Essays on International Capital Flows

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Abstract

This dissertation consists of three chapters on international capital flows. Chapter 1 emphasizes the importance of innovations in the investment opportunity set, captured by changes in expected asset returns, as an important mechanism to explain international capital flows. More specifically, it analyzes the implications of time-varying portfolio shares on the dynamics of the current account. The predictions of a partial-equilibrium model of the current account, with dynamic portfolio choices, are evaluated using data for the U.S. and Japan. We show that variations in investment opportunities change agents' optimal portfolios in a direction consistent with the actual bilateral current account movements. Chapter 2 focuses on two questions related to international investment and access to international capital markets. First, does the structural change in the U.S. mutual fund industry toward more "aggregation" (favoring funds that invest globally over funds that invest in specific countries or regions) affect firms in other countries? And second, are investors forgoing gains from international diversification by shifting toward more global funds? The empirical evidence presented suggests that the answer is yes to both questions. Chapter 3 investigates the relation between information asymmetries and institutional investor mandate. The results suggest that information asymmetries vary across institutional investor mandates, being significantly more pronounced for funds with broader mandates.

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Introduction

I study three different aspects of international capital flows in this thesis. In the fist chapter, my co-author and I focus on the dynamics of the financial account, empirically measured by its accounting counterpart, the current account. In other words, the current account can be understood as the outcome of investment decisions made by domestic and foreign investors. Focusing on this asset allocation aspect of the problem, we analyze the implications of time-varying portfolio shares on the dynamics of the current account. We emphasize the importance of innovations in the investment opportunity set, captured by changes in expected asset returns, as the main mechanism behind variations in countries' portfolios. We evaluate the predictions of a partial-equilibrium model of the current account, with dynamic portfolio choices. Using data for the U.S. and Japan, we show that variations in investment opportunities change agents' optimal portfolios in a direction consistent with the actual bilateral current account movements. Furthermore, we provide econometric evidence of a robust positive relation between our predicted and the actual bilateral current account series. Therefore, our approach highlights changes in expected asset returns as an important mechanism to explain international capital flows.

In the second chapter, my co-authors and I study the lack of perfect international diversification by analyzing unique micro data on U.S. institutional investors' foreign holdings. This chapter focuses on two questions related to international investment and access to international capital markets. First, does the structural change in the U.S. mutual fund industry toward more "aggregation" (favoring funds that invest globally over funds that invest in specific countries or regions) affect firms in other countries? And second, are investors forgoing gains from international diversification by shifting toward more global funds? We find that the answer is yes to both questions. In particular, we find that mutual fund managers tend to invest in a finite – and rather small – number of stocks almost independently of the level of country aggregation. In other words, the number of stocks in a mutual fund portfolio does not tend to rise significantly as funds have a broader mandate to invest in more countries. We also show that there are unexploited diversification gains to be made, even when the both Specialized and Global funds are all part of the same mutual fund family. The work has several important implications for emerging and transitional economies trying to attract foreign capital and trying to develop their own institutional investor bases. It sheds light on the scope of action that government and companies have when attracting funds from international institutional investors.

Lastly, the third chapter expands the literature on the home bias that characterizes international capital flows. In particular, two biases have been identified in the literature: a foreign bias and an institutional investor bias. The first bias describes the fact that foreign investors tend to hold assets from larger firms than domestic investors, whereas the second one goes one step further and state that this is actually a feature of institutional investors, independent of their nationality. Moreover, firm size is interpreted as a proxy for information asymmetries. In this chapter, I further analyze this institutional investor bias. The hypothesis is that there is actually heterogeneity in the institutional investor bias across investors with different investment mandates. My main argument relies on managers with different mandates facing different costs and benefits in gathering and processing information. As the investment mandate becomes broader, informational costs for a specific region becomes higher and benefits lower. Therefore, Global fund managers would prefer to invest in larger firms, less prone to information asymmetries, than Specialized fund managers. After controlling for transaction costs, liquidity, and other direct and indirect barriers to international capital flows, I find strong evidence in favor of our hypothesis. Hence, the results suggest that information asymmetries vary across institutional investor mandates, being significantly more pronounced for funds with broader mandates.

Chapter 1

The Current Account as a Dynamic Portfolio Choice Problem

Co-author: Alexandre Lowenkron, *Banco BBM*

The current account can be understood as the outcome of investment decisions made by domestic and foreign investors. Focusing on this asset allocation aspect of the problem, we analyze the implications of time-varying portfolio shares on the dynamics of the current account. We emphasize the importance of innovations in the investment opportunity set, captured by changes in expected asset returns, as the main mechanism behind variations in countries' portfolios. We evaluate the predictions of a partial-equilibrium model of the current account, with dynamic portfolio choices. Using data for the U.S. and Japan, we show that variations in investment opportunities change agents' optimal portfolios in a direction consistent with the actual bilateral current account movements. Furthermore, we provide econometric evidence of a robust positive relation between our predicted and the actual bilateral current account series. Therefore, our approach highlights changes in expected asset returns as an important mechanism to explain international capital flows.

"... specific trade-related factors cannot explain the magnitude of the U.S. current account imbalance and its recent sharp rise. Rather, the U.S. trade balance is the tail of the dog; for most part it has been passively determined by foreign and domestic incomes, asset prices, interest rates, and exchange rates, which are themselves in turn the product of more fundamental driving forces..." - Ben Bernanke (2005)

1.1. Introduction

In theory, the current account can be understood as the outcome of investment decisions made by domestic and foreign investors. Empirically, we can study the outcome of these decisions by analyzing a country's gross foreign asset positions. Factors that affect these gross positions, such as asset returns and exchange rates, also have an impact on the current account. Furthermore, the recent empirical literature on the dynamics of countries' portfolios highlights the importance of their variations over time.[1] Thus, in this chapter, we analyze the implications of changes in a country's optimal portfolio allocation for the dynamics of the current account. In particular, we focus on time-varying optimal portfolio shares caused by variations in the investment opportunity set.[2] Most significantly, we empirically evaluate the relevance of these variations to explain movements in the current account. We focus on the predictions of a partial-equilibrium model of the current account with dynamic portfolio choice. In this model, time-varying investment opportunities, captured by the dynamics of asset returns, are the main mechanism behind portfolio rebalances. Therefore, our approach highlights changes in expected asset returns as an important factor to explain international capital flows.

Although the current account is essentially an issue of portfolio allocation, standard macroeconomic models have not incorporated this aspect of the problem until very recently. Even then, commonly used models have static-like solutions with constant

[1] See, for example, Calderon, Loayza, and Serven (2003), Lane and Milesi-Ferretti (2005), and Gourinchas and Rey (2006).

[2] Other reasons for optimal portfolio reallocations have been suggested, namely time-varying preferences (e.g. risk aversion), parameter uncertainty, and financial constraints.

portfolios over time. For example, Kraay and Ventura (2000) use Merton's (1971) model of portfolio allocation to analyze the current account. This model assumes constant asset risk and return, and agents with log-utilities. The optimal portfolio allocation is thus characterized by constant portfolio shares, implying that a country's net foreign asset position is a constant fraction of its wealth. Therefore, this model highlights only a portfolio growth component as an explanation for the dynamics of the current account.

On the other hand, in this chapter we focus on portfolio rebalancing as the driving force behind the dynamics of the current account. We extend existing structural models of the current account in order to incorporate the growing empirical evidence on the dynamics of countries' portfolios.[3] More specifically, we emphasize the importance of innovations in investment opportunities, captured by changes in expected asset returns, as the main mechanism behind variations in countries' portfolios. Merton's (1971) portfolio model is the foundation of our theoretical framework. By changing two central assumptions of Merton's model, we are able to obtain a structural model of the current account with dynamic portfolio choice. First, we assume that asset returns are non-i.i.d. and exploit their predictability. Second, we depart from the assumption of a log utility function. To separate the elasticity of intertemporal substitution from the relative risk aversion parameter, and therefore to model savings and investment decisions separately, we assume agents with Epstein-Zin utility function. We also assume a relative risk aversion parameter greater than one. Both assumptions are important in obtaining time-varying optimal portfolio shares for investors with long-term investment horizons. As already discussed, the main mechanism behind optimal portfolio reallocations in our model is time-varying investment opportunities, characterized by the dynamics of expected asset returns. The model allows us to obtain clear predictions of this mechanism for the current account balance.[4]

Next, we empirically analyze the model's implications for the current account. Due mostly to data availability, we focus on two countries and their bilateral current account.

[3] See for example, Lane and Milesi-Ferretti (2005).

[4] In contrast to the approach taken by Kraay and Ventura (2000), our model can generate predictions for both gross and net capital flows.

Campbell, Chan and Viceira′s (2003) method is used to solve and estimate the model for U.S. and Japanese investors. We present robust empirical evidence that time-varying investment opportunities are important determinants of the dynamics of the bilateral current account. We show that variations in expected asset returns change agents' optimal portfolios in a direction consistent with the actual bilateral current account movements. We also find that positive changes in the predicted bilateral current account are significantly associated with improvements in the actual bilateral current account. Furthermore, we provide robust evidence that predicted portfolio shares, combined with actual data on savings and consumption instead of the model's predictions, can explain the dynamics of the bilateral current account. Our empirical results thus provide strong support for the main mechanism highlighted in this chapter.

Although our model effectively captures the dynamics of the bilateral current account, it does not successfully explain the level of the bilateral current account. There are two reasons for that. First, we do not impose either borrowing or short-selling constraints in the model, and as a result, we allow leveraged portfolios. We are thus bound to obtain larger and more volatile capital flows than actual ones. This problem is typical of models which assume perfect mobility of capital flows. Similar implications have been reported in portfolio allocation models by Campbell, Chan, and Viceira (2003), Evans and Hnatkovska (2005), Mendoza, Quadrini, and Rios-Rull (2007), and Rapach and Wohar (2007). Correcting this issue in a portfolio model with several assets is not simple, so we share this problem with the rest of the literature.

Furthermore, similar models have been widely used to analyze issues of optimal portfolio allocation. For example, Campbell and Viceira (1999), Campbell et al. (2001), Normandin and St-Amour (2002, 2005), Watcher (2002), and Sangvinatsos and Watcher (2005) highlight these models' success in explaining optimal portfolio choice in different contexts. However, they acknowledge that they are not well-suited to capture the dynamics of agents' wealth. The models predict rapidly growing wealth, low consumption-wealth ratios, and relatively low consumption volatility. Nonetheless, the predicted dynamics of consumption is reasonable: an investor wants more wealth in states when the marginal utility is higher. Therefore, given our focus on changes in optimal portfolio allocation as an explanation for movements in the current account, we believe that our model is appropriate. It effectively captures variations in the optimal portfolio allocation caused by changes in the investment opportunity set.

To the best of our knowledge, this is the first article to empirically analyze the relevance of changes in investment opportunities for the dynamics of the current account. Although we develop our own theoretical framework, a few theoretical papers should be mentioned.[5] Devereux and Sutherland (2006) and Tille and van Wincoop (2007) highlight the importance of time-varying portfolio shares in a dynamic stochastic general equilibrium (DSGE) model with portfolio choice. In theoretical terms, they show the importance of portfolio rebalancing for net and gross capital flows. Also from a theoretical perspective, Evans and Hnatkovska (2005) and Hnatkovska (2006) use a general equilibrium model with portfolio choice to discuss the size and volatility of capital flows and their determinants. Closely related to the empirical findings of this chapter, Caballero, Farhi, and Gourinchas (2007) discuss theoretically the possibility that a collapse in financial development in Japan and emerging markets could have led to a sustained reallocation of savings to the United States.

The rest of the chapter is structured as follows. In Section 1.2, we present preliminary evidence to illustrate the empirical relevance of our argument. Section 1.3 presents our model of the current account with dynamic asset allocation. In Section 1.4, we further develop our empirical analysis. We estimate the model for the U.S. and Japan and compare its predictions with the actual bilateral current account data. Section 1.5 concludes and is followed by the appendices.

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[5] From a different perspective, the International RBC literature has incorporated the effects of changes in the productivity of physical capital on investment decisions. See, for example, Backus, Kehoe, and Kydland (1992).

1.2. Preliminary Empirical Evidence

As a starting point to illustrate the empirical importance of portfolio rebalancing as opposed to the portfolio growth component, a simple accounting exercise is helpful. A country's wealth can be decomposed in to the sum of its net foreign asset positions and domestic assets:

$$W_t = NFA_t + Dom.Assets_t \tag{1.1}$$

We can then define the portfolio share in net foreign assets as:

$$NFA_t = \alpha^* \cdot W_t \tag{1.2}$$

Next, differentiating this equation, we obtain the standard definition of the current account:

$$\underbrace{\Delta NFA_t}_{\text{Current Account}} = \underbrace{\Delta\alpha^* \cdot W_t}_{\substack{\text{Portfolio Rebalancing} \\ \text{Component}}} + \underbrace{\alpha^* \cdot \Delta W_t}_{\substack{\text{Portfolio Growth} \\ \text{Component}}} \tag{1.3}$$

Lastly, we perform a variance-decomposition analysis based on equation (1.3):

$$\begin{aligned} \text{var}(\Delta\alpha^* \cdot W_t + \alpha^* \cdot \Delta W_t) = \text{var}(\Delta\alpha^* \cdot W) + \text{var}(\alpha^* \cdot \Delta W_t) + \\ + 2\,\text{cov}(\Delta\alpha^* \cdot W, \alpha^* \cdot \Delta W_t) \end{aligned} \tag{1.4}$$

The results are shown in Table 1.1. High-income countries are shown in the top panel, middle-income countries in the middle-panel, and low-income countries in the bottom panel.[6] The first column on these tables, R-squared, reports how much of the variation of the current account can be explained by these two components, the portfolio growth and portfolio rebalancing. The other three columns report the three RHS variables on equation (1.4), scaled by the LHS variable. Thus, these three columns should sum up to one. Lastly, the final two columns report the relative size of the portfolio rebalancing and portfolio growth components.

[6] A detailed description of the data is presented in Section 1.4.

For high-income countries, the portfolio rebalancing component is on average three-times as large as the portfolio growth component. This is indeed the case for both the U.S. and Japan for example. For middle-income countries, the same pattern is observed. The portfolio rebalancing component is on average 2.5 times larger than the portfolio growth component. In low-income countries, it is slightly smaller, but it is still double the size of the portfolio growth factor. Although these average effects are large, there is heterogeneity across countries. The portfolio growth component can be as large as 96% in Belgium and 92% in the U.K. and Malaysia or as low as 37% in Argentina. But in either scenario, portfolio rebalancing seems to be important to explain the dynamics of the current account.

Next, we focus on the empirical relevance of changes in expected asset returns to explain the dynamics of the current account. We thus graphically analyze the relation between real asset returns and the current account. More specifically, we focus on two countries and their bilateral current account, namely the U.S. and Japan. We compute the expected real return differential between U.S. and Japanese assets.[7,8] Figure 1.1 shows the results for long-term government bonds, averaged over decades.[9] In this figure, a positive real return differential implies that the return on a Japanese bond is larger than the return on a U.S. bond. We also report the actual real return differential on these bonds. We plot the U.S. bilateral current account with Japan in the bottom panel of Figure 1.1.

The patterns based on actual and expected returns are very similar and consistent with the observed movements in the bilateral current account. For example, as the expected return differential declines in the 70s and 80s, our theory would suggest that, *ceteris paribus*, investors should shift their portfolios toward U.S. assets, implying a deterioration in the bilateral current account. The actual data shows that the dynamics of the bilateral current account supports this argument. Similarly, from the 80s to the 90s, the expected

[7] As will become clear in Section 1.4, the empirical analysis of this chapter focuses on the bilateral current account between the U.S. and Japan, as opposed to the total U.S. current account.
[8] Expected returns are calculated using a vector autoregression system (VAR) with past returns and other predictive variables identified in the finance literature. Our methodology is explained in Section 1.4.
[9] The results are qualitatively similar if other assets are considered.

return differential slightly increases. The mechanism highlighted in this chapter implies an improvement in the bilateral current account, which is actually observed in the data. Lastly, the reversal of the expected return differential from the 90s to the 00s – U.S. returns become larger than Japanese ones – is also accompanied by a worsening of the bilateral current account. Therefore, this preliminary evidence is consistent with the mechanism proposed here: changes in expected returns can be an important factor behind the dynamics of the current account.

We can further develop the argument behind this preliminary evidence. We propose a simple reduced form model of the bilateral current account. We assume that *ex-ante* domestic and foreign expected asset returns (both in levels and in differences), and domestic and foreign savings can explain the dynamics of the bilateral current account, from the perspective of a domestic investor. Expected asset returns are capturing changes in investment opportunities as a driving force behind portfolio reallocations. For example, as domestic expected asset returns increase, *ceteris paribus*, there is an incentive for both domestic and foreign investors to rebalance their portfolios toward domestic assets. Therefore, a decrease in foreign investments by domestic investors and an increase in domestic investments by foreign investors imply a deterioration of the current account. The opposite effect happens if foreign expected asset returns increase. Domestic and foreign savings capture a portfolio growth effect. Larger domestic savings should imply larger holdings of foreign assets, being thus associated with an improvement on the bilateral current account. Conversely, if foreign savings increase, we should observe a negative effect on the bilateral current account. Equation (1.5) summarizes this model:

$$\begin{aligned} BCA_t = \beta_0 + \beta_1(E_t R_{t+1}) + \beta_2(E_t R^*_{t+1}) + \beta_3(E_t R_{t+1} - E_{t-1} R_t) + \beta_4(E_t R^*_{t+1} - E_{t-1} R^*_t) \\ + \beta_5 S^*_t + \beta_6 S_t \end{aligned} \quad (1.5)$$

We estimate this simple reduced-form model of the bilateral current account between the U.S. (domestic) and Japan (foreign) from 1960 to 2005. The following assets are considered: short-term and long-term government bonds and equities. The estimated coefficients are correctly signed and statistically significant in both annual and quarterly samples.[10] Figure 1.2 plots the fitted values of this model. For comparison purposes, we also show the results for a variant of Kraay and Ventura's (2000) model of the current account. They use Merton's (1971) model, which assumes constant asset risk and return, and agents with log-utilities. The optimal portfolio allocation is thus characterized by constant portfolio shares. In other words, agents behave as mean-variance optimizers' à la Markowitz-Tobin. This implies that a country's net foreign asset position is a constant fraction of its wealth. As opposed to our reduced form model, Kraay and Ventura's model emphasizes only a portfolio growth component. It does not incorporate a portfolio rebalancing component.

As can be seen in Figure 1.2, our simple setup, with portfolio rebalancing effects, explains the dynamics of the bilateral current account remarkably well. It provides us preliminary evidence that portfolio rebalancing can be empirically important. More specifically, it emphasizes that portfolio rebalances caused by changes in investment opportunities can be empirically relevant in explaining current account movements. In the next sections, we further develop the argument behind the preliminary evidence shown here. We extend existing structural models of the current account in order to allow optimal time-varying portfolio shares caused by changes in investment opportunities. We then empirically evaluate the predictions of our model of the current account.

1.3. A Dynamic Portfolio Allocation Model of the Current Account

In this section, we present a structural model of the current account, with dynamic portfolio choice. The main mechanism behind portfolio reallocations in our model is time-varying investment opportunities, characterized by the dynamics of expected asset returns. Therefore, this model provides a theoretical framework to further analyze the empirical evidence shown in Section 1.2. It allows us to obtain clear predictions of the effects of changes in expected returns on the current account balance.

[10] See Appendix A for a detailed description of the estimated regressions.

Our model is an extension of Merton's (1971) model to examine the dynamics of the current account. Merton's model assumes agents with logarithmic utility functions and i.i.d. asset returns. It thus implies that long-term investors behave as mean-variance optimizers, choosing the same portfolio as a short-term investor. Given the assumptions, the optimal portfolio allocation is characterized by constant portfolio shares. To obtain a model with dynamic portfolio choice, we change two central assumptions of Merton's model. We assume agents with an Epstein-Zin utility function and non-i.i.d. asset returns.

1.3.1. The Environment

The model is set in discrete time. We consider a partial equilibrium analysis in which agents face exogenous asset returns. There is an arbitrary set of traded assets. We also assume that all individuals are identical and have access to the same information set regarding the current state of the world. This common-knowledge assumption is standard in international macroeconomic models and it implies that capital flows in our model do not result from differences of opinion on future asset returns or risks.

1.3.2. A Representative Country

Consider a country populated by identical and infinitely lived individuals whose preferences are represented by Epstein-Zin (1989, 1991) recursive preferences defined over their consumption stream:

$$U(C_t, E_t(U_{t+1})) = \left[(1-\delta)C_t^{1-\gamma/\theta} + \delta\left(E_t\left(U_{t+1}^{1-\gamma}\right)\right)^{1/\theta}\right]^{\theta/1-\gamma}, \tag{1.6}$$

where $\theta \equiv \frac{1-\gamma}{1-\psi^{-1}}$, C_t is consumption at time t, $0 < \delta < 1$ is the time discount factor, $\gamma > 0$ is the relative risk aversion coefficient, and $\psi > 0$ is the elasticity of intertemporal substitution.

This utility function nests as special cases the power utility specification, in which the relative risk aversion (RRA) coefficient is the reciprocal of the elasticity of intertemporal substitution (EIS), and the log-utility specification, in which both parameters are equal to one. Therefore, these preferences have the flexibility of modeling the EIS and the RRA parameters separately. The former has first order effects on savings and consumption decisions and only secondary effects on investment decisions. In contrast, the RRA parameter is essential to portfolio allocation. Hence, this functional form disentangles savings and portfolio allocation decisions.[11]

We assume that individuals can invest in domestic and foreign assets. There are n securities available for investment at home and n securities available abroad, so that $2n$ is the total number of available securities. Therefore, the intra-temporal budget constraint can be defined as:

$$W_t = C_t + \sum_{i=1}^{n} A_{i,t+1} + \sum_{j=1}^{n} A^*_{j,t+1}, \tag{1.7}$$

where W_t is total wealth at time t, $A_{i,t+1}$ is the amount invested in domestic asset i at time t, and $A^*_{j,t+1}$ is the amount invested in foreign asset j at time t.

The wealth accumulation equation can then be defined as:

$$W_{t+1} = \sum_{i=1}^{n} R_{i,t+1} A_{i,t+1} + \sum_{j=1}^{n} R^*_{j,t+1} A^*_{j,t+1}, \tag{1.8}$$

where $R_{i,t+1}$ is the gross real return on domestic asset i from time t to time $t+1$, and $R^*_{j,t+1}$ is the gross real return on foreign asset j from time t to time $t+1$.

As can be seen from equations (1.7) and (1.8), we do not model labor income. The income available for consumption at time t is given by the returns on portfolio holdings and by the sales of these assets (short sales are allowed). This country's GDP can be interpreted as the total real return on domestic assets, independently of who owns them.

From equation (1.7), we can define portfolio shares $\alpha_t \equiv A_{t+1} / (W_t - C_t)$:

[11] The reason for this particular utility function as opposed to a more standard power utility function will become clear in Section 1.3.4.

$$\sum_i A_{i,t+1} + \sum_j A^*_{j,t+1} = W_t - C_t$$
$$\sum_i [A_{i,t+1}/(W_t - C_t)] + \sum_j [A^*_{j,t+1}/(W_t - C_t)] = 1$$
$$\sum_i \alpha_{i,t} + \sum_j \alpha^*_{j,t} = 1,$$

where $\alpha_{i,t}$ is the proportion of a country's wealth, net of consumption, invested in a domestic asset i from t to $t+1$, and $\alpha^*_{j,t}$ is the proportion of a country's available wealth invested in foreign asset j from t to $t+1$.

The real portfolio return, $R_{p,t+1}$, is thus given by:

$$R_{p,t+1} = \sum_{i=1}^{n} \alpha_{i,t} R_{i,t+1} + \sum_{j=1}^{n} \alpha^*_{j,t} R^*_{j,t+1}. \tag{1.9}$$

Finally, equations (1.7), (1.8), and (1.9) can be combined in order to obtain the intertemporal budget constraint:

$$W_{t+1} = R_{p,t+1}(W_t - C_t). \tag{1.10}$$

In summary, the problem faced by individuals in this representative country is to choose consumption (C_t) and portfolio shares (α_t) that maximize (1.6) subject to (1.10), given an initial level of wealth W_0. We thus allow countries to differ in their size, i.e., investors from different countries can start with different levels of wealth, W_0. In this setup, Epstein and Zin (1989, 1991) show that investor's optimal consumption and savings decisions must satisfy the following Euler equation:

$$E_t\left\{\left[\delta(C_{t+1}/C_t)^{-1/\psi}\right]^{\theta} R_{p,t+1}^{-(1-\theta)} R_{k,t+1}\right\} = 1, \forall k, \tag{1.11}$$

where $R_{k,t+1}$ is the gross real return on any asset, including the portfolio itself.

When investment opportunities are constant, portfolio shares are also constant, implying that $R_{p,t+1}$ is time-invariant. Thus, the optimal consumption policy, characterized by equation (1.11), implies a constant consumption-wealth ratio. It also entails a constant portfolio share in all available assets. In other words, agents behave as short-term investors and optimally choose a "myopic" portfolio allocation. To obtain dynamic portfolio choices, we relax the hypothesis of constant investment opportunities over time. In our setup, a relative risk aversion parameter greater than one is a sufficient condition for the optimal portfolio allocation to be dynamic (non-myopic) if asset returns are non-i.i.d.[12] Thus, we assume a relative risk aversion parameter greater than one.

Therefore, to model time-varying investment opportunities, we explore the empirical evidence that financial asset returns are predictable to some extent.[13] For example, Amromin and Sharpe (2005) provide empirical evidence based on survey data suggesting, for example, that expected stock returns are extrapolated from actual returns. We thus assume that asset returns follow a first-order vector autoregression (VAR).[14] This assumption captures the history-dependence of expected returns. The empirical finance literature has identified several predictive variables, besides the historical values of asset returns themselves. Nominal yield on short-term bonds, the term spread, and earnings-to-price ratio have been documented to forecast asset returns on many asset classes. Thus, we also use these predictive variables (s_t) to estimate expected returns.

Define a vector z_{t+1} containing the log real return of a benchmark asset ($r_{1,t+1}$), log excess returns of domestic and foreign assets, i.e. ($r_{i,t+1} - r_{1,t+1}$) and ($r^*_{j,t+1} - r_{1,t+1}$), and other state variables (s_{t+1}) used to predict asset returns:

$$z_{t+1} = \begin{bmatrix} r_{1,t+1} \\ x_{t+1} \\ s_{t+1} \end{bmatrix}, \text{ where } \quad x_{t+1} = \begin{bmatrix} r_{i,t+1} - r_{1,t+1} \\ \dots \\ r^*_{j,t+1} - r_{1,t+1} \\ \dots \end{bmatrix}, \qquad (1.12)$$

[12] See Campbell and Viceira (2002) for an extensive study on strategic asset allocation.

[13] See Fama and Schwert (1977), Shiller, Campbell, Schoenholtz, and Weiss (1983), Campbell (1987), Campbell and Shiller (1988), Fama and French (1988, 1989, 1992), and more recently, Watcher and Warusawitharana (2007), among many others.

[14] Several papers have used a similar specification, for example, Campbell, Chan, and Viceira (2003), Campbell, Viceira and White (2003), Barberis (2000), Normandin and St-Amour (2002, 2005), among many others.

and where $r_{1,t+1}$ is the log real return on the benchmark asset, and x_{t+1} is the vector of log excess returns, measured as excess returns over this benchmark asset.

As mentioned above, we assume that z_{t+1} follows a VAR(1) process:

$$z_{t+1} = \Phi_0 + \Phi_1 z_t + v_{t+1}$$
$$\text{where } v_{t+1} \overset{i.i.d.}{\sim} N(0, \Sigma_v) \text{ and } \Sigma_v = \begin{bmatrix} \sigma_1^2 & \sigma_{1x}^{'} & \sigma_{1s}^{'} \\ \sigma_{1x} & \Sigma_{xx} & \Sigma_{xs}^{'} \\ \sigma_{1s} & \Sigma_{xs} & \Sigma_{ss} \end{bmatrix}. \quad (1.13)$$

We allow shocks to be cross-sectionally correlated, but homoskedastic and independently distributed over time. In other words, we assume that state variables are not able to predict changes in asset risk. Therefore, only changes in expected asset returns, not changes in expected asset risks, affect portfolio choices. Even though this assumption may be unrealistic, it is not restrictive from the perspective of long-term portfolio allocation. The empirical evidence suggests that changes in risk are not persistent enough to have large effects on portfolio choices.[15]

1.3.3. The Current Account

At every period, agents decide how to allocate their wealth, net of consumption, among available financial assets. By analyzing this portfolio choice, it is possible to determine the total wealth allocated to domestic and foreign assets at each point in time. More specifically, we can determine the optimal portfolio allocation. Therefore, obtaining an expression for the current account balance is straightforward.

The current account balance of the Home country (H) can be defined as domestic savings minus investment in domestic assets: $CA_t = S_t - I_t$. Using equations (1.7) and (1.8), it is clear that domestic savings must equal domestic and foreign investments made by domestic agents. Hence, domestic savings are given by:

[15] See Campbell (1987), Harvey (1989, 1991), and Chacko and Viceira (2005).

$$S_t = \sum_i (A^H_{i,t+1} - A^H_{i,t}) + \sum_j (A^{*,H}_{j,t+1} - A^{*,H}_{j,t}). \quad (1.14)$$

Investment in domestic assets is given by the change in holdings of all domestic assets, aggregated across all countries (c) that have access to domestic assets:

$$I_t = \sum_c \sum_i (A^c_{i,t+1} - A^c_{i,t}). \quad (1.15)$$

Thus, the current account balance of the Home country is defined as (1.14)-(1.15):

$$\begin{aligned} CA_t &= \sum_j (A^{*,H}_{j,t+1} - A^{*,H}_{j,t}) - \sum_{c \neq H} \sum_i (A^c_{i,t+1} - A^c_{i,t}) \\ &= \sum_j [\alpha^{*,H}_{j,t} (W^H_t - C^H_t) - \alpha^{*,H}_{j,t-1} (W^H_{t-1} - C^H_{t-1})] \\ &\quad - \sum_{c \neq H} \sum_i [\alpha^c_{i,t} (W^c_t - C^c_t) - \alpha^c_{i,t-1} (W^c_{t-1} - C^c_{t-1})]. \end{aligned} \quad (1.16)$$

Similarly, the Home country bilateral current account with a Foreign country (F) can be defined as:

$$\begin{aligned} BCA_{HF,t} &= \sum_{j \in F} [\alpha^{*,H}_{j,t} (W^H_t - C^H_t) - \alpha^{*,H}_{j,t-1} (W^H_{t-1} - C^H_{t-1})] \\ &\quad - \sum_i [\alpha^F_{i,t} (W^F_t - C^F_t) - \alpha^F_{i,t-1} (W^F_{t-1} - C^F_{t-1})] \end{aligned} \quad (1.17)$$

Equations (1.16) and (1.17) clearly show how changes in wealth and optimal portfolio shares affect the bilateral and the total current account balances, respectively. Therefore, in order to explain the dynamics of the (bilateral) current account, we need an explicit solution for these time-varying optimal portfolio shares and for the dynamics of wealth. More specifically, in the case of the bilateral current account, we need these solutions for both Home and Foreign countries.

1.3.4. Model's Approximate Solution

Campbell, Chan, and Viceira (2003) show that there is no closed-form solution for this multivariate model of strategic asset allocation. However, they propose an approximate solution method. They show that we can reduce this model to an approximate system of linear-quadratic equations for portfolio weights and consumption as functions of the state variables. Therefore, we follow their procedure in order to obtain an approximate solution to our model.

The solution to our model is characterized by three equations: the portfolio return, the inter-temporal budget constraint of the representative country, and the Euler equation. We can rewrite equation (1.9), which characterizes the gross portfolio real return, in the following way:

$$R_{p,t+1} = \sum_{i=2}^{n} \alpha_{i,t}(R_{i,t+1} - R_{1,t+1}) + \sum_{j=1}^{n} \alpha^{*}_{j,t}(R^{*}_{j,t+1} - R_{1,t+1}) + R_{1,t+1}, \tag{1.18}$$

where the first asset, whose real return is given by $R_{1,t+1}$, is a domestic short-term instrument used as a benchmark asset. Even though asset returns are measured relative to this benchmark asset, it is not assumed to be riskless. This benchmark asset is subject to short-term inflation risk. The log return on the portfolio can then be approximated as:

$$r_{p,t+1} \approx r_{1,t+1} + \alpha_t' x_{t+1} + \frac{1}{2}\alpha_t'(\sigma_x^2 - \Sigma_{xx}\,\alpha_t), \tag{1.19}$$

where $\sigma_x^2 \equiv diag(\Sigma_{xx})$ is a vector containing the variance of excess asset returns, and α_t is a vector of portfolio shares. This approximation holds exactly in continuous time and it is highly accurate for short-time intervals.[16]

The next equation is the budget constraint, equation (1.10). Log-linearizing it around the unconditional mean of the log consumption-wealth ratio, we obtain the following expression for the wealth dynamics:

$$\Delta w_{t+1} \approx r_{p,t+1} + \left(1 - \frac{1}{\rho}\right)(c_t - w_t) + k, \tag{1.20}$$

where $\rho \equiv 1 - \exp(E[c_t - w_t])$ and $k \equiv \log(\rho) + (1-\rho)\log(1-\rho)/\rho$.

[16] This approximation to the log return on the portfolio has the effect of ruling out the possibility of bankruptcy. See Campbell and Viceira (2002), pp. 28-29.

This form of the budget constraint is exact if the elasticity of intertemporal substitution (ψ) is equal to 1, in which case $\rho = \delta$ and $c_t - w_t$ is constant.

Lastly, we apply a second-order Taylor expansion to the Euler equation (1.11) around the conditional means of $\Delta c_{t+1}, r_{p,t+1}, r_{k,t+1}$ to obtain:

$$\begin{aligned} &\theta \log \delta - \frac{\theta}{\psi} E_t \Delta c_{t+1} - (1-\theta) E_t r_{p,t+1} + E_t r_{k,t+1} \\ &\quad + \frac{1}{2} \operatorname{var}_t \left[-\frac{\theta}{\psi} \Delta c_{t+1} - (1-\theta) r_{p,t+1} + r_{k,t+1} \right] \approx 0, \ \forall k. \end{aligned} \tag{1.21}$$

This form of the Euler equation is exact if consumption and asset returns are jointly log-normally distributed, e.g. when $\psi = 1$.

In sum, the model's approximate solution can be described by these three equations, (1.19), (1.20), and (1.21). The optimal solution is accurate for an elasticity of intertemporal substitution around one, independent of the value of the relative risk aversion parameter.[17] A model with a distinction between these two parameters is essential to the empirical evidence presented in the next section. We evaluate the sensitivity of the optimal portfolio allocation to different values of the relative risk aversion parameter. In the power utility case, as we increase the relative risk aversion parameter, the model solution becomes inaccurate. However, with the Epstein-Zin utility function, we have the autonomy to do so without interfering with the accuracy of the solution. This reason underpins our focus on an Epstein-Zin utility function as opposed to the more standard power utility function.

Campbell, Chan, and Viceira (2003) show that the optimal portfolio choice is linear in the VAR state vector. It is characterized by the following optimal portfolio allocation:

$$\alpha_t = A_0 + A_1 z_t, \tag{1.22}$$

[17] This is reasonably consistent with recent estimates of the elasticity of intertemporal substitution for stockholders reported in Vissing-Jorgensen (2002) and Vissing-Jorgensen and Attanasio (2003). However, this parameter for non-stockholders is typically below unity, as are estimates based on aggregate data. See Hall (1988) and Yogo (2004).

where

$$A_0 = \left(\frac{1}{\gamma}\right)\Sigma_{xx}^{-1}\left(H_x\Phi_0 + \frac{1}{2}\sigma_x^2 + (1-\gamma)\sigma_{1x}\right) + \left(1-\frac{1}{\gamma}\right)\Sigma_{xx}^{-1}\left(\frac{-\Lambda_0}{1-\psi}\right),$$

$$A_1 = \left(\frac{1}{\gamma}\right)\Sigma_{xx}^{-1} H_x\Phi_1 + \left(1-\frac{1}{\gamma}\right)\Sigma_{xx}^{-1}\left(\frac{-\Lambda_1}{1-\psi}\right),$$

and Λ_0 and Λ_1 are constants.

They also show that the optimal consumption rule is quadratic in this VAR state vector. It is given by:

$$c_t - w_t = -\rho\psi\log\delta - \rho\chi_{p,t} + \rho(1-\psi)E_t(r_{p,t+1}) + \rho k + \rho E_t(c_{t+1} - w_{t+1}), \qquad (1.23)$$

where $\mathrm{E}_t(r_{p,t+1})$ and $\chi_{\mathrm{p,t}}$ are quadratic functions of the VAR state variables.

A numerical recursive procedure, described in Campbell, Chan, and Viceira (2003), is used to solve for the optimal consumption and portfolio shares. Using equation (1.17), we are thus able to construct a measure of the predicted current account balance based on this model of the current account with dynamic portfolio choice.

