks*". They argue that if a fund holds domestic stocks (e.g. U.S. stocks) and stocks from foreign companies (e.g. Japanese stocks), and if there is turbulence in its home market, it is likely to result in "*… constrained U.S. funds facing withdrawals at home, also liquidation of their holdings of Japanese stocks, leading to a deterioration of liquidity in the Japanese market*" (Massa and Zhang, 2012: 1).

Overall, our empirical results are according to what we have hypothesized. In more competitive mutual fund industries, those where investors are more sophisticated, fund performance decreases more in periods of market distress.

Our work contributes to the literature in different ways. First, to our knowledge, it is the first to study the impact of market distress on mutual fund performance using such a wide number of countries around the world. Second, it is also the first to study the impact of fund level characteristics to explain differences in performance during periods of market distress. Furthermore, we are the first to try to explain differences in fund performance in periods of market downturn using country-level characteristics. Finally, we add to the literature on international mutual fund performance. Apart from a small number of studies (see, e.g. Ferreira *et al.*, 2013) that use cross-country data, most papers focus on U.S. fund performance.

The remainder of this study is organized as follows. In Section 2 we present the literature review. Section 3 describes the data and variables construction. Section 4 shows our methodology. Section 5 presents our main results and Section 6 the robustness tests. Section 7 concludes.

2. LITERATURE REVIEW

This section presents the literature review and it is divided into three subsections. We first focus on the impact of mutual fund characteristics on fund performance. Second, we present country-level variables that the literature has shown to explain differences in fund performance across countries. Finally, we focus on the literature regarding market distress.

2.1 Fund characteristics

There are many studies trying to analyze the impact of different fund level characteristics on mutual fund performance, including size, family size, age, fees, flow and past performance. However, the results are far from unanimous.

2.1.1. Fund size

Ferreira *et al*. (2013) show that small non-U.S. funds underperform compared to large funds. There are several reasons that could explain why larger funds perform better than small ones: (1) a larger base to spread fixed expenses (Ferreira *et al*., 2013); (2) more investment opportunities available (Ferreira *et al*., 2013); (3) a pool of accessible resources (Ferreira *et al*., 2013); (4) more negotiation power of spreads (Ferreira *et al*., 2013); (5) fewer brokerage commissions (Brennan and Hughes, 1991). On the other hand, according to Ferreira *et al*. (2013), small U.S. funds perform better than large funds, which means that there are diseconomies of scale in the U.S.. Also, Berk and Green (2004) state that, in a perfectly competitive capital market, when the portfolio's fund is bigger, the return to an actively managed fund is lower. Moreover, Berk and Binsbergen (2015) show that small funds perform better. This is because: (1) the managerial skills' effect still exists and makes small funds more active than the index funds (Cremers and Petajisto, 2009); (2) small funds have a lower price impact cost because market participants are focused on large funds behavior (Ferreira *et al*., 2013); (3) there are organizational diseconomies (Ferreira *et al*., 2013); (4) liquidity constraints make it difficult to scale to investment strategy (Ferreira *et al*., 2013); (5) most inflows are not used for diversifying into new assets, but they are used for reinforcing their positions in the same assets (Ferreira *et al*., 2013). Also, according to Chen *et al*. (2004), there is a negative relation between fund performance and fund size in U.S. funds because a

cashflow weighted portfolio of small funds with positive cashflows in the previous quarter consistently beats the market portfolio. Ferreira *et al*. (2013) show that liquidity constraints are the reason for the different relation between size and performance in the U.S. and elsewhere. The main idea is 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*" (Ferreira *et al*., 2013: 36). Contrarily, U.S. mutual funds usually invest in small and domestic stocks, which makes funds face diminishing returns to scale related to liquidity constraints. Some studies (e.g. Reuter and Zitzewitz, 2015) also find that there is no significant relationship between size and fund performance.

2.1.2. Fund family size

Chen *et al*. (2004) argue that small fund families not benefit from substantial economies in trading commissions and lending fees as much as large fund families do. Moreover, research and administrative expenses may be lower because they can allocate some resources to various funds and divide expenses by all the funds (Ferreira *et al*., 2018). Also, there is an advantage to launching new funds because large families can seize the opportunity of economies of scale and scope (Khorana and Servaes, 1999). Therefore, there is a positive relation between fund family size and performance around the world (Ferreira *et al*., 2013). Agnesens (2013) also finds a positive relation between performance and fund family size, stating that funds that belong to large families take advantage of economies of scale. Kempf and Ruenzi (2008) conclude that funds that are in the last positions of a family's funds' ranking receive fewer inflows than those which are at the top of family's funds' ranking. Furthermore, this discrepancy is most notable in large fund families: in large families of U.S. equity funds, funds that reach a top position within the family tend to have more inflows in the next periods.

2.1.3. Fund age

Funds with less longevity have less experience than older funds and may face high initial expenses which will have consequences in mutual funds' performance (Ferreira *et al*., 2013). Besides that, returns and rating of new funds cannot be as reliable as the older ones (Ferreira *et al*., 2013). However, Ferreira *et al*. (2013) conclude that there is no significant relation between fund age and fund performance in the U.S.. On the other hand, outside the U.S., older funds perform worse, according to Ferreira *et al*. (2013),

who show that older non-U.S. funds are less able to detect good investment opportunities than younger funds. Also, Webster and Fok (2002) state that fund age negatively influences fund performance.

2.1.4. Fund fees

Keswani *et al*. (2017) find that the level of fees charged is not the same between countries or within the same country. In detail, when there are differences in the total of assets under management, the amount of fees charged is not the same and also there is not a clear pattern. In some countries, smaller funds charge significantly more fees than larger funds, while in other countries larger funds charge more. There are also countries in which there are not significant differences in the level of fees charged for funds with different size. However, Keswani *et al*. (2017) show that the level of competition in the mutual fund industry determines the level of fees charged, i.e. less competition in the mutual fund industry leads larger funds to charge more. This is because, in less competitive fund industries, investors are less sensitive to fees charged by larger funds.

Ferreira *et al*. (2013) find that there is no significant relation between fees and fund performance. Contrarily, other studies point out differences in performance according to the amount of fees charged. For various authors, the performance increases when lower fees are charged (e.g. Carhart, 1997). Cremer *et al*. (2016) conclude that more active funds, i.e. funds with portfolios that differ more from their correspondent market index, tend to perform better and to charge lower fees and, consequently, improve the competitive structure of the mutual fund market. Also, Sirri and Tufano (1998) argue that fees influence an investor's decision because funds with lower total fees get more flows. On the other hand, Agnesens (2013) shows the opposite. He demonstrates that high fees lead to a high performance, which results in a higher return to investors.

Apart from management fees, some funds also charge loads. This includes front-end or back-end loads or both. According to Ferreira *et al*. (2013) this variable does not have a statistically significant influence in performance. However, other studies (e.g. Carhart, 1997) show that there is an inverse relationship between performance and charged loads, as these discourage redemptions. In other words, when investors have to pay when they want to buy (front-end load) or to sell (back-end load) their participations, it makes them think twice and, hence, it can improve performance because fund managers can invest more in more risky assets instead of saving money for eventual redemptions

(Chordia, 1996). Huang *et al*. (2007), who created proxies for the reduction in participation costs through different fund characteristics, have a different idea. They argue that "*mutual funds with lower participation costs have a higher flow sensitivity to medium performance and a lower flow sensitivity to high performance than their higher-cost peers*" (Huang *et al*., 2007: 1273).

2.1.5. Fund flow

The *smart money effect* (Sapp and Tiwari, 2004) results from mutual funds that receive the most inflows having higher returns in the future (see, e.g., Gruber, 1996; Zheng, 1999). Ferreira *et al*. (2013) find the smart money effect, but only for non-U.S. funds. In particular, Ferreira *et al*. (2013) show that there is a smart money effect outside the U.S., but not in the U.S.. So, there is a positive relation between flows and performance outside the U.S..

There is also a large literature on the relation between flow and performance. Chevalier and Ellison (1997), Sirri and Tufano (1998) and Huang *et al*. (2007) state that there is a convex relation between flow and performance, i.e. investors invest significantly more in high-yielding funds and do not sell with the same intensity funds with the worst returns. In other words, Lynch and Musto (2003) explain that this convexity in the flow-performance relationship comes from the poor response of investors to bad performance because they consider that bad returns do not tell anything about future performance. Contrarily, Kim (2017) states that this convex relationship is not always consistent over time. When there is a high volatility in the markets and less dispersion in fund performance, the sensitivity of flows to funds with a higher performance is low, which makes the shape of the relationship become more linear or even concave. Spiegel and Zhang (2012) sustain that flow and performance have a linear relationship, which means that a good performance attracts more investors and vice versa. Ferreira *et al*. (2013) find that the relation between money flow and performance changes substantially in different countries and that its convexity can be explained by the different level of investors' sophistication, which is measured by economic and financial development.

2.1.6. Past performance (persistence)

According to most literature on mutual fund performance, in the U.S. there is no long-term persistence in performance (see, e.g. Hendricks *et al*., 1993; Brown and

Goetzmann, 1995; Carhart, 1997; Ferreira *et al*., 2018). This means that we cannot predict the future performance looking at past performance. There is, however, evidence of short-term persistence. Ferreira *et al*. (2018) study mutual fund performance outside the U.S. and conclude that, in contrast to what happens with U.S. funds, outside the U.S., there is long-term persistence, particularly in countries where the financial markets are less developed. Berk and Green (2004) also document that there is a convex relationship between new investments and past performance by using variable cost functions for managers, even if there is no persistence in fund performance. They argue that if investors and managers look to past returns, they can learn from them all the managers' abilities and profitable strategies because they defend that "*rational learning and strong response of flows to performance can be consistent with no persistence in performance*" (Berk and Green, 2004: 1271). Ippolito (1992) and Lynch and Musto (2003) share the above idea that changes in fund managers' ability lead to differences in performance persistence. Also, Agnesens (2013) concludes that past performance is a good indicator of future performance. Thus, fund managers have an incentive to beat their opponents in the same market segment because funds that have a higher rank tend to have more inflows. Sirri and Tufano (1998) also agree, but they argue that past performance has a better influence on fund flows when search costs are lower because this attracts investors more easily.

2.1.7. Other fund characteristics

The management structure of the funds is another characteristic that has been shown to determine fund performance. Although the large majority of the funds are managed by teams, i.e. managed by more than one fund manager (Ferreira *et al*., 2013), according to Hornstein and Hounsell (2016), a fund performs better when it is managed by a single manager rather than a team. Also, Berkowitz *et al*. (2017) conclude that funds with large management teams tend to perform worse when compared with funds with small management teams. Furthermore, Chen *et al*. (2004) and Ferreira *et al*. (2013) show that, although management teams can share resources and change opinions, it can be more difficult to implement ideas. That happens because several members of the team might have different points of view about each problem. So, both state that funds with a single manager perform better than funds with a management team.

Jeon *et al*. (2017) examine the importance of determining the skills of mutual fund managers, measuring the imprecision through the standard deviation of various

performance-based signals. They conclude that higher precision means a lower probability of short-term performance's persistence, whether the manager's capacity is positive or negative, because it significantly influences the results, which are measured before costs and through expenditure ratios. However, some authors as Carhart (1997: 57) state that their "… *results do not support the existence of skilled or informed mutual fund manager portfolio manager*". Believing that managers' skills determine fund performance, where are most of them located? Christoffersen and Sarkissian (2009) find that financial centers have more experienced managers who achieve higher gross and risk-adjusted returns on average. For them, performance can be directly affected by fund managers' knowledge and learning opportunities which in turn are influenced positively by city size.

2.2. Country-level variables

It is also important to emphasize that performance is not only related to funds' characteristics, but also to countries' characteristics.

2.2.1. Development and concentration of mutual fund industry

To better understand the development and concentration of mutual fund industry in mutual fund performance in each country, Ferreira *et al*. (2013) study the age of fund industry, the ratio between mutual fund equity and market capitalization, and, to measure industry concentration, the Herfindahl index. Mutual fund industry age corresponds to the number of years since the first open-end fund was sold in the country (Khorana *et al*., 2005). Ferreira *et al*. (2013) conjecture that in older fund industries, the expertise of investors and fund management should be greater, which, consequently, could lead to higher performance, but their results are not significant.

Regarding the second variable, the ratio between mutual fund equity and market capitalization, Ferreira *et al*. (2013) find a negative and statistically significant relation with mutual fund performance. In countries where the relative equity mutual fund industry size is greater, there are fewer unexploited arbitrage opportunities, leading to lower performance.

Finally, the Herfindahl index, which corresponds to the sum of the squared market shares of portfolio management companies for equity funds in each country, has a positive relation with industry concentration. This means that when the Herfindahl index presents

larger values, higher is the industry concentration. Ferreira *et al*. (2013) find that mutual fund industry concentration is positively related with performance.

Kacperczyk *et al*. (2013) argue that there is more concentration during recessions in U.S. equity funds with skilled managers, who demonstrate market timing ability. On the other hand, Goetzmann and Kumar (2008) show that the most concentrated group of individual investors, investors with concentrated portfolios, has a lower return than the most diversified group, investors with diversified portfolios. Hiraki *et al*. (2015) also study the concentration of funds. They divide funds by concentration measures and show that funds with a more concentrated portfolio in a country and more concentrated portfolio in an industry have a higher performance than the most diversified funds because of the existence of global industry private information. Moreover, industry concentration dominates country concentration which means "*...that global industry private information, rather than country-specific knowledge, helps international mutual fund managers deliver higher returns*", according to Hiraki *et al*. (2015: 310). Besides that, the superior performance in cases of concentration of industry portfolio is more prominent among small funds (Hiraki *et al*., 2015).

