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# An Industrial Organization Approach to International Portfolio Diversification: Evidence from the U.S. Mutual Fund Families

**Chae Hee Shin**

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# An Industrial Organization Approach to International Portfolio Diversification: Evidence from the U.S. Mutual Fund Families

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**Abstract**

Although the lack of international portfolio diversification has long interested the financial economics literature, the role of financial intermediaries in the market for diversified portfolios has rarely been studied. In this paper, I introduce a microeconomic aspect of under-diversification by examining a new data on U.S.-based mutual fund families' global diversification. I document the fund families' investments in global equity markets and explore features of supply and demand in the mutual fund market to explain their limited global diversification. Demand estimation confirms that consumers are not only sensitive to the fund families' portfolio characteristics such as global diversification, but also to the non-portfolio characteristics such as fund family age and size. On the supply side, the model of fund families' global investment decisions uses a revealed preference approach and shows small cross-border investment frictions can justify the fund families' observed limited global diversification. Other factors such as destination country's investor protection level and fund family's investment experience significantly affect the degree of diversification as well. (JEL G11, G23, L21, F30)

* Board of Governors of the Federal Reserve System, Washington, DC 20551 (E-mail: chaehee.shin@frb.gov).
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## 1 Introduction

Why do investors invest heavily in domestic assets and much less in foreign assets? In a frictionless world as in international Capital Asset Pricing Model (CAPM), investors hold a world market portfolio that assigns to each country a weight equal to the world market capitalization rate. The lack of global diversification — as it has been observed and become known as the home bias puzzle — has drawn interest of many scholars who offered valuable insights into the seemingly suboptimal allocation (Ahearne, Griever, and Warnock (2004); Coeurdacier and Guibaud (2011); French and Poterba (1991); Grinblatt and Keloharju (2001); Tesar and Werner (1995); van Nieuwerburgh and Veldkamp (2009), among others).[1]

In this paper, I study a new microeconomic aspect of what may be behind the puzzle by examining financial intermediaries' global diversification. Many investors today use financial intermediaries to gain convenient exposure to diversification. Most notably, in recent decades, mutual fund families have attracted massive assets with their increasingly popular investment vehicles. These fund families act as financial intermediaries offering a variety of mutual funds under a common brand name and via common marketing and distribution channels.

Like any other typical goods market, interactions between investors (on the *demand* side) and the mutual fund families (on the *supply* side) determine the equilibrium, resulting in an equilibrium level of diversification as well. Two particular aspects can thus induce a deviation from the optimal level of diversification solely based on the CAPM. First, the investors' demands for mutual fund might be affected by the funds' various characteristics other than diversification, such as the fund family's reputation or marketing. Second, as the existing literature suggests, any friction in cross-border investment might cost the fund families to globally diversify.

I construct a new data set on global equity investment by U.S.-based mutual fund families, which reveals compelling evidence of fund families' under-diversification and their varied levels.[2] I find that a given fund family usually limits its entire equity portfolio, that is, the aggregate of its individual equity fund portfolios, to invest in just a few countries. It is rather unexpected because, compared to most end-investors, cost and resource constraints are not

[1] There are numerous explanations for the persistence of this phenomenon: transaction and information costs, hedging motives, behavioral biases, endogenous information acquisition, etc. See Coeurdacier and Rey (2013) for an excellent survey on the literature.

[2] I examine fund families rather than individual funds because they, not the managers of the individual funds, decide whether to launch global funds, add global stocks to the existing funds, etc.

as binding for fund families that manage a multitude of funds with millions of dollars in revenue. Perhaps what is more surprising is that fund families often omit entire geographic regions in their equity portfolios, rather than investing small amounts across many countries over different regions. Yet, some fund families invest in consistently more countries than other fund families, creating a considerable variation in the level of diversification.

To see how the supply and demand for mutual funds affect the level of diversification fund families ultimately offer, I model optimization by fund families and investors (*consumers*, hereafter). Consumer chooses which fund family to invest his or her assets in, considering various aspects of the fund family, including fee, non-portfolio characteristics, and portfolio characteristics including their degree of global entry.[3] Given fixed costs of foreign investment, each fund family chooses a set of foreign equity markets to enter and determines the fee for its fund family-bundle of equity portfolios in order to maximize the profit, i.e., total fees from all of its funds, net of costs.

For the purpose of this study, I interpret the cross-border frictions as fixed costs of foreign investment mutual fund families must pay upon investing in a foreign market. Observations on selective and lumpy global equity investments by the fund families motivate the assumption of *fixed* nature of these costs. The costs can encompass transactional, administrative, institutional, legal, and informational cost incurred by a foreign entry.[4]

Estimation results on demand for mutual fund families confirm that consumers are not only sensitive to the fund families' portfolio characteristics including different levels of global diversification, performance, and fee, but are also significantly affected by the non-portfolio characteristics such as fund family age, reputation, and diversity of investment options in the same fund family. This shows that consumers consider each fund family as a different product bundle comprised of various distinct portfolio and non-portfolio characteristics. In this way, demands become less elastic to the diversification benefits induced by global investment than otherwise.

How do such multi-dimensional preferences of consumers then affect fund families' diver-

[3] I measure a fund family's degree of global entry by the maximum attainable Sharpe ratio from the set of countries entered by the fund family. See Section 6.1 for details. As for fund family's entry into a foreign equity market, I define it as the fund family's active investment in the corresponding country's equities in *any* of its equity funds. A fund family's entry into a *country* hereafter implies its entry into the country's equity market.

[4] For instance, fund families need to arrange a necessary infrastructure to obtain foreign currencies, accommodate different time zones, learn about the relevant rules and policies of foreign stock exchanges and pay commissions and fees on foreign exchanges. Global investment might also necessitate deploying resources in research on foreign markets, which the fund families can achieve either by hiring analysts or equity researchers specialized in certain countries or regions or by outsourcing it to the sell-side.

sification decisions? Because such preferences allow each fund family's idiosyncratic markup according to its relative position in the spectrum of differentiated fund families, they bring about a divergence in fund families' degrees of market power. Different magnitudes of market power and assets under management affect the ease with which fund families can tap into their assets to pay the costs for global entry and therefore, the fund families' abilities to enter foreign equity markets.

While product differentiation composes the demand-side factor affecting the fund families' global investment decisions, fixed costs of global investment, on the other hand, constitute the model's supply-side factor affecting the fund families' global investment decisions. Now, by considering both demand- and supply-side factors, the model can produce the dollar amounts of the fixed costs that can justify the observed under-diversification.

In estimating the fixed costs of foreign investment, I use the moment inequalities methodology suggested by Pakes, Porter, Ho, and Ishii (2014), a revealed preference approach that can take the computational burden off of considering fund families' optimal decisions on global entry. Following this method, I consider one counterfactual scenario for each possible fund family and country pair by changing the fund family's entry status to the opposite of what is observed. Each counterfactual then gives an inequality based on the necessary equilibrium condition that no deviation from the observed choice on global entry can give a higher profit than what the observed choice gives.[5] The model produces dollar estimates of the bounds for fixed costs of foreign investment that can justify the fund families' observed investment patterns.

Estimation of fixed costs of foreign investment reveals that mutual fund families pay an estimated cost between $111,657 and $291,704 per year to invest in a foreign equity market.[6] There are two primary reasons why only such a modest amount of foreign investment cost can justify the observed limited foreign entries by fund families. First, as demand estimation results show, consumers value many other non-portfolio characteristics in addition to portfolio characteristics such as fee and the level of global diversification when choosing a fund family. It implies that demands become less elastic to the diversification benefits induced by

[5] For every observed entry, I calculate the expected loss in profit had the entry not taken place. In this counterfactual, because the fund family can save on the fixed cost, the fact that an entry was observed bounds upward the amount of fixed cost by (the absolute amount of) this expected loss. For every observed non-entry, we can make an analogous argument to obtain a lower bound.

[6] Since the model is static, there is no distinction between sunk and fixed costs of investment. In reality, it is more likely that there is a sunk part of the cost fund families pay upon entering a foreign equity market for the first time, separately from the ensuing fixed costs associated with continued investment.

global investment than they would be otherwise. Second, additional gain from diversification is often minimal for fund families already investing in diverse countries or some countries. These two factors together often make the profit gain from an additional entry into a foreign equity market smaller than even such small fixed cost of entry.

Using the quantification of fixed costs of foreign investment produced by the model, we can also examine what causes the variation in fund families' presence in global equity markets. That is, what type of countries have higher barriers in terms of fixed cost of entry, how much more the fund families will need to pay to enter those countries, and what type of fund families have a competitive advantage in readily overcoming such barriers.

I find that fixed costs can vary with certain country and fund family characteristics. As at the aggregate level of countries, countries with higher levels of economic development, familiarity, and investor protection significantly affect fund families' decisions to invest in their equity markets by having lower fixed costs. Also, fund families that have operated longer in the industry or have investment experience in similar countries (in terms of geography and income) benefit from further lower fixed costs than those faced by their peers. Such advantages of fund families matter to a greater extent when one is investing in countries that have adverse country characteristics (such as Greece, as opposed to Canada).

This paper contributes to several strands of research in empirical finance, industrial organization, and international economics. First, the microeconomic approach to investor's choosing of financial intermediary and the intermediary's optimal global entry decision suggests a new way to examine various incentives and determinants behind the observed degree of lack of global diversification. In particular, this approach can parse the motives in more detail than when studying the aggregate level data.

The structural model also makes the first step to quantify, in dollars, the cross-border investment frictions. Besides studies that use indirect measures to gauge the magnitude of frictions, such as the perceived annual percentage decrease in return necessary to match the home bias (French and Poterba (1991)), no attempts have been made to measure the dollar costs of foreign investment, to the best of my knowledge. As Coeurdacier and Rey (2013) point out, directly observed trade costs in equity markets are often very low and may only partially capture the costs. Mutual funds data provides an accessible way to measure the dollar values of the comprehensive costs related to foreign investment by allowing us to take into account all the fees that investors pay to the financial intermediaries.

Second, by estimating the supply and demand for fund family's equity portfolios, this paper makes contribution to studying competition in the mutual fund market. With ever-growing assets, the mutual fund industry has been constantly re-shaping itself with incessant entries and emergence of huge asset management companies.[7] Accordingly, a recent strand of the literature has begun to examine asset flows into mutual funds — in particular, their determinants (Barber, Odean, and Zheng (2005); Ivkovic and Weisbenner (2009); Khorana and Servaes (1999); Sirri and Tufano (1998)). Not only a fund's portfolio characteristics, such as performance and fee, but also non-portfolio characteristics, such as fund age, reputation, diversity of investment options in the same fund family, seem to be important factors in determining market shares.[8] Here, I further shift focus from individual mutual funds to mutual fund *families* in line with the recent studies on fund family competition (Gasper, Massa, and Matos (2006); Gerken, Starks, and Yates (2014); Khorana and Servaes (2012); Massa (2003); Nanda, Wang, and Zheng (2004), among others).

Finally, this paper addresses the literature studying international trade and financial flows. Conceptually, my model of mutual fund families' global entry decisions resembles studies in the trade literature regarding the heterogeneous firms' decisions to export to foreign markets.[9] In particular, Helpman, Melitz, and Rubinstein (2008) share the intuition closest to this paper in terms of directly accounting for zero trade flows between some countries. In this paper, I use the fixed cost of entry and an equilibrium cutoff condition similar to their set-up and explain why some fund families choose not to hold even a single stock in some countries.

Also, as in the well-known gravity models, I examine the roles of country characteristics, continuing the emerging literature on global equity investment decisions at the micro level. Chan, Covrig, and Ng (2005) confirm that country characteristics such as familiarity variables and the extent of economic development have considerable effects on the home and foreign bias of mutual funds. In particular, the findings here are closely aligned with those in Hau and Rey (2008) that document the limited extent and high heterogeneity of global investment of individual mutual funds and also the findings in Didier, Rigobon, and Schmukler (2013) that U.S. global equity mutual funds invest only in a small number of countries. This study extends their fund-level results to the fund family-level and confirms the existence of an even more restricted form of global investment by fund families.

[7] See Coates and Hubbard (2007) for a comprehensive study on competition in the mutual fund industry.

[8] The universe of S&P 500 index funds demonstrates the most striking example: despite being the closest to what we can call financially equivalent products, they still exhibit high product proliferation and fee dispersion (Hortaçsu and Syverson (2004)).

[9] Starting with Melitz (2003), research in this literature regarding how heterogeneous firms self-select into exporting to foreign markets and its implications has been active.

I organize the remainder of the paper as follows. Section 2 gives a brief background on the competition and demand in the U.S. mutual fund market. Section 3 describes the data. Section 4 presents new observations on global diversification by U.S. mutual fund families. Section 5 discusses the model. Section 6 gives details on the calculation of the measure for fund family's global entry and presents the demand estimation strategy and results. Section 7 describes the methodologies for identification and estimation of fixed costs of foreign investment. Section 8 extends the model and discusses the effects of various determinants of foreign investment cost. Section 9 concludes.

## 2 Competition and Demand in the U.S. Mutual Fund Market

As Coeurdacier and Rey (2013) have pointed out, it is important to recognize the role of the market for delegated investment in understanding the home bias from a microeconomic view. The mutual fund market gives us an excellent setting for such purpose. In this market, mutual fund families act as important financial intermediaries managing investment portfolios on behalf of households and institutional investors. In the U.S., the total assets of the mutual fund market reached $17.1 trillion in 2013 and 46% of households (56.7 million households) invested through mutual funds, of which 86% held equity funds.[10] Their impact on the aggregate equity holdings is considerable as well: mutual funds held 29% of U.S. corporate equities in 2013.

What drives such strong demand for delegated portfolio management? Costs are considered to explain a large part of investors' dependence on mutual funds. For individual and many institutional investors as well, to even track an already well-diversified index is not a trivial task. For each sale and purchase, reconstitution of portfolios will involve non-negligible operational costs and be time-consuming such that the opportunity costs of direct investment become considerably large. Cost reduction via delegated portfolio management becomes even larger if investors wish to globally diversify their equity holdings. Different currencies, time zones, commissions and fees, and rules in foreign stock exchanges make the task of making a direct investment even more daunting. Any type of cost involved in learning about the global markets will add more to this cost of global investment. On the other hand, mutual fund families' economies of scale give them a competitive advantage by spreading

[10] Source: Investment Company Institute.

out the costs over large volumes.