1.4. An Application to the U.S. Bilateral Current Account with Japan

In this section, we present a quantitative analysis of the framework developed in Section 1.3. More specifically, we focus on the bilateral current account between the U.S. and Japan. The model yields optimal portfolio rules that are linear in the vector of state variables. Therefore, we empirically evaluate time-varying portfolio shares, caused by changes in expected asset returns, as an explanation for the actual dynamics of the U.S. bilateral current account with Japan. We estimate our model separately for investors in the U.S. (Home) and in Japan (Foreign) from 1960 to 2005. We then construct the time series of portfolio weights for each country, i.e., $\alpha_{j,t}^{*,H}$ *and* $\alpha_{i,t}^{F}$. After aggregating foreign holdings for both countries, we present a first round of empirical evidence. We analyze whether variations in expected asset returns change agents' optimal portfolios in a direction consistent with the actual bilateral current account movements. Next, we combine these optimal portfolio weights, according to equation (1.17), to obtain our predicted measure of the bilateral current account. We take into consideration differences in the countries' sizes. We then evaluate whether our predicted measure can explain the dynamics of the actual bilateral current account data. Finally, as a robustness exercise, we construct a hybrid version of equation (1.17): we use the optimal portfolio shares combined with actual data on wealth, savings, and consumption. We thus obtain another measure of the predicted current account. We re-estimate the relation between the predicted and the actual bilateral current accounts. In summary, we provide strong empirical evidence that changes in investment opportunities are an important mechanism behind the dynamics of the bilateral current account between the U.S. and Japan.

1.4.1. Why the Bilateral Current Account between the U.S. and Japan?

A large number of countries have significant exposure to U.S. assets. An empirical analysis of the mechanism highlighted in this chapter for the total U.S. current account would thus require an estimation of the model for all these different countries. Moreover, many assets would need to be considered in our quantitative analysis. By focusing on two countries and their bilateral current account, we only need to analyze the behavior of investors from these two countries. Hence, we empirically study the U.S. and Japan and their bilateral current account. In this case, only U.S. holdings of Japanese assets and Japanese holdings of U.S. assets matter.

There are many reasons for choosing the U.S. and Japan in our empirical exercise. The first one is data availability. Bilateral current account data between the U.S. and Japan, Canada, or the U.K. is available since 1960 on a quarterly basis. The data for other countries starts in the late 1970s, and therefore, has an insufficient time span for our purposes. Furthermore, in our empirical exercise, we use asset returns on stock markets, government bonds, and private firm profits (return on equity). This last variable is not available for the U.K. and Canada, although we could have excluded it from our analysis.

Second, Japan was economically relevant for international capital flows from 1960 to 2006. Both the U.S. and Japan are representatives of the so-called "global imbalances."[18] Figure 1.3 plots the current account balance as a percentage of world GDP for countries with the largest current account deficits or surpluses in the world. The current account deficit in the U.S. was soaring and reached 7% of its own GDP in 2005 – almost 2% of world GDP. Japan has long been the country with the largest current account surplus. Furthermore, the U.S. and Japanese current account balances were mirror images of each other until the late 90s, suggesting that they could have had a large counterpart in each other's balances. Moreover, the importance of the U.S. and Japan was even larger when their external wealth is considered. As pointed out by Lane and Milesi-Ferretti (2005), Japan was by far the largest net creditor in international investment positions and the U.S. the largest net debtor in international investment positions.

Third, the total U.S. current account and the U.S.-Japan bilateral current account have similar dynamics. This is highlighted in Figure 1.4, which plots these series as a percentage of U.S. GDP. Movements in the total U.S. current account clearly resemble movements in the U.S. bilateral current account with Japan. Thus, determinants of the bilateral current account could indeed be relevant to the understanding of factors affecting the total U.S. current account.

Lastly, it is well known that countries' portfolios are subject to home bias – that is, portfolio composition tends to be biased toward domestic assets. For example, institutional investors in the U.S. held only 11% of their portfolios in foreign equity and bonds in 2003. A similar pattern is observed in Japan, where institutional investors held only 16% of their portfolios abroad in 2003.[19] Although domestic residents hold the majority of their assets in their own countries, a large number of foreign investors, if allowed, tend to hold these foreign assets as well. Survey data published by the U.S. Department of the Treasury shows that residents of Japan were the largest foreign portfolio investors in U.S. securities

[18] See Eichengreen (2006) and Bernanke (2005), among others.
[19] See IMF (2005).

by a wide margin in 2005.[20] They held US$1.1 trillion (or 16% of the total holdings of U.S. securities by foreign investors), whereas residents of the U.K., the second major investing country, had holdings of US$0.56 trillion, only half the holdings of Japanese investors. Previous surveys show that this pattern is stable over time. For example, in 1994, when the first survey was conducted, Japan held 18% of the total foreign holdings of U.S. securities. At the same time, Japan has consistently been one of the main destinations of foreign purchases of securities by U.S. residents. U.S. investors held around 10% of total market capitalization of equity markets in Japan in 2005.[21] Moreover, in 1994 U.S. residents invested 15% of their foreign portfolio holdings in Japan – the country that attracted the largest share of U.S. portfolio investments abroad. A more recent survey shows that Japan is still a large destination for U.S. funds, attracting 12% of U.S. holdings of foreign securities in 2005. Although no data is available on the holdings of other foreign investors in Japan (or even other holdings of Japanese investors), the evidence presented here suggests that the U.S. has been a major participant in this market.

By focusing on the U.S. and Japan and their bilateral current account, given the evidence presented above, we are analyzing the two largest holders of U.S. securities: U.S. investors themselves and Japanese investors, the largest foreign holders. We also examine large holders of Japanese securities: Japanese investors themselves and U.S. investors. In sum, U.S. and Japanese investors together are possibly the largest holders of U.S. and Japanese securities. Moreover, the empirical evidence suggests that U.S. and Japanese investors hold the majority of their portfolios in the U.S. and Japan themselves. Therefore, this empirical evidence, combined with the data presented in Figure 1.4, suggests that U.S. and Japanese assets are the most relevant assets affecting the bilateral current account between the U.S. and Japan, and possibly the total U.S. current account. We thus assume in our empirical exercise that U.S. and Japanese investors can only hold assets from either the U.S. or Japan. Because of the limited time span of our sample, we do not consider other assets; four decades of data would not be enough for an estimation of our VAR system. On

[20] See "Report on U.S. Portfolio Holdings of Foreign Securities," U.S. Department of the Treasury.
[21] See "Report on Foreign Portfolio Holdings of U.S. Securities," U.S. Department of the Treasury.

the other hand, we assume that investors from other countries can hold assets anywhere, including the U.S. and Japan. Thus, if a Japanese investor decides to sell some of her holdings, a U.S. investor does not need to buy them. In other words, we are considering a partial-equilibrium analysis. We are fully aware of the limitations of this last assumption. Including assets from other countries in the analysis could significantly change the calculated optimal portfolio allocation among the assets actually considered here. Therefore, we tried to include assets from a "third" country in our empirical analysis. According to the survey evidence reported by the U.S. Department of the Treasury, the U.K. and the Euro-area as a whole are the relevant candidates. Thus, we included in our exercise assets from either the U.K. or Germany, the latter as a representative of Euro-area assets. The results are qualitatively similar to the ones presented in this chapter and, therefore, not reported. Moreover, if the inclusion of other relatively large investors does not qualitatively change our empirical analysis, the inclusion of other smaller investors is similarly unlikely to affect our results.

1.4.2. Data Description

We use quarterly data extending from the second quarter of 1960 to the third quarter of 2005. As already discussed, we consider financial assets from the U.S. and Japan. The data was obtained from Global Financial Database, the financial statements from the Ministry of Finance in Japan, and the U.S. Flow of Funds Accounts calculated by the U.S. Federal Reserve. The following asset classes are considered in the analysis: stocks, short-term government bonds, long-term government bonds, and private firms' profits (ROE). U.S. stock returns are calculated as returns on the S&P 500 index, and Japanese stock returns are given by the returns on the Tokyo Stock Exchange Topix All Shares Index. The U.S. and Japanese returns on short-term interest rates are the quarterly returns implied by the Fed Funds rate and the Japanese Discount rate, respectively. The return on long-term government bonds is calculated as the return on 10-year constant maturity U.S. government bonds and as the return on 7-year Japanese government bonds. Government bonds of longer maturity were not available for Japan. ROE is constructed as the total operational profits divided by capital (net worth).

Our model is written in real terms. Therefore, our benchmark asset is the *ex-post* real return on short-term government bonds. More specifically, the benchmark asset is the real return on a U.S. short-term bond for a U.S. investor and a Japanese short-term bond for a Japanese investor. Real returns are constructed as the difference between the log return on an asset and the log of CPI-inflation. In our theoretical framework, investors analyze excess returns over the benchmark asset. Thus, all excess returns are calculated as the log difference between the real return on a specific asset and the real return on the appropriate benchmark asset, both denominated in the same currency. We use the log change of the real exchange rate to convert returns to a common currency. We define the log real exchange rate as the sum of log nominal exchange rate and log domestic CPI less the log foreign CPI. Lastly, we use variables known to predict asset returns, such as nominal short-term yield (3-month T-Bills), price-to-earnings ratio, and the nominal term spread in government bonds.

Table 1.2 reports the summary statistics for real asset returns denominated in local currency. Data is in annualized percentage units. It shows the sample average and the standard deviations of the quarterly asset returns used in the analysis. The table also reports these sample statistics for the CPI-inflation rates and the real exchange rate. Among the U.S. assets, the short-term government bond is the safest asset, with an average real return of 1.8% p.a., and equities are the riskiest asset, with larger real returns, 7.1% p.a. on average. A similar pattern is observed in Japan. Stocks are also the riskiest asset class and short-term government bonds, the safest, with average real returns of 7.6% p.a. and 0.4% p.a., respectively. Average inflation rates are smaller in Japan than in the U.S., but more volatile. Lastly, the real exchange rate shows, on average, an appreciation of the Japanese yen against the U.S. dollar in our sample from 1960 to 2005.

We have tested all series of asset returns for unit roots using Augmented Dickey-Fuller tests. These tests strongly reject unit roots in all data series considered, except for the returns on U.S. long-term government bonds. However, we recognize the low power of these tests and the evidence in favor of mean-reversion in the long run, and assume U.S. long-term bonds to be stationary.[22] Our VAR estimations also include the CPI-inflation rates, the nominal exchange rate, or the real exchange rate, depending on the specification considered. Both CPI-inflation rates are stationary according to Augmented Dickey-Fuller tests. These tests on the nominal exchange rate and the real exchange rate could not reject the existence of a unit root. However, the empirical evidence on the stationarity of exchange rates is highly controversial.[23] Therefore, in order to show the robustness of our results, we present them considering exchange rates in levels or in differences, or no exchange rate at all.

Besides asset returns, our empirical analysis also uses data on the bilateral current account between the U.S. and Japan, total wealth, national savings, national consumption, and GNP. The bilateral current account data is from the U.S. Bureau of Economic Analysis. We follow the methodology described in Kraay, Loayza, Serven and Ventura (2005) to construct measures of total wealth. National savings, national consumption, and GNP are from IMF's *International Financial Statistics.*

1.4.3. VAR Estimation

Our empirical results depend on the estimation of the system of equations (1.13). We thus report the estimations based on five different specifications of this VAR system.[24] Through the rest of the chapter, we report results for all these specifications. We show that the expected asset returns obtained from these different estimations have similar dynamics. We will argue that our empirical analysis is robust to these different estimations. In other words, the portfolio allocations implied by these different VAR systems are similar in their composition, and thus lead to similar predictions for the bilateral current account between the U.S. and Japan.

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[22] Excluding this variable from the analysis does not qualitatively change the results.
[23] See Rogoff (1996), Imbs, Mumtaz, Ravn, and Rey (2005), and Chen and Engel (2004).
[24] We have analyzed more than these five reported specifications, but choose not to report them here. The results are qualitatively similar to those shown in this chapter.

In our theoretical model, we have assumed that investors from both countries have access to the same information set. They use the same model and know the current state of the world. Therefore, to characterize the dynamics of asset returns, we estimate a single VAR that treats Home and Foreign symmetrically.[25] The single framework described in this section summarizes concisely the information set available to both investors, although it is not in the format of the system of equations (1.13). In Appendix B, we show how to obtain the parameters of the system of equations (1.13) for each investor from these estimated VARs.

When estimating these VARs, we have imposed the following restriction: the unconditional means of the variables implied by the estimated coefficients should be equal to their full-sample arithmetic counterparts. Moreover, the estimated systems might be subject to finite sample bias. However, bias corrections are complex in a multivariate system. Thus, no corrections were attempted here. Instead, the estimated coefficients are taken as given and known by investors.

As already mentioned, we estimate five different specifications of this system of equations. The following variables are considered: real asset returns in local currency, predictive variables (nominal yield on T-Bills, price-earnings ratio, and the term spread), the nominal and real exchange rates, and the inflation rates for both countries. The first estimated system includes only real asset returns and predictive variables for both the U.S. and Japan. This is our basic VAR.[26] The other estimated VARs add control variables to this basic system. Our second specification includes the real exchange rate in levels. The third one adds the real exchange rate in differences instead of levels to the basic system. Our fourth specification includes the nominal exchange rate and the CPI-inflation rates.

[25] One of the VAR specifications considered here cannot be estimated by this unified framework; other control variables are needed. Thus, in this particular case, separate VARs are estimated for U.S. and Japanese investors.

[26] This system cannot be estimated by our single unified framework – other control variables are necessary. One VAR was estimated for U.S. investors with all variables denominated in U.S. dollars, and another VAR was estimated for Japanese investors with all variables denominated in Japanese yen.

Lastly, our fifth specification expands the basic VAR system by including the nominal exchange rate in differences and the CPI-inflation rates.

We report only the estimation of the VAR system based on our second specification in order to save space.[27] The results are presented in Table 1.3. The estimated coefficients are comparable to the ones identified in the finance literature.[28] The coefficients in all equations are jointly significant at the standard significance level, as can be seen from the low p-values of the F-statistics. The U.S. short-term return is significantly explained by the short-term nominal yield and the term spread with a positive coefficient, however, its own lagged value is not significant. The R-squared is similar to what has been found in other studies. The same variables significantly explain U.S. long-term government bond returns. U.S. stock returns are negatively related to price-earnings ratio. No other variable is significant in this equation. Stock returns have proven rather difficult to predict, and, as expected, this equation has the lowest R-squared. U.S. ROE, U.S. short-term bond yield, and the U.S. price-earnings ratio are significantly explained by their own lagged values, illustrating that a univariate AR(1) process could describe them reasonably well. The results for the Japanese real returns are less typical than the ones for U.S. assets. Most of the predictive variables do not significantly explain asset returns, which in turn can be explained mostly by their own lagged values. However, empirical evidence on Japanese returns is scarce. Therefore, we do not lengthen our discussion here.

As already highlighted, the model uses the information on expected asset returns. Table 1.4 reports summary statistics of expected real asset returns implied by the estimated VARs. They are reported in local currency. Common across all specifications, short-term government bonds are the safest asset. In both U.S. and Japanese markets, stocks are the riskiest asset. Therefore, the basic mean-variance pattern of actual returns is reflected in these expected returns. Furthermore, the standard deviation of expected real returns is stable across different specifications. Although they consistently increase when the

[27] The other estimated VARs are qualitatively similar and the results are available upon request.

[28] See Fama and Schwert (1977), Shiller, Campbell, Schoenholtz, and Weiss (1983), Campbell and Shiller (1988), Fama and French (1988, 1989, 1992), Hodrick (1992), Lettau and Ludvigson (2001), Ang and Bekaert (2006), Campbell and Yogo (2006), among many others.

nominal exchange rate and the CPI-inflation rates are included in the VAR (instead of the real exchange rate), they do so by less than 1% p.a. Thus, these measures of expected returns seem robust to different system estimations. The real expected returns are on average equal to actual returns, given the in-sample predictions considered here. Nevertheless, they are much less volatile than actual returns (summary statistics reported in Table 1.2). In other words, these real expected returns are more persistent than the actual real returns.

Although this data in local currency is informative, investors actually consider real returns in their own currency. We thus calculate them in a common currency, the U.S. dollar, to better understand the implications of these expected real returns to U.S. and Japanese investors. The results were reported in Figure 1.1, Section 1.2. This figure shows that the expected real return differential between U.S. and Japanese long-term government bonds are consistent with the dynamics of the U.S. bilateral current account with Japan. This preliminary evidence thus supports the mechanism proposed in this chapter: changes in expected real returns can be an important factor behind the dynamics of the current account.

1.4.4. Optimal Portfolio Choice and the Bilateral Current Account

Using the estimated VAR coefficients, the model is calibrated using different relative risk aversion parameters (γ). As already mentioned, the model's calibration is accurate for elasticities of intertemporal substitution around 1. Therefore, results are reported for different risk aversion coefficients, but we assume that $\psi = 0.99$ and $\delta = 0.92$ in annual terms.[29] We first calculate each country's optimal allocation to foreign assets. For a U.S. investor, this optimal allocation is the sum of all holdings in Japanese assets. Similarly, for a Japanese investor, it is the share of Japanese post-consumption wealth invested in U.S. assets. Formally, we obtain the time series of $\alpha_t^{*,H}$ and α_t^F:

[29] The results are robust to different parameter values of the time discount factor and the elasticity of intertemporal substitution, as long as these values are close enough to 1.

$$\alpha_t^{*,H} = \alpha_{stb,t}^{*,H} + \alpha_{ltb,t}^{*,H} + \alpha_{stocks,t}^{*,H} + \alpha_{ROE,t}^{*,H}, \tag{1.24}$$

$$\alpha_t^{F} = \alpha_{stb,t}^{F} + \alpha_{ltb,t}^{F} + \alpha_{stocks,t}^{F} + \alpha_{ROE,t}^{F}. \tag{1.25}$$

Figure 1.5 plots the time series of $\alpha_t^{*,H}$, $(-\alpha_t^F)$, and the U.S. bilateral current account with Japan. The negative of the optimal Japanese portfolio shares allocated to U.S. assets is the relevant variable to the U.S. bilateral current account according to equation (1.17). These optimal portfolio shares are calculated based on the VAR specification with real exchange rates. We plot the series for a relative risk aversion of 10 and 100.[30]

Even though this figure addresses only part of the story, it sheds some light on agents' behavior. The main mechanism behind the time-varying portfolio shares in our model is the expected changes in asset returns across the different assets. If we assume a permanent improvement in the U.S. investment opportunity set and everything else remains unchanged, then, according to our model, an investor should increase her portfolio share on U.S. assets. If this investor is Japanese, she would increase her holdings of U.S. assets. If a U.S. investor is considered, her holdings of Japanese assets should fall. This implies, *ceteris paribus*, that the U.S. bilateral current account with Japan should worsen. The reported results are robust to the exclusion of individual assets and to different parameter values. Although the dynamics of optimal portfolio shares does not change considerably with the relative risk aversion parameter, the average values of $\alpha_t^{*,H}$ and α_t^F are highly sensitive to this parameter. When a smaller value of the relative risk aversion parameter is used, individual portfolio shares are extremely high – because of leveraged portfolios. Reasonable values for these shares are obtained only when larger parameter values are considered. In our model with exogenous asset returns and endogenous portfolios, agents take advantage of any small excess risk-adjusted returns. High levels of relative risk aversion are thus needed to discourage excessive portfolio leverage. This

[30] The empirical evidence on the equity premium puzzle suggests values between 0 and 60 (see Ait-Sahalia and Lo (2000)). See also Mehra and Prescott (1985), Epstein and Zin (1991), Cochrane and Hansen (1992), Jorion and Giovannini (1993), and Normandin and St-Amour (1998).

parameter might be capturing the model's sensitivity to the well-known equity premium puzzle, extensively documented in the international finance literature.

Given the mechanism highlighted in this chapter and the estimated expected asset returns, the pattern of increased weight on U.S. assets reported in Figure 1.5 is striking. The correlation coefficient between these two measures is around 0.75, varying little with the relative risk aversion parameter. The fit of the graphs is remarkable, especially if one considers that only information on asset returns was used. Therefore, the main argument in this chapter relies on these figures: optimal portfolio reallocations, caused by improvements in the U.S. investment opportunity set relative to its Japanese counterpart, are partly responsible for the shift of the countries' portfolios toward U.S. assets in recent decades.

Formally, a regression analysis confirms the evidence from the figures. The results are reported in Tables 1.5A and 1.5B for different values of the relative risk aversion parameter, for our five different VAR specifications, and for U.S. and Japanese investors, respectively. Three different regressions are reported: a basic specification that regresses the bilateral current account on contemporaneous and lagged optimal portfolio shares, the basic specification with a time trend, and the basic specification with a lagged dependent variable. We have no priors with respect to the magnitude of these coefficients. However, our theoretical framework, summarized in equation (1.17), allows us to sign them. Increases in the optimal portfolio shares abroad should be associated with positive changes in the U.S. bilateral current account with Japan, if a U.S. investor is considered. On the other hand, if a Japanese investor is considered, such increases should be related to negative changes in the bilateral current account. The results confirm these priors. They are also consistent across the different regression specifications, different measures of expected returns, and different risk aversion parameters. It should be noted that the regression coefficients increase in magnitude as the relative risk aversion parameter increases. This simply reflects the smaller portfolio shares, as observed in Figure 1.5: the larger the risk aversion parameter, the smaller the shares. Lagged values of optimal portfolio shares tend not to be significant, although correctly signed. The R-squared obtained from the basic regression specification is between 0.39 and 0.58, though it is not reported. If a time trend or a lagged dependent variable is added, the R-squared increases to values around 0.63 and 0.92, respectively. Thus, in this section, we show that variations in investment opportunities change agents' optimal portfolios in a direction consistent with actual bilateral current account movements.[31]

1.4.5. The Bilateral Current Account: Predicted vs. Actual Values

Going one step further, we use the model's calibrated wealth and consumption to fit equation (1.17). Our predicted measure of the bilateral current account is scaled by U.S. wealth, the stock variable of our model. We thus need to make an assumption about relative country sizes in order to aggregate U.S. and Japanese investors. We assume U.S. wealth is four times Japanese wealth when denominated in the same currency. This assumption is consistent with actual data on total wealth for these countries.

Table 1.6 shows our econometric analysis based on the predicted bilateral current account. We report the regression results based on a quarterly sample. Once more, four different regression specifications are analyzed. First, our basic specification considers a regression of the actual bilateral current account on our predicted measure. The second specification adds a time trend to the basic specification. Given the highly persistent dynamics of the current account, our third specification adds a lag of both dependent and independent variables. Finally, the fourth specification considers these variables in differences. As shown in previous tables, we report the results for our five different measures of expected returns. Furthermore, we have shown that our measures of optimal portfolio allocation are similar across different levels of risk aversion. The results in this section are also robust to different parameter values. Therefore, we report only those for a reasonable value of the relative risk aversion coefficient – we use a parameter value of 10. The results on an annual basis are reported in Appendix C.

[31] In Appendix C, we report the results when annual data is analyzed – the results are robust to this change.

The empirical evidence from this econometric analysis reinforces the intuition behind our previous results. The estimated regression coefficients are significant and correctly signed in all specifications. They are always significant at the 1% level in our basic specifications, whether a trend is added or not. In other words, our predicted values can explain more than just a trend in the actual data. In our third specification, the lagged independent variable is also significant and negative, as equation (1.17) would suggest. That is to say, an increase in the predicted bilateral current account is associated with a contemporaneous significant increase in the bilateral current account, and with a decrease in next period's balance. The regressions in differences shed some light on the relevance of changes in expected returns as a mechanism to explain short-term movements in the bilateral current account. Therefore, based on the evidence of the third and fourth specifications, positive changes in our predicted values are associated with positive changes in the actual data.

Although the regression coefficients are always significant and correctly signed in Table 1.6, they also reflect problems in our model. Our theory suggests that the coefficients of our basic specification should be equal to one. Even though these coefficients increase with larger values of the risk aversion parameter, they are statistically different from one for any value of the relative risk aversion parameter considered. The first source of this problem is attenuation bias. If we predict expected returns that are more volatile than actual non-observable expected returns, then our regression coefficients are downward biased. Although potentially relevant, it is not the main reason behind the low estimated coefficients. Our assumptions of no financial constraints on investors or market-wide financial frictions are, however, relevant in our theoretical model. These assumptions imply larger and more volatile capital flows than actual ones, thus smaller regression coefficients. In the next section, we discuss these modeling issues. Nevertheless, our model still effectively captures the dynamics of the bilateral current account. Empirically, our model is able to explain the short-run movements and long-run trends of the bilateral current account between the U.S. and Japan. Therefore, our results provide strong evidence that changes in investment opportunities can explain current account movements.

1.4.6. Modeling Issues

We use a portfolio model of the current account with uncertainty to explain the dynamics of the current account. We do not impose financial constraints on investors nor market-wide financial frictions. Thus, we are bound to obtain larger and more volatile capital flows than actual ones. This problem is typical of models with free capital flows. Similar implications have been reported in portfolio allocation models by Campbell, Chan, and Viceira (2003), Evans and Hnatkovska (2005), Mendoza, Quadrini, and Rios-Rull (2007), and Rapach and Wohar (2007). Therefore, the differences between the actual and our fitted bilateral current account balances are caused mostly by large portfolio shares allocated abroad and their impact on the dynamics of wealth.

As already mentioned, we allow portfolios to be leveraged. We do not impose either borrowing or short-selling constraints. In our model with exogenous asset returns and endogenous portfolios, agents thus take advantage of any small excess risk-adjusted returns. When small values of the risk aversion parameter are used, portfolio shares are exceedingly high. Reasonable values of portfolio shares are obtained only when investors become extremely risk averse. Campbell, Chan, and Viceira (2003) acknowledge the problem. In an application to U.S. bonds and equities only, their model also predicts very large portfolio shares. Similar issues have been reported by Campbell et al. (2001), Sangvinatsos and Watcher (2005), Brandt and Santa-Clara (2006), and Rapach and Wohar (2007). Correcting this first problem is particularly difficult. The approximate solution used here is no longer valid. Discrete-state numerical algorithms become slow and unreliable in the presence of many assets and state variables.[32] Therefore, it remains extremely hard to solve realistically complex cases of the Merton model.

Nevertheless, similar models have been widely used to analyze issues of optimal portfolio allocation. For example, Campbell and Viceira (1999), Campbell et al. (2001), Normandin and St-Amour (2002, 2005), Watcher (2002), and Sangvinatsos and Watcher (2005) highlight the models' success in explaining optimal portfolio choice in different

[32] See Balduzzi and Lynch (1999) and Lynch (2001).

contexts. However, they also acknowledge that these models are not well-suited to capture the dynamics of agents' wealth. Normandin and St-Amour (2002, 2005) test whether portfolio models, similar to ours, are able to replicate the dynamics of consumption-wealth ratios and optimal portfolio choices between equities and bonds in the U.S. and in Canada. They obtain portfolio allocations consistent with actual data, but recognize the difficulty in replicating the empirical process of consumption shares.

According to equation (1.10), the total portfolio return is the main channel through which portfolio shares affect the dynamics of wealth. These portfolio returns can be high when portfolio shares are large. Therefore, wealth grows too rapidly. Transaction costs proportional to wealth could minimize the problem. However, they would not solve this issue, given the size of quarterly portfolio returns. Developing a model with financial constraints, such as borrowing and short-selling constraints, could potentially minimize the problem of large predicted portfolio shares and, therefore, obtain a better fit for wealth dynamics.

These models of dynamic portfolio allocation, including ours, predict reasonable dynamics for consumption shares: an investor wants more wealth in states when the marginal utility is higher. However, they predict low consumption-wealth ratios and relatively low consumption volatility. For example, consumption-wealth ratios implied by these models are around 2% p.a., whereas the actual data for the U.S. suggests values around 10% p.a., according to Normandin and St-Amour (2005). Furthermore, the implications of a model with financial constraints for the optimal consumption path are ambiguous. Although the average portfolio return falls, potentially causing an increase in average consumption, the standard deviation of the consumption-wealth ratio tends to fall in comparison to the unconstrained portfolio allocation, assuming binding constraints.[33] Thus, a portfolio allocation model with financial constraints is not a *panacea*. Given our focus on changes in the optimal portfolio allocation as an explanation for changes in the

[33] See for example Campbell et al. (2001) for an analysis of a two-asset world.

current account, we believe that our model is still appropriate. It effectively captures the dynamics of optimal portfolio allocation caused by changes in investment opportunities.

1.4.7. Predicted Portfolio Allocation: Further Analysis

The empirical evidence reported in Section 1.4.5 suggests that our model captures changes in optimal portfolio allocation consistent with movements in the bilateral current account, although it does not succeed at fitting wealth dynamics. Therefore, in order to further test whether the mechanism in our model is empirically relevant, we construct a hybrid version of equation (1.17). Depending on data availability, we combine the predicted portfolio shares with actual data on total post-consumption wealth or domestic savings. We then compare these new measures of the bilateral current account with the actual data.

Wealth data is only available on an annual basis. On the other hand, savings and consumption data are available on a quarterly basis. Thus, we need to adapt our theoretical framework to use quarterly data. We can rewrite equation (1.17) in the following way:

$$\frac{BCA_{HF,t}}{Y_t^H} = [\Delta\alpha_t^{*,H}(\frac{W_t^H - C_t^H}{Y_t^H}) + \alpha_{t-1}^{*,H}\frac{\Delta(W_{t-1}^H - C_{t-1}^H)}{Y_t^H}] - [\Delta\alpha_t^F(\frac{W_t^F - C_t^F}{Y_t^H}) + \alpha_{t-1}^F\frac{\Delta(W_{t-1}^F - C_{t-1}^F)}{Y_t^H}].$$

If we assume that W_t / Y_t and W_t^F / Y_t^F are constant ($K+1$ and K^F+1, respectively), we can write this last equation as a function of the savings rate and GNP:

$$\frac{BCA_{HF,t}}{Y_t^H} = \alpha_t^{*,H}\frac{S_t^H}{Y_t^H} - \alpha_t^F\frac{S_t^F}{Y_t^H} + \Delta\alpha_t^{*,H}K - \Delta\alpha_t^F K^F\frac{Y_t^F}{Y_t^H}. \qquad (1.26)$$

Table 1.7 reports the regressions of the actual bilateral current account on these predicted values. These regressions use our quarterly sample based on equation (1.26). We have assumed K and K^F equal to their sample averages, given the data availability on wealth. The top panel shows the regressions for a relative risk aversion parameter of 10. As discussed in the previous section, more risk averse investors hold smaller portfolio shares. Furthermore, the evidence presented in Section 1.4.4 shows that the dynamics of portfolio holdings are independent of the level of risk aversion. Thus, in the bottom panel of Table

1.7, we report these same regressions for an extreme value of the relative risk aversion parameter, 2000 – the largest value used in the literature on optimal portfolio allocation. The results are robust to the level of risk aversion: positive changes in the predicted values are strongly associated with improvements in the current account. Moreover, the estimated coefficients are significantly larger in the bottom panel of the table. It suggests that if our model could endogenously generate smaller portfolio shares for reasonable risk aversion parameters, we would be able to better explain the level of the current account.

Lastly, Figure 1.6 shows the actual and the predicted bilateral current account based on annual regressions.[34] Our estimated model for the bilateral current account between the U.S. and Japan can effectively explain the movements of the actual bilateral current account for the majority of our sample, although it is not able to fully capture the stock market bubble in the mid-80s. Thus, the quantitative analysis presented here in Section 1.4 provides strong support for the mechanism highlighted in this chapter. Variations in investment opportunities change agents' optimal portfolios in a direction consistent with actual bilateral current account movements. Furthermore, changes in the predicted bilateral current account are associated with positive changes in the actual bilateral current account.

1.5. Conclusion

The current account is essentially an issue of portfolio allocation. In this chapter, we focus on this asset allocation aspect by analyzing the current account as a portfolio choice problem with uncertainty. We explore the recent empirical evidence on the dynamics of countries' portfolios. More specifically, we evaluate the implications of optimal time-varying portfolio shares on the dynamics of the current account. We highlight the importance of innovations in investment opportunities, captured by changes in expected asset returns, as the main mechanism behind variations in countries' portfolios. Thus, the main contribution of the chapter is to provide a theoretical framework and, most significantly, to empirically test this mechanism on the current account dynamics.

[34] These regressions are reported in Appendix C.

We propose a partial-equilibrium portfolio model of the current account to empirically analyze our main hypothesis. We extend Merton's (1971) model of portfolio allocation to obtain a structural model of the current account with dynamic portfolio choice. We assume non-i.i.d. asset returns and exploit their predictability. We also depart from the assumption of log utility and model agents with Epstein-Zin utility functions. Both assumptions are important in obtaining optimal time-varying portfolio shares for investors with long-term investment horizons. More specifically, we analyze optimal time-varying portfolio shares caused by changes in investment opportunities. These innovations in the investment opportunity set are captured by the dynamics of expected asset returns. Our model allows us to obtain clear testable predictions for the current account. Therefore, our approach highlights changes in expected asset returns as an important factor to explain international capital flows.

In our empirical analysis, due mostly to data availability, we focus on two countries, namely the U.S. and Japan, and analyze the model implications for their bilateral current account. First, we show that changes in expected asset returns change agents' optimal portfolios in a direction consistent with the actual bilateral current account movements. Second, we compare the time series of the predicted bilateral current account with its observed counterpart. Econometric tests provide robust evidence of a positive relation between these two series, although the model does not fully capture the average level of the bilateral current account. More specifically, we find that changes in the predicted bilateral current account are significantly associated with improvements in the actual data. Furthermore, we provide robust empirical evidence that predicted portfolio shares, if combined with actual data on savings and consumption instead of the model's predictions, are able to explain the dynamics of the bilateral current account. Therefore, our results strongly suggest that changes in expected asset returns are an important factor behind movements in the bilateral current account between the U.S. and Japan. In order to improve the empirical results obtained, we need to further develop our theoretical framework. Extensions to the model should be related to financial constraints, such as short-sale constraints or limited ability to invest abroad in order to generate home bias in countries portfolios.

Although we do not aim to obtain direct policy implications, our results can also contribute to the current debate on global imbalances. Many competing explanations have been developed. One of them relies on the argument of better investment opportunities in the U.S. compared to other G7 countries, as in Cooper (2004), Backus and Lambert (2005), Clarida (2005), and Dooley, Folkerts-Landau, and Garber (2005). Our model can be understood as a formalization of this hypothesis. Given the similarities between the dynamics of the U.S. bilateral current account with Japan and the total U.S. current account, the empirical evidence in this chapter is a first step toward showing the relevance of this explanation for the current account balance. We address only a subset of factors relevant to the total U.S. current account. We would still need to extend our empirical analysis by including asset returns from other G7 countries and emerging economies in order to fully analyze the mechanism highlighted in this chapter for the U.S. current account. Nonetheless, our results indicate that better investment opportunities in the U.S. can indeed be an important explanation for the U.S. current account balance.

1.6. Appendices

1.6.1. Appendix A: Preliminary Empirical Evidence

In this chapter, we empirically analyze the relevance of time-varying investment opportunities, captured by changes in expected returns, as an explanation for movements in the current account. The following reduced form specification has been assumed as a starting point: the bilateral current account depends linearly on domestic and foreign expected returns (both in levels and in differences) and on domestic and foreign savings. Equation (1.A1) summarizes this model:

$$\begin{aligned} BCA_t = \beta_0 + \beta_1(E_t R_{t+1}) + \beta_2(E_t R^*_{t+1}) + \beta_3(E_t R_{t+1} - E_{t-1} R_t) + \beta_4(E_t R^*_{t+1} - E_{t-1} R^*_t) \\ + \beta_5 S^*_t + \beta_6 S_t \end{aligned} \quad (1.A1)$$

In Figure 1.2 in the main text, we also plotted the fitted results from an adaptation of Kraay and Ventura's (2000) model. They use Merton's (1971) model to develop their predictions for the current account. In their model, asset risk and return are constant over time and agents have log-utilities, implying constant portfolio shares. Therefore, the current account response to a temporary income shock depends on the (optimal) portfolio allocation. In order to maintain its portfolio unchanged, the marginal unit of savings should be invested as the average unit. The argument can be simplified as follows: define the current account as in (1.A2):[35]

$$CA_t = S_t - I_t \tag{1.A2}$$

Investment is thus:

$$\begin{aligned} I_t &= K_t - K_{t-1} \\ &= \frac{K_t}{(W_t\text{-}C_t)}(W_t\text{-}C_t)\text{-}\frac{K_{t\text{-}1}}{(W_{t\text{-}1}\text{-}C_{t\text{-}1})}(W_{t\text{-}1}\text{-}C_{t\text{-}1}) \\ &= \alpha_t(W_t\text{-}C_t)\text{-}\alpha_{t\text{-}1}(W_{t\text{-}1}\text{-}C_{t\text{-}1}). \end{aligned}$$

But $\forall i : \alpha_{\mathrm{t}} = \alpha_{\mathrm{t\text{-}i}} = \alpha$:

$$\begin{aligned} I_{\mathrm{t}} &= \alpha\Delta(W_t\text{-}C_t) \\ &= \alpha S_t. \end{aligned}$$

Substituting this expression for investment in (1.A2), we obtain the following:

$$CA_t = S_t - \alpha S_t = \alpha^* S_t = (NFA/W)S_t, \tag{1.A3}$$

where α is the portfolio share allocated to domestic assets, α^* is the portfolio share allocated to foreign assets, and *NFA* is the home country's net foreign assets, i.e., $\alpha^* W$.

