Unexploited Gains from International Diversification?

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Abstract

Using unique micro data on U.S. institutional investor portfolios, this paper studies how capital, meant to be invested globally, is actually diversified internationally. We show that although the mutual fund industry has moved toward funds that have more flexibility to invest across countries and regions (global funds), mutual funds invest in a finite, rather small number of firms, almost independently of the set of available instruments. The number of mutual fund holdings in stocks and countries from a given region declines as funds become more global. This restricted investment practice has a cost: there are unexploited gains from international diversification. Mutual funds could achieve better returns by broadening their investment scope to include stocks held by specialized funds within the same mutual fund family. This investment pattern is neither explained by the lack of available instruments or information, nor by a better ability of global funds to minimize losses.

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I. Introduction

Financial globalization has advanced substantially since the early 1990s. In fact, the degree of financial globalization achieved in the last decade has been unprecedented.[1] One of the key drivers of the increased globalization has been the potential gains from international diversification. On the supply side of funds, investors can reduce risk for a given level of expected returns (or increase returns for a given level of risk) by investing internationally.[2] On the demand side, governments and firms can reduce the cost of capital by tapping international investors as well as decrease the exposure of their balance sheet to macroeconomic shocks.[3]

Despite the potential benefits from globalization and the sharp increase in the level of international financial integration, the evidence suggests that investors are still not diversified enough.[4] The literature has mostly concentrated on evidence based on aggregate measures and has only recently begun to exploit asset-level data.[5] Several factors might explain the insufficient diversification: the role of non-tradable goods;[6] the existence of explicit barriers to international investment;[7] and the existence of implicit barriers, such as political or country risks, and informational asymmetries, including "familiarity" effects.[8]

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[1] See, for example, Frankel (2000), Eichengreen (2001), Obstfeld and Taylor (2002), Stulz (2005), and Kose et al. (2006).

[2] For example, Harvey (1995) provides evidence that the standard deviation of the global minimum variance portfolio could be reduced by 6% by including emerging markets assets in portfolios between 1986 and 1992.

[3] See, for example, Rajan and Zingales (1998), Stulz (1999), Beck et al. (2000), Bekaert and Harvey (2000), and Mishkin (2007).

[4] There is a large literature on home bias suggesting that investors are not nearly as internationally diversified as their consumption and income paths would imply. See Lewis (1999) and Karolyi and Stulz (2003) for comprehensive surveys of the literature.

[5] For studies focusing on accumulated capital flows and valuation adjustments, see, for example, Cooper and Kaplanis (1994), Tesar and Werner (1995), Brennan and Cao (1997), Froot et al. (2001), Kaminsky et al. (2001), Borensztein and Gelos (2003), Warnock and Cleaver (2003), and Gelos and Wei (2005). For studies using firm-level data, see, for example, Kang and Stulz (1997), Dahlquist and Robertsson (2001), Ahearne et al. (2004), Chan et al. (2005), and Ammer et al. (2006).

[6] See, for example, Baxter and Jermann (1997), Obstfeld and Rogoff (2001), Pesenti and van Wincoop (2002), and Engel and Matsumoto (2005).

[7] Explicit barriers include foreign exchange control, withholding taxes, and other directly observable obstacles. See, for example, Black (1974), Stulz (1981), Eun and Janakiramanan (1986), Errunza and Losq (1985), Stulz and Wasserfallen (1995), and Henry (2000).

[8] Some of the papers that mention the presence of implicit barriers are Merton (1987), French and Poterba (1991), Cooper and Kaplanis (1994), Tesar and Werner (1995), Coval and Moskowitz (1999), Huberman (2001), Bertaut and Kole (2004), Chan et al. (2005), and Portes and Rey (2005).

In this paper, we construct a unique micro dataset of actual asset-level portfolios for a group of large institutional investors, namely, U.S. mutual funds. This unique dataset allows us to shed light on interesting aspects of the extent of international diversification. Importantly, we are able to analyze portfolios and the degree of international diversification for different types of funds within the same mutual fund family. That is, we study funds with different mandates to invest around the world. Some funds are specialized in some countries or regions (*specialized funds*), while others are meant to invest more globally (*global funds*). Naturally, the ones with a wider scope of investment have a-priori access to a wider set of instruments (firms from more countries). The within-family comparison is particularly important because knowing that a fund within a mutual fund family holds some stocks is an indication that those stocks are available for trading and are indeed desirable, at least by other fund managers within the same family. Moreover, information about those stocks has already been collected at the mutual fund firm level, and in principle, is available to all managers of the same mutual fund company. Therefore, the relevance of asymmetric information and transaction costs can be assessed by comparing portfolios across different funds within the same mutual fund family.

Two reasons motivate our emphasis on the U.S. mutual fund industry. First, the mutual fund industry in the U.S. is very large (in 2005 there were 8,044 mutual funds with a market capitalization of 8 trillion U.S. dollars or 69% of U.S. GDP), it has a strong international presence (U.S. mutual funds represent more than 70% of the assets held worldwide by all mutual funds), it channels a significant share of retirement savings (mutual funds captured 24% of retirement savings in the U.S. in 2004), and it is a relatively mature and sophisticated industry.[9] Second, we work with the universe of U.S. mutual funds established to purchase assets around the world. Given the regular reporting requirements for these types of investors, asset-level portfolios can be constructed and traced over time since their inception period. This characteristic of the mutual fund industry contrasts with other types of investors such as hedge funds, many pension funds, and individual international investors, for which data are not publicly available.

[9] These statistics are from IMF (2005).

We collect two types of data: holdings and returns. The data on holdings contain asset-level annual portfolios between 1991 and 2005. We work with a total of 505 fund families and 3,651 funds, covering most of the U.S. mutual fund industry. We concentrate only on those funds that are already investing internationally. The total number of fund-year observations is 8,547 and the total number of asset-level holdings for all funds in all years is 1,359,750. The portfolio holdings have been matched in a way that allows us to identify the country to which each stock belongs, and track them over time. Regarding the returns data, we use returns at the fund level on a daily basis between September 1989 and June 2006 for 36 fund families. We work with a total of 722,885 daily observations, composed of the returns for all funds within these families.

The analysis in the paper is divided into two parts. The first one documents some stylized facts associated with the degree of international diversification of different types of mutual funds. The second part of the paper focuses on the factors behind the level of international diversification. It analyzes whether the availability of instruments constraints the asset allocation of mutual funds. It also studies where the variation in the number of stocks held by mutual funds comes from; in particular, to what extent it is driven by information asymmetries and family effects. Lastly, we also investigate whether there are potential gains from further international diversification.

In the first part of the paper we show that individual mutual funds hold a relatively small number of assets in their portfolios. Importantly, the number of assets in a mutual fund portfolio seems to be independent of the investment scope of the mutual fund. In other words, the number of asset holdings in mutual fund portfolios does not tend to increase for global funds compared to specialized funds within the same mutual fund family, even though the number of investable assets increases significantly. For example, global funds from Vanguard Group held on average 426 stocks in 2004, whereas specialized funds within this family of funds held 576 stocks. These numbers are small because there were over 39,000 stocks available worldwide in 2004.

Consistent with the observation that the number of holdings does not increase as the investment scope broadens, we also show that global funds hold fewer assets in fewer countries compared to specialized funds within each region of exposure, especially in emerging countries. For example, if holdings in Latin America are considered, the

median specialized fund holds 41 stocks, whereas global funds hold 94% fewer stocks than specialized funds within their mutual fund families. Furthermore, global funds also invest 75% fewer countries in Latin America than their specialized counterparts, respectively.

These patterns of investments are especially relevant given that the industry has shifted towards global funds relative to specialized funds. Although the entire U.S. mutual fund industry investing internationally has expanded sharply since the early 1990s, with significant increases in the number of both global and specialized funds, global funds have become significantly larger than specialized funds in terms of assets under management. For example, global funds had 38 billion U.S. dollars of assets under management in 1992, being about 3 times as large as specialized funds. However, in 2004, global funds were 6 times as large as specialized funds with 532 billion versus 89 billion U.S. dollars of assets under management. In sum, global funds seem to be investing an increasing amount of funds in a limited number of assets.

The paper then explores the possible reasons behind the apparent lack of international diversification of mutual funds. First, the patterns we document regarding mutual fund holdings do not seem to be driven by the inability of funds to hold more companies across countries. For example, we show that, on average, mutual funds hold a very small fraction of market capitalization: global fund and specialized fund investments account (separately) for just 0.12% of firms' market capitalization. Therefore, if funds want to increase their exposure, they could probably do so without major difficulties.[10]

Second, we study the possible role of information asymmetries. If global and specialized funds within mutual fund companies shared information and made similar decisions, one should observe similar portfolios across them. However, we show that this is not the case. Different types of mutual funds within families hold portfolios that are not very similar. For example, global and specialized funds share only 16% of their holdings (or, on average, 36% of net asset value of investments). In other words, we do not find evidence that managers are using information already gathered by other managers within

[10] We show that global funds are significantly larger than specialized funds. Moreover, Didier (2008) shows that global funds tend to invest in firms significantly larger than specialized funds. However, transaction costs should not be important if global funds were to invest amounts similar to those of the specialized funds in small firms. Still, transaction costs, especially price impact, could still be relevant for global funds investing large amounts in small firms.

the same mutual fund firm. Furthermore, we also find that measures that capture the ability of funds to gather and process information explain only a small proportion of the variance of the number of stocks held by each fund. In sum, informational asymmetries alone do not seem to explain the apparent lack of international diversification.

Next, we show that the limited number of stocks in mutual fund portfolios is explained by strong family effects. The number of holdings across mutual funds is largely explained by the family to which the fund belongs. For example, funds in the Templeton Group held on average 129 stocks in 2005, significantly smaller than the 517 stocks held on average by funds in the Vanguard Group. In fact, family effects explain almost 50% of the cross-section variation in the number of portfolio holdings.

Lastly, the apparent lack of international diversification is only relevant for investors if the restricted number of holdings is actually translated into return losses or excessive variance. In other words, does the fact that global funds do not tend to hold more stocks than specialized funds imply a diversification loss? If assets within and across countries are correlated, it might be possible for global funds to obtain the same degree of diversification benefits as the specialized funds by simply holding fewer stocks, possibly in fewer countries. In that case, return correlations would account for the patterns observed in the data.

To address whether there are unexploited gains from diversification, we ask whether a global fund can improve its performance simply by investing in specialized funds within the same mutual fund family. In other words, we compare the performance of global funds to that of a portfolio of specialized funds and the global fund itself. That is, by definition, we conduct a very restrictive exercise. We are not asking a global fund to invest in any possible stock available to a specialized fund; we are restricting global funds to invest in a portfolio already held by another fund within the same company. This guarantees that the stocks are available for investment (that we are considering a feasible set), that they are at least attractive to another manager in the same firm, and that information about the stocks was already collected and analyzed by someone close to the global fund manager. If the gains were negligible, the additional stocks in the specialized fund would not be necessarily useful for global funds, not at least in the proportions they

enter the specialized fund portfolios. Importantly, we do not allow short selling within the same family, but only portfolios that imply buy and hold.

Our results suggest that there are potential gains from further diversification. Global funds could obtain better returns for a given level of risk if they invested in portfolios similar to those of specialized funds. In other words, by not increasing the number of stocks as funds expand their investment scope, global funds forgo the benefits that broader international diversification provides. The results are robust to many types of estimation methods that take into account expected returns, variances, and several benchmarks to which a fund is compared. For example, we find that the average return of world funds can be increased by 4.6% per year (p.y.) if their strategies were to minimize risks given a certain level of return. Alternatively, the average return can improve by 1.6% p.y. if they were to maximize expected returns given a specific level of riskiness for their portfolios. To the extent that mutual funds hold portfolios similar to typical stock market indexes, these results also imply that holding a portfolio of sub-indexes dominates holding broader ones.

There is however a possible explanation for our results: the existence of an insurance premium in the returns of global funds. Global funds have the ability to shift their asset holdings across countries and regions, which is not an option to specialized funds. Since this extra flexibility might yield gains during turbulent times, investors might be willing to pay for this benefit. In other words, global funds might be better suited than specialized funds to avoid large losses due to their ability to move away from trouble spots. Our results indicate that this does not seem to be the case. For example, we find that the skewness and kurtosis of global fund returns are similar to those of specialized funds. These higher moments of the distribution of returns are important if global funds were to minimize losses during bad times instead of following the standard mean-variance approach. Moreover, conditional on large negative returns on either specialized funds or the MSCI Emerging Market Index, we find that returns on our constructed portfolios are broadly similar to those on the global funds.

Our findings have important implications to the literature. The fact that funds meant to invest around the world are not diversified enough, even when there are potential gains to do so, represents a significant puzzle. The experiment in this paper

shows that global funds would gain by investing in stocks that specialized funds within the same mutual fund company already hold. Our results cast doubts on the idea that asymmetric information drives the lack of international diversification, at least in the dimensions highlighted here. Moreover, the fact that each individual fund is small relative to the market size suggests that the lack of diversification is not driven by the inability of global funds to purchase the securities that specialized funds hold; that is, the results are not driven by transaction costs. Although global funds are larger than specialized funds, at the minimum they could invest a fraction similar to that invested by specialized funds in the securities that global funds do not hold. The finding that the number of stocks held across mutual funds is significantly explained by family effects and does not vary much across fund types within families suggests that the way the financial industry is organized might be an important factor in determining the degree of international diversification. Finally, to the extent that global funds continue growing relative to specialized funds, the findings in this paper suggest that there will be foregone diversification gains to investors. Also, several countries and firms will not benefit from tapping international investors, with the associated reduction in the cost of financing.

The rest of the paper is organized as follows. Section 2 describes the dataset analyzed. Section 3 studies the extent of international diversification of U.S. mutual funds. Section 4 analyzes the factors behind the degree of international diversification. Section 5 studies whether there are potential gains from further international diversification. Section 6 concludes.

II. Data

We use data on U.S. equity mutual funds that are established to purchase assets around the world.[11] We use two types of data in our empirical analysis: mutual fund holdings data and mutual fund price data.

Mutual fund holdings data are available from Morningstar International Equity Mutual Funds, a private company that collects mutual fund data. We analyze monthly Morningstar reports from March 1992 (when they became available) until June 2006.

[11] Funds that focus on both debt and equity are excluded from the analysis, even though they do invest a significant share of their portfolios in foreign stocks.

However, mutual funds do not disclose their holdings as frequently. They do so, at most, on a quarterly basis, and typically bi-annually (coinciding with SEC reporting). Given this heterogeneity in the release of new information, we construct our database with the last reported portfolio information for each fund on any given year. For example, our sample of mutual fund holdings for 2005 contains portfolio data for the Fidelity Worldwide Fund as of October 2005 and portfolio data for the Scudder Global Fund as of December 2005. In sum, we collect end-of-year detailed information on portfolio holdings between 1991 and 2005. Specifically, we collect stock names, amount invested in each stock by each fund, and country of origin of these holdings.

A difficulty in constructing the holdings database is that mutual funds report their asset allocation in separate reports over time. In other words, their holdings are not linked across reports; we had to link them. This is not a simple task because stock identifiers are rarely available and, if so, are not always unique. We match these holdings across mutual funds over time based on the country of origin and the stock name for each security holding. We can thus determine whether the same stocks appear in different mutual fund portfolios, across and within fund families. Since information on the country of origin is only available for the 1997-2005 period, we do not attempt any matching of holdings for the pre-1997 period.

Table 1 describes our datasets. We collect data on 8,547 fund-year portfolio holdings over the period 1991 to 2005, covering 505 different families (companies) of mutual funds, and a total of 3,651 funds. Each mutual fund family has on average six different mutual funds. Some families sell the same portfolio to investors under different names depending on their fee structure and minimum investment requirements. In this paper, we consider these different funds only once; i.e., we do not treat them as separate funds as Morningstar does.[12] The total number of asset-level observations in our dataset is 1,359,750, counting each stock-level allocation across all funds over time.

The U.S. mutual fund industry is organized by splitting funds according to their investment scope. In particular, funds are classified into five distinct categories: world funds, foreign funds, emerging market funds, regional funds, and country funds. Regional

[12] For example, Fidelity Advisors Funds contain the following Latin America funds with the same portfolio: Fidelity Advisors Latin America A, Fidelity Advisors Latin America B, and Fidelity Latin America T.

funds are divided into: Asia (and Pacific) funds, Europe funds, Latin America (and the Caribbean) funds, and Middle East and Africa funds.[13] World funds invest all over the world including the U.S., while foreign funds invest around the world excluding assets in the United States. Emerging market funds invest only in emerging market assets.[14] Regional and country funds invest only in a particular region or country, respectively. For ease of exposition, we group funds into two categories: "global funds" and "specialized funds." Global funds encompass world funds and foreign funds. All other fund types are called "specialized funds." The latter invest in a subset of assets that can be held by global funds. This organization of the mutual fund industry is displayed in Figure 1. Naturally, funds with a wider (more global) investment scope can always invest in the stocks held by more specialized funds.

We also collect data on the time series of return/price data on mutual funds themselves. Since these are open-ended funds, the value of each fund each day reflects the value of the underlying holdings or the net asset value (NAV). We thus use returns at the fund level on a daily basis between September 1989 and June 2006, for 36 mutual fund families, as reported in Table 1. We work with a total of 722,885 daily observations, composed of all returns for all funds. We include all funds within a given family of funds. On average, each family has ten different mutual funds.[15] We work with a restricted number of mutual fund families, focusing on the larger families. This dataset allows us to assess issues related to the gains from international diversification by holding different types of mutual funds.