Mutual fund industry age, the ratio between mutual fund equity and market capitalization, and the Herfindahl index have also been used in different studies to explain differences across countries.

Keswani *et al*. (2017) add to these variables mutual fund industry size, mutual fund industry top 5 share (the share of the top 5 mutual fund companies), and mutual fund industry number of funds. They use these six proxies for competition to study the flow-fee relationship. Their results show that the sensitivity to fees increases with competition. More specifically, "*in more competitive fund industries, funds that increase their TSC suffer significantly higher withdrawals as investors are able to more easily find alternative investment opportunities*" (Keswani *et al*., 2017: 25). On the other hand, when a country faces less competition, there are few investment opportunities and, consequently, the investors become less fee-sensitive (Keswani *et al*., 2017).

Khorana *et al*. (2005) study the size of the mutual fund industry in 56 countries. They conclude that there is a significant difference in the size of the mutual fund industry between countries. In detail, mutual fund industry size is bigger in countries with higher protection to mutual fund investors. Moreover, the size of the mutual fund industry increases with wealthier and stronger educated populations, where the industry is older, when trading costs are smaller and where they give more importance to defined

contribution pension plans. On the other hand, in countries where barriers to entry are higher, they show that mutual fund industries are smaller. Thus, Khorana *et al*. (2005) state that, a combination of demand-side, supply-side, and legal and regulatory factors can explain differences in the size of mutual fund industry across countries.

Keswani *et al*. (2018) study the importance of culture in mutual funds' performance using Hofstede variables. In general, they measure culture using five dimensions as the social psychologist Geert Hofstede defends: uncertainty avoidance, individualism, power distance, masculinity, and long-term orientation. They conclude that national culture has influence in the sensitivity of investor flows to performance (and to fees) and, hence, in fund management industry. In particular, they demonstrate that when there is more individualism, less power distance, uncertainty avoidance, and long-term orientation, the flow-performance relationship is greater.

Cremers *et al*. (2016) use financial sophistication from the World Economic Forum and show that this variable is connected with the demand for low-cost alternatives to achieve beta exposure. This means that more financially sophisticated retail investors are aware that passive funds and active funds can have an equal beta exposure and also that passive funds offer at a lower cost, which makes them prefer passive funds.

Guiso and Jappelli (2008) study whether financial literacy influences portfolio diversification. They conclude that individuals with poor financial literacy attach little or no importance to the benefits of diversification or the risk of the pool of assets in the fund.

2.2.2. Other country-level variables

As with fund variables, there are also more country variables that have been used in mutual fund literature. There are other dimensions that can affect mutual fund performance besides development and concentration of the fund industry. According to Ferreira *et al*. (2013), these dimensions include economic development, financial development, and investor protection and quality of legal institution.

2.2.2.1. Economic development

Ferreira *et al*. (2013) use two variables to study economic development: GDP per capita and "*… the ratio between the number of internet users and the population of a particular country"* (Ferreira *et al*., 2013: 14), but only the second variable explains mutual fund performance. In fact, it is shown that in countries with more internet users

there is superior performance. One reason for that could be because in these countries investors have access to more detailed information which makes investors choose funds with a better performance.

2.2.2.2. Financial development

Ferreira *et al*. (2013) measure the level of financial development through share turnover ratio and country-level trading cost. They show that high trading activity and low trading costs improve mutual funds' performance, which means that the relationship between the level of financial development and mutual funds' performance is positive.

2.2.2.3. Investor protection and quality of legal institutions

To analyze the dimension of the investor protection and quality of legal institutions, Ferreira *et al*. (2013) study three different variables: country's legal origin (common law), anti-director rights, and securities regulation. They conclude that the performance of domestic funds increases when investors are more protected. Ferreira *et al*. (2013) find that both the protection of minority shareholder interests and the quality of securities market regulations have positive influence in the performance of mutual funds. Therefore, "*domestic funds located in countries with stronger legal institutions, better investor protection, and more rigorous law enforcement tend to perform better*", according to Ferreira *et al*. (2013: 36).

2.3. Market distress

Over the years, there have been several episodes of financial market distress, which is equivalent to saying that "*... market liquidity suddenly evaporated, as signaled by disorderly adjustments in asset prices, a sharp increase in the costs of executing transactions and, in the acutest cases, a "seizing up" of markets. In turn, the market disruptions threatened to have serious implications for the financial system more generally and, possibly, the real economy. In several such instances, policymakers intervened in order to restore orderly functioning*" (Borio, 2004: 1).

So, we would assume that the big challenge of mutual fund performance is related to the bad moments because, in the first instance, these are the moments that most probably have a negative effect on fund performance. However, Moskowitz (2000), who studied the period of 1975-1994, and Kosowski (2011), who studied the period of 1962-

2005, argue that during economic crises U.S. equity mutual funds tend to increase their performance at a greater rate than economic recoveries. So, there is a positive relation between U.S. mutual fund risk-adjusted performance and recession periods, according to them. Moskowitz (2000) also adds that active managers can deliver higher returns during market difficulties, even if they do not invest in low beta portfolios. Besides them, Glode (2011), who studied the performance of U.S. funds between 1980 and 2005, also argues that there is a higher performance during periods of economic recession. Moreover, there are also more fees charged to investors because they are willing to pay for insurance. Glode (2011) explains that there is a superior performance in recession periods because it is when investors' marginal utility of consumption increases and, consequently, fund managers will have a greater incentive to generate higher returns. Also, Glode (2011) defends that investors pay more attention to downside risks, even though this means a lower performance in rising markets. So, Moskowitz (2000), Kosowski (2011) and Glode (2011) defend that U.S. mutual funds have a higher performance in recession periods than in non-recession periods.

On the other hand, Lynch and de Souza (2012) and Badrinath and Gubellini (2012) document that there is no constant relation between economic cycles and performance over time. For them, the fund's specific investment style influences this relation. Kacperczyk *et al*. (2013) also defend that fund manager abilities vary over the time and the business cycle. In concrete, they show that it is likely to have a higher performance when fund managers have time-varying skill, which allow them to make good decisions in different periods. In other words, Kacperczyk *et al*. (2013) defend that funds that have superior state-dependent managerial ability can consistently achieve better performance, no matter if we are in a good or bad economic time. Thus, Lynch and de Souza (2012), Badrinath and Gubellini (2012) and Kacperczyk *et al*. (2013) state that the performance-market distress relation is not always the same and depends on other factors.

As we saw, some authors defend that market distress increases fund performance and others believe that the performance in market distress periods can be maintained, if controlling other variables. The study of Fink *et al*. (2015) tries to understand better if all mutual funds managers have a higher performance in periods of market difficulties and, if so, whether managers try hard to outperform or this is easier for them. They conclude that mutual funds do not outperform at an international level. Fink *et al*. (2015) demonstrate that there is lower performance during recession periods, pointing out as a possible reason the persistence on the part of mutual funds managers to take advantage

of large investors' marginal utility of consumption and paying higher fees, thus being damaged by this excessive active trading and high liquidity costs, which in the end makes the performance worse. Furthermore, they study the development of capital markets, mutual fund industry and security regulation laws and show that these have a less negative impact on mutual funds' performance in recession periods. Fink *et al*. (2015) also try to comprehend better fee structures in difficult market times. They document that mutual funds which have higher performance in recession periods do not have a different fee structure and mutual funds in the quintile with the highest recession performance have total fund fees lower than funds in the quintile with the lowest recession performance.

Other authors have been investigating the relation between other variables and bear markets. It is important to refer that Kacpercyk *et al*. (2013) and Chen *et al*. (2004) compute a size-related analysis in line with environment economics. They notice that small funds have higher performance regardless of the economic situation. However, the Chen *et al*. (2004) approach is much simpler because it does not require knowledge of portfolio weights, which is difficult for retail investors to access, especially in real time.

There are also studies that combine flows and economic situation. According to Kacpercyk *et al.* (2013), if a fund has a great performance in non-recessions periods, it can maintain it in recessions periods. Chen *et al*. (2004) show that it is possible to identify these funds through the smart money algorithm, which selects funds based on past flows. This algorithm says that investors should put their money in funds that received large cash inflows in the previous quarter (Berk and Green, 2004) because, if a fund receives positive cash inflows, it is expected to achieve significantly higher risk-adjusted returns than a fund with cash outflow (Gruber, 1996; Zheng, 1999). One possible explanation is given by Berk and Binsbergen (2015) who argue that flows indicate managerial skill, so, after expense, alphas are zero in equilibrium. This happens because the fee should be proportional to the level of gross alpha generated. Thus, a positive alpha after expenses allows managers to charge higher expenses and keep higher returns. Still on this subject, flows are also studied by Ferreira *et al*. (2013) who observe mutual funds whose investor location are not the same as the stock holdings. Contrarily to previous authors, Ferreira *et al*. (2013) conclude that these funds have lower outflows in recession periods and lower inflows in non-recessionary periods.

Another aspect that can help to forecast performance during bear markets is the type of stocks they invest in. Hau and Lai (2012) show that funds with large investments in bank stocks were the most affected by the 2007-2009 financial crisis. They also

investigate if this devaluation had consequences for the other non-financial stocks kept by the funds affected. Although financial stocks only represented 15% of total U.S. stock market value in 2017, the decrease in these stock prices affected more or less 50% of the value of the stocks of a non-financial sector. This impact of such a crisis happens through "*fire sales*". So, as we can see, Hau and Lai (2012: 78) defend there is a "*price contagion from the financial to the non-financial stock market sector based on the strength of their joint fund ownership linkage*". Hau and Lai (2012) also argue that, when non-financial stocks have a high exposure to distressed funds, they present a lower performance in recessions periods.

To conclude, we present Prospect Theory that seems to guide the majority of investors in general, according to Kahneman and Tversky (1979). This theory claims that investors are more negatively influenced by losses than they are positively influenced by a gain of similar magnitude. So, people have preference for a portfolio with skewed or asymmetric performance for having a gain in utility in recessions periods bigger than the loss in utility in non-recession periods compared to other investors.

3. DATA AND VARIABLES CONSTRUCTION

In this study, we investigate whether fund characteristics and the level of countries' development can explain the differences in performance between mutual funds in periods of market distress. We use equity mutual funds which are the most common type of fund corresponding to 40.70% of worldwide regulated open-end funds (see Appendix 5) and they have a higher net asset value compared to the other type of funds, presenting a value of 17,559 billion euros in the first quarter of 2017 (see Appendix 6). The data on mutual funds in our sample is from Lipper Hindsight, which is survivorship-bias free[4]. Moreover, we use quarterly data of open-end actively managed equity funds covering 34 countries (Argentina, Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Ireland, Italy, Japan, Malaysia, Netherlands, New Zealand, Norway, Poland, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, UK, and U.S.) spanning the period 1999 to 2015. Studying this timeframe, we can analyze different periods of market distress.

3.1. Data

Our sample, as mentioned above, is constructed by open-ended actively managed equity mutual funds for the period 1999 to 2015 provided by Lipper Hindsight. The Lipper Hindsight database sometimes includes share classes with the equal manager, equal holdings and equal returns prior to expenses and loads. Thereby, we follow Ferreira *et al*. (2013) to define the sample without multiple counting returns, keeping just the primary share class recognized by the Lipper Hindsight and excluding all the other multiple share classes of the same fund. Furthermore, the Lipper Hindsight classifies funds according to funds' geographic investment styles. This way, there are four types of funds: (1) domestic funds, which correspond to funds that invest in their domiciled country; (2) foreign funds which are the funds that put their money in any country in the world except where the fund is located; (3) region funds, which are the funds that buy stocks from any regions in the world except the region where the fund is located; (4) global funds, which means that the funds invest anywhere. We require mutual funds to

[4] This database has been used by Ferreira *et al.* (2013), by Cremers *et al*. (2016) and by Keswani *et al*. (2017).

have data on TNA (size), TNA family (family size), age, fees, and flows. To calculate fund factor loadings, we use past fund returns. So, we just include mutual funds that had at least three years of reported returns. We have 1,159,245 fund-quarter observations. The final sample is displaying in Table 1, Panel A, Panel B and Panel C, by country as of 2015.

Table 1 - Number, size and percentages of mutual funds by country

This table describes the sample of funds by country at the end of 2015. Panel A shows the number of funds and total net assets (TNA) under management (sum of all share classes in U.S. dollars millions). Panel B shows the weight of all funds, domestic and international funds (foreign funds, region funds and global funds), in each country per type of fund. Panel C reports the percentage of domestic and international funds in each country. Data is from the Lipper Hindsight database. The sample is composed exclusively of open-end and actively managed equity funds.