The analysis is extended to obtain predictions for the bilateral current account:

[35] The authors assume that foreigners cannot hold domestic capital, and therefore, they focus on net capital flows instead of gross flows.

$$CA_t = \alpha^* S_t$$
$$= (\sum_i \alpha_i^*) S_t,$$

where i represents foreign countries. Therefore, the bilateral current account between the Home country (H) and the Foreign country (F) can be expressed in the following way:

$$BCA_{t,HF} = \alpha_F^{*,H} S_t = \beta \alpha^{*,H} S_t, \tag{1.A4}$$

where $\beta \equiv (\alpha_F^{*,H} / \sum_i \alpha_i^{*,H})$.

Under the assumption of constant portfolio shares, the net foreign asset position between the U.S. and any other country is proportional to the net foreign asset position between the U.S. and the rest of the world.

Appendix Table 1.1 shows the estimated regressions for the bilateral current account between the U.S. and Japan from 1960 to 2005 (1970-2004 for annual data). The first column reports the regression based on (1.A4) on an annual basis.[36] However, because we do not observe β, this specification does not provide us a test of this theory. The other columns show the results for equation (1.A1), using both annual and quarterly data. The coefficient on domestic savings is correctly signed and significant in all specifications. The coefficient on foreign savings is also significant and correctly signed in the quarterly regressions, but not significant in the annual regressions. Expected long-term and short-term government bond returns have significant and correctly signed coefficients in most specifications. However, when the two variables are simultaneously included in the same regression, the coefficient on the short-term bond changes sign. The expected U.S. stock return is not significant, except for one specification in which it is wrongly signed. The expected Japanese stock return is usually not significant, but where it is, it is wrongly signed. Changes in expected returns, when significant, have the same sign as their level

[36] Kraay and Ventura (2002) and Ventura (2003) extend this analysis by introducing adjustment costs and are better able to explain the time series variation of the current account.

counterparts. Figure 1.2, in the main text, plots the fitted values from the regressions in columns (1) and (5) of Appendix Table 1.1.

1.6.2. Appendix B: VAR Estimated Parameters

In this appendix, we describe how to obtain the coefficients of the system (1.13) for a U.S. investor from the estimated VARs presented in Section 1.4.3.[37] I focus specifically on the fourth VAR specification, with the nominal exchange rate in levels and the U.S. and Japanese inflation rates. This is the most complicated case. An adaptation for the other cases is straightforward and not shown here. In order to simplify the notation, I consider only four assets, two from each country. An extension to eight assets, as estimated in the main text, is simple. Japanese real asset returns are denoted with stars. s_t includes both U.S. and Japanese predictive variables. Thus, the following VAR system is estimated:[38]

$$Z_{t+1} = A_0 + A_1 Z_t + u_{t+1}, \tag{1.A5}$$

where $Z_{t+1} = \begin{bmatrix} r_{1,t+1} \\ r_{2,t+1} \\ r^*_{1,t+1} \\ r^*_{2,t+1} \\ s_{t+1} \\ e_{t+1} \\ \pi_{t+1} \\ \pi^*_{t+1} \end{bmatrix}$.

Considering a U.S. investor, notice that:

$$z_{t+1} = B_0 Z_{t+1} + B_1 Z_t, \tag{1.A6}$$

where B_0 and B_1 are defined as:

[37] In a different context, Campbell, Viceira, and White (2003) perform a similar analysis.
[38] Variables are in natural units.

$$\begin{bmatrix} r_{1,t+1} \\ r_{2,t+1}-r_{1,t+1} \\ r^*_{1,t+1}-r_{1,t+1}-\Delta RER_{t+1} \\ r^*_{2,t+1}-r_{1,t+1}-\Delta RER_{t+1} \\ s_{t+1} \\ \Delta e_{t+1} \\ e_{t+1} \\ \pi_{t+1} \\ \pi^*_{t+1} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 & -1 & -1 & 1 \\ -1 & 0 & 0 & 1 & 0 & -1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} r_{1,t+1} \\ r_{2,t+1} \\ r^*_{1,t+1} \\ r^*_{2,t+1} \\ s_{t+1} \\ e_{t+1} \\ \pi_{t+1} \\ \pi^*_{t+1} \end{bmatrix} + \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} r_{1,t} \\ r_{2,t} \\ r^*_{1,t} \\ r^*_{2,t} \\ s_t \\ e_t \\ \pi_t \\ \pi^*_t \end{bmatrix}.$$

Also notice that $B_1 Z_t = \lambda z_{t+1}$, where λ is defined as:

$$B_1 Z_t = \begin{bmatrix} 0 \\ 0 \\ e_t \\ e_t \\ 0 \\ -e_t \\ 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} r_{1,t+1}-\pi_{t+1} \\ r_{2,t+1}-r_{1,t+1} \\ r^*_{1,t+1}-r_{1,t+1}-\Delta e_{t+1} \\ r^*_{2,t+1}-r_{1,t+1}-\Delta e_{t+1} \\ s_{t+1} \\ \Delta e_{t+1} \\ e_{t+1} \\ \pi_{t+1} \\ \pi^*_{t+1} \end{bmatrix}.$$

Therefore, replacing it in (1.A6):

$$(1-\lambda)z_{t+1} = B_0 Z_{t+1}$$
$$(B_0' B_0)^{-1} B_0' (1-\lambda) z_{t+1} = Z_{t+1}$$

or

$$(B_0' B_0)^{-1} B_0' (1-\lambda) z_t = Z_t. \qquad (1.A7)$$

We can re-write (1.A5) in the following way:

$$Z_{t+1} = A_0 + A_1 Z_t + u_{t+1}$$
$$B_0 Z_{t+1} + B_1 Z_t = B_0 A_0 + (B_0 A_1 + B_1) Z_t + B_0 u_{t+1}.$$

Using (1.A6) on the LHS and (1.A7) on the RHS, we have the desired relation between the estimated VAR coefficients and the ones in the system of equations (1.13):

$$z_{t+1} = B_0 A_0 + (B_0 A_1 + B_1)(B_0^{'} B_0)^{-1} B_0^{'}(1-\lambda) z_t + B_0 u_{t+1}, \qquad (1.A8)$$

where $\Phi_0 = B_0 A_0$, $\Phi_1 = (B_0 A_1 + B_1)(B_0^{'} B_0)^{-1} B_0^{'}(1-\lambda)$, $v_{t+1} = B_0 u_{t+1}$, and $\Sigma_v = B_0 \Sigma_u B_0^{'}$.

An analogous exercise should be conducted for the case of a Japanese investor. To save space, we do not describe it here.

1.6.3. Appendix C: Empirical Evidence with Annual Data

In this appendix, we present the results reported in Sections 1.4.4, 1.4.5, and 1.4.7 using annual samples instead of quarterly samples. Expected returns are calculated based on quarterly data, but portfolio holdings at the end of the year are considered.

In Section 1.4.4, we provided empirical evidence based on model-predicted optimal portfolio shares. In this appendix, Appendix Tables 1.2 and 1.3 display similar regressions based on annual data instead of quarterly data. Once more, we show the results for different values of the relative risk aversion parameter and for our five different VAR specifications. We have no priors about the magnitude of these coefficients. However, according to our model, summarized in equation (1.17), increases in the optimal portfolio shares abroad should be associated with positive changes in the U.S. bilateral current account with Japan, if a U.S. investor is considered. On the other hand, if a Japanese investor is analyzed, it should be related to negative changes in the bilateral current account. The results confirm these priors and are consistent with the tables shown in the main text. In other words, variations in investment opportunities change agents' optimal portfolios in a direction consistent with actual bilateral current account movements.

In Section 1.4.5, we presented some empirical evidence based on the predicted bilateral current account. In this appendix, Appendix Table 1.4 reports similar regressions based on annual data instead of quarterly data. Once more, four different regression specifications are considered. As in the main text, we consider the results for a relative risk aversion parameter of 10 only. The results in this appendix are also robust to different parameter values of the time discount factor, the elasticity of intertemporal substitution, and the risk aversion parameters. The results from the econometric analysis presented here reinforce the evidence previously reported. Our predicted values can explain more than just a trend in the actual data. Furthermore, positive changes in our predicted values are associated with positive changes in the actual data. The estimated regression coefficients are statistically significant and correctly signed in all specifications. In our third specification, our lagged independent variable is also significant and negative, as equation (1.17) would suggest.

Lastly, using annual data instead of quarterly data, we report in Appendix Table 1.5 results equivalent to those presented in Section 1.4.7. Thus, our regressions use wealth and consumption data and are based on equation (1.17). The estimates shown here are also significant and correctly signed. In addition, they are robust to the relative risk aversion parameter. Thus, an improvement in the predicted bilateral current account is associated with improvements in the actual values. Furthermore, as reported in the main text, the estimated coefficients are also significantly larger in the bottom panel of the table.

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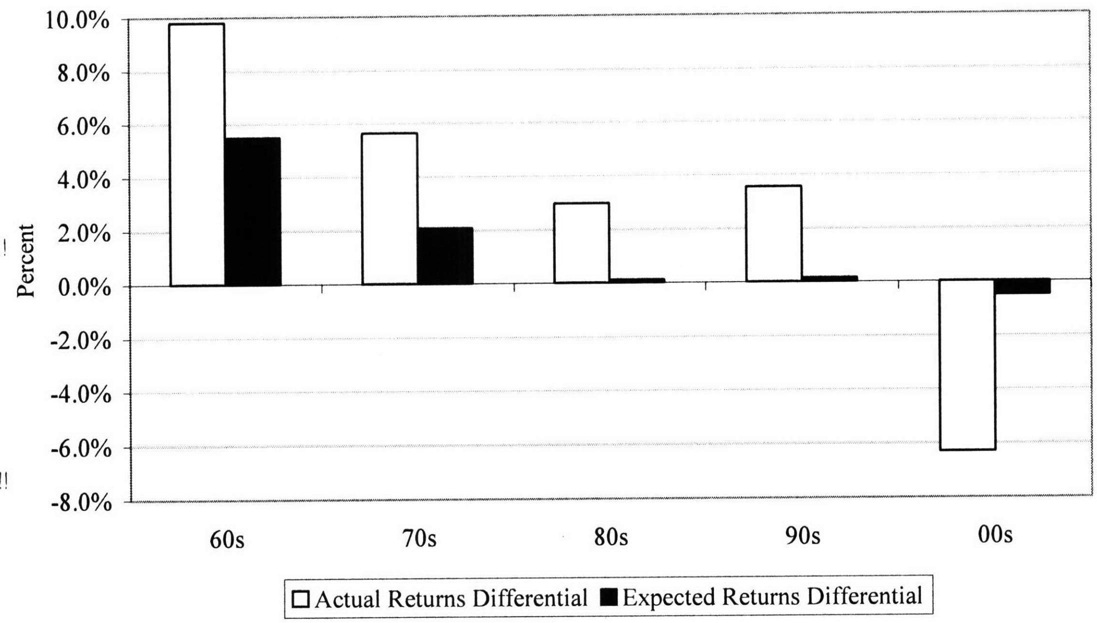

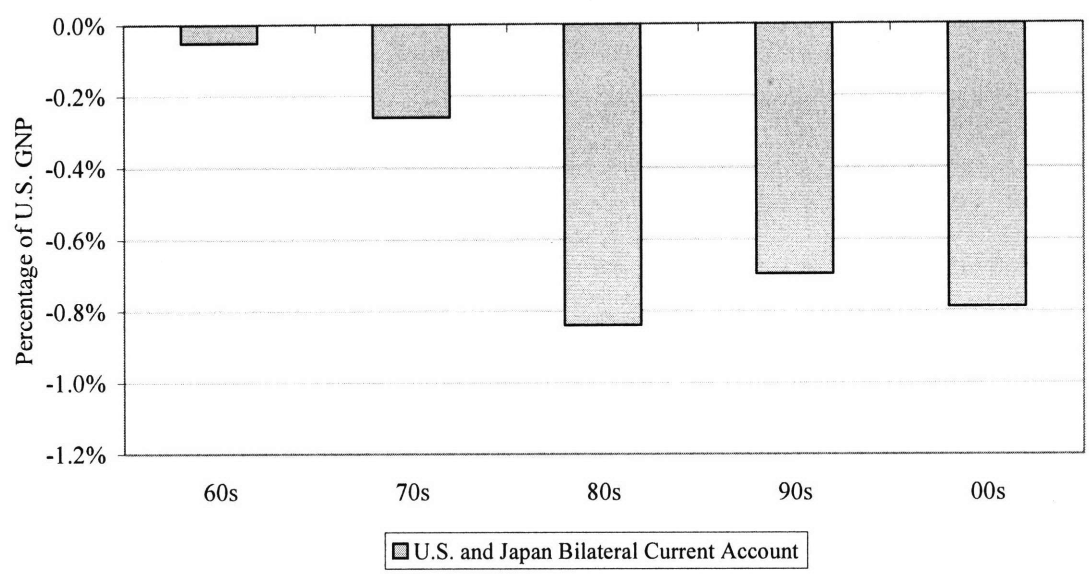

Figure 1.1. Real Return Differential in Long-Term Bonds and the Bilateral Current Account

The top panel of this figure shows the interest rate differential between U.S. and Japanese long-term government bonds. Both actual and expected interest rate differentials are shown. Expected returns are calculated using a VAR system with lagged asset returns and the real exchange rate. The data is shown in annualized percentage units. The bottom panel shows the bilateral current account between the U.S. and Japan. The data is shown as a percentage of U.S. GNP. Both panels show decade averages.

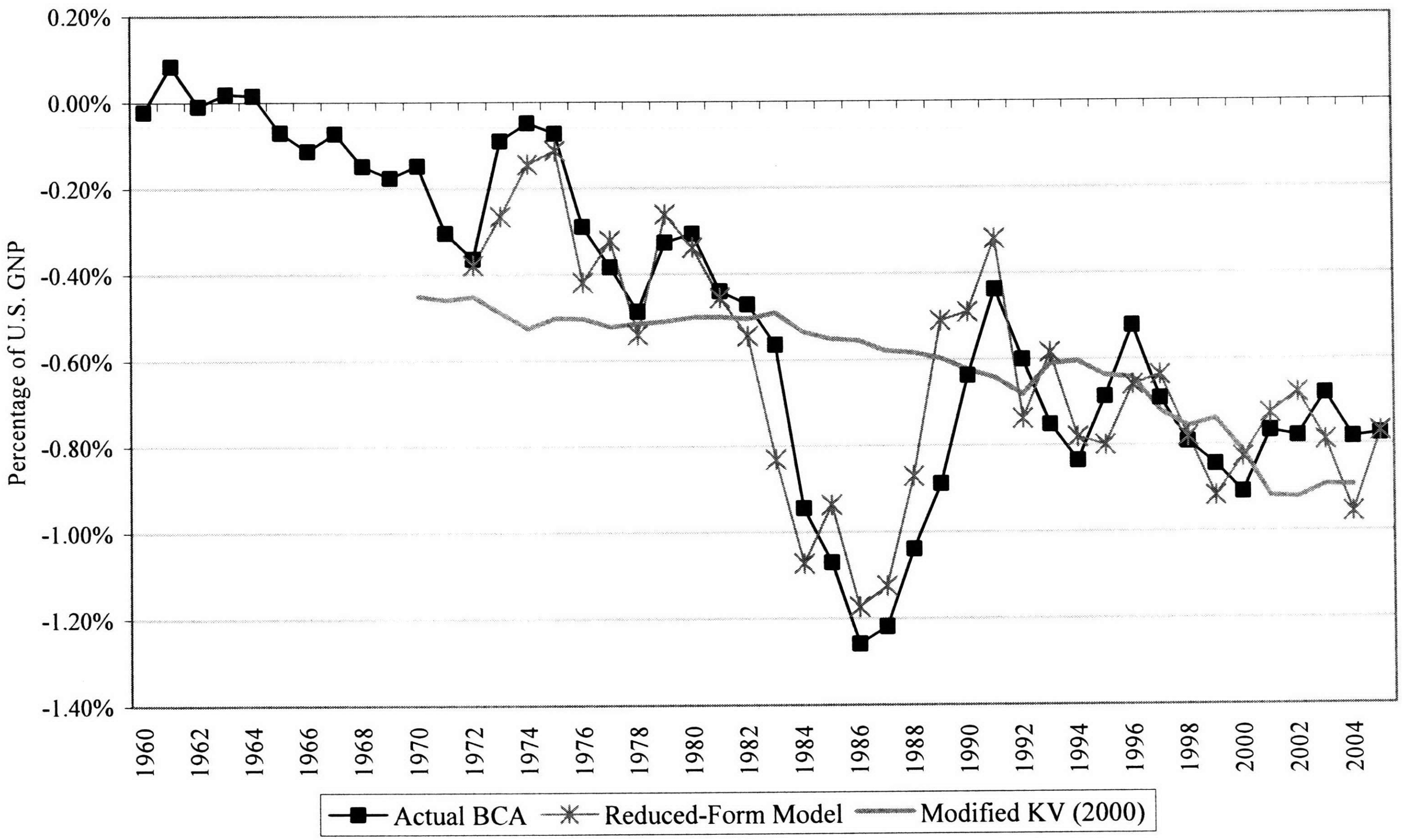

Figure 1.2. Bilateral Current Account: U.S. and Japan

This figure shows the annual bilateral current account balance between the U.S. and Japan, from 1960 to 2005. It also shows the fitted values representing an adaptation of Kraay and Ventura's (2000) model and the estimates of our reduced-form model. Values are shown as a percentage of U.S. GNP.

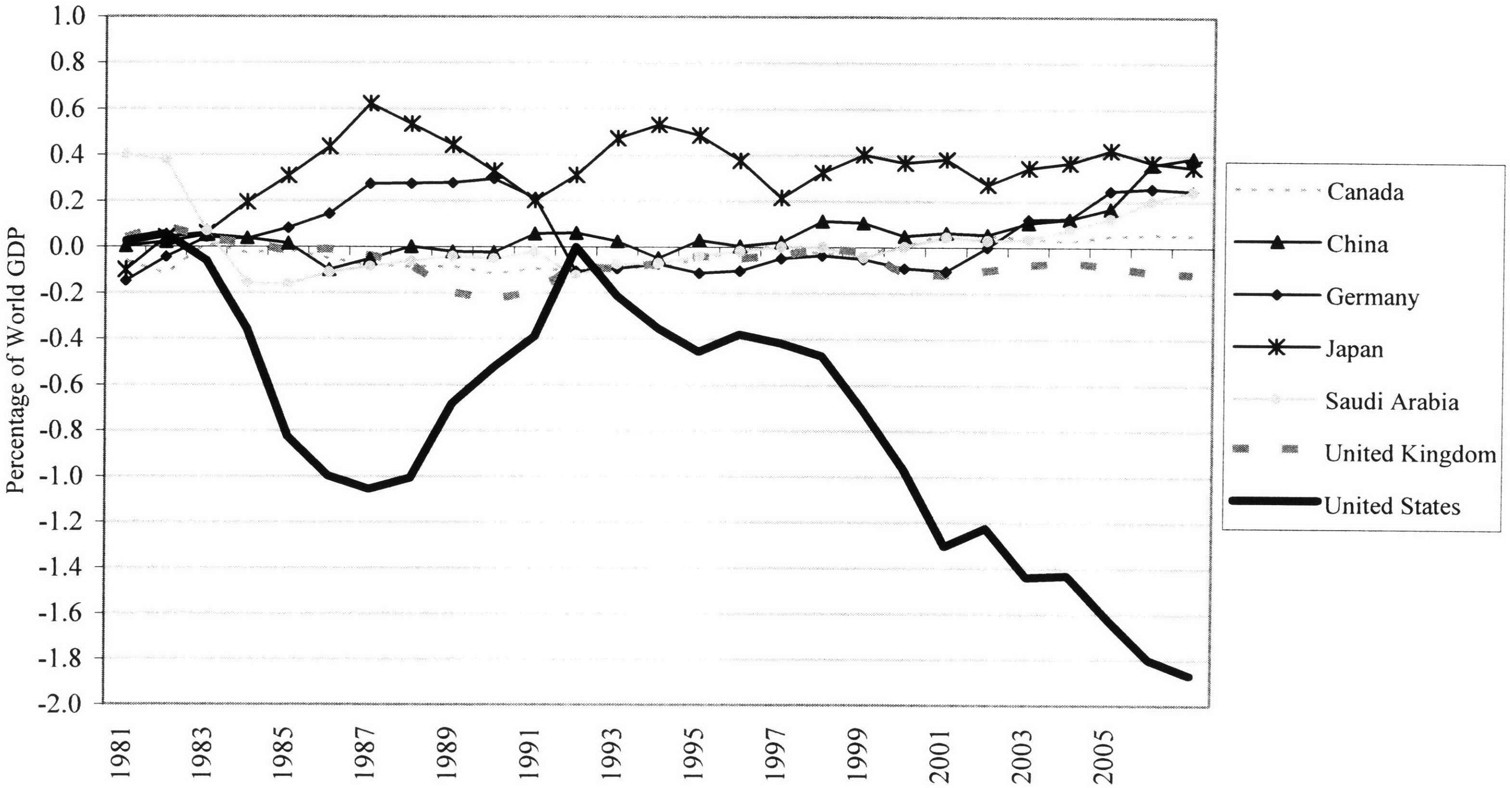

Figure 1.3. Current Account Balances

This figure shows annual current account balances by country from 1981 to 2006. Data is shown as a percentage of world GDP. Source: *World Economic Outlook* (IMF).

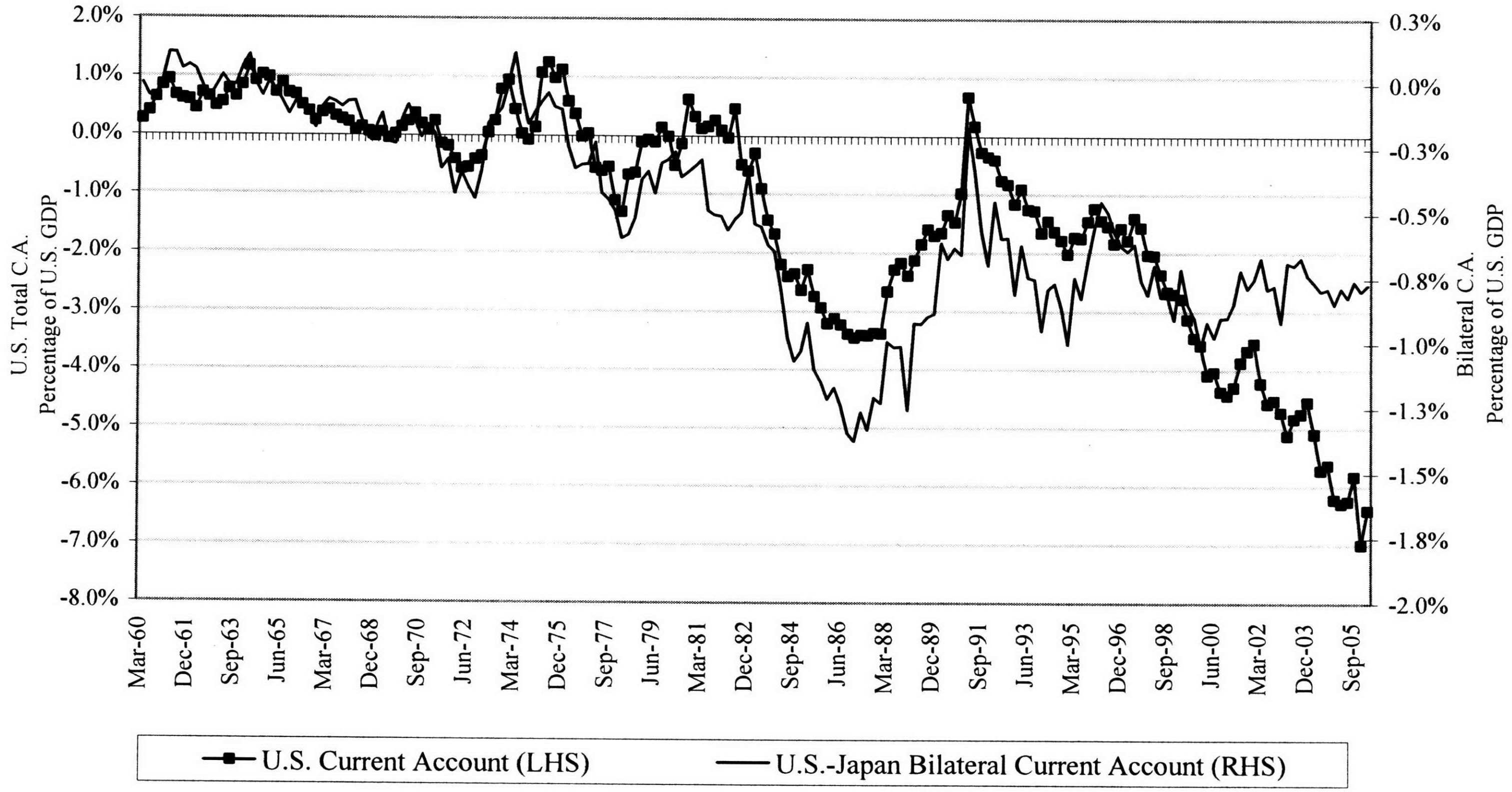

Figure 1.4. U.S. Current Account and U.S. and Japan Bilateral Current Account

This figure shows the quarterly U.S. total current account balance and one of its components, the bilateral current account with Japan, from 1960 to 2005. Values are shown as a percentage of U.S. GDP.

Source: Bureau of Economic Analysis (U.S. Department of Commerce).

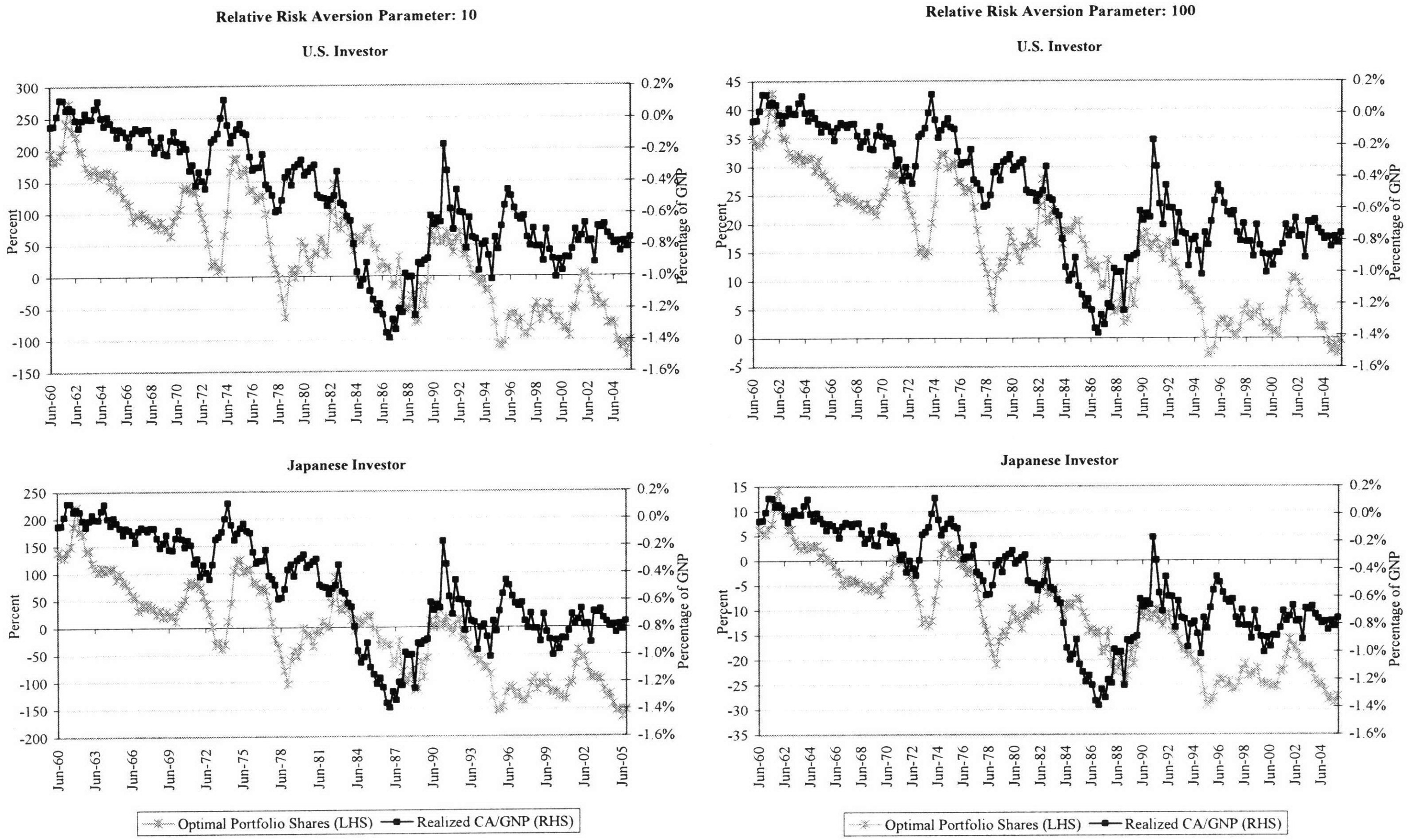

Figure 1.5. Optimal Portfolio Share Abroad by Investor Type

This figure plots the actual bilateral current account and the model-predicted optimal portfolio shares of foreign investments by investor type, from 1960 to 2005. Expected returns are calculated according to the second specification of the VAR system. We plot the results for relative risk aversion coefficients of 10 and 100. The actual bilateral current account is scaled by U.S. GNP.

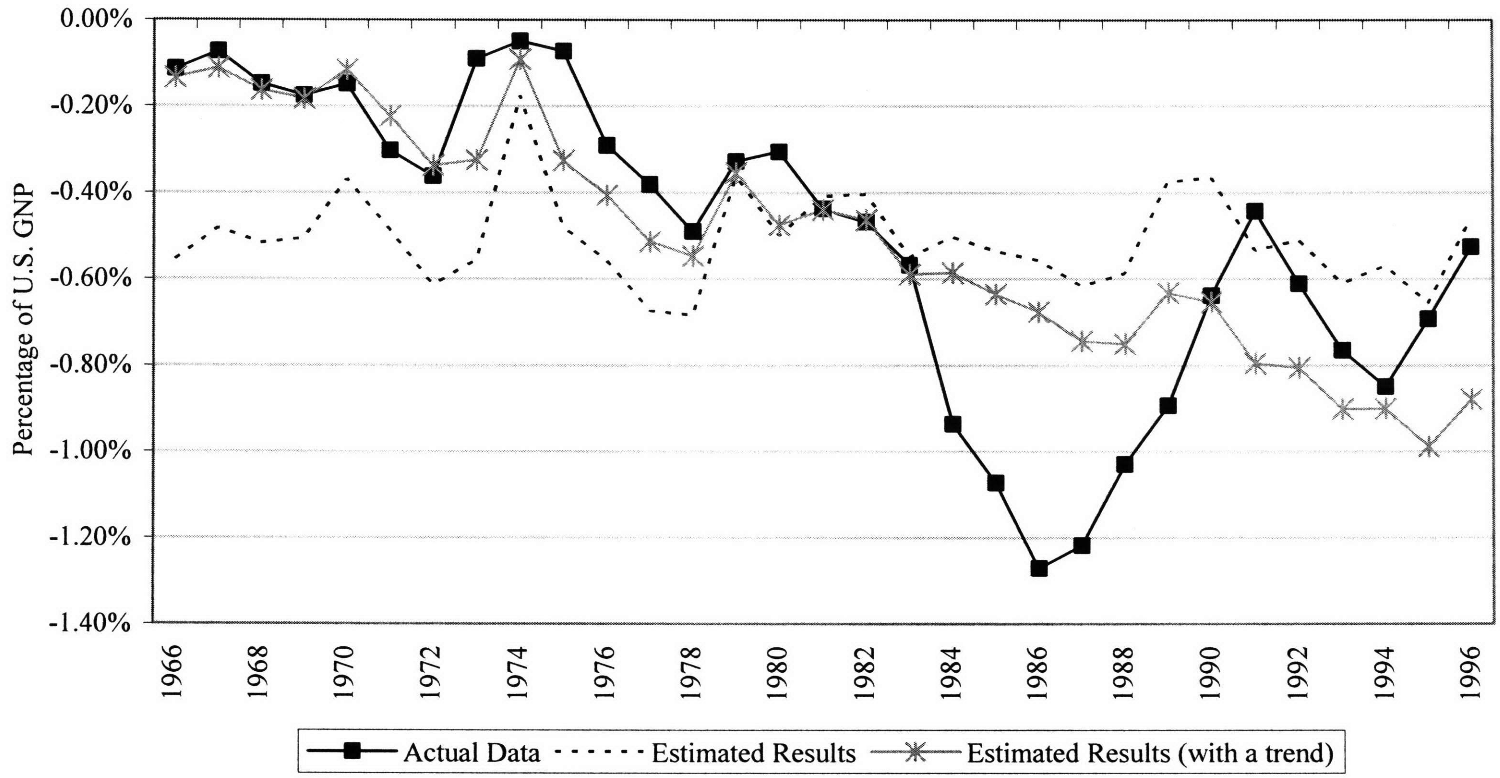

Figure 1.6. Actual vs. Predicted Bilateral Current Account with Actual Data for Consumption and Wealth

This figure plots the actual bilateral current account and the predicted bilateral current account based on annual regressions. Expected returns are calculated according to the second specification of our VAR system. Actual data for consumption and wealth is used. Both measures of the bilateral current account balance are scaled by U.S. GNP. We assume a relative risk aversion parameter equal to 10.

Table 1.1. Current Account: Variance-Decomposition Analysis

Country	R^2	Portfolio Rebalancing	Portfolio Growth	2*cov(PR,PG)	Portfolio Rebalancing	Portfolio Growth
		High-Income Countries				
Australia	0.989	1.638	0.860	-1.498	66%	34%
Austria	0.938	1.689	0.462	-1.149	79%	21%
Belgium-Lux.	0.999	0.911	0.034	0.056	96%	4%
Canada	0.992	1.008	0.418	-0.423	71%	29%
Denmark	0.935	2.430	1.318	-2.749	65%	35%
Finland	0.819	4.248	3.461	-6.709	55%	45%
France	0.992	0.815	0.098	0.087	89%	11%
Germany	0.999	0.818	0.028	0.152	97%	3%
Ireland	0.951	2.295	1.030	-2.325	69%	31%
Israel	0.977	1.514	0.336	-0.850	82%	18%
Italy	0.985	1.015	0.083	-0.099	92%	8%
Japan	0.996	0.613	0.206	0.178	75%	25%
Netherlands	0.983	0.848	0.966	-0.814	47%	53%
New Zealand	0.986	1.389	0.804	-1.193	63%	37%
Norway	0.997	0.731	0.081	0.187	90%	10%
Singapore	0.997	0.599	0.144	0.257	81%	19%
Sweden	0.818	2.855	1.450	-3.304	66%	34%
Switzerland	0.994	0.927	0.590	-0.516	61%	39%
U.K	0.996	0.842	0.075	0.082	92%	8%
U.S.	0.999	0.505	0.161	0.334	76%	24%
AVERAGE					76%	24%
		Middle-Income Countries				
Argentina	0.916	1.143	1.933	-2.076	37%	63%
Brazil	0.915	2.318	1.955	-3.273	54%	46%
Chile	0.885	2.717	1.671	-3.388	62%	38%
Costa Rica	0.930	3.098	2.321	-4.420	57%	43%
Greece	0.955	3.195	2.627	-4.824	55%	45%
Malaysia	0.998	0.895	0.075	0.029	92%	8%
Mauritius	0.958	1.739	0.520	-1.259	77%	23%
Mexico	0.982	1.390	0.775	-1.165	64%	36%
Oman	0.998	0.720	0.036	0.244	95%	5%
Peru	0.642	6.533	6.866	-12.40	49%	51%
Portugal	0.903	2.314	0.547	-1.860	81%	19%
South Africa	0.956	1.311	0.305	-0.616	81%	19%
South Korea	0.991	0.638	0.229	0.132	74%	26%
Spain	0.985	1.238	0.412	-0.649	75%	25%
Thailand	0.996	1.082	0.304	-0.385	78%	22%
Trinidad Tobago	0.878	1.632	0.278	-0.910	85%	15%
Turkey	0.865	2.160	1.084	-2.243	67%	33%
Venezuela	0.975	1.215	0.182	-0.397	87%	13%
AVERAGE					71%	29%
		Low-Income Countries				
Algeria	0.989	0.729	0.282	-0.011	72%	28%
Bolivia	0.987	1.455	0.275	-0.730	84%	16%
China	0.993	0.854	0.018	0.127	98%	2%
Colombia	0.992	1.054	0.180	-0.235	85%	15%
Cote D-Ivoire	0.372	2.023	2.555	-3.578	44%	56%
Dominican Rep.	0.085	4.907	1.923	-5.829	72%	28%
Ecuador	0.964	2.052	1.294	-2.346	61%	39%
El Salvador	0.990	0.860	0.776	-0.636	53%	47%
Guatemala	0.968	0.922	1.645	-1.567	36%	64%
India	0.991	1.633	0.528	-1.161	76%	24%
Indonesia	0.967	1.567	0.455	-1.022	78%	22%
Jordan	0.980	0.798	0.884	-0.682	47%	53%
Morocco	0.962	1.638	0.587	-1.224	74%	26%
Pakistan	0.759	6.347	6.113	-11.463	51%	49%
Philippines	0.991	1.115	0.350	-0.465	76%	24%
Sri Lanka	0.981	1.851	1.423	-2.274	57%	43%
Syria	0.970	1.012	0.231	-0.242	81%	19%
Tunisia	0.981	2.221	1.028	-2.249	68%	32%
AVERAGE					67%	33%

This table reports the variance-decompositon analysis based on equation (4) in the main text. The first column reports how much of the variation of the current account can be explained by the portfolio growth and portfolio rebalancing components. The next three columns report the three RHS components of equation (4), scaled by the LHS variable. Thus, these three columns should sum up to one. The last two columns report the relative size of the portfolio rebalancing and portfolio growth components. The top-panel shows the results for high-income countries. The middle-panel reports the results for middle-income countries.The bottom-panel shows the results for low-income countries. This country classification follows the official World Bank classification of countries according to their income levels.