Based on ever-growing demand, competition among fund families has generated a wide spectrum of products over the past decades. As Coeurdacier and Rey (2013) stress as well, the role of product differentiation in this market should not be overlooked. Like any other typical goods market, interactions between consumers and firms determine the prices, quantities, and the extents of product differentiation. In particular, from the consumer's point of view, fund families have developed a multitude of dimensions through which they, as fund families, can be regarded as distinct brands: investment style, fee structure including expense ratio, front load, and 12b-1 fee, types and total number of funds they manage, past returns, managers, etc.[11]

Summary statistics of mutual fund family characteristics in Table 1 show such product differentiation. For instance, in 2011, an average fund family had 14 funds under its roof (including all types of funds — equity, bond, etc.), but some fund families managed only one fund, and a large fund family such as Fidelity Investments managed as many as 393 funds. The fund family with the lowest expense ratio, net of 12b-1 fee, for equity funds charged only 0.25%, whereas the one with the highest charged more than 30 times larger, 7.68%. Of 511 fund families, 65% did not charge any front load fee, and 38% tended to shun publicity, implied by no 12b-1 fee.[12]

Finally, an interesting aspect of demand in this market is worth noting. In their 1991 survey on mutual fund purchasers in the U.S., Capon, Fitzsimons, and Prince (1996) found the mean number of mutual fund families in which these respondents invest is one. Findings by Gerken, Starks, and Yates (2014) from data on 78,000 households from 1991 to 1996 report a similar degree of concentration in households' fund family memberships. Not only do the households holding only a few mutual funds show such tendency to invest in the same fund family, but also more than 60% of households with at least ten mutual funds reported having four funds from the same fund family.

There are several explanations for what can be driving such tendency for fund family concentration. For instance, search or switching costs might be present. Hortaçsu and Syverson (2004) show even small search costs can account for much of the proliferation of S&P 500 index funds, controlling for non-portfolio differentiation. Retirement plans can

[11] 12b-1 fee is fee earmarked for marketing and distribution.

[12] The high degree of variation still remains after I exclude the top three fund families, or even top 100, from the sample, although the means do change in magnitude. To describe the magnitude of variation, the last column in Table 1 shows the 75th to 25th percentile ratios.

be another factor. While 62% of U.S. households in 2013 identified the source of their first mutual fund as an employer-sponsored retirement plan (and the trend has been increasing),[13] these retirement plans often seem to contribute to such concentration by restricting the menu within a single fund family: Elton, Gruber, and Blake (2006) find 186 out of 417 401k plans restrict fund choices of participants to one fund family. Additionally, policies such as waiving of load fees when switching funds within the same fund family can promote consumer loyalty, leading to higher mutual fund family concentration by the consumers.

## 3 Data

The main data set for this paper was created using the Morningstar database that provides profiles and complete portfolio holdings of all U.S. open-end mutual funds as of June 30, 2011. For the purpose of this study, I define the relevant market to be primarily comprised of two types of equity funds: actively and passively managed. To a greater or lesser degree, most funds we associate with mutual funds belong to the first category. On the other hand, index funds and exchange-traded funds (ETFs) belong to what I refer to as passive funds. Defining the foreign investment costs induced by cross-border frictions is less meaningful when it comes to the passive funds' global entry since these funds simply hold the whole universe of stocks under a certain category. Therefore, I focus on the supply and demand for active equity mutual funds only, whose more active investment styles tend to be accompanied by non-negligible costs, and take the universe of passive funds as an alternative – "outside option" – to the consumers in the mutual fund market.

As of the date, data includes 710 fund families competing with 8,457 open-end mutual funds and ETFs in this market.[14] Table 1 provides summary statistics for the final sample of 471 fund families with equity funds. The variables are in fund family units, constructed by taking asset-weighted averages across all actively managed equity mutual funds within each fund family (see Data Appendix for details).

In order to create data on fund families' global entry, I first identified the list of invested countries for each individual fund and then aggregated them across all funds within each fund

[13] Source: Investment Company Institute.

[14] Taking different share classes of the same fund as comprising one fund.

family, thereby transforming the fund-level data into fund family-level data.[15] Therefore, a country does not need to be invested in by all funds belonging to a fund family; just one fund investing in that country will be enough to have it considered entered by the fund family.

Investing in a country by buying an ADR (American depositary receipt) is likely to improve the relative ease of global entry since it can lower the transaction cost part of the cross-border friction. However, in the empirical estimation, I treated investment through ADRs identically as investing directly through a foreign equity market.[16]

## 4 A First Look at Global Diversification of U.S. Mutual Fund Families

Despite mutual fund families' growing significance in investors' portfolio investments, fund family-level diversification has not yet been documented. Among the few recent studies on mutual funds' global investment, Hau and Rey (2008) and Didier, Rigobon, and Schmukler (2013) are the closest to this study, but their focus is on the individual fund-level.

Based on the new fund family-level data on global equity investment, I make the following observations on fund families. First, a typical mutual fund family entered only 17 countries from among more than 120 countries available for investment in 2011. Figure 1 shows the (non-weighted) empirical distribution of the number of countries in which fund families invested their equity funds. Nearly one third of the mutual fund families entered less than five countries in all of its equity funds of which a typical fund family managed 9. In fact, fund families show completely zero investments outside their group of investing countries.

This observation is puzzling for several reasons. Most fundamentally, such limited investment is suboptimal from the perspective of diversification benefits. Even if we ignore the diversification benefits, it should be nearly effortless to buy equities of any foreign market because it does not involve any movement of physical goods. In this aspect, global investments by fund families rather bear a close resemblance to the cross-border trade of physical goods where trade volumes between countries are discontinuous at zero due to the presence of fixed costs (Helpman, Melitz, and Rubinstein (2008)). I build upon this observation to assume cross-border investment frictions in the form of fixed cost in my model.

[15] I consider only the fund family's investment in equity, thereby excluding any other security type. In the very few cases of funds that exceed 250 stock holdings, I consider only the largest 250 stocks in terms of net assets, due to data limitation.

[16] ADRs take up only 3% of the total equity investment by assets in the data.

Second, fund families' selective global entries remain evident even when examined by geographic region. Table 2 shows the global entry patterns, broken down by geographic region.[17] The first column shows the total number of fund families entering the corresponding region or country. The second column transforms the first column into a percentage out of the total number of fund families in the sample. As expected, all fund families invest in the U.S./Canada/U.K., but the percentage drops to 76%, 63%, 53%, 52%, and 32% for regions of Europe, East/South Asia and the Pacific, Latin American and the Caribbean, Middle East and North Africa, and Sub-Saharan Africa, respectively. Since a fund family's entry takes into account all of the fund family's equity funds, if a typical fund family managing 9 funds is said to not have entered the East/South Asian region, it implies that it invests in *none* of the East/South Asian countries with *any* of its 9 funds. Purely from the perspective of diversification benefits, it would have been more beneficial to spread investment across continents. It thus seems likely that fund families are clustering their investment by region to some benefit.

Finally, fund families' entry choices vary even within a geographical region. For instance, in Europe, Switzerland receives the most fund families, 59.1%, whereas Portugal and Poland receive investments from less than 20% of the total fund families (Table 2). Variation becomes more noticeable for other regions: in the Middle East and North Africa and Sub-Saharan Africa, Israel and South Africa lead the entries of U.S. mutual fund families into their regions. In fact, certain expansion patterns emerge as fund families begin to enter foreign markets. Fund Families entering one foreign market mostly choose Canada, those entering two most often add U.K. or Switzerland, moving onto Israel, China, Netherlands, Australia, France, etc. with inclusion of more foreign markets. This observation indicates that the well-known effect of certain country characteristics on aggregate equity allocation might be present at the micro-level of fund families as well.

[17] Geographic classification here follows that suggested by the World Bank. Because it provides classification only for developing countries, I filled out the rest of the developed countries whose geographic locations were clear. I also added "U.S./Canada/U.K." to the list.

## 5 The Model

### 5.1 Demand

I use a simple logit demand model to estimate the demand for fund family's bundle of equity portfolios, measured in terms of fund family total assets. Each consumer $i = 1, ..., I$ chooses a fund family $j = 1, ..., J$ to obtain a fund family-bundle of equity portfolios. I assume consumer $i$'s indirect utility from choosing fund family $j$ to take the following linear form:

$$u_{ij} = X_j \beta - \alpha p_j + \gamma G_j + \xi_j + \epsilon_{ij}. \tag{1}$$

The matrix of observable characteristics of fund family $j$, $X_j$, includes the fund family's size, diversity of equity portfolios, years of operation, past performance, publicity, and other factors possibly affecting the consumer's utility. The (average) fee that fund family $j$ charges consumers is denoted by $p_j$.

I define $G_j$ as the measure for fund family $j$'s degree of global entry and calculate it as $j$'s highest risk-adjusted return attainable based on its current foreign entries. Therefore, it acts as the channel through which fund family $j$'s degree of global entry affects demand for its funds.

This simplified demand estimation at the fund family-level assumes a link between the fund family's overall degree of global entry and the aggregate demand for the fund family. Therefore, it may not perfectly reflect reality because some (sophisticated) investors will pay attention to individual funds, rather than fund families when choosing mutual funds. In this light, a more structured demand estimation for mutual funds remains an important task for future studies.

Nevertheless, not only for various reasons and observations for investors' choosing fund families as described in Section 2, fund family-level demand estimation can be sufficiently useful and reliable for the purpose of this study. Most simply, consumers with a strong preference for global diversification will seek fund families with higher $G_j$'s. Even if there are consumers who care less about global diversification, as long as they are sufficiently sensitive about the performance of fund families, the fact that returns are often highly correlated within a fund family can lead to the consumers' choosing fund families with better global diversification in the end.[18] I describe the calculation of $G_j$ in detail in Section 6.

[18] Elton, Gruber, and Green (2007) find fund returns exhibit higher correlation within fund families, compared

I denote fund family $j$'s characteristics that are unobserved by the econometrician, by $\xi_j$. Demand parameters $\theta_d \equiv (\alpha, \beta')'$, where $\alpha > 0$, measure how sensitive the investors are to the fee and observable characteristics, respectively. Any error coming from the idiosyncratic preference of consumer $i$ with respect to fund family $j$ is denoted by $\epsilon_{ij}$ and is assumed to follow a Type 1 Extreme Value (T1EV) distribution. Possible sources for this error include consumers' difference in terms of investments other than mutual funds, source of income, and the industry in which they work. I normalize the mean utility of the outside option, denoted by $j = 0$, by zero such that $u_{i0} = \epsilon_{i0}$.

The distributional assumption of T1EV on the error then gives the following closed-form solution for the share of consumers choosing to invest in fund family $j$:[19]

$$s_j = \frac{exp(X_j\beta - \alpha p_j + \gamma G_j + \xi_j)}{1 + \sum_{l=1}^{J} exp(X_l\beta + \xi_l - \alpha p_l + \gamma G_l + \xi_l)}. \tag{2}$$

This provides the predicted market share of fund family $j$ in the mutual fund market.

### 5.2 Supply

Each fund family makes two types of decision: it determines the fee for offering its bundle of equity portfolios, and entry into foreign markets. There are two stages. In the first stage, it decides which countries to enter among total $N$ foreign markets, where each country is denoted by $n = 1, ..., N$.[20] In the second stage, it sets the fee it will charge consumers given its own (and others') entry decisions from the first stage.

To specifically focus on global entry, I abstract away from alternative means of diversification such as that over industrial sectors or currencies. I further simplify the model such that when fund families enter a country, they are assumed to earn a return equivalent to the country's equity market index fund return.

Let us work backwards from the second stage in which fund families choose their best responses to each other's fees taking the first-stage entries as given.

to between fund families, due to similar risk exposure stemming from common holdings of stocks and investing in similar industries. Didier, Rigobon, and Schmukler (2013) similarly report high explanatory power of fund family fixed effects regarding the fund family's stock holdings and concentration.

[19] See McFadden (1973).

[20] Entry decisions are made only over the set of foreign markets other than the home country ($n = 0$), i.e., the U.S.

### Second Stage

In determining the fee $p_j$, each fund family takes into account its marginal cost, $mc_j$, which is also assumed to be incurred by the basic transaction, and the sales and marketing cost in delivering \$1 of $j$'s funds. Because $p_j$ takes the form of an annual expense ratio, marginal cost is also expressed as percentage of total assets in the fund family's funds. At the beginning of the second stage, each fund family observes the realized demand shock, $\epsilon_{ij}$, based on which fund family $j$ solves for fee maximizing the second stage profit:

$$\pi_j = M \cdot s_j(p) \cdot (p_j - mc_j), \tag{3}$$

where $M$ is size of the mutual fund market and the market share of fund family $j$, $s_j$, is defined as in Equation (2). I measure both in terms of assets such that $M$ is total assets in the mutual fund market and $s_j$ is $j$'s assets divided by $M$.

### First Stage

At the beginning of the first stage, each fund family observes shocks to its fixed costs of foreign investment and determines which foreign markets to enter.[21] In the absence of fixed costs, entering more countries is always optimal because doing so can attract a higher demand flow via its effect on the degree of a fund family's global entry (as in demand specification (1)). However, in the presence of fixed costs, the costs adversely affect the fund family's net profit, thereby creating a trade-off.

Let us define the set of all countries available for equity investment by $C = \{1, ..., N\}$. $\mathbb{E} = \{(I_1, ..., I_N) : \; I_n \in \{0, 1\} \; \forall n = 1, ..., N\}$ is the set of all possible entry decisions. fund family $j$ makes its entry decision, denoted by $e_j = \{(I_{1j}, ..., I_{Nj}) : \; I_{nj} \in \{0, 1\} \; \forall n = 1, ..., N\} \in \mathbb{E}$. $I_{nj}$ is an indicator function that equals 1 if fund family $j$ decides to invest in country $n$ and 0 otherwise. Taking into consideration the expectation on its operating profit in the second-stage, $\pi_j$, and the fixed costs of foreign investment, $FC(\cdot)$, each fund family chooses foreign entries $e_j$ so as to maximize the expected overall profit $\Pi_j$:

$$\underset{e_j \in \mathbb{E}}{\text{Max}} \; E\left[\Pi_j(e_j, e_{-j}, \varepsilon_j) \,|\, \Im_j\right] = E\left[\pi_j(p_j^*(e_j; e_{-j}, \epsilon)) - FC(e_j, \upsilon_j) \,|\, \Im_j\right]. \tag{4}$$

[21] I assume that unobservable fund family characteristic $\xi_j$ and demand shocks $\epsilon_{ij}$ are yet to be known to the fund families until they reach the second stage.