Panel A – Number and size of mutual funds by country

	All Funds		Domestic Funds		International Funds	
Country	Number of funds	TNA ($ million)	Number of funds	TNA ($ million)	Number of funds	TNA ($ million)
Argentina	59	718	42	698	17	21
Australia	1,364	204,222	696	86,443	668	117,779
Austria	425	30,435	25	3,005	400	27,430
Belgium	435	47,159	28	2,695	407	44,464
Brazil	845	24,384	845	24,384		
Canada	1,992	612,938	694	295,244	1,298	317,694
China	97	17,196	82	15,070	15	2,127
Denmark	206	36,388	25	4,884	181	31,504
Finland	166	30,217	29	5,015	137	25,201
France	1,578	347,578	257	69,417	1,321	278,161
Germany	366	159,133	51	46,953	315	112,180
Greece	56	1,158	25	735	31	423
Hong Kong	112	40,646	13	10,218	99	30,428
India	648	107,185	608	106,910	40	275
Indonesia	55	4,712	55	4,712		
Ireland	1,485	905,360	2	14	1,483	905,345
Italy	116	27,309	21	4,922	95	22,387
Japan	1,253	201,308	598	78,643	655	122,665
Malaysia	239	15,675	139	13,277	100	2,398
Netherlands	98	29,616	11	3,692	87	25,924
New Zealand	56	3,225	13	699	43	2,526
Norway	140	47,950	50	11,280	90	36,670
Poland	117	7,840	59	5,022	58	2,818
Portugal	55	1,729	12	253	43	1,475
Singapore	111	9,843	12	1,328	99	8,515
South Africa	173	23,700	139	18,874	34	4,825
South Korea	1,895	113,104	1,048	90,826	847	22,278
Spain	248	28,389	52	7,246	196	21,143
Sweden	238	140,745	83	56,827	155	83,918
Switzerland	591	292,849	219	123,217	372	169,633
Taiwan	304	13,427	141	6,178	163	7,249
Thailand	230	12,816	162	11,671	68	1,145
UK	1,800	1,223,382	678	498,053	1,122	725,329
U.S.	8,644	34,800,000	5,917	23,200,000	2,727	11,600,000
Non-U.S.	17,553	4,762,336	6,914	1,608,406	10,639	3,153,930
All countries	26,197	39,562,336	12,831	24,808,406	13,366	14,753,930

Relative to the number, there are 26,197 funds reported by the Lipper Hindsight (see Table 1, Panel A) while there are 34,060 funds reported by EFAMA (2017), which

means that our sample covers 77% of the worldwide equity funds in terms of funds' number. In terms of TNA of funds, our sample covers above 99% of the aggregate statistics on mutual funds, which are provided by EFAMA (2017). In detail, according to Lipper Hindsight the total net assets are 39,562,336 million dollars (see Table 1, Panel A) and to EFAMA (2017) are 40,105,786 million of dollars. More specifically, our sample comprises 26,197 funds, where 12,831 are domestic funds and 13,366 are international funds (see Table 1, Panel A). We can also see that there is a total of 24,808,406 million dollars of net assets of domestic funds and a total of 14,753,930 million dollars of net assets of international funds, which makes a total of 39,562,336 million dollars of net assets of all funds (see Table 1, Panel A).

Analyzing together Table 1, Panel A and Panel B, we can notice that the vast

Panel B – Percentage of number and size of all mutual funds, domestic and international, by country

	All Funds		Domestic Funds		International Funds	
Country	% of total funds	% of TNA	% of total domestic funds	% of TNA of domestic funds	% of total international funds	% of TNA of international funds
Argentina	0.23	0.00	0.33	0.00	0.13	0.00
Australia	5.21	0.52	5.42	0.35	5.00	0.80
Austria	1.62	0.08	0.19	0.01	2.99	0.19
Belgium	1.66	0.12	0.22	0.01	3.05	0.30
Brazil	3.23	0.06	6.59	0.10		
Canada	7.60	1.55	5.41	1.19	9.71	2.15
China	0.37	0.04	0.64	0.06	0.11	0.01
Denmark	0.79	0.09	0.19	0.02	1.35	0.21
Finland	0.63	0.08	0.23	0.02	1.02	0.17
France	6.02	0.88	2.00	0.28	9.88	1.89
Germany	1.40	0.40	0.40	0.19	2.36	0.76
Greece	0.21	0.00	0.19	0.00	0.23	0.00
Hong Kong	0.43	0.10	0.10	0.04	0.74	0.21
India	2.47	0.27	4.74	0.43	0.30	0.00
Indonesia	0.21	0.01	0.43	0.02		
Ireland	5.67	2.29	0.02	0.00	11.10	6.14
Italy	0.44	0.07	0.16	0.02	0.71	0.15
Japan	4.78	0.51	4.66	0.32	4.90	0.83
Malaysia	0.91	0.04	1.08	0.05	0.75	0.02
Netherlands	0.37	0.07	0.09	0.01	0.65	0.18
New Zealand	0.21	0.01	0.10	0.00	0.32	0.02
Norway	0.53	0.12	0.39	0.05	0.67	0.25
Poland	0.45	0.02	0.46	0.02	0.43	0.02
Portugal	0.21	0.00	0.09	0.00	0.32	0.01
Singapore	0.42	0.02	0.09	0.01	0.74	0.06
South Africa	0.66	0.06	1.08	0.08	0.25	0.03
South Korea	7.23	0.29	8.17	0.37	6.34	0.15
Spain	0.95	0.07	0.41	0.03	1.47	0.14
Sweden	0.91	0.36	0.65	0.23	1.16	0.57
Switzerland	2.26	0.74	1.71	0.50	2.78	1.15
Taiwan	1.16	0.03	1.10	0.02	1.22	0.05
Thailand	0.88	0.03	1.26	0.05	0.51	0.01
UK	6.87	3.09	5.28	2.01	8.39	4.92
U.S.	33.00	87.96	46.11	93.52	20.40	78.62
Non-U.S.	67.00	12.04	53.89	6.48	79.60	21.38
All countries	100.00	100.00	100.00	100.00	100.00	100.00

majority of funds is domiciled in the U.S., namely 33%, which corresponds to 8,644 funds. This means that non-U.S. funds represent 67%, more specifically 17,553 funds. Canada is the country with more funds after the U.S., namely 7.60% of the funds in our sample are from there, which corresponds to 1,992 funds, followed by South Korea with 7.23% of the funds, which is about 1,895 funds (see Table 1, Panel A and Panel B). On the other hand, Indonesia, Portugal and New Zealand represent just 0.21% of total funds in our sample, which means that they are the countries with fewer funds. Indonesia and Portugal have 55 funds and New Zealand has 56 (see Table 1, Panel A and Panel B). Regarding the TNA, almost all TNA, around 87.96%, is in the U.S., namely 34,800,000 million dollars' worth (see Table 1, Panel A and Panel B). The second and third countries with higher TNA compared to other countries, despite a huge difference from the first one, the U.S., is the UK with a TNA of 1,223,382 million of dollars, which corresponds to 3.09%, and Ireland with a TNA of 905,360 million of dollars, which corresponds to 2.29% (see Table 1, Panel A and Panel B). Contrarily, Argentina, Greece and Portugal have the lower TNA in our sample, namely 718; 1,158 and 1,729 million of dollars, respectively, which corresponds to less than 0.01% (see Table 1, Panel A and Panel B). Generally, only 12.04% of TNA, more specifically 4,762,336 million dollars' worth, belongs to non-U.S. funds. Furthermore, we can also observe in Table 1, Panel B, that all the countries present a superior percentage in a total number of funds relative to the total net assets, except the U.S.. In the U.S., funds have a higher proportion of TNA at around 87.96% for a lower proportion of total number of funds, namely 33%. This means that a large part of funds in the U.S. is bigger than the in the other countries. Analyzing only the domestic funds in our sample, we can notice that almost half of them are from the U.S., namely 46.11% which is equivalent to 5,917 domestic funds (see Table 1, Panel A and Panel B). The remaining domestic funds are outside the USA, namely 53.89% which means 6,914 domestic funds (see Table 1, Panel A and Panel B). South Korea, Brazil and Australia are the countries that own more of the total of domestic funds outside the USA. South Korea has 8.17%, which corresponds to 1,048 domestic funds, Brazil has 6.59%, which corresponds to 845 domestic funds, and Australia has 5.42%, which corresponds to 696 domestic funds (see Table 1, Panel A and Panel B). On the opposite side of the table, we have Ireland with just 0.02% of the domestic funds in our sample, namely two funds (see Table 1, Panel A and Panel B). Also, Netherlands, Portugal and Singapore have almost no domestic funds, presenting only 0.09% of the total of domestic funds in our sample, which corresponds to 11, 12 and 12 domestic funds, respectively (see Table

1, Panel A and Panel B). Regarding TNA of domestic funds, we observe that, once again, the biggest proportion of domestic funds in our sample in terms of size is from U.S. funds, namely 93.52%, which is equivalent to 23,200,000 million dollars' worth of domestic funds (see Table 1, Panel A and Panel B). Thus, only 1,608,406 million dollars' worth of domestic funds are from outside the USA, namely the remaining 6.48% (see Table 1, Panel A and Panel B). Although a huge difference compared to the U.S., there is 2.01%, 1.19% and 0.50% of the TNA of domestic funds in our sample in the UK, Canada and Switzerland respectively, which means that they are the countries with a higher value of domestic funds TNA outside the U.S., corresponding to 498,053; 295,244 and 123,217 million dollars respectively (see Table 1, Panel A and Panel B). The rest of the countries have a percentage of TNA of domestic funds near zero (see Table 1, Panel B). In relation to international funds, we observe that the U.S. present the highest proportion of them in our sample, namely 20.40%, which means that they have 2,727 international funds (see Table 1, Panel A and Panel B). The remaining 79.60% of the international funds are non-U.S. funds corresponding, respectively, to 10,639 international funds (see Table 1, Panel A and Panel B). We can also see in Table 1, Panel A and Panel B, that of this 79.60%, 11.10% are from Ireland (1,483 international funds), 9.88% are from France (1,321 international funds) and 9.71% are from Canada (1,298 international funds). Contrarily, China, Argentina and Greece are the countries that contribute less to our sample in terms of international funds. China has only 15 international funds, which correspond to 0.11%, Argentina has 17 international funds, which correspond to 0.13% and Greece has 31 international funds, which correspond to 0.23% (see Table 1, Panel A and Panel B). Finally, we analyze the TNA of international funds. We can see that 78.62%, namely, 11,600,000 million dollars' worth of TNA of international funds is owned by U.S. funds (see Table 1, Panel A and Panel B). This means that, in our sample, in the rest of the world there is only 3,153,930 million dollars' worth from international funds, which corresponds to 21.38% of all international funds in our sample (see Table 1, Panel A and Panel B). As we show in Table 1, Panel A and Panel B, of this 21.38%, 6.14% belongs to Ireland (905,345 million dollars), 4.92% belong to the UK (725,329 million dollars), 2.15% belongs to Canada (317,694 million dollars), 1.89% belongs to France (278,161 million dollars) and 1.15% to Switzerland (169,633 million dollars). The remaining countries present percentages below 1% (see Table 1, Panel B).

In Table 1, Panel C, we compare domestic and international funds in each country.

Panel C – Percentage of number and size of domestic and international mutual funds in each country

	Domestic Funds		International Funds	
Country	% of total funds in each country	% of fund TNA of each country	% of total funds in each country	% of fund TNA of each country
Argentina	71.19	97.12	28.81	2.88
Australia	51.03	42.33	48.97	57.67
Austria	5.88	9.87	94.12	90.13
Belgium	6.44	5.71	93.56	94.29
Brazil				
Canada	34.84	48.17	65.16	51.83
China	84.54	87.63	15.46	12.37
Denmark	12.14	13.42	87.86	86.58
Finland	17.47	16.60	82.53	83.40
France	16.29	19.97	83.71	80.03
Germany	13.93	29.51	86.07	70.49
Greece	44.64	63.47	55.36	36.53
Hong Kong	11.61	25.14	88.39	74.86
India	93.83	99.74	6.17	0.26
Indonesia				
Ireland	0.13	0.00	99.87	100.00
Italy	18.10	18.02	81.90	81.98
Japan	47.73	39.07	52.27	60.93
Malaysia	58.16	84.70	41.84	15.30
Netherlands	11.22	12.47	88.78	87.53
New Zealand	23.21	21.67	76.79	78.33
Norway	35.71	23.52	64.29	76.48
Poland	50.43	64.06	49.57	35.94
Portugal	21.82	14.66	78.18	85.34
Singapore	10.81	13.49	89.19	86.51
South Africa	80.35	79.64	19.65	20.36
South Korea	55.30	80.30	44.70	19.70
Spain	20.97	25.53	79.03	74.47
Sweden	34.87	40.38	65.13	59.62
Switzerland	37.06	42.08	62.94	57.92
Taiwan	46.38	46.01	53.62	53.99
Thailand	70.43	91.06	29.57	8.94
UK	37.67	40.71	62.33	59.29
U.S.	68.45	66.67	31.55	33.33
Non-U.S.	39.39	33.77	60.61	66.23
All countries	48.98	62.71	51.02	37.29

Analyzing Table 1, Panel C, we can observe that India, China and South Africa are the countries with the highest proportion of domestic funds compared to international funds in terms of number (93.83%, 84.54% and 80.35%, namely) whereas India, Argentina and Thailand have the highest proportion of domestic funds compared to international funds in terms of size (99.74%, 97.12% and 91.06%, respectively). In the case of the U.S., 68.45% of the funds are domestic against 31.55% that are international funds and 66.67% of the TNA are represented by domestic funds whereas 33.33% of total net assets are from international funds (see Table 1, Panel C). On the other hand, outside the U.S., we can see that there are more international funds in number and in value, namely 60.61% funds are international against 39.39% of domestic funds and 66.23% of the TNA are from international funds and 33.77% are from domestic funds (see Table 1,

Panel C). Globally, we can observe that domestic funds and international funds have a similar weight, 48.98% and 51.02%. In terms of size proportion of all countries, 62.71% of total net assets pertains to domestic funds and the remaining 37.29% of total net assets belongs to international funds (see Table 1, Panel C). In addition, Ireland, Austria and Belgium are the countries that own more international funds than domestic funds, namely 99.87%, 94.12% and 93.56%, from the point of view of number (see Table 1, Panel C). Also, Ireland, Belgium and Austria are the countries with the biggest proportion of international funds in terms of size with 100%, 94.29% and 90.13, respectively, according to the available data (see Table 1, Panel C).