Table 1.2. Summary Statistics

Variables	Mean	Std. Dev.
U.S. Short-term Government Bond	1.8	2.9
U.S. Long-term Government Bond	2.6	3.1
U.S. Stock	7.1	29.8
U.S. ROE	1.3	3.9
Japanese Short-term Government Bond	0.4	4.0
Japanese Long-term Government Bond	2.1	4.3
Japanese Stock	7.6	34.1
Japanese ROE	0.8	4.5
U.S. CPI-Inflation	4.3	3.6
Japanese CPI-Inflation	3.9	5.6
Real Exchange Rate (Change)	-2.0	24.5

This table shows the summary statistics of quarterly real returns from 1960 to 2005. The assets considered in the analysis are: short-term government bonds, long-term government bonds, stocks, and ROE for both the U.S. and Japan. It also shows the sample summary statistics of the CPI-inflation rates and the real exchange rate. Real returns are reported in local currency. Data is in annual percentage units.

Source: *Global Financial Database.*

Table 1.3. VAR Estimation

		$ussb_t$	$uslb_t$	uss_t	$usroe_t$	$ustbill_t$	$uspe_t$	$usspread_t$	$jpsb_t$	$jplb_t$	jps_t	$jproe_t$	$jptbill_t$	$jppe_t$	$jpspread_t$	rer_t	R^2
US Short-term Bond	$ussb_{t+1}$	0.43	-1.11	0.01	0.81	1.58	0.00	1.71	-0.59	0.92	0.00	-0.32	-0.13	0.00	-0.46	-0.02	0.37
		[0.30]	[0.42]	[0.01]	[0.22]	[0.29]	[0.00]	[0.49]	[0.36]	[0.44]	[0.01]	[0.20]	[0.23]	[0.00]	[0.36]	[0.01]	[0.00]
US Long-term Bond	$uslb_{t+1}$	0.19	-0.73	0.01	0.67	1.36	0.00	2.13	-0.73	1.41	0.00	-0.64	-0.37	0.00	-0.88	-0.01	0.50
		[0.28]	[0.40]	[0.01]	[0.21]	[0.28]	[0.00]	[0.47]	[0.35]	[0.42]	[0.01]	[0.20]	[0.22]	[0.00]	[0.35]	[0.01]	[0.00]
US Stock	uss_{t+1}	-7.72	9.61	0.04	-1.56	-3.23	-0.02	-10.70	1.52	4.18	-0.12	-4.80	-6.30	0.00	-7.24	-0.07	0.17
		[3.59]	[5.13]	[0.08]	[2.77]	[3.60]	[0.01]	[6.02]	[4.46]	[5.47]	[0.07]	[2.52]	[2.81]	[0.00]	[4.46]	[0.10]	[0.01]
US ROE	$usroe_{t+1}$	0.14	-1.68	0.00	1.65	1.42	0.00	2.23	-0.91	1.73	0.00	-0.79	-0.51	0.00	-1.09	-0.01	0.65
		[0.30]	[0.43]	[0.01]	[0.23]	[0.30]	[0.00]	[0.51]	[0.37]	[0.46]	[0.01]	[0.21]	[0.24]	[0.00]	[0.37]	[0.01]	[0.00]
US T-Bill Yield	$ustbill_{t+1}$	0.09	-0.15	0.00	0.08	0.89	0.00	0.21	0.17	-0.47	0.00	0.31	0.22	0.00	0.42	0.00	0.90
		[0.11]	[0.15]	[0.00]	[0.082]	[0.11]	[0.00]	[0.18]	[0.13]	[0.16]	[0.00]	[0.07]	[0.08]	[0.00]	[0.13]	[0.00]	[0.00]
US P/E Ratio	$uspe_{t+1}$	-15.58	51.84	0.12	-34.14	-53.38	0.84	-83.73	11.52	33.85	-0.68	-39.49	-46.94	-0.01	-70.38	-0.07	0.93
		[23.66]	[33.78]	[0.51]	[18.24]	[23.70]	[0.04]	[39.69]	[29.37]	[36.02]	[0.47]	[16.60]	[18.53]	[0.01]	[29.39]	[29.39]	[0.00]
US Spread	$usspread_{t+1}$	0.01	0.18	0.00	-0.18	-0.11	0.00	0.58	-0.07	0.31	0.00	-0.25	-0.18	0.00	-0.33	0.00	0.71
		[0.08]	[0.12]	[0.00]	[0.06]	[0.08]	[0.00]	[0.14]	[0.10]	[0.13]	[0.00]	[0.06]	[0.07]	[0.00]	[0.10]	[0.00]	[0.00]
JP Short-term Bond	$jpsb_{t+1}$	-0.57	1.37	-0.01	-0.42	-0.04	0.00	-1.05	-1.35	2.63	0.00	-1.26	-1.28	0.00	-2.27	-0.02	0.29
		[0.45]	[0.64]	[0.01]	[0.35]	[0.45]	[0.00]	[0.76]	[0.56]	[0.69]	[0.01]	[0.32]	[0.35]	[0.00]	[0.56]	[0.01]	[0.00]
JP Long-term Bond	$jplb_{t+1}$	-0.63	1.57	-0.01	-0.52	-0.21	0.00	-1.25	-2.01	3.26	0.01	-1.23	-1.23	0.00	-2.11	-0.02	0.33
		[0.45]	[0.65]	[0.01]	[0.35]	[0.45]	[0.00]	[0.76]	[0.56]	[0.69]	[0.01]	[0.32]	[0.36]	[0.00]	[0.56]	[0.01]	[0.00]
JP Stock	jps_{t+1}	0.45	4.71	0.27	-3.92	-6.02	-0.01	-5.91	-1.19	2.77	0.29	-0.74	-4.52	0.00	-4.23	-0.10	0.27
		[3.52]	[5.03]	[0.08]	[2.72]	[3.53]	[0.01]	[5.91]	[4.37]	[5.36]	[0.07]	[2.47]	[2.76]	[0.00]	[4.37]	[0.10]	[0.00]
JP ROE	$jproe_{t+1}$	-0.68	1.45	-0.01	-0.39	0.02	0.00	-1.05	-2.29	2.78	0.01	-0.46	-1.49	0.00	-2.44	-0.03	0.42
		[0.46]	[0.66]	[0.01]	[0.35]	[0.46]	[0.00]	[0.77]	[0.57]	[0.70]	[0.01]	[0.32]	[0.36]	[0.00]	[0.57]	[0.01]	[0.00]
JP T-Bill Yield	$jptbill_{t+1}$	0.04	-0.06	0.00	0.02	0.01	0.00	0.02	-0.07	-0.07	0.00	0.13	1.09	0.00	0.13	0.00	0.98
		[0.04]	[0.06]	[0.00]	[0.03]	[0.04]	[0.00]	[0.07]	[0.05]	[0.06]	[0.00]	[0.03]	[0.03]	[0.00]	[0.05]	[0.00]	[0.00]
JP P/E Ratio	$jppe_{t+1}$	90.59	-13.02	1.82	-72.43	-78.65	-0.15	-9.49	-78.49	229.13	1.31	-143.27	-181.45	0.89	-236.42	-3.91	0.94
		[70.42]	[100.56]	[1.50]	[54.30]	[70.55]	[0.11]	[118.18]	[87.45]	[107.25]	[1.39]	[49.43]	[55.17]	[0.03]	[87.49]	[2.02]	[0.00]
JP Spread	$jpspread_{t+1}$	-0.05	0.20	0.00	-0.11	-0.19	0.00	-0.23	0.20	-0.26	0.00	0.06	0.08	0.00	1.08	0.00	0.88
		[0.06]	[0.09]	[0.00]	[0.05]	[0.06]	[0.00]	[0.10]	[0.08]	[0.09]	[0.00]	[0.04]	[0.05]	[0.00]	[0.08]	[0.00]	[0.00]
Real Exchange Rate	rer_{t+1}	0.53	1.94	-0.03	-1.24	-1.87	-0.01	-6.75	0.74	-0.75	0.01	0.01	-2.78	0.00	0.41	0.02	0.12
		[2.67]	[3.81]	[0.06]	[2.06]	[2.67]	[0.00]	[4.47]	[3.31]	[4.06]	[0.05]	[1.87]	[2.09]	[0.00]	[3.31]	[0.08]	[0.05]

This table shows the results of our VAR estimation with log real asset returns on a quarterly basis from 1960 to 2005. The following asset returns are included in the estimation: short-term government bonds, long-term government bonds, stocks, and ROE. Other state variables include: T-Bill nominal yields, price-earnings ratios, term spreads, and the real exchange rate. Each row corresponds to one equation. The table also shows the R-squared for each equation (with p-values of the F-test of joint significance in brackets). *t-statistics* for coefficient estimates are shown in brackets.

Table 1.4. Summary Statistics of Expected Real Asset Returns

Assets	Basic VAR (BVAR)		BVAR + RER in Levels		BVAR + RER in Differences		BVAR + NER in Levels and Inflation Rates		BVAR + NER in Differences and Inflation Rates	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
U.S. Short-term Govt. Bond	1.75	1.74	1.75	1.77	1.74	1.78	1.75	1.81	1.74	1.81
U.S. Long-term Govt. Bond	2.63	2.21	2.63	2.22	2.61	2.25	2.63	2.25	2.61	2.28
U.S. Stocks	3.37	12.37	3.38	12.51	3.46	12.33	3.47	13.21	3.56	13.06
U.S. ROE	1.27	3.18	1.27	3.19	1.24	3.20	1.27	3.24	1.24	3.25
Japanese Short-term Govt. Bond	0.32	2.18	0.32	2.23	0.32	2.22	0.32	2.23	0.32	2.21
Japanese Long-term Govt. Bond	2.02	2.47	2.02	2.51	2.00	2.51	2.02	2.51	2.00	2.50
Japanese Stocks	3.67	16.50	3.70	16.76	3.52	16.41	3.77	17.29	3.59	16.92
Japanese ROE	0.74	2.91	0.74	2.96	0.76	2.94	0.74	2.96	0.76	2.94

This table shows the summary statistics of predicted real asset returns from 1960 to 2005 based on VAR estimations. The assets considered in the analysis are: short-term government bonds, long-term government bonds, stocks, and ROE for both the U.S. and Japan. The control variables are: nominal yield on T-Bills, price-earnings ratio, and the term spread. Depending on the specification, the nominal exchange rate (NER), the real exchange rate (RER), or the U.S. and Japanese CPI-inflation rates are included. The values are real returns in local currency. Data is shown in annual percentage units.

Table 1.5A. Regression Analysis: Actual Bilateral Current Account vs. Optimal Portfolio Shares U.S. Investors

	Basic Specification (BS)		BS + Time Trend		BS + Lagged BCA	
	Alpha	L.Alpha	Alpha	L.Alpha	Alpha	L.Alpha
Relative Risk Aversion: 5						
Basic VAR	0.002 ***	-0.000	0.001 **	-0.001	0.000 *	-0.000 *
+ RER in Levels	0.002 ***	-0.000	0.001 **	-0.001	0.000	-0.000 *
+ RER in Differences	0.002 ***	-0.000	0.001 **	-0.001	0.000 *	-0.000 *
+ Infl., NER in Levels	0.001 ***	-0.000	0.001 **	-0.001	0.000	-0.000
+ Infl., NER in Differences	0.002 ***	-0.000	0.001 ***	-0.001	0.000	-0.000 *
Relative Risk Aversion: 10						
Basic VAR	0.004 ***	-0.000	0.002 **	-0.002	0.001 *	-0.001 *
+ RER in Levels	0.003 ***	-0.000	0.002 **	-0.001	0.001 *	-0.001 *
+ RER in Differences	0.004 ***	-0.000	0.002 **	-0.001	0.001 *	-0.001 *
+ Infl., NER in Levels	0.003 ***	-0.000	0.002 **	-0.001	0.001 *	-0.001
+ Infl., NER in Differences	0.003 ***	-0.000	0.002 ***	-0.001	0.001	-0.001 *
Relative Risk Aversion: 30						
Basic VAR	0.011 ***	-0.000	0.006 **	-0.005	0.002 *	-0.002 *
+ RER in Levels	0.009 ***	-0.001	0.006 **	-0.004 *	0.002 *	-0.002 *
+ RER in Differences	0.011 ***	-0.000	0.006 **	-0.004	0.002 *	-0.002 *
+ Infl., NER in Levels	0.008 ***	-0.001	0.006 ***	-0.004 *	0.002 *	-0.002
+ Infl., NER in Differences	0.010 ***	0.001	0.006 ***	-0.003	0.002	-0.002 *
Relative Risk Aversion: 100						
Basic VAR	0.037 ***	-0.000	0.021 **	-0.016	0.008 *	-0.008 *
+ RER in Levels	0.030 ***	-0.005	0.021 ***	-0.014 *	0.007 *	-0.006 *
+ RER in Differences	0.036 ***	-0.000	0.021 **	-0.014	0.007 *	-0.007 *
+ Infl., NER in Levels	0.027 ***	-0.004	0.019 ***	-0.012 *	0.006 *	-0.005
+ Infl., NER in Differences	0.034 ***	0.002	0.020 ***	-0.011	0.006	-0.006 *

This table shows the regression results of the bilateral current account on the model-predicted portfolio shares. It shows the results for a U.S. investor. Three different regressions are reported: our basic specification that regresses the bilateral current account on contemporaneous and lagged optimal portfolio shares (alpha and L.alpha, respectively), the basic specification with a time trend, and the basic specification including a lagged dependent variable. The results are shown for different values of the relative risk aversion parameter: 5, 10, 30, and 100. Different series of model-predicted portfolio shares are considered based on our five VAR specifications used to calculate expected asset returns. The bilateral current account data is expressed as a percentage of GNP. * means significant at 10%, ** at 5%, and *** at 1% levels.

Table 1.5B. Regression Analysis: Actual Bilateral Current Account vs. Optimal Portfolio Shares
Japanese Investors

	Basic Specification (BS)		BS + Time Trend		BS + Lagged BCA	
	Alpha	L.Alpha	Alpha	L.Alpha	Alpha	L.Alpha
Relative Risk Aversion: 5						
Basic VAR	-0.002 ***	0.000	-0.001 **	0.001 *	-0.000	0.000
+ RER in Levels	-0.002 ***	0.000	-0.001 **	0.001 *	-0.000	0.000
+ RER in Differences	-0.002 ***	0.000	-0.001 **	0.001	-0.000	0.000
+ Infl., NER in Levels	-0.002 ***	0.000	-0.001 **	0.001 *	-0.000 **	0.000 **
+ Infl., NER in Differences	-0.002 ***	0.000	-0.001 **	0.001	-0.000 **	0.000 **
Relative Risk Aversion: 10						
Basic VAR	-0.004 ***	0.000	-0.002 **	0.002 *	-0.001	0.001
+ RER in Levels	-0.004 ***	0.000	-0.002 **	0.002 *	-0.001	0.000
+ RER in Differences	-0.004 ***	0.000	-0.002 **	0.002	-0.001	0.001
+ Infl., NER in Levels	-0.003 ***	0.000	-0.002 **	0.001 *	-0.001 **	0.001 **
+ Infl., NER in Differences	-0.004 ***	0.000	-0.002 **	0.001	-0.001 **	0.001 **
Relative Risk Aversion: 30						
Basic VAR	-0.012 ***	0.000	-0.007 **	0.005	-0.002	0.002
+ RER in Levels	-0.010 ***	0.002	-0.007 **	0.005 *	-0.002	0.001
+ RER in Differences	-0.011 ***	0.000	-0.007 **	0.005	-0.002	0.002
+ Infl., NER in Levels	-0.009 ***	0.001	-0.006 ***	0.004 *	-0.002 **	0.002 **
+ Infl., NER in Differences	-0.011 ***	0.000	-0.006 **	0.004	-0.003 **	0.003 **
Relative Risk Aversion: 100						
Basic VAR	-0.040 ***	0.001	-0.023 **	0.017	-0.006	0.006
+ RER in Levels	-0.034 ***	0.006	-0.024 ***	0.016 *	-0.006	0.005
+ RER in Differences	-0.038 ***	0.001	-0.022 **	0.016	-0.006	0.006
+ Infl., NER in Levels	-0.030 ***	0.005	-0.021 ***	0.014 *	-0.008 **	0.007 **
+ Infl., NER in Differences	-0.035 ***	-0.001	-0.021 **	0.014	-0.009 **	0.009 **

This table shows the regression results of the bilateral current account on the model-predicted portfolio shares. It shows the results for a Japanese investor. Three different regressions are reported: our basic specification that regresses the bilateral current account on contemporaneous and lagged optimal portfolio shares (alpha and L.alpha, respectively), the basic specification with a time trend, and the basic specification including a lagged dependent variable. The results are shown for different values of the relative risk aversion parameter: 5, 10, 30, and 100. Different series of model-predicted portfolio shares are considered based on our five VAR specifications used to calculate expected asset returns. The bilateral current account data is expressed as a percentage of GNP. * means significant at 10%, ** at 5%, and *** at 1% levels.

Table 1.6. Regression Analysis: Actual vs. Predicted Bilateral Current Account

	Basic Specification (BS)	BS + Time Trend	BS + Lagged Vars.		Vars. in Diff.
			PBCA	L.PBCA	
Basic VAR	0.004 ***	0.001 ***	0.001 **	-0.001 **	0.001 **
+ RER in Levels	0.003 ***	0.001 ***	0.001 *	-0.001 *	0.001 *
+ RER in Differences	0.004 ***	0.001 ***	0.001 *	-0.001 *	0.001 *
+ Infl., NER in Levels	0.003 ***	0.001 ***	0.001 **	-0.001 *	0.001 *
+ Infl., NER in Differences	0.004 ***	0.001 ***	0.001 **	-0.001 **	0.001 **

This table shows the results of four different regression specifications: a basic specification that regresses the actual bilateral current account on the predicted bilateral current account (PBCA), the basic specification with a time trend, the basic specification including lagged values of both the dependent and independent variables, and a fourth specification with both variables in differences. The results are reported for different series of model-predicted portfolio shares: our five VAR specifications are considered to calculate expected asset returns. The regressions use quarterly data. Actual data is scaled by U.S. GNP and the predicted data is scaled by model-based U.S. wealth. A relative risk aversion coefficient of 10 has been assumed. * means significant at 10%, ** at 5%, and *** at 1% levels.

Table 1.7. Regression Analysis: Actual vs. Hybrid Predicted Bilateral Current Account

	Basic Specification (BS)	BS + Time Trend	BS + Lagged Vars. HPBCA	BS + Lagged Vars. L.HPBCA	Vars. in Diff.
Relative Risk Aversion: 10					
Basic VAR	0.002 ***	0.001 **	0.000 *	-0.000	0.000 **
+ RER in Levels	0.003 ***	0.001 ***	0.000 *	-0.000	0.000 **
+ RER in Differences	0.002 ***	0.001 ***	0.000 *	-0.000	0.000 **
+ Infl., NER in Levels	0.002 ***	0.001 ***	0.000 **	-0.000 *	0.000 ***
+ Infl., NER in Differences	0.002 ***	0.001 **	0.000 **	-0.000 **	0.000 ***
Relative Risk Aversion: 2000					
Basic VAR	0.603 ***	0.205 ***	0.069 **	-0.045	0.058 **
+ RER in Levels	0.294 ***	0.124 ***	0.053 ***	-0.036	0.045 **
+ RER in Differences	0.599 ***	0.198 ***	0.065 **	-0.042	0.055 **
+ Infl., NER in Levels	0.310 ***	0.126 ***	0.061 ***	-0.040 **	0.052 ***
+ Infl., NER in Differences	0.544 ***	0.150 **	0.077 **	-0.051 *	0.065 ***

This table shows the results of four different regression specifications: a basic specification that regresses the actual bilateral current account on our hybrid measure (HPBCA), the basic specification with a time trend, the basic specification including lagged values of both the dependent and independent variables, and a fourth specification with both variables in differences. Our hybrid bilateral current account uses actual data on wealth, consumption, and savings. The results are based on different series of model-predicted portfolio shares: our five VAR specifications are considered to calculate expected asset returns. The regressions use quarterly data. Both measures of the bilateral current account are scaled by U.S. GNP. The results are shown for a relative risk aversion coefficient of 10 and 2000 in the top and bottom panel, respectively. * means significant at 10%, ** at 5%, and *** at 1% levels.

Appendix Table 1.1. Determinants of the Bilateral Current Account

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	-0.006	-0.003	-0.006	-0.007	-0.004	-0.011	-0.015	-0.014	-0.009
	[11.119]	[1.912]	[3.805]	[4.904]	[2.649]	[4.631]	[6.959]	[6.256]	[3.727]
Dom. Savings*(NFA/W)	0.265								
	[3.192]								
Dom. Savings		0.241	0.297	0.302	0.152	0.058	0.078	0.075	0.043
		[2.905]	[3.625]	[3.280]	[2.065]	[4.346]	[7.764]	[6.686]	[3.423]
For. Savings		0.025	0.021	0.017	0.019	-0.014	-0.023	-0.028	-0.023
		[1.563]	[1.073]	[0.810]	[1.055]	[2.615]	[4.146]	[5.159]	[4.476]
US Long-term Bond		-0.234	-0.017		-0.272	-0.126	-0.033		-0.131
		[2.960]	[0.826]		[3.966]	[5.551]	[3.920]		[6.068]
US Short-term Bond		0.153		-0.004	0.179	0.08		-0.016	0.094
		[2.411]		[0.209]	[3.176]	[4.011]		[2.194]	[4.915]
US Stocks			0.003	0.002	0		0.002	0.002	0.004
			[0.542]	[0.439]	[0.065]		[1.355]	[1.164]	[2.690]
JP Long-term Bond		0.244	0.013		0.377	0.038	0.007		0.058
		[2.411]	[1.369]		[3.369]	[1.538]	[2.763]		[2.526]
JP Short-term Bond		-0.233		0.011	-0.349	-0.029		0.005	-0.042
		[2.241]		[1.004]	[3.065]	[1.201]		[1.761]	[1.850]
JP Stocks			-0.006	-0.006	-0.01		-0.006	-0.006	-0.007
			[1.296]	[1.230]	[2.415]		[4.762]	[4.901]	[5.455]
D.US Long-term Bond		-0.047	0.057		-0.092	-0.049	-0.006		-0.041
		[0.528]	[1.003]		[1.103]	[3.167]	[0.477]		[2.793]
D.US Short-term Bond		-0.024		0.027	0.077	0.057		-0.019	0.093
		[0.338]		[0.542]	[1.166]	[1.910]		[0.753]	[3.171]
D.US Stock			0.006	0.006	0.002		0.000	-0.001	0.002
			[1.136]	[1.076]	[0.616]		[0.139]	[0.290]	[1.105]
D.JP Long-term Bond		0.048	0.014		0.146	0.056	0.004		0.101
		[0.566]	[1.899]		[1.297]	[1.331]	[1.250]		[2.478]
D.JP Short-term Bond		-0.044		0.018	-0.13	-0.053		0.002	-0.094
		[0.522]		[1.537]	[1.181]	[1.244]		[0.570]	[2.279]
D.JP Stock			-0.001	-0.002	0.000		-0.003	-0.003	-0.004
			[0.180]	[0.418]	[0.109]		[2.350]	[2.340]	[3.055]
Observations	35	34	34	34	34	180	180	180	180
R-squared	0.24	0.68	0.57	0.54	0.82	0.60	0.62	0.59	0.67

This table reports the regressions of the bilateral current account between Japan and the U.S. on: domestic and foreign savings, expected asset returns, and changes in expected asset returns. Expected asset returns are obtained from the VAR estimation presented in Table 2. The bilateral current account and the domestic and foreign savings are expressed as a percentage of GNP. Net foreign asset positions, taken from Lane and Milesi-Ferretti (2005), are expressed as a percentage of U.S. total wealth. Expected asset returns are denominated in U.S. dollars. The table also shows the R-squared for each equation and the number of observations. *t-statistics* are shown in brackets.

Appendix Table 1.2. Actual Bilateral Current Account vs. Optimal Portfolio Shares

U.S. Investors

	Basic Specification (BS)		BS + Time Trend		BS + Lagged BCA	
	Alpha	L.Alpha	Alpha	L.Alpha	Alpha	L.Alpha
Relative Risk Aversion: 5						
Basic VAR	0.001 ***	0.000	0.001 **	-0.000	0.001 ***	-0.001 ***
+ RER in Levels	0.001 ***	0.000	0.001 **	-0.000	0.000 **	-0.000 ***
+ RER in Differences	0.001 ***	0.000	0.001 **	-0.000	0.001 ***	-0.001 ***
+ Infl., NER in Levels	0.001 ***	0.000	0.001 **	-0.000	0.000 **	-0.000 ***
+ Infl., NER in Differences	0.001 ***	0.000	0.001 ***	-0.000	0.001 ***	-0.001 ***
Relative Risk Aversion: 10						
Basic VAR	0.003 ***	0.001	0.001 **	-0.001	0.001 ***	-0.001 ***
+ RER in Levels	0.002 ***	0.001	0.001 **	-0.001	0.001 **	-0.001 ***
+ RER in Differences	0.003 ***	0.001	0.001 **	-0.001	0.001 ***	-0.001 ***
+ Infl., NER in Levels	0.002 ***	0.000	0.001 **	-0.001	0.001 **	-0.001 ***
+ Infl., NER in Differences	0.003 ***	0.001	0.001 ***	-0.000	0.001 ***	-0.001 ***
Relative Risk Aversion: 30						
Basic VAR	0.009 ***	0.003	0.004 **	-0.002	0.004 ***	-0.004 ***
+ RER in Levels	0.007 ***	0.001	0.004 **	-0.002	0.002 **	-0.002 ***
+ RER in Differences	0.008 ***	0.003	0.004 **	-0.002	0.003 ***	-0.004 ***
+ Infl., NER in Levels	0.006 ***	0.001	0.004 **	-0.002	0.002 ***	-0.002 ***
+ Infl., NER in Differences	0.008 ***	0.003	0.004 ***	-0.001	0.003 ***	-0.003 ***
Relative Risk Aversion: 100						
Basic VAR	0.029 ***	0.009	0.012 **	-0.007	0.012 ***	-0.012 ***
+ RER in Levels	0.022 ***	0.003	0.013 **	-0.006	0.008 ***	-0.008 ***
+ RER in Differences	0.028 ***	0.009	0.012 **	-0.006	0.012 ***	-0.012 ***
+ Infl., NER in Levels	0.021 ***	0.002	0.013 **	-0.006	0.007 ***	-0.007 ***
+ Infl., NER in Differences	0.027 ***	0.009	0.013 ***	-0.004	0.011 ***	-0.011 ***

This table shows the regression results of the bilateral current account on the model-predicted portfolio shares on an annual basis. It shows the results for a U.S. investor. Three different regressions are reported: our basic specification that regresses the bilateral current account on contemporaneous and lagged optimal portfolio shares (alpha and L.alpha, respectively), the basic specification with a time trend, and the basic specification including a lagged dependent variable. The results are shown for different values of the relative risk aversion parameter: 5, 10, 30, and 100. Different series of model-predicted portfolio shares are considered based on our five VAR specifications used to calculate expected asset returns. The bilateral current account data is expressed as a percentage of GNP. * means significant at 10%, ** at 5%, and *** at 1% levels.

Appendix Table 1.3. Actual Bilateral Current Account vs. Optimal Portfolio Shares
Japanese Investors

	Basic Specification (BS)		BS + Time Trend		BS + Lagged BCA	
	Alpha	L.Alpha	Alpha	L.Alpha	Alpha	L.Alpha
Relative Risk Aversion: 5						
Basic VAR	-0.002 ***	0.000	-0.001 **	0.000	-0.001 ***	0.001 ***
+ RER in Levels	-0.001 ***	0.000	-0.001 **	0.000	0.000 **	0.000 ***
+ RER in Differences	-0.001 ***	0.000	-0.001 **	0.000	-0.001 ***	0.001 ***
+ Infl., NER in Levels	-0.001 ***	0.000	-0.001 **	0.000	0.000 **	0.000 ***
+ Infl., NER in Differences	-0.001 ***	0.000	-0.001 **	0.000	-0.001 ***	0.001 ***
Relative Risk Aversion: 10						
Basic VAR	-0.003 ***	-0.001	-0.001 **	0.001	-0.001 ***	0.001 ***
+ RER in Levels	-0.003 ***	-0.001	-0.001 **	0.001	-0.001 **	0.001 ***
+ RER in Differences	-0.003 ***	-0.001	-0.001 **	0.001	-0.001 ***	0.001 ***
+ Infl., NER in Levels	-0.002 ***	0.000	-0.001 **	0.001	-0.001 **	0.001 ***
+ Infl., NER in Differences	-0.003 ***	-0.001	-0.001 ***	0.001	-0.001 ***	0.001 ***
Relative Risk Aversion: 30						
Basic VAR	-0.009 ***	-0.003	-0.004 **	0.002	-0.004 ***	0.004 ***
+ RER in Levels	-0.007 ***	-0.001	-0.004 **	0.002	-0.003 ***	0.003 ***
+ RER in Differences	-0.009 ***	-0.003	-0.004 **	0.002	-0.004 ***	0.004 ***
+ Infl., NER in Levels	-0.007 ***	-0.001	-0.004 **	0.002	-0.002 **	0.002 ***
+ Infl., NER in Differences	-0.008 ***	-0.003	-0.004 ***	0.002	-0.003 ***	0.003 ***
Relative Risk Aversion: 100						
Basic VAR	-0.030 ***	-0.010	-0.013 **	0.007	-0.012 ***	0.012 ***
+ RER in Levels	-0.024 ***	-0.003	-0.014 **	0.007	-0.009 ***	0.008 ***
+ RER in Differences	-0.029 ***	-0.010	-0.012 **	0.006	-0.012 ***	0.012 ***
+ Infl., NER in Levels	-0.022 ***	-0.002	-0.013 **	0.006	-0.008 ***	0.007 ***
+ Infl., NER in Differences	-0.027 ***	-0.009	-0.012 ***	0.005	-0.011 ***	0.011 ***

This table shows the regression results of the bilateral current account on the model-predicted portfolio shares on an annual basis. It shows the results for a Japanese investor. Three different regressions are reported: our basic specification that regresses the bilateral current account on contemporaneous and lagged optimal portfolio shares (alpha and L.alpha, respectively), the basic specification with a time trend, and the basic specification including a lagged dependent variable. The results are shown for different values of the relative risk aversion parameter: 5, 10, 30, and 100. Different series of model-predicted portfolio shares are considered based on our five VAR specifications used to calculate expected asset returns. The bilateral current account data is expressed as a percentage of GNP. * means significant at 10%, ** at 5%, and

Appendix Table 1.4. Regression Analysis: Actual vs. Predicted Bilateral Current Account

	Basic Specification (BS)	BS + Time Trend	BS + Lagged Vars.		Vars. in Diff.
			PBCA	L.PBCA	
Basic VAR	0.004 ***	0.001 *	0.001 ***	-0.001 **	0.001 ***
+ RER in Levels	0.003 ***	0.001 *	0.001 ***	-0.001 ***	0.001 ***
+ RER in Differences	0.004 ***	0.001 **	0.001 ***	-0.001 **	0.001 ***
+ Infl., NER in Levels	0.003 ***	0.001 **	0.001 ***	-0.001 ***	0.001 ***
+ Infl., NER in Differences	0.004 ***	0.001 **	0.001 ***	-0.001 **	0.001 ***

This table shows the results of four different regression specifications: a basic specification that regresses the actual bilateral current account on the predicted bilateral current account (PBCA), the basic specification with a time trend, the basic specification including lagged values of both the dependent and independent variables, and a fourth specification with both variables in differences. The results are reported for different series of model-predicted portfolio shares: our five VAR specifications are considered to calculate expected asset returns. The regressions use annual data. Actual data is scaled by U.S. GNP and the predicted data is scaled by model-based U.S. wealth. A relative risk aversion coefficient of 10 has been assumed. * means significant at 10%, ** at 5%, and *** at 1% levels.

Appendix Table 1.5. Regression Analysis: Actual vs. Hybrid Predicted Bilateral Current Account

	Basic Specification (BS)	BS + Time Trend	BS + Lagged Vars. HPBCA	BS + Lagged Vars. L.HPBCA	Vars. in Diff.
Relative Risk Aversion: 10					
Basic VAR	0.001 *	0.001 *	0.001 **	-0.000	0.000
+ RER in Levels	0.001 **	0.001 **	0.000 **	-0.000	0.000 **
+ RER in Differences	0.001 *	0.001 *	0.001 **	-0.000	0.000
+ Infl., NER in Levels	0.001 **	0.001 **	0.000 ***	-0.000	0.000 ***
+ Infl., NER in Differences	0.001 *	0.000 *	0.001 ***	-0.000	0.000 **
Relative Risk Aversion: 2000					
Basic VAR	0.188 **	0.104 *	0.104 **	-0.006	0.060
+ RER in Levels	0.102 ***	0.039 **	0.028 **	-0.014	0.023
+ RER in Differences	0.189 **	0.099 *	0.099 **	-0.002	0.056
+ Infl., NER in Levels	0.102 ***	0.039 **	0.028 **	-0.014	0.023
+ Infl., NER in Differences	0.186 ***	0.092 **	0.088 **	-0.026	0.064 **

This table shows the results of four different regression specifications: a basic specification that regresses the actual bilateral current account on our hybrid measure (HPBCA), the basic specification with a time trend, the basic specification including lagged values of both the dependent and independent variables, and a fourth specification with both variables in differences. Our hybrid bilateral current account uses actual data on wealth, consumption, and savings. The results are based on different series of model-predicted portfolio shares: our five VAR specifications are considered to calculate expected asset returns. The regressions use annual data. Both measures of the bilateral current account are scaled by U.S. GNP. The results are shown for a relative risk aversion coefficient of 10 and 2000 in the top and bottom panel, respectively. * means significant at 10%, ** at 5%, and *** at 1% levels.

Chapter 2

Unexploited Gains from International Diversification: Evidence from the Mutual Fund Industry

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This chapter studies the lack of perfect international diversification by analyzing unique micro data on U.S. institutional investors' foreign holdings. It focuses on two questions related to international investment and access to international capital markets. First, does the structural change in the U.S. mutual fund industry toward more "aggregation" (favoring funds that invest globally over funds that invest in specific countries or regions) affect firms in other countries? And second, are investors forgoing gains from international diversification by shifting toward more global funds? We find that the answer is yes to both questions. In particular, we find that mutual fund managers tend to invest in a finite – and rather small – number of stocks almost independently of the level of country aggregation. In other words, the number of stocks in a mutual fund portfolio does not tend to rise significantly as funds have a broader mandate to invest in more countries. We also show that there are unexploited diversification gains to be made, even when the both

Specialized and Global funds are all part of the same mutual fund family. The work has several important implications for emerging and transitional economies trying to attract foreign capital and trying to develop their own institutional investor bases. It sheds light on the scope of action that government and companies have when attracting funds from international institutional investors.

2.1. Introduction

One of the most studied and well known puzzles in international economics is that portfolio holdings are home biased. It simply states that investors are not nearly as internationally diversified as their consumption and income path would imply. This has profound implications for both individuals (who supply funds) and firms and countries (which demand funds).