III. How Diversified Are Mutual Fund Portfolios?

The U.S. mutual fund industry investing internationally has expanded sharply since the early 1990s. For example, in 1991 there were less than 200 mutual funds established to invest in international equity, while in 2005, there were almost 700 funds. This marked increase is not restricted to a specific type of mutual fund. Figure 2 shows the number of

[13] Asia funds can actually invest in countries located in both Asia and Pacific regions. Latin America funds can also invest in countries in the Caribbean. Some Europe funds also tend to invest in countries in Africa, such as South Africa.
[14] Emerging markets are typically middle-income countries. However, these funds might invest a small proportion of their portfolios in low-income countries as well.
[15] See Appendix Table 1 for a detailed description of the sample coverage of the price/returns data for each mutual fund family.

funds between 1991 and 2005; both the number of global and specialized funds increased significantly. However, while the number of global funds has increased steadily until the early 2000s, that of specialized funds increased until 1998 and then declined. This has likely been driven by the Asian and Russian crises that might have generated a desire to hold funds that can invest more freely around the world. At the end of 2005, there were 499 global funds and 191 specialized funds. In terms of assets under management, the differences are even starker. Global (specialized) funds managed 29 (7) billion U.S. dollars in 1991 and 787 (162) billion U.S. dollars in 2005. This pattern is broader than global versus specialized funds.[16] For instance, foreign funds are the ones with the most noticeable increase: assets under management increased from 10.3 billion to 543 billion U.S. dollars between 1991 and 2005. In sum, the data show a clear trend in the U.S. mutual fund industry toward funds with a wider investment scope (global funds) over funds that invest in specific regions or countries (specialized funds).

Given the increasing importance of global funds, a natural question is to what extent their portfolio differs from the ones held by specialized funds and how much diversification they provide. We thus explore to what degree mutual fund holdings vary across different fund types within mutual fund families. In principle, as the investment scope increases, funds should be able to hold more assets across more countries and diversify risk better.

Table 2 presents the average, median, and the standard deviation in the number of holdings across mutual fund types over the entire 1991-2005 period. Moreover, Figure 3 shows the median number of holdings for different mutual fund types from 1991 to 2005. The top panel reports these medians for world funds (with and without U.S. holdings), foreign funds, emerging market funds, and regional funds. The bottom panel displays the number of stocks held by Asia funds, Europe funds, Latin America funds, and country funds. The median number of holdings is surprisingly stable over the 15-year sample period and similar across fund types.[17] The median world fund holds on average 106 stocks and 76 when excluding the U.S., with no clear time trend. The median foreign

[16] Appendix Figure 1 shows similar plots but disaggregated by world, foreign, emerging market, regional, and country funds.

[17] Although not show, the average number of holdings is also stable over time and similar across fund types.

fund holds on average 105 stocks, while the median emerging market funds holds 121 stocks. Europe and Asia funds hold on average 70 and 64 stocks, respectively, while Latin America and country funds hold 56 and 63 stocks, respectively. These median values are lower for more specialized funds. However, across fund categories there is no clear time pattern. The only apparent exceptions are foreign funds, which have increased the number of holdings in the last few years. In sum, the evidence suggests that mutual fund managers tend to invest in a finite number of stocks that does not increase significantly as the scope of investment widens.

Given that the number of stocks held by global funds does not increase significantly relative to specialized funds, and global funds have a broader scope of investment, a natural question is whether global funds hold fewer assets than specialized funds within each region of exposure. The evidence presented in Table 3 confirms that this is indeed the case. If holdings in Latin America are considered, the median Latin America fund holds 41 stocks. However, emerging market funds, i.e. funds with a greater scope of investment, hold 34% less assets than the Latin America fund within its mutual fund family. The drop in the number of holdings is even more striking for global funds, it falls 94% for either world or foreign funds. Furthermore, world and foreign funds also invest, respectively, in 71% and 75% fewer countries than their specialized counterparts. For Asia, the numbers suggest a similar pattern. The median foreign and world funds hold 35 and 19 assets, implying a drop of 42% and 69% relative to the Asian fund within the same mutual fund company. If the number of countries is considered, a global fund also holds assets in significantly fewer countries than the Asia fund in the same mutual fund family. Lastly, a similar trend is observed if holdings in developed Europe are considered: global funds hold fewer assets in fewer countries within Europe than specialized funds do.

In sum, as their scope of investment becomes broader, mutual funds invest a growing amount of funds in fewer stocks in fewer countries within each region of exposure, especially in emerging countries. In principle, if assets are not redundant, this behavior seems surprising.

However, several reasons could rationalize this pattern. First, the existence of transaction costs. It is possible that global funds are relatively large, and thus, are unable

to buy and hold some of the smaller stocks in emerging markets without incurring in large transaction costs. Second, information gathering and processing by fund managers can be costly. However, if there is not any communication within mutual fund families, informational costs cannot be an explanation. Lastly, it is also possible that there are actually no benefits to further diversification; the assets are indeed redundant. This is the theme of the following two sections.

IV. What Factors Might Explain the Investment Patterns?

In this section, we explore several reasons that might be behind the investment in a limited number of stocks documented in the previous section. First, we study to what extent the availability of instruments constraints the asset allocation of mutual funds. Second, we analyze where the variation in the number of stocks held by mutual funds comes from; in particular, to what degree it is driven by information asymmetry stories and family effects.

A. Share of Total Assets

A first step to understanding the extent of international diversification by mutual funds is to analyze the universe of assets that can be held by the sample of mutual funds covered in this paper. Table 4 reports the size of the universe of stocks in 1997 and 2004 in which funds can invest in.[18] It shows the total number of listed stocks across different regions for both developed and emerging countries. These potential holdings are larger in emerging countries than in developed countries; however, the difference has fallen over time. The number of stocks has grown 40% during the period in developed countries, and 20% in emerging countries – mostly concentrated in developing Europe.

Of the universe of potential holdings, mutual funds only invest in a fraction of these assets. Table 4 reports the actual number of mutual fund holdings and the fraction of holdings relative to the number of listed companies.[19] It does so for all funds in our

[18] Assets in the U.S. and Canada have been excluded from this table as we focus on the international holdings of mutual funds. Offshore centers have also been excluded from this table as firms usually only have offices in these centers, but their main operations are somewhere else.

[19] This number is an underestimation of the true universe of assets that can be purchased by mutual funds. First, mutual funds occasionally hold assets that are not listed in stock exchanges and therefore would not show up in these aggregate numbers. And second, there are a number of firms, especially from developing countries, with headquarters and operations in one country but with stock exchange listings in another, usually in financial centers such as London, U.K, and Hong Kong. These companies have been "relocated" to the country in which main operations take place.

dataset and, separately, for global funds. In 1997, mutual funds invested in around 9,000 different firms. In developed countries, they held around 6,800 firms, an average of 50% of the available assets. However, in emerging countries, these numbers are significantly smaller: they held 2,271 firms, or 13% of the available stocks. An even more pronounced pattern emerges when we focus on global funds only, the mutual fund type that has become very large over the sample period. In 1997, they held 4,953 different firms in developed countries, which constitute 38% of the number of potential stocks available. In emerging economies, global funds held only 8% of the available shares.

In Table 4, we also show that, although the universe of listed companies has increased between 1997 and 2004, there has been a considerable fall in the number of mutual fund holdings during this period. In 2004, mutual funds held 5,204 in developed countries and 1,085 different firms in emerging countries. This decline in holdings has not been concentrated in any particular region, but has been more accentuated in emerging countries where a fall of 52% is observed. In developed countries, the number of holdings declined 24%. If only global funds are considered, a similar investment pattern emerges. In 2004, their holdings have decreased to 4,799 firms in developed countries, or 26% of the available assets. In developing countries, the number of holdings fell approximately 46%, from 1,314 to 711 firms, or equivalently, from 8% to only 3% of the number of available stocks. Notice that even though the "number" of firms might be affected by mergers and acquisitions, the share of the total available firms is not.

Although the number of mutual fund holdings has been falling between 1997 and 2004, the amount invested in these stocks has grown significantly, in both developed and emerging countries. Investments in developed countries have increased from 204 billion U.S. dollars in 1997 to 446 billion U.S. dollars in 2004, a 119% increase. In emerging countries, investments have also more than doubled, increasing from 30 billion U.S. dollars in 1997 to 62 billion U.S. dollars in 2004. Thus, a growing amount of funds is being invested in fewer firms, and more significantly so in emerging countries.

A concern about mutual fund investment across countries is that institutional investors tend to be large; therefore, the amount they invest in different assets might be determined by their ability to invest in them. For example, if specialized funds held a large fraction of the available shares, global funds would find it difficult to invest in them

without adverse price effects. To investigate whether there are restrictions coming from the supply side of instruments, Table 5 shows the size of individual mutual fund holdings relative to firms' market capitalization. The table shows that, on average, mutual funds hold a very small fraction of market capitalization. For example, both global fund and specialized fund investments each account for 0.12% of firms' market capitalization. Therefore, if funds wanted to increase their exposure, they could probably do so without generating a major price impact. For example, if global funds invested all of their assets under management in specialized funds, each fund would still capture a small fraction of market capitalization, around 0.73%. Even if one aggregates all mutual fund holdings, the fraction of market capitalization remains small. The sum of all global fund holdings accounts on average for 2.8% of firms' market capitalization and that of specialized funds accounts for 1.3% of market capitalization. Therefore, the patterns we observe regarding mutual fund holdings do not seem to be driven by the inability of funds to hold more companies across countries.

To complement the evidence that mutual fund investments are concentrated in few companies and not evenly distributed across regions, Figure 4 illustrates to what extent mutual funds invest differently across countries. The figure plots the ratio of the number of companies held in mutual fund portfolios to the total number of listed companies. These ratios are computed on a yearly basis and reported according to their averages over the 1997-2004 period.[20] Countries are sorted by the extent of mutual fund investment and divided in five equally-sized groups (quintiles). Reinforcing the previous evidence, this figure shows that mutual fund holdings are not evenly spread across countries. For around half of the countries in the sample, mutual funds invest in at most 20% of the listed companies. In no country do mutual funds exhaust the available stocks. Moreover, only developed countries appear in the highest quintile. Among emerging countries, Mexico is the one with the largest ratio (44%), whereas among developed countries, Netherlands has the largest ratio (77%). In the bottom two percentiles, there are 24 developing countries but only four developed countries. In other words, mutual funds

[20] The reported numbers are an upper bound of the true values. As mentioned before, firms that have operations in one country and listed in another are assigned to the country in which operations occur. Hence, the number of available assets for investment is reduced in the listing country.

tend to hold a larger fraction of listed firms from developed countries than from emerging countries.

B. Informational Costs

In the second part of this section, we analyze the degree to which information asymmetries can explain the patterns of international investments by different types of mutual funds. We focus on costly information gathering and processing. To the extent that information is costly to obtain and process and the managers of specialized funds have already decided on an asset allocation, global funds within the same mutual fund company could benefit from this information and choose among the stocks selected by the managers of specialized funds. In other words, if global and specialized funds within mutual fund companies shared information and made similar decisions, one should observe similar portfolios across them. We also analyze the extent to which the number of managers and other measures related to the ability of funds to obtain and manage information might explain the number of asset holdings in mutual fund portfolios.

To asses the portfolio similarity we ask: what is the likelihood that a stock held by a specialized fund also belongs to the portfolio of global funds, within the same family of funds? The within family comparison is important given a large heterogeneity in holdings across mutual fund families and the hypothesis of interest, that is, whether fund managers in the same company make share information. To answer this question, we compute frequency counts in our sample. We consider two types of funds (global and specialized) within a mutual fund family and count the number of observations for which a stock is held by one of these two fund types, with each of the close to 400,000 observations being a family-year-stock observation. Then we compute the fraction of the observations in which a stock is held by a certain fund type but not held by the other, a stock is held by both the fund types, and a stock is held by the global fund but there is no specialized fund within the same family that could hold that stock.[21] We make these comparisons on a yearly basis; for example, we compare a stock held by a specialized fund at time *t* with the stocks held by the corresponding global fund also at time *t*. By construction, no observation falls into the case where there is no global fund that could not hold a stock

[21] U.S. assets are excluded from the analysis here.

held by a specialized fund; that is, for every specialized fund there is always a global fund within the mutual fund family.[22] Moreover, also by construction, there are no observations for which a stock is held by neither the global fund nor the specialized fund. We repeat this exercise just for holdings in emerging markets and by breaking global funds into world funds and foreign funds.

The basic results are shown in Table 6 for total holdings and those in emerging markets only (Appendix Table 2 shows the results splitting global funds into world and foreign funds). Each cell represents the relative frequency of the observations, that is, the joint probability that the global and specialized funds hold/do not hold a particular stock. Conditional probabilities can be obtained by looking at a particular row or column. The evidence from Table 6 suggests that global funds and specialized funds do not hold many stocks in common. When considering all holdings, only 16% of actual holdings are shared by both fund types; in emerging markets, that fraction is 13%. Moreover, only 23% of the global fund holdings are shared by specialized funds, and 32% of the stocks are held by specialized funds alone but not by global funds.

The results from Table 6 also suggest that the vast majority of mutual fund holdings in emerging countries are done through specialized funds and not through global funds. For example, 76% of the stocks are held by specialized funds but not by global funds. In other words, a mere 24% of emerging market stocks in our sample is held by global funds. Furthermore, conditional on being held by a specialized fund, there is only a 15% probability that an emerging market stock is held by a global fund. However, as opposed to patterns observed if all holdings are considered, global funds tend to hold a larger subset of what specialized funds hold in emerging countries. Around half of global fund holdings are shared by their specialized counterparts in developing countries. This evidence also implies that the results on all holdings are being driven mostly by holdings in developed countries. In other words, global funds seem to be holding a different set of firms in developed countries than specialized funds do.

Appendix Table 2 splits global funds into world funds and foreign funds and compares them with specialized funds. The results suggest that there is no significant

[22] We exclude all family-year-stock observations for which mutual fund families that do not have either one of the fund types considered in that given year.

difference in portfolio holdings across global funds: specialized funds invest in a wider set of assets than both world funds and foreign funds (when specialized funds are available). World funds and specialized funds share only 10% of their holdings. This percentage increases to 15% if foreign funds are considered. In other words, the intersection of portfolio holdings between specialized funds and foreign funds is larger than between specialized funds and world funds. In sum, the results presented so far suggest that global funds actually hold a different set of assets than specialized funds hold, although the similarity in portfolios increases if holdings in developing countries are considered.

The frequency counts shown in Table 6 and Appendix Table 2 measure to what degree mutual funds with different investment scopes invest in the same stocks. However, that evidence does not take into account the size of the mutual fund investments in each stock. It might be possible that though the range of stocks in which mutual funds invest differs, global and specialized mutual fund portfolios have a large loading on stocks that are common to their portfolios. Therefore, mutual fund portfolios could actually be more similar than they appear with the evidence presented above. The reverse could also be true. To address this issue, we study entropy or similarity measures that analyze how alike mutual fund investments actually are.

The entropy measure is constructed as follows:

$$Entropy_{f,t}^{i,j} = \frac{\sum_{s,i} NAV_{s,f,t}^{i} + \sum_{s,j} NAV_{s,f,t}^{j}}{\sum_{i} NAV_{f,t}^{i} + \sum_{j} NAV_{f,t}^{j}}, \qquad (1)$$

where $Entropy_{f,t}^{i,j}$ is the entropy measure for a pair of fund types (i and j) within family f, at time t. $i, j \in \{\text{global fund, specialized fund}\}$. s are stocks common to the portfolio of both funds i and j from family f at time t. Therefore, $NAV_{s,f,t}^{i}$ ($NAV_{s,f,t}^{j}$) is the net asset value of the investments by fund type i (j), in family f, in common stock s at time t. $NAV_{f,t}^{i}$ ($NAV_{f,t}^{j}$) is the total net asset value of investments by fund type i (j), in family f at time t. As above, global funds are then split into world funds and foreign funds. In words, for a given pair of different fund types within the same mutual fund family, the entropy measure is the ratio of the sum of the mutual fund dollar investment in stocks

common to the portfolio of these two fund types over the total net assets of the same funds. It should be noted that this entropy measure overestimates the commonality between any pair of individual funds as it aggregates funds according to their types. The measure is calculated for every year. Moreover, this measure is constructed within families, given our focus on information sharing within mutual fund companies.

The entropy measures indicate that mutual funds do indeed hold a more similar portfolio than what frequency counts suggest, however, mutual funds still invest in quite different portfolios. For example, when comparing global and specialized funds, the entropy measure shows that, on average, 36% of the value of their holdings is in common assets. In contrast, as mentioned for the case of Table 6, 16% of the number of their holdings is in the same stocks. The entropy measure is slightly higher in the case of emerging countries, reaching on average 42%, compared to the 13% obtained for the frequency count of Table 6. As shown in Figure 5, the entropy measure is stable over the sample period, and if anything it decreases since 2001 (and since 1999 for the case of emerging countries), suggesting that there is no rise in commonality over time. Similar patterns are obtained when splitting global funds. As Appendix Figure 2 shows, funds have been investing a smaller share of their portfolios in assets that are common across fund types. On average, the entropy measure is 26% when comparing the holdings of world funds and specialized funds and 28% when comparing those of foreign funds and specialized funds.

To the extent that funds tend to hold portfolios that are not very similar, we do not find evidence of information sharing within mutual fund companies. Managers do not seem to be using information already gathered by other managers within the same mutual fund firm. We now analyze the degree to which the number of managers and other measures related to the ability of funds to obtain and process information might influence the number of stocks mutual funds hold. The results are shown in Table 7.[23] Column 1 shows that the number of stocks is positively associated with the number of managers; however, the marginal effect is low. For example, funds with one manager hold, on average, 132 stocks, while funds with two managers hold 135 stocks, and funds with six

[23] In Appendix Table 3, we report regressions with the percentage of net assets in the top 10 holdings as a dependent variable. The results are qualitatively similar to the ones presented here.

managers hold 197 stocks. In all other specifications, we consider the number of managers as a single count variable in order to summarize its results. Columns 2 and 3 add manager tenure and fund age to the regressions. The effects of these variables are also positive although statistically insignificant. The number of managers has a significant positive effect on the number of fund holdings. Nevertheless, the proportion of the total variance explained by these variables is small, between 3% and 5%. We repeat these regressions in columns 4 and 5 but adding mutual fund expenses instead of the variable for the number of managers. While the variable fund expenses is positively associated with the number of holdings, the effect reverses when we control for fund size. We also report one last specification including the variable for the number of managers and the variables for fund expenses together. The results are similar to the ones obtained with the other specifications. Additionally, less than 7% of the total variance is explained by all these variables together. In summary, although the variables related to the ability of funds to collect and manage information are positively associated with the number of holdings, their explanatory power is small.