Specifically, the expectation operator $E$ is taken over a set of shocks $\varepsilon_j \equiv (\epsilon, \upsilon_j)$, where $\epsilon \equiv \{\epsilon_{ij} : i = 1, ..., I,\ j = 1, ..., J\}$ and $\upsilon_j \equiv \{\upsilon_{nj} : n = 1, ..., N\}$ refer to demand and fixed cost shocks, respectively, conditional on the information set given to fund family $j$ at the time of entry decision, $\Im_j$. Operating profit from the second-stage, $\pi_j$, is a function of $p_j^*$, the optimally solved fee of fund family $j$'s fund from the second stage given $j$'s entry decision over $N$ countries. Subscript $-j$ refers to fund families other than $j$. Therefore, $p^*(e_j; e_{-j})$ implies that not only its own entry decision, $e_j$, but also those of others, $e_{-j}$, affect the determination of its own fee in the second stage. $FC(e_j, \upsilon_j)$ is a scalar indicating the total amount of fixed cost incurred by fund family $j$'s entry decision. I assume it is a linear sum of fund family $j$'s fixed cost for each country it chooses to enter:

$$FC(e_j) = e_j \cdot (\mathbb{F}_j + \upsilon_j), \tag{5}$$

where $\mathbb{F}_j = (F_{1j}, ..., F_{Nj})'$ is an $N \times 1$ vector of fund family $j$'s fixed cost for each country, $F_{nj}$, and $\upsilon_j = (\upsilon_{1j}, ..., \upsilon_{Nj})'$ an $N \times 1$ vector of fund family $j$'s idiosyncratic shock for the cost of entering each country.

## 6 Estimating the Supply and Demand for Mutual Funds

### 6.1 Measuring the Degree of Mutual Fund Family's Global Entry

First, I assume commonly known rates of return for all countries $n = 0, 1, ..., N$. These rates are set by a marginal global investor who does not face any cross-border investment friction, and therefore, the country rates of return are the returns that make the world market portfolio the optimal portfolio. Let us denote this $(N+1) \times 1$ vector of expected returns by $\mu$, where $N$ is the number of foreign markets available for investment, and $+1$ indicates the home country. Denoting the corresponding $(N+1) \times (N+1)$ variance-covariance matrix of returns and an $(N+1) \times 1$ vector of 1's, by $\Sigma$ and $i$, respectively, the expected returns $\mu$ can be obtained using the following asset-allocation problem of return and variance trade-off:

$$\underset{\omega}{\text{Max}}\, \mu'\omega - \frac{\lambda}{2}\omega'\Sigma\omega, \tag{6}$$

subject to an adding-up constraint of portfolio weights, $i'\omega = 1$, and a non-negativity constraint, $\omega \geq 0$. For the variance-covariance matrix, I use historical MSCI monthly return indices. The risk-aversion parameter $\lambda$ is calibrated using this historical data.[22] The first-order condition to the above problem gives the following formula, into which we can substitute in the weights of the value-weighted portfolio $\omega^{VW}$ to calculate the perceived rates of return:

$$\mu = \lambda \Sigma \omega^{VW}. \tag{7}$$

Unlike the marginal investor, since most fund families face cross-border frictions, not all choose to invest in every country. Instead, they selectively enter only a subset of foreign markets to their capacity. To estimate how much demand a fund family's global entry choice can attract, I assume consumers consider the fund family's specific investment set, composed of countries the fund family has decided to enter. As a representative measure for this mix, I calculate the highest possible Sharpe ratio based on the fund family's global entry and the rates of return for the subset of countries the fund family enters, solving the following asset-allocation problem:

$$\underset{\omega}{\text{Max}} \frac{\mu' \omega}{(\omega' \Sigma \omega)^{\frac{1}{2}}} \quad \text{subject to } i'\omega = 1 \text{ and } \omega \geq 0, \tag{8}$$

where $\mu$ are the perceived rates of return on countries from (7), and $\Sigma$ and $i$ are defined the same as above.[23]

There are several things to note. First, this measure does not imply that the fund family will necessarily achieve this exact level of performance. Rather, it is to be interpreted as a measure gauging the sensitivity of demand for a fund family's funds, induced by the fund family's entry status in foreign markets. Second, because I calculate $G_j$ for a specifically given set of foreign entries, the impact of each additional entry into a country on $G_j$ will differ according to each country's marginal contribution to the hypothetically highest possible performance of the overall portfolio. Lastly, the estimation of expected returns is notorious for accompanying large estimation errors and so is the construction of an optimal portfolio

[22] Several candidates exist for the value of $\lambda$. One can take the value used in the existing literature (for instance, $\lambda = 3$ as in French and Poterba (1991)), or alternatively, re-calibrate following the same method, based on more recent data. This method fits $\lambda$ such that the model's implied rate of return for the U.S. matches its observed historical average from 1988 to 2011, and yields the value of 3.82.

[23] Because the optimal portfolio calculation is a small-scale problem, it sometimes gives computational errors at a tiny scale in single-country deviation counterfactuals. An instance of such an error includes a rise (or a decline) in the Sharpe ratio when a country is subtracted from (or added to) the previous investment set. Errors are especially likely to be present when the portfolio is already achieving a higher level of investment by entering many countries. I exclude these instances with computational errors from the estimation (3% of total calculations).

based on any sample-based mean-variance model.[24] Although the optimal portfolios hereby constructed cannot avoid such errors, the calculated Sharpe ratios can still capture demand for mutual fund families as long as they can act as an ordinal measure for the expected performance of funds. As the fund family's investment set includes more countries, the Sharpe ratio rises by construction. Therefore, such monotonicity can give the Sharpe ratios an ordinal property, enabling it to capture consumers' preferences for either more investment options or better performance. The results from the demand estimation as will be shown in Table 8 confirm Sharpe ratios do indeed attract consumer demand in a significantly positive way, even after controlling for numerous other variables.

### 6.2 Demand and Marginal Costs Estimation

In estimating demand, I consider the possibility of an omitted variable bias, generated by unobservable fund family characteristic $\xi_j$, that is not perfectly captured by the control variables $X_j$ in demand specification (1) but affects determination of fee $p_j$. For instance, there could be desirable fund family characteristics that the consumers (and fund families) can observe, but not the econometrician, such as a general fund family-brand effect, promotional activities, and reputation. If such variables positively affect demand for a fund family's funds and the fund family simultaneously determines the fee based on such demand, then the fee $p_j$ will be positively correlated with the unobservable $\xi_j$. In such a case, demand elasticity of the fee will have an upward bias, understating the true negative effect of the fee on assets into the fund family.[25]

I correct for this possible bias by using an instrumental variable, $Z_j$. Specifically, I use a measure for the close competing fund families' recent performance as the instrument. Because other fund families' short-term performance is uncorrelated with the fund family's own unobservable characteristics such as brand effect, it satisfies the orthogonality condition, $E[\xi_j|Z_j] = 0$. On the other hand, a fund family's fee pricing is likely to be negatively correlated with the returns of the fund family's competitors. Consider an instance where one or more of the fund family's competitors have recently earned high returns, thereby attracting large asset inflows to their funds, possibly reducing the fund family's own assets. To stay competitive, the fund family is likely to lower its fee to stay competitive. Wahal and

[24] Such optimal portfolios often underperform even the most naive investment strategy such as the 1/N rule. See DeMiguel, Garlappi, and Uppal (2009).

[25] For more discussion on unobserved product characteristics and price endogeneity, see Berry (1994) and Berry, Levinsohn, and Pakes (1995), among others.

Wang (2011) report evidence for mutual funds' such strategic pricing at work. They study instances where funds are faced with an entry of another fund with overlapping portfolio and find the incumbents respond by reducing their fees.

To define close competitors, I sort all fund families in the order of total assets, number of funds, and turnover ratio, and assign each fund family to one among 7 groups of 40 fund families each. A fund family's close competitors are defined as those belonging to the same group.[26]

The instrument variable for a fund family is calculated by the average recent return of the group it belongs to, excluding its own return, and dividing by the average group return including its own, in order to normalize for any group fixed effect. For the recent return, I use the maximum annual fund return of each fund family in 2009.[27] As Nanda, Wang, and Zheng (2004) report, since star funds drive a lion's share of asset flows into the fund family's funds as a whole, I take advantage of this spillover to gauge the magnitude of price reaction of fund family's competitors.

In comparison to the endogeneity issue caused by the unobserved fund family characteristics' correlation with the fee, because the fund family's entry decision takes place during the first stage before demand shocks are observed, first-stage action does not affect the decision with regard to pricing in the second stage. Therefore, demand estimation is assumed to be immune from the endogeneity concern arising from the fund family's entry decision.

Using the instruments, I estimate demand by an IV regression of the log odds-ratio of market share of fund family, $s_j$, to that of the outside option, $s_0$, on the variables, $X_j$, $p_j$, and $G_j$:

$$ln\left(\frac{s_j}{s_0}\right) = X_j\beta - \alpha p_j + \gamma G_j + \xi_j. \tag{9}$$

Given the estimates for demand parameters $\hat{\alpha}$, $\hat{\beta}$, and $\hat{\gamma}$, I compute fund families' marginal costs from the first-order condition of (3) with respect to fee $p_j$, for all $j = 1, ..., J$:

[26] Turnover ratio is an indicator of the fund family's trading activity and hereby calculated as the minimum of fund family's purchases or sales of securities with maturities longer than one year, divided by the fund family's average monthly assets. I use these specific three variables, total assets, number of funds, and turnover ratio, to group similar fund families because these variables inform us of the fund family's most fundamental stance in the mutual fund industry, and its investment coverage and style. However, there can be other ways to define a fund family's close competitors as well.

[27] I take the year 2009 returns among several candidates belonging to the years preceding 2011, since controlling for the maximum annual fund return in 2010, the 2009 maximum return will matter only minimally in determining the fund families' market shares in 2011, but is still likely to be reflected in the fees we observe in 2011. Using 2009 returns also produce the highest F-statistics in first-stage regression.

$$s(p) - \Delta(p - mc) = 0. \tag{10}$$

Market shares, fees, and marginal costs are expressed in terms of $J \times 1$ vectors, $s(p)$, $p$, and $mc$, respectively. The $J \times J$ matrix, $\Delta$, indicates own- and cross-demand sensitivities with respect to fee, where $\Delta_{jr} = \Delta^*_{jr} * S_{jr}$ , $S_{jr} = -\frac{\partial s_r(p)}{\partial p_j}$ and

$$\Delta^*_{jr} = \begin{cases} 1 & \text{if } j = r \\ 0 & \text{otherwise} \end{cases}.$$

We can retrieve marginal costs by substituting in the observed market share and fee, $s(p)$ and $p$, and the estimated elasticities, $\Delta$, to the following:

$$mc = p - \Delta^{-1} s(p). \tag{11}$$

The elasticities are obtained by analytically solving the partial differentiation of market share in Equation (2) with respect to fee $p_j$, and substituting in the demand estimates $\hat{\alpha}$, $\hat{\beta}$, and $\hat{\gamma}$.

### 6.3 Demand Estimation Results

Result from the first-stage regression (Table 7) confirms the instrumental variable's strong correlation with price: the recent performance of fund family's competitors enters negatively at the 1% significance level. For instance, if we take the first group of 40 fund families (sorted in terms of total assets, number of funds, and turnover ratio), it implies that if, in 2009, the best-performing fund of a fund family in this group earned a 10% lower return than the average return of the best funds of 39 other fund families in the same group, the fund family's (average) fee in 2011 was 0.61% points lower than the (average) fee of a fund family who earned just the average return of the group. This result confirms the presence of strategic price response by fund families to stay competitive.[28]

It is also interesting to see how the fund family's observable characteristics are related to its fee. Indicators of fund family size such as total number of funds and managers have negative

[28] To the extent that certain funds — say, belonging to the "Emerging Markets" category — of a fund family compete more directly with the corresponding funds in the same category of other fund families, taking an average over the fees of all funds under each fund family as done here will only have mitigated the magnitude of the strategic response.

coefficients, significant at the 1% level for the total number of funds, possibly suggesting the effect of economies of scale. Although lacking in significance, the negative coefficient of the fund family's years of operation might also imply the effect of fund family's learning on fee reduction.

Having a higher turnover is correlated to a higher fee, significant at the 5% level, which should naturally follow from the fact that more active management typically calls for more human resources, higher compensations for managers, etc. Additionally, marketing may be working to increase the fee: both the front load and 12b-1 fee enter positively and, in particular, the coefficient for the 12b-1 fee, which is the fee earmarked for marketing purposes, is significant at the 5% level.[29]

Columns (1) and (2) in Table 8 report the results from OLS and IV estimation, respectively. Both models have downward-sloping demands, and as the model changes from OLS to IV, the coefficient on the fee considerably increases in magnitude, adjusting for the downward bias in fee sensitivity. The result from IV estimation suggests that as the fee decreases by 0.1% points annually, market share increases by approximately 32%. The high fee sensitivity suggests effective price competition in the mutual fund market, but its considerable magnitude can also stem from the high nonlinearity of demand uncaptured by the linear estimation.[30]

The degree of fund family's global entry also shows a highly positive effect on demand, significant at the 1% level, in IV estimation. A one standard deviation increase in this measure induces a 49% increase in the market share. This high sensitivity creates the channel through which a fund family's global entry affects its total assets.

Most other fund family characteristics return estimated coefficients of the expected sign and high significance as well. First, consumers have strong tastes for non-portfolio fund family characteristics such as fund family's size, experience, and diversity of equity portfolio offerings. A typical fund family with 9 funds under management can increase its market share by approximately 20% if it adds five more funds. All else equal, ten more years in the industry are associated with an 12% higher market share and fund families with ten years higher maximum manager tenure have 58% higher market shares.

[29] Note that the (management) fee, which is the dependent variable in this regression, has been calculated net of the 12b-1 fee.

[30] Several other factors can also induce high fee sensitivity, in particular, the way market share is defined in terms of stock of total assets, as opposed to flows, and the use of variables that include all funds of a fund family (i.e., equity, bond, and index funds).

Consumers also strongly value fund families' past performance. A one standard deviation increase in the load-adjusted return since inception induces an approximately 50% increase in the fund family's market share. The coefficient is significant at the 1% level. A one standard deviation increase in fund family's maximum fund return in the previous year entails a 12% increase in the fund family's market share, although the coefficient lacks in significance.

There are several channels through which non-portfolio characteristics can affect consumers' utility. The first such possibility is search or switching cost.[31] In the presence of disutilities to search and with long investment horizons, investors are likely to take into their fund-purchase decision any future possibility of investing in other investment products. In this regard, variables proxying accessibility to other investment options within the fund family, such as the total number of funds the fund family manages, investment objective coverage, availability of brokerage or assistance from financial advisers, or the extent of marketing and advertising, can be positively related to demand.