For individuals, the presence of home bias means that they could do better in terms of risk diversification by holding more international assets, for a given level of expected returns (or, alternatively, they could increase returns for a given level of risk). This is especially important nowadays as many countries are adopting defined contribution pension systems, according to which individuals need to save for retirement by investing locally and globally through institutional investors. Among other things, less home bias would help improve the performance of the savings invested in mutual and pension funds, boosting pension benefits.

For borrowers (firms and governments), specially in developing countries, imperfect international diversification in developed countries means that international capital is not available to everyone, even as domestic fundamentals improve. This might present a serious constraint, since capital is expected to flow from rich to poor countries to finance investment in higher return projects in the developing world. Home bias might then lead to problems of access to finance as some firms and countries are unable to tap international capital at "reasonable" costs. For governments, home bias also presents a challenge as they try both to foster capital market development (attracting foreign savings) and to promote domestic savings (allowing residents to invest abroad).

The literature has advanced several explanations for the lack of international diversification, starting with the seminal work by French and Poterba (1991). It has mentioned the existence of non-tradable goods, the prevalence of frictions in international transactions, the costly collection of information, and the limited information handling by fund managers among other sources of the home bias. All these explanations have proven to be successful in accounting for some of the observed patterns in the data. See, for example, Lewis (1999), Obstfeld and Rogoff (2001), Pesenti and van Wincoop (2002), and Engel and Matsumoto (2005) for the role of non-tradables; Portes and Rey (2005) for frictions in international transactions; Brennan and Cao (1997), Ahearne, Griever and Warnock (2004), and Hatchondo (2005) for the effects of asymmetric information; Fidora, Fratzscher, and Thimann (2006) for the role of bilateral real exchange rate volatility; and Strong and Xu (2003) for bias in relative optimism among fund managers toward their home market. Lewis (1999) and Karolyi and Stulz (2003) provide a detailed survey of the literature on home bias. The empirical evidence has mostly concentrated on aggregate variables. One exception is Cai and Warnock (2005).

We propose a different approach to study the lack of perfect international diversification, by analyzing unique micro data on institutional investors' international holdings. In particular, we study how U.S. mutual funds established to purchase assets around the world invest in other countries. We also assess the implicit costs, if any, involved in their investment strategies.

The first advantage of working with mutual funds is that they manage a significant portion of world savings. In particular, they constitute a mature industry with a strong presence in international markets. In 2005, there were 8,044 U.S. mutual funds with market capitalization of US$8 trillion (69% of U.S. GDP). In fact, out of US$13 trillion of assets invested in the U.S. retirement market, 24% of it is invested through mutual funds. European mutual funds are also equally developed. In 2005, there were 28,500 European mutual funds (EU15), with market capitalization of US$5 trillion (44% of GDP in 2004). Mutual funds also have a strong presence in developing countries. For instance, in Latin America and Asia (ex-Japan), mutual fund assets represent 16 and 18% of GDP, respectively, and they account for 6% of GDP in Eastern Europe. The second advantage is data availability. Mutual funds are required to disclose their portfolio on a regular basis. We can thus track their investment behavior over time. This characteristic of the mutual fund industry contrasts with other types of investors such as hedge funds, many pension funds, and individual international investors, for which data is not publicly available. Lastly, we choose the U.S. industry because it is the largest one in the world; it is a large provider of funds to developed and developing countries alike; it has very clear reporting rules; and we have access to historical reports. Furthermore, lessons derived from the U.S. mutual fund industry tend to apply to other countries, as they foster their own institutional investors. Also, U.S. mutual funds tend to be replicated abroad, so whatever this industry does has spillover effects on other countries. Finally, U.S. mutual funds are held not only by U.S. investors but also by foreigners.

In this chapter, we focus on two questions related to international investment and access to international capital markets. The first question arises from the fact that the U.S. mutual fund industry is moving toward higher levels of "aggregation," favoring large funds that invest globally (Global funds) over smaller funds that invest in more specific regions or countries (Specialized funds). This shift toward higher aggregation has probably been prompted by financial crises, which induced mutual funds to try to avoid constraints in their investment decisions. So a natural question that arises is: to what extent this structural change in the U.S. mutual fund industry affects firms in other countries?

We start by evaluating the degree of international diversification among mutual funds across and within fund families (a mutual fund company for most cases) for different investment spans. In particular, the U.S. mutual fund industry is organized by splitting funds according to their scope of investment. There are five distinct classes: World Stock, Foreign Stock, Emerging Market, Regional, and Country funds. These different classes indicate what type of stocks they are aiming at: World Stock funds can invest everywhere; Foreign Stock funds can invest everywhere except the U.S.; Emerging Market funds are supposed to invest only in emerging markets; Regional and Country funds invest only in a particular region or country, respectively. This classification can be understood as the different degrees of aggregation of the investment portfolio. For instance, World Stock funds aggregate Foreign Stock and U.S. funds, Foreign Stock funds aggregate several Emerging Market, Regional, and Country funds, and so forth. Thus, we compare the degree of international diversification by comparing the different degrees of investment specialization within the same mutual fund family. In principle, as the level of aggregation increases, funds should be able to hold more assets across countries and diversify risk better.

To clarify our strategy, it is convenient to concentrate on a particular fund family: Fidelity Group. Fidelity Group has a Regional fund for South East Asia, and has Country funds for China and Japan (there are more, but let's just keep the example as simple as possible). These funds are supposed to be investing in different countries/regions, and therefore their holdings are unlikely to intersect. And indeed, they had no stocks in common in 2005. Fidelity Group also has a mutual fund for Asia. This fund has access to all assets that the Regional and Country funds have, and to many other assets as well. Therefore, we should expect that some of the holdings from the Regional and Country funds are also present in the Asian fund. Furthermore, Fidelity has a World Stock fund and Foreign Stock fund, which also include Specialized funds as part of their investment possibilities – as depicted in Figure 2.1.

Thus, our first question is simply: what is the likelihood that a stock that is held by a Specialized fund also belongs to the portfolio of Global funds? We find, very surprisingly, that the likelihood is small. More than 70% of the holdings of Specialized funds are not shared by their Global counterparts. In other words, as their scope of investment becomes broader, mutual funds invest in fewer stocks within each region of exposure. Therefore, the trend in international investing favoring more aggregate funds is at the expense of some firms (and possibly countries) not having access to those funds. The latter are likely small firms and small countries, which do not tend to be attractive to large funds.[39]

Of course, it is possible to argue that the optimal Specialized fund portfolio should include a specific asset, but the optimal Global fund portfolio would have a zero weight on the same asset – maybe because another asset in the world already provides the diversification benefits that this asset was providing at the regional level. This motivates our second question. Are investors forgoing gains from international diversification by the shift toward more global funds? Or, in our example, can Fidelity Asia improve its performance by investing in Fidelity China? Not any form of investment is assumed; we only allow a buy and hold strategy, with no short-selling.

Notice that this is a very restrictive question. We are not asking Fidelity Asia to invest in any possible stock available in Asia. We are asking Fidelity Asia to buy and hold Fidelity China. If the gains are negligible, it means that the additional stocks in the Fidelity China fund are not necessarily useful for Fidelity Asia – at least not in the same proportions as they are currently held in Fidelity China. It could also mean that firms (and countries) excluded from the investment decisions of more aggregate funds might find it difficult to attract international capital in the future. Nonetheless, we find conclusive evidence of the opposite. Fidelity Asia would enormously benefit from investing in Fidelity China.

In sum, we find that, even within the same fund company, more aggregate funds (Global funds) are not diversified enough – even though the information costs about particular stocks have already been paid by the mutual fund company once a Specialized fund holds them. We study in detail different definitions of what "better performance" means. They depend on expected returns, variance, and benchmarks to which a fund is

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[39] See Agaarwal, Klapper, and Wysocki (2005) for an analysis of country level and firm level characteristics that affect the cross-section of U.S. mutual fund holdings in emerging markets in 2002.

compared. We are more precise in the empirical section; however, independent of the definition, we do find significant benefits to diversifying within a mutual fund family.

The chapter is organized as follows: Section 2.2 describes our data. Section 2.3 discusses our stylized fact regarding the shift toward more aggregate funds. It also presents the empirical evidence on the extent of international diversification by analyzing mutual fund portfolio holdings. Section 2.4 studies whether there are potential gains from further international diversification by Global funds. Section 2.5 concludes.

2.2. Data Description

In this chapter, we focus on U.S. equity mutual funds that are established to purchase assets around the world. Funds that focus primarily on a debt-equity allocation are excluded from the analysis, even though they do invest a significant share of their portfolios in foreign stocks. We use two types of data in our empirical analysis: mutual fund holdings data and mutual fund price data.

Mutual fund holdings data is available from Morningstar International Equity Mutual Funds, a private company that collects mutual fund data, and from the U.S. Securities and Exchange Commission (SEC). Reports are published on a monthly basis since 1992.[40] However, mutual funds do not disclose their holdings as frequent. They do so, at most, on a quarterly basis, and typically bi-annually. Given this heterogeneity in the releases of holdings, we construct our database with the last reported portfolio information for each fund for any given year. For example, our sample of mutual fund holdings for 2005 contains portfolio data for the Fidelity Worldwide fund, with portfolio holdings as of October 2005, and portfolio data for Scudder Global fund, with portfolio holdings as of December 2005. We collect detailed information on portfolio holdings: stock names, amount invested in each stock by each fund, and country of origin of these holdings on a yearly basis.

[40] We analyze Morningstar reports from March 1992 to June 2006.

A difficulty in constructing this database is that holdings for each fund are reported separately. Moreover, stock identifiers are rarely available, and if so, are not always unique. We do match these holdings across mutual funds over time based on the country of origin and the stock name for each security holding.[41] We can thus determine whether the same stocks appear in different mutual fund portfolios over time, across and within fund families. The top panel of Table 2.1 describes the dataset. We collect data on about 8,000 fund-year portfolio holdings over the period 1991 to 2005, covering 505 different families of mutual funds. Each mutual fund family has on average 6 different mutual funds.[42] Within each family, funds are classified as: World Stock funds, Foreign Stock funds, Emerging Market funds, Latin America and the Caribbean funds, Asia and Pacific funds, Europe funds, and Country funds. Funds in the first two classifications, World Stock and Foreign Stock, are also called Global funds throughout this chapter. All other fund types are denominated Specialized funds, as they invest in a subset of assets that can be held by Global funds.

The other type of data collected is return/price data on mutual funds themselves, over time. This dataset allows us to assess issues related to the gains from international diversification at different levels of portfolio aggregation by mutual funds. The data is available from Bloomberg from September 1989 to June 2006 on a daily basis. As reported in Table 2.1, we collect data for the largest 36 mutual fund families, including all funds within a given family of funds. On average, each family has 10 different mutual funds.[43]

2.3. The Extent of International Diversification by U.S. Mutual Funds

2.3.1. Recent Trends: Increased Importance of Global Funds

[41] The country of origin is available for the 1997-2005 period only. We thus do not attempt any matching of holdings for earlier periods.

[42] Some families sell the same portfolio to investors under different names depending on their fee structure. Here, we count them as one. For example, Fidelity Advisors Funds had the following funds in 2005: Fidelity Advisors Latin America A, Fidelity Advisors Latin America B, Fidelity Latin America T, etc. These funds have a different fee structure and are thus treated differently by Morningstar. However, because they all hold the same portfolio, we consider them as being the same fund for our purposes.

[43] See Appendix Table 2.1 for a detailed description of the sample coverage of the price/returns data for each mutual fund family.

The total number of funds has increased dramatically in the last two decades. For instance, in 1991 there were less than 200 U.S. mutual funds established to invest in international equity, while in 2005, there are almost 800 funds, more than a four-fold increase. This marked increase is not restricted to a specific type of mutual fund. Figure 2.2A shows the number of mutual funds from 1991 to 2005 by fund type. Foreign Stock funds are the ones with the most noticeable increase: from 61 funds in 1991 to 388 in 2005. Emerging market funds also follow a similar trend: they were almost inexistent in 1991 and there are roughly 75 funds in 2005, although most of this increase happened in the late 1990s. Regional funds also experience a sizeable growth up to the end of 1990s as well, but have been decreasing since then. In Figure 2.2B, we aggregate mutual funds into Global and Specialized funds. Although the number of both fund types has grown four times between 1991 and 2005, there are almost three times as many Global funds as Specialized funds.

Once the size of these funds is taken into account, Global funds are even more important than Specialized funds, being almost four times as large as Specialized funds in 2005. Global funds manage US$787 billion, whereas Specialized funds have net assets under management around US$162 billion. Moreover, these fund types have been growing at different rates. Global funds, especially Foreign Stock funds, have grown much faster than Specialized funds, as shown in Figures 2.2A and 2.2B. Notice that after 2000, although the speed at which funds are growing in number has declined, the net assets under management have continued to increase, and significantly so for Global funds. This empirical evidence thus shows a clear trend in the U.S. mutual fund industry toward more aggregate funds (Global funds) over funds that invest in specific regions or countries (Specialized funds).

2.3.2. Size of Potential Holdings and Actual Holdings

A first step to understand the extent of international diversification by mutual funds is to analyze the universe of assets that can be held by the sample of mutual funds analyzed in this chapter. As already highlighted, they can potentially invest in stocks anywhere in the world. Table 2.2A reports the size of this universe of stocks in 1997 and in 2004.[44,45] It shows the total number of listed stocks across different regions for both developed and developing countries. These potential holdings are larger in developing countries than in developed countries. However, this difference has fallen over time. The number of stocks has grown 40% during the period in developed countries, but "only" 20% in developing countries – mostly concentrated in developing Europe.

This universe of potential holdings is large, and not surprisingly, mutual funds only invest in a fraction of these assets. Table 2.2A reports the actual number and size of mutual fund holdings. In 1997, funds invested in around 9,000 different firms. In developed countries, they held around 6,800 firms, an average of 50% of the available assets, and invested US$204 billion on these firms. However, in developing countries, these numbers are much smaller: they held only 2,271 firms, or 13% of the available stocks, that amounted to an investment of US$30 billion. To further analyze this evidence, Figure 2.3 reports the distribution of these investment ratios across countries, averaged over the 1997-2004 period.[46] Countries are sorted by the extent of foreign investments they receive measured by the ratio of number of assets held by mutual funds over the total number of listed stocks. Countries are divided in five equally-sized groups (quintiles). Reinforcing the previous evidence, this figure shows that mutual fund holdings are not evenly spread across countries. Half of the countries in the sample have investment ratios of 20% or less. For example, only developed countries appear in the highest quintile. Among developing countries, Mexico is the one with the largest ratio (44%), whereas among developed

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

[45] This number is an underestimation of the true universe of assets that can be purchased by mutual funds. First, mutual funds occasionally hold assets that are not listed in stock exchanges and therefore would not show up in these aggregate numbers. This is the case when they buy government bonds for example. And second, there are a number of firms, especially from developing countries, with headquarters and operations in one country but with stock exchange listings in another, usually in financial centers such as London, U.K. Thus, they would also not be counted in the number of total listed firms in its own country, but actually in another one.

[46] The reported numbers are an overestimation of the true values, for the same reasons why the total number of listed stocks is an underestimation of the true values.

countries, Netherlands has the largest ratio (77%). In the bottom two percentiles, there are 24 developing countries but only four developed countries. In sum, mutual funds tend to hold a larger fraction of listed firms from developed countries than from developing countries.

Although the universe of listed companies has increased between 1997 and 2004, there has been a considerable fall in the number of mutual fund holdings during this period, as shown in Table 2.2A. These holdings are spread across 1,085 different firms in developing countries and around 5,200 in developed countries in 2004. These numbers represent a decline in holdings that has not been concentrated in any particular region, but has been more accentuated in developing countries – a fall of 52% is observed, evenly spread across the different regions. In developed countries, the number of holdings decline 24%. Notice however that the amount invested in these foreign firms has increased significantly over time. Mutual funds invest 119% more in developed countries in 2004 than they did in 1997. Similarly, in developing countries, the amount invested increases by 106%, to US$62 billion. Thus, this evidence implies that a smaller subset of firms is receiving a growing amount of investments from these institutional investors.

As shown in Table 2.2B, a similar pattern emerges when we focus on Global funds only, the mutual fund type that has grown more significantly in recent years. In 1997, they held 4,953 different firms in developed countries, an average 38% of the number of potential stocks available. This is a smaller fraction than the average in the U.S. mutual fund industry as a whole. In 2004, these holdings have decreased to 4,799 firms, only 26% of the available assets. In developing countries, the number of holdings fell approximately 46%, from 1,314 to 711 firms, or equivalently, from 8% to only 3% of the number of available stocks. This fraction is also smaller than the industry average.

Although the number of holdings has been falling, the amount invested in these stocks has grown significantly, in both developed and developing countries. Investments in developed countries have increased from US$178 billion to US$392 billion, more than doubling during this period. In developing countries, investments have increased from

US$17 billion in 1997 to US$31 billion in 2004. Thus, the evidence for Global funds reinforces our previous results: a growing amount of funds is being invested in fewer firms, and more significantly so in developing countries.

2.3.3. Actual Holdings: Further Evidence

In this section, we explore if and how mutual fund holdings vary across different fund types. In other words, we evaluate the extent of international diversification among mutual funds across and within fund families for different investment spans. In principle, as the level of aggregation increases, funds should be able to hold more assets across countries and diversify risk better. However, if this turns out not to be the case, the trend in international investing favoring more aggregate funds will be at the expense of some firms, and possibly even countries, not having access to funds from this pool of investors.

Figure 2.4 shows the average number of holdings for different mutual fund types from 1991 to 2005. The top panel reports these averages for the following fund types: World Stock funds (with and without U.S. holdings), Foreign Stock funds, Emerging Market funds, and Regional funds. The average number of holdings is surprisingly stable over time and similar across fund types. Global funds hold on average between 100 and 190 stocks, with no trend clearly observed over time. Holdings of Emerging Market funds fluctuate between 70 and 170 stocks, very similar to the number of holdings of Foreign Stock funds. Regional funds hold slightly less stocks, on average between 90 and 120. In the bottom panel of Figure 2.4, Regional funds are expanded into its three categories: Latin America and the Caribbean funds, Asia and Pacific funds, and Europe funds. The average number of holdings for Country funds is also shown. The same pattern is observed for all these funds: there is no clear trend and the number of stocks is similar across the different types.

Although we present some evidence that the number of holdings is relatively stable over time and across fund types, we have not yet shown how important are family effects. Figures 2.5A and 2.5B show the average number of holdings within the largest mutual fund families, averaged across all funds within a given family. The figures suggest that there is a great variance in these numbers across families. Some families, e.g. GAM Funds and Oppenheimer Funds, hold on average a lot less than 200 stocks, while others hold at least two times more, e.g. Dreyfus Founders and Vanguard Group. There is also heterogeneity in the number of holdings within mutual fund families. In some families, there is almost no variance in the number of holdings across different funds, e.g. Smith Barney Group and Goldman Sachs Management Group, whereas in others there is a large difference, e.g. DFA Investment Dimensions Group and Morgan Stanley Funds. Thus, family effects do seem large and potentially important.

Next, we compare how important are family effects versus time and fund type effects to explain the number of holdings across mutual funds over time. In Table 2.3, we report a summary of regressions of the number of holdings, as our dependent variable, on year, fund type, and family dummies. The dummy coefficients are not reported, although they are usually significant at 1% confidence level. Seven different specifications are reported. In the first specification only year dummies are considered. In this case, less than 1% of the variance in these mutual fund holdings can be explained. Next, we report a regression with fund type dummies alone. Once more, a small percentage of the variance of our dependent variable, only 3%, can be explained by these dummies. If an interaction between family and year dummies are considered, as in specification three, the R-square increases to 0.05, still a small number though. Next, in the fourth specification, we include family dummies. In this case, 46% of the variance in the number of holdings across funds over time can be explained by family effects, a much greater percentage than what was explained by fund type and year effects alone. The last three reported regressions include family dummies and: fund type dummies; or fund type and year dummies; or alternatively, dummies with the interactions between family and year effects. In all these cases, there is only a slight increase in the R-squared. Therefore, family effects indeed seem to be the relevant ones to explain mutual fund holdings. Lastly, given the importance of family effects, Figure 2.6 illustrates the size of the family effect. It shows the distribution of the estimated coefficients for family dummies in specification four of Table 2.3. The estimated coefficients are sorted from the lowest to the highest value. There is large heterogeneity in family effects, reinforcing our previous evidence.

In sum, we have shown so far that mutual fund managers tend to invest in a finite – and rather small – number of stocks almost independently of the level of country aggregation. In other words, the number of stocks in a fund's portfolio does not tend to rise significantly as funds have a broader mandate to invest in more countries. However, there is a lot of heterogeneity in mutual fund holdings that can be partly explained by mutual fund family effects.

2.3.4. International Diversification by Mutual Funds

In this section, we extend the evidence presented so far by addressing a more specific question: what is the likelihood that a stock held by a Specialized fund also belongs to the portfolio of Global funds, within the same family of funds? Do Global funds hold only a subset of the assets that Specialized funds hold? Or do they hold a completely different portfolio? We are thus trying to shed light on the portfolio composition of funds with different scope of investments.

To answer these questions, we compute frequency counts in our sample. In other words, we count the number of observations for pairs of fund types in which: either a stock is held by a certain fund type but not held by the other; or a stock is held by both types of funds; or a stock is not held by either of these two types, but some other fund type holds it. This comparison is made between the following pairs of funds: World Stock vs. Foreign Stock funds; Global vs. Specialized Funds; World Stock vs. Specialized funds; and Foreign Stock vs. Specialized funds. Given the large heterogeneity in holdings across mutual fund families, these frequency counts are done within mutual fund families. Hence, if a given family does not have both types of funds analyzed, it is excluded from the frequency count. Each observation is thus a family-year-stock observation. The results are shown in Table 2.4A, for all foreign holdings in the sample, and Table 2.4B, for holdings in developing countries. Each of these tables is divided into four sub-tables, representing the different comparisons between fund types. In each of these sub-tables, we report relative frequencies of each cell, i.e., the unconditional probabilities.

First, we analyze the composition of portfolios within Global funds, i.e. the comparison between World Stock and Foreign Stock funds reported in Table 2.4A.[47] In our sample, there is a 15% probability that a stock is held by both World Stock and Foreign Stock funds, conditional on a family having both types of Global funds. Moreover, conditional on being held by a Foreign Stock fund, there is a 24% probability that a stock is also held by a World Stock fund. On the other hand, if a stock is held by a World Stock fund, there is 56% probability that it would also be held by the Foreign Stock fund. Therefore, being held by a Foreign Stock fund suggests a high probability that a Global fund can also invest in this firm, but the opposite is not the case. The results suggest that Foreign Stock funds hold more assets than World Stock funds. Nevertheless, they also have a significant number of common stock holdings – there is a 15% probability that this is indeed the case.

Next, we analyze the portfolio holdings of Global funds versus Specialized funds. Given that Global funds are growing a lot faster than Specialized funds, this comparison can shed light on the consequences of this trend to foreign firms (and countries) trying to attract capital from these institutional investors. The evidence in Table 2.4A suggests that these funds do share some of their holdings – 16% of actual holdings are shared by both fund types. For example, conditional on being held by a Specialized fund, there is a probability of 33% that a Global fund would hold the asset as well. These funds also have a significant share of their portfolios in a different subset of assets. For instance, 25% of the observations imply holdings by only Global Funds, although there is a Specialized fund that could potentially invest in these assets. On the other hand, 32% of the observations imply holdings to Specialized funds alone even though these families do have Global funds. It should be noted though that there is a subset of assets, 27% of the observations, that are held by Global funds alone because there is no Specialized fund covering that region.

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

These numbers suggest that, conditional on the existence a Specialized fund covering a particular region, Specialized funds would actually hold a larger set of assets than Global funds. But if absolute numbers are considered, then Global funds might actually invest in a greater number of assets.

However, if only holdings in developing countries are analyzed, as reported in Table 2.4B, these results become stronger: 76% of the observations imply holdings by only Specialized funds, whereas the same number for Global funds is only 10%. The set of assets held by Global funds alone because of no Specialized fund decreases significantly to less than 2%. Moreover, if conditional probabilities are analyzed, these numbers are even more striking. Conditional on being held by a Specialized fund, there is a 91% probability that a stock is not held by a World Stock fund and an 87% that it is not held by a Foreign Stock fund. As expected, these funds also have common holdings in developing countries – 13% of them are shared. In sum, the vast majority of the mutual fund holdings in firms from developing countries are done through Specialized funds and not through Global funds. This evidence also implies that the results from Table 2.4A are being driven by holdings in developed countries – Global funds seem to be holding a larger set of firms in developed countries than Specialized funds, but mostly because there are not many Specialized funds covering these countries.

We have also distinguished between the different types of Global funds, namely World Stock and Foreign Stock funds, and compared them with Specialized funds. The results reported in the bottom sub-tables of Tables 2.4A and 2.4B reinforce the evidence above. It suggests that there is not a significant difference on portfolio holdings across Global funds: Specialized funds invest in a wider set of assets than both World Stock and Foreign Stock funds. They also have holdings in common assets. However, once all holdings are analyzed, the difference in the portfolio composition between World Stock and Foreign Stock funds made above is apparent. Conditional on being held by a Specialized fund, there is a 16% probability that a World Stock fund would also hold this asset. This probability increases to 30% if Foreign Stock funds are considered. In other words, the intersection of portfolio holdings between Specialized funds and Foreign Stock funds is significantly larger than with World Stock funds. This last result is being driven by portfolio holdings the larger number of holdings of Foreign Stock funds than that of World Stock funds.

The evidence reported in this section suggests that there is some intersection among the holdings of different mutual fund types. But the size of this commonality varies according to the different fund types in question and the different investment regions. We find that more almost 70% of the holdings of Specialized funds are not shared by their Global counterparts. This number is even larger if only holdings in developing countries are considered. On the other hand, the number of Global fund holdings not shared by their Specialized counterparts is small in developing countries. This suggests that in developing countries, Global funds tend to hold a subset of what Specialized funds hold. In developed countries, they do share some of the same assets; however a considerable part of Global fund portfolios is kept in different assets than the ones in Specialized fund portfolios. This result is being driven though by the lack of Specialized funds covering these countries.

In broad terms, the evidence in this section suggests that as their scope of investment becomes broader, mutual funds invest in fewer stocks (and possibly fewer countries) within each region of exposure. Therefore, the trend in international investing favoring more aggregate funds are at the expense of some firms not having access to those funds. The latter are likely small firms (and small countries), which do not tend to be attractive to large funds.

2.3.5. Entropy Measures

In the previous section, we analyzed the portfolio composition of funds with different scopes of investment. We focused on how similar mutual fund portfolios are. However, we have not addressed for example the size of investments in common assets. We have presented evidence that Global funds hold only a small subset of the stocks that Specialized funds hold. But if the loadings on those stocks are high, the portfolios would actually be more similar than they appear right now. Therefore, in this section, we study entropy or similarity/commonality measures to analyze how similar mutual fund investments actually are.

The entropy measure is constructed as follows:

$$Entropy_{f,t} = \frac{\sum\limits_{\substack{s\,=\,\text{Common Assets,}\\ f\,=\,\text{Fund Type } i}} NAV_{s,f,t} + \sum\limits_{\substack{s\,=\,\text{Common Assets,}\\ f\,=\,\text{Fund Type } j}} NAV_{s,f,t}}{\sum\limits_{\substack{s\,=\,All\text{ Assets,}\\ f\,=\,\text{Fund Types } i,j}} NAV},$$

Where:

$NAV_{s,f,t}$ is the net asset value of investments in stock s, by funds in family f, at time t;

$i, j \in$ {Global, World Stock, Foreign Stock, Specialized}.

In words, for a given pair of fund types, it is the ratio between the sum of mutual fund investments in assets common to the portfolio of these two fund types over the total net assets of the same two fund types in a given year for a given family. This measure is constructed within families, given the large family effects on the number of holdings. As reported in the previous section, the following pairs of fund types are analyzed: World Stock and Foreign Stock funds, Global and Specialized funds, World Stock and Specialized funds, and Foreign Stock and Specialized funds.

The summary statistics for this entropy measure are reported in the top panel of Table 2.5. In the bottom panel of Table 2.5, we constructed this entropy measured based only on holdings in developing countries. The results are very similar in the two cases. Within Global Funds, World Stock and Foreign Stock funds do share 50% of their portfolio investments in common assets. This suggests that their portfolios are more similar than the previous section had pointed to. Between Global and Specialized funds, the entropy measure also implies more similar portfolios, although the numbers are not as high: on average, 36% of investments are made in common assets. This number is only slightly higher if developing countries alone are considered. If World Stock funds and Foreign Stock funds are separately compared to Specialized funds, then the entropy measures indicate a lower degree of commonality in portfolio investments, 26% and 28%, respectively. Nevertheless, the standard deviation in all these comparisons is high, indicating that family and time effects can be large.

In Figure 2.7, we evaluate time effects. The figure shows the evolution of our entropy measures, averaged across families. Surprisingly, these measures seem to be falling over time. A decrease in these measures indicates that mutual fund portfolios are becoming less similar. In other words, they have been investing a smaller share of their portfolios in assets that are common across fund types.

Next, we evaluate the relative importance of time and family effects to explain variations in our entropy measures of portfolio similarities. We regress the four different measures on year and family dummies. The results are shown Table 2.6. For each pair of funds analyzed, three regression specifications are reported: the first one with time dummies, the second with only family dummies, and the third with both time and family dummies. The results are comparable across the different pairs of fund types: time effects explain around 3% of the variance in the entropy measures; family effects alone explain a significantly larger proportion of this variance, around 75%. When both family and time effects are considered, approximately 80% of the variance in the entropy measures can be explained. This outcome is similar to the evidence reported in Section 2.3.3.

In sum, we find that a considerably large proportion of the number holdings of Specialized funds are not shared by their Global counterparts. Moreover, once the size of mutual fund investments is considered, this number remains significantly high. In other words, as their scope of investment becomes broader, mutual funds invest a growing amount of funds in fewer stocks (and possibly fewer countries) within each region of exposure, especially in developing countries. One possible reason for this lack of international diversification in the portfolio of more aggregate funds is the existence of transaction costs. It is possible that Global funds are relatively large, and thus, are unable to buy and hold some of the smaller stocks in emerging markets without incurring in large transactions costs. Another reason could be costly information gathering. However, if there is any communication at all within mutual fund families, this cannot be the case. Even worse, this information is actually supposed to be public. So, there is no reason (at least legally) why Specialized funds don't just simply print out their holdings and share them with the Global fund manager. Of course, one reason could be that there are actually no benefits to this diversification. This is the theme of the following section.

2.4. Gains from International Diversification

In the second part of the chapter, we explore two alternative explanations for why, during the process of expanding the scope of investment, mutual funds drop stocks that are held at the regional level. First, we analyze the hypothesis that there are no gains from further international diversification for Global funds. We find actually that there are significant gains from the extra diversification, although there is heterogeneity among different fund families. We show that relatively cheap strategies, such as buy and hold, provide large gains that should compensate for transaction costs. Next, we test whether benchmark effects would justify the portfolio of choice of Global funds. Managers are generally evaluated on their performance relative to benchmark indices. Thus, portfolio decisions should incorporate these managerial incentives. We assess whether this extra constraint is sufficient to eliminate the gains from further diversification, as found in the previous exercise. Our results suggest that benchmark effects cannot explain the empirical evidence described in Section 2.3. Moreover, based on the results of the two tests we also conjecture that transaction costs are not large enough to offset the large gains from international diversification found. However, further tests are required for a definitive answer.

2.4.1. Empirical Strategy

In this section, we test different hypothesis for why, during the process of expanding the scope of investment, mutual funds drop stocks that are held at the regional level. Our first hypothesis is that Global funds do not need to increase their number of holdings. They already obtain the diversification provided by these extra assets by holding assets not available to Regional funds. We thus ask: how can we evaluate the gains from diversification that Global funds lose by not holding the stocks that Regional fund hold?

The first possibility is to construct a portfolio that includes all the stocks in the investment universe of a fund. We could then evaluate the performance of this new portfolio in several dimensions, preferably out-of-sample. This exercise almost surely will show that there are huge gains from diversification that have not been exploited. Indeed, the exercise is too unrestrictive and with too many degrees of freedom, which make unlikely the fact that it cannot improve upon the performance of the Global fund.

A second possibility is to restrict this portfolio to include only the stocks dropped within the mutual fund family, allowing any position on that stock. This strategy is more restrictive than the previous one; however there are still too many degrees of freedom. When you drop 100 stocks from different Specialized funds, it is still too easy to improve upon the performance of the Global fund.

Therefore, we have chosen a more conservative strategy to test the existence of further gains from international trade. We allow Global funds to invest in a portfolio that replicates exactly Specialized fund holdings, within the same mutual fund family. In other words, we are not asking Global funds to design their own strategies, but to follow exactly the portfolio that Specialized funds hold – portfolio that indeed is public information. Furthermore, we do not allow shorting of any of the Specialized funds.

There is an important advantage in concentrating these simulated portfolios at the family level – we can easily argue that the cost of collecting information has already been paid. In other words, if there is a cost to collect information about a particular country, or about a particular stock, then the fact that one mutual fund within a family of funds is already holding the asset is an indication that at least someone in the company has already paid for those costs. Therefore, if another fund within this same family is not holding the asset, it cannot be because the information cost has not been paid.

2.4.2. Optimization Strategies

There are several ways in which a portfolio can be constructed and evaluated. In this section we describe the ones we have focused on. The following restrictions are imposed:

1. Portfolios can be constructed for a specific fund type (among Global funds) using the respective fund itself and funds within the same mutual fund family with lower degrees of aggregation (Specialized funds).
2. Strategies can only be buy and hold.
3. Funds cannot be shorted.
4. The performance evaluation is always conducted out-of-sample.
5. The portfolio is optimized on a daily basis.

For instance, assume that there is a Global fund whose return history we observe and that we identify it as *G*. Assume that this Global fund is comprised of several Specialized funds, whose returns are denoted S_i. We can then construct a portfolio *P*, which puts non-negative weights on all Specialized mutual funds and on the Global fund itself. This portfolio *P* is the optimal portfolio that minimizes its own variance but it is constrained at achieving at least the same expected return as the Global fund itself. The optimization problem is described by (2.1) and (2.2). As already mentioned, this portfolio is constructed and evaluated out of sample – i.e. portfolio shares are computed at time *t* and held for the next period. We call this simulation approach our active strategy because we re-optimize portfolio weights every period.

$$\underset{x}{Min}\ \text{var(P)} = x'\Sigma x \ , \qquad (2.1)$$

$$
\begin{aligned}
&\text{such that:}\\
&E(P) \geq E(G)\\
&0 \leq x_i \leq 1\\
&\sum_i x_i < 1\\
&P = (1 - \sum_i x_i) * G + \sum_i x_i * S_i .
\end{aligned}
\qquad (2.2)
$$

There is a multitude of possibilities, and therefore, almost by construction this exercise is limited. Although it is incomplete in many dimensions, most mutual funds are compared and evaluated along two dimensions, once administrative aspects and their investment objective has been determined: returns and variances. In other words, Global mutual funds are evaluated according to their return and variance, after costs and loads have been taken into account. What we are doing in the exercise described above is to keep the return "constant", i.e. with the same objective, and to try to find a better portfolio in terms of its volatility.

Alternatively, another exercise we perform is to keep the variance "constant" and to maximize the expected return. This also active strategy is described as:

$$
\underset{x}{Max}\ \mathrm{E(P)} \qquad (2.3)
$$

$$
\begin{aligned}
&\text{such that:}\\
&\mathrm{var}(P) \leq \mathrm{var}(G)\\
&0 \leq x_i \leq 1\\
&\sum_i x_i < 1\\
&P = (1 - \sum_i x_i) * G + \sum_i x_i * S_i
\end{aligned}
\qquad (2.4)
$$

Furthermore, we can perform these exercises at several degrees of aggregation. We thus compare Specialized and World Stock funds, Specialized and Foreign Stock funds, Specialized funds and a portfolio of World Stock funds, and Specialized funds and a portfolio of Foreign Stock funds. Portfolios of either World Stock or Foreign Stock funds exist when more than one fund in a mutual fund family is classified as a Global fund but their main objective is either value, growth, or blend strategies. These funds aim at different sets of assets than "plain" Global funds. However, Specialized funds usually do not clearly state these investment strategies. We are thus trying to make a fairer comparison by putting together these Global funds. Regarding comparisons within Specialized funds, e.g. compare Regional and Emerging Market funds, we cannot make them because their scope of investment (or their aggregation) across fund types does not perfectly overlap, as in the studied cases.

Finally, and probably the most important benefit of these strategies is that we do not need to identify the exact stocks dropped across different mutual funds. In other words, the only information we need to perform this exercise is mutual fund returns and fund characteristics, i.e. the type of investments they are supposed to follow. This allows us to extend the time horizon of the data to start in the late 80's.

The summary statistics of these simulations are shown in two tables. In Table 2.7A we report the best simulation for each Global fund. These simulations typically include the largest possible number of Specialized funds, but generally do not have a very long time span due to data availability on mutual fund returns. In Table 2.7B we report the longest simulation for each Global fund – typically fewer Specialized funds are available within each of one of them, but a longer time span is covered. The following statistics are presented: the annualized returns for both Global fund and the constructed portfolio (called "active strategy"), the annualized improvement in returns if the constructed portfolio is compared with the Global fund, daily standard deviation of returns, and the number of simulations. We report averages across mutual fund families.