In this sub-section, we do not find evidence that managers are using information already gathered by other managers within the same mutual fund firm. Furthermore, we also find that measures that capture the ability of funds to gather and process information explain only a small proportion of the variance of the number of stocks held by each fund. In sum, informational asymmetries alone do not seem to explain the apparent lack of international diversification.

C. Family versus Fund Effects

Lastly, the third part of this section analyzes what can potentially drive the variation in the number of stocks held by mutual funds. Figure 3 already shows that the number of stocks held by mutual funds is relatively constant over time and does not vary significantly by fund type. We now study these effects more formally and measure, in particular, the relevance of family characteristics.

Figure 6 (top panel) shows the distribution of the number of holdings for all fund-year observations. The median number of holdings is 95, while 95% of the observations are below 450. Although there is some dispersion, with some funds holding many stocks in some years, 74% of the observations imply holdings below 150 stocks and 88%,

holdings below 250 stocks. The bottom part of Figure 6 shows the median number of stocks per family, sorted from the lowest to the highest number of holdings. This panel suggests that the dispersion in the number of stocks found in the fund-year observations is linked to the dispersion in the number of stocks held across mutual fund families. Mutual fund families differ substantially in the number of stocks they hold. For example, GAM Funds and Oppenheimer Funds, hold on average substantially less than 200 stocks, while others (such as Dreyfus Founders and Vanguard Group) hold at least two times more. The mean of the fist quintile of the distribution is 38 stocks, whereas the mean of the fifth quintile is 329. While there are extreme cases, with the median fund in one family holding 1,027 stocks, most families hold a limited number of stocks, with the mean of the fourth quintile being 121 stocks.

We now compare how important family effects are versus time and fund type effects to explain the number of holdings across mutual funds over time. The top panel of Table 8 reports regressions of the number of holdings, as the dependent variable, on year, fund type, and family dummies.[24] The dummy coefficients are not reported, although they are usually significant at 1% confidence level. Seven different specifications are reported. In the first specification only year dummies are considered. In this case, less than 1% of the variance in mutual fund holdings can be explained. Column 2 reports a regression with fund type dummies alone. Again, a small percentage (only 2%) of the variance of the dependent variable is explained by these dummies. The specification in column 3 includes family dummies. In this case, 46% of the variance in the number of holdings across funds over time is explained, a much greater percentage than what was explained by fund type and year effects alone. The next three reported regressions include a combination of these three types of dummies: family dummies, fund type dummies, and year dummies. In all these cases, the R-squared is relatively high only when family dummies are included. Lastly, we report a specification with all dummies together (column 7). We observe only a slight increase in the R-squared in comparison to the other regressions with family dummies. Therefore, family effects indeed seem to be the important ones to explain mutual fund holdings.

[24] In Appendix Table 4, we report regressions with the percentage of net assets in the top 10 holdings as our dependent variable. The results are qualitatively similar to the ones presented here.

Given the importance of family effects, we revisit the hypothesis that informational asymmetries can explain the apparent lack of international diversification. It might be that the relevant variables for the ability of funds to gather and process information are family-level expenses, not fund-level ones. In this case, family expenses (and family size) should explain a significantly higher proportion of the variance of the number of stocks held by each mutual fund than the fund-level expenses included in the regressions reported in Table 7.

The results are shown in the bottom panel of Table 8. In the first three columns, the regressions do not include family dummies, but incorporate fund-level variables (the count variable on the number of managers, manager's tenure, and fund's age) and family-level ones (family expenses and family size). The results are similar to the ones reported in Table 7. Expenses at the mutual fund family level are positively associated with the number of holdings. Nevertheless, they explain only a small proportion of the variance of the number of stocks held by mutual funds, between 1% and 7% versus 46% explained by family dummies alone. In other words, family-level expenses do not seem to explain what family dummies capture. Moreover, if we include family dummies in these regressions (reported in columns 4 to 7 in the bottom of Table 8), both fund-level and family-level variables become statistically insignificant.

In sum, the results presented in this section suggest that the apparent lack of international diversification in mutual fund portfolios cannot be explained by the lack of available instruments or by informational asymmetries alone. Family effects unrelated to these two factors seem to be the relevant ones. Then, the next obvious reason to explore is whether there are indeed potential gains from further diversification.

V. Measuring the Cost of Lack of Diversification

This section analyzes mutual fund returns to shed light on whether they explain the reasons why global funds do not have a substantially larger number of holdings relative to specialized funds. As reported in the previous section, global funds tend to hold a lower number of stocks in fewer countries within regions of exposure if compared to specialized funds. These investment patterns might be explained by the lack of diversification gains and/or by the desire of investors to minimize risk.

To analyze these hypotheses, we first study if there are potential gains from further international diversification by global funds. It is possible that global funds do not need to hold many stocks because returns are correlated and, therefore, they achieve as much diversification as specialized funds do. We also test whether benchmark effects can justify the portfolio choice of global funds, since managers are generally evaluated on their performance relative to benchmark indexes. Consequently, portfolio decisions should incorporate these managerial incentives. Lastly, we investigate the existence of an insurance premium in the returns of global funds. Global funds have the ability to shift their asset holdings across countries and regions, which is not an option to specialized funds. Since this extra flexibility might yield gains during turbulent times, investors might be willing to pay for this benefit.

A. Standard Portfolio Model: Mean-Variance Analysis

To evaluate the potential cost of the apparent lack of diversification by global funds, we compare the return of global funds to that of a simulated portfolio that combines specialized funds and the global fund itself within mutual fund families. In particular, we allow global funds to invest in a portfolio that replicates specialized fund holdings within the same mutual fund family. Namely, we are not asking global funds to design their own strategies; we ask them to just follow the portfolio that specialized funds in the same mutual fund company hold.

There is an important advantage in constructing these simulated portfolios at the family level. If collecting and processing information about a particular stock or country is costly, then the fact that a fund within the mutual fund family is already holding the asset is an indication that the mutual fund company has already paid for those costs. Moreover, the fact that at least one fund is investing in those stocks is a clear indication that they are within the subset of investable assets. In other words, from the manager's perspective there are no restrictions to investing in those assets; transaction costs should not be very high. Finally, we follow a conservative strategy to evaluate the gains from international diversification. We are not using all stocks in the investment universe of a fund to construct alternative portfolios, which might include assets that are hard to reach, but could apparently yield substantially higher returns.

To construct these simulated portfolios we impose the following restrictions: (i) portfolios are constructed for a specific global fund type using a combination of the fund itself and specialized funds within the same mutual fund family; (ii) only buy and hold strategies are considered; (iii) funds cannot be shorted; (iv) the performance evaluation is always conducted out-of-sample; and (v) the portfolio is optimized on a daily basis.

Assume that there is a global fund whose return history *G* we observe. Assume that this global fund is comprised of several specialized funds, whose returns are denoted by S_i . We can then construct a portfolio *P*, which puts non-negative weights on all specialized funds and on the global fund itself. This portfolio *P* is the optimal portfolio that minimizes its own variance but it is constrained at achieving at least the same expected return as the global fund itself. In other words, we compare and evaluate funds along two dimensions: returns and variances, once administrative fees and their investment objective have been determined.

The optimization problem is described by (2) and (3).

$$\underset{x}{Min}\ \text{var}(P) = x'\Sigma x\ , \tag{2}$$

$$\begin{aligned} &\text{such that}: E(P) \geq E(G) \\ &0 \leq x_i \leq 1 \\ &\sum_i x_i \leq 1 \\ &P = \left(1 - \sum_i x_i\right) * G + \sum_i x_i * S_i . \end{aligned} \tag{3}$$

where x_i is the portfolio weight on the specialized fund *i* within a mutual fund family and Σ is the covariance matrix of mutual fund returns. Since this portfolio is constructed and evaluated out of sample, portfolio shares are computed at time *t* and held for the next period. We call this simulation approach our active strategy as portfolio weights are re-optimized every period.

In the previous exercise, we keep the return "constant" (i.e., with the same objective) and try to find a better portfolio in terms of its volatility. As an alternative, we keep the variance "constant" and maximize expected returns. This strategy is described as follows:

$$\underset{x}{Max}\ \text{E}(P), \tag{4}$$

$$\begin{aligned} &\text{such that}: \operatorname{var}(P) \le \operatorname{var}(G) \\ &0 \le x_i \le 1 \\ &\sum_i x_i \le 1 \\ &P = \left(1 - \sum_i x_i\right) * G + \sum_i x_i * S_i. \end{aligned} \tag{5}$$

We perform these simulations for several types of global funds. We compare specialized funds and: world funds, foreign funds, a portfolio of world funds, or a portfolio of foreign funds. Portfolios of either world or foreign funds exist when more than one fund in a mutual fund family is classified as a global fund. This might take place because funds have different objectives such as value, growth, or blend strategies. Therefore, these funds aim at different sets of assets than "plain" global funds do. In contrast, specialized funds usually do not clearly state their investment strategies. We are thus trying to make a fairer comparison by combining these global funds together.

An important benefit of these strategies is that we do not need to identify the exact stocks held by different mutual funds within the same mutual fund family. In other words, the only information we need in order to perform this exercise is mutual fund returns and fund characteristics, i.e., the type of investments they are supposed to follow. This allows us to extend the time horizon of the data to start in the late 1980s.

The summary statistics of these simulated portfolios with the respective comparisons with global funds are shown in two tables. Table 9 reports the results for simulations that yield the highest return differential between the simulated portfolio and the global fund for each global fund, i.e. the "best" simulation. The "best" simulated portfolio typically includes the largest possible number of specialized funds, but generally do not have a very long time span due to data availability on mutual fund returns. On the other hand, Table 10 reports the longest simulation for each global fund. In this case, fewer specialized funds are typically available for comparison, but a longer time span is covered. The tables present the following statistics: the average annualized returns for the global fund and the constructed portfolio (called "active strategy"), the

annualized difference in accumulated daily returns between the constructed portfolio and the global fund, daily standard deviation of returns, and the number of comparisons. [25]

The top panel of these tables report the summary statistics of portfolios constructed based on equations (2) and (3). The results based on the "best" simulations show that our strategy yields an increase in average annualized return of 509 basis points per year for the world funds, by 404 basis points for the foreign funds, and by 1,159 and 397 basis points for the portfolio of world and foreign funds, respectively. With these increases in risk-adjusted expected returns, it would be difficult to argue that there are no potential gains from further international diversification, even if investing only in stocks that other funds within the same mutual fund family hold. Moreover, the daily standard deviation of the constructed portfolio returns is also smaller than that of the global fund. It falls by nine basis points for world funds, by six basis points for foreign funds, and by eight and six basis points for the portfolio of world and foreign funds, respectively. Although these numbers seem small, it is important to remember that they are reductions in the daily standard deviation of returns.

If the simulations with the longest time span are considered, the results still hold. For example, the average improvement in returns is around 289 basis points per year and the improvement in the daily standard deviation of returns is seven basis points. The results are more modest though than the ones reported on Table 9. The reason is that fewer specialized funds are available when the longest simulations are considered. In other words, there is less scope for improvement than in the previous case.

The bottom panels of Tables 9 and 10 report the summary statistics of portfolios constructed based on equations (4) and (5), i.e., maximizing expected returns while holding the variance constant. Considering the simulations with the greater number of specialized funds, the improvements in annualized returns are around 161 basis points, whereas the improvement in the daily standard deviation is almost negligible at less than one basis point. If the longest simulations are considered, the improvement in returns is around 80 basis points and the improvement in the daily standard deviation is on average one basis point.

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[25] We computed these tables at the family level as well. The results are shown in Appendix Table 5A and 5B for the "best" simulations, and in Appendix Table 6A and 6B for the longest simulation for each global fund. As expected, there is heterogeneity across mutual fund families.

In sum, the results from these simulations allow us to reject the hypothesis that there are no costs from further international diversification. To the contrary, although there is some heterogeneity in the results depending on the strategy used, there are potential gains from further diversification in terms of both return and volatility.[26]

B. Benchmarking

The optimization strategies described above are perhaps somewhat unrestricted because the objective of most mutual funds is not necessarily to minimize the variance given some expected return, or to maximize returns given some variance. The performance of mutual funds is actually evaluated in comparison to benchmark indexes. Moreover, managers are usually compensated according to this relative performance. Thus, portfolio decisions should incorporate these managerial incentives. We test whether these benchmark effects would justify the portfolio choice of global funds. In other words, we assess whether this extra constraint is sufficient to eliminate the gains from further international diversification found in the previous exercise.

In the case of the first strategy, the variance minimization one, we modify the objective function to take into consideration a benchmark index. The benchmark is the appropriate MSCI index (B), specific for each global fund as described in the Morningstar database or in the fund's website. Instead of minimizing the variance of the portfolio, we minimize the variance of the difference between the portfolio and the benchmark index. Thus, equation (6) replaces equation (2) for this strategy. The constraints of this optimization problem remain as stated in equation (3):

$$\underset{x}{Min}\ \text{var}(P-B) \qquad (6)$$

For our second strategy, the maximization of expected returns, we impose an additional restriction: the variance of the difference between the constructed portfolio and the benchmark index has to be at most the same as the variance of the difference between the global fund and the benchmark index. Equation (7) states this additional restriction:

$$\text{var}(P-B) \leq \text{var}(G-B) \qquad (7)$$

The results of these new simulations are reported in Table 11 for the "best"

[26] For robustness, we have also performed these simulations with a more restricted sample. We use rolling windows of 240 business days. The results are robust to this change. They are reported in Appendix Tables 7A and 7B.

simulations for each global fund, and in Table 12 for the longest simulations for each global. For simulations that minimize the variance of the portfolio, the results are similar to the ones reported in the previous section. For the "best" simulations reported on the top panel of Table 11, typically the ones with the greatest number of specialized funds, there is an improvement in annualized returns of 375 basis points for world funds, 397 basis points for foreign funds, 735 basis points for portfolio of world funds, and 334 for portfolios of foreign funds. Therefore, even for the strategy with benchmarking considerations, the increase in expected returns is large, being thus hard to justify the lack of diversification based on managerial incentives. Improvements in the standard deviation are also observed. On average, the daily standard deviation falls four basis points. If the longest simulations are considered, as reported in the top panel of Table 12, the results are consistently robust. There is an increase in annualized expected returns of 262 basis points on average across the different simulations, and a decrease in daily standard deviations of three basis points.

If the second strategy is considered, the results are even stronger than before. In Table 11, we report an improvement in annualized returns of 251 basis points on average across mutual fund families and an improvement in daily standard deviations of four basis points. In Table 12, where fewer specialized funds are included in portfolio simulations, the improvement in returns is 168 basis points, but reaches 544 basis points for the portfolio of world funds. The improvement in daily standard deviations is also considerable: ten basis points on average across mutual fund families.

Therefore, our results suggest that benchmark effects cannot explain the empirical evidence described regarding investment patterns. We find that, even within the same mutual fund family, more aggregate funds are not internationally diversified enough with possible improvements in both risk and returns.

C. Insurance Premium in the Global Fund Returns

There is still another possible explanation for our results: the existence of an insurance premium in the returns of global funds. Global funds have the ability to shift their stock holdings across countries and regions, which is not an option to specialized funds. Investors might be willing to pay for this benefit since this extra flexibility might yield gains during turbulent times. In other words, global funds might be better suited

than specialized funds to avoid large losses due to their ability to move away from trouble spots. Therefore, we evaluate whether global funds have indeed a better ability to minimize losses if compared to specialized funds.

We first compare the skewness and kurtosis of the global fund returns to those of returns on our constructed portfolio of specialized funds. Higher moments of the distribution of returns are important if global funds were to minimize losses during bad times instead of following the standard mean-variance approach. The results are reported on Table 13 for our "best" simulations and Table 14 for our longest simulations. We find that skewness and kurtosis measures are similar, and not statistically different, across global fund returns and returns on our constructed portfolio of specialized funds. For example, if the "best" (longest) simulations are considered, the skewness of global fund returns is -0.71 (-0.43) on average, whereas that of the returns on our constructed portfolio is -0.56 (-0.28) if based on simulations of variance minimization or -0.74 (-0.44) if based on simulations of maximization of expected returns. If the kurtosis is analyzed, the returns on global funds exhibit kurtosis of 11.40 and 35.76 for "best" and longest samples, respectively. Similarly, the kurtosis on the returns on our constructed portfolio is 24.39 (48.93) if based on simulations of variance minimization or 11.42 (35.71) if based on simulations of maximization of expected returns for the "best" (longest) simulations. Overall, the evidence suggests that, despite the differences in the mean and the variances already reported, higher moments of the distribution of returns are not considerably different across global fund returns and returns on our constructed portfolio of specialized funds.

We now consider the ability of global funds to move away from crisis-hit countries or regions, and thus actually avoid realized risks across countries and regions. Given the limited information on portfolio holdings, we focus the analysis on the incidence of negative returns during turbulent times. For instance, conditional on large negative returns on the MSCI Emerging Market Index, our proxy for crises periods, we compare the realized returns of both global funds and our constructed portfolios of specialized funds. [27] The results reported in Table 15 show that their performances are not

[27] The evidence reported here considers only weekly returns. The results are similar if monthly returns are analyzed. Results are available from the authors upon request.

statistically different. For example, the average global fund return is -3.51% per week (p.w.) when the MSCI Emerging Market Index falls more than 10% in one week, while the returns on our portfolios of specialized funds are on average -3.54% (-3.57%) p.w. if the "best" simulations for variance minimization (maximization of expected return) are considered. Therefore, to the extent that our turbulent periods do not simply reflect global systemic risks that cannot be diversified, global funds do not seem better suited to avoid large losses if compared to specialized funds.