3.2. Variables construction

In this subsection, we describe all the variables used in our regressions. The dependent variable is mutual fund performance. Fund-level control variables include size, family size, age, TSC, flows and past performance. Regarding country characteristics, we have considered the following variables: mutual fund industry age (MFI age), mutual fund industry size (MFI size), the number of funds in the mutual fund industry (MFI number of funds), the number of mutual fund companies in the country (MFI number of companies), the mutual fund industry Herfindahl (MFI Herfindahl), mutual fund industry top 5 share (MFI top 5 share), individualism index, based on Hofstede index (individualism – Hofstede), financial sophistication and financial literacy.

3.2.1. Mutual fund performance

Mutual fund performance is measured using four-factor alpha (Carhart, 1997).[5] Our quarterly four-factor alpha are calculated following Ferreira *et al*. (2013).

The CAPM model assumes that the return is explained by the market factor. It considers the rate of return of a risk-free asset and the market risk premium, which varies proportionally to the systematic/market risk; in other words, varies with the risk that cannot be eliminated with portfolio diversification. Thus, this model allows measuring the volatility of a security or portfolio in relation to the market. The three-factor model of Fama and French (1992) adds to CAPM two new factors: SMB (Small Market Equity Minus Big Market Equity) that "… *is the average return on the small-capitalization portfolio minus the average return on the large-capitalization portfolio on the fund's*

[5] We also run our main tests using raw returns, benchmark-adjusted returns and one-factor alpha in our robustness tests.

investment region" (Ferreira *et al*., 2017: 14) and HML (High B/M Equity Minus Low B/M Equity) that "…*is the difference in return between the portfolio with high book-to-market stocks and the portfolio with low book-to-market stocks on the fund's investment region*" (Ferreira *et al*., 2017: 14). Finally, the four-factor model of Carhart (1997) adds to the three-factor model of Fama and French (1992), the MOM factor (Momentum), which derives from the evidence that through past stock returns it is possible to obtain a higher return (Jegadeesh and Titman, 1993). In other words, MOM is the difference between the return of the best and the worst portfolio of the previous year, showing that it is possible to benefit both from the sale of stocks whose value has recently increased and from the purchase of stocks that have lost much value recently, because the market tends to equilibrium. The following equation shows four-factor model of Carhart (1997):

$$\alpha_i = R_{it} - (\beta_{0i} RM_t + \beta_{1i} SMB_t + \beta_{2i} HML_t + \beta_{3i} MOM_t + \varepsilon) \quad (1)$$

Where:

α_i: is the excess of return according to benchmark index and risk-free adjusted with four factors;

β_i: are the loadings on each factor;

R_{it}: is the realized return of fund *i* in month *t*;

RM_t: is the expected return by investors according to the risk of fund at the end of the month *t*;

SMB_t: is the difference between the average return of the three smaller and bigger portfolios according to their market equity at the end of the year *t*;

HML_t: is the difference between the average return of two portfolios with the highest and lowest ratio B/M at the end of the year *t*;

MOM_t: is the difference between the portfolio with the higher return in the past 12 months and the portfolio with the lower return in the past 12 months of the year *t*;

ε: is a generic error term that is not correlated with any of the independent variables.

All our factors were downloaded from AQR[6]. To compute the Jensen alpha, we use the previous 36 months of funds' excess return per month in the market where the fund is domiciled if it is a domestic fund or in the region market where the fund invests in the case of international funds or even a global market factor if it is a global fund that

[6] Available on https://www.aqr.com/Insights/Datasets

invests all over the world. We compare this with the realized return to obtain the Jensen alpha. We then compound the monthly alphas in order to calculate quarterly alphas. We do likewise when calculating four-factor alphas, except that we use the four factors above mentioned. Table 2 presents descriptive statistics by country for our four-factor alphas.

Table 2 - Descriptive statistics of four-factor alpha

This table reports descriptive statistics of mutual fund performance measured using four-factor model (Carhart, 1997), including mean, standard deviation, median, percentile 10 and percentile 90, R^2, and the number of observations.

Country	Mean	Standard deviation	Median	p10	p90	R^2	Number of observations
Argentina	-1.22	10.17	-2.23	-14.64	15.79	0.61	2,621
Australia	-0.45	6.13	-0.80	-7.67	6.90	0.79	45,286
Austria	-0.78	4.62	-0.79	-5.80	4.19	0.81	20,529
Belgium	-0.49	4.32	-0.51	-5.39	4.34	0.76	23,421
Brazil	-3.03	8.44	-3.97	-13.34	9.05	0.68	22,423
Canada	-0.71	4.60	-0.75	-5.75	3.99	0.85	76,958
China	2.05	11.67	1.33	-15.32	18.31	0.31	1,536
Denmark	0.06	4.73	-0.24	-5.02	5.49	0.83	10,236
Finland	-0.15	5.39	-0.39	-6.05	6.20	0.83	8,697
France	-0.63	3.93	-0.76	-4.70	3.67	0.88	76,933
Germany	-0.69	3.80	-0.75	-4.83	3.58	0.88	19,569
Greece	-1.78	7.64	-1.57	-11.84	8.67	0.79	1,678
Hong Kong	0.29	6.27	-0.16	-7.11	8.05	0.73	4,014
India	1.52	9.54	2.03	-11.93	14.35	0.55	19,986
Indonesia	0.00	10.38	-0.38	-14.37	17.22	0.48	1,643
Ireland	-0.46	4.32	-0.52	-5.13	4.21	0.84	50,146
Italy	-0.84	3.15	-0.93	-4.11	2.47	0.9	10,190
Japan	-0.63	5.56	-0.84	-7.10	5.94	0.74	51,633
Malaysia	0.18	6.17	0.14	-7.82	8.25	0.57	8,021
Netherlands	-0.24	4.52	-0.34	-5.02	4.92	0.83	5,783
New Zealand	0.07	6.23	-0.40	-7.25	8.45	0.77	1,288
Norway	-0.19	5.27	-0.36	-6.25	6.03	0.84	8,772
Poland	-1.83	7.38	-1.56	-11.96	7.77	0.74	3,356
Portugal	-0.88	5.42	-1.31	-7.28	5.92	0.81	3,053
Singapore	0.04	5.55	-0.32	-6.23	6.82	0.75	6,659
South Africa	-0.59	6.55	-0.44	-8.80	6.62	0.72	5,777
South Korea	-0.92	7.19	-0.53	-10.68	7.43	0.64	41,785
Spain	-0.87	4.43	-0.98	-5.91	4.32	0.87	16,696
Sweden	0.44	5.08	-0.12	-4.80	7.05	0.84	15,172
Switzerland	-0.30	4.02	-0.27	-4.51	4.16	0.85	18,465
Taiwan	0.28	7.12	0.07	-8.44	9.23	0.56	12,164
Thailand	-0.37	8.43	-0.60	-13.11	11.04	0.55	7,305
UK	-0.04	4.14	-0.18	-4.38	4.66	0.84	67,854
U.S.	-0.34	3.92	-0.33	-4.37	3.55	0.88	491,228
Non-U.S.	-0.40	6.13	-0.59	-7.96	7.43	0.74	669,649
All countries	-0.40	6.06	-0.58	-7.85	7.31	0.74	1,160,877

It also includes the R^2 from the four-factor regressions and the number of observations by country. The R^2 in Table 2 confirms the goodness of fit of the four-factor model of Carhart (1997) in the different countries in our sample. More specifically, the variation in mutual fund performance of all countries and non-U.S. is, on average, explained by the model in 74%. Furthermore, in the case of the USA, 88% of the variation in U.S. mutual fund performance is explained by the model.

From Table 2 we can also see that 42.32% of the observations correspond to the U.S., namely there are 491,228 of 1,160,877, which means that there are 669,649 observations outside the U.S. in our sample. Canada and France have roughly 76,900 observations, more specifically, 76,958 and 76,933 observations, which makes them the countries with most observations in our sample outside the U.S.. On the other hand, we have New Zealand with just 1,288 observations, China with 1,536 and Indonesia with 1,643. Secondly, we can see that the average four-factor alpha across countries is -0.40% with a standard deviation of 6.06%. Excluding the U.S., the average four-factor alpha is also -0.40% with a standard deviation of 6.13%. The country with the greatest average alpha is China, with 2.05%, followed by 1.52% in India, and 0.44% in Sweden. The country with lowest average alpha is Brazil with -3.03%, followed by Poland, -1.83%, and Greece with an average alpha of -1.78%. The median four-factor alpha is -0.58% for all countries in our sample and -0.59% for non-U.S.. In other words, 50% of the observations have a performance inferior to -0.58%. Only Taiwan (0.07%), Malaysia (0.14%), China (1.33%) and India (2.03%) have a positive median, meaning that 50% of their observations outperform the market. The remaining countries present a mostly negative performance. The percentile 10 of the performance of the countries in our sample is on average -7.85% and the percentile 90 of the performance of the countries in our sample is on average 7.31%.

3.2.2. Market distress

Our main explanatory variable is market distress. We define market distress by creating two different variables, following Ferreira *et al*. (2013), for the first one, and Keswani *et al*. (2017) for the second one. Therefore, our variables are:

(1) Cboe Volatility Index (VIX): a dummy variable that assumes the value one when the Chicago Board Options Exchange (Cboe)[7] volatility index is above the 75th percentile of distribution and zero otherwise;

(2) Average Return Market (ARM): a dummy variable that takes the value one when the country average return market is below the 25th percentile of distribution and zero otherwise.

[7] One of the world's largest exchange holding companies with contracts focusing on individual equities, indexes, and interest rates.

The literature presents alternative gauges to measuring market distress. Fink *et al.* (2015) use The National Bureau of Economic Research (NBER). However, the available data do not cover all the period of our sample (from 1999 to 2015). There is just data for NBER[8] until 20th September 2010. Other studies (e.g., Nofsinger and Varma, 2014) use S&P 500® Index. Our decision to use VIX is because it "*…is [also] based on options of the S&P 500® Index, [and is] considered the leading indicator of the broad U.S. stock market*" *(*Cboe Global Markets, 2016)[9]. Also, VIX is a benchmark index that measures the market's expectation of future volatility and "*…is recognized as the world's premier gauge of U.S. equity market volatility"* (Cboe Global Markets, 2016). Moreover, to enrich and support our results, we also include in our tests an alternative variable: ARM. This variable is the average market return in the fund investment region in each year of our sample period (Keswani *et al*., 2017).

In the Table 3, Panel A and B, we can observe the mean of our market distress proxy by ARM, per country and by VIX, per year, respectively. We can see that Greece, Brazil and Japan present a lower average return market, namely -0.95%, -0.60% and 1.44%. On the other hand, Norway, Thailand and Sweden have a higher average returns market: 3.91%, 3.17% and 2.98%. Table 3, Panel B, shows that on average 2008 and 2009, the years when we find more volatility in financial markets, present a mean of 32.62 and 31.65, respectively. Contrarily, 2005 and 2006 have on average less volatility in their markets with a mean around 12.80.

[8] Data available on NBER – U.S. Business Cycle Expansions and Contractions. http://www.nber.org/cycles.html (acceded on 26th June 2018).
[9] Available on http://www.cboe.com/vix

Table 3 – Market distress variables

Table 3, Panel A, shows means of ARM by country-year for the period 1999-2015, whereas Panel B shows means of VIX by year. For further details about the variables, see Appendix 7.

Panel A – Means of ARM by country

Country	ARM (%)
Argentina	1.90
Australia	1.84
Austria	1.96
Belgium	2.85
Brazil	-0.60
Canada	2.03
China	1.63
Denmark	2.76
Finland	1.99
France	2.44
Germany	2.79
Greece	-0.95
Hong Kong	2.14
India	2.47
Indonesia	2.39
Ireland	2.21
Italy	2.38
Japan	1.44
Malaysia	2.26
Netherlands	2.84
New Zealand	2.03
Norway	3.91
Poland	1.98
Portugal	1.65
Singapore	2.68
South Africa	1.80
South Korea	1.58
Spain	2.19
Sweden	2.98
Switzerland	2.44
Taiwan	2.60
Thailand	3.17
UK	2.14
U.S.	1.96
Non-U.S.	2.12
All countries	1.94

Panel B – Means of VIX by year

Date	VIX
1999	24.41
2000	23.32
2001	25.74
2002	27.20
2003	21.94
2004	15.50
2005	12.81
2006	12.80
2007	17.48
2008	32.62
2009	31.65
2010	22.54
2011	24.15
2012	17.80
2013	14.22
2014	14.18
2015	16.66

3.2.3. Fund size

Fund size is given by the total net asset value (TNA) in millions of U.S. dollars. Table 4, Panel A, presents summary statistics for our fund-level control variables, and shows that the largest funds are in the U.S. with an average size of 2,476 million dollars, China, with an average size of 527 million dollars and UK with an average size of 510 million dollars. By contrast, the smallest funds are from Thailand, Portugal and Taiwan with an average TNA of 37, 41 and 56 million of dollars, respectively.

3.2.4. Fund family size

Fund family size is measured by the total net assets in millions of U.S. dollars of total equity funds in the same management company excluding the own fund TNA. According to Table 4, Panel A, we observe that U.S. funds are managed by the largest families, with an average TNA of 75,878 million of dollars, followed by Switzerland with 17,407 million of dollars, and Japan with 16,888 million of dollars. At the bottom, Greece, Portugal, and Indonesia are the countries where fund families have on average lower assets under management.