In the top panel of these tables, we report the summary statistics of portfolios built based on equations (2.1) and (2.2). The tables with the best simulations show that using our active strategy the average annualized return of the portfolio increases by 509 basis points per year for the World Stock funds, by 404 basis points for the Foreign Stock funds, and by 1,159 and 397 basis points for the portfolio of World Stock and Foreign Stock funds, respectively. With these increases in expected returns, it is hard to justify the lack of diversification on transaction costs! Again, this is assuming that they invest in other funds within the same family of funds – so there is no extra cost on acquiring information. Moreover, the daily standard deviation of the constructed portfolio returns is also smaller than the one on the Global fund. It falls by 9 basis points for the World Stock funds, by 6 basis points for the Foreign Stock funds, and by 8 and 6 basis points for the portfolio of World Stock and Foreign Stock funds, respectively. Although this number seems small, it is important to remember that this is the reduction in the daily standard deviation.[48]

If the longest possible simulations are considered, the results are still surprising. For example, the average improvement in returns is around 289 basis points per year and the improvement in the daily standard deviation of returns is 7 basis points. The results are more modest though than the ones reported on Table 2.7A. The reason is that fewer Specialized funds are available when the longest simulations are considered. This implies that there is less scope for improvement than in the other case.

In the bottom of Tables 2.7A and 2.7B, we report the summary statistics of portfolios constructed based on equations (2.3) and (2.4), i.e. maximization of the portfolio expected return holding its variance constant.[49] Considering the simulations with the greater number of Specialized funds, the improvements in annualized returns are around 161 basis point, whereas the improvement in the daily standard deviation is almost negligible at less than 1 basis point. If the longest simulations are considered, the improvement in returns is around 80 basis points and the improvement in the daily standard deviation is at 1 basis point, on average.

Therefore, the results on these simulations allow us to reject our first hypothesis: there are gains from further diversification to be made in both dimensions – return and

[48] We computed these tables at the family level as well. The results are shown in Appendix Table 2.2A for the best simulations, and in Appendix Table 2.2B for the longest simulation for each mutual fund. As expected, there is a lot of heterogeneity among them.

[49] The results at the mutual fund family level are reported on Appendix Tables 2.3A and 2.3B. There is a lot of heterogeneity in the results across mutual fund families.

volatility, although there is some heterogeneity in the results depending on the strategy used.[50]

2.4.3. Benchmarking

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

In the case of the first strategy, the variance minimization one, we modify the objective function to take into consideration a benchmark index. The benchmark is the appropriate MSCI index, specific for each Global fund as described in the Morningstar database. Instead of minimizing the variance of the portfolio, we minimize the variance of the difference between the portfolio and the benchmark index. Thus, equation (2.5) replaces equation (2.1) for this strategy. The constraints of this problem are unchanged and remain as stated in (2.2):

$$\underset{x}{Min}\ \text{var}(P - Bench). \qquad (2.5)$$

For our second strategy, the maximization of expected returns, we impose an additional restriction: the variance of the difference between the portfolio and the benchmark index has to be at most the same as the variance of the difference between the Global fund and the benchmark index. Equation (2.6) states this additional restriction:

[50] For robustness purposes, we try these simulations with a more restricted sample. We use rolling windows of 240 business days. The results are robust. They are reported in Appendix Tables 2.4A and 2.4B.

$$\text{var}(P - G_{Bench}) \le \text{var}(G - G_{Bench}) \tag{2.6}$$

The results of these new simulations are reported on Table 2.8A for simulations with the greatest number of Specialized funds for each Global fund, and on Table 2.8B for the longest simulations for each Global fund, and thus fewer Specialized funds. Once more, the tables report averages across mutual fund families.

For simulations that minimize the variance of the portfolio, the results are similar to the ones reported in the previous section. For simulations with the greatest number of Specialized funds, reported on the top panel of Table 2.8A, there is an improvement in annualized returns of 375 basis points for World Stock funds, 397 basis points for Foreign Stock funds, 735 basis points for portfolio of World Stock funds, and 334 for portfolios of Foreign Stock Funds. Thus, even for this strategy with benchmarking considerations, the increase in expected returns is large and hard to justify the lack of diversification based on transaction costs. Improvements in the standard deviation are also observed. On average, the daily standard deviation falls 4 basis points. If the longest simulations are considered, as reported in the top panel of Table 2.8B, the results are consistently robust. There is an increase in annualized expected returns of 262 basis points on average across the different simulations, and a decrease in daily standard deviations of 3 basis points.

If the second strategy is considered, the results are even stronger than before. In Table 2.8A, we report an improvement in annualized returns of 251 basis points on average across mutual fund families and an improvement in daily standard deviations of 4 basis points. In Table 2.8B, where fewer Specialized funds are included in portfolio simulations, the improvement in returns is 168 basis points, but reaches 544 basis points for the portfolio of World Stock funds. The improvement in daily standard deviations is also considerable: 10 basis points on average across mutual fund families.

Therefore, our results suggest that benchmark effects cannot explain the empirical evidence described in Section 2.3. We find that even within the same fund company more aggregate funds are not nearly internationally diversified enough. Although we do use restrictions in our simulations, including benchmarking restrictions, it is important to highlight that these simulations are far from fully satisfactory. Other restrictions can be used, and should be implemented, to evaluate the robustness of our results. For instance, we could include a value-at-risk constraint in which we limit the maximum loss the portfolio can bear. We can also evaluate the insurance they provide against some particular shock, or market condition.

2.5. Conclusion

In this chapter we study the old question of international diversification. Using a novel data set that describes in detail all stock holdings of U.S. mutual funds that invest in international stocks, we find two main results. First, Global mutual funds are not nearly diversified enough. Second, there are gains from further international diversification that can be achieved by simply replicating portfolios that are already being implemented within the same family of funds.

In the first part of the chapter, we find that as their scope of investment becomes broader, mutual funds invest in fewer stocks (and possibly fewer countries) within each region of exposure. Therefore, the identified trend in international investing favoring more aggregate funds is at the expense of some firms not having access to these funds. It is likely that small firms (and small countries), which do not tend to be attractive to large funds, are the ones being excluded from the portfolio of Global funds. However, further research is needed to better understand the characteristics of stocks (and perhaps countries) dropped by Global funds. If indeed stocks are being consistently excluded from the portfolio of Global funds, then these firms (and even countries) will have more difficulty in raising capital from foreign investors.

In the second part of the chapter, we test two alternative hypotheses regarding the reasons behind the empirical regularities documented in Sections 2.2 and 2.3. We find that, even within the same mutual fund company, more aggregate funds can gain substantially from further international diversification. Moreover, the costly information gathering hypothesis cannot explain this finding because supposedly mutual fund families have already paid for the information cost about particular stocks once their Specialized funds are investing in them. One hypothesis is that mutual fund managers have a limited capacity to manage information, and therefore, they can only handle a maximum number of assets. This has important implications for the optimal portfolios of investors willing to achieve optimal international diversification. Another possibility is the existence of an insurance premium in the returns of Global funds – there might be some gains during turbulent times achieved through the extra flexibility available to them. Investors might be willing to pay something for this benefit. We leave the analysis of these possibilities for future research.

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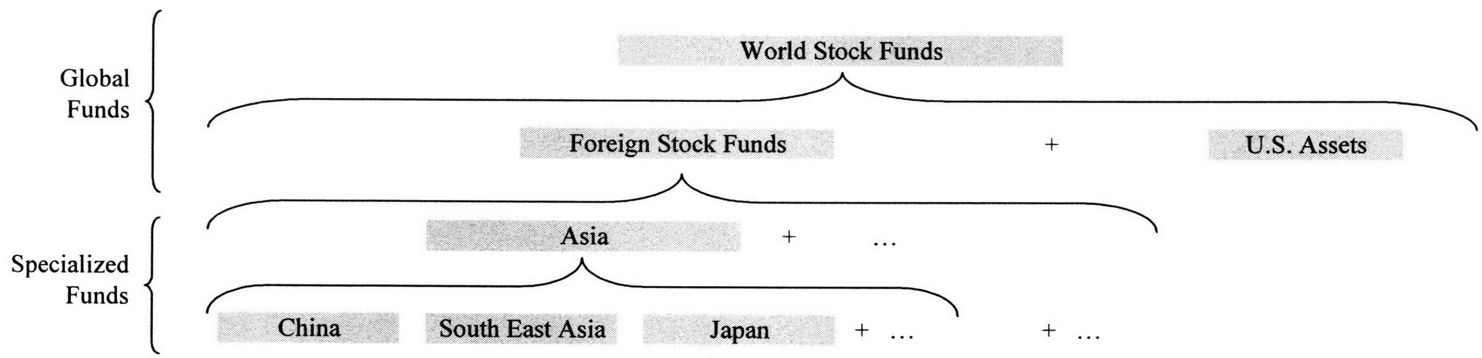

Figure 2.1. An Example of the Structure of the U.S. Mutual Funds Industry: Fidelity Group

This figure shows the structure of a family of funds analyzed in this paper - Fidelity Group. (This figure does not include all funds within this family.) This is just an example to characterize the organization of U.S. mutual fund families that invest in foreign assets. See description in the main text for more details. The figure also clarifies our classification between Global and Specialized Funds. Global Funds include both World Stock and Foreign Stock funds. Specialized funds include: Emerging Market funds, Regional funds, and Country funds.

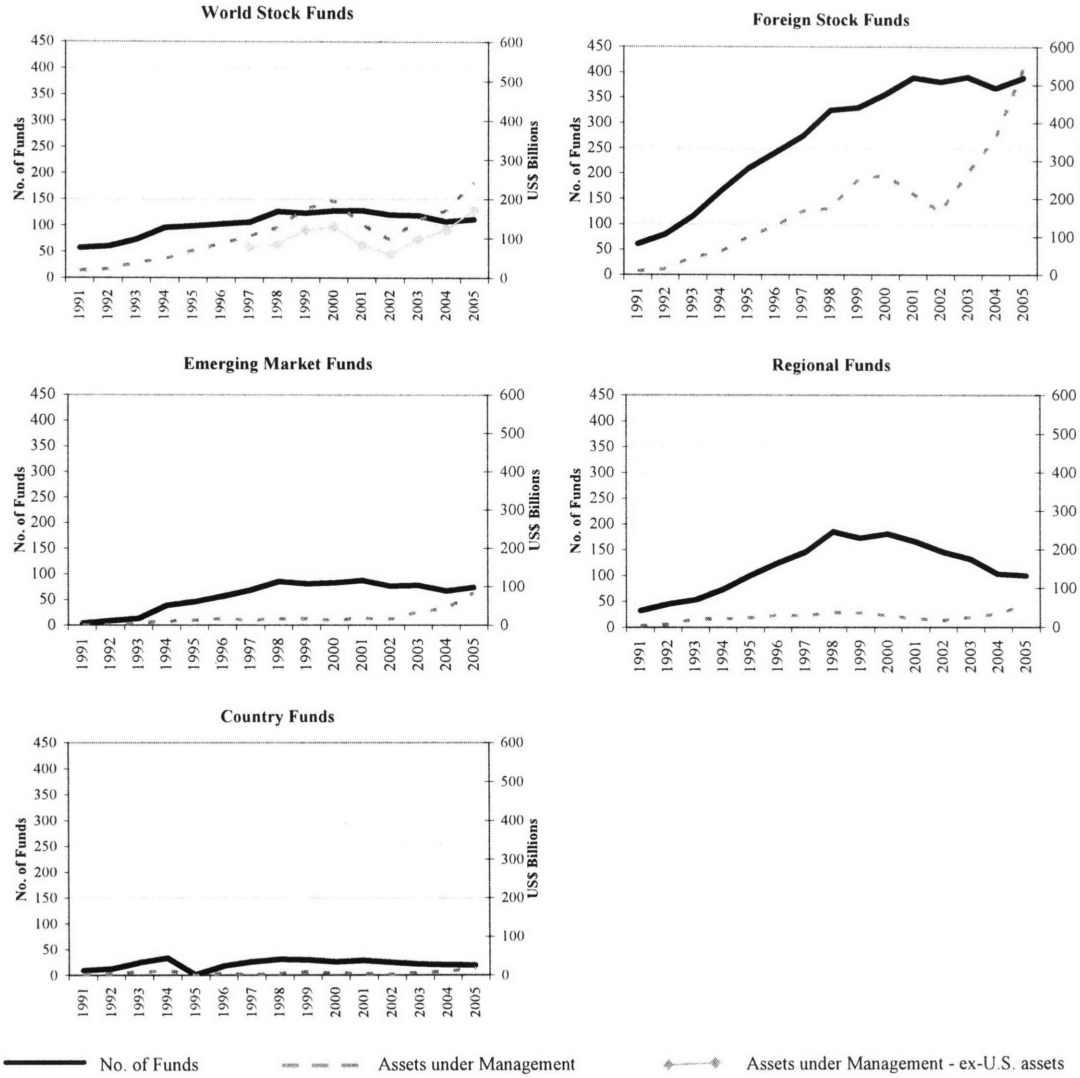

Figure 2.2A. Total Number of U.S. Mutual Funds and Total Assets under Management by Fund Type

This figure shows the total number of U.S. mutual funds and their total assets under management by fund type from 1991 to 2005. World Stock funds are allowed to invest anywhere in the world, Foreign Stock funds are also allowed to invest in all countries in the world with the exception of the U.S., Emerging Market funds can invest in emerging markets, Regional funds invest in specific regions, and Country funds, in specific countries. Thus, for World Stock funds, the value of assets under management that are invested in non-U.S. assets is also shown (data available after 1997 only). The following Regional funds are included in this figure: Latin America and Caribbean, Europe, and Asia and Pacific funds. Data on assets under management are in US$ billions. The data source is Morningstar International Equity Mutual Funds.

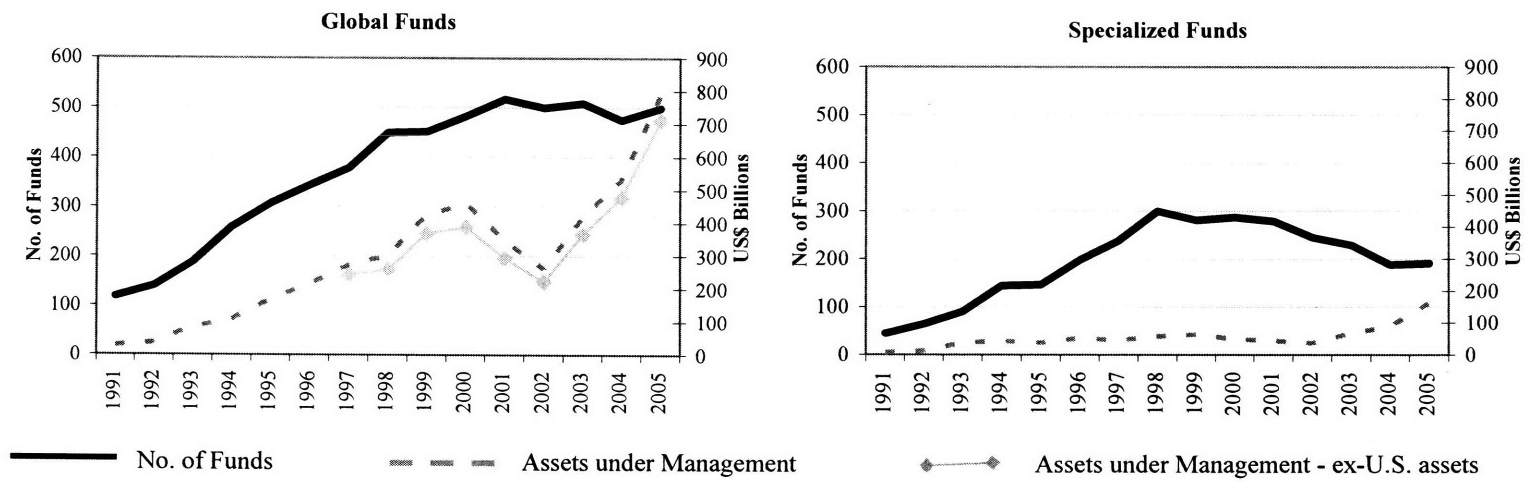

Figure 2.2B. Total Number of U.S. Mutual Funds and Total Assets under Management by Fund Type

This figure shows the total number of U.S. mutual funds and their total assets under management by fund type from 1991 to 2005. Global funds include both World Stock and Foreign Stock funds. Specialized funds include: Emerging Market funds, Regional funds, and Country funds. For Global funds, the value of assets under management that are invested in non-U.S. assets is also shown (data available after 1997 only). The following Regional funds are included in this figure: Latin America and Caribbean, Europe, and Asia and Pacific funds. Data on assets under management are in US$ billions. The data source is Morningstar International Equity Mutual Funds.

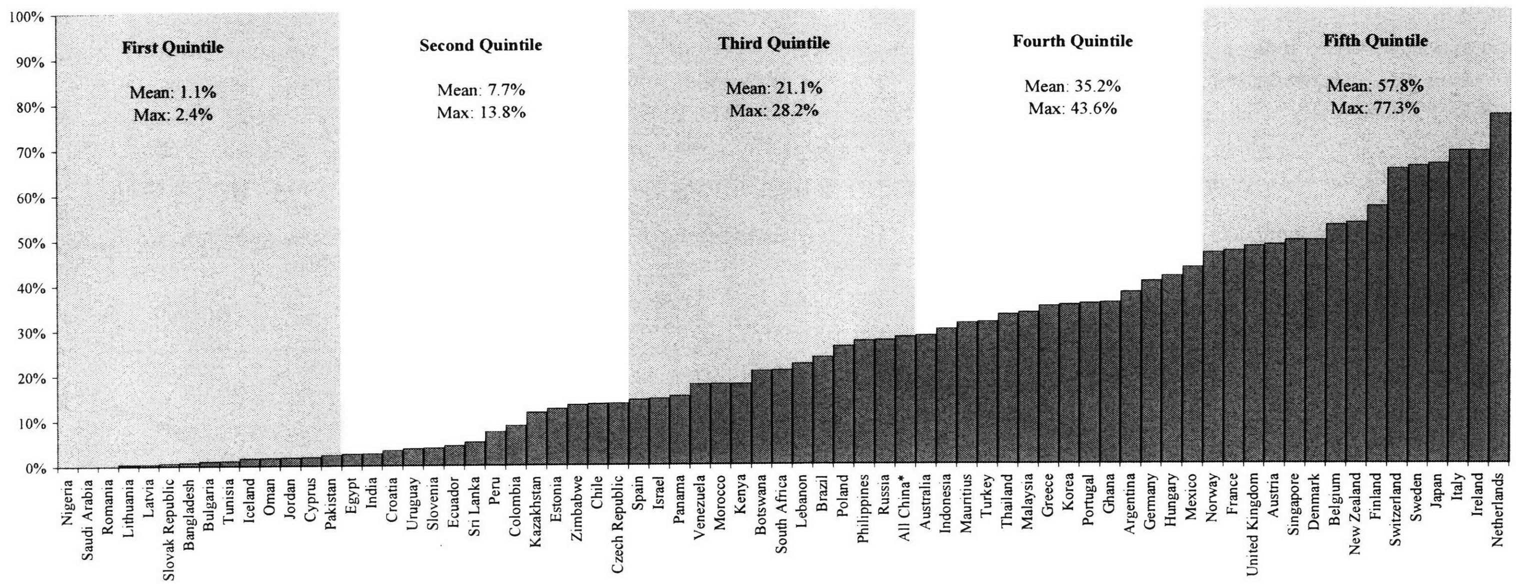

Figure 2.3. Mutual Fund Holdings as a Proportion of the Total No. of Listed Stocks: Distribution across Countries

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

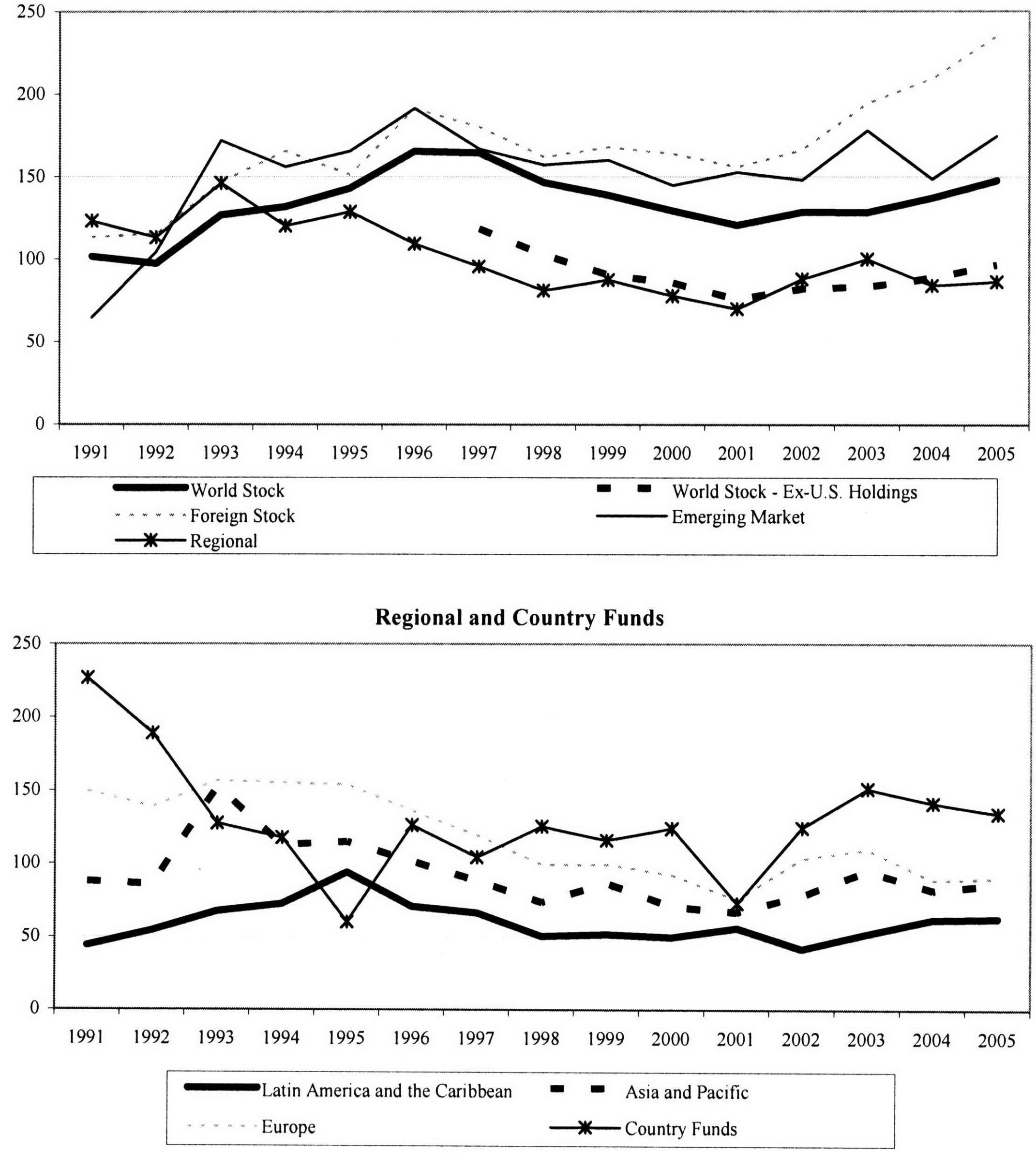

Figure 2.4. Average Number of Holdings by Fund Type

This figure shows the average number of holdings by mutual fund type between 1991 and 2005. The following mutual fund types are shown in the top panel of the figure: World Stock, Foreign Stock, Emerging Market, and Regional funds. The average number of foreign holdings of World Stock mutual funds is also shown. In the bottom panel, Regional funds are divided into three different categories, namely: Latin America and Caribbean, Europe, and Asia and Pacific funds. The average number of holdings for Country funds is also reported in the bottom panel. The data source is Morningstar International Equity Mutual Funds.

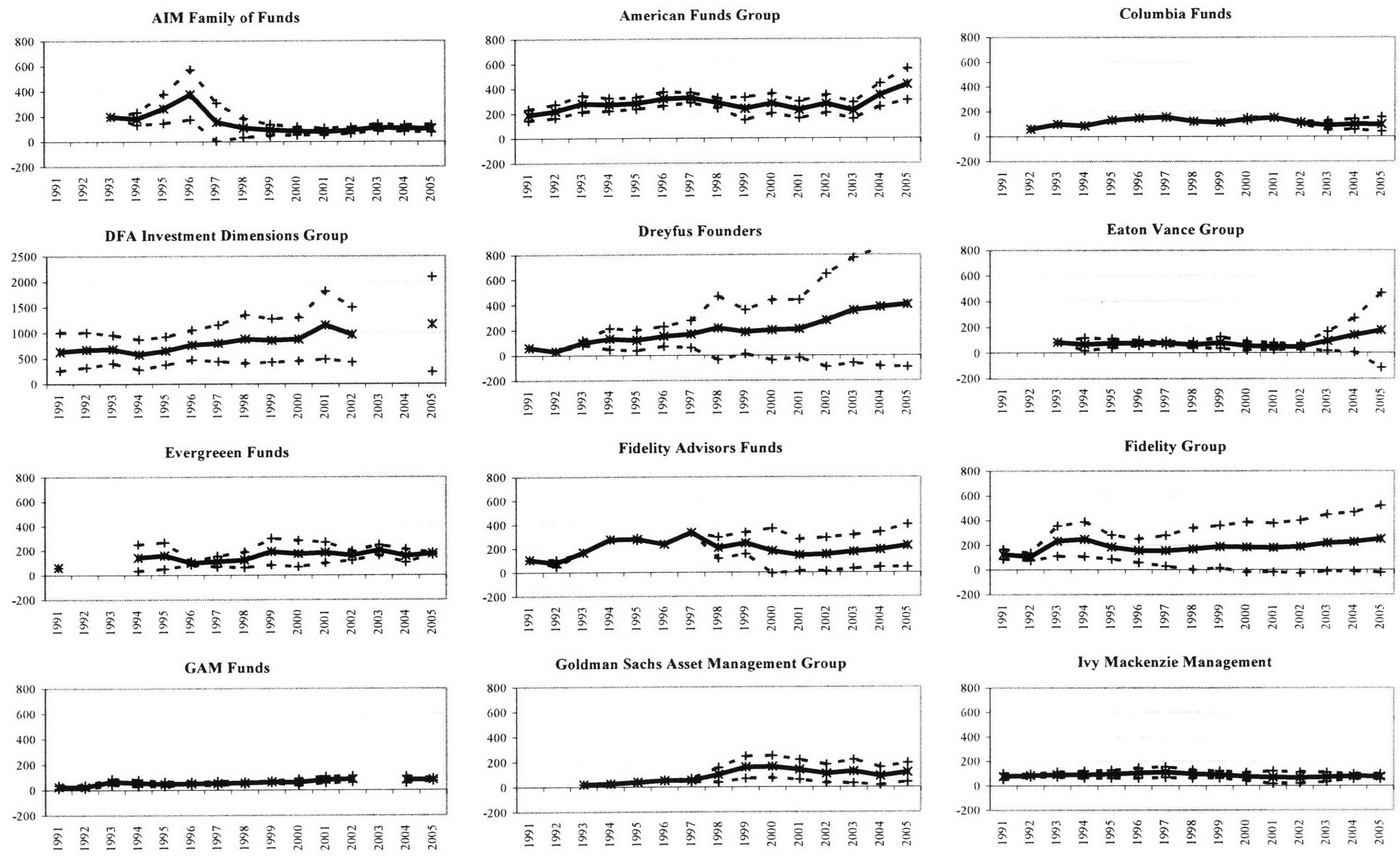

Figure 2.5. Average No. of Holdings by Mutual Fund Families

This figure shows the average number of holdings (thick line) by mutual fund family from 1991 to 2005. It also shows +/- one standard deviation from this average (dotted lines). The data source is Morningstar International Equity Mutual Funds.

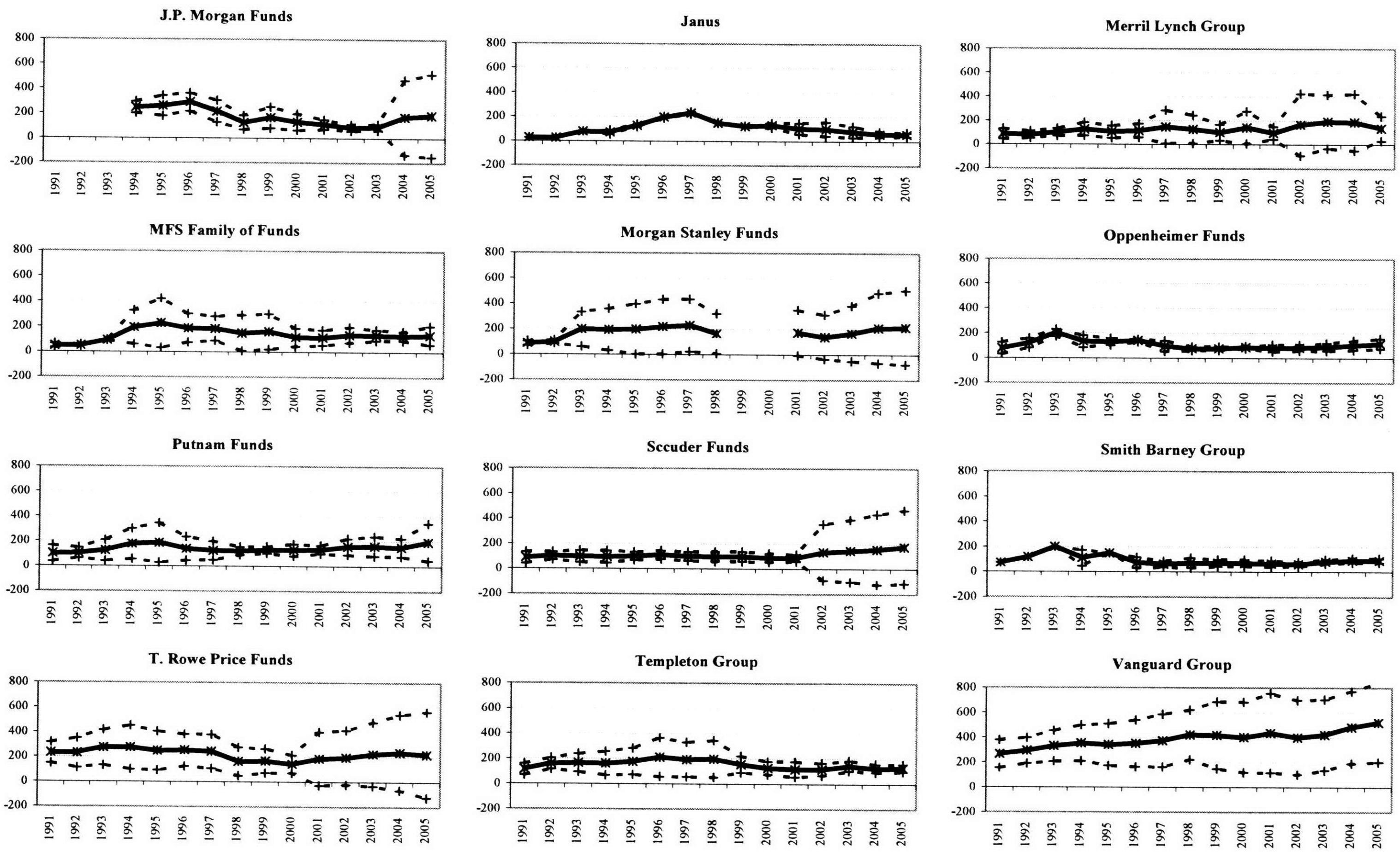

Figure 2.5. (Cont'd.) Average No. of Holdings per Mutual Fund Family

This figure shows the average number of holdings (thick line) by mutual fund family from 1991 to 2005. It also shows +/- one standard deviation from this average (dotted lines). The data source is Morningstar International Equity Mutual Funds.

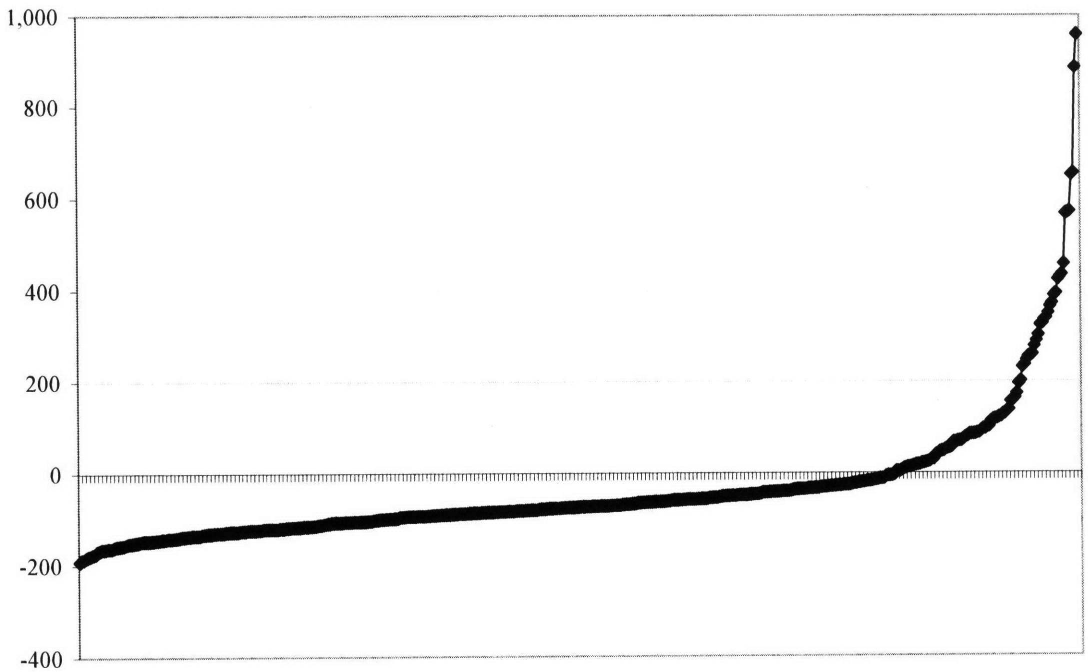

Figure 2.6. Family Fixed Effects

This figure shows the estimated coefficients on family fixed effects of the regression reported on column (4) of Table 4. The estimated coefficients are ordered from the smallest to the largest value.

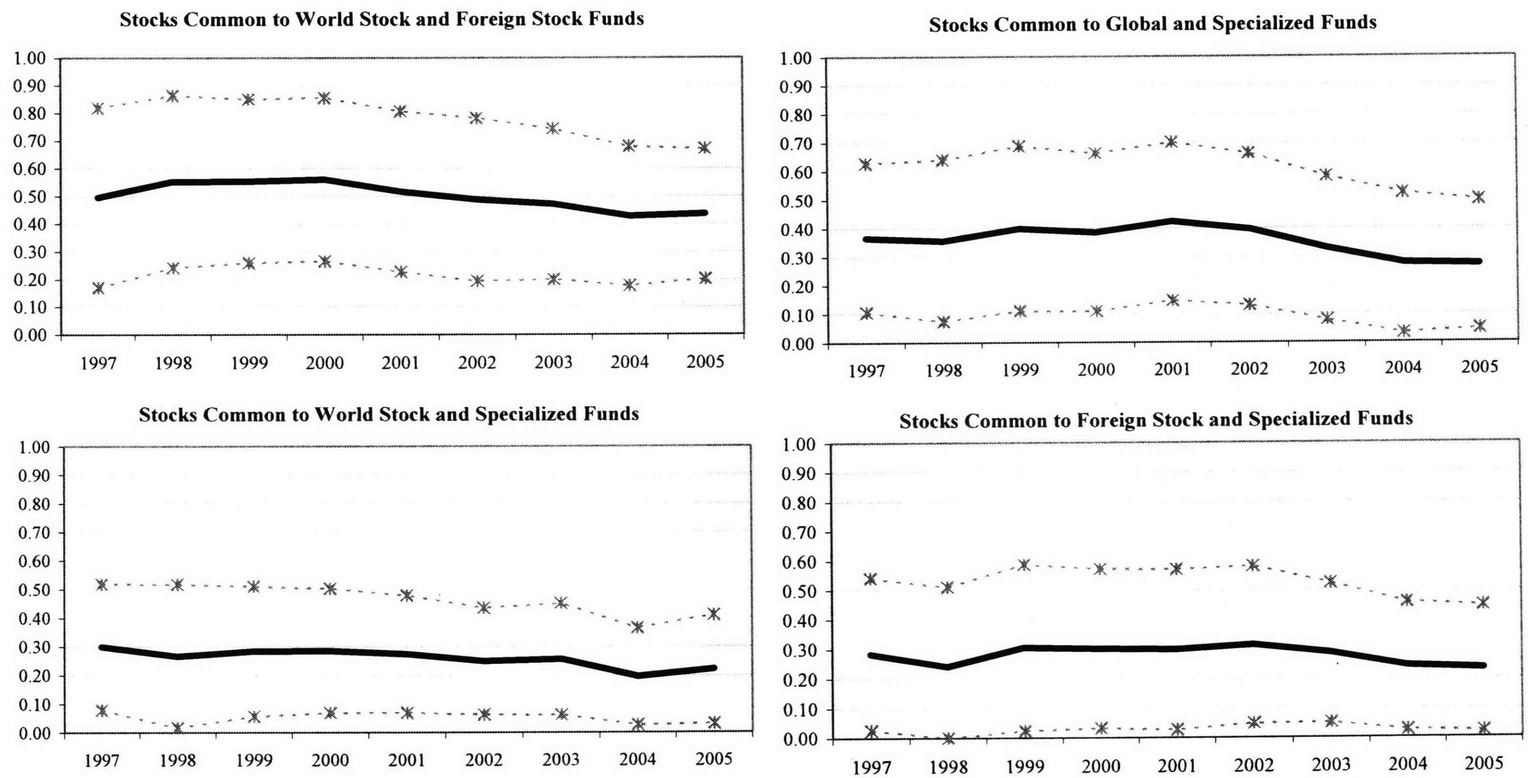

Figure 2.7. Evolution of Entropy Measures

This figure shows the evolution of our entropy meaures from 1997 to 2005. The thick line is the average across families in a given year. The figure also shows +/- one standard deviation from this average (dotted grey lines).The four different measures based on the pairs of mutual fund types are considered: World Stock and Foreign Stock funds (left-top panel), Global and Specialized funds (right-top panel), World Stock and Specialized funds (left-bottom panel), and Foreign Stock and Specialized funds (right-bottom panel). Specialized funds include: Emerging Market, Latin America and the Caribbean, Asia and Pacific, Europe, and Country funds. In each of these tables, if any given family does not have both types of funds analyzed, it is excluded. U.S. holdings are not included in these figures.