Alternatively, we also analyze those return differentials conditional on periods in which our constructed portfolios perform badly in Table 16. In these situations, global funds obtain slightly higher weekly return, with differentials between 0.05% and 0.98% p.w., although these return differentials are not always statistically different than zero. However, in Table 17 we evaluate the realized returns on our constructed portfolios when global funds do not perform well. In this case, our constructed portfolios of specialized funds perform slightly better than global funds. For example, when the actual return on global funds is less than 10% in one week, our portfolios of specialized funds yield on average returns 1.95% p.w. higher than returns on global funds if the longest simulations of variance minimization are considered. However, if the longest simulations for return maximization are considered, the difference in returns falls to 0.22% p.w. on average, being no longer significantly different than zero.

Therefore, the results in this section suggest that there are indeed gains from further international diversification to be made in both dimensions – return and volatility, although there is some heterogeneity in the results depending on the strategy used. We provide some evidence that benchmark effects cannot explain the evidence presented here. Furthermore, the existence of an insurance premium in the returns of global funds is also not enough to explain this lack of international diversification, as global funds do not seem to perform consistently better than specialized funds during turbulent times.

VI. Conclusion

This paper studied whether there are unexploited gains from international diversification using a novel dataset of portfolio holdings of U.S. institutional investors. We take advantage of the fact that mutual funds belong to families, with each mutual fund

company having several funds with different scopes for international investment. As the investment scope broadens, one would expect that risk is better diversified internationally and that funds would hold more securities, to the extent that assets are not perfectly correlated.

We find that mutual funds are not well diversified and could benefit from more international diversification. In particular, we find that mutual funds hold a rather small number of stocks. Moreover, as their investment scope widens, mutual funds invest in fewer stocks within each region of exposure and in fewer countries. Furthermore, there are strong family effects behind these investment patterns. That is, the number of stocks held across fund types is similar within mutual fund companies but different across them. Importantly, holding few stocks represents a cost to the mutual fund. Even within the same mutual fund company, global funds could substantially gain from further international diversification by simply replicating portfolios that are already held by other funds within the same company.[28]

Several conclusions can be drawn from our paper. First, the evidence we found does not seem consistent with the idea that the lack of diversification is driven by asymmetric information. Since we compare the potential diversification gains within mutual fund companies, one can argue that the cost of gathering and processing information has already been paid and that mutual fund managers could freely share that information. Moreover, we also evaluate whether or not the number of managers working in the fund, fund and family expenses, and fund or family size could explain these differences – in line with theories based on limited capacity to acquire and process information. We find that while more managers tend to increase the number of stocks held by the fund, this effect is very small and not statistically significant once other family effects are considered. Similar results are obtained for the other proxies for theories of information asymmetry. Second, our comparison also allows us to conclude that the lack of diversification is not driven by transaction costs, understood as barriers to purchase securities. Specialized funds have already purchased those assets, so they are available to global funds as well. Furthermore, each fund is not very large relative to

[28] This departure from full diversification and from apparently optimal portfolios is consistent with evidence on pension funds. See for example Opazo, Raddatz, and Schmukler (2008) and Raddatz and Schmukler (2008).

market capitalization; therefore the pattern of investment in few firms does not seem to be driven by the size of global funds. Lastly, our results indicate that global funds are not better suited to avoid large losses than specialized funds due to their ability to shift their stock holdings across countries and regions. Thus, the existence of an insurance premium in the returns of global funds is also not enough to explain the existence of large gains from further international diversification.

What remains for future research is why, given the potential gains, global funds are not more internationally diversified. Perhaps the remuneration scheme gives no incentives for the information gathered by specialized funds to be freely shared within each mutual fund company, with each fund manager collecting her own information. Given the differences in the performance of specialized funds relative to global funds, it is important to also understand why investors do not arbitrage these differences and favor specialized funds over global ones. These puzzles remain open in the literature, and what this paper has done is to cast some doubts over the standard explanations offered in the literature regarding them.

VII. References

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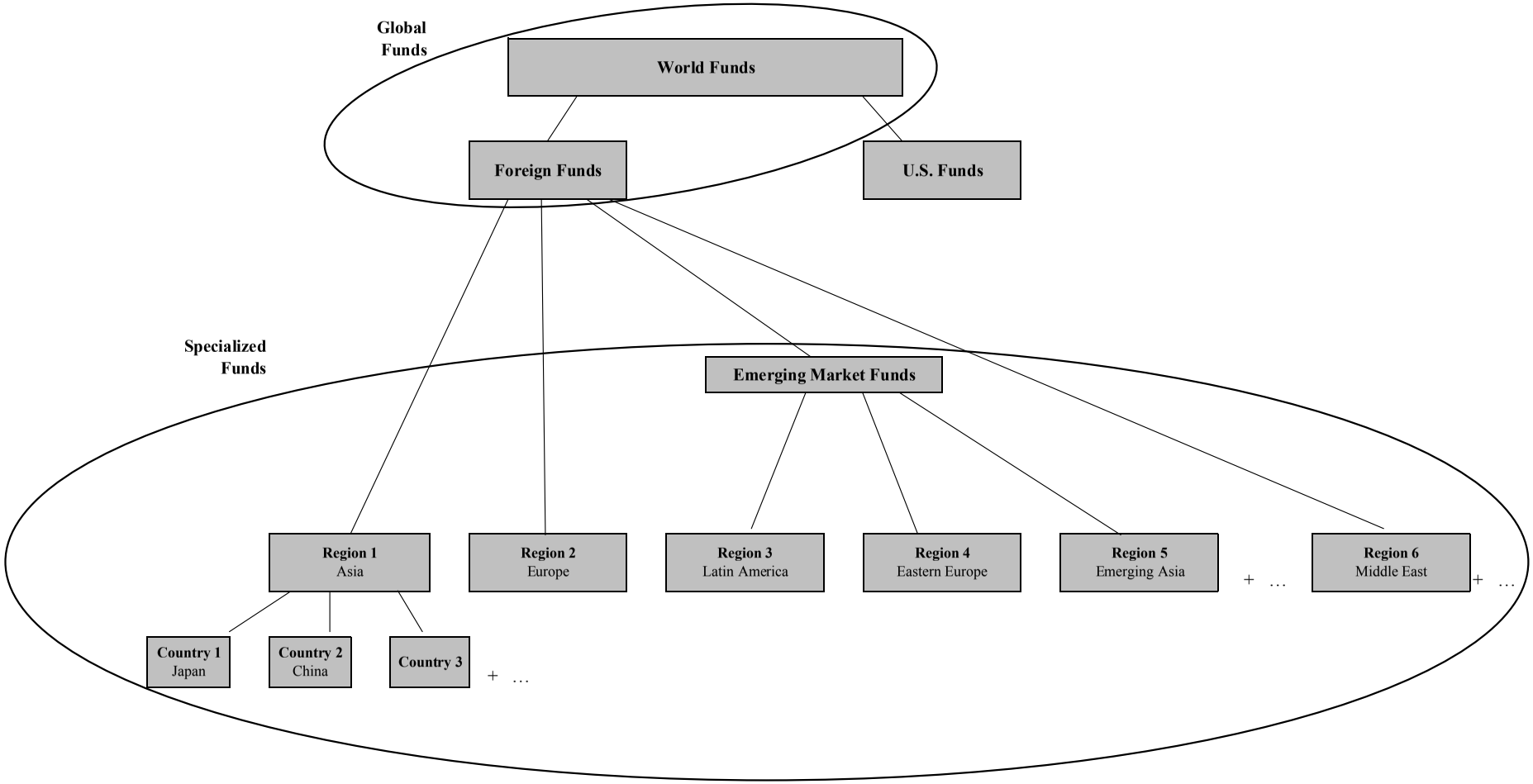
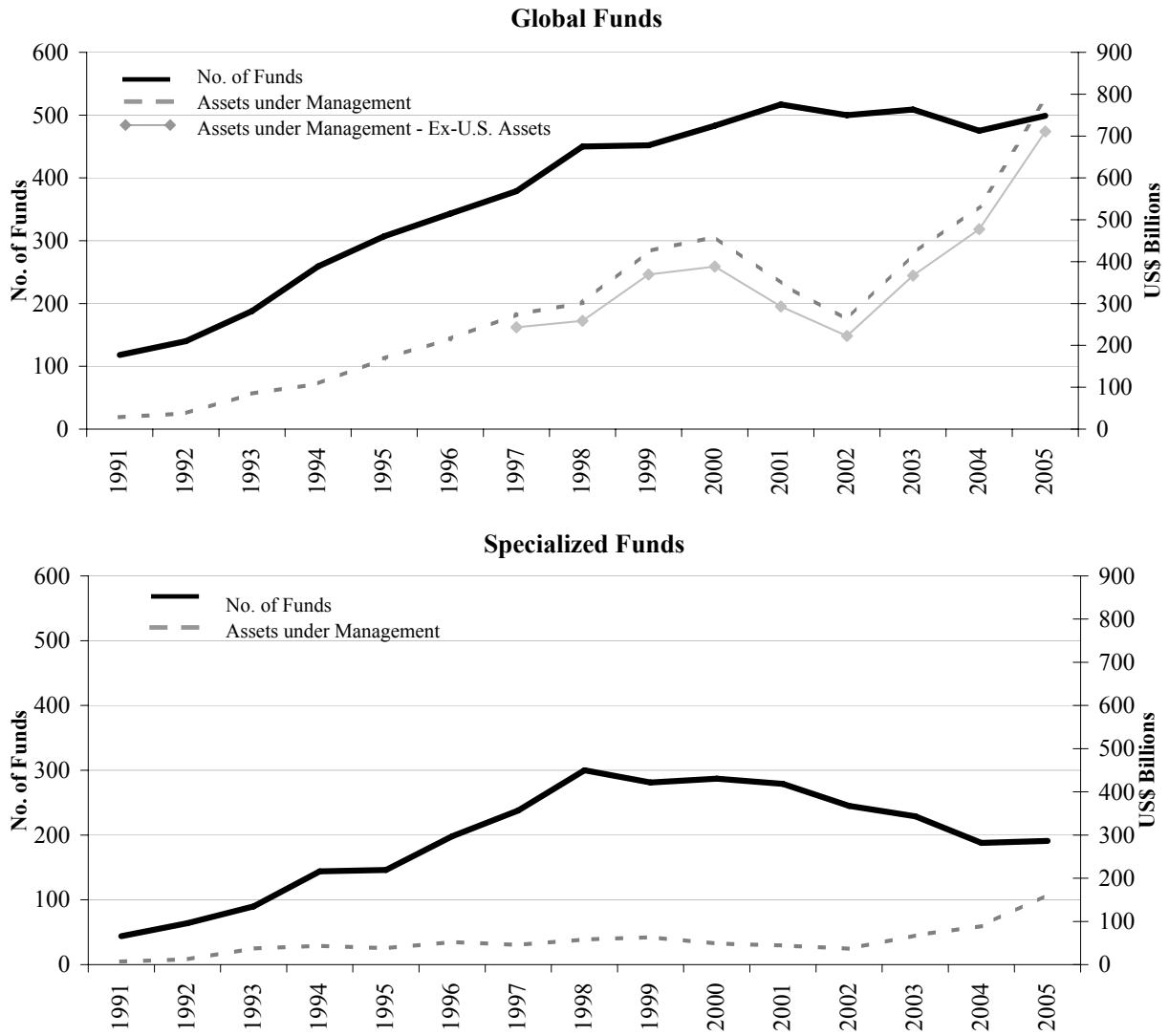
Figure 1. Structure of the U.S. Mutual Funds Industry



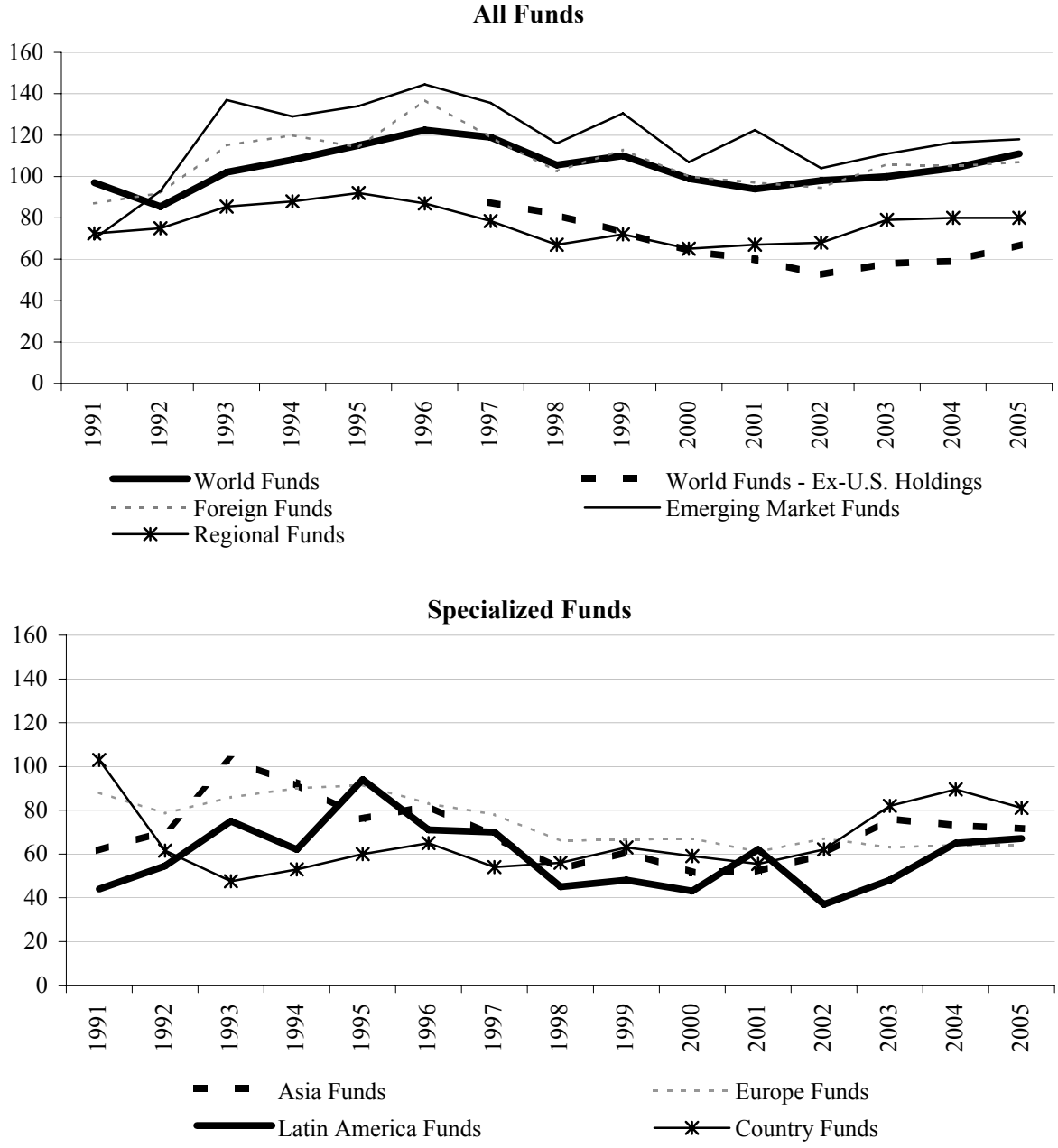
This figure characterizes the organization of U.S. mutual fund families that invest in foreign assets. See description in the main text for details. The figure also clarifies our classification between global and specialized funds. Global funds include both world and foreign funds. Specialized funds include: emerging market funds, regional funds, and country funds.

Figure 2. Total Number of Funds and Total Assets under Management by Fund Type



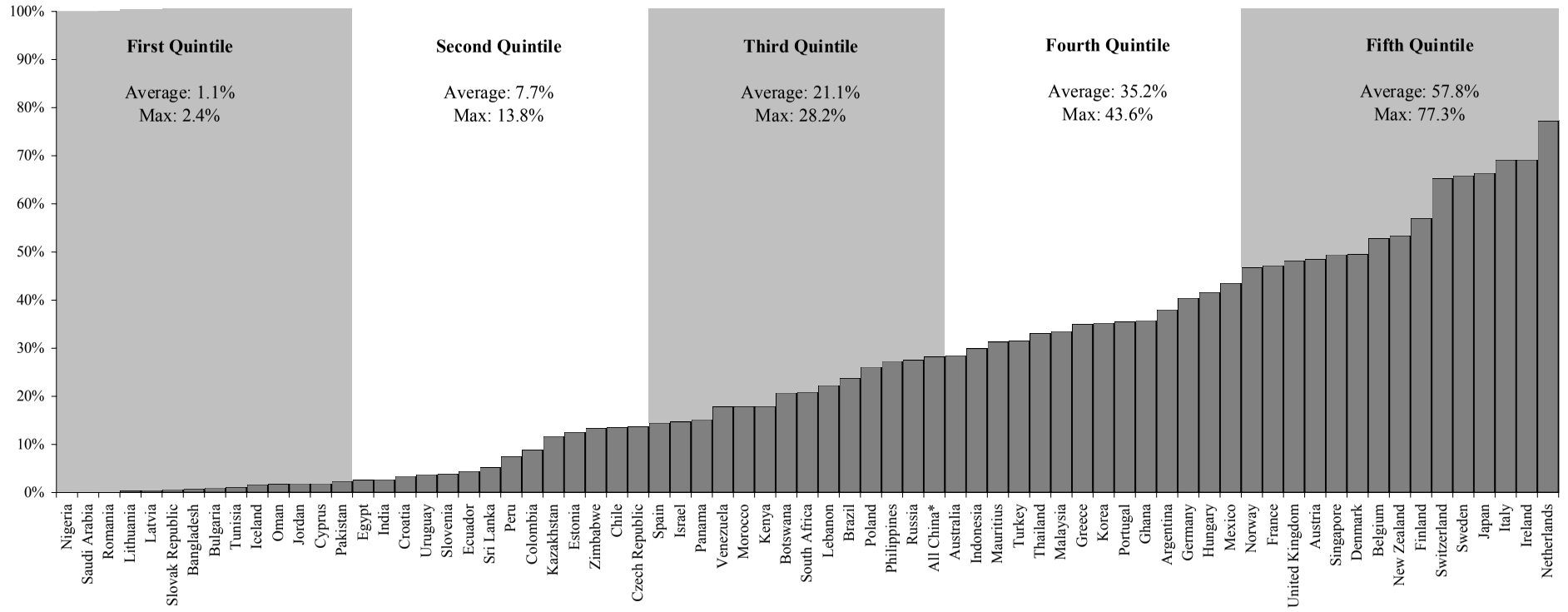
This figure shows the total number of mutual funds in our holdings database and their total assets under management by fund type from 1991 to 2005. Global funds include both world and foreign funds. Specialized funds include: emerging market funds, regional funds, and country funds. For global funds, the value of assets under management that are invested in non-U.S. assets is also shown (data available after 1997 only). Data on assets under management are in US$ billions. The data source is Morningstar International Equity Mutual Funds.