Table 4 – Mutual fund characteristics

This table reports in Panel A the means of fund level variables by country for open-end actively managed equity funds for the 1999-2015 period. Standard deviations across all funds and for non-U.S. funds are presented in parentheses. Panel B exhibits pairwise correlations for fund characteristics. T-statistics are presented in parentheses. For further details about variables, see Appendix 7.

Panel A – Means of mutual fund characteristics by country

Country	Size ($ million)	Family size ($ million)	Age (years)	TSC (% quarter)	Flows (% quarter)	SMB	HML
Argentina	11	46	10.56	3.02	-0.88	0.33	0.01
Australia	176	4,758	9.87	1.76	-1.06	-0.09	-0.05
Austria	81	1,785	9.62	2.73	-0.37	0.18	-0.11
Belgium	87	11,402	8.62	2.24	-2.74	-0.08	-0.08
Brazil	81	4,342	8.03	1.83	-1.78	0.22	-0.26
Canada	298	14,480	10.56	3.38	0.43	0.03	-0.04
China	527	2,899	6.07	1.81	-4.98	0.37	0.12
Denmark	136	2,544	11.69	1.81	0.53	0.09	-0.13
Finland	135	2,880	9.03	1.99	1.82	0.18	-0.13
France	199	7,453	11.56	2.30	-0.38	0.04	-0.05
Germany	344	13,033	13.54	2.38	-1.50	0.04	-0.12
Greece	59	277	11.53	3.81	0.38	0.14	0.32
Hong Kong	255	3,737	12.19	2.19	0.63	0.02	-0.14
India	125	1,954	7.77	2.43	-0.23	0.05	-0.68
Indonesia	91	394	8.37	3.52	3.58	0.33	-0.03
Ireland	457	6,497	7.85	2.32	-0.77	0.08	-0.08
Italy	230	3,563	10.95	2.67	-1.53	-0.06	-0.06
Japan	129	16,888	9.34	1.87	-1.70	0.15	0.01
Malaysia	56	1,904	10.36	2.79	-1.69	0.21	0.12
Netherlands	325	4,171	13.59	1.37	-0.84	0.07	-0.09
New Zealand	61	557	11.43	1.66	-0.19	0.11	-0.11
Norway	214	3,213	11.53	1.66	0.75	0.15	0.00
Poland	108	483	7.29	4.00	3.67	-0.05	0.30
Portugal	41	310	11.26	2.22	-1.09	0.11	-0.10
Singapore	66	891	10.43	2.87	-1.47	0.08	-0.18
South Africa	144	1,604	10.79	1.98	0.67	0.01	-0.26
South Korea	77	3,570	6.57	1.83	-6.17	0.33	-0.02
Spain	66	1,451	10.46	2.16	0.81	-0.18	0.06
Sweden	362	12,842	12.90	1.40	1.40	0.01	-0.17
Switzerland	382	17,407	10.13	1.52	-1.12	0.06	-0.10
Taiwan	56	1,179	10.05	3.54	-1.60	0.46	-0.40
Thailand	37	710	9.22	1.79	-0.95	0.33	-0.17
UK	510	10,485	14.02	2.01	-0.18	0.20	-0.09
U.S.	2,476	75,878	10.61	1.70	0.35	0.16	-0.03
Non-U.S.	180	4,840	10.22	2.33	-0.56	0.12	-0.08
	(118)	(4,056)	(1.54)	(0.56)	(1.35)	(0.12)	(0.11)
All Countries	247	6,929	10.23	2.31	-0.54	0.12	-0.08
	(204)	(6,912)	(1.51)	(0.55)	(1.34)	(0.12)	(0.11)

3.2.5. Fund age

The variable age corresponds to the total number of years since the inception date, in other words, the number of years since the fund was launched, according to the Lipper Hindsight database. Table 4, Panel A, shows that China is the country with the youngest funds. The average age of the Chinese funds is six years. Germany, Netherlands, and the UK are the countries with older funds (approximately 14 years). The average fund age of all countries in our samples is around 10 years with a standard deviation of 1.51 years.

3.2.6. Fund fees: TSC

We follow Khorana *et al*. (2009) and Keswani *et al*. (2017) and measure fees as total shareholder costs (TSC), computed as follows:

$$TSC_t = \frac{total\ expense\ ratio_t + loads_t}{investor's\ \text{average}\ holding\ period} \quad (2)$$

Where:

$Total\ expense\ ratio$: is the total annual expenses as a fraction of TNA (we use management fees when the total expense ratio is not available);
$Loads$: is the sum of front-end loads and back-end loads;
$Investor's$ average $holding\ period$: is the average period that investors hold mutual funds, which the literature has shown to be 5 years.

Panel A of Table 4 shows that Greece, Poland and Taiwan have the highest average TSC, around 4%. The lowest average TSC are from Netherlands with 1.37%, Sweden with 1.40%, and Switzerland with 1.52%. The U.S. presents an average TSC of 1.70%, which is below the average TSC of the non-U.S. countries of 2.33%. Overall, all countries in our samples present an average TSC of 2.31%. We winsorize flows at the bottom and top 1% level of the distribution.

3.2.7. Fund flow

We compute quarterly fund flows for the funds in our sample. Following Chevalier and Ellison (1997), Sirri and Tufano (1998) and others, we use the net growth in TNA stemming from the new external money to calculate the flow. In other words, the fund flow corresponds to "*…the percentage growth in total assets under management (in local currency) of the fund between the beginning and the end of quarter t, net of internal growth (assuming reinvestment of dividends and distributions)*" (Ferreira *et al*., 2017: 10). Thereby, fund flow for fund *i* in country *c* at quarter *t* is given by:

$$Flow_{i,c,t} = \frac{TNA_{i,c,t} - TNA_{i,c,t-1} * \left(1 + R_{i,c,t}\right)}{TNA_{i,c,t-1}} \quad (3)$$

Where:

$TNA_{i,c,t}$: is the total net asset value in local currency of fund *i* in country *c* at the end of quarter *t*;

$TNA_{i,c,t-1}$: is the total net asset value in local currency of fund *i* in country *c* at the beginning of quarter *t*;

$R_{i,c,t}$: is the raw return of fund *i* of country *c* at the end of quarter *t*.

We winsorize flows at the bottom and top 1% level of the distribution. From Table 4, Panel A, we can see that there is a discrepancy between countries in terms of the flow. South Korea presents on average large outflows (-6.17%). The same happens in China and Belgium with, on average, -4.98% and -2.74% of flows, respectively. Poland as well as Indonesia are the countries that get more flows, presenting a percentage per quarter of, on average, 3.67% and 3.58%. The average flow is -0.54% per quarter for our whole sample with a standard deviation of 1.34%. When we exclude the U.S., the average flow is -0.56% per quarter with standard deviation of 1.35%. There are 22 out of 34 countries with a negative flow.

3.2.8. SMB and HML loadings

Taiwan and China are the countries that have a higher loading on SMB (see Table 4, Panel A). More specifically, Taiwan presents an average loading of 0.46, and China an average loading of 0.37. The average loading in the U.S. is 0.16. Contrarily, Spain, Australia and Belgium show, on average, a negative SMB, of -0.18, -0.09, and -0.08.

Regarding HML, we observe that there Greece and Poland, with an average of 0.32 and 0.30, respectively, are the countries that load more on HML. Contrarily, India, Taiwan, Brazil and South Africa show, on average, a lower loading on HML. More specifically, the average loading on HML for these countries is -0.68 for India, -0.40 for Taiwan and -0.26 for Brazil and South Africa. The U.S. also presents a negative HML, namely -0.03. On average, the HML of all countries in our sample is -0.08 with standard deviation of 0.11.

Table 4, Panel B, shows the pairwise correlation matrix between fund-level characteristics. We can observe that there is a relatively high correlation between size and family size (0.4975), which is comparable with the numbers in the literature. The remaining variables present a statistically significant correlation inferior to 0.30. So, it is shown that in general there is not a strong correlation between our variables. Therefore, we can include all these variables together in our regressions.

Panel B – Pairwise correlation of mutual fund characteristics

	Size	Family size	Age	TSC	Flows	Past performance	SMB	HML
Size	1							
Family size	0.4975*	1						
	(0.00)							
Age	0.0564*	0.0513*	1					
	(0.00)	(0.00)						
TSC	-0.0746*	-0.0955*	0.0624*	1				
	(0.00)	(0.00)	(0.00)					
Flows	0.007*	0.0181*	-0.0339*	-0.0097*	1			
	(0.00)	(0.00)	(0.00)	(0.00)				
Past performance	0.0092*	0.0138*	0.0072*	-0.012*	0.0715*	1		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)			
SMB	-0.0509*	-0.0224*	-0.0321*	-0.0255*	-0.0121*	-0.0151*	1	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		
HML	0.0058*	0.0062*	0.0195*	-0.0092*	0.016*	-0.0193*	-0.1751*	1
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

3.2.9. Country-level variables

We also incorporate in our model a number of country-level variables in order to explain differences between each variable of market distress and performance across countries. To this end, we select a set of variables to proxy for mutual fund industry competition. As mentioned before, these variables include: mutual fund industry age (MFI age); mutual fund industry size (MFI size); the number of funds in the mutual fund industry (MFI number of funds); the number of mutual fund companies in the country (MFI number of companies); mutual fund industry Herfindahl index (MFI Herfindahl); the percentage of assets managed by the five biggest mutual fund management companies in the industry (MFI top 5 share); individualism index, based on Hofstede index (individualism - Hofstede); financial sophistication; and financial literacy.

Table 5, Panel A, shows means for each country-level variable for the different countries.

Table 5 – Country variables

The table below presents the means of country characteristics by country. The standard deviations are shown in parentheses. See Appendix 7 for variables definitions.

Country	MFI age (years)	MFI size ($ million)	MFI number of funds	MFI number of companies	MFI Herfindahl	MFI top 5 share (%)	Individualism - Hofstede (%)	Financial sophistication	Financial literacy (%)
Argentina	51	624	63	27	0.12	64.83	46	3.90	28
Australia	46	197,309	1,521	137	0.04	37.13	90	6.28	64
Austria	54	17,954	342	23	0.13	66.17	55	5.60	53
Belgium	63	37,566	653	24	0.30	87.08	75	5.80	55
Brazil	55	81,488	1,545	159	0.09	53.89	38	5.40	35
Canada	78	322,497	1,597	164	0.06	44.61	80	6.26	68
China	12	81,082	308	55	0.08	53.49	20	3.20	28
Denmark	47	31,749	252	40	0.11	62.64	74	5.95	71
Finland	23	27,286	227	22	0.17	77.16	63	5.96	63
France	46	274,347	1,819	225	0.05	40.74	71	5.92	52
Germany	60	153,319	532	43	0.16	82.07	67	6.08	66
Greece	42	2,100	53	14	0.21	82.96	35	4.64	45
Hong Kong	51	46,157	163	35	0.13	72.17	25	6.47	43
India	47	35,403	363	36	0.10	61.38	48	5.13	24
Indonesia	15	6,037	99	41	0.21	79.15	14	3.56	32
Ireland	37	321,063	1,087	216	0.08	46.62	70	6.09	55
Italy	25	57,500	291	46	0.12	64.07	76	4.30	37
Japan	45	241,866	1,695	65	0.11	64.07	46	5.18	43
Malaysia	52	14,065	268	32	0.37	82.44	26	5.30	36
Netherlands	80	43,760	178	35	0.15	78.02	80	6.14	66
New Zealand	53	4,059	107	23	0.34	85.41	79	5.60	61
Norway	16	35,543	199	23	0.18	81.06	69	5.63	71
Poland	19	10,517	149	28	0.13	67.92	60	4.07	42
Portugal	23	2,936	69	15	0.18	84.59	27	5.37	26
Singapore	50	10,782	170	26	0.11	62.37	20	6.07	59
South Africa	46	26,200	231	37	0.09	60.29	65	5.97	42
South Korea	43	58,678	1,075	53	0.10	59.96	18	5.11	33
Spain	51	25,573	428	66	0.10	62.42	51	5.51	49
Sweden	51	104,887	347	49	0.17	71.55	71	6.16	71
Switzerland	73	127,513	449	41	0.19	81.67	68	6.68	57
Taiwan	26	21,747	342	38	0.09	51.76	17	4.74	37
Thailand	16	9,348	271	19	0.12	67.01	20	4.70	27
UK	76	586,313	1,369	174	0.03	29.85	89	6.71	67
U.S.	84	5,337,899	4,197	609	0.05	44.53	91	6.41	57
Non-U.S.	45	91,432	553	62	0.14	65.65	53	5.44	49
	(15)	(330,201)	(586)	(67)	(0.06)	(12.11)	(21)	(0.7)	(13)
All countries	66	2,378,996	2,405	324	0.08	50.35	75	6.08	55
	(14)	(91,286)	(447)	(43)	(0.06)	(11.88)	(21)	(0.7)	(13)

In this table, we can see that the average mutual fund industry age is 66 years with standard deviation of 14 for all the countries presented in our sample. Excluding the U.S., the average mutual fund industry age is 45 years with a standard deviation of 15. The U.S. is the oldest mutual fund industry in the world with 84 years, followed by Netherlands and Canada, with 80 years and 78 years, respectively. The youngest mutual fund industry in our sample is China with 12 years. Regarding the average total net assets of mutual fund industry of our data is 2,378,996 million dollars with a standard deviation of 91,286 million dollars. The U.S. is by far the country where the mutual fund industry has the greatest total net assets under management, namely, 5,337,899 million dollars. The UK is the second largest mutual fund industry, but with a significant difference from the U.S. The UK has total net assets of 586,313 million dollars. Canada is the third biggest mutual funds industry owning total net assets of 322,497 million dollars. Contrarily, Argentina together with Greece and Portugal lie at the end of the table reporting only 624, 2,100 and 2,936 million dollars of total net assets, respectively. These three countries, Argentina, Greece and Portugal, are also the ones who have a smaller number of funds in the mutual funds industry. Greece has only 53 funds in the mutual funds industry, Argentina has 63, and Portugal 69 funds. Relative to the biggest number of funds in the mutual fund industry of each country and also to the biggest number of mutual fund companies in each country, we observe that once again, the U.S. leads with 4,197 and 609, on average. Subsequently, France has, on average, 1,819 funds in the mutual funds industry and 225 mutual funds companies in the country. Regarding to the number of companies in the mutual fund industry, we report that Greece, Portugal and Thailand have fewer companies in their mutual fund industry compared to other countries. Greece only has, on average, 14 companies in the mutual fund industry, Portugal has, on average, 15 and Thailand has, on average, 19. Overall, there are, on average, 2,405 funds with a standard deviation of 447, and there are, on average, 324 mutual funds companies with standard deviation of 43. When we exclude the U.S., the average decreases drastically to 553 funds with a standard deviation of 586 in the mutual funds industry in each country and for 62 mutual funds companies with a standard deviation of 67.