Investors might as well be affected by such observable fund family characteristics as they formulate the expected performance of fund families. Such reliance on observable characteristics could be based on behavioral reasons, or these fund family characteristics may indeed contain information about the fund family's future performance. For instance, Kacperczyk, Sialm, and Zheng (2008) study return gap, that is, the difference between the reported return and the return calculated based on disclosed holdings of the fund, and find the gap exists in a cross-sectional fashion, is persistent, and is related to fund characteristics such as age and size.

As for front load, 12b-1 fee, and turnover ratio, it is difficult to *a priori* conjecture about the average consumers' preference for them. The estimation results also show these variables' estimated coefficients lacking in significance. Front load and the 12b-1 fee, two variables that represent the availability of broker and professional investment-assistance service and the level of marketing, show weakly negative signs. Many studies in the literature report different reactions of investors to various types of fees, including the front load, the 12b-1 fee, and the expense ratio. Sirri and Tufano (1998) find nonlinear effects of advertising on demand, showing a particularly notable effect for funds with high performance. Barber, Odean, and Zheng (2005) find that consumers of mutual funds are more sensitive to more

[31] See Sirri and Tufano (1998) and Hortaçsu and Syverson (2004), among others. As mentioned in Section 2.1, fund families' fee-waivers may magnify the effect of such costs. Massa (2003) explicitly considers this point in his demand model with investors of different investment horizons and further explains how it could be a driving force of fund families' strategic behaviors.

salient fees such as front-end loads than annual management fees. Khorana and Servaes (2012) find front load has a significantly positive effect on demand only for the fund families relatively small in asset size.

## 7 Estimating the Fixed Costs of Foreign Investment

### 7.1 Calculating the Expected Profits

Using the estimated demand parameters and mutual fund families' marginal costs, I estimate the profit that a fund family expects to earn as a result of any entry decision from the first stage. In this way, we can calculate the hypothetical profit gains in counterfactual entry scenarios.

Specifically, for each counterfactual entry by a fund family, I first calculate the degree of a fund family's global entry induced by this particular entry. Substituting it into the demand equation and using the estimated demand parameters, I calculate the new demand for all fund families under this counterfactual. Since fund families do not observe the realized demand shocks until they reach the second stage, they formulate an expectation on its own market share for each counterfactual. The T1EV distributional assumption on the demand shocks gives these expectations on market shares in the form of logit as in Equation (2). Finally, based on the marginal cost estimates and the (expectation on) new market shares, I calculate the new equilibrium fees and profits for all fund families under this counterfactual, triggered by the marginal change in this specific fund family's foreign entries.[32]

### 7.2 Estimation by Moment Inequalities

For the estimation of fixed costs, I follow the partial identification methodology suggested by Pakes, Porter, Ho, and Ishii (2014).[33] They define a set of moment inequalities based

[32] Small and, in particular, relatively new fund families may face different constraints or goals than the larger, more established ones, that are not captured within the framework hereby used. Therefore, I use only the top 200 fund families in terms of total assets in the fixed cost estimation.

[33] The literature on modeling entry games with fixed costs of investment often uses this method. For instance, Holmes (2011) and Eizenberg (2014) each analyze Wal-Mart's diffusion strategy and the U.S. home PC makers' entry game with regard to products with different CPU technology. Morales, Sheu, and Zahler (2014) study export firms' dynamic entries into foreign markets, and estimate the fixed and sunk costs of entry by using moment inequalities. Nosko (2014) uses moment inequalities to estimate sunk cost of CPU innovation and discuss strategic product line decisions in the upstream CPU industry.

on the notion of revealed preference and develop a strategy to obtain an identified set for the model parameters. This method is based only upon a few parsimonious assumptions and does not make any parametric assumption on the data-generating process. Once the moment inequalities are defined, the sample analogs are constructed and aggregated across, to be transformed into a set of inequalities that makes identification of each model parameter possible.

Keeping close to their notations, the first assumption follows from the previous assumption on fund families' optimization in (4):

*Assumption 1.*

$$\underset{e\in\mathbb{E}}{sup}\; E\left[\Pi_j(e, e_{-j}, \varepsilon_j)|\Im_j\right] \;\leq\; E\left[\Pi_j(e_j,\, e_{-j},\, \varepsilon_j)|\Im_j\right],$$

where $s_j : \Im_j \rightarrow \mathbb{E}$ is a strategy function such that $e_j$ is the outcome of this strategy for fund family $j$; that is, $e_j = s_j(\Im_j)$. It states that any other feasible entry decision by fund family $j$ can only result in an expected profit lower than or equal to that given by $j$'s observed entry decision. Note that assuming simultaneity in the fund families' first-stage entry decisions ensures the independence of conditional distribution of $e_{-j}$ on $\Im_j$ and $e$, from $e \in \mathbb{E}$. Now, define the difference between the profit given by the observed choice $e_j$ and that resulting from a deviation from this choice, some $e \in \mathbb{E}$, by $d = (e_j, e)$ as follows :

$$\triangle\Pi_{jd} = \Pi_j(e_j,\, e_{-j},\, \varepsilon_j) - \Pi_j(e, e_{-j}, \varepsilon_j). \tag{12}$$

Then, *Assumption 1* implies

$$E\left[\triangle\Pi_{jd}(e_j, e, e_{-j}, \varepsilon_j)|\Im_j\right] \geq 0. \tag{13}$$

To apply this method of moment inequalities to fixed costs estimation, let us assume the simplest specification possible, in which there is a constant fixed cost of entry for every fund family–foreign market pair. By assuming an identical fixed cost per country for any fund family, the variation in gains from the entry becomes solely responsible for the observed differences in entry across fund families and countries. Figures 4(a) and (b) describe two trends in the expected profit gains that can make it possible. First, all else equal, fund families are more likely to enter large countries rather than small countries. Fund families that do not enter large countries see a significant drop in their expected profits compared to when they do not enter smaller countries. Second, all else equal, large fund families are more likely to enter a foreign market than smaller fund families since their larger customer base, that is, their total assets and ability to raise fees, results in a higher gain from entry. Therefore, on average, the expected profit gains in cases of observed entry are much higher than the gains in cases of observed non-entry.

To formally define, from the definition of fund family $j$'s total fixed costs in Equation (5), let $F_{nj} = a$ for all $n$ and $j$, with $\upsilon_{nj}$ independently and identically following a distribution with $E[\upsilon_{nj}|\, e_j] = 0$. This zero conditional expectation implies there is no selection bias caused by any idiosyncratic shock to the fixed cost of fund family $j$–country $n$ pair, that is observed by $j$ but not by the econometrician and taken into $j$'s consideration for its entry decision with regard to $n$. For every observed entry by some fund family $j$, we can re-write the inequality (13) as

$$F_{nj} \leq E\left[\pi_j(e_j, e_{-j}, \epsilon_j) - \pi_j(e_j - \mathbf{1}_j^n, e_{-j}, \epsilon_j)|\Im_j\right], \tag{14}$$

where $\mathbf{1}_j^n$ is a $N \times 1$ vector of zeros except for the $n$th cell equal to 1. That is, $j$ enters $n$ if the expected gain in its operating profit $\pi_j$ by adding $n$ exceeds its out-of-pocket fixed cost of entering $n$. Analogously, for every observed non-entry by fund family $j$, the expected gain in its operating profit by adding $n$ would have been smaller than its fixed cost of entering $n$; that is,

$$F_{nj} \geq E\left[\pi_j(e_j + \mathbf{1}_j^n, e_{-j}, \epsilon_j) - \pi_j(e_j, e_{-j}, \epsilon_j)|\Im_j\right]. \tag{15}$$

Since $F_{nj} = a + \upsilon_{nj}$, the above two inequalities imply

$$\begin{aligned} a + \upsilon_{nj} &\leq \overline{F_{nj}}(\theta) \\ a + \upsilon_{nj} &\geq \underline{F_{nj}}(\theta), \end{aligned} \tag{16}$$

where $\overline{F_{nj}}(\theta) \equiv E\left[\pi_j(e_j, e_{-j}, \epsilon_j) - \pi_j(e_j - \mathbf{1}_j^n, e_{-j}, \epsilon_j)|\Im_j\right]$ and $\underline{F_{nj}}(\theta) \equiv E[\pi(e_j+\mathbf{1}_j^n, e_{-j}, \epsilon_j)$ $-\pi_j(e_j, e_{-j}, \epsilon_j)|\Im_j]$ are the expected gains in operating profit, which we can obtain from the structural estimation of supply and demand. Taking unconditional expectation on both sides of inequalities in (16),

$$\begin{aligned} E[a] &\leq E\left[\overline{F_{nj}}(\theta)\right] \\ E[a] &\geq E\left[\underline{F_{nj}}(\theta)\right]. \end{aligned} \tag{17}$$

The upper and lower bound of $a$ can be estimated by taking the sample average of $\overline{F_{nj}}(\theta)$ across entries and $\underline{F_{nj}}(\theta)$ across non-entries, respectively.

### 7.3 How Big Are the Fixed Costs of Foreign Investment?

Table 9 reports the results. The estimation gives a range of \$111,657 - \$291,704 for the cost, matching 46% of all observed entry decisions with the model's predictions. The assumption of constant fixed cost seems to capture the observed non-entries in the data particularly well, explaining up to 91% of the observed non-entries by fund families.

Notice how only a modest amount of foreign investment cost is all we need to justify the observed foreign entry decisions by the fund families. There are two major reasons why the expected increase in profit from an entry may often be smaller than even this small fixed cost of entry. First, as shown from the demand estimation results in Table 8, consumers value many other non-portfolio characteristics in addition to the portfolio characteristics such as fee and the level of global diversification when choosing a fund family. Fund family's size, experience, and diversity of equity portfolio offerings all significantly affect fund family demand. This means that to a certain extent, consumers are willing to sacrifice the level of diversification they get from a fund family if the fund family's particular characteristics — say, its vastly diverse menu of fund offerings or highly experienced portfolio managers — sufficiently appeal to them. Therefore, demands become less elastic to the diversification benefits induced by global investment than they would be otherwise.

Another reason comes from the fact that gains from investment are often minimal for fund families already investing in many countries or some countries. For instance, if a fund family is investing in ten major countries across different regions, the marginal benefit from further diversification begins to sharply decrease. This is true within a geographic region as well: if a fund family already invests in, say, China, Japan, and India, then the additional benefit from entering the Korean equity market is smaller than it would be when the fund family does not participate in any of the East/South Asian equity markets.

Although there is no literature on the dollar amounts of the cross-border investment frictions, the existing literature on home bias has conjectured that the frictions' magnitude would need to be substantial to justify the observed degree of home bias. In this literature, most recent findings re-confirm the well-known result from French and Poterba (1991) that the expected returns of domestic equity markets would have to be several hundred basis points higher than under the international CAPM benchmark to match the home bias. For instance, using the same CAPM benchmark, Jeske (2001) finds the perceived excess return on U.S. equity market would need to be 60 basis points higher and that on foreign equity markets 88 basis points lower.

Yet, as pointed out by Coeurdacier and Rey (2013), such findings are hard to reconcile with the fact that directly observed trade costs in equity markets are often very low and may only partially capture the costs. Tesar and Werner (1995) have also concluded high turnovers on foreign equity investment make it unlikely that the variable transaction costs are behind the observed magnitude of home bias. The industrial organization approach of global diversification can suggest a new explanation on such a puzzle. Taking into account the features of mutual fund demand that resemble those of demand for any other typical consumer goods might provide a way to fill the gap between the two seemingly irreconcilable findings.

## 8 Measuring the Effects of Various Determinants of Fixed Costs of Foreign Investment

Previous studies at the aggregate level have attributed the countries' difference in their magnitude of divergence from the optimal portfolio allocation to the difference in deadweight costs the countries face in cross-border investments. Portes and Rey (2005) find that country characteristics such as market size and proxies for transaction and information costs explain the cross-border flows of equity well. Chan, Covrig, and Ng (2005) find mutual funds' foreign bias, the extent to which a specific country among foreign markets is either overweighted or underweighted, is significantly affected by the country's degree of familiarity, economic development, and extent of capital controls.

In much the same way, such variables may as well be affecting the magnitude of the mutual fund families' cost of entering into a country. One such characteristic can be the destination country's level of economic development. Figure 2(a) shows that countries with higher GDP per capita tend to attract more U.S. fund families. In a similar vein to Chan, Covrig, and Ng (2005), this correlation may suggest lower costs of investing in developed countries, compared to developing countries.

In addition to the observed cross-country differences, fund families also seem to make highly distinct global entry decisions, as is evident from Figure 1.[34] There might be several factors influencing their decision-making. For instance, one potential factor might come from fund families' varying levels of investment experience. By learning over time, global entry might become easier for certain fund families that have operated longer in the industry, such that older fund families tend to enter more countries as in Figure 2(b).

In the following augmented specification, I thus allow fixed costs to vary both across destination countries and mutual fund families.

### 8.1 Set-up

Each $F_{nj}$ (in natural logarithm) takes the form of the sum of a constant $a$ and matrices of fund family, country, and pair observables, $W_j^f$, $W_n^c$, and $W_{nj}^p$, as follows:

$$ln(F_{nj}) = a + W_j^f \kappa^f + W_n^c \kappa^c + W_{nj}^p \kappa^p + \upsilon_{nj}. \tag{18}$$

Thus I examine three possible sources for variation in fixed costs based on fund family, destination country, and the pair-wise investment relationship between the fund family and the country.

For $W_j^f$, I use fund family variables indicative of the fund family's level of experience and expertise in portfolio management, which also possibly affect foreign equity investment. Specifically, I use the number of years that the fund family has operated in the industry and the maximum manager tenure.

For destination country variables $W_n^c$, I choose from the country characteristics that the empirical literature uses most often as determinants of cross-border investment flows.[35] These

[34] This cross-fund family variation confirms the stylized facts put forward by Hau and Rey (2008). Whereas they find a high degree of heterogeneity in global investment pattern at the individual fund-level, the observation in this paper confirms that global entry behaviors grouped at the fund family level also exhibit high heterogeneity.

[35] For the most comprehensive list of country variables, see Okawa and Van Wincoop (2012); Chan, Covrig, and Ng (2005); and Portes and Rey (2005).

variables include, for instance, the gravity variables (i.e., distance and market capitalization), indicators of economic development (e.g., GDP per capita), extent of equity market development (e.g., equity market capitalization, turnover ratio), measures of familiarity (e.g., the amount of trade, common language, common currency, adjacency, common legal system, regulatory similarity, common time zone), and the extent of investor protection, and correlation of stock returns. For ease of identification, I choose the following three variables that seem to be among the most influential in determining the idiosyncratic level of country fixed cost: each destination country's GDP per capita, the amount of bilateral trade with the U.S., and an index measuring the extent of the country's investor protection.