Figure 3. Median Number of Holdings by Fund Type



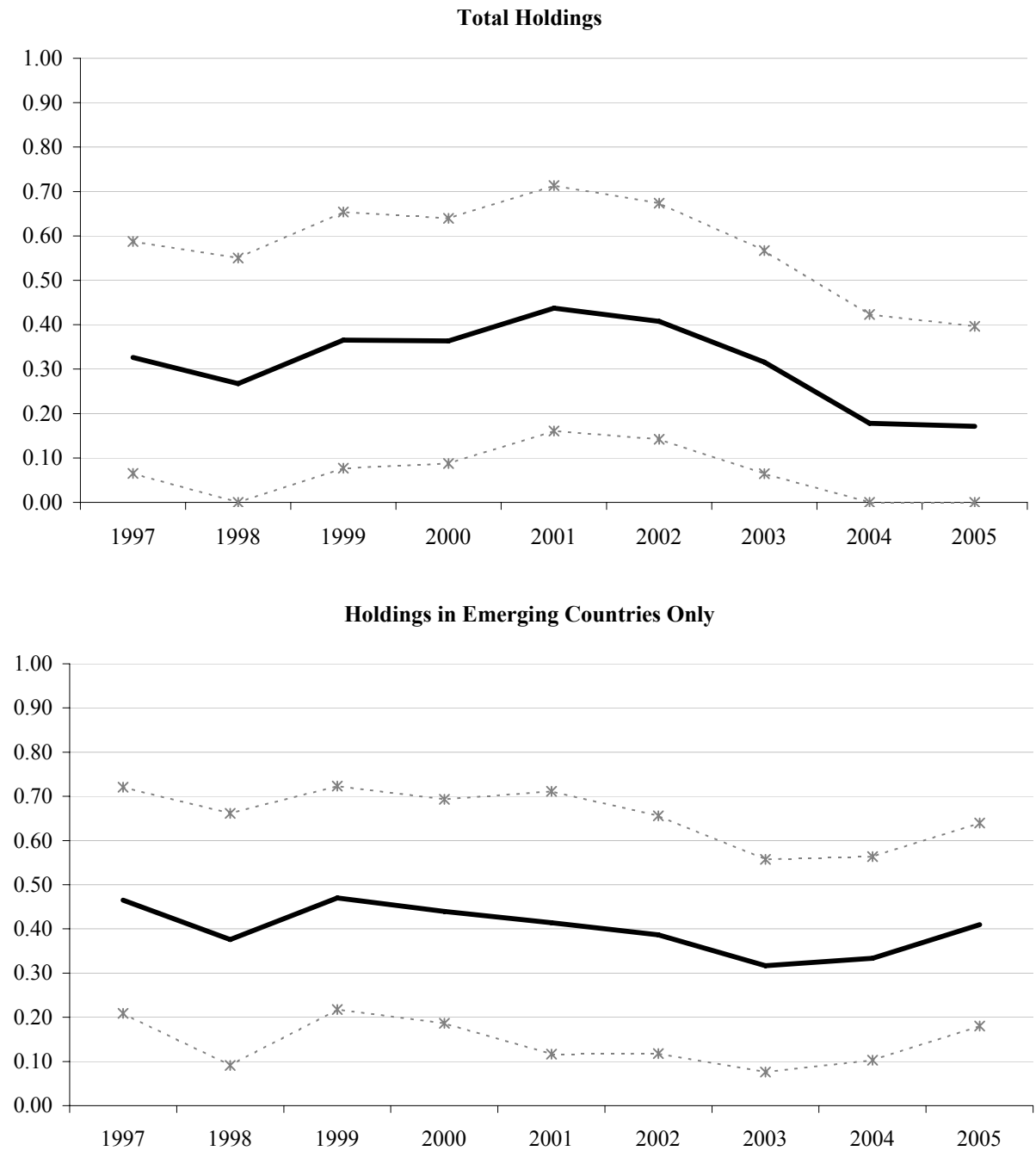
This figure shows the median number of holdings by mutual fund type between 1991 and 2005. The following mutual fund types are shown in the top panel of the figure: world, foreign, emerging market, and regional funds. The median number of foreign holdings of world funds is also shown. In the bottom panel, regional funds are divided into three different categories, namely: Latin America, Europe, and Asia funds. The median number of holdings for country funds is also reported in the bottom panel. The data source is Morningstar International Equity Mutual Funds.

Figure 4. Mutual Fund Holdings as a Proportion of the Total No. of Listed Stocks



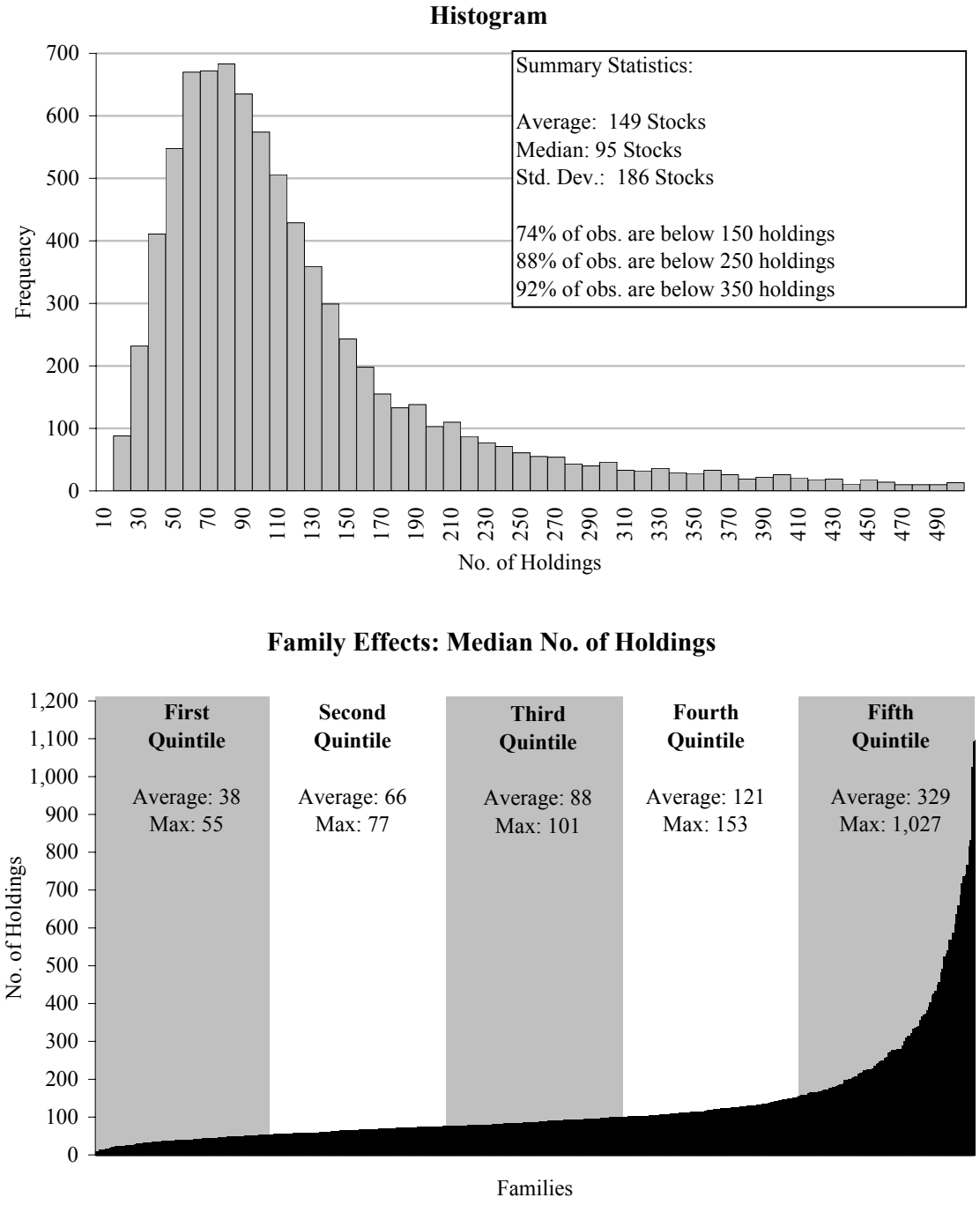
This figure shows the number of mutual fund holdings as a percentage of the total number of listed stocks by country. Countries are sorted according to their average ratio in the 1997-2004 period. Countries are divided into five equally-sized groups (quintiles); the average and maximum values for each quintile are reported. The United States and Canada were excluded from figure. The data sources are Morningstar International Equity Mutual Funds and Global Financial Database. * "All China" includes the following countries: Mainland China, Hong Kong, and Taiwan.

Figure 5. Evolution of Entropy Measures



This figure shows the evolution of our entropy measure, in which stocks common to both global and specialized funds are considered, from 1997 to 2005. In the top panel, holdings in assets from all countries except the U.S. are considered, whereas in the bottom panel, only asset holdings in emerging countries are analyzed. The thick line represents the median value across families in a given year. The figure also shows +/- one standard deviation from this median (dotted grey lines). Specialized funds include: emerging market, Latin America, Asia, Europe, and country funds.

Figure 6. No. of Holdings: Dispersion and Family Effects



This figure shows two characteristics of mutual fund holdings. The top panel, shows the distribution of the number of holdings in the 1991-2005 period. The bottom panel reports the median number of holdings by mutual fund family. All funds in any given family are considered. Families are sorted according to their median number of holdings in the 1991-2005 period. Families are divided into five equally-sized groups (quintiles); the average and maximum values for each quintile are reported.

Table 1. Data Coverage

Holdings Data	
Sample	1991-2005
Frequency	Annual
No. of Families	505
Total Number of Funds	3,651
Price Data	
Sample	September 1989 - June 2006
Frequency	Daily
No. of Families	36
Total Number of Funds	371

This table describes the two datasets analyzed in this paper. The source of the data on mutual fund holdings is Morningstar International Equity Mutual Funds. The source of the mutual fund price/return dataset is Bloomberg.

Table 2. Mutual Fund Holdings

	Average	Median	Std. Dev.
Fund Type:			
Global Funds	155	96	196
World Funds	136	106	131
Excluding U.S. Assets	101	76	100
Foreign Funds	175	105	219
Specialized Funds	116	78	135
Emerging Market Funds	160	121	138
Asia Funds	88	64	109
Europe Funds	108	70	155
Latin America Funds	57	56	24
Country Funds	126	63	176
Total	149	95	186

This table shows the average, the median, and the standard deviation of the number of holdings by mutual fund type over the period 1991-2005. The following mutual fund types are shown: global funds (world and foreign funds) and specialized funds (emerging market, regional, and country funds). The data source is Morningstar International Equity Mutual Funds.

Table 3. Differences in Holdings Within Regions across Fund Types

No. of Assets

Fund Type	Latin America	Asia	Developed Europe
Regional Funds			
Median No. of Holdings	41	60	62
Changes Relative to:			
Emerging Market Funds	-34%	-33%	-
Foreign Funds	-94%	-42%	-5%
World Funds	-94%	-69%	-49%

No. of Countries

Fund Type	Latin America	Asia	Developed Europe
Regional Funds			
Median No. of Holdings	6	8	11
Changes Relative to:			
Emerging Market Funds	-17%	-10%	-
Foreign Funds	-71%	-31%	0%
World Funds	-75%	-36%	-14%

This table reports differences in asset holdings across fund types within regions of exposure. These differences are expressed as a percentage change relative to the holdings of the appropriate regional fund. Median values for regional funds are reported. The top panel shows the differences in the number of holdings across fund types. The bottom panel shows the differences in the number of countries receiving investments from different fund types. The first row in each panel reports the median number of holdings or countries in a given region for the appropriate regional fund. The comparisons are made within mutual fund families. Families without the appropriate regional fund are excluded from the analysis. The sample period is from 1997 to 2005. Global funds are comprised of both world and foreign funds. Regional funds include the following fund types: Latin America funds, Asia funds, and Europe funds.

Table 4. Mutual Fund Holdings

	No. Listed Companies	All Fund Holdings: No. of Holdings	All Fund Holdings: As a Percentage of All Listed Stocks	Global Fund Holdings: No. of Holdings	Global Fund Holdings: As a Percentage of All Listed Stocks
			1997		
Total	30,319	9,086	30%	6,267	21%
Developed Countries	12,987	6,815	52%	4,953	38%
Asia	5,760	3,249	56%	2,246	39%
Europe	6,392	3,459	54%	2,635	41%
Middle East	802	87	11%	54	7%
Emerging Countries	17,332	2,271	13%	1,314	8%
Asia	10,089	1,304	13%	693	7%
Europe	2,697	319	12%	167	6%
Latin America	2,196	399	18%	297	14%
Middle East & Africa	2,350	249	11%	157	7%
			2004		
Total	39,061	6,289	16%	5,510	14%
Developed Countries	18,282	5,204	28%	4,799	26%
Asia	7,758	2,748	35%	2,429	31%
Europe	9,817	2,392	24%	2,315	24%
Middle East	686	45	7%	37	5%
Emerging Countries	20,779	1,085	5%	711	3%
Asia	10,444	566	5%	394	4%
Europe	6,279	184	3%	114	2%
Latin America	1,525	195	13%	141	9%
Middle East & Africa	2,531	140	6%	62	2%

This table shows the number of stocks that can be potentially held by U.S. mutual funds in 1997 (top panel) and in 2004 (bottom panel). The first column shows the total number of listed stocks in the main stock exchange in each country within each region. The data is from Claessens and Schmukler (2006) and from Global Financial Database. This is considered the universe of stocks that can be held by mutual funds. The second column shows the number of stocks actually held by all U.S. mutual funds in these regions, in absolute terms and as a percentage of the universe of stocks available. The third column reports the same numbers for global funds only. Developed countries include high-income countries and emerging countries are non-high-income countries, according to the World Bank classification of countries. The United States, Canada, and offshore centers are excluded from the analysis. The data source of mutual fund holdings data is Morningstar International Equity Mutual Funds.

Table 5. Size of Mutual Fund Holdings

	Holdings as a Percentage of Firms' Market Capitalization			Average Mutual Fund Size
	Average	Median	Std. Dev.	
Fund Type:				
Global Funds	0.12%	0.01%	0.74%	894
World Funds	0.18%	0.01%	0.86%	1,315
Foreign Funds	0.11%	0.01%	0.72%	754
Specialized Funds	0.12%	0.02%	0.59%	272
Emerging Market Funds	0.15%	0.02%	0.70%	367
Asia Funds	0.12%	0.01%	0.53%	131
Europe Funds	0.08%	0.01%	0.35%	332
Latin America Funds	0.09%	0.02%	0.46%	146

This table shows the average, median, and standard deviation of mutual fund foreign holdings as a percentage of firms' market capitalization, by fund type. The average size of mutual funds is also reported. This data is in US$ millions. The sample period considered is from 1997 to 2005.

Table 6. Probabilities of Being Held by a Mutual Fund

Total Holdings

		Global Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	25%	25%
	Being Held	32%	16%	48%
No Specialized Fund		0%	27%	27%
Total		32%	68%	100% [399,281]

Holdings in Emerging Countries Only

		Global Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	10%	10%
	Being Held	76%	13%	89%
No Specialized Fund		0%	2%	2%
Total		76%	24%	100% [92,355]

This table shows frequency tables for mutual fund holdings from 1997 to 2005. It reports the probability of being held (or not) by certain types of mutual funds, given that a mutual fund family has both fund types. The top panel considers asset holdings in all countries except the U.S., whereas the bottom panel considers asset holdings in emerging countries only. Each observation is a family-year-stock observation. The total number of observations is reported in brackets in the "Total" column of each table. The cell percentage is reported. If in a given family-year observation, a global fund holds an asset in a country not covered by the specialized funds within that family in that year, then this observation is counted in the "No Specialized Fund" line.