In contrast to the previous variables, for mutual fund industry Herfindahl index and mutual fund industry top 5 share, higher values mean lower competition in the country. Analyzing the Herfindahl index, we conclude that the UK (0.03), Australia (0.04), France (0.05) and U.S. (0.05) are the countries with the most competitive mutual fund industries in our sample. The least competitive mutual fund industries are Malaysia

(0.37), New Zealand (0.34), and Belgium (0.30). Overall, the mean Herfindahl index across all countries in our sample is 0.08 with a standard deviation of 0.06. When excluding the U.S., the mean is 0.14 with a standard deviation 0.06.

Using mutual fund industry top 5 share instead of Herfindahl index as a proxy for competition, we find that the more competitive countries remain the same, namely the UK (29.85), Australia (37.13), France (40.74) and the U.S. (44.53). However, there is a slight difference in the less competitive mutual fund industries. Belgium (87.08), New Zealand (85.41), and Portugal (84.59) are the least competitive countries. The mean of all countries in our samples is 50.35 with a standard deviation of 11.88.

Individualism index is based on Hofstede index. The average individualism index for all countries of our samples is 75 with a standard deviation of 21. The individualism index is 91 in the U.S., 90 in Australia, and 89 in the UK, the countries where investors are more individualistic. The lowest indexes belong to Indonesia (14), Taiwan (17), and South Korea (18).

Another proxy for competition in the fund industry is investor's financial sophistication. To measure it, we follow Cremers *et al*. (2016), who used the question "*The level of sophistication of financial markets is higher than international norms*" from the World Economic Forum in the annual Global Competitiveness Report of 2015[10] to create the financial sophistication variable. This variable is near 1 when the level of sophistication is lower than international norms and near 7 when it is higher than international norms. Thus, the average financial sophistication for all countries in our sample is 6.08 with a standard deviation of 0.7, and 5.44 with standard deviation of 0.7 for non-U.S. countries. The highest values are 6.71 for the UK, 6.68 for Switzerland and 6.47 for Hong Kong whereas the lowest ones are on average 3.20 for China, 3.56 for Indonesia and 3.90 for Argentina. In the U.S., the financial sophistication is on average 6.41.

Finally, we use the country-level variable financial literacy based on Klapper *et al.* (2015). The level of financial literacy is determined by country based on the results of four questions presented in the S&P Global FinLit Survey[11]. These questions aim to test some main concepts of financial decision-making, namely about the knowledge of risk diversification, inflation, interest rates and interest compounding. The average for all

[10] Available on http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf
[11] Available on http://gflec.org/wp-content/uploads/2015/11/Finlit_paper_16_F2_singles.pdf

countries in our sample is 55% with a standard deviation of 13. Going through the data, we find that 71% of adults are financially literate in Denmark, Norway, and Sweden. These countries are the most financially literate of our sample. On the other hand, in India and in Portugal only 24% and 26%, respectively, of adults are financially literate, which means that these are the countries with lower score in our sample.

4. METHODOLOGY

Our regressions aim to determine whether there are differences in mutual fund performance in periods of market distress. In particular, we run panel data regressions, where we regress quarterly fund performance, measure by four-factor alpha on our proxies for market distress, VIX or ARM. We also include fund characteristics, described in Section 2.1., to control for differences between funds, namely, size, family size, age, TSC, flows and past performance. Consequently, our first regression has the following configuration:

$$Performance_{i,t} = \beta_0 + \beta_1 * Dummy\ market\ distress_{i,t-1} + \beta_2 * Fund\ control\ variable_{i,t-1} + \varepsilon \quad (4)$$

Where:

$Dummy\ market\ distress$: is VIX or ARM;
$Fund\ control\ variables$: are size, family size, age, TSC, flows and past performance;
t: is quarter t;
i: is fund i;
ε: is generic error term that is not correlated with any of the independent variables.

This regression is computed for all countries, for the U.S. and for non-U.S. funds. We also include time, geographic, and fund type fixed effects. Additionally, we include country fixed effects when countries are pooled. The standard errors are clustered by fund.

We also want to analyze the role of market distress in fund characteristics. To further examine this, we run a similar regression where we also interact each one of our market distress variables, VIX or ARM, with fund control variables. Thus, our second regression, is described in the below equation:

$$Performance_{i,t} = \beta_0 + \beta_1 * dummy\ market\ distress_{i,t-1} + \beta_2 * fund\ control\ variables_{i,t-1} + \beta_3 * dummy\ market\ distress_{i,t-1} * fund\ control\ variables_{i,t-1} + \varepsilon \quad (5)$$

Where:

$Dummy\ market\ distress$: is VIX or ARM;

$Fund\ control\ variabiles$: are size, family size, age, TSC, flows and past performance;

t: is quarter *t*;

i: is fund i;

ε: is generic error term that is not correlated with any of the independent variables.

We also run the regression for all countries, U.S. and non-U.S. funds. We also include the time, geographic and fund type fixed effects, and country fixed effects when countries are pooled. The standard errors are clustered by fund.

Finally, we would also expect competition in the mutual fund industry to explain differences in the level of mutual fund performance during periods of market turmoil. To test that, we introduce country-level variables. We use several variables to proxy for competition in the mutual fund industry, as described in Section 2.2: mutual fund industry age (MFI age), mutual fund industry total net assets, (MFI size), the number of funds in mutual fund industry (MFI number of funds), the number of mutual fund companies in the country (MFI number of companies), mutual fund industry Herfindahl index (MFI Herfindahl), the percentage of assets managed by the five biggest mutual fund management companies in the industry (MFI top 5 share), individualism, financial sophistication and financial literacy. Several authors (e.g., Khorana *et al*., 2005, and Ferreira *et al.*, 2013) have also used these variables as proxies for mutual fund industry development and competition.

To test whether, in periods of market distress, fund performance is different for funds in more or less competitive countries, we interact each variable of market distress, VIX or ARM, with the previous proxies of competition. We also control for the same

fund level control variables used in previous regressions. Our third regression is described below:

$$Performance_{i,t} = \beta_0 + \beta_1 * dummy\ market\ distress_{i,t-1} + \beta_2 * fund\ control\ variables_{i,t-1} + \beta_3 * dummy\ market\ distress_{i,t-1} * fund\ control\ variables_{i,t-1} + \beta_4 * competition\ variables_{c,t-1} + \beta_5 * dummy\ market\ distress_{i,t-1} * competition\ variables_{c,t-1} + \varepsilon \quad (6)$$

Where:

$Dummy\ market\ distress$: is VIX or ARM;
$Fund\ control\ variabiles$: are size, family size, age, TSC, flows and past performance;
$Competition\ variables$: MFI age, MFI size, MFI number of funds, MFI number of companies, MFI Herfindahl, MFI top 5 share, individualism, financial sophistication and financial literacy;
t: is quarter *t*;
i: is fund i;
c: is country *c*;
ε: is generic error term that is not correlated with any of the independent variables.

This regression is also computed for all countries, U.S. and non-U.S. funds. We also include the time, geographic and fund type fixed effects, and country fixed effects when countries are pooled. The standard errors are clustered by fund.

Our empirical results of running the regressions presented above are shown in Section 5.

5. EMPIRICAL RESULTS

This section presents the results of the regressions presented in Section 4. We start by reporting the results of regression (4), where we regress fund performance on our proxies for market distress. We interpret in parallel both VIX and ARM in order to find a better understanding of each effect on performance. Then, we report the results when we interact fund variables with our measures of market distress, VIX or ARM (equation 5). Finally, we show the findings when we test our main working hypothesis, which is that more competitive countries have a lower performance than less competitive countries during periods of market distress (equation 6).

Table 6 presents the results of running equations (4) and (5). In Panel A, we include VIX as our proxy for market distress, while the results for ARM are presented in Panel B. We estimate performance for U.S., non-U.S. and all countries englobing market distress variables, VIX or ARM, and fund variables in Columns (1), (3) and (5), respectively, according to equation (4). The first regression examines the impact of market distress on general, using VIX or ARM, while controlling fund characteristics. In Columns, (2), (4) and (6), we show the results when interacting VIX or ARM with fund characteristics, according to equation (5).

In Column (1) of Panels A and B, we find that market distress decreases performance in the U.S.. This means that probably the most competitive fund industry in the world has lower performance during periods of market distress. Relatively to non-U.S. funds, we do not find any statistically significant relation for VIX, see Column (3) of Panel A, and we find a positive and statistically significant relation between performance and ARM. When we pool all countries, in Column (5) of Panel A, the relation between VIX and performance is negative and significant, while, in Column (5) of Panel B, we can see that ARM as no significant impact on fund performance. Regarding the coefficients on fund characteristics for U.S. funds, in both Panels A and B, fund size significantly decreases performance. This means larger U.S. funds perform worse, which is consistent with several authors (e.g., Chen *et al*., 2004, and Ferreira *et al*., 2013). Outside the U.S., we also find a negative and statistically significant relation between fund size and fund performance. Thus, according to our models, there are diseconomies of scale all over the world and not only in the U.S., consistent with Berk

Table 6 - Mutual fund performance and market distress

This table presents panel regressions results of regressing quarterly performance on proxies for market distress and control variables. Performance is measured using four-factor alpha. We run separate regressions for the U.S., for non-U.S. countries and for all countries. Panel A reports the results where market distress is proxied by VIX, and Panel B reports the results where market distress is proxied by ARM. In Columns (1), (3) and (5) we report the results of regressing performance on market distress variables together with fund control variables, according to equation (4). In Columns (2), (4) and (6) we also interact our proxies for market distress with fund characteristics, as shown in equation (5). Regressions include time, country (when countries are pooled), geographic and fund type fixed effects. In parentheses, we show *t*-statistics clustered by fund. * is used to indicate the level of significance at 10%, ** 5% and *** 1%. See Appendix 7 for further details about variables.

Panel A – Market distress proxied by VIX

	U.S.		Non-U.S.		All countries	
	(1)	(2)	(3)	(4)	(5)	(6)
VIX	-1.313***	-2.963***	-0.245	0.591	-1.312***	-0.425**
	(-9.26)	(-15.88)	(-0.15)	(0.34)	(-9.28)	(-2.54)
Size (log)	-0.052***	-0.056***	-0.013***	0.003	-0.027***	-0.003
	(-12.77)	(-12.89)	(-2.77)	(0.56)	(-8.38)	(-0.79)
Size (log) x VIX		0.002		-0.069***		-0.120***
		(0.19)		(-5.36)		(-13.83)
Family size (log)	0.057***	0.051***	0.014***	0.015***	0.032***	0.040***
	(14.41)	(12.38)	(3.20)	(3.20)	(10.64)	(12.63)
Family size (log) x VIX		0.027**		0.009		-0.036***
		(2.55)		(0.73)		(-4.54)
Age (log)	0.027**	0.011	0.000	-0.012	0.022***	0.003
	(2.57)	(0.94)	(0.03)	(-0.90)	(2.64)	(0.30)
Age (log) x VIX		0.062**		0.010		0.061**
		(1.99)		(0.28)		(2.56)
TSC	-9.462***	-14.042***	-7.163***	-6.395***	-9.741***	-11.628***
	(-8.98)	(-12.88)	(-9.93)	(-8.24)	(-16.30)	(-18.19)
TSC x VIX		14.777***		-4.638**		7.995***
		(5.13)		(-2.28)		(4.71)
Flow	-0.086*	-0.135***	0.098**	0.058	0.040	-0.006
	(-1.96)	(-2.91)	(2.29)	(1.30)	(1.27)	(-0.17)
Flow x VIX		0.057		-0.004		0.090
		(0.49)		(-0.03)		(0.94)
Past Performance	0.061***	0.089***	0.062***	0.063***	0.069***	0.072***
	(24.83)	(28.77)	(35.07)	(32.54)	(47.66)	(44.66)
Past Performance x VIX		-0.085***		-0.054***		-0.045***
		(-13.46)		(-10.60)		(-11.11)
SMB	0.023	0.134***	0.140***	0.132***	0.108***	0.166***
	(1.34)	(7.56)	(6.99)	(6.83)	(7.68)	(12.18)
SMB x VIX		-0.360***		0.544***		0.028
		(-7.60)		(9.35)		(0.69)
HML	0.397***	0.751***	0.553***	1.001***	0.488***	0.943***
	(19.33)	(31.43)	(29.92)	(50.56)	(34.93)	(61.74)
HML x VIX		-1.387***		-2.414***		-2.129***
		(-28.70)		(-60.30)		(-69.77)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	Yes	Yes
Geographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	490,633	490,633	668,612	668,612	1,159,245	1,159,245
Adjusted R^2	0.059	0.065	0.080	0.089	0.052	0.061