The third type of variation I consider is that coming from the pair-wise investment relationship between the fund family and the country. For instance, the fixed cost of entering Korea is likely to be lower for a fund family that is already investing in Japan, compared to a fund family that is not investing in any countries in the vicinity. To quantify this pair-wise investment relationship, I count the number of countries that are similar to country $n$ in terms of geography and income, and are invested in by fund family $j$. I create 13 country groups following the country classification of the World Bank based on geographic region and income group, and in the case of Europe, also the United Nations geoscheme (see Table 3). Two countries are defined as similar if they belong to the same country group. To account for the fact that different numbers of countries are in each region, I divide the number of entries within the country group by the total number of countries in the group. Table 4 presents summary statistics for all variables. Lastly, $\upsilon_{nj}$ are shocks to each fund family–country pair's fixed cost, where $E[\upsilon_{nj}|\, W_{nj},\, e_j] = 0$.

### 8.2 Identification

Let $\widehat{\Pi}_j(e, e_{-j}, \theta)$ denote an approximate to the first-stage profit function of fund family $j$ that an econometrician can access up to parameter $\theta \equiv \left(\theta_d, \kappa^c, \kappa^f, \kappa^p\right)$, and $\triangle\widehat{\Pi}_{jd}(e_j, e, e_{-j}, \theta)$ an approximation to $\triangle\Pi_{jd}(e_j, e, e_{-j}, \varepsilon_j)$. To identify the coefficients to country, fund family, and pair variables, I adopt a type of difference-in-difference method. Figure 3 describes the intuition. Putting the pair-specific component to zero for ease of exposition, say fund family 1 is investing in Country X. By considering the counterfactual profit of fund family 1 if it did not invest in X, we can obtain an upper bound for $F_{X1}$ by comparing the difference between this counterfactual profit and the current profit. However, since $F_{X1} = W_1^f\kappa^f + W_X^c\kappa^c$, identifying the parameters, $\kappa^f$ and $\kappa^c$ , is impossible without further information. To be able to identify a fund family-specific cost parameter, for instance, the coefficient for the fund family's age, we need another fund family, say, fund family 2, that is identical to fund family 1 except for its age and does not invest in Country X. In this way, we can measure the impact of the difference in the fund family's age on (the bounds for) $F_{X\cdot}$.

Identifying the country-specific cost-parameter shares the same intuition. Consider again the case of fund family 1 investing in Country X. To identify the coefficient for bilateral trade, we need another country, say, Country Y, that looks identical to Country X except for bilateral trade, and in which fund family 1 is not making any investment. Then we can attribute the reason fund family 1 is not investing in Y while it is investing in X to the two countries' differences in the amount of bilateral trade with the U.S.

To follow this difference-in-difference strategy, let $d' = (e_{j'}, e')$ denote a second deviation for some $j'$ and a counterfactual $e'$. The sum of these two moment inequalities based on deviation $d$ and $d'$ will also retain its nonnegativity:

$$E\left[\triangle\Pi_{jd}(e_j, e, e_{-j}, \varepsilon_j) + \triangle\Pi_{j'd'}(e_{j'}, e', e_{-j'}, \varepsilon_{j'})|\Im_j, \Im_{j'}\right] \geq 0. \tag{19}$$

Denoting each observation pair composed of the two deviations by $\widetilde{d} \equiv (d, d')$, the following assumption allows us to use the approximate functions, $\triangle\widehat{\Pi}_{jd} + \triangle\widehat{\Pi}_{j'd'}$, by taking a weighted average over a certain set of $\widetilde{d}$'s that will give nonnegative values as in (19) despite the unobserved errors.

*Assumption 2.* A nonnegative function $h(d, d')$ exists such that

$$m_k(\theta) = E\left[\frac{1}{D}\sum_{\widetilde{d}=1}^{D} h(\widetilde{d})\left(\triangle\widehat{\Pi}_{jd} + \triangle\widehat{\Pi}_{j'd'}\right)\right] \geq 0.$$

$h(\widetilde{d})$ gives a positive weight to the observation pairs that make the unobserved errors $\upsilon_{nj}$ zero or negative in expectation altogether. With $D$ as the total number of observations $\widetilde{d}$, $K$ instruments transform the $D$ moment inequalities into $K$ moment inequalities. Each of these moment inequalities are denoted by $m_k(\theta)$, where $k = 1, ..., K$. Define $Q(\theta)$ by

$$Q(\theta) = \sum_{k=1}^{K} \left(min\left\{0,\, m_k(\theta)\right\}\right)^2. \tag{20}$$

Letting $\widehat{m}_k(\theta)$ and $\widehat{Q}(\theta)$ be the sample analogs of $m_k(\theta)$ and $Q(\theta)$, respectively,

$$\widehat{m}_k(\theta) = \frac{1}{D}\sum_{\widetilde{d}} h(\widetilde{d})\left(\triangle\widehat{\Pi}_{jd} + \triangle\widehat{\Pi}_{j'd'}\right)$$

$$\widehat{\theta} = \underset{\theta}{\operatorname{argmin}}\widehat{Q}(\theta) = \underset{\theta}{\operatorname{argmin}}\sum_{k=1}^{K}\left(min\left\{0,\, \widehat{m}_k(\theta)\right\}\right)^2. \tag{21}$$

As shown in Pakes, Porter, Ho, and Ishii (2014), as long as the sample moments are uniformly consistent estimates of the true moments, the estimate for the bounds will be consistent. Now we need only to define observation pair groups and weights $h(\cdot)$ for observation pairs in each of these groups. Table 5 summarizes the group definitions. For each parameter to estimate, two groups of observation pairs are defined so as to narrow down and identify the lower and upper bound for the parameter.

For parameters in $\kappa^f$, all possible pairs of fund families that are similar to each other in terms of all other variables in $W^f$ except for the variable of interest are picked out and given a group. Analogously, for each parameter in $\kappa^c$, all possible pairs of countries that are similar to each other in terms of all other variables in $W^c$ except for the variable of interest are searched for and defined to form a group. Since I have only one variable in $W^p$, for $\kappa^p$, I simply look for all possible fund family–country pairs that do not share similarity in terms of this variable (see Data Appendix for details on defining similarity). In the end, indicator variables of similarity will be the $h(\cdot)$.

Within each group, observation pairs are then regrouped into two sub-groups according to whether the pair helps identify the lower or upper bound for the parameter of interest.[36] For the lower-bound group, the entry case involves smaller values for the parameter of interest and higher profit gains, such that it measures the maximum positive influence the variable can give on lowering the fixed cost. For the upper-bound group, the entry case should involve larger values for the parameter of interest and lower profit gains; these cases put a cap on the magnitude of the beneficial effect that the variable can give to the reduction of fixed cost.

Table 6 summarizes all relevant sample averages for the deviation groups. Notice the average of a variable was constructed to be the largest in absolute magnitude whenever it belongs to the group defined to estimate its own coefficient. To solve for the lower and upper

[36] Since I examine each variable's possible beneficial effect on the reduction of fixed cost, any estimated coefficient — if not equal to zero — will be negative. Therefore, the lower and upper bound for each coefficient imply the maximum and minimum effect of the variable on the fixed cost, respectively.

bounds of $\kappa^f, \kappa^c$, and $\kappa^p$ as given in Equation (21), I look for the smallest and largest value for each parameter among the set of $\left(\kappa^f, \kappa^c, \kappa^p\right)$ that satisfy all the sample inequalities given the values in Table 6.[37] If no set of values that satisfy all the sample inequalities exist, then I take the value that gives the lowest value of the objective function.

Lastly, assuming fund family, country, and fund family–country pair variables capture all systematic variation in the fixed cost, leaving only mean-zero errors conditional on these variables, I estimate the constant $a$ by calculating the value that equalizes the match rate of entries and non-entries.

### 8.3 Inference

To estimate the confidence interval for the bounds on $\kappa^f, \kappa^c$, and $\kappa^p$, I make draws of bootstrap sample average by assuming deviation observation, $\omega_{\tilde{d}}$, follows a distribution with mean $\mu$ and variance $\Sigma$. $\omega_{\tilde{d}}$ is a vector that stacks the columns similar to those in Table 6, but for each observation $\tilde{d}$, not the average over $\tilde{d}$'s. Note that in identifying the bounds of $\kappa^f, \kappa^c$, and $\kappa^p$, each deviation observation $\tilde{d}$ will consist of a pair of entry and non-entry cases. Specifically, the two components in (19) are rewritten as follows using the second-stage operating profit $\pi$ and fixed cost $F$:

$$\begin{aligned} \triangle\Pi_{jd}(e_j, e, e_{-j}, \varepsilon_j) &= \triangle\pi_j(e_j, e, e_{-j}, \epsilon_j) - F_{nj} \\ \triangle\Pi_{j'd'}(e_{j'}, e', e_{-j'}, \varepsilon_{j'}) &= F_{n'j'} - \triangle\pi_{j'}(e_{j'}, e', e_{-j'}, \epsilon_{j'}), \end{aligned} \tag{22}$$

where $\triangle\pi_j(e_j, e, e_{-j}, \epsilon_j) \equiv \pi_j(e_j, e_{-j}, \epsilon_j) - \pi_j(e_j - \mathbf{1}_j^n, e_{-j}, \epsilon_j)$ and $\triangle\pi_{j'}(e_{j'}, e', e_{-j'}, \epsilon_{j'}) \equiv \pi_{j'}(e_{j'} + \mathbf{1}_{j'}^{n'}, e_{-j'}, \epsilon_{j'}) - \pi_{j'}(e_{j'}, e_{-j'}, \epsilon_{j'})$. For ease of exposition, I denote the entry by deviation $d$ for some fund family $j$ and country $n$, whereas I denote the non-entry by deviation $d'$ for some fund family $j'$ and country $n'$. Counterfactual $e$ in deviation $d$ will naturally involve subtraction of country $n$ from the fund family $j$'s choice; that is, $e \equiv e_j - \mathbf{1}_j^n$. Similarly, counterfactual $e'$ in deviation $d'$ will add country $n'$ to the fund family $j'$'s choice; that is, $e' \equiv e_{j'} + \mathbf{1}_{j'}^{n'}$. Then the inequality (19) becomes

[37] By construction, the Cartesian products of the lower and upper bounds of $\kappa^f, \kappa^c$, and $\kappa^p$ might not necessarily belong to the set of $\left(\kappa^f, \kappa^c, \kappa^p\right)$ that satisfy all the sample inequalities.

$$E\left[F_{nj} - F_{n'j'}|\Im_j, \Im_{j'}\right] \leq E\left[\triangle\pi_j(e_j, e, e_{-j}, \epsilon_j) - \triangle\pi_{j'}(e_{j'}, e', e_{-j'}, \epsilon_{j'})|\Im_j, \Im_{j'}\right], \tag{23}$$

which, substituting in the parametric form for the fixed cost, is rewritten as

$$E\left[(W_j^f - W_{j'}^f)\kappa^f + (W_n^c - W_{n'}^c)\kappa^c + (W_{nj}^p - W_{n'j'}^p)\kappa^p + v_{nj} - v_{n'j'}|\Im_j, \Im_{j'}\right]$$
$$\leq E\left[\triangle\pi_j(e_j, e, e_{-j}, \epsilon_j) - \triangle\pi_{j'}(e_{j'}, e', e_{-j'}, \epsilon_{j'})|\Im_j, \Im_{j'}\right]. \tag{24}$$

Let $H$ denote the $D \times K$ matrix assigning weights $h(\cdot)$ to every observation $\widetilde{d}$. Denoting the row of $H$ that corresponds to observation $\widetilde{d}$ by $h(\widetilde{d})$, for each observation $\widetilde{d}$, $\omega_{\widetilde{d}}$ stacks $h(\widetilde{d})' \cdot (\triangle\pi_j(e_j, e, e_{-j}, \epsilon_j) - \triangle\pi_{j'}(e_{j'}, e', e_{-j'}, \epsilon_{j'}))$ and $h(\widetilde{d})' \cdot \left[W_j^f - W_{j'}^f \;\; W_n^c - W_{n'}^c \;\; W_{nj}^p - W_{n'j'}^p\right]$ into a $(K + L \cdot K) \times 1$ column where $L$ is the total number of variables used in $W^f$, $W^c$, and $W^p$.[38] Consistent estimators for sample average and variance-covariance are calculated by $\hat{\mu} = \sum_{d=1}^{D} \frac{\omega_d}{D}$ and $\hat{\Sigma}/D$, respectively, where $\Sigma$ is the variance-covariance matrix of $\omega_d$'s and $D$ is the total number of deviation observations used in the estimation. To compute the $\alpha\%$ confidence interval, I take the $(1 - \alpha/2)$ percentile of the estimated bounds of $\kappa^f, \kappa^c$, and $\kappa^p$ from the bootstrapped draws.

### 8.4 What Creates the Differences in Fixed Costs of Foreign Investment?

The fund family, country, and fund family–country pair variables, $W^f$, $W^c$, and $W^p$, seem to significantly affect the level of fixed cost of foreign investment. Table 9 reports the estimated coefficients $\hat{\kappa^f}, \hat{\kappa^c}$, and $\hat{\kappa^p}$ from Equation (18) (notice that the fixed costs in this equation are in logarithm). Table 10 translates each estimated coefficient under this specification into a percentage of reduction in fixed cost.[39]

Moreover, using this parsimonious set of six variables improves the overall match rate of the observed entry decisions to approximately 67.4% (see Table 11). Compared to assuming a constant fixed cost, this is an improvement by approximately 21% points. Hence, it seems to corroborate the presence of fund family- and destination country-level heterogeneity in

[38] If there are more than one variable within $W^f$, $W^c$ or $W^p$, then columns for each variable are stacked into one column.

[39] There was no set of values simultaneously satisfying all 12 sample inequality moments, therefore the estimation returns a unique value for each variable, which altogether results in the lowest value for the objective function.

the fixed costs of foreign investment.

There can be various ways fund family's investment experience and expertise obtained throughout the years of operating in the industry can lower its cost of global diversification. For instance, a higher expertise may lead to developing better investment strategies, earning high returns, or drawing a larger demand by providing a more attractive selection of investment products. The estimation results confirm strong effects of fund family variables that measure such experience and expertise, on lowering their fixed costs. Five additional years in the fund family's maximum manager tenure reduce their fixed cost of investment per country by 45%. As years operated in the industry increase by five years, the fund family's fixed cost of entering a foreign market decreases by 25% as well.