Table 7. No of Holdings: Importance of No. of Managers and Fees

	(1)	(2)	(3)	(4)	(5)	(6)
Independent Variables:						
No. of Managers		16.814***	15.612***			16.075***
		[4.507]	[4.568]			[4.797]
1	132.205***					
	[10.665]					
2	134.980***					
	[8.602]					
3	153.479***					
	[19.083]					
4	165.689***					
	[19.957]					
5	151.307***					
	[16.569]					
6	196.882***					
	[31.305]					
7 or More	216.827***					
	[27.617]					
Manager Tenure		2.32	2.78	-1.42	-2.26	1.11
		[2.462]	[2.465]	[2.673]	[2.509]	[2.226]
Fund Age		1.00	0.28	0.45	0.85	0.22
		[0.800]	[0.777]	[0.885]	[0.912]	[0.848]
Fund Expenses				0.655***	-2.175*	-2.228*
				[0.116]	[1.225]	[1.267]
Fund Size					0.028**	0.026**
					[0.013]	[0.013]
Year Dummies	No	No	Yes	No	No	Yes
Fund Type Dummies	No	No	Yes	No	No	Yes
No. of Observations	6,419	6,170	6,170	5,733	5,732	5,726
R-squared	0.02	0.03	0.05	0.01	0.02	0.07

This table reports the regressions of the number of mutual fund holdings on the number of managers, manager's tenure, age of fund in years, fund expenses, and fund size. Depending on the specification, year and/or fund type dummies are included in these regressions. The sample period is from 1997 to 2005. Fund expenses and fund size are in US$ millions. R-squared and total number of observations are reported in the bottom of the table. Standard errors are clustered at the family level. Standard deviation is shown in brackets. ***, **, and * indicate significance at one, five, or ten percent, respectively.

Table 8. No of Mutual Fund Holdings

Importance of Year, Fund Type, and Family Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
R-squared	0.01	0.02	0.46	0.02	0.47	0.48	0.48
Independent Variables:							
Year Dummies	Yes	No	No	Yes	Yes	No	Yes
Fund Type Dummies	No	Yes	No	Yes	No	Yes	Yes
Family Dummies	No	No	Yes	No	Yes	Yes	Yes
No. of Observations	8,543	8,543	8,543	8,543	8,543	8,543	8,543

Importance of Family Expenses and Family Size

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Independent Variables:							
No. of Managers			14.172***	4.57			4.48
			[4.483]	[3.667]			[3.668]
Manager Tenure	-0.60	-1.71	1.30	2.068*	1.47	1.48	2.055*
	[2.652]	[2.441]	[2.232]	[1.209]	[1.222]	[1.224]	[1.205]
Fund Age	0.82	1.23	0.38	-0.97	-0.91	-0.91	-0.96
	[0.885]	[0.925]	[0.845]	[0.850]	[0.853]	[0.857]	[0.850]
Family Expenses	0.095**	-0.742***	-0.644**		0.05	-0.02	-0.02
	[0.047]	[0.232]	[0.251]		[0.036]	[0.157]	[0.159]
Family Size		0.009***	0.007***			0.00	0.00
		[0.003]	[0.003]			[0.002]	[0.002]
Year Dummies	No	No	Yes	Yes	Yes	Yes	Yes
Fund Type Dummies	No	No	Yes	Yes	Yes	Yes	Yes
Family Dummies	No	No	No	Yes	Yes	Yes	Yes
No. of Observations	6,177	6,177	6,170	6,170	6,177	6,177	6,170
R-squared	0.01	0.03	0.07	0.49	0.49	0.49	0.49

The top table shows the R-squared of the regressions of the number of mutual fund holdings on year dummies, fund type dummies, and family dummies. Seven different specifications are shown. See the main text for a detailed description. The sample period is from 1991 to 2005. The bottom table reports the regressions of the number of mutual fund holdings on the number of managers, manager's tenure, age of fund in years, mutual fund family expenses, and mutual fund family size. Depending on the specification, year, fund type, and/or family dummies are included in these regressions. The sample period is from 1997 to 2005. Family expenses and family size are in US$ millions. R-squared and total number of observations are reported in the bottom of the table. Standard errors are clustered at the family level. Standard deviation is shown in brackets. ***, **, and * indicate significance at one, five, or ten percent, respectively.

Table 9. Simulations: "Best" Result for Each Fund

Minimizing the Variance

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	6.05%	11.08%	5.09%	0.89%	0.80%	60
Foreign Funds	6.40%	10.40%	4.04%	0.96%	0.90%	72
Portfolio of World Funds	22.54%	36.41%	11.59%	0.79%	0.71%	3
Portfolio of Foreign Funds	9.18%	13.22%	3.97%	0.89%	0.83%	21
Total	6.92%	11.49%	4.58%	0.92%	0.85%	156

Maximizing Expected Return

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	6.05%	7.93%	1.91%	0.89%	0.89%	60
Foreign Funds	6.40%	6.85%	0.46%	0.96%	0.96%	73
Portfolio of World Funds	22.54%	34.83%	10.10%	0.79%	0.81%	3
Portfolio of Foreign Funds	9.18%	12.65%	3.46%	0.89%	0.89%	20
Total	6.92%	8.51%	1.61%	0.92%	0.92%	156

This table shows the results of the following simulations: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). The simulation yielding the highest realized average return ("best") for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Table 10. Simulations: "Longest" Available Sample

Minimizing the Variance

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	8.05%	10.83%	2.84%	1.15%	1.08%	60
Foreign Funds	5.52%	7.97%	2.55%	0.97%	0.92%	73
Portfolio of World Funds	2.29%	12.35%	10.37%	1.04%	0.88%	3
Portfolio of Foreign Funds	8.77%	11.91%	3.15%	0.92%	0.86%	20
Total	6.84%	9.65%	2.89%	1.04%	0.97%	156

Maximizing Expected Return

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	8.05%	8.14%	0.08%	1.15%	1.15%	60
Foreign Funds	5.52%	5.77%	0.24%	0.97%	0.97%	73
Portfolio of World Funds	2.29%	16.32%	14.03%	1.04%	0.99%	3
Portfolio of Foreign Funds	8.77%	11.75%	3.02%	0.92%	0.92%	20
Total	6.84%	7.63%	0.80%	1.04%	1.03%	156

This table shows the results of the following simulations: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). The simulation with the longest time series for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Table 11. Benchmarking: "Best" Result for Each Fund

Minimizing the Variance

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	8.45%	12.24%	3.75%	0.91%	0.86%	54
Foreign Funds	6.35%	10.36%	3.97%	0.96%	0.94%	72
Portfolio of World Funds	22.54%	31.39%	7.35%	0.79%	0.75%	3
Portfolio of Foreign Funds	9.00%	12.34%	3.34%	0.90%	0.86%	20
Total	7.77%	11.69%	3.87%	0.93%	0.89%	149

Maximizing Expected Return

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	8.45%	11.60%	3.18%	0.91%	0.85%	54
Foreign Funds	6.35%	8.63%	2.28%	0.96%	0.94%	72
Portfolio of World Funds	22.54%	24.44%	1.59%	0.79%	0.78%	3
Portfolio of Foreign Funds	9.00%	10.74%	1.66%	0.90%	0.88%	20
Total	7.77%	10.29%	2.51%	0.93%	0.89%	149

This table shows the results of the following simulations: minimization of the variance of returns relative to a benchmark index subject to restrictions on expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns relative to a benchmark index (bottom panel). The simulation yielding the highest realized average return ("best") for each main fund in each family is considered. For each simulation, we consider the appropriate benchmark indexes for the global fund. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Table 12. Benchmarking: Simulations with The Longest Available Sample

Minimizing the Variance

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	9.04%	11.63%	2.59%	1.15%	1.11%	60
Foreign Funds	5.49%	7.70%	2.24%	0.97%	0.95%	73
Portfolio of World Funds	2.29%	11.68%	9.51%	1.04%	0.93%	3
Portfolio of Foreign Funds	8.53%	11.58%	3.08%	0.93%	0.89%	19
Total	7.16%	9.76%	2.62%	1.03%	1.00%	155

Maximizing Expected Return

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Funds	9.04%	10.08%	1.87%	1.15%	0.91%	60
Foreign Funds	5.49%	6.98%	1.52%	0.97%	0.95%	73
Portfolio of World Funds	2.29%	7.56%	5.44%	1.04%	0.96%	3
Portfolio of Foreign Funds	8.53%	9.67%	1.11%	0.93%	0.91%	19
Total	7.16%	8.51%	1.68%	1.03%	0.93%	155

This table shows the results of the following simulations: minimization of the variance of returns relative to a benchmark index subject to restrictions on expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns relative to a benchmark index (bottom panel). The simulation with the longest time series for each main fund in each family is considered. For each simulation, we consider the appropriate benchmark indexes for the global fund. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Table 13. Skewness and Kurtosis based on "Best" Simulations

Minimizing the Variance

	Returns on Global Funds		Returns on Port. Spec. Funds		No. of
	Skewness	Kurtosis	Skewness	Kurtosis	Compar.
Type of Global Fund					
World Stock	-0.68	11.35	-0.64	8.10	60
	[1.08]	[15.54]	[0.71]	[9.50]	
Foreign Stock	-0.84	13.10	-0.41	42.67	72
	[1.22]	[20.53]	[5.01]	[261.77]	
Portfolio of World Stock Funds	-0.02	4.99	-0.39	6.60	3
	[0.11]	[1.93]	[0.24]	[3.35]	
Portfolio of Foreign Stock Funds	-0.45	6.64	-0.88	10.82	21
	[0.49]	[6.00]	[0.97]	[12.82]	
Total	-0.71	11.40	-0.56	24.39	156
	[1.09]	[17.17]	[3.44]	[178.14]	

Maximizing Expected Return

	Returns on Global Funds		Returns on Port. Spec. Funds		No. of
	Skewness	Kurtosis	Skewness	Kurtosis	Compar.
Type of Global Fund					
World Stock	-0.68	11.35	-0.70	11.33	60
	[1.08]	[15.54]	[1.07]	[15.65]	
Foreign Stock	-0.84	13.10	-0.79	11.74	72
	[1.22]	[20.53]	[1.07]	[16.34]	
Portfolio of World Stock Funds	-0.02	4.99	-0.17	5.33	3
	[0.11]	[1.93]	[0.14]	[2.74]	
Portfolio of Foreign Stock Funds	-0.45	6.64	-0.80	11.43	21
	[0.49]	[6.00]	[1.08]	[14.08]	
Total	-0.71	11.40	-0.74	11.42	156
	[1.09]	[17.17]	[1.06]	[15.56]	

This table shows skewness and kurtosis for global funds and portfolio of specialized funds based on the following simulations: minimization of the variance of returns subject to restrictions on expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). The simulation yielding the highest realized average return ("best") for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. Standard deviation of both skewness and kurtosis across comparisons are shown in brackets.

Table 14. Skewness and Kurtosis based on Longest Simulations

Minimizing the Variance

	Returns on Global Funds		Returns on Port. Spec. Funds		No. of
	Skewness	Kurtosis	Skewness	Kurtosis	Compar.
Type of Global Fund					
World Stock	0.19	72.81	0.21	69.95	60
	[7.87]	[458.13]	[7.83]	[458.41]	
Foreign Stock	-0.94	14.52	-0.50	43.74	73
	[1.26]	[20.82]	[5.00]	[259.82]	
Portfolio of World Stock Funds	-0.23	7.21	-0.52	7.65	3
	[0.49]	[3.52]	[0.11]	[2.07]	
Portfolio of Foreign Stock Funds	-0.44	6.44	-0.90	10.98	20
	[0.43]	[4.72]	[0.98]	[13.15]	
Total	-0.43	35.76	-0.28	48.93	156
	[4.96]	[284.55]	[5.93]	[334.32]	

Maximizing Expected Return

	Returns on Global Funds		Returns on Port. Spec. Funds		No. of
	Skewness	Kurtosis	Skewness	Kurtosis	Compar.
Type of Global Fund					
World Stock	0.19	72.81	0.19	72.78	60
	[7.87]	[458.13]	[7.87]	[458.14]	
Foreign Stock	-0.94	14.52	-0.87	12.96	73
	[1.26]	[20.82]	[1.08]	[16.58]	
Portfolio of World Stock Funds	-0.23	7.21	-0.08	7.72	3
	[0.49]	[3.52]	[0.43]	[2.17]	
Portfolio of Foreign Stock Funds	-0.44	6.44	-0.83	11.72	20
	[0.43]	[4.72]	[1.11]	[14.60]	
Total	-0.43	35.76	-0.44	35.71	156
	[4.96]	[284.55]	[4.95]	[284.45]	

This table shows skewness and kurtosis for global funds and portfolio of specialized funds based on the following simulations: minimization of the variance of returns subject to restrictions on expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). The simulation with the longest time series for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. Standard deviation of both skewness and kurtosis across comparisons are shown in brackets.

Table 15. Average Returns Conditional on Returns on the MSCI Emerging Market Index

Return on MSCI Emerging Market Index:	Average Return (per week)		ttest: Diff	No. of
	Global Fund	Port. Spec. Funds	> 0	Obs.
Minimization of Variance:				
"Best" Simulation				
Between 0% and -1%	-0.34%	-0.23%	3.10	5,346
Between -1% and -5%	-1.52%	-1.49%	1.44	10,763
Between -5% and -10%	-4.12%	-4.47%	-2.19	971
Smaller than -10%	-3.51%	-3.54%	-0.13	198
Longest Simulation				
Between 0% and -1%	-0.29%	-0.22%	2.41	7,088
Between -1% and -5%	-1.49%	-1.47%	1.05	13,839
Between -5% and -10%	-4.07%	-4.33%	-1.87	1,256
Smaller than -10%	-3.71%	-3.81%	-0.42	279
Maximization of Return:				
"Best" Simulation				
Between 0% and -1%	-0.34%	-0.32%	0.40	5,346
Between -1% and -5%	-1.52%	-1.53%	-0.29	10,763
Between -5% and -10%	-4.12%	-4.23%	-0.65	971
Smaller than -10%	-3.51%	-3.57%	-0.23	198
Longest Simulation				
Between 0% and -1%	-0.29%	-0.29%	0.26	7,088
Between -1% and -5%	-1.49%	-1.50%	-0.04	13,839
Between -5% and -10%	-4.07%	-4.12%	-0.34	1,256
Smaller than -10%	-3.71%	-3.78%	-0.31	279

This table shows the average return for both global funds and our constructed portfolios of specialized funds conditional on negative returns on the MSCI Emerging Market Index. Weekly data is considered. Results for the following simulations are shown: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). Both simulations yielding the highest realized average return ("best") and simulations with the longest time series for each main fund in each family are considered. T-statistics for the test of equality of means are shown. A positive t-statistic means that the return on the constructed portfolio is larger than that on the global fund. The number of observations is also shown.

Table 16. Average Returns Conditional on Constructed Portfolio Returns

Return on Portfolios of Specialized Funds:	Average Return (per week)		ttest: Diff	No. of
	Global Fund	Port. Spec. Funds	> 0	Obs.
Minimization of Variance:				
"Best" Simulation				
Between 0% and -1%	-0.52%	-0.47%	4.63	6,872
Between -1% and -5%	-2.22%	-2.17%	2.46	9,363
Between -5% and -10%	-6.11%	-6.33%	-2.18	638
Smaller than -10%	-11.98%	-12.81%	-1.68	112
Longest Simulation				
Between 0% and -1%	-0.49%	-0.47%	3.03	9,091
Between -1% and -5%	-2.22%	-2.19%	1.96	12,071
Between -5% and -10%	-6.28%	-6.37%	-1.05	867
Smaller than -10%	-11.73%	-12.71%	-2.43	156
Maximization of Return:				
"Best" Simulation				
Between 0% and -1%	-0.46%	-0.47%	-0.66	6,863
Between -1% and -5%	-2.21%	-2.23%	-1.85	9,684
Between -5% and -10%	-6.30%	-6.37%	-1.08	813
Smaller than -10%	-12.77%	-13.31%	-1.23	123
Longest Simulation				
Between 0% and -1%	-0.46%	-0.47%	-0.96	8,986
Between -1% and -5%	-2.21%	-2.23%	-1.47	12,356
Between -5% and -10%	-6.41%	-6.46%	-0.84	1,083
Smaller than -10%	-12.96%	-13.27%	-0.84	160

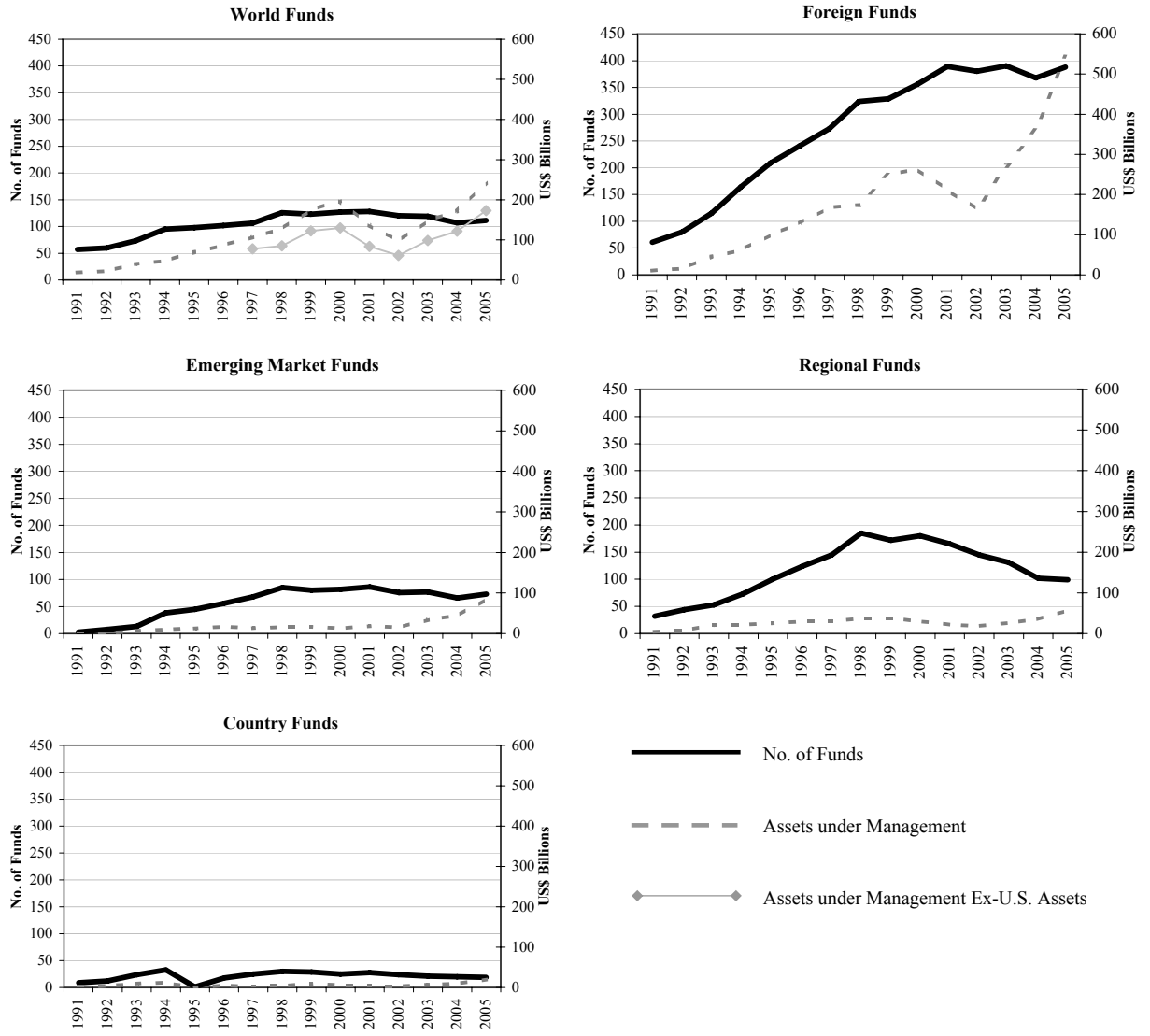
This table shows the average return for both global funds and our constructed portfolios of specialized funds conditional on negative returns on the constructed portfolio itself. Weekly data is considered. Results for the following simulations are shown: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restiction on the variance of returns (bottom panel). Both simulations yielding the highest realized average return ("best") and simulations with the longest time series for each main fund in each family are considered. T-statistics for the test of equality of means are shown. A positive t-statistic means that the return on the constructed portfolio is larger than that on the global fund. The number of observations is also shown.