Table 2.1. Data Coverage

Holdings Data	
Sample	1991-2005
Frequency	Annual
No. of Families	505
Average Number of Funds per Family	6
Price Data	
Sample	09/18/1989 - 06/12/2006
Frequency	Daily
No. of Families	36
Average Number of Funds per Family	10

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

Table 2.2A. U.S. Mutual Fund Holdings

	No. Listed Companies	Mutual Fund Holdings: No. of Holdings	Mutual Fund Holdings: Amount Invested (US$ Billions)	Mutual Fund Holdings (% of all listed stocks)
		1997		
Total	30,319	9,086	234	30%
Developed Countries	12,987	6,815	204	52%
Asia & Pacific	5,760	3,249	54	56%
Europe	6,392	3,459	149	54%
Middle East	802	87	1	11%
Developing Countries	17,332	2,271	30	13%
Asia & Pacific	10,089	1,304	8	13%
Europe	2,697	319	3	12%
Latin America & Caribbean	2,196	399	17	18%
Middle East & Africa	2,350	249	2	11%
		2004		
Total	39,061	6,289	508	16%
Developed Countries	18,282	5,204	446	28%
Asia & Pacific	7,758	2,748	149	35%
Europe	9,817	2,392	294	24%
Middle East	686	45	1	7%
Developing Countries	20,779	1,085	62	5%
Asia & Pacific	10,444	566	22	5%
Europe	6,279	184	9	3%
Latin America & Caribbean	1,525	195	25	13%
Middle East & Africa	2,531	140	7	6%

This table shows the number of stocks that can be potentially held by U.S. equity mutual funds in 1997 (top panel) and in 2004 (bottom panel). The first column shows the total number of listed stocks in the main stock exchange in each country within each region. This is the universe of stocks that can be held by mutual funds. The second column shows the number of stocks actually held by U.S. mutual funds in these regions. The third column shows the size of these investments in US$ billions. The fourth column shows the proportion of stocks held by mutual funds as a percentage of the universe of stocks available. Developed countries include high-income countries and developing countries are non-high-income countries, according to the World Bank income classification of countries. The United States, Canada, and offshore centres are exlcuded from the analysis. The data source is Claessens and Schmukler (2007) and Global Financial Database for the total number of listed companies, and Morningstar International Equity Mutual Funds for actual mutual fund holdings.

Table 2.2B. Global Fund Holdings

	No. Listed Companies	Global Fund Holdings: No. of Holdings	Global Fund Holdings: Amount Invested (US$ Billions)	Global Fund Holdings (% of all listed stocks)
		1997		
Total	30,319	6,267	195	21%
Developed Countries	12,987	4,953	178	38%
Asia & Pacific	5,760	2,246	45	39%
Europe	6,392	2,635	132	41%
Middle East	802	54	1	7%
Developing Countries	17,332	1,314	17	8%
Asia & Pacific	10,089	693	4	7%
Europe	2,697	167	2	6%
Latin America & Caribbean	2,196	297	11	14%
Middle East & Africa	2,350	157	1	7%
		2004		
Total	39,061	5,510	423	14%
Developed Countries	18,282	4,799	392	26%
Asia & Pacific	7,758	2,429	120	31%
Europe	9,817	2,315	270	24%
Middle East	686	37	1	5%
Developing Countries	20,779	711	31	3%
Asia & Pacific	10,444	394	11	4%
Europe	6,279	114	4	2%
Latin America & Caribbean	1,525	141	14	9%
Middle East & Africa	2,531	62	2	2%

This table shows the number of stocks that can be potentially held by U.S. equity mutual funds in 1997 (top panel) and in 2004 (bottom panel). The first column shows the total number of listed stocks in the main stock exchange in each country within each region. This is the universe of stocks that can be held by mutual funds. The second column shows the number of stocks actually held by Global funds in these regions. The third column shows the size of these investments in US$ billions. The fourth column shows the proportion of stocks held by mutual funds as a percentage of the universe of stocks available. Developed countries include high-income countries and developing countries are non-high-income countries, according to the World Bank income classification of countries. The United States, Canada, and offshore centres are exlcuded from the analysis. The data source is Claessens and Schmukler (2007) and Global Financial Database for the total number of listed companies, and Morningstar International Equity Mutual Funds for actual mutual fund holdings.

Table 2.3. No of Holdings: Importance of Year, Fund Type, and Family Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Independent Variables:							
Year Dummies	Yes	No	No	No	No	Yes	No
Fund Type Dummies	No	Yes	No	No	Yes	Yes	No
Interaction Dummies:							
Fund Types and Years	No	No	Yes	No	No	No	Yes
Family Dummies	No	No	No	Yes	Yes	Yes	Yes
No. of Observations	8,543	8,543	8,543	8,543	8,543	8,543	8,543
R-squared	0.01	0.03	0.05	0.46	0.48	0.49	0.49

This table shows the R-squared of regressions of the number of holdings by mutual funds on year dummies, fund type dummies, and family dummies. Seven different specifications are shown. See the main text for a description. The following fund types are considere in the analysis: World Stock, Foreign Stock, Emerging Market, Regional, and Country funds. Regional Funds include the following fund types: Latin America and Caribbean, Asia and Pacific, and Europe funds.

Table 2.4A. Probabilities of Being Held by a Mutual Fund

		World Stock Funds Probability of: Not Being Held	World Stock Funds Probability of: Being Held	Total
Foreign Stock Funds Probability of:	Not Being Held	24.9%	11.9%	36.8%
	Being Held	48.3%	14.9%	63.2%
Total		73.2%	26.8%	100.0% [265,744]

		Global Funds Probability of: Not Being Held	Global Funds Probability of: Being Held	Total
Specialized Funds Probability of:	Not Being Held	0.0%	25.1%	25.1%
	Being Held	32.3%	15.7%	48.0%
No Specialized Fund		0.0%	26.9%	26.9%
Total		32.3%	67.8%	100.0% [399,281]

		World Stock Funds Probability of: Not Being Held	World Stock Funds Probability of: Being Held	Total
Specialized Funds Probability of:	Not Being Held	22.4%	9.4%	31.8%
	Being Held	40.4%	7.5%	47.9%
No Specialized Fund		11.9%	8.4%	20.3%
Total		74.7%	25.3%	100.0% [233,655]

		Foreign Stock Funds Probability of: Not Being Held	Foreign Stock Funds Probability of: Being Held	Total
Specialized Funds Probability of:	Not Being Held	3.2%	21.9%	25.2%
	Being Held	33.4%	14.5%	47.9%
No Specialized Fund		2.1%	24.9%	27.0%
Total		38.7%	61.3%	100.0% [395,493]

This table reports the frequency tables for mutual fund holdings. The cell percentage is reported. Each observation is a family-year-stock observation. The total number of observations is reported in brackets in the "Total" column of each table. The table thus reports the probability of being held (or not) by certain types of mutual fund, given that a fund family has both fund types. If in a given family-year observation, a Global fund holds an asset in a country not covered by Specialized funds within that family, then this observation is counted in the "No Specialized Fund" line. In each of these tables, if any given family does not have both types of funds being analyzed, it is excluded. Specialized funds include Country, Latin America and the Caribbean, Asia and Pacific, Europe, and Emerging Market funds. U.S. holdings are not included in these tables.

Table 2.4B. Probabilities of Being Held by a Mutual Fund - Excluding Holdings in Developed Countries

		World Stock Funds Probability of: Not Being Held	World Stock Funds Probability of: Being Held	Total
Foreign Stock Funds Probability of:	Not Being Held	64.9%	10.0%	74.9%
	Being Held	18.2%	6.9%	25.1%
Total		83.1%	16.9%	100.0% [51,901]

		Global Funds Probability of: Not Being Held	Global Funds Probability of: Being Held	Total
Specialized Funds Probability of:	Not Being Held	0.0%	9.6%	9.6%
	Being Held	75.6%	13.2%	88.8%
No Specialized Fund		0.0%	1.6%	1.6%
Total		75.6%	24.4%	100.0% [92,355]

		World Stock Funds Probability of: Not Being Held	World Stock Funds Probability of: Being Held	Total
Specialized Funds Probability of:	Not Being Held	6.0%	5.2%	11.3%
	Being Held	78.4%	8.0%	86.4%
No Specialized Fund		1.2%	1.1%	2.3%
Total		85.6%	14.4%	100.0% [49,146]

		Foreign Stock Funds Probability of: Not Being Held	Foreign Stock Funds Probability of: Being Held	Total
Specialized Funds Probability of:	Not Being Held	2.1%	7.5%	9.6%
	Being Held	77.6%	11.3%	88.9%
No Specialized Fund		0.3%	1.2%	1.5%
Total		80.0%	20.0%	100.0% [91,263]

This table reports the frequency tables for mutual fund holdings. The cell percentage is reported. Each observation is a family-year-stock observation. The total number of observations is reported in brackets in the "Total" column of each table. The table thus reports the probability of being held (or not) by certain types of mutual fund, given that a fund family has both fund types. If in a given family-year observation, a Global fund holds an asset in a country not covered by Specialized funds within that family, then this observation is counted in the "No Specialized Fund" line. In each of these tables, if any given family does not have both types of funds being analyzed, it is excluded. Specialized funds include Country, Latin America and the Caribbean, Asia and Pacific, Europe, and Emerging Market funds. Holdings in developed countries are not included in these tables. Developed countries are all high-income countries according to the World Bank country classification by income level.

Table 2.5. Entropy Measures: Summary Statistics

Holdings in All Countries in the Sample			
	Average	Median	Standard Deviation
Stocks Common to Portfolios of:			
World Stock and Foreign Stock Funds	0.50	0.52	0.29
Global and Specialized Funds	0.36	0.32	0.27
World Stock and Specialized Funds	0.26	0.20	0.21
Foreign Stock and Specialized Funds	0.28	0.17	0.26

Holdings in Developing Countries			
	Average	Median	Standard Deviation
Stocks Common to Portfolios of:			
World Stock and Foreign Stock Funds	0.50	0.51	0.31
Global and Specialized Funds	0.42	0.41	0.26
World Stock and Specialized Funds	0.24	0.19	0.21
Foreign Stock and Specialized Funds	0.35	0.30	0.26

This table reports the summary statistics of our entropy meaure: given a pair of fund types, it is the ratio of the sum of net assets allocated to assets common to the portfolio of these two types of funds over the total net assets of the same two types of funds in a given year for a given family. The top panel shows the results for all holdings in the sample - we only exclude assets from the United States. In the bottom panel, the entropy measure was constructed based on holdings in developing countries only. The following pairs of fund types are considered: World Stock and Foreign Stock funds, Global and Specialized funds, World Stock and Specialized funds, and Foreign Stock and Specialized funds. Specialized funds include: Emerging Market, Latin America and the Caribbean, Asia and Pacific, Europe, and Country funds. In each of these measures, if any given family does not have both types of funds analyzed, it is excluded.

Table 2.6. Entropy Measures: Importance of Year and Family Effects

	World Stock and Foreign Stock Funds			Global and Specialized Funds			World Stock and Specialized Funds			Foreign Stock and Specialized Funds		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Independent Variables:												
Year Dummies	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Family Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
No. of Observations	516	516	516	371	371	371	373	373	373	711	711	711
R-Squared	0.03	0.75	0.77	0.04	0.79	0.82	0.02	0.71	0.74	0.01	0.76	0.78

This table shows the R-squared of the regressions of our four entropy meaures on family and year dummies. Three specifications are reported for each one of the entropy meaures - see main text for details. The four different measures based on pairs of mutual fund types analyzed are: World Stock and Foreign Stock funds, Global and Specialized funds, World Stock and Specialized funds, and Foreign Stock and Specialized funds. Specialized funds include: Emerging Market, Latin America and the Caribbean, Asia and Pacific, Europe, and Country funds. Each observation is a family-year observation. In each of these tables, if any given family does not have both types of funds analyzed, it is excluded. U.S. holdings are not included in these tables.

Table 2.7A. Simulations: Best Result for Each Fund

Mininmizing the Variance

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	6.05%	11.08%	4.87%	5.09%	0.89%	0.80%	60
Foreign Stock	6.40%	10.40%	3.88%	4.04%	0.96%	0.90%	72
Portfolio of World Stock Funds	22.54%	36.41%	11.40%	11.59%	0.79%	0.71%	3
Portfolio of Foreign Stock Funds	9.18%	13.22%	3.84%	3.97%	0.89%	0.83%	21
Total	6.92%	11.49%	4.40%	4.58%	0.92%	0.85%	156

Maximizing Expected Returns

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	6.05%	7.93%	1.92%	1.91%	0.89%	0.89%	60
Foreign Stock	6.40%	6.85%	0.45%	0.46%	0.96%	0.96%	73
Portfolio of World Stock Funds	22.54%	34.83%	10.14%	10.10%	0.79%	0.81%	3
Portfolio of Foreign Stock Funds	9.18%	12.65%	3.46%	3.46%	0.89%	0.89%	20
Total	6.92%	8.51%	1.61%	1.61%	0.92%	0.92%	156

This tables shows the results of the following simulations: minimization of the variance of returns subject to restrictions on expected returns (top panel) and maximization of expected returns subject to a restiction on the variance of returns (bottom panel). Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The best simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Table 2.7B. Simulations: Longest Available Sample, But Fewer Regional Funds

Mininmizing the Variance

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	No. of Sims.
World Stock	8.05%	10.83%	2.65%	2.84%	1.15%	1.08%	60
Foreign Stock	5.52%	7.97%	2.41%	2.55%	0.97%	0.92%	73
Portfolio of World Stock Funds	2.29%	12.35%	9.93%	10.37%	1.04%	0.88%	3
Portfolio of Foreign Stock Funds	8.77%	11.91%	3.02%	3.15%	0.92%	0.86%	20
Total	6.84%	9.65%	2.73%	2.89%	1.04%	0.97%	156

Maximizing Expected Returns

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	No. of Sims.
World Stock	8.05%	8.14%	0.09%	0.08%	1.15%	1.15%	60
Foreign Stock	5.52%	5.77%	0.24%	0.24%	0.97%	0.97%	73
Portfolio of World Stock Funds	2.29%	16.32%	13.86%	14.03%	1.04%	0.99%	3
Portfolio of Foreign Stock Funds	8.77%	11.75%	3.01%	3.02%	0.92%	0.92%	20
Total	6.84%	7.63%	0.80%	0.80%	1.04%	1.03%	156

This tables shows the results of the following simulations: minimization of the variance of returns subject to restrictions on expected returns (top panel) and maximization of expected returns subject to a restiction on the variance of returns (bottom panel). Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The longest simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Table 2.8A. Benchmarking: Best Simulation Result for Each Fund

Mininmizing the Variance

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	8.45%	12.24%	3.59%	3.75%	0.91%	0.86%	54
Foreign Stock	6.35%	10.36%	3.90%	3.97%	0.96%	0.94%	72
Portfolio of World Stock Funds	22.54%	31.39%	7.26%	7.35%	0.79%	0.75%	3
Portfolio of Foreign Stock Funds	9.00%	12.34%	3.25%	3.34%	0.90%	0.86%	20
Total	7.77%	11.69%	3.77%	3.87%	0.93%	0.89%	149

Maximizing Expected Returns

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	8.45%	11.60%	3.00%	3.18%	0.91%	0.85%	54
Foreign Stock	6.35%	8.63%	2.22%	2.28%	0.96%	0.94%	72
Portfolio of World Stock Funds	22.54%	24.44%	1.56%	1.59%	0.79%	0.78%	3
Portfolio of Foreign Stock Funds	9.00%	10.74%	1.63%	1.66%	0.90%	0.88%	20
Total	7.77%	10.29%	2.41%	2.51%	0.93%	0.89%	149

This tables shows the results of the following simulations: minimization of the variance of returns, net of the benchmark index, subject to restrictions on expected returns (top panel) and maximization of expected returns subject to a restiction on the variance of returns, net of the benchmark index (bottom panel). Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The best simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Table 2.8B. Benchmarking: Simulations With The Longest Available Sample, But Fewer Regional Funds

Mininmizing the Variance

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	No. of Sims.
World Stock	9.04%	11.63%	2.46%	2.59%	1.15%	1.11%	60
Foreign Stock	5.49%	7.70%	2.19%	2.24%	0.97%	0.95%	73
Portfolio of World Stock Funds	2.29%	11.68%	9.19%	9.51%	1.04%	0.93%	3
Portfolio of Foreign Stock Funds	8.53%	11.58%	2.99%	3.08%	0.93%	0.89%	19
Total	7.16%	9.76%	2.53%	2.62%	1.03%	1.00%	155

Maximizing Expected Returns

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	No. of Sims.
World Stock	9.04%	10.08%	1.20%	1.87%	1.15%	0.91%	60
Foreign Stock	5.49%	6.98%	1.45%	1.52%	0.97%	0.95%	73
Portfolio of World Stock Funds	2.29%	7.56%	5.21%	5.44%	1.04%	0.96%	3
Portfolio of Foreign Stock Funds	8.53%	9.67%	1.07%	1.11%	0.93%	0.91%	19
Total	7.16%	8.51%	1.38%	1.68%	1.03%	0.93%	155

This tables shows the results of the following simulations: minimization of the variance of returns, net of the benchmark index, subject to restrictions on expected returns (top panel) and maximization of expected returns subject to a restiction on the variance of returns, net of the benchmark index (bottom panel). Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The longest simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Appendix Table 2.1. Price Data on Mutual Funds

	Family	No. of Funds	Sample Beginning	Sample End
1	AIM Family of Funds	17	08-Apr-92	18-Jul-05
2	AllianceBernstein	10	24-Dec-99	09-Jun-06
3	Allianz Funds	4	20-Dec-04	18-Jul-05
4	American Funds Group	7	13-Mar-02	09-Jun-06
5	Columbia Funds	8	17-Oct-00	09-Jun-06
6	Credit Suisse	8	21-Dec-01	09-Jun-06
7	DFA Investment Dimensions Group	9	08-Mar-93	18-Jul-05
8	Dreyfus Founders	11	01-Jul-96	09-Jun-06
9	Eaton Vance Group	7	21-Sep-99	18-Jul-05
10	Evergreen Funds	5	07-Sep-94	09-Jun-06
11	Excelsior Funds	4	20-Sep-93	18-Jul-05
12	Fidelity Advisors Funds	14	21-Dec-00	09-Jun-06
13	Fidelity Group	18	18-Sep-89	18-Jul-05
14	GAM Funds	7	09-Jan-90	18-Jul-05
15	Gartmore	5	02-Jul-04	09-Jun-06
16	GMO LLC	17	29-Jan-99	18-Jul-05
17	Goldman Sachs Asset Management Group	11	30-Oct-98	18-Jul-05
18	Hartford Mutual Funds	10	02-May-01	09-Jun-06
19	ING Funds Trust	12	29-Nov-94	18-Jul-05
20	Ivy Mackenzie Management	9	06-May-99	18-Jul-05
21	J.P. Morgan Funds	10	30-Jul-02	09-Jun-06
22	Janus	12	19-Oct-98	09-Jun-06
23	Merrill Lynch Group	15	30-Nov-94	18-Jul-05
24	MFS Family of Funds	11	28-Jun-96	09-Jun-06
25	Morgan Stanley Funds	26	18-Oct-94	18-Jul-05
26	Oppenheimer Funds	9	10-Sep-04	09-Jun-06
27	Putnam Funds	6	08-Nov-91	18-Jul-05
28	RiverSource (former AXP)	9	13-Jul-90	18-Jul-05
29	Scudder Funds	18	17-Jun-98	18-Jul-05
30	Seligman Group	4	12-Jun-03	09-Jun-06
31	Smith Barney Group	6	03-Mar-98	09-Jun-06
32	T. Rowe Price Funds	14	04-Jun-92	18-Jul-05
33	Templeton Group	20	20-Nov-92	18-Jul-05
34	UBS Funds	6	01-Mar-01	09-Jun-06
35	Vanguard Group	11	17-Jul-00	09-Jun-06
36	Wells Fargo Advantage	5	09-Oct-97	18-Jul-05

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

Appendix Table 2.2A. Simulations: Best Result for Each Fund

	Family	Average Return (p.y.) Global Fund	Average Return (p.y.) Active Strategy	Improvement in Returns (p.y.) Daily	Improvement in Returns (p.y.) Accumulated	Standard Deviation of Daily Returns Global Fund	Standard Deviation of Daily Returns Active Strategy	No. of Sims.
	Mininmizing the Variance							
1	Allianz Funds	0.95%	-3.05%	-3.94%	-3.91%	0.66%	0.65%	2
2	AllianceBernstein	10.89%	14.76%	3.51%	3.59%	0.90%	0.86%	9
3	American Funds Group	10.57%	13.93%	3.06%	3.33%	0.87%	0.74%	4
4	AIM Family of Funds	8.37%	20.92%	11.71%	12.08%	0.95%	0.82%	10
5	Columbia Funds	17.52%	21.06%	3.14%	3.32%	0.85%	0.77%	3
6	Credit Suisse	8.46%	12.15%	3.40%	3.63%	0.95%	0.85%	2
7	DFA Investment Dimensions Group	3.15%	1.22%	-1.85%	-1.70%	0.91%	0.84%	4
8	Dreyfus Founders	4.75%	11.96%	6.99%	7.33%	0.95%	0.83%	6
9	Evergreen Funds	5.76%	5.56%	-0.19%	-0.21%	1.07%	1.08%	2
10	Eaton Vance Group	-0.75%	15.22%	16.10%	16.91%	1.08%	0.79%	2
11	Excelsior Funds	3.95%	7.15%	3.09%	3.13%	0.89%	0.87%	2
12	Fidelity Group	5.97%	9.42%	3.29%	3.59%	1.02%	0.91%	7
13	Fidelity Advisors Funds	7.76%	11.86%	3.84%	4.09%	0.87%	0.77%	6
14	GAM Funds	-1.42%	3.04%	4.53%	3.67%	1.04%	1.43%	2
15	Gartmore	22.30%	18.99%	-2.68%	-2.62%	0.81%	0.78%	3
16	GMO LLC	6.65%	8.05%	1.37%	1.36%	0.76%	0.77%	8
17	Goldman Sachs Asset Management Group	1.63%	6.80%	5.12%	5.42%	1.04%	0.94%	3
18	Hartford Mutual Funds	14.82%	18.72%	3.40%	3.50%	0.91%	0.86%	2
19	ING Funds Trust	-4.77%	0.10%	5.34%	5.71%	1.11%	1.01%	6
20	Ivy Mackenzie Management	-0.56%	4.80%	5.41%	5.73%	0.94%	0.81%	3
21	Janus	-7.01%	0.08%	7.65%	7.60%	0.67%	0.70%	5
22	J.P. Morgan Funds	22.11%	24.06%	1.60%	1.68%	0.90%	0.87%	4
23	MFS Family of Funds	20.70%	39.09%	15.78%	15.93%	0.88%	0.81%	3
24	Merrill Lynch Group	10.35%	13.01%	2.46%	2.64%	0.99%	0.93%	9
25	Morgan Stanley Funds	1.87%	6.83%	4.91%	5.28%	0.98%	0.84%	9
26	Oppenheimer Funds	10.45%	9.72%	-0.64%	-0.69%	0.82%	0.84%	3
27	Putnam Funds	4.86%	5.53%	0.65%	0.74%	1.08%	1.05%	5
28	RiverSource (former AXP)	13.45%	22.06%	7.63%	7.87%	0.84%	0.73%	2
29	Scudder Funds	6.31%	13.19%	6.49%	6.75%	1.00%	0.90%	6
30	Smith Barney Group	2.03%	2.35%	0.31%	0.30%	0.94%	0.94%	1
31	Seligman Group	14.45%	15.89%	1.26%	1.26%	0.82%	0.82%	2
32	Templeton Group	1.13%	2.46%	1.34%	1.55%	0.83%	0.73%	8
33	T. Rowe Price Funds	19.58%	32.17%	10.64%	10.71%	0.85%	0.82%	6
34	UBS Funds	4.41%	7.30%	2.77%	2.88%	0.89%	0.84%	1
35	Vanguard Group	7.77%	10.39%	2.43%	2.54%	0.96%	0.92%	4
36	Wells Fargo Advantage	5.22%	11.69%	6.16%	6.65%	0.98%	0.78%	2
	Total	6.92%	11.49%	4.40%	4.58%	0.92%	0.85%	156

This tables shows the results of the following simulation: minimization of the variance of returns subject to restrictions on expected returns. The results are shown per family. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The best simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Appendix Table 2.2B. Simulations: Longest Available Sample, But Fewer Regional Funds

Mininmizing the Variance

	Family	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
		Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
1	Allianz Funds	0.95%	-3.05%	-3.94%	-3.91%	0.66%	0.65%	2
2	AllianceBernstein	9.49%	13.26%	3.46%	3.54%	0.90%	0.87%	9
3	American Funds Group	10.57%	13.93%	3.06%	3.33%	0.87%	0.74%	4
4	AIM Family of Funds	9.43%	20.69%	10.47%	10.86%	0.99%	0.85%	10
5	Columbia Funds	14.11%	17.02%	2.64%	3.03%	0.92%	0.77%	3
6	Credit Suisse	8.46%	12.15%	3.40%	3.63%	0.95%	0.85%	2
7	DFA Investment Dimensions Group	3.15%	1.22%	-1.85%	-1.70%	0.91%	0.84%	4
8	Dreyfus Founders	4.71%	7.83%	3.05%	3.33%	1.02%	0.92%	6
9	Evergreen Funds	5.76%	5.56%	-0.19%	-0.21%	1.07%	1.08%	2
10	Eaton Vance Group	-4.98%	8.94%	14.69%	15.46%	1.13%	0.87%	2
11	Excelsior Funds	1.58%	1.67%	0.09%	0.10%	0.99%	0.99%	2
12	Fidelity Group	6.89%	8.09%	1.13%	1.36%	0.95%	0.86%	7
13	Fidelity Advisors Funds	7.40%	10.14%	2.59%	2.85%	0.93%	0.82%	6
14	GAM Funds	41.57%	45.05%	2.51%	1.43%	8.19%	8.66%	2
15	Gartmore	22.30%	18.99%	-2.68%	-2.62%	0.81%	0.78%	3
16	GMO LLC	6.65%	8.05%	1.37%	1.36%	0.76%	0.77%	8
17	Goldman Sachs Asset Management Group	1.63%	6.80%	5.12%	5.42%	1.04%	0.94%	3
18	Hartford Mutual Funds	6.10%	8.06%	1.85%	2.17%	1.04%	0.91%	2
19	ING Funds Trust	0.66%	4.26%	3.74%	4.09%	1.05%	0.94%	6
20	Ivy Mackenzie Management	0.89%	5.81%	4.91%	5.25%	0.99%	0.86%	3
21	Janus	4.97%	7.82%	2.78%	2.75%	0.88%	0.87%	5
22	J.P. Morgan Funds	22.11%	24.06%	1.60%	1.68%	0.90%	0.87%	4
23	MFS Family of Funds	12.47%	16.07%	3.22%	3.19%	0.80%	0.82%	3
24	Merrill Lynch Group	5.09%	6.49%	1.39%	1.57%	1.03%	0.96%	9
25	Morgan Stanley Funds	2.58%	5.83%	3.23%	3.49%	0.98%	0.88%	9
26	Oppenheimer Funds	12.61%	11.27%	-1.18%	-1.22%	0.79%	0.81%	3
27	Putnam Funds	4.86%	5.53%	0.65%	0.74%	1.08%	1.05%	5
28	RiverSource (former AXP)	3.46%	3.15%	-0.30%	-0.28%	1.14%	1.13%	2
29	Scudder Funds	3.78%	8.29%	4.37%	4.55%	1.01%	0.94%	6
30	Smith Barney Group	2.03%	2.35%	0.31%	0.30%	0.94%	0.94%	1
31	Seligman Group	14.45%	15.89%	1.26%	1.26%	0.82%	0.82%	2
32	Templeton Group	4.07%	4.14%	0.07%	0.21%	0.78%	0.71%	8
33	T. Rowe Price Funds	5.04%	10.10%	4.92%	5.07%	0.98%	0.92%	6
34	UBS Funds	4.41%	7.30%	2.77%	2.88%	0.89%	0.84%	1
35	Vanguard Group	5.40%	7.05%	1.58%	1.68%	0.99%	0.95%	4
36	Wells Fargo Advantage	6.44%	8.39%	1.87%	2.18%	1.01%	0.88%	2
	Total	6.84%	9.65%	2.73%	2.89%	1.04%	0.97%	156

This tables shows the results of the following simulation: minimization of the variance of returns subject to restrictions on expected returns. The results are shown per family. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The longest simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Appendix Table 2.3A. Simulations: Best Result for Each Fund

	Maximizing Expected Returns							
		Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of
	Family	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	Sims.
1	Allianz Funds	0.95%	0.95%	0.00%	0.00%	0.66%	0.66%	2
2	AllianceBernstein	10.89%	10.90%	0.01%	-0.01%	0.90%	0.90%	9
3	American Funds Group	10.57%	10.78%	0.19%	0.18%	0.87%	0.87%	4
4	AIM Family of Funds	8.37%	12.94%	4.46%	4.47%	0.95%	0.95%	10
5	Columbia Funds	17.52%	16.06%	-1.23%	-1.21%	0.85%	0.84%	3
6	Credit Suisse	8.46%	8.39%	-0.07%	-0.06%	0.95%	0.95%	2
7	DFA Investment Dimensions Group	3.15%	3.85%	0.69%	0.73%	0.91%	0.88%	4
8	Dreyfus Founders	4.75%	6.27%	1.51%	1.56%	0.95%	0.93%	6
9	Evergreen Funds	5.76%	5.76%	0.00%	0.00%	1.07%	1.07%	2
10	Eaton Vance Group	-0.75%	0.69%	1.45%	1.50%	1.08%	1.06%	2
11	Excelsior Funds	3.95%	3.95%	0.01%	0.01%	0.89%	0.89%	2
12	Fidelity Group	5.97%	6.10%	0.12%	0.11%	1.02%	1.03%	7
13	Fidelity Advisors Funds	7.76%	7.45%	-0.28%	-0.27%	0.87%	0.87%	6
14	GAM Funds	-1.42%	-2.18%	-0.76%	-0.72%	1.04%	1.03%	2
15	Gartmore	22.30%	22.30%	0.00%	0.00%	0.81%	0.81%	3
16	GMO LLC	6.65%	7.50%	0.81%	0.74%	0.76%	0.79%	8
17	Goldman Sachs Asset Management Group	1.63%	1.55%	-0.08%	-0.08%	1.04%	1.04%	3
18	Hartford Mutual Funds	14.82%	14.82%	0.00%	0.00%	0.91%	0.91%	2
19	ING Funds Trust	-4.77%	4.83%	10.70%	10.82%	1.11%	1.08%	6
20	Ivy Mackenzie Management	-0.56%	3.70%	4.31%	4.57%	0.94%	0.84%	3
21	Janus	-7.01%	11.09%	19.58%	19.43%	0.67%	0.74%	5
22	J.P. Morgan Funds	22.11%	21.52%	-0.48%	-0.48%	0.90%	0.90%	4
23	MFS Family of Funds	20.70%	20.40%	-0.25%	-0.25%	0.88%	0.88%	3
24	Merrill Lynch Group	10.35%	11.17%	0.75%	0.68%	0.99%	1.03%	9
25	Morgan Stanley Funds	1.87%	2.19%	0.32%	0.31%	0.98%	0.98%	9
26	Oppenheimer Funds	10.45%	9.70%	-0.67%	-0.68%	0.82%	0.82%	3
27	Putnam Funds	4.86%	4.96%	0.10%	0.11%	1.08%	1.08%	5
28	RiverSource (former AXP)	13.45%	13.45%	0.00%	0.00%	0.84%	0.84%	2
29	Scudder Funds	6.31%	7.83%	1.47%	1.45%	1.00%	1.01%	6
30	Smith Barney Group	2.03%	2.41%	0.37%	0.37%	0.94%	0.94%	1
31	Seligman Group	14.45%	14.44%	-0.01%	0.00%	0.82%	0.81%	2
32	Templeton Group	1.13%	1.06%	-0.06%	-0.08%	0.83%	0.83%	8
33	T. Rowe Price Funds	19.58%	19.77%	0.16%	0.16%	0.85%	0.85%	6
34	UBS Funds	4.41%	4.41%	0.00%	0.00%	0.89%	0.89%	1
35	Vanguard Group	7.77%	7.50%	-0.25%	-0.24%	0.96%	0.96%	4
36	Wells Fargo Advantage	5.22%	6.03%	0.78%	0.87%	0.98%	0.95%	2
	Total	6.92%	8.51%	1.61%	1.61%	0.92%	0.92%	156

This tables shows the results of the following simulation: maximization of expected returns subject to a restiction on the variance of returns. The results are shown per family. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The best simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Appendix Table 2.3B. Simulations: Longest Available Sample, But Fewer Regional Funds

	Maximizing Expected Returns							
		Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of
	Family	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	Sims.
1	Allianz Funds	0.95%	0.95%	0.00%	0.00%	0.66%	0.66%	2
2	AllianceBernstein	9.49%	9.48%	-0.01%	-0.01%	0.90%	0.91%	9
3	American Funds Group	10.57%	10.78%	0.19%	0.18%	0.87%	0.87%	4
4	AIM Family of Funds	9.43%	15.72%	6.04%	6.07%	0.99%	0.98%	10
5	Columbia Funds	14.11%	12.69%	-1.24%	-1.21%	0.92%	0.91%	3
6	Credit Suisse	8.46%	8.39%	-0.07%	-0.06%	0.95%	0.95%	2
7	DFA Investment Dimensions	3.15%	3.85%	0.69%	0.73%	0.91%	0.88%	4
	Group	4.71%	4.84%	0.12%	0.13%	1.02%	1.02%	6
8	Dreyfus Founders	5.76%	5.76%	0.00%	0.00%	1.07%	1.07%	2
9	Evergreen Funds	-4.98%	-4.41%	0.59%	0.59%	1.13%	1.13%	2
10	Eaton Vance Group	1.58%	1.54%	-0.05%	-0.05%	0.99%	0.99%	2
11	Excelsior Funds	6.89%	6.85%	-0.04%	-0.04%	0.95%	0.95%	7
12	Fidelity Group	7.40%	6.81%	-0.55%	-0.54%	0.93%	0.93%	6
13	Fidelity Advisors Funds	41.57%	40.49%	-0.76%	-0.72%	8.19%	8.17%	2
14	GAM Funds	22.30%	22.30%	0.00%	0.00%	0.81%	0.81%	3
15	Gartmore	6.65%	7.50%	0.81%	0.74%	0.76%	0.79%	8
16	GMO LLC	1.63%	1.55%	-0.08%	-0.08%	1.04%	1.04%	3
17	Goldman Sachs Asset Management Group	6.10%	6.10%	0.00%	0.00%	1.04%	1.04%	2
18	Hartford Mutual Funds	0.66%	5.36%	5.26%	5.32%	1.05%	1.03%	6
19	ING Funds Trust	0.89%	5.14%	4.24%	4.53%	0.99%	0.88%	3
20	Ivy Mackenzie Management	4.97%	4.94%	0.00%	-0.05%	0.88%	0.88%	5
21	Janus	22.11%	21.52%	-0.48%	-0.48%	0.90%	0.90%	4
22	J.P. Morgan Funds	12.47%	12.18%	-0.26%	-0.26%	0.80%	0.80%	3
23	MFS Family of Funds	5.09%	6.11%	0.99%	0.98%	1.03%	1.04%	9
24	Merrill Lynch Group	2.58%	3.33%	0.74%	0.70%	0.98%	1.00%	9
25	Morgan Stanley Funds	12.61%	11.85%	-0.67%	-0.67%	0.79%	0.80%	3
26	Oppenheimer Funds	4.86%	4.96%	0.10%	0.11%	1.08%	1.08%	5
27	Putnam Funds	3.46%	3.46%	0.00%	0.00%	1.14%	1.14%	2
28	RiverSource (former AXP)	3.78%	4.88%	1.06%	1.03%	1.01%	1.02%	6
29	Scudder Funds	2.03%	2.41%	0.37%	0.37%	0.94%	0.94%	1
30	Smith Barney Group	14.45%	14.44%	-0.01%	0.00%	0.82%	0.81%	2
31	Seligman Group	4.07%	4.08%	0.00%	0.00%	0.78%	0.78%	8
32	Templeton Group	5.04%	5.20%	0.15%	0.15%	0.98%	0.98%	6
33	T. Rowe Price Funds	4.41%	4.41%	0.00%	0.00%	0.89%	0.89%	1
34	UBS Funds	5.40%	5.13%	-0.25%	-0.24%	0.99%	0.99%	4
35	Vanguard Group	6.44%	6.11%	-0.31%	-0.27%	1.01%	1.00%	2
36	Wells Fargo Advantage							
		6.84%	7.63%	0.80%	0.80%	1.04%	1.03%	156
	Total	6.84%	9.65%	2.73%	2.89%	1.04%	0.97%	156

This tables shows the results of the following simulation: maximization of expected returns subject to a restiction on the variance of returns. The results are shown per family. Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The longest simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active one, in which portfolio weights are updated every day. Simulations use all previous data available at each point in time.