Destination country variables show significant effects on reducing fund families' fixed costs as well. As the destination country's GDP per capita increases by $10,000, the fixed cost decreases by 37%. A $10 billion higher amount of bilateral trade with the U.S. decreases the fixed cost of entering that country by 22%. The amount of bilateral trade can indicate the degree of familiarity, since domestic investors can learn more about the other country through interactions during trades.

Measures of investor protection are commonly used to proxy for the extent of development of a financial market (see La Porta et al. (1997)). The measure I use here (ranging from 0 to 10) covers three sub-categories representing the extent of legal protections of investors: extent of disclosure, extent of the director liability index, and ease of shareholder suits indices.[40] The result shows, as the country's investor protection index increases by one level, the fixed cost of entering that country reduces by 58%. The Czech Republic and Portugal, for instance, have similar amounts of bilateral trade with the U.S., but Portugal's investor protection index, 6, is one level higher than that of the Czech Republic, 5. Aside from the $3,000 difference in GDP per capita, the estimated coefficient implies a 58% lower fixed cost of entering Portugal than entering the Czech Republic for any fund family.

Finally, a significant reduction in fixed cost can also occur when a fund family invests in countries that are similar in terms of geography and income. If the fund family has 10% investment experience in countries that are similar to the one under consideration in terms of geography and income, the fund family's fixed cost of entering this country can be reduced by 46%.

[40] Countries with the highest score for this index include New Zealand (9.7), Singapore (9.3), and Hong Kong (9). The U.S. has a score of 8. Source: Doing Business 2011 by the World Bank.

To provide an understanding of the magnitude of this variable, Figure 5 illustrates an example. There are two fund families identical in terms of all the fund family variables used in the fixed cost estimation, namely, years of operation and the maximum manager tenure. The only difference between these two fund families lies in the number of investing countries among the three countries in Eastern Europe: the Czech Republic, Hungary, and Poland. fund family A is currently investing in the Czech Republic while fund family B is investing in none of the three countries. It follows that when considering entry into either Hungary or Poland, fund family A's percentage of coverage of countries within this group of three countries is one third percentage points higher than fund family B's, which has no coverage. This difference in investment coverage gives a discount in the fixed cost of entering either Hungary or Poland to fund family A only. Therefore, if fund family A decides to additionally enter Hungary, it only needs to pay \$709,113, whereas fund family B's cost could be as high as \$5,451,318. Similarly, if fund family A decides to additionally enter Poland, its cost of entry is only \$162,709, an amount substantially smaller than what fund family B must pay to additionally enter Poland, \$1,250,827.[41]

I do a simple test to check for evidence in the data that is indicative of investment clustering resulting from such an effect of investment experience on the reduction of entry cost. The average percentage of cases in which only one of the two countries is entered is significantly lower for the sample of pairs of countries belonging to the same country group than those of different country groups (as defined in Table 3). For the sample pairs of countries in the same group, this percentage is 20.86%, whereas in different groups, the percentage is 27.47%. This difference is statistically significant at the 1% level. This finding, albeit preliminary, suggests fund families' tendency to cluster entries into similar countries.

The effect of such experience-related fund-family variables on fund families' fixed investment costs suggests that certain fund families can have a competitive advantage in entering foreign equity markets. The estimation results show that the degree to which such competitive advantages of fund families can play an important role vary across countries: countries that are closer to the U.S. and that have high amounts of bilateral trade and investor-protection measures, such as France and Germany, incur lower fixed costs of entry to all fund families, as opposed to countries that are distant and have small amounts of bilateral trade and investor-protection measures, such as Greece, Philippines, and Sri Lanka. Since

[41] For this example, I assume that fund family A and B both have operated 25 years in the industry with 15 years of maximum manager tenure.

the fixed costs are already low by such country factors, any further effect of cross-family differentials on the fixed cost, that is, the competitive advantage of fund families, will matter to a lesser extent in determining whether or not to enter these countries.

For instance, among the countries that exhibit high cross-fund family variation of fixed costs is Greece. It has a standard deviation of $4,259,971 in fixed costs across fund families. Such high variation is attributed to U.S. investors' low degree of familiarity with Greece, as measured by trade and distance or low ratings for the investor-protection measure. Naturally, fund families that are small in size or lack competitive advantage in foreign investment cannot afford the fixed cost of entry into such countries. On the other hand, for countries such as Canada, Japan, and Switzerland, the fund family's competitive advantage is of a lesser importance. These countries have standard deviations of fund-family fixed costs ranging below $33,678. Such a higher degree of similarity in the fund family's entry cost diminishes the role of competitive advantage on the family's foreign investment for these countries.

## 9 Conclusion

In recent decades, mutual funds have increasingly become one of the most popular investment vehicles. These vehicles have substantially contributed to alleviating the consumers' burden of direct investment and allowed anyone to conveniently achieve diversification. Not only the mutual fund market has amassed large assets, because a considerable amount of equities are held through the mutual funds, the market has also significantly affected the aggregate equity holdings. Therefore, this market gives us an excellent microeconomic setting to study the phenomenon of lack of international equity portfolio diversification.

Nevertheless, besides few recent studies, international equity diversification of mutual funds has not been much examined. In this study, I bring focus to the mutual fund families to take into account the fact that the fund families decide overall international investment decisions and, under a common brand and via common marketing and distribution channels, they act like firms producing any other typical consumer products. Their interactions with consumers will determine the prices (i.e., fees) and quantities for their products (i.e., mutual funds), and, most importantly, the extents of international diversification in their mutual funds as a way of product differentiation.

Based on a new data set on global equity investment by U.S.-based mutual fund families, I document the fund families' extents of under-diversification and their varied levels. Motivated by such observations, I model optimization by fund families and consumers to explore features of supply and demand in the mutual fund market that can justify the observed degree of fund families' limited global diversification.

Demand estimation confirms that consumers are not only sensitive to the fund families' portfolio characteristics such as global diversification, but also to the non-portfolio characteristics such as fund family age and size. On the supply side, I use a model of fund families' global investment decisions and moment inequalities methodology of Pakes, Porter, Ho, and Ishii (2014) to calculate how much cross-border investment frictions should be present in order to justify the observed limited global diversification. The results show the frictions need only be between \$111,657 and \$291,704 per year and foreign equity market.

There are two reasons why only such a modest amount of foreign investment cost can justify the observed limited foreign investment by fund families. First, because consumers value many other non-portfolio characteristics in addition to portfolio characteristics such as fee and the level of global diversification when choosing a fund family, demands become less elastic to the diversification benefits induced by global investment than they would be otherwise. Second, additional gain from diversification is often minimal for fund families already investing in diverse countries or some countries.

Other factors significantly affect the fund families' degrees of diversification as well, confirming the findings of the existing literature on determinants of aggregate international diversification, at the micro-level. Specifically, I find that the frictions are smaller when investing in countries with higher levels of economic development, familiarity, and investor protection than others. Some fund families have easier access to foreign markets, thanks to larger gains from entry (due to a higher asset base and market power to raise the fee), lower costs of entry (due to experience and expertise that can be mobilized for accessing the foreign equity market), or investment experience in similar countries (in terms of geography and income). Such competitive advantage of fund families matters to a greater extent if the fund family is investing in countries with adverse country characteristics.

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## A Tables and Figures

**Table 1.** Summary Statistics of Mutual Fund Family Characteristics

| #Obs = 471 | Mean | Stdev | Min | Max | 75th-25th Percentile Ratio |
|---|---|---|---|---|---|
| Total assets in equity funds | 12,990 | 65,710 | 0.3 | 880,649 | 62.5 |
| Market share | 0.002 | 0.008 | < 1e-7 | 0.106 | 62.5 |
| Fee (= Expense ratio – 12b-1 fee) | 1.22 | 0.55 | 0.25 | 7.68 | 1.5 |
| Degree of global entry | 19.01 | 0.59 | 17.76 | 19.57 | 1.0 |
| Total number of funds | 14 | 31 | 1 | 393 | 12.0 |
| Age | 23 | 19 | 4 | 90 | 2.7 |
| Total number of managers | 16 | 28 | 1 | 229 | 8.0 |
| Maximum manager tenure | 13 | 8 | 0.1 | 54 | 2.7 |
| Load-adjusted return since inception | 7.7 | 5.2 | -16.2 | 30.3 | 2.0 |
| Past year maximum fund return | 23.0 | 10.6 | -41.0 | 60.0 | 2.0 |
| Front load | 0.72 | 1.38 | 0 | 5.75 | . |
| 12b-1 fee | 0.12 | 0.15 | 0 | 0.91 | . |
| Turnover ratio | 78 | 119 | 0 | 1,383 | 3.2 |

Note: This table reports summary statistics for the sample of 471 U.S.-based mutual fund families. Total assets in equity funds are in millions of dollars. Market share of a fund family is calculated by the fund family's total assets in equity funds divided by the total equity mutual fund market size, and is expressed in ratio. Age is measured in years that the fund family has operated in the industry. Expense ratio, load-adjusted return since inception, past year maximum fund return, front load, 12b-1 fee, and turnover ratio are all expressed in percentages. Turnover ratio is an indicator of the fund family's trading activity and hereby calculated as the minimum of fund family's purchases or sales of securities with maturities longer than one year, divided by the fund family's average monthly assets.

**Table 2.** Global Entry Patterns of Mutual Fund Families by Geographic Region

| | Number of Fund Families Entering | % Fund Families Entering | Average % Net Assets of Entering Fund Families |
|---|---|---|---|
| U.S./ Canada/ U.K. | 511 | 1 | 0.839 |
| United States | 511 | 1 | 0.783 |
| Canada | 373 | 0.730 | 0.039 |
| United Kingdom | 334 | 0.654 | 0.041 |
| Europe | 388 | 0.759 | 0.088 |
| Germany | 227 | 0.444 | 0.022 |
| France | 226 | 0.442 | 0.025 |
| Italy | 185 | 0.362 | 0.008 |
| Russian Federation | 137 | 0.268 | 0.013 |
| Spain | 185 | 0.362 | 0.011 |
| Netherlands | 262 | 0.513 | 0.014 |
| Turkey | 116 | 0.227 | 0.005 |
| Switzerland | 302 | 0.591 | 0.025 |
| Poland | 96 | 0.188 | 0.004 |
| Belgium | 157 | 0.307 | 0.006 |
| Sweden | 178 | 0.348 | 0.009 |
| Norway | 169 | 0.331 | 0.006 |
| Austria | 114 | 0.223 | 0.002 |
| Greece | 113 | 0.221 | 0.004 |
| Denmark | 155 | 0.303 | 0.007 |
| Finland | 141 | 0.276 | 0.004 |
| Portugal | 75 | 0.147 | 0.002 |
| Ireland | 153 | 0.299 | 0.004 |
| East/South Asia & Pacific | 322 | 0.630 | 0.090 |
| China | 265 | 0.519 | 0.033 |
| Japan | 225 | 0.440 | 0.041 |
| India | 163 | 0.319 | 0.011 |
| Korea, Republic of | 191 | 0.374 | 0.014 |
| Indonesia | 120 | 0.235 | 0.005 |
| Thailand | 116 | 0.227 | 0.005 |
| Hong Kong | 200 | 0.391 | 0.017 |
| Malaysia | 110 | 0.215 | 0.004 |
| Singapore | 197 | 0.386 | 0.008 |
| Philippines | 93 | 0.182 | 0.002 |
| Pakistan | 8 | 0.016 | 0.002 |
| Bangladesh | 1 | 0.002 | 0.001 |
| Vietnam | 5 | 0.010 | 0.001 |
| Sri Lanka | 5 | 0.010 | 0.001 |
| Papua New Guinea | 2 | 0.004 | 0.001 |
| Mongolia | 17 | 0.033 | 0.001 |

(Cont'd)

| | Number of Fund Families Entering | % Fund Families Entering | Average % Net Assets of Entering Fund Families |
|---|---|---|---|
| Latin America & the Caribbean | 269 | 0.526 | 0.027 |
| Brazil | 226 | 0.442 | 0.020 |
| Mexico | 180 | 0.352 | 0.008 |
| Argentina | 106 | 0.207 | 0.003 |
| Venezuela | 1 | 0.002 | 0.002 |
| Colombia | 69 | 0.135 | 0.002 |
| Chile | 101 | 0.198 | 0.003 |
| Peru | 88 | 0.172 | 0.004 |
| Panama | 44 | 0.086 | 0.002 |
| Jamaica | 1 | 0.002 | 0.000 |
| Middle East & North Africa | 264 | 0.517 | 0.015 |
| United Arab Emirates | 45 | 0.088 | 0.001 |
| Egypt | 52 | 0.102 | 0.001 |
| Israel | 254 | 0.497 | 0.015 |
| Morocco | 8 | 0.016 | 0.000 |
| Lebanon | 9 | 0.018 | 0.001 |
| Jordan | 4 | 0.008 | 0.002 |
| Sub-Saharan Africa | 166 | 0.325 | 0.009 |
| South Africa | 163 | 0.319 | 0.009 |
| Nigeria | 31 | 0.061 | 0.001 |
| Kenya | 8 | 0.016 | 0.000 |
| Ghana | 6 | 0.012 | 0.000 |
| Zambia | 3 | 0.006 | 0.000 |
| Botswana | 1 | 0.002 | 0.000 |
| Namibia | 6 | 0.012 | 0.000 |
| Mauritius | 5 | 0.010 | 0.005 |
| Zimbabwe | 2 | 0.004 | 0.000 |

Note: This table shows descriptive statistics of 511 U.S. mutual fund families' entries into 61 countries that have entry by one or more fund families in the Morningstar data set. It takes into account the entries only within the equity funds of each fund family. For fixed-cost estimation, all of the above countries with the exception of the following 13 countries are used: Malaysia, Bangladesh, Vietnam, Sri Lanka, Papua New Guinea, Mongolia, Venezuela, Panama, Jamaica, United Arab Emirates, Lebanon, and all countries in Sub-Saharan Africa region except South Africa. These are excluded for lack of data on the relevant country variables.

**Table 3.** Classification of Countries Based on Geographical and Income Similarities

| Group | Countries | Group Description |
|---|---|---|
| 1 | United States, Canada, United Kingdom | |
| 2 | Austria, Belgium, France, Germany, Switzerland | High income OECD in Western Europe |
| 3 | Denmark, Finland, Ireland, Netherlands, Norway, Sweden | High income OECD in Northern Europe |
| 4 | Czech Republic, Hungary, Poland | High income OECD in Eastern Europe |
| 5 | Greece, Italy, Spain, Portugal | High income OECD in Southern Europe |
| 6 | Russia, Turkey | Upper middle income in Europe |
| 7 | Hong Kong, Korea, Japan, Singapore | High income in Asia |
| 8 | China, Taiwan, Thailand | Upper middle income in Asia |
| 9 | India, Indonesia, Pakistan, Philippines, Sri Lanka | Lower middle income in Asia |
| 10 | Australia, New Zealand | Pacific |
| 11 | Argentina, Brazil, Chile, Colombia, Mexico, Peru | Latin America |
| 12 | Israel, Jordan | Middle East |
| 13 | Egypt, Morocco, South Africa | Africa |

Source: World Bank country classification and the United Nations geoscheme.