Panel B – Market distress proxied by ARM

	U.S.		Non-U.S.		All countries	
	(1)	(2)	(3)	(4)	(5)	(6)
ARM	-1.414***	-1.273***	0.043*	0.859***	0.019	0.143**
	(-8.17)	(-5.60)	(1.79)	(9.70)	(0.84)	(2.24)
Size (log)	-0.052***	-0.035***	-0.013***	-0.021***	-0.027***	-0.033***
	(-12.78)	(-3.71)	(-2.74)	(-3.78)	(-8.36)	(-7.18)
Size (log) x ARM		-0.021**		0.021**		0.013**
		(-2.00)		(2.38)		(2.19)
Family size (log)	0.057***	0.035***	0.014***	0.050***	0.032***	0.047***
	(14.44)	(3.44)	(3.18)	(9.89)	(10.63)	(10.28)
Family size (log) x ARM		0.025**		-0.095***		-0.026***
		(2.28)		(-11.04)		(-4.52)
Age (log)	0.027**	-0.201***	0.000	0.027*	0.022***	-0.021*
	(2.52)	(-8.03)	(0.03)	(1.92)	(2.64)	(-1.72)
Age (log) x ARM		0.274***		-0.071***		0.076***
		(10.09)		(-2.97)		(4.82)
TSC	-9.566***	14.883***	-7.139***	-5.940***	-9.728***	-6.394***
	(-9.08)	(6.11)	(-9.89)	(-7.43)	(-16.26)	(-8.35)
TSC x ARM		-30.933***		-2.333*		-6.364***
		(-11.69)		(-1.75)		(-5.94)
Flow	-0.095**	-0.153	0.098**	0.095**	0.040	0.145***
	(-2.16)	(-1.57)	(2.30)	(2.10)	(1.28)	(3.57)
Flow x ARM		0.066		0.018		-0.196***
		(0.60)		(0.19)		(-3.16)
Past Performance	0.060***	0.071***	0.062***	0.077***	0.069***	0.082***
	(24.34)	(14.16)	(34.91)	(31.41)	(47.48)	(36.91)
Past Performance x ARM		-0.018***		-0.025***		-0.021***
		(-3.11)		(-7.16)		(-7.15)
SMB	0.023	0.448***	0.140***	-0.078***	0.108***	0.019
	(1.30)	(8.97)	(6.99)	(-3.09)	(7.67)	(0.85)
SMB x ARM		-0.536***		0.416***		0.137***
		(-10.05)		(11.30)		(4.84)
HML	0.393***	0.386***	0.554***	0.392***	0.488***	0.356***
	(19.15)	(8.89)	(29.94)	(17.00)	(34.94)	(17.54)
HML x ARM		0.038		0.303***		0.225***
		(0.77)		(8.37)		(8.00)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	Yes	Yes	Yes	Yes
Geographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	490,633	490,633	668,612	668,612	1,159,245	1,159,245
Adjusted R^2	0.059	0.060	0.080	0.081	0.052	0.053

and Green (2004). However, we can see that the coefficient is lower for the U.S., which suggests that a bigger difference in performance exists between small and big funds in more competitive countries than in less competitive countries.

We find that family size is statistically significant and positively related to fund performance in both U.S. and non-U.S. funds. So, larger family funds perform better all over the world, consistent with the results in Chen *et al*. (2004), Ferreira *et al*. (2013) and in Ferreira *et al*. (2017).

Older funds perform better in the U.S.. However, if we exclude U.S. funds, we find that fund age has no significant impact on fund performance. These results contrast with Ferreira *et al*. (2017) who find that there is no relation between fund age and

performance in the U.S. and that fund age is negatively related to performance outside the U.S..

Regarding TSC, we report a statistically significant and negative relation with performance. Our findings are in line with other authors such as Carhart (1997), Cremer *et al*. (2016), among others.

We find a smart money effect outside the U.S.. Our result is in line with Ferreira *et al*. (2013) who find the same for non-U.S. funds. These results indicate that funds with more inflows in the previous periods tend to perform better than those which receive fewer flows. Contrarily, we observe that U.S. funds present a negative and statistically significant coefficient. This suggests that in the U.S. there is no smart money effect.

Our results show that investors can use past performance to predict future performance, both in the U.S. and outside the U.S., namely we find a positive and statistically significant coefficient. However, according to some authors (e.g. Carhart, 1997 and Ferreira *et al*., 2018), in the U.S. there is no long-term persistence in performance. Relatively to non-U.S. funds, Ferreira *et al.* (2018) conclude that, in contrast to what happens with U.S. funds, outside the U.S., there is long-term persistence.

Regarding SMB, we do not find a statistically significant relation for U.S. funds. However, we report a positive and statistically significant coefficient outside the U.S..

Finally, we report for HML a positive and statistically significant coefficient for both the U.S. and non-U.S. countries.

The results of running equation (5), where we include interaction of our market distress variables (VIX or ARM) and fund-level variables, are reported in Column (2) for U.S., in Column (4) for non-U.S., and in Column (6) for all countries.

We find that VIX and size interaction is statistically significant and negative for non-U.S. funds. This suggest that in periods of high volatility in the markets, smaller funds perform even better than larger funds in less competitive countries. Regarding U.S. funds, the relationship is not significant. Contrarily, we find a statistically significant and negative coefficient in ARM regression for U.S. funds. Relative to non-U.S. funds, we report a statistically significant and positive interaction between ARM and size in less competitive countries. This means that in more competitive countries, larger funds tend to perform worse during periods of market downturn.

In relation to family size, we present different results for U.S. funds and non-U.S. funds. For U.S. funds, we find that periods of market distress have a more positive effect

on performance when a fund belongs to a larger TNA family than to a smaller TNA family in a competitive country. On the other hand, we do not detect a statistically significant influence of VIX in family size outside the USA, but we find that ARM influence family size: a lower average return market makes that funds with a larger family size reduce their performance in less competitive countries.

Regarding VIX and age interaction, we can state that when there is high volatility in the markets, there is a bigger difference between the performance of young and old U.S. funds. In detail, periods of market distress improve the mutual fund performance of older funds in more competitive countries. We find the same results in ARM regression for U.S. funds. These also suggest that the lower the average return market, the higher is the performance of older funds compared to the younger ones. However, we do not find a statistically significant relation between VIX and age in less competitive countries, but we find a statistically significant negative relation between ARM and age in less competitive countries, which suggests that, during falling markets, older age diminishes performance.

We also show that VIX and TSC interaction is statistically significant and positive for U.S. funds. This result indicates that market distress periods in the most competitive countries mean that a superior level of TSC charged positively influences performance. However, the coefficient is statistically significant and negative for U.S. funds in ARM regression. For non-U.S. funds, we find a statistically significant and negative coefficient. So, in market turbulent periods, the least competitive countries show that the level of TSC charged has a bigger and negative influence on performance.

Relative to flows, our regressions show that neither VIX nor ARM set a statistically significant relation with them, independently of being a competitive or non-competitive country.

Regarding the interaction between SMB and market distress variables, we find a negative relation for the U.S. and positive relation for outside the USA.

Finally, we interpret the interaction between HML and VIX and between HML and ARM. In the U.S., periods of market turbulence mean that HML decreases mutual fund performance. However, we do not find a statistically significant relation between HML and ARM for U.S. funds. Regarding non-U.S., periods of high volatility also mean that HML negatively influences mutual fund performance. Contrarily, when the average return market is lower, HML positively influences non-U.S. performance.

In Table 7 we present our regression results where we include country-level variables as proxies for market competition (see equation 6).

Table 7 – Mutual fund performance, market distress and fund industry competition

This table presents panel regressions results of regressing quarterly performance on proxies for market distress, control variables and fund industry competition. Performance is measured using four-factor alpha. We run separate regressions for the U.S., for non-U.S. countries and for all countries. Panel A reports the results where market distress is proxied by VIX, and Panel B reports the results where market distress is proxied by ARM. In Columns (1)-(10) we report the results of regressing performance on market distress variables interacting with proxies of fund industry competition, according to equation (6). Regressions include time, geographic and fund type fixed effects. In parentheses, we show *t*-statistics clustered by fund. * is used to indicate the level of significance at 10%, ** 5% and *** 1%. See Appendix 7 for further details about variables.

Panel A – Market distress proxied by VIX

	MFI age	MFI size	MFI number of funds	MFI number of companies	MFI Herfindahl	MFI top 5 share	Individualism - Hofstede	Financial sophistication	Financial literacy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MFI age (log) x VIX	-1.362***								
	(-28.85)								
MFI size (log) x VIX		-0.346***							
		(-45.66)							
MFI number of funds (log) x VIX			-0.616***						
			(-37.51)						
MFI number of companies (log) x VIX				-0.598***					
				(-43.16)					
MFI Herfindahl x VIX					5.234***				
					(19.60)				
MFI top 5 share x VIX						1.969***			
						(18.65)			
Individualism - Hofstede (log) x VIX							-1.843***		
							(-40.60)		
Financial sophistication x VIX								-0.906***	
								(-24.12)	
Financial literacy x VIX									-4.435***
									(-21.80)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	No	No	No	No
Geographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,105,565	1,114,074
Adjusted R^2	0.044	0.045	0.045	0.045	0.043	0.042	0.045	0.043	0.043

Panel B - Market distress proxied by ARM

	MFI age	MFI size	MFI number of funds	MFI number of companies	MFI Herfindahl	MFI top 5 share	Individualism - Hofstede	Financial sophistication	Financial literacy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MFI age (log) x ARM	-0.469***								
	(-11.09)								
MFI size (log) x ARM		-0.108***							
		(-11.94)							
MFI number of funds (log) x ARM			-0.408***						
			(-20.77)						
MFI number of companies (log) x ARM				-0.316***					
				(-19.51)					
MFI Herfindahl x ARM					3.283***				
					(15.22)				
MFI top 5 share x ARM						1.533***			
						(16.79)			
Individualism - Hofstede (log) x ARM							-0.230***		
							(-6.47)		
Financial sophistication x ARM								-0.559***	
								(-22.66)	
Financial literacy x ARM									-2.719***
									(-18.67)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	No	No	No	No
Geographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,105,565	1,114,074
Adjusted R^2	0.042	0.042	0.043	0.043	0.042	0.042	0.042	0.042	0.043

In Table 7, Panel A, we present the results with market distress measure by VIX, and in Panel B we present the results with market distress measure by ARM. Our aim is to see whether there are differences in performance during periods of markets distress in countries with different levels of competition.

Our main hypothesis is that countries with more competitive mutual fund industries would present lower performance during recession periods. In more competitive countries, investors are more sophisticated and react more to poor performance (see Ferreira *et al*, 2013) by selling more heavily their positions. As a consequence, mutual fund managers are forced to rebalance their portfolios by selling assets, particularly those with higher risk-taking positions, at distressed or "*fire sale*" prices and therefore experience severe losses. Coval and Stafford (2007) and Wu (2017) show that "*fire sales*" in mutual funds that experience large outflows lead to a negative stock price pressure. Also, Massa and Zhang (2012: 1) show that during the 2007-2009 financial crisis there was a "*...significant jump for both stock illiquidity and fire-sale pressure of foreign stocks*". They argue that if a fund holds domestic stocks (e.g. U.S. stocks) and stocks from foreign companies (e.g. Japanese companies), and if there is turbulence in the U.S. market, it is likely to result in"*... constrained U.S. funds facing withdrawals at home, also liquidation of their holdings of Japanese stocks, leading to a deterioration of liquidity in the Japanese market*" (Massa and Zhang, 2012: 1).

We use nine proxies for competition across countries and, in our regressions, we will focus on the interaction between our market distress variables, VIX and ARM, and the different proxies for competition in the mutual fund industry. From Table 7, we can see that our results are consistent with what we would expect for both measures of market distress. We provide empirical evidence that when market volatility is higher and also when the market overall return is lower, mutual funds present lower performance in more competitive countries. For that, we predict a negative and statistically significant relation between our market distress variables and MFI age, MFI size, MFI number of funds, MFI number of companies, individualism, financial sophistication and financial literacy; and we expect a positive relation between our market distress variables and MFI Herfindahl and MFI top 5 share. As we expected, we confirm all the expected relations. Overall, these results support our hypothesis that in more competitive countries, funds underperform during periods of market turmoil.

6. ROBUSTNESS TESTS

In this section, we perform several robustness checks on our main findings. One potential issue is the performance measure we use. Given our evidence that funds of developed countries have a lower performance during periods of market downturn using four-factor alpha as our performance measure, we expect the same results when we use different performance measures. We therefore run our main results using raw returns, benchmark-adjusted return and one-factor alpha. Berk and Binsbergen (2015) study asset pricing models in order to understand what is the model that explains better investor's capital allocation decisions, and they find that one-factor alpha is the best model. After studying six different asset-pricing models, Barber *et al*. (2016) also demonstrate that the one-factor model is the best model to illustrate variation in flows across mutual funds. This result is also shared with Graham and Harvey (2001) who show that one-factor alpha is the most used model by companies to make investment decisions. Therefore, although we find similar results using raw returns and benchmark-adjusted return, we decided to report only the results for one-factor alpha. The results of rerunning Table 7 (equation 6) are reported in Table 8. Overall, we can see that our main results remain unchanged.