Appendix Tabble 2.4A. Simulations: Best Result for Each Fund

Mininmizing the Variance (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	8.86%	14.08%	5.10%	5.12%	0.88%	0.78%	53
Foreign Stock	6.53%	10.37%	3.69%	3.96%	0.96%	0.89%	70
Portfolio of World Stock Funds	14.77%	20.74%	6.60%	4.09%	0.71%	0.65%	3
Portfolio of Foreign Stock Funds	12.19%	13.70%	1.98%	1.37%	0.85%	0.78%	18
Total	8.25%	12.35%	4.06%	4.06%	0.91%	0.83%	144

Maximizing Expected Returns (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	8.86%	9.81%	1.03%	0.79%	0.88%	0.88%	53
Foreign Stock	6.53%	7.40%	0.85%	0.91%	0.96%	0.97%	70
Portfolio of World Stock Funds	14.77%	21.87%	8.32%	6.76%	0.71%	0.76%	3
Portfolio of Foreign Stock Funds	12.19%	12.08%	0.52%	-0.30%	0.85%	0.86%	18
Total	8.25%	9.15%	1.03%	0.84%	0.91%	0.92%	144

This tables shows the results of the following simulations: minimization of the variance of returns subject to restrictions on expected returns (top panel) and maximization of expected returns subject to a restiction on the variance of returns (bottom panel). Realized returns of the simulated portfolio are calculated out-of-sample, as described in the main text. The best simulation for each main fund in each family is considered. The main funds are World Stock funds, Foreign Stock funds, portfolios of World Stock funds, and portfolios of Foreign Stock funds. Portfolios of World Stock funds are composed of several World Stock funds within the same family but of different objectives, e.g. World Stock Value funds and World Stock Growth funds. Portfolios of Foreign Stock funds are similarly formed, e.g. Foreign Stock Value funds and Foreign Stock Growth funds. The strategy considered is an active, in which portfolio weights are updated every day. Simulations use information based on the previous 240 business days only at each point in time.

Appendix Table 2.4B. Simulations: Longest Available Sample, But Fewer Regional Funds

Mininmizing the Variance (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	8.24%	10.82%	2.56%	2.65%	0.90%	0.81%	59
Foreign Stock	5.79%	8.44%	2.56%	2.78%	0.97%	0.91%	71
Portfolio of World Stock Funds	6.91%	17.38%	9.64%	10.51%	1.04%	0.83%	3
Portfolio of Foreign Stock Funds	11.92%	13.34%	1.90%	1.25%	0.87%	0.80%	18
Total	7.48%	10.11%	2.62%	2.70%	0.93%	0.86%	151

Maximizing Expected Returns (Rolling Windows: 240 Business Days)

Type of Global Fund	Average Return (p.y.)		Improvement in Returns (p.y.)		Standard Deviation of Daily Returns		No. of Sims.
	Global Fund	Active Strategy	Daily	Accumulated	Global Fund	Active Strategy	
World Stock	8.24%	8.45%	0.28%	0.14%	0.90%	0.90%	59
Foreign Stock	5.79%	6.06%	0.23%	0.28%	0.97%	0.98%	71
Portfolio of World Stock Funds	6.91%	15.83%	8.50%	8.87%	1.04%	0.96%	3
Portfolio of Foreign Stock Funds	11.92%	11.89%	0.59%	-0.29%	0.87%	0.88%	18
Total	7.48%	7.86%	0.46%	0.33%	0.93%	0.93%	151

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

Chapter 3

Information Asymmetry and Institutional Investor Mandates: Evidence from U.S. Mutual Fund Foreign Holdings

The literature on home bias and portfolio choice has identified both a foreign bias and an institutional investor bias. The first bias is characterized by foreign investors holding larger firms than domestic investors, whereas the second one goes one step further and state that this is actually a feature of institutional investors, independent of their nationality. Moreover, firm size is interpreted as a proxy for information asymmetries. In this chapter, we further analyze this institutional investor bias. The hypothesis is that there is actually heterogeneity in the institutional investor bias across investors with different investment mandates. Our main argument relies on managers with different mandates facing different costs and benefits in gathering and processing information. As the investment mandate becomes broader, informational costs for a specific region becomes higher and benefits lower. Therefore, Global fund managers would prefer to invest in larger firms, less prone to information asymmetries, than Specialized fund managers. After controlling for transaction costs, liquidity, and other direct and indirect barriers to international capital flows, we find strong evidence in favor of our hypothesis. Hence, our results suggest that information asymmetries vary across institutional investor mandates, being significantly more pronounced for funds with broader mandates.

3.1. Introduction

It is well known that investors have not been nearly as internationally diversified as their consumption and income path would imply. The literature has advanced several explanations for this lack of international diversification, also known as the home bias. Most arguments can be classified into two categories: deviations from the international CAPM affecting foreign asset holdings, and foreign investors facing barriers in selecting and investing in assets abroad.

Arguments based on departures from the mean-variance optimization suggest that investors build their portfolios to hedge themselves against unanticipated changes in their consumption and investment opportunities. For example, investors might want to hedge against changes in the return on their human capital or protect the purchasing power of their currency. In this case, it is possible to obtain, optimally, incomplete international diversification in a setup with fully integrated international capital markets. However, a tilting of portfolios toward foreign assets is the standard outcome of arguments based on hedging demands.[1]

The second set of explanations involves both explicit and implicit barriers to international investments. Explicit barriers are directly observable and quantifiable. They include but are not restricted to capital controls, restrictions on foreign exchange transactions, and withholding taxes. These barriers have fallen over time but have not been accompanied by a significant reduction in home bias, as argued by Tesar and Werner (1995) for example. They are thus not sufficient to explain the home bias. Hence, the recent literature has emphasized the implicit barriers to international capital flows.

[1] See for example Uppal (1993), Baxter and Jermann (1993), and Baxter, Jermann, and King (1994).

These non-observable implicit barriers include political or country risks that differ for resident and non-resident investors. For instance, foreign investors face a positive probability that they might have difficulties in repatriating their investments or that their holdings might be expropriated altogether. Foreign investors thus have lower expected returns and might appear less diversified than domestic investors, especially if these risks do not materialize. The other type of implicit barriers to international investments is information asymmetries between domestic and foreign investors. There are several potential sources for these asymmetries, most of them focusing to some extent on the different costs of acquiring and processing information across investors. For example, if non-residents face higher informational costs, they would consequently be less informed about a country and its firms. Moreover, because of a higher variance of their predictive distribution, foreign investors would also invest less in that country than its domestic residents. Investors might also process information differently because of cognitive and behavioral biases. One possible behavioral bias is explored by Shiller, Kon-ya, and Tsutsui (1990). They provide survey evidence that domestic investors are generally more optimistic regarding expected returns in their own market than foreign investors. This would clearly imply a pattern of home bias in cross-country investments. Another bias is explored by Merton (1987) and Huberman (2001). They argue that investors tend to invest in firms that they are familiar with. If this were indeed the case, we could expect foreign investors to hold more assets from firms well-known abroad, e.g. large exporters.

Although somewhat successful in explaining some feature of the home bias puzzle, not all these explanations can address the firm-level aspect of international portfolio choice. Many arguments made in the literature have implications for investors' choice of assets across countries only. For example, some direct barriers such as capital controls affect all firms within a country in the same way. Therefore, it cannot explain differences in portfolio holdings between domestic and foreign investors within a given country, a widely documented fact.[2] Alternatively, deviations from the international CAPM can only lead to

[2] See for example Kang and Stulz (1997) for an analysis of Japanese markets and Dahlquist and Robertsson (2001) for the Swedish market.

predictions on firm-level investments if there are clearly stated and strong assumptions about the reasons behind hedging demands.[3] Even arguments using implicit barriers, such as political risks, might have limited implications for investments at the firm-level. Nonetheless, implicit barriers, and information asymmetries in particular, do play an important role in explaining differences in firm-level investment patterns between domestic and foreign investors.

An extensive literature documents a preference among foreign investors for large firms, a characteristic interpreted as a proxy for information asymmetries. For example, Kang and Stulz (1997) analyze differences in the portfolio composition of domestic and foreign investors in Japan. They present some evidence that foreign investors prefer to hold assets from larger firms, and controlling for size, from firms with higher export sales and with greater share turnover. Moreover, they show that here is a cost to foreign investors of over-investing in large firms – they face more volatile returns than if they held the market portfolio. The results are interpreted as an indication that information asymmetries are important, as a model in which foreigners know less about small firms would be able to fit these findings. Similarly, also in favor of information asymmetry stories, Coval and Moskowitz (1999) find evidence that U.S. investors prefer geographically close investments. Focusing on institutional investors, Falkenstein (1996), Gompers and Metrick (2001), and Aggarwal, Klapper, and Wysocki (2003) document a foreign bias as well – i.e. foreign investors' preference toward larger firms. Taken together, these results suggest that foreign investors dislike information asymmetries.[4] Nevertheless, Dahlquist and Robertsson (2001) argue that these preferences for larger firms are not particular to foreign investors, but distinctively of institutional investors. They analyze the portfolio holdings of different types of investors in Sweden and find that institutional investors, independent of their nationality, tend to hold assets from larger and more visible firms. In other words, they document an institutional investor bias.

[3] We are not aware of any well-specified hypothesis for state-variable risks predicting that investors hold home biased portfolios.
[4] See also Choe, Kho, and Stulz (2001), Covrig, Lau, and Ng (2005), Edison and Warnock (2004), Chan, Covrig, and Ng (2005), among others.

In this chapter, we investigate further this institutional investor bias. The hypothesis is that there is actually heterogeneity in this bias across institutional investors with different investment mandates. The analysis sheds light on the extent that information asymmetries affect the portfolio decisions of different institutional investors. Chapter 2 of this thesis documents the growing importance of Global funds in recent years. Thus, understanding the market frictions that affect their portfolio choices and how these frictions have evolved over time is important for both individuals (who supply funds) and firms and countries (which demand funds). For individuals, it might help improve the performance of their savings invested through mutual funds. For borrowers (firms and governments) in developing countries, imperfect international diversification in developed countries due to information asymmetries restricts the set of policies that can facilitate access to foreign finance.

We focus on portfolio decisions by U.S. mutual funds from 1997 to 2004. In this industry, managers have different mandates: there are Global funds, that can invest anywhere in the world, and Specialized funds, that can invest in particular regions or countries. These managers can be considered equally sophisticated and skilled, and hence can be assumed to have similar preferences. However, they might not be equally informed about the regions they are allowed to invest in. Managers with different mandates might have different costs and benefits in gathering and processing information. For example, a Global fund manager has lower benefits to learn about Latin America than the manager of a Latin America fund (Specialized) because she does not have to invest 100% of her portfolio in that region. Therefore, we test the hypothesis that information asymmetries are more pronounced in the investment decisions of Global funds than in that of Specialized funds. The empirical evidence presented here suggests that this is indeed the case.

Following an extensive literature, we use firm size as a proxy for information asymmetries – the larger the firm, the less exposed to these frictions a firm is. However, firm size, through its correlations with other variables, might be capturing other effects that are not purely related to information asymmetries, and therefore need to be controlled for.

First, firm size is positively correlated with liquidity. If institutions turnover their portfolio often and are large relative to foreign stocks, they might prefer firms with high liquidity and low transaction costs.[5] For example, Perold and Salomon (1991), Lowenstein (1997), and Chen, Hong, Huang, and Kubik (2003) argue that a large asset base might erode performance because of trading costs associated with liquidity or price impact. In this case, firm size would not be capturing any effects related to information asymmetries. Therefore, it is important to control for them. Second, we address other direct and indirect barriers to international capital flows. Firm size is significantly correlated with foreign listings for example – larger firms are more likely to have international activity. In other words, the shares of large firms might be more easily available abroad through ADRs for example.[6] This would imply that asset holders of large firms would face fewer indirect barriers to international investments. Furthermore, firms adopting these discretionary policies also make themselves more attractive to foreign investors by overcoming institutional shortcomings of their home country. Hence, foreign investors could hold assets from these firms because of improved shareholder protection or because of lower barriers. None of these possibilities are directly related to information asymmetries and are thus controlled for. Lastly, we also analyze whether firm size is capturing Merton's (1987) familiarity effect. Firm size could be simply a proxy for visibility through their correlation with exports: larger firms are also more well-known. Although an interesting point to be analyzed, it is not essential to the main argument of the chapter because it is an informational asymmetry argument.

Nevertheless, any residual effect of firm size on mutual fund portfolio choices is interpreted as evidence of information asymmetries. For example, there are no controls in the analysis that allow us to identify, or even capture, differences in costs related to information acquisition and information processing across investors types. Firm size still captures these effects. We thus test whether these residual effects are significant and different across mutual fund mandates. As already explained, the argument relies on

[5] See for example, Schwartz and Shapiro (1992).
[6] American Depositary Receipts (ADRs) are claims against the ordinary shares traded in the home market.

managers with different mandates facing different costs and benefits in gathering and processing information. As the investment mandate becomes broader, informational costs for a specific region becomes higher and benefits lower. Therefore, Global fund managers would prefer to invest in firms less prone to information asymmetries than Specialized fund managers. We do find strong evidence that there is indeed a heterogeneous size effect across investors' mandates. Hence, our results suggest that information asymmetries vary across institutional investor mandates, being significantly more pronounced for funds with broader mandates.

The chapter is organized as follows: Section 3.2 describes our data. Section 3.3 presents a bivariate analysis of firm characteristics and mutual fund holdings. Section 3.4 reports the multivariate analysis with logit and poisson models with over-dispersion (negative binomial models) of the determinants of mutual fund holdings. Section 3.5 concludes.

3.2. Data Description

In this chapter, we focus on U.S. equity mutual funds that are established to purchase assets around the world. Funds that focus primarily on a debt-equity allocation are excluded from the analysis, even though they do invest a significant share of their portfolios in foreign stocks. We use two types of data in our empirical analysis: mutual fund holdings data and data on firm attributes.

Mutual fund holdings data is available from Morningstar International Equity Mutual Funds, a private company that collects mutual fund data, and from the U.S. Securities and Exchange Commission (SEC). Reports are published on a monthly basis since 1992.[7] However, mutual funds do not disclose their holdings as frequent. They do so, at most, on a quarterly basis, and typically bi-annually. Given this heterogeneity in the releases of holdings, we construct our database with the last reported portfolio information for each fund for any given year. For example, our sample of mutual fund holdings for

[7] We analyze Morningstar reports from March 1992 to June 2006.

2005 contains portfolio data for the Fidelity Worldwide fund, with portfolio holdings as of October 2005, and portfolio data for Scudder Global fund, with portfolio holdings as of December 2005. We collect detailed information on portfolio holdings: stock names, amount invested in each stock by each fund, and country of origin of these holdings. [8,9]

Mutual funds are classified according to their investment mandates: World Stock funds, Foreign Stock funds, Emerging Market funds, Latin America and the Caribbean funds, Asia and Pacific funds, Europe funds, and Country funds. World Stock funds can invest anywhere in the world, whereas Foreign Stock funds can invest anywhere except the U.S. Hence, funds classified as either World Stock or Foreign Stock funds, are also called Global funds throughout this chapter. All other fund types, as their name suggest can invest in a specific set of countries/regions, and are thus denominated Specialized funds, as they invest in a subset of assets that can be held by Global funds.

The other type of data collected is firm characteristics on a yearly basis. We use three types of data: balance sheet data, information on foreign activity (i.e. whether and when a firm issues ADRs), and trading data. We collect firm-level balance sheet data from Worldscope (Thomson Financial Company). This constitutes our "universe" of firms covering the period 1997-2004.[10]

On foreign activity, we have data from the Bank of New York, which covers the three major stock exchanges in the U.S.: NYSE, NASDAQ, and AMEX. The Complete DR Directory contains the list of current DR programs and the effective date of each program. However, to account for DR programs that were terminated during the 1997-

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[8] Some families sell the same portfolio to investors under different names depending on their fee structure. Here, we count them as one. For example, Fidelity Advisors Funds had the following funds in 2005: Fidelity Advisors Latin America A, Fidelity Advisors Latin America B, Fidelity Latin America T, etc. These funds have a different fee structure and are thus treated differently by Morningstar. However, because they all hold the same portfolio, we consider them as being the same fund for our purposes.

[9] A difficulty in constructing this database is that holdings for each fund are reported separately. Moreover, stock identifiers are rarely available, and if so, are not always unique. We do match these holdings across mutual funds over time based on the country of origin and the stock name for each security holding. However, the country of origin is available for the 1997-2005 period only. We thus do not attempt any matching of holdings for earlier periods.

[10] Although data on U.S. mutual fund portfolios is available for 2005, we have limited access to firm-level data from Worldscope for that year.

2004 period, we use an additional database, also provided by the Bank of New York, which lists all terminated DR programs. These two databases allow us to determine whether a firm has issued ADRs on any year in our sample.

Lastly, firm-level domestic stock market trading data comes from Standard & Poor's Emerging Markets Data Base (EMDB), which was formerly collected by the International Finance Corporation. The EMDB provides data on domestic market capitalization and domestic value traded in current U.S. dollars by firm. Although the EMBD is the most comprehensive database on firm-level trading of equities around the world, the EMDB focuses on emerging markets and does not include 100 percent of local firms (e.g., while varying by country, the EMDB typically covers about 70 percent of market capitalization). Given the importance of trading activity for our analysis, we restrict our sample to firms from developing countries. Therefore, the list of countries covered is the following: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hong Kong, Hungary, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Slovakia, South Africa, Taiwan, Thailand, Turkey, and Venezuela. It should be noted that Hong Kong has been included in our database because of Chinese firms listed in its exchange. However, the results documented here are robust to its exclusion from the sample.

3.3. Firm Characteristics and Mutual Fund Portfolio Holdings

In this section, we describe in more details our sample of mutual fund holdings, specify the balance sheet variables considered, and analyze the relationship between mutual fund holdings and firm characteristics, especially across mutual fund types.

Our sample of mutual fund portfolios was analyzed in great details in the previous chapter. Nevertheless, Table 3.1 summarizes its main characteristics. As already mentioned, we classify mutual funds as Global or Specialized funds. There are on average 727 funds in any given year on our sample, out of which 471 are classified as Global funds, and 256 as Specialized funds. Moreover, Global funds are also larger than Specialized funds. They manage US$802 million on average, whereas Specialized funds have average net assets under management around US$222 million. Thus, once the size of these funds is taken into account, Global funds are even more important than Specialized funds, being almost four times as large as Specialized funds. Table 3.1 also reports the average number of mutual fund holdings. Global funds usually hold more assets than Specialized funds, 179 vs. 122 holdings. However, in developing countries, the reverse is true. Specialized funds invest in 72 firms on average in any given year and Global funds invest in only 21 firms. In other words, a considerably large proportion of the number holdings of Specialized funds in developing countries are not shared by their Global counterparts. In the rest of the chapter, we analyze to what extent the portfolio of these funds differ from one another and what it implies about the market frictions that affect their portfolio choices.

To characterize the portfolio holdings of these mutual funds, we analyze balance sheet data at the firm-level. Based on an extensive literature characterizing portfolio choice with balance sheet data, the following attributes are considered: firm size measures (market capitalization, total assets, and total sales), performance variables (price-to-book value ratio and price-earnings ratio), a prudence variable (dividend yield), and financial health variables (return on assets, leverage, and current ratio).[11] We have grouped these variables into 4 categories according to their effect on portfolio choice.

1. Market capitalization: this is the market value of a firm's shares at the end of the fiscal year, measured in US$ million. In the regressions, we consider the log of the market capitalization.

2. Total assets: measured in US$ million. In the regressions, we consider the log of a firm's total assets.

3. Total sales: measured in US$ million. In the regressions, we consider the log of a firm's total sales.

4. Price-to-book value ratio: this is a valuation measure of the firm, capturing historical returns. "Growth" firms typically have high price-to-book value ratios, whereas "value"

[11] See for example Falkenstein (1996), Kang and Stulz (1997), Dahlquist and Robertsson (2001), and Gompers and Metrick (2001), among many others.

firms have low ratios. This ratio is defined as the market value of equity at year-end divided by the book value of equity.

5. Price-earnings ratio: it is also a valuation measure of the firm calculated as the market value per share divided by earnings per share. A high P/E ratio suggests that investors are expecting higher earnings growth in the future in comparison to companies with a lower price-earnings ratio.

6. Dividend yield: this is the value of dividends paid during the fiscal year divided by the market value of the firm at year-end. Stocks paying higher dividend yields are considered safer as they guarantee some income to its holders. Also, there might be institutional restrictions on holdings of assets that do not pay dividends.

7. Return on assets: this is the net income divided by total assets at year-end.

8. Leverage: it captures a firm's financial vulnerability in the long run. It is calculated as the ratio between total liabilities to total assets at year-end.

9. Current Ratio: this is a proxy for short-term financial distress, measuring a firm's ability to meet its short-term payment requirements. It is calculated as current assets divided by current liabilities at year-end.

Table 3.2A describes the attributes of firms on mutual fund portfolios. Our universe of firms include 9,501 firms, out of which 1,982 have received investments from Global funds and 3,710 firms have received investments from Specialized funds at some point in the sample. This is simply re-states the evidence on mutual fund holdings presented in Table 3.1 – Specialized funds invest in a greater number of firms in developing countries than Global funds. The average firm size in our sample is US$417 million in market capitalization, US$1,062 million in total assets, and US$385 million in total sales. However, the average size of firms in mutual fund portfolios is significantly higher, independent of the proxy considered. Global funds invest in firms with an average size of US$1,460 million in market capitalization for example, more than three times as large as the sample average. Specialized funds also hold significantly larger firms: US$1,013 million in market capitalization. This data is consistent with the existence of an institutional investor bias, as both fund types hold assets from firms that are significantly larger than the market portfolio.

On the other hand, the two performance variables show that the typical firm in the portfolio of mutual funds does not deviate significantly from the average firm. If dividend yield is considered though, mutual funds invest in firms with slightly lower values than the average firm in our database. The results on financial health variables are somewhat mixed. Mutual funds pick firms lower leverage but higher current ratio, which suggests that they give greater weight to financial vulnerabilities in the long run than in the short run. Mutual funds also seem to prefer firms with higher return on assets. These results are consistent with what has been reported in the literature. For example, Kang and Stulz (1997) and Dahlquist and Robertsson (2001) also find that foreign investors prefer firms with low dividends and firms with large cash positions on their balance sheets.

The results in Table 3.2A also provide preliminary evidence on our main hypothesis of heterogeneity in foreign portfolio holdings across institutional investors with different investment mandates. More specifically, we focus on the hypothesis that information asymmetries are more pronounced in the investment decisions of Global funds than in that of Specialized funds. Managers from both Global and Specialized funds can be considered equally sophisticated and skilled, and hence are assumed to have similar preferences. However, they might not be equally informed about the regions they are allowed invest in. Managers with different mandates might have different costs and benefits in gathering and processing information.

Following an extensive literature, firm size is a proxy for information asymmetries.[12] As reported in Table 3.2A, Global funds hold assets from firms that are significantly larger than that on the portfolio of Specialized funds, corroborating our initial hypothesis. If other firm attributes are considered, Global funds prefer firms with higher

[12] See for example Falkenstein (1996), Kang and Stulz (1997), Dahlquist and Robertsson, (2001), Edison and Warnock (2004), and Chan, Covrig, and Ng (2005), among many others.

price-to-book values and higher leverage if compared with Specialized funds, although the results are significant only at 10% level.

Next, we further explore the evidence on heterogeneous firm size across the portfolios of mutual funds with different mandates. In Table 3.2B, we show the average firm size in the portfolio of Global and Specialized funds on a yearly basis since 1997. The top panel reports the average values for market capitalization, the middle one for total assets, and the bottom one for total sales. These cross-sectional results support our hypothesis as well. The average firm in the portfolio of Global funds is significantly larger in than that on the portfolio of Specialized funds, the only exception being on 2004. Moreover, the results are robust to the different measures of firm size.

This table also supports the existence of an institutional investor bias. Typically, firms in the portfolio of mutual funds are on average significantly larger than the average firm on our database.[13] It should be highlighted that the evidence in Table 3.2B also suggests that information asymmetries might have become considerably worse in recent years, especially in the last two years of our sample. In 1997, the average size of firms in the portfolio of mutual funds was not even twice that of the average firm in the full sample, independent of the proxy used. However, in 2004, mutual funds held firms that were at least five times as large as those in our universe of firms!

3.4. Multivariate Analysis

To disentangle the various relationships found, we run multivariate regressions. Ideally, we would like to analyze the impact of firm-level variables on ownership measures. The standard ownership measure used in the literature is constructed as the number of shares held by certain investors (e.g. domestic or foreign investors) divided by the total number of outstanding shares at a given point in time. As described in Section 3.2, Worldscope reports the number of outstanding shares on a yearly basis. However, our database on holdings is not as consistent – portfolio holdings are reported on different dates. Therefore,

[13] Although not reported, results from these tests are available upon request.

we are not able to construct an ownership measure given that numerator and denominator are measured at different points in time. Hence, we focus on two other variables. First, we focus on a dummy that equals one when a firm is held by a certain mutual fund type, and zero otherwise. In this case, maximum-likelihood logit models are estimated. Alternatively, we use count data: we count the number of funds with a certain mandate that holds assets of a given firm in a certain year. This count data contains evidence of over-dispersion, and thus negative binomial maximum-likelihood models are estimated. [14] Both variables capture the relevant information for the purposes of the analysis conducted here. We are able to quantify the impact of firm-level attributes on the portfolio choice of mutual funds, although we will not be able to measure their impact on the size of mutual fund investments.

For both types of regressions, we estimate multivariate models dividing mutual funds according to their mandate: Global and Specialized funds. This multivariate setup accounts for any residual correlation between the equations for different investor types. We are thus able to perform hypothesis tests on the estimated coefficients across equations.

3.4.1. Determinants of Mutual Fund Holdings

To analyze the determinants of mutual fund holdings, we run multivariate regressions with firm-level attributes as explanatory variables. These are pooled regressions including the whole sample from 1997 to 2004. Country and year dummies are included in these estimations, and standard errors are clustered at the industry level. We present the first set of results in Table 3.3A, where constants and fixed effects are not shown.

In the first column of the table, we show the estimated maximum-likelihood logit model. Remember that our dependent variable is binary. Hence, this regression measures the probability of a positive outcome, i.e. the probability that a given firm in a certain year is part of the portfolio of either Global or Specialized funds. The reported coefficients can

[14] A poisson model assumes that the mean and the variance of the count data are equal. However, in our dataset, the variance is considerably larger, making the negative binomial model more appropriate.

be interpreted as the effect on the log of the odds ratio of a unit change in the independent variable. The odds ratio shows the strength of the association between a predictor (a firm-level attribute) and the response (likelihood of being part of mutual fund portfolio). Moreover, an odds ratio of one means that there is no association between them.[15]

The results are very similar to the ones on the bivariate analysis. Firms with higher market capitalization are more likely to be in the portfolio of mutual funds, a finding consistent with the institutional investor bias. Mutual funds are also more likely to invest in assets of firms with lower price-to-book values, i.e. their odds ratio increase as the price-to-book value falls. Although not reported, the results are strongly robust to the other proxies of firm size.[16]

The results in Table 3.3A also support our main hypothesis of differences in foreign portfolio holdings across institutional investors with different investment mandates with respect to firm size. The odds ratio for market capitalization is 3.28 in the regression explaining holdings of Global funds, a number significantly larger than one. This means that an increase in US$ 1 million in a firm's market capitalization, improves the odds of being held by a Global mutual fund in 3.28. For Specialized funds, these odds increase by only 2.58. A Wald test can reject the hypothesis that these effects are equal. In other words, firm size is a stronger determinant of whether a Global fund holds assets from a certain firm than it is for Specialized funds. This is the same as saying that Global funds hold assets from larger firms than Specialized funds do. Moreover, firm size is the only firm attribute that is significantly different across mutual fund types. We could not reject the hypothesis that the other characteristics are equal across the two estimated equations.

In the second column of Table 3.3A, we show the estimated maximum-likelihood negative binomial model. We can interpret the negative binomial regression coefficient as follows: for a unit change in the predictor variable, the difference in the logs of expected

[15] There is a direct association between the reported coefficients and the odds ratio: the log of the odds ratio is equal to the estimated coefficients.

[16] In order to save space, we only report the results in which market capitalization is a proxy for firm size for the rest of the chapter. Results considering total assets or total sales are available upon request.

counts of the response variable is expected to change by the respective regression coefficient, given the other predictor variables in the model are held constant. In our case, the dependent variable this time is the number of mutual funds, Global or Specialized, that hold assets from a certain firm at a given point in time. Hence, the estimated coefficients mean that a unit change in a firm characteristic increases the number of funds that invest on that company if the estimated coefficient is positive, where the coefficient value measures the magnitude of such increase.

The results for the negative binomial model are similar to the ones obtained using a logit model with respect to the firm size effects across mutual fund types. The number of Global mutual funds with positive holdings increases significantly more than the number of Specialized funds with positive holdings as firms get larger. In other words, Global funds tend to hold firms that are considerably larger than the firms held by Specialized funds. In this regression, the portfolios of Global and Specialized funds also differ with respect to return on assets and leverage.

Next, for robustness purposes, we estimate logit models on a yearly basis instead of the pooled-sample regression.[17] The results are reported on Table 3.3B. Once more, the outcome of these regressions is comparable to the results shown in the previous section. The heterogeneous size effect across mutual fund types is consistently significant over time. All other firm attributes are not consistently different across portfolios of different mutual fund types. They might be relevant for a short period of time though, as the dividend yield in the first years of our sample. Therefore, the results reported in Tables 3.3A and 3.3B support our hypothesis that information asymmetries are more pronounce for Global funds than for Specialized funds.

Furthermore, as highlighted with the simple bivariate analysis, firm size affects considerably more the portfolio choice of mutual funds in the later part of the sample, independent of their mandate. We performed Wald tests of whether the effects of firm size

[17] The firm size effect on the negative binomial model is also robust to these cross-sectional estimations and not reported to save space. The other effects are not robust and change considerably with the sample.

were equal in 1997 and 2004 across mutual fund mandates. The results are shown in the last column of Table 3.3B. The null hypothesis was strongly rejected at 1% level. This evidence suggests that information asymmetries might be getting worse over time.

3.4.2. Information Asymmetries in Mutual Fund Portfolios

Following the literature, we have used so far firm size as a proxy for information asymmetries – the larger the firm, the less exposed to these frictions a firm is. The results shown in the previous sections thus support our hypothesis that Global fund managers prefer to invest in firms less prone to information asymmetries than Specialized fund managers. However, firm size, through its correlations with other variables, might be capturing other effects that are not purely related to information asymmetries, and therefore need to be controlled for. Therefore, the goal of this section is to identify and control for these other effects on mutual fund portfolio choices captured by firm size.

3.4.2.1. Transaction Costs and Liquidity

First, firm size is positively correlated with liquidity. If institutions turnover their portfolio often and are large relative to foreign stocks, they might prefer firms with high liquidity and low transaction costs.[18] For example, Perold and Salomon (1991), Lowenstein (1997), and Chen, Hing, Huang, and Kubik (2003) argue that a large asset base might erode performance because of trading costs associated with liquidity or price impact. In this case, firm size would not be capturing any effects related to information asymmetries. Therefore, it is important to control for both liquidity and transaction costs.

It should be noted that liquidity might also be capturing an aspect of information asymmetries: the less informed about a particular region/country a manager is, greater the incentives to hold assets from more liquid firms because of lower transaction costs. However, we cannot distinguish these two effects without information at the fund level.

[18] See for example, Schwartz and Shapiro (1992).

Given the methodology followed here, this is not possible. We thus have no strong prior about the impact of liquidity across mutual fund mandates.

We interpret the residual effect of firm size on mutual fund portfolio choices as evidence in favor of information asymmetries, given that only one particular aspect of it might be captured by the liquidity controls. For example, liquidity should not be associated with different costs of processing information. Hence, we test whether these residual effects are significantly different across mutual fund mandates.

To control for price impact, we use a country-level transaction cost variable measuring market impact from Elkins/McSherry. This market impact variable is calculated by comparing trades to the volume-weighted average price (VWAP) on a given trade day.[19] The reported values are the yearly averages of the principally weighted loss to the VWAP. We use the log of the turnover ratio at the firm-level to control for liquidity effects. Turnover ratio is defined as the number of traded shares during the year divided by the total number of outstanding shares.

The results are shown in Tables 3.4A and 3.4B for the logit and negative binomial models, respectively. The coefficient on firm size is always significant at the 1% level. Moreover, the Wald tests show that the effect of firm size on mutual fund portfolio choice is still significantly larger for Global funds than for Specialized funds. The estimated coefficients on the transaction costs control, especially on the logit regressions, indicate a negative effect on the portfolio choice of Global funds, and to a lesser extent, an also negative effect on Specialized fund holdings. This piece of evidence is consistent with the fact that Global funds tend to be larger than Specialized funds, and thus might be more responsive to market impact costs. The effects of turnover as a determinant of mutual fund holdings are mixed. The logit regressions suggest that greater liquidity increases the probability of being held by a mutual fund. However, the negative binomial estimations point toward the opposite effect. The results on the literature on these effects are also

[19] VWAP are calculated by calculating the ratio between all shares traded in a particular stock on a particular day and the total principal traded within that stock.

mixed. For example, Dahlquist and Robertsson (2001) document a positive relation between foreign ownership and liquidity. On the other hand, Kang and Stulz (1997) find mixed effects at best, with negative estimates on cross-sectional regressions. Edison and Warnock (2004) also find a negative impact if holdings in Emerging Asia are considered.

In sum, adding control variables for liquidity and transaction costs did not change our previous results. We still find robust evidence that information asymmetries become more pronounced as mutual funds mandates become broader.

3.4.2.2. Other Barriers to International Capital Flows

In this sub-section, we address other direct and indirect barriers to international capital flows. Firm size is significantly correlated with foreign listings for example – larger firms are more likely to have international activity, i.e. be cross-listed in a U.S stock exchange. In other words, the shares of large firms might be more easily available abroad through ADRs. This would imply that asset holders of large firms would face fewer direct barriers to international investments. Furthermore, firms adopting these discretionary policies also make themselves more attractive to foreign investors by overcoming institutional shortcomings of their home country, such as shareholder protection. Hence, foreign investors could hold assets from these firms because of improved shareholder protection or because of lower barriers. None of these possibilities are directly related to information asymmetries. We thus need to control for them.

When firms issue ADRs, they not only reduce direct barriers to international capital flows but they might also improve the information environment due to stricter disclosure rules for example. This last effect has implications for our hypothesis. If this were indeed the case, these firms should become more attractive to Global fund managers. Luckily, we can distinguish between these two effects. ADRs can be basically classified into two types for our purposes: private issues with no additional requirement on information disclosures (Levels I and IV, which are OTC and private placements) and public issues that are required to comply with U.S. disclosure rules (Levels II and III). Therefore, both types of

ADRs involve reductions in the direct barriers but only the "public" type is associated with a better informational environment. Therefore, we expect public ADRs