**Table 4.** Summary Statistics of Fund Family, Country, and Pair Variables

| Variable | Average | Median | Stdev | Min | Max | #Obs |
|---|---|---|---|---|---|---|
| Years in the industry | 35 | 22 | 28 | 5 | 90 | 200 |
| Maximum manager tenure | 17 | 8 | 17 | 3 | 54 | 200 |
| GDP per capita | 25,494 | 20,951 | 21,097 | 1,025 | 86,156 | 46 |
| Bilateral trade | 59,107 | 113,330 | 21,078 | 1,906 | 526,752 | 46 |
| Investor protection index | 6 | 2 | 6 | 3 | 10 | 46 |
| Investment experience in similar countries | 0.30 | 0.30 | 0.25 | 0 | 0.83 | 14,288 |

Note: GDP per capita is measured in dollars (Source: World Development Indicators by the World Bank). I measure the amount of a country's bilateral trade with the U.S. by combining total annual imports and exports in millions of dollars, from the 2010 U.S. Trade in Goods by Country provided by the U.S. Census Bureau. For the investor-protection index, I use the Strength of Investor Protection index of the World Bank's Doing Business reports from 2011, ranging from 0(low protection) to 10(high protection). I follow the classification scheme for countries as shown in Table 3 to compute the pair variable which is constructed by dividing the number of countries that belong to the same group and are invested by fund family $j$, by the total number of countries in that group.

**Table 5.** Definition of Deviation Groups

| | Deviation Group Description |
|---|---|
| Fund Family Variables<br>- Years in the industry<br>- Maximum manager tenure | All quadruples composed of two fund family–country pairs, $(j, n)$ and $(j', n')$ that satisfy the following conditions: (1) $j$ and $j'$ are similar in terms of all fund family variables except for the variable of interest, (2) $n$ and $n'$ are similar in terms of all country variables, (3) $j$ enters $n$ while $j'$ does not enter $n'$, and (4) $(j, n)$ and $(j', n')$ are similar in terms of the pair variable. |
| Country Variables<br>- GDP per capita<br>- Bilateral trade<br>- Investor protection index | All quadruples composed of two fund family–country pairs, $(j, n)$ and $(j', n')$ that satisfy the following conditions: (1) $j$ and $j'$ are similar in terms of all fund family variables, (2) $n$ and $n'$ are similar in terms of all country variables except for the variable of interest, (3) $j$ enters $n$ while $j'$ does not enter $n'$, and (4) $(j, n)$ and $(j', n')$ are similar in terms of the pair variable. |
| Pair Variable<br>- Investment experience in similar countries | All quadruples composed of two fund family–country pairs, $(j, n)$ and $(j', n')$ that satisfy the following conditions: (1) $j$ and $j'$ are similar in terms of all fund family variables, (2) $n$ and $n'$ are similar in terms of all country variables, (3) $j$ enters $n$ while $j'$ does not enter $n'$, and (4) $(j, n)$ and $(j', n')$ differ in terms of the pair variable. |

Note: $j$ and $j'$ refer to mutual fund families and $n$ and $n'$ indicate destination countries. It is possible that $j = j'$ and $n = n'$. Two fund families (or countries) are defined as *similar* in terms of a variable if they belong to the same group when sorted into different groups according to the size of this variable. As for the pair variable, two pairs are defined as similar if the difference in their pair variables is less than or equal to 0.2 (see Data Appendix for more details). For all deviation groups, the deviation scenario is to switch the entry status of the two fund family–country pairs in the quadruple.

**Table 6.** Sample Averages Across Deviation Groups

| | Δyears | Δtenure | Δgdppc | Δtrade | Δprotect | Δexperience | Δlog(profit) | #Obs |
|---|---|---|---|---|---|---|---|---|
| LB: years | -0.416 | -0.001 | 6.4 | 0.4 | 0.000 | 0.000 | 0.020 | 228 |
| LB: tenure | -0.029 | -0.320 | 21.4 | 1.4 | 0.000 | 0.000 | 0.035 | 396 |
| LB: gdppc | 0.019 | 0.023 | -2161.3 | 2258.5 | 0.015 | 0.000 | 0.124 | 765 |
| LB: trade | 0.000 | 0.001 | -18.9 | -943.4 | 0.001 | 0.000 | 0.005 | 58 |
| LB: protect | 0.001 | 0.007 | 159.0 | -64.4 | -0.301 | 0.000 | 0.225 | 1,470 |
| LB: experience | 0.004 | 0.010 | 12.9 | 0.8 | 0.000 | -0.005 | 0.026 | 166 |
| UB: years | 2.169 | 0.036 | -15.0 | -1.0 | 0.000 | 0.000 | -0.128 | 1,004 |
| UB: tenure | -0.054 | 0.548 | -6.4 | -0.4 | 0.000 | 0.000 | -0.065 | 642 |
| UB: gdppc | 0.011 | -0.068 | 5479.4 | -786.9 | -0.020 | 0.001 | -0.342 | 2,183 |
| UB: trade | 0.005 | -0.039 | 151.5 | 6859.3 | -0.046 | 0.000 | -0.146 | 1,069 |
| UB: protect | 0.049 | -0.069 | 323.7 | -285.7 | 0.311 | 0.000 | -0.303 | 1,539 |
| UB: experience | 0.098 | -0.354 | -17.1 | -1.1 | 0.000 | 0.178 | -0.885 | 4,343 |

Note: "years," "tenure," "gdppc," "trade," "protect," and "experience" refer to the fund family's years in the industry and maximum manager tenure, the destination country's GDP per capita, amount of bilateral trade with U.S., and investor-protection index, and the fund family's investment experience in similar countries in terms of geography and income. "LB" and "UB" refer to the lower bound and the upper bound, respectively.

**Table 7.** First-Stage Regression Results

| | Fee |
|---|---|
| Competing fund families' recent performance | -11.16*** |
| | (1.657) |
| Degree of global entry | -0.0517 |
| | (0.0539) |
| Log(Total number of funds) | -0.148*** |
| | (0.0334) |
| Age | -0.00145 |
| | (0.00115) |
| Total number of managers | -0.000290 |
| | (0.000904) |
| Maximum manager tenure | 0.00109 |
| | (0.00282) |
| Load-adjusted return since inception | -0.00518 |
| | (0.00463) |
| Past year maximum fund return | 0.00225 |
| | (0.00263) |
| Front load dummy | 0.0448 |
| | (0.0432) |
| 12b-1 fee dummy | 0.0898** |
| | (0.0450) |
| Turnover ratio | 0.000741** |
| | (0.000325) |
| Constant | 13.47*** |
| | (2.034) |
| Observations | 300 |
| R-squared | 0.363 |

Note: This table reports estimation results from the first-stage regression. Dependent variable is fund family's fee, calculated as the expense ratio minus the 12b-1 fee. Total number of funds counts the number of all active funds including the funds of asset classes other than equity funds, owned by the fund family. Age is measured in years that the fund family has operated in the industry. Past performance is proxied by the load-adjusted return since inception and the past year maximum fund return. Fee, load-adjusted return since inception, the 2010 maximum fund return, and the turnover ratio are all expressed in percentages. Dummies for front load and 12b-1 fee indicate whether the fund family charges a positive front load and 12b-1 fee, respectively. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table 8.** Demand Estimation Results

| Dependent variable: Log(Market share) | (1) OLS | (2) IV |
|---|---|---|
| Fee | -1.743*** | -2.809*** |
| | (0.219) | (0.612) |
| Degree of global entry | 0.678*** | 0.677*** |
| | (0.250) | (0.255) |
| Log(Total number of funds) | 0.736*** | 0.591*** |
| | (0.140) | (0.162) |
| Age | 0.0130*** | 0.0110*** |
| | (0.00371) | (0.00377) |
| Total number of managers | 0.00611** | 0.00586** |
| | (0.00261) | (0.00272) |
| Maximum manager tenure | 0.0473*** | 0.0457*** |
| | (0.0107) | (0.0110) |
| Load-adjusted return since inception | 0.0801*** | 0.0780*** |
| | (0.0231) | (0.0258) |
| Past year maximum fund return | 0.00413 | 0.0107 |
| | (0.0114) | (0.0132) |
| Front load dummy | -0.0682 | -0.0547 |
| | (0.174) | (0.183) |
| 12b-1 fee dummy | -0.249 | -0.166 |
| | (0.195) | (0.203) |
| Turnover ratio | -0.00119 | -0.000202 |
| | (0.00100) | (0.00138) |
| Constant | -21.62*** | -20.32*** |
| | (4.795) | (4.832) |
| Observations | 304 | 300 |
| R-squared | 0.743 | 0.716 |

Note: This table reports demand estimation results using ordinary least squares (OLS) in the first column and instrumental variable estimation (IV) in the second column. Dependent variable is the natural logarithm of the market share of the fund family, where market share is calculated as the fund family's stock of total assets. Fee is calculated as the expense ratio minus the 12b-1 fee. Total number of funds counts the number of all active funds including the funds of asset classes other than equity funds, owned by the fund family. Age is measured in years that the fund family has operated in the industry. Past performance is proxied by the load-adjusted return since inception and the past year maximum fund return. Fee, load-adjusted return since inception, the 2010 maximum fund return, and the turnover ratio are all expressed in percentages. Dummies for front load and 12b-1 fee indicate whether the fund family charges a positive front load and 12b-1 fee, respectively. Robust standard errors are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

**Table 9.** Results of Fixed Cost Estimation

| | Estimate | Confidence Interval | #Obs: LB | #Obs: UB |
|---|---|---|---|---|
| Constant Fixed Cost | (111,657, 291,704) | (100,926, 352,368) | 3,910 | 4,947 |
| Years in the industry | -0.058 | (-0.066, -0.054) | 228 | 1,004 |
| Maximum manager tenure | -0.119 | (-0.127, -0.111) | 396 | 642 |
| GDP per capita | -0.00009 | (-0.00010, -0.00009) | 765 | 2,183 |
| Bilateral trade | -0.00003 | (-0.00003, -0.00002) | 58 | 1,069 |
| Investor protection index | -0.858 | (-0.892, -0.828) | 1,470 | 1,539 |
| Investment experience | -6.119 | (-6.967, -5.343) | 166 | 4,343 |
| Constant | 9.89 | (9.485, 10.439) | - | - |

Note: This table shows fixed cost estimation results from the constant fixed cost and the heterogeneous fixed costs specifications described in Section 5. For the results from constant fixed cost specification, the results for the estimated cost and the confidence interval are expressed in dollars. For the results obtained from assuming heterogeneous fixed costs, each coefficient measures the effect of the corresponding variable on the log of fixed cost. 5% confidence intervals are obtained by constructing the (one-sided) interval using 1,000 simulations. "LB" and "UB" refer to the lower bound and the upper bound, respectively.

**Table 10.** Effects of Fund Family, Country, and Pair Characteristics on Fixed Cost Reduction

| | Decrease in Fixed Cost |
|---|---|
| A 5 years increase in fund family's age | 25% |
| A 5 years increase in fund family's maximum manager tenure | 45% |
| A $10,000 increase in country's GDP per capita | 37% |
| A $10 bil increase in country's bilateral trade | 22% |
| A one score increase in country's investor protection index | 58% |
| A 0.1 increase in fund family's investment experience in similar countries | 46% |

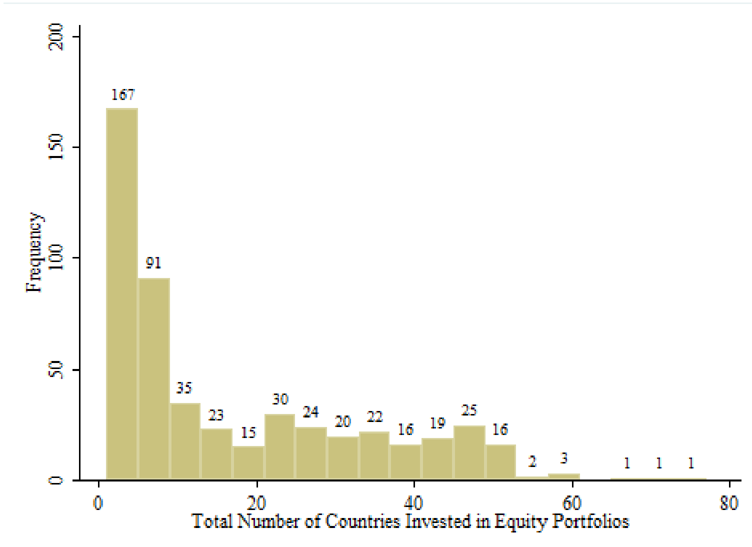
Note: This table shows the effects of fund family, country, and pair characteristics on fixed cost reduction, under the heterogeneous fixed costs specification described in Section 8. Each value indicates the amount of reduction in percentage.

**Table 11.** Observed Entry Match Rates

| | Entry | Non-entry | Total |
|---|---|---|---|
| Constant Cost: Lower bound | 19.0% | 79.7% | 45.8% |
| Constant Cost: Upper bound | 10.8% | 91.3% | 46.3% |
| Heterogeneous Costs | | | 67.4% |

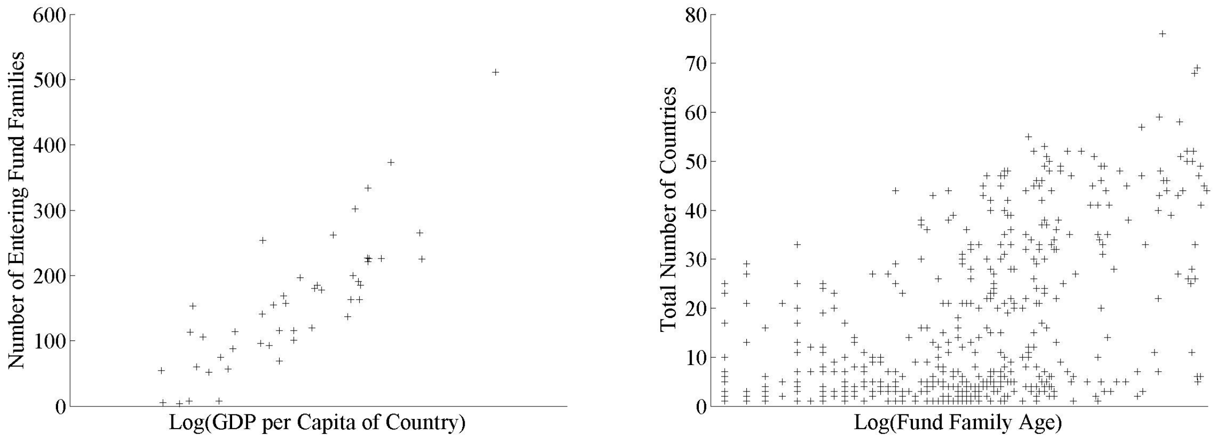
Note: This table shows the match rate of the observed entry decisions under the constant fixed cost specification in Section 7 and that under the heterogeneous fixed costs specification in Section 8. The first column, "Entry," indicates the match rate among only the observed *entries*, whereas the second column, "Non-entry," indicates that among only the observed *non-entries*. The last column, "Total," is the overall match rate among all the observed entries and non-entries.