Table 17. Average Returns Conditional on Global Fund Returns

Return on Global Funds:	Average Return (per week)		ttest: Diff > 0	No. of Obs.
	Global Fund	Port. Spec. Funds		
Minimization of Variance:				
"Best" Simulation				
Between 0% and -1%	-0.47%	-0.35%	11.46	6,923
Between -1% and -5%	-2.23%	-1.92%	16.58	9,696
Between -5% and -10%	-6.39%	-5.37%	13.35	828
Smaller than -10%	-13.17%	-11.28%	4.03	122
Longest Simulation				
Between 0% and -1%	-0.47%	-0.38%	11.33	9,019
Between -1% and -5%	-2.23%	-1.98%	15.45	12,365
Between -5% and -10%	-6.46%	-5.55%	13.17	1,104
Smaller than -10%	-13.29%	-11.34%	4.92	159
Maximization of Return:				
"Best" Simulation				
Between 0% and -1%	-0.47%	-0.45%	1.88	6,923
Between -1% and -5%	-2.23%	-2.19%	2.79	9,696
Between -5% and -10%	-6.39%	-6.22%	2.67	828
Smaller than -10%	-13.17%	-13.05%	0.29	122
Longest Simulation				
Between 0% and -1%	-0.47%	-0.46%	1.40	9,019
Between -1% and -5%	-2.23%	-2.19%	2.69	12,365
Between -5% and -10%	-6.46%	-6.34%	2.21	1,104
Smaller than -10%	-13.29%	-13.07%	0.63	159

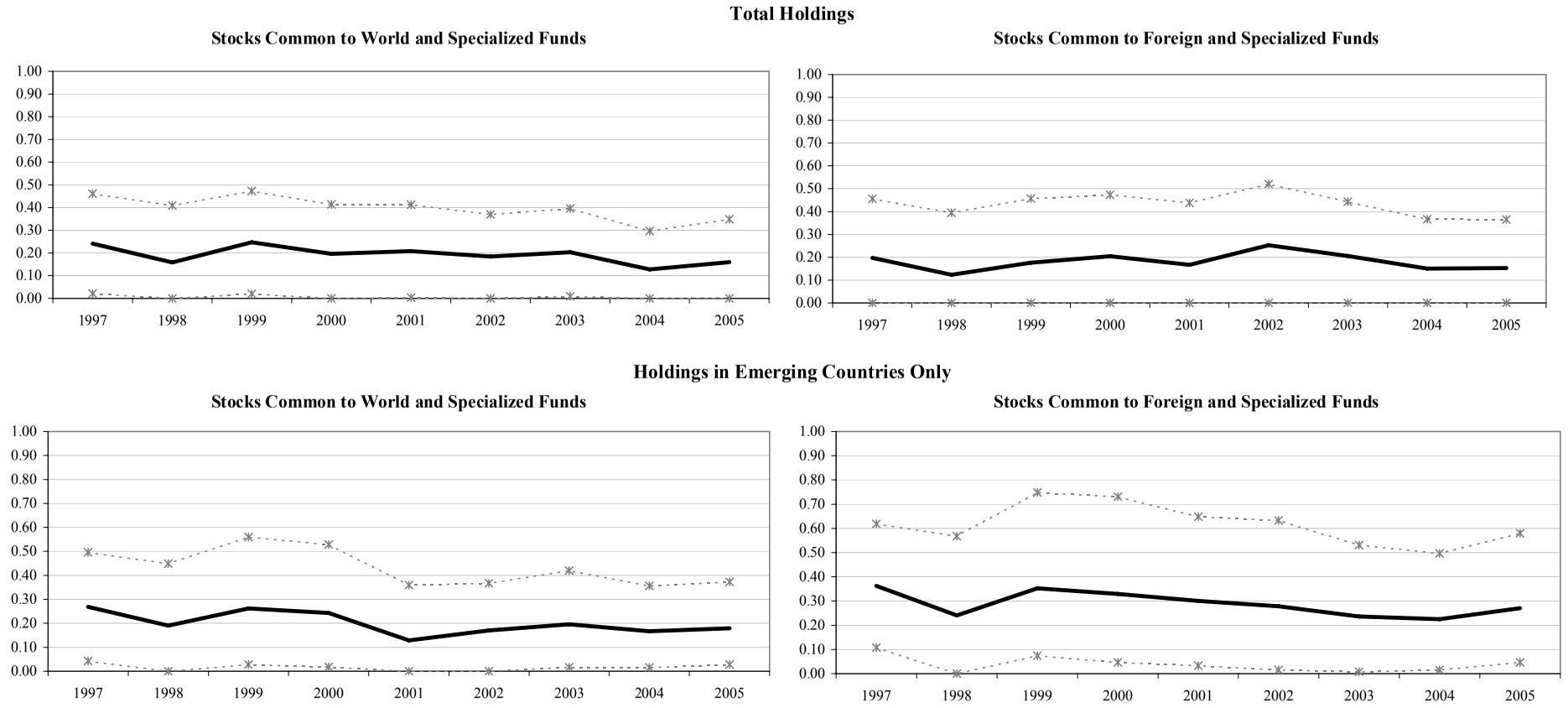
This table shows the average return for both global funds and our constructed portfolios of specialized funds conditional on negative returns on the global fund itself. Weekly data is considered. Results for the following simulations are shown: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). Both simulations yielding the highest realized average return ("best") and simulations with the longest time series for each main fund in each family are considered. T-statistics for the test of equality of means are shown. A positive t-statistic means that the return on the constructed portfolio is larger than that on the global fund. The number of observations is also shown.

Appendix Figure 1. Total Number of Funds and Total Assets under Management by Fund Type



This figure shows the total number of mutual funds in our holdings database and their total assets under management by fund type from 1991 to 2005. World funds are allowed to invest anywhere in the world, foreign funds are also allowed to invest in all countries except the U.S., emerging market funds can invest in emerging countries, regional funds invest in specific regions, and country funds, in specific countries. For world funds, the value of assets under management for only non-U.S. assets is also shown (data available after 1997 only). Data on assets under management are in US$ billions. The data source is Morningstar International Equity Mutual Funds.

Appendix Figure 2. Evolution of Entropy Measures



This figure shows the evolution of our entropy measures from 1997 to 2005. Two different measures based on different pairs of mutual fund types are considered: stocks common to both world and specialized funds (left panels) and stocks common to both foreign and specialized funds (right panels). In the top panel, holdings in assets from all countries except the U.S. are considered, whereas in the bottom panel, only asset holdings in emerging countries are analyzed. The thick line represents the median value across families in a given year. The figure also shows +/- one standard deviation from this median (dotted grey lines). Specialized funds include: emerging market, Latin America, Asia, Europe, and country funds.

Appendix Table 1. Price Data on Mutual Funds

	Family	No. Funds	Sample	
			Beginning	End
1	AIM Family of Funds	17	Apr-92	Jul-05
2	Alliance Bernstein	10	Dec-99	Jun-06
3	Allianz Funds	4	Dec-04	Jul-05
4	American Funds Group	7	Mar-02	Jun-06
5	Columbia Funds	8	Oct-00	Jun-06
6	Credit Suisse	8	Dec-01	Jun-06
7	DFA Investment Dimensions Group	9	Mar-93	Jul-05
8	Dreyfus Founders	11	Jul-96	Jun-06
9	Eaton Vance Group	7	Sep-99	Jul-05
10	Evergreen Funds	5	Sep-94	Jun-06
11	Excelsior Funds	4	Sep-93	Jul-05
12	Fidelity Advisors Funds	14	Dec-00	Jun-06
13	Fidelity Group	18	Sep-89	Jul-05
14	GAM Funds	7	Jan-90	Jul-05
15	Gartmore	5	Jul-04	Jun-06
16	GMO LLC	17	Jan-99	Jul-05
17	Goldman Sachs Asset Management Group	11	Oct-98	Jul-05
18	Hartford Mutual Funds	10	May-01	Jun-06
19	ING Funds Trust	12	Nov-94	Jul-05
20	Ivy Mackenzie Management	9	May-99	Jul-05
21	J.P. Morgan Funds	10	Jul-02	Jun-06
22	Janus	12	Oct-98	Jun-06
23	Merrill Lynch Group	15	Nov-94	Jul-05
24	MFS Family of Funds	11	Jun-96	Jun-06
25	Morgan Stanley Funds	26	Oct-94	Jul-05
26	Oppenheimer Funds	9	Sep-04	Jun-06
27	Putnam Funds	6	Nov-91	Jul-05
28	RiverSource (former AXP)	9	Jul-90	Jul-05
29	Scudder Funds	18	Jun-98	Jul-05
30	Seligman Group	4	Jun-03	Jun-06
31	Smith Barney Group	6	Mar-98	Jun-06
32	T. Rowe Price Funds	14	Jun-92	Jul-05
33	Templeton Group	20	Nov-92	Jul-05
34	UBS Funds	6	Mar-01	Jun-06
35	Vanguard Group	11	Jul-00	Jun-06
36	Wells Fargo Advantage	5	Oct-97	Jul-05

This table describes mutual fund price data by fund families. It shows the number of funds in each family analyzed. It also shows the beginning and the end of our sample. The data source is Bloomberg.

Appendix Table 2. Probabilities of Being Held by a Mutual Fund

Total Holdings

		World Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	12%	12%
	Being Held	52%	10%	62%
No Specialized Fund		15%	11%	26%
Total		67%	33%	100% [181,292]

		Foreign Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	23%	23%
	Being Held	34%	15%	49%
No Specialized Fund		2%	26%	28%
Total		37%	63%	100% [382,591]

Holdings in Emerging Countries Only

		World Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	6%	6%
	Being Held	83%	9%	92%
No Specialized Fund		1%	1%	3%
Total		85%	15%	100% [45,617]

		Foreign Funds Probability of:		Total
		Not Being Held	Being Held	
Specialized Funds Probability of:	Not Being Held	0%	8%	8%
	Being Held	79%	12%	91%
No Specialized Fund		0%	1%	2%
Total		80%	20%	100% [89,260]

This table shows frequency tables for mutual fund holdings from 1997 to 2005. It reports the probability of being held (or not) by certain types of mutual funds, given that a mutual fund family has both fund types. The top panel considers asset holdings in all countries except the U.S., whereas the bottom panel considers asset holdings in emerging countries only. Each observation is a family-year-stock observation. The total number of observations is reported in brackets in the "Total" column of each table. The cell percentage is reported. If in a given family-year observation, a global fund holds an asset in a country not covered by the specialized funds within that family in that year, then this observation is counted in the "No Specialized Fund" line.

Appendix Table 3. Percentage of Net Assets in Top 10 Holdings: Importance of No. of Managers and Fees

	(1)	(2)	(3)	(4)	(5)	(6)
Independent Variables:						
No. of Managers		-0.577***	-0.460**			-0.578***
		[0.202]	[0.193]			[0.161]
1	29.303***					
	[0.592]					
2	27.585***					
	[0.660]					
3	25.545***					
	[0.992]					
4	24.685***					
	[2.274]					
5	24.370***					
	[1.112]					
6	22.751***					
	[2.323]					
7 or More	27.794***					
	[1.366]					
Manager Tenure		-0.02	-0.04	0.15	0.15	0.00
		[0.122]	[0.119]	[0.114]	[0.114]	[0.122]
Fund Age		-0.186***	-0.141***	-0.141**	-0.139**	-0.108**
		[0.063]	[0.054]	[0.056]	[0.056]	[0.048]
Fund Expenses				-0.052***	-0.07	-0.04
				[0.009]	[0.043]	[0.050]
Fund Size					0.00	0.00
					[0.000]	[0.000]
Year Dummies	No	No	Yes	No	No	Yes
Fund Type Dummies	No	No	Yes	No	No	Yes
No. of Observations	6,405	6,156	6,156	5,719	5,719	5,713
R-squared	0.02	0.01	0.13	0.02	0.02	0.16

This table reports the regressions of the percentage of net assets in the top 10 holdings on the number of managers, manager's tenure, age of fund in years, fund expenses, and fund size. Depending on the specification, year and/or fund type dummies are included in these regressions. The sample period is from 1997 to 2005. Fund expenses and fund size are in US$ millions. R-squared and total number of observations are reported in the bottom of the table. Standard errors are clustered at the family level. Standard deviation is shown in brackets. ***, **, and * indicate significance at one, five, or ten percent, respectively.

Appendix Table 4. Percentage of Net Assets in Top 10 Holdings

Importance of Year, Fund Type, and Family Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
R-squared	0.06	0.11	0.39	0.16	0.42	0.44	0.48
Independent Variables:							
Year Dummies	Yes	No	No	Yes	Yes	No	Yes
Fund Type Dummies	No	Yes	No	Yes	No	Yes	Yes
Family Dummies	No	No	Yes	No	Yes	Yes	Yes
No. of Observations	8,522	8,522	8,522	8,522	8,522	8,522	8,522

Importance of Family Expenses and Family Size

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Independent Variables:							
No. of Managers	-0.18			-0.436**			-0.18
	[0.184]			[0.196]			[0.183]
Manager Tenure	-0.13	0.09	0.11	-0.01	-0.10	-0.10	-0.12
	[0.083]	[0.112]	[0.111]	[0.116]	[0.081]	[0.081]	[0.084]
Fund Age	-0.125***	-0.164***	-0.170***	-0.117**	-0.128***	-0.128***	-0.126***
	[0.048]	[0.060]	[0.060]	[0.052]	[0.048]	[0.048]	[0.048]
Family Expenses		-0.007**	0.01	0.00	-0.005**	-0.01	-0.01
		[0.003]	[0.010]	[0.011]	[0.002]	[0.009]	[0.009]
Family Size			0.00	0.00		0.00	0.00
			[0.000]	[0.000]		[0.000]	[0.000]
Year Dummies	Yes	No	No	Yes	Yes	Yes	Yes
Fund Type Dummies	Yes	No	No	Yes	Yes	Yes	Yes
Family Dummies	Yes	No	No	No	Yes	Yes	Yes
No. of Observations	6,156	6,163	6,163	6,156	6,163	6,163	6,156
R-squared	0.47	0.01	0.01	0.14	0.47	0.47	0.47

The top table shows the R-squared of the regressions of the percentage of net assets in the top 10 holdings on year dummies, fund type dummies, and family dummies. Seven different specifications are shown. See the main text for a detailed description. The sample period is from 1991 to 2005. The bottom table reports the regressions of the percentage of net assets in the top 10 holdings on the number of managers, manager's tenure, age of fund in years, mutual fund family expenses, and mutual fund family size. Depending on the specification, year, fund type, and/or family dummies are included in these regressions. The sample period is from 1997 to 2005. Family expenses and family size are in US$ millions. R-squared and total number of observations are reported in the bottom of the table. Standard errors are clustered at the family level. Standard deviation is shown in brackets. ***, **, and * indicate significance at one, five, or ten percent, respectively.