Table 8 – Mutual fund performance, market distress and fund industry competition using one-factor alpha as performance measure

This table presents panel regressions results of regressing quarterly performance on proxies for market distress, control variables and fund industry competition. Performance is measured using one-factor alpha. We run separate regressions for the U.S., for non-U.S. countries and for all countries. Panel A reports the results where market distress is proxied by VIX, and Panel B reports the results where market distress is proxied by ARM. In Columns (1)-(10) we report the results of regressing performance on market distress variables interacting with proxies of fund industry competition, according to equation (6). Regressions include time, geographic and fund type fixed effects. In parentheses, we show *t*-statistics clustered by fund. * is used to indicate the level of significance at 10%, ** 5% and *** 1%. See Appendix 7 for further details about variables.

Panel A - Market distress proxied by VIX

	MFI age	MFI size	MFI number of funds	MFI number of companies	MFI Herfindahl	MFI top 5 share	Individualism - Hofstede	Financial sophistication	Financial literacy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MFI age (log) x VIX	-1.264***								
	(-26.70)								
MFI size (log) x VIX		-0.287***							
		(-37.78)							
MFI number of funds (log) x VIX			-0.482***						
			(-29.55)						
MFI number of companies (log) x VIX				-0.477***					
				(-34.05)					
MFI Herfindahl x VIX					4.503***				
					(17.39)				
MFI top 5 share x VIX						1.869***			
						(18.13)			
Individualism - Hofstede (log) x VIX							-2.034***		
							(-45.69)		
Financial sophistication x VIX								-1.044***	
								(-27.16)	
Financial literacy x VIX									-6.358***
									(-32.81)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	No	No	No	No
Geographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,105,565	1,114,074
Adjusted R^2	0.051	0.052	0.051	0.051	0.050	0.050	0.053	0.051	0.052

Panel B - Market distress proxied by ARM

	MFI age	MFI size	MFI number of funds	MFI number of companies	MFI Herfindahl	MFI top 5 share	Individualism - Hofstede	Financial sophistication	Financial literacy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MFI age (log) x ARM	-1.028***								
	(-24.79)								
MFI size (log) x ARM		-0.173***							
		(-17.18)							
MFI number of funds (log) x ARM			-0.577***						
			(-26.33)						
MFI number of companies (log) x ARM				-0.482***					
				(-26.00)					
MFI Herfindahl x ARM					5.071***				
					(23.08)				
MFI top 5 share x ARM						2.260***			
						(24.40)			
Individualism - Hofstede (log) x ARM							-0.498***		
							(-12.57)		
Financial sophistication x ARM								-0.708***	
								(-26.41)	
Financial literacy x ARM									-3.697***
									(-23.78)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	No	No	No	No
Geographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund-level control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,117,947	1,105,565	1,114,074
Adjusted R^2	0.050	0.050	0.052	0.051	0.050	0.050	0.050	0.050	0.051

Another potential concern with our findings could arise from the way we defined our market distress variables. To validate our results, we also redefine both variables. In our main regressions, our variable VIX takes the value one when Cboe volatility index is above the 75^{th} percentile of distribution (and zero otherwise) and our variable ARM takes the value one when average return market is below 25^{th} percentile of distribution (and zero otherwise). In non-reported results, we rerun our regression assuming the value one for above one third of VIX distribution and below one third of ARM distribution. We find similar results.

Finally, we take a more conservative approach and rerun our main regressions clustering the standard errors by country-date. Our main findings also remain when we do this.

7. CONCLUSION

We study the impact of market instability on mutual fund performance by examining a comprehensive sample of funds from 34 countries in the period 1999-2015. We believe that our work contributes to three different strands of literature.

First, we document the relation between mutual fund performance and periods of market distress. To this end, we create two dummy variables to capture the influence of periods of market distress: VIX, which takes the value of one when Cboe volatility index is above the 75th percentile of distribution and zero otherwise, and ARM that assumes the value one when the country average return market is below the 25th percentile of distribution and zero otherwise. We include these two variables together with fund characteristics in our performance regressions. We find that periods of market turbulence have a negative influence in mutual fund performance in the U.S., but not outside the U.S..

Second, we study how fund characteristics react to periods of market distress and their consequences for mutual fund performance. To test this, we include an interaction term between our fund characteristics and our proxies for market distress. We conclude that the impact of periods of market distress on mutual fund characteristics is different between U.S. and non-U.S. funds. We find a statistically significant and positive influence of market distress periods in performance for funds with larger family size and for older funds in U.S. funds. On the other hand, we document a statistically significant and negative influence of market distress periods in TSC for non-U.S. funds.

Finally, we analyze the impact of periods of market distress on mutual fund performance according to the level of competition in the mutual fund industry in the different countries. We find that market distress decreases performance in competitive fund industries. This is because in more competitive countries investors are more sophisticated and, therefore, react more during periods of market turbulence by selling more of their positions, forcing fund manager funds to sell securities at "*fire sales*".

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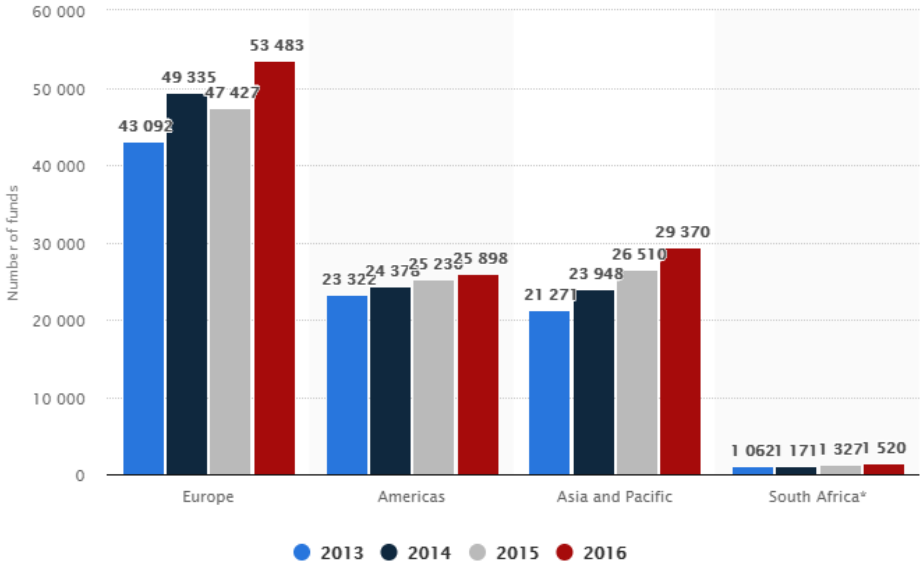
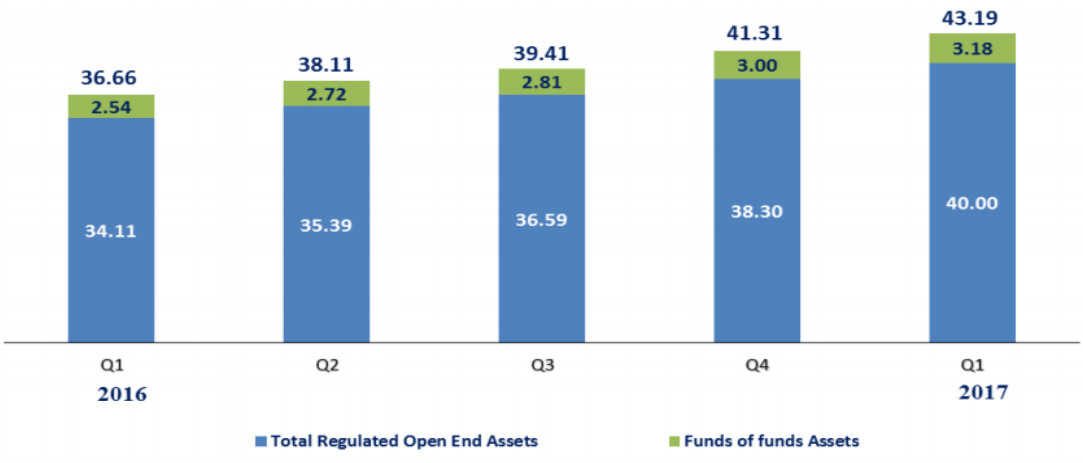
APPENDIXES

Appendix 1 – Number of open-end mutual funds around the world between 2013-2016 by region



Source: The Statistics Portal (2017) (adapted)

Appendix 2 – Worldwide assets of regulated open-end fund (trillions of euros)



Source: EFAMA (2017) (adapted)

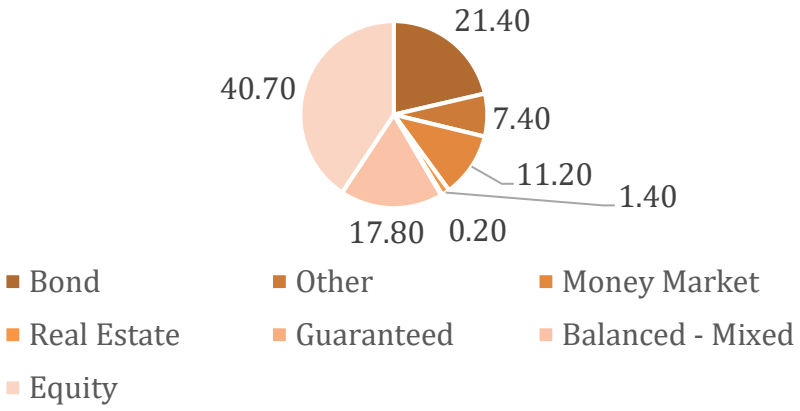
Appendix 3 – Evolution of 1,000 euros of the fund Santander Stocks Portugal FIMA (euros)

Source: Morningstar (2017) (adapted)

Appendix 4 – Growth of 1,000 euros of the fund Santander Stock Portugal FIMA (euros)

Source: Morningstar (2017) (adapted)

Appendix 5 – Worldwide Regulated Open End Funds Net Assets by Type of Fund, first quarter of 2017 (percentages)



Source: EFAMA (2017) (adapted)

Appendix 6 – Net Assets of Worldwide Regulated Open-End Funds (billions of euros)

	2016				2017
	Q1	Q2	Q3	Q4	Q1
All Funds	36,657	38,108	39,408	41,305	43,186
Long Term	32,210	33,613	34,887	36,434	38,362
Equity	14,377	14,873	15,516	16,449	17,559
Bond	7,794	8,336	8,666	8,837	9,250
Balanced/mixed	6,578	6,861	7,054	7,343	7,706
Guaranteed	64	63	61	63	66
Real Estate	495	524	536	576	596
Other	2,901	2,956	3,054	3,166	3,185
Money Market	4,447	4,496	4,521	4,871	4,824
Memo Items Included Above:					
ETFs	2,472	2,592	2,852	3,145	3,509
Institutional	2,982	3,191	3,322	3,377	3,553

Source: EFAMA (2017) (adapted)

Appendix 7 - Variables definitions

Variable	Definition
Panel A: Mutual fund performance	
Raw Return	Percentage per quarter of fund net return winsorized (1% bottom and top) in local currency.
Benchmark-adjusted Return	Percentage per quarter of the difference between the fund net return and its benchmark return in U.S. dollars.
One-Factor Alpha	One-factor alpha (percentage per quarter) estimated with three years of past monthly fund excess returns in U.S. dollars.
Four-Factor Alpha	Four-factor alpha (percentage per quarter) estimated with three years of past monthly fund excess returns in local currency.
Panel B: Market distress variables	
VIX	Dummy that takes the value one when the Cboe volatility index is above the 75^{th} percentile of distribution and zero otherwise (http://www.cboe.com/vix).
ARM	Dummy that takes the value one when the country average return market is below the 25^{th} percentile of distribution and zero otherwise.
Panel C: Fund characteristics	
Size	Total net asset in millions of U.S. dollars (Lipper Hindsight).
Family size	Total net assets in millions of U.S. dollars of other equity funds in the same management company excluding the own fund total net asset (Lipper Hindsight).
Age	Total number of years of funds' existence (Lipper Hindsight).
TSC	Sum of fund's expense ratio and fund's annualized front-end and back-end loads: Total shareholder costs = (Expense ratio + Loads) / 5.

Appendix 7 (continued)

Variable	Definition
Flow	Percentage per quarter of growth in TNA in local currency, net of internal growth (assuming reinvestment of distributions and dividends)
SMB	Loadings on the small big size factor minus big size factor.
HML	Loadings on the high book-to-market factor minus low book-to-market factor.
Panel D: Country characteristics	
MFI age	The number of years since the year when the first fund was traded in each country (Khorana *et al*., 2005).
MFI size	The size of the mutual fund industry in each country (https://www.ici.org/pdf/2017_factbook.pdf).
MFI number of funds	The number of funds in mutual fund industry.
MFI number of companies	The number of companies in mutual fund industry in the country.
MFI Herfindahl	Sum of squared market shares of parent management companies for equity funds in each country (Lipper Hindsight).
MFI top 5 share	Sum of the market share (TNA) of the top five management companies for equity funds in each country.
Individualism – Hofstede	Individualism Hofstede's individualism index (http://geer*t*-hofstede.com/dimensions.html).
Financial sophistication	Survey-measure of financial sophistication (Cremers *et al*., 2016)
Financial literacy	Percentage of adults who are financially literate (Klapper *et al*., 2015)