**Figure 1.** Total Number of Countries Invested in Equity Funds by U.S. Mutual Fund Families




Note: This figure shows a non-weighted empirical distribution of the total number of countries invested, pooled across all equity funds within each fund family, for the sample of 511 U.S.-based mutual fund families. The mean and the standard deviation are both 17, the median is 8, and the maximum is 76 countries.

**Figure 2.** Global Entry Patterns of U.S. Mutual Fund Families




(a) (b)

Note: Figure 2(a) shows the relationship between the (natural logarithm of) country's GDP per capita and the total number of fund families entering the country in its equity funds, for the sample of 48 countries used for estimation. Similarly, Figure 2(b) shows the relationship between the natural logarithm of fund family's age (measured by years it has operated in the industry) and the total number of countries invested, pooled across all equity funds within each fund family, for the sample of 511 U.S.-based mutual fund families used for estimation. The $R^2$'s are 0.84 and 0.51, for Figure 2(a) and 2(b), respectively.

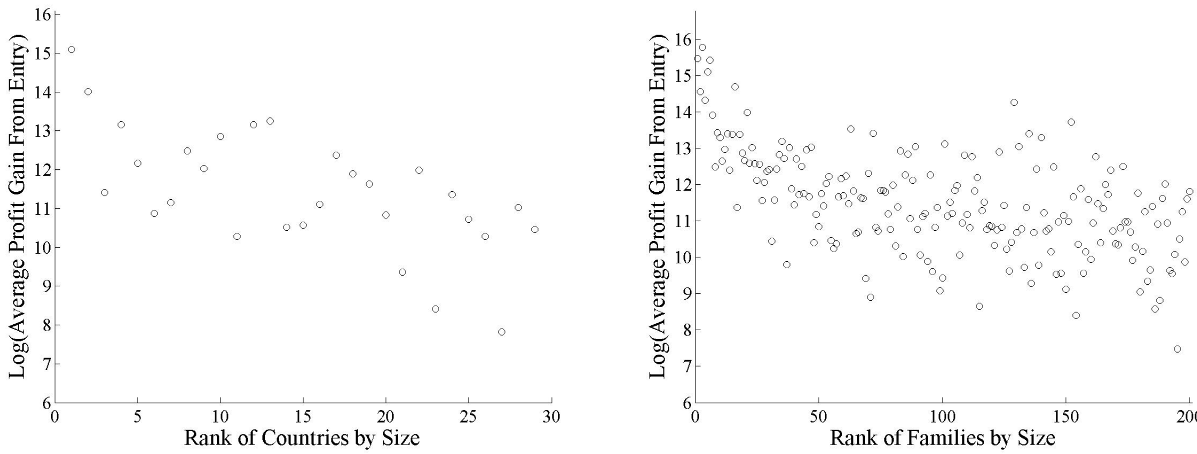
**Figure 3.** Difference-in-Difference Method Used in Fixed Cost Estimation

| | Fund Family 1 | Fund Family 2 |
|---|---|---|
| Country X | Invest | Not invest |
| Country Y | Not invest | Invest |

| | Fund Family 1 | Fund Family 2 | Fund Family 1 – Fund Family 2 |
|---|---|---|---|
| Country X | $\overline{F_{X1}}$ | $\underline{F_{X2}}$ | $\overline{F_{X1}} - \underline{F_{X2}}$ |
| Country Y | $\underline{F_{Y1}}$ | $\overline{F_{Y2}}$ | $\underline{F_{Y1}} - \overline{F_{Y2}}$ |
| Country X - Country Y | $\overline{F_{X1}} - \underline{F_{Y1}}$ | $\underline{F_{X2}} - \overline{F_{Y2}}$ | |

Note: This illustrates intuition of the difference-in-difference method I use to identify the coefficients, $\kappa^c, \kappa^f, \kappa^p$. Putting the pair-specific component to zero for ease of exposition, say fund family 1 is investing in Country X. By considering the counterfactual profit of fund family 1 if it did not invest in X, we can obtain an upper bound for $F_{X1}$ by comparing the difference between this counterfactual profit and the current profit. However, since $F_{X1} = W_1^f \kappa^f + W_X^c \kappa^c$, identifying the parameters, $\kappa^f$ and $\kappa^c$ , is impossible without further information. To be able to identify a fund family-specific cost parameter, for instance, the coefficient for the fund family's age, we need another fund family, say, fund family 2, that is identical to fund family 1 except for its age and does not invest in Country X. In this way, we can measure the impact of the difference in the fund family's age on (the bounds for) $F_{X\cdot}$. Identifying the country-specific cost-parameter can be done analogously.

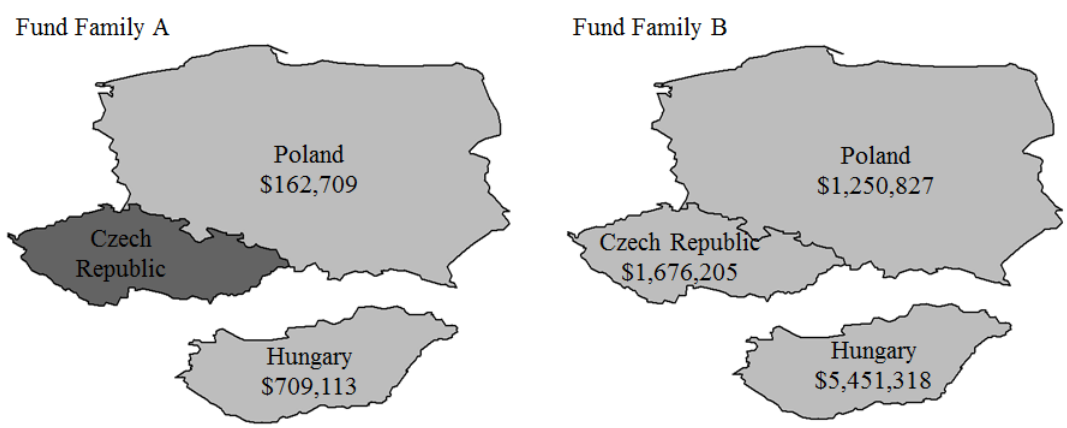
**Figure 4.** Average Expected Profit Gains of Entry, by Fund Family and Country




**(a)** **(b)**

Note: Figure 4(a) shows the average expected gain in operating profit that each destination country gives to a U.S. mutual fund family that enters it, where the gain is averaged across fund families for each country. In a similar fashion, Figure 4(b) shows the U.S. mutual fund families' average expected gains in operating profit, induced by entry into a foreign market. For each fund family, the gains are averaged across foreign markets.

**Figure 5.** Effect of Investment Experience on Fixed Cost Reduction




Note: This figure illustrates the effects of fund families' investment experiences on reduction of fixed cost of investment in a foreign equity market. Investment experience is measured by the percentage of entry into similar countries in terms of geography and income, as defined in Table 3. In this example, I consider high income OECD countries in Eastern Europe, i.e., Czech Republic, Hungary, and Poland. Fund Families A and B are identical in terms of all fund family characteristics considered in the fixed-cost estimation of this paper (i.e., years in the industry and maximum manager tenure). The only difference is in the entry status with respect to this group of countries. fund family A is investing in the Czech Republic, whereas fund family B is currently investing in none of the three countries. The dollar values indicate the amount of fixed cost needed to additionally enter the corresponding country.

## B Data Appendix

### B.1 Data Source

The primary source for data is the Morningstar Principia. For each active U.S.-based mutual fund, it provides the basic information including total and net assets, investment approach, share class type, risk and return profile, tax cost, performance, the fund family to which it belongs, profiles on managers, and all types of fees and expenses, and also a complete description of portfolio holdings in all industrial sectors and countries. Except for the returns data, which go back as far as a decade ago, all variables are cross-sectional as of June 30, 2011.

### B.2 Construction of Fund Family-Level Equity Portfolios Data Set

I make several adjustments to the data to fit the purpose of this study. First, I took a series of measures to construct a sample consisting only of fund families' equity funds. Among the total 27,819 funds available in Principia, I kept only the security types that matched "Mutual Fund" or "Load-Waived A Share," dropping others identified as "Exchange Traded Fund," "Money Market," "Index," and so forth. To keep only the *equity* funds, I also excluded funds belonging to the asset classes that put less focus on equity investment, such as "Alternative," "Commodities," "Taxable Bond," "Municipal Bond," and "Money Market." I used only the three asset classes dedicated to equity investment, "Domestic Equity," "Hybrid," and "Global Stock." (This asset class classification follows that of Morningstar.)

Calculating the weighted averages of mutual fund families' various characteristics was crucial in creating the fund family-level dataset and individual funds' net assets were used as the weights. Therefore, I excluded fund families that had missing observations on some of their funds' net assets, whose total amount exceeded 20% of the fund family's total assets. I also dropped fund families that only invest in U.S. equities or manage only one fund. Taking different share classes of the same fund as comprising one fund, 4,567 funds from 511 fund families remained.

Based on this sample of equity mutual funds, I transformed individual fund variables into fund family variables through re-grouping by fund families. First, I generated fund IDs to group each fund's different share classes under one ID. Although different share classes follow different fee structures and have varying net assets, they are otherwise identical in every aspect, including the portfolio composition and managers. For most variables used in the estimation, such as the expense ratio, front load, previous returns and 12b-1 fee, I took the assets-weighted average of the corresponding variable within the fund IDs to create the fund family variables. Trivially, the Morningstar variables, namely, the Morningstar risk, return, and rating, which have qualitative inputs of five categories ranging from "Low" to "High," were numerically transformed into integers from 1("Low") to 5("High").

On the other hand, there are some fund family variables I constructed before excluding the funds belonging to asset classes other than equity. These variables are the total assets, the total number of funds the fund family owns, the fund family's earliest fund-inception date, and the manager variables including the total number of managers and the average and maximum manager tenure. Because they relate to size, asset coverage, and industry experience of fund families, considering all funds under the fund family rather than using only a subset consisting of the fund family's equity funds seemed more reasonable. To transform these variables into fund family-wide observations, I used simple aggregation: first, I gathered fund observations under each fund family to produce a non-duplicate list of the corresponding variable for the fund family. Then, I took the necessary calculation, that is, counting or taking the minimum, maximum, or (equal-weighted) average.

For use in the calculation of Sharpe ratios, I downloaded 2011 market capitalization data from the U.S. Census Bureau, and MSCI monthly country gross return indices from January 1995 to June 2011 from Datastream.

### B.3 Calculating the Fund Family's (Average) Fee

The fees that funds charge consumers comprise two primary components, the expense ratio, and front and deferred loads. The expense ratio is an annual expense that is expressed in percentage of total assets and is taken from the assets on an annual basis. It covers portfolio-management fees, marketing and distribution costs commonly known as 12b-1 fees, administrative fees, costs for daily fund accounting and pricing, shareholder services including mail distribution and management of call centers and websites, and other miscellaneous costs of operating the funds. Sales loads are one-time charges paid either at the time of purchase or redemption of fund shares. These mostly go to the brokers and financial planners who sold the fund, to compensate for their brokerage and sales service.

Amid various measures to calculate a fund family's (average) fee, I use the fund family's asset-weighted average of the annual audited net expense ratio. The pricing with regard to sales charges given to brokers is less likely to be strongly correlated with the global entry decision. Any cost incurred by investing abroad, for example, the cost of hiring new regional specialists or outsourcing research on foreign markets, will be more likely to be reflected in the annual management fees of fund families. The audited net expense ratios take into consideration fee waivers, reimbursements, etc., to portray the actual fees charged (as opposed to the prospectus expense ratios which reflect the anticipated fees). Also, I subtract from the expense ratio the 12b-1 fee, which is the portion of the expense ratio earmarked for marketing.

### B.4 Country Variables

In the model estimation, I use only 47 countries among a total of 119 countries in which the equity funds in Morningstar Principia made investments, due to the availability in the data for country index returns and market capitalization (see Table 2 for the list). These 47 countries comprise most global entries; the mean of the sum of portfolio weights given to the excluded countries is less than 0.5% in this sample.

I resort to several data sources to obtain country variables used in the fixed cost estimation. For data on destination country's GDP per capita, I use the World Development Indicators by the World Bank. I calculate the amount of each destination country's bilateral trade with the U.S. by combining the total annual imports and exports in millions of dollars from 2010 U.S. Trade in Goods by Country, provided by the U.S. Census Bureau. To measure the destination country's extent of investor protection, I use the Strength of Investor Protection index of the World Bank's Doing Business reports from 2011, ranging from 0(low protection) to 10(high protection). I also use the World Bank country classification and the United Nations geoscheme, in grouping countries according to similarity in terms of geography and income.

### B.5 Construction of Similarity Measures

To define similarity for use in creating deviation groups for fixed cost parameters estimation, first, each variable in $W^f$ and $W^c$ was divided into 7 and 8 bins, respectively, according to the size of the variable. Two fund families (or countries) were defined to be similar in terms of a variable if they belong to the same bin with respect to the variable. Lastly, two fund family–country pairs are defined as similar in terms of $W^p$ if the difference in their $W^p$'s is less than the threshold of 0.2.

However, while there were 511 fund families available for identification of $\kappa^f$, only 45 countries – 47 countries minus the *home* and New Zealand (the latter due to missing country variables) – were available to identify $\kappa^c$. Therefore, I adjusted the above definition of similar countries such that two countries can diverge in terms of variables other than the variable of interest as well, but the distance between the bins the countries belong to cannot be farther apart than one. On the other hand, for the variable of interest, I further imposed a tighter restriction such that the distance between the bins each of the two countries belongs to must be farther apart than three. The same restriction was put on the estimation of fund family variables as well.