Appendix Table 5A. Simulations: "Best" Result for Each Fund

Minimizing the Variance

	Family	Average Return (p.y.) Global Fund	Average Return (p.y.) Port. Spec. Funds	Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns Global Fund	Standard Deviation of Daily Returns Port. Spec. Funds	No. of Compar.
1	Allianz Funds	0.95%	-3.05%	-3.91%	0.66%	0.65%	2
2	Alliance Bernstein	10.89%	14.76%	3.59%	0.90%	0.86%	9
3	American Funds Group	10.57%	13.93%	3.33%	0.87%	0.74%	4
4	AIM Family of Funds	8.37%	20.92%	12.08%	0.95%	0.82%	10
5	Columbia Funds	17.52%	21.06%	3.32%	0.85%	0.77%	3
6	Credit Suisse	8.46%	12.15%	3.63%	0.95%	0.85%	2
7	DFA Investment Dimensions Group	3.15%	1.22%	-1.70%	0.91%	0.84%	4
8	Dreyfus Founders	4.75%	11.96%	7.33%	0.95%	0.83%	6
9	Evergreen Funds	5.76%	5.56%	-0.21%	1.07%	1.08%	2
10	Eaton Vance Group	-0.75%	15.22%	16.91%	1.08%	0.79%	2
11	Excelsior Funds	3.95%	7.15%	3.13%	0.89%	0.87%	2
12	Fidelity Group	5.97%	9.42%	3.59%	1.02%	0.91%	7
13	Fidelity Advisors Funds	7.76%	11.86%	4.09%	0.87%	0.77%	6
14	GAM Funds	-1.42%	3.04%	3.67%	1.04%	1.43%	2
15	Gartmore	22.30%	18.99%	-2.62%	0.81%	0.78%	3
16	GMO LLC	6.65%	8.05%	1.36%	0.76%	0.77%	8
17	Goldman Sachs Asset Management Group	1.63%	6.80%	5.42%	1.04%	0.94%	3
18	Hartford Mutual Funds	14.82%	18.72%	3.50%	0.91%	0.86%	2
19	ING Funds Trust	-4.77%	0.10%	5.71%	1.11%	1.01%	6
20	Ivy Mackenzie Management	-0.56%	4.80%	5.73%	0.94%	0.81%	3
21	Janus	-7.01%	0.08%	7.60%	0.67%	0.70%	5
22	J.P. Morgan Funds	22.11%	24.06%	1.68%	0.90%	0.87%	4
23	MFS Family of Funds	20.70%	39.09%	15.93%	0.88%	0.81%	3
24	Merrill Lynch Group	10.35%	13.01%	2.64%	0.99%	0.93%	9
25	Morgan Stanley Funds	1.87%	6.83%	5.28%	0.98%	0.84%	9
26	Oppenheimer Funds	10.45%	9.72%	-0.69%	0.82%	0.84%	3
27	Putnam Funds	4.86%	5.53%	0.74%	1.08%	1.05%	5
28	RiverSource (former AXP)	13.45%	22.06%	7.87%	0.84%	0.73%	2
29	Scudder Funds	6.31%	13.19%	6.75%	1.00%	0.90%	6
30	Smith Barney Group	2.03%	2.35%	0.30%	0.94%	0.94%	1
31	Seligman Group	14.45%	15.89%	1.26%	0.82%	0.82%	2
32	Templeton Group	1.13%	2.46%	1.55%	0.83%	0.73%	8
33	T. Rowe Price Funds	19.58%	32.17%	10.71%	0.85%	0.82%	6
34	UBS Funds	4.41%	7.30%	2.88%	0.89%	0.84%	1
35	Vanguard Group	7.77%	10.39%	2.54%	0.96%	0.92%	4
36	Wells Fargo Advantage	5.22%	11.69%	6.65%	0.98%	0.78%	2
	Total	6.92%	11.49%	4.58%	0.92%	0.85%	156

This table shows the results of the following simulation: minimization of the variance of returns subject to restrictions on the expected returns. The results are shown per family. The simulation yielding the highest realized average return ("best") for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Appendix Table 5B. Simulations: "Best" Result for Each Fund

Maximizing Expected Return

	Family	Average Return (p.y.) Global Fund	Average Return (p.y.) Port. Spec. Funds	Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns Global Fund	Standard Deviation of Daily Returns Port. Spec. Funds	No. of Compar.
1	Allianz Funds	0.95%	0.95%	0.00%	0.66%	0.66%	2
2	Alliance Bernstein	10.89%	10.90%	-0.01%	0.90%	0.90%	9
3	American Funds Group	10.57%	10.78%	0.18%	0.87%	0.87%	4
4	AIM Family of Funds	8.37%	12.94%	4.47%	0.95%	0.95%	10
5	Columbia Funds	17.52%	16.06%	-1.21%	0.85%	0.84%	3
6	Credit Suisse	8.46%	8.39%	-0.06%	0.95%	0.95%	2
7	DFA Investment Dimensions Group	3.15%	3.85%	0.73%	0.91%	0.88%	4
8	Dreyfus Founders	4.75%	6.27%	1.56%	0.95%	0.93%	6
9	Evergreen Funds	5.76%	5.76%	0.00%	1.07%	1.07%	2
10	Eaton Vance Group	-0.75%	0.69%	1.50%	1.08%	1.06%	2
11	Excelsior Funds	3.95%	3.95%	0.01%	0.89%	0.89%	2
12	Fidelity Group	5.97%	6.10%	0.11%	1.02%	1.03%	7
13	Fidelity Advisors Funds	7.76%	7.45%	-0.27%	0.87%	0.87%	6
14	GAM Funds	-1.42%	-2.18%	-0.72%	1.04%	1.03%	2
15	Gartmore	22.30%	22.30%	0.00%	0.81%	0.81%	3
16	GMO LLC	6.65%	7.50%	0.74%	0.76%	0.79%	8
17	Goldman Sachs Asset Management Group	1.63%	1.55%	-0.08%	1.04%	1.04%	3
18	Hartford Mutual Funds	14.82%	14.82%	0.00%	0.91%	0.91%	2
19	ING Funds Trust	-4.77%	4.83%	10.82%	1.11%	1.08%	6
20	Ivy Mackenzie Management	-0.56%	3.70%	4.57%	0.94%	0.84%	3
21	Janus	-7.01%	11.09%	19.43%	0.67%	0.74%	5
22	J.P. Morgan Funds	22.11%	21.52%	-0.48%	0.90%	0.90%	4
23	MFS Family of Funds	20.70%	20.40%	-0.25%	0.88%	0.88%	3
24	Merrill Lynch Group	10.35%	11.17%	0.68%	0.99%	1.03%	9
25	Morgan Stanley Funds	1.87%	2.19%	0.31%	0.98%	0.98%	9
26	Oppenheimer Funds	10.45%	9.70%	-0.68%	0.82%	0.82%	3
27	Putnam Funds	4.86%	4.96%	0.11%	1.08%	1.08%	5
28	RiverSource (former AXP)	13.45%	13.45%	0.00%	0.84%	0.84%	2
29	Scudder Funds	6.31%	7.83%	1.45%	1.00%	1.01%	6
30	Smith Barney Group	2.03%	2.41%	0.37%	0.94%	0.94%	1
31	Seligman Group	14.45%	14.44%	0.00%	0.82%	0.81%	2
32	Templeton Group	1.13%	1.06%	-0.08%	0.83%	0.83%	8
33	T. Rowe Price Funds	19.58%	19.77%	0.16%	0.85%	0.85%	6
34	UBS Funds	4.41%	4.41%	0.00%	0.89%	0.89%	1
35	Vanguard Group	7.77%	7.50%	-0.24%	0.96%	0.96%	4
36	Wells Fargo Advantage	5.22%	6.03%	0.87%	0.98%	0.95%	2
	Total	6.92%	8.51%	1.61%	0.92%	0.92%	156

This table shows the results of the following simulation: maximization of expected returns subject a restriction on the variance of returns. The results are shown per family. The simulation yielding the highest realized average return ("best") for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Appendix Table 6A. Simulations: Longest Available Sample

Minimizing the Variance

	Family	Average Return (p.y.) Global Fund	Average Return (p.y.) Port. Spec. Funds	Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns Global Fund	Standard Deviation of Daily Returns Port. Spec. Funds	No. of Compar.
1	Allianz Funds	0.95%	-3.05%	-3.91%	0.66%	0.65%	2
2	Alliance Bernstein	9.49%	13.26%	3.54%	0.90%	0.87%	9
3	American Funds Group	10.57%	13.93%	3.33%	0.87%	0.74%	4
4	AIM Family of Funds	9.43%	20.69%	10.86%	0.99%	0.85%	10
5	Columbia Funds	14.11%	17.02%	3.03%	0.92%	0.77%	3
6	Credit Suisse	8.46%	12.15%	3.63%	0.95%	0.85%	2
7	DFA Investment Dimensions Group	3.15%	1.22%	-1.70%	0.91%	0.84%	4
8	Dreyfus Founders	4.71%	7.83%	3.33%	1.02%	0.92%	6
9	Evergreen Funds	5.76%	5.56%	-0.21%	1.07%	1.08%	2
10	Eaton Vance Group	-4.98%	8.94%	15.46%	1.13%	0.87%	2
11	Excelsior Funds	1.58%	1.67%	0.10%	0.99%	0.99%	2
12	Fidelity Group	6.89%	8.09%	1.36%	0.95%	0.86%	7
13	Fidelity Advisors Funds	7.40%	10.14%	2.85%	0.93%	0.82%	6
14	GAM Funds	41.57%	45.05%	1.43%	8.19%	8.66%	2
15	Gartmore	22.30%	18.99%	-2.62%	0.81%	0.78%	3
16	GMO LLC	6.65%	8.05%	1.36%	0.76%	0.77%	8
17	Goldman Sachs Asset Management Group	1.63%	6.80%	5.42%	1.04%	0.94%	3
18	Hartford Mutual Funds	6.10%	8.06%	2.17%	1.04%	0.91%	2
19	ING Funds Trust	0.66%	4.26%	4.09%	1.05%	0.94%	6
20	Ivy Mackenzie Management	0.89%	5.81%	5.25%	0.99%	0.86%	3
21	Janus	4.97%	7.82%	2.75%	0.88%	0.87%	5
22	J.P. Morgan Funds	22.11%	24.06%	1.68%	0.90%	0.87%	4
23	MFS Family of Funds	12.47%	16.07%	3.19%	0.80%	0.82%	3
24	Merrill Lynch Group	5.09%	6.49%	1.57%	1.03%	0.96%	9
25	Morgan Stanley Funds	2.58%	5.83%	3.49%	0.98%	0.88%	9
26	Oppenheimer Funds	12.61%	11.27%	-1.22%	0.79%	0.81%	3
27	Putnam Funds	4.86%	5.53%	0.74%	1.08%	1.05%	5
28	RiverSource (former AXP)	3.46%	3.15%	-0.28%	1.14%	1.13%	2
29	Scudder Funds	3.78%	8.29%	4.55%	1.01%	0.94%	6
30	Smith Barney Group	2.03%	2.35%	0.30%	0.94%	0.94%	1
31	Seligman Group	14.45%	15.89%	1.26%	0.82%	0.82%	2
32	Templeton Group	4.07%	4.14%	0.21%	0.78%	0.71%	8
33	T. Rowe Price Funds	5.04%	10.10%	5.07%	0.98%	0.92%	6
34	UBS Funds	4.41%	7.30%	2.88%	0.89%	0.84%	1
35	Vanguard Group	5.40%	7.05%	1.68%	0.99%	0.95%	4
36	Wells Fargo Advantage	6.44%	8.39%	2.18%	1.01%	0.88%	2
	Total	6.84%	9.65%	2.89%	1.04%	0.97%	156

This table shows the results of the following simulation: minimization of the variance of returns subject to restrictions on the expected returns. The results are shown per family. The simulation with the longest time series for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Appendix Table 6B. Simulations: Longest Available Sample

Maximizing Expected Return

	Family	Average Return (p.y.) Global Fund	Average Return (p.y.) Port. Spec. Funds	Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns Global Fund	Standard Deviation of Daily Returns Port. Spec. Funds	No. of Compar.
1	Allianz Funds	0.95%	0.95%	0.00%	0.66%	0.66%	2
2	Alliance Bernstein	9.49%	9.48%	-0.01%	0.90%	0.91%	9
3	American Funds Group	10.57%	10.78%	0.18%	0.87%	0.87%	4
4	AIM Family of Funds	9.43%	15.72%	6.07%	0.99%	0.98%	10
5	Columbia Funds	14.11%	12.69%	-1.21%	0.92%	0.91%	3
6	Credit Suisse	8.46%	8.39%	-0.06%	0.95%	0.95%	2
7	DFA Investment Dimensions Group	3.15%	3.85%	0.73%	0.91%	0.88%	4
8	Dreyfus Founders	4.71%	4.84%	0.13%	1.02%	1.02%	6
9	Evergreen Funds	5.76%	5.76%	0.00%	1.07%	1.07%	2
10	Eaton Vance Group	-4.98%	-4.41%	0.59%	1.13%	1.13%	2
11	Excelsior Funds	1.58%	1.54%	-0.05%	0.99%	0.99%	2
12	Fidelity Group	6.89%	6.85%	-0.04%	0.95%	0.95%	7
13	Fidelity Advisors Funds	7.40%	6.81%	-0.54%	0.93%	0.93%	6
14	GAM Funds	41.57%	40.49%	-0.72%	8.19%	8.17%	2
15	Gartmore	22.30%	22.30%	0.00%	0.81%	0.81%	3
16	GMO LLC	6.65%	7.50%	0.74%	0.76%	0.79%	8
17	Goldman Sachs Asset Management Group	1.63%	1.55%	-0.08%	1.04%	1.04%	3
18	Hartford Mutual Funds	6.10%	6.10%	0.00%	1.04%	1.04%	2
19	ING Funds Trust	0.66%	5.36%	5.32%	1.05%	1.03%	6
20	Ivy Mackenzie Management	0.89%	5.14%	4.53%	0.99%	0.88%	3
21	Janus	4.97%	4.94%	-0.05%	0.88%	0.88%	5
22	J.P. Morgan Funds	22.11%	21.52%	-0.48%	0.90%	0.90%	4
23	MFS Family of Funds	12.47%	12.18%	-0.26%	0.80%	0.80%	3
24	Merrill Lynch Group	5.09%	6.11%	0.98%	1.03%	1.04%	9
25	Morgan Stanley Funds	2.58%	3.33%	0.70%	0.98%	1.00%	9
26	Oppenheimer Funds	12.61%	11.85%	-0.67%	0.79%	0.80%	3
27	Putnam Funds	4.86%	4.96%	0.11%	1.08%	1.08%	5
28	RiverSource (former AXP)	3.46%	3.46%	0.00%	1.14%	1.14%	2
29	Scudder Funds	3.78%	4.88%	1.03%	1.01%	1.02%	6
30	Smith Barney Group	2.03%	2.41%	0.37%	0.94%	0.94%	1
31	Seligman Group	14.45%	14.44%	0.00%	0.82%	0.81%	2
32	Templeton Group	4.07%	4.08%	0.00%	0.78%	0.78%	8
33	T. Rowe Price Funds	5.04%	5.20%	0.15%	0.98%	0.98%	6
34	UBS Funds	4.41%	4.41%	0.00%	0.89%	0.89%	1
35	Vanguard Group	5.40%	5.13%	-0.24%	0.99%	0.99%	4
36	Wells Fargo Advantage	6.44%	6.11%	-0.27%	1.01%	1.00%	2
	Total	6.84%	7.63%	0.80%	1.04%	1.03%	156

This table shows the results of the following simulation: maximization of expected returns subject a restriction on the variance of returns. The results are shown per family. The simulation with the longest time series for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text.

Appendix Table 7A. Simulations: "Best" Result for Each Fund

Minimizing the Variance (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Stock	8.86%	14.08%	5.12%	0.88%	0.78%	53
Foreign Stock	6.53%	10.37%	3.96%	0.96%	0.89%	70
Portfolio of World Stock Funds	14.77%	20.74%	4.09%	0.71%	0.65%	3
Portfolio of Foreign Stock Funds	12.19%	13.70%	1.37%	0.85%	0.78%	18
Total	8.25%	12.35%	4.06%	0.91%	0.83%	144

Maximizing Expected Return (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Stock	8.86%	9.81%	0.79%	0.88%	0.88%	53
Foreign Stock	6.53%	7.40%	0.91%	0.96%	0.97%	70
Portfolio of World Stock Funds	14.77%	21.87%	6.76%	0.71%	0.76%	3
Portfolio of Foreign Stock Funds	12.19%	12.08%	-0.30%	0.85%	0.86%	18
Total	8.25%	9.15%	0.84%	0.91%	0.92%	144

This table shows the results of the following simulations: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). The simulation yielding the highest realized average return ("best") for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. Simulations use information based on the previous 240 business days only at each point in time.

Appendix Table 7B. Simulations: Longest Available Sample

Minimizing the Variance (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Stock	8.24%	10.82%	2.65%	0.90%	0.81%	59
Foreign Stock	5.79%	8.44%	2.78%	0.97%	0.91%	71
Portfolio of World Stock Funds	6.91%	17.38%	10.51%	1.04%	0.83%	3
Portfolio of Foreign Stock Fund	11.92%	13.34%	1.25%	0.87%	0.80%	18
Total	7.48%	10.11%	2.70%	0.93%	0.86%	151

Maximizing Expected Return (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Differences in Accumulated Daily Returns	Standard Deviation of Daily Returns		No. of Compar.
	Global Fund	Port. Spec. Funds		Global Fund	Port. Spec. Funds	
World Stock	8.24%	8.45%	0.14%	0.90%	0.90%	59
Foreign Stock	5.79%	6.06%	0.28%	0.97%	0.98%	71
Portfolio of World Stock Funds	6.91%	15.83%	8.87%	1.04%	0.96%	3
Portfolio of Foreign Stock Fund	11.92%	11.89%	-0.29%	0.87%	0.88%	18
Total	7.48%	7.86%	0.33%	0.93%	0.93%	151

This table shows the results of the following simulations: minimization of the variance of returns subject to restrictions on the expected returns (top panel) and maximization of expected returns subject a restriction on the variance of returns (bottom panel). The simulation with the longest time series for each main fund in each family is considered. The main funds are world funds, foreign funds, portfolios of world funds, and portfolios of foreign funds. Portfolios of world funds are composed by several world funds within the same family but with different scopes, e.g. world value funds and world growth funds. Portfolios of foreign funds are similarly formed. The strategy considered is an active one, in which portfolio weights are updated every day. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. Simulations use information based on the previous 240 business days only at each point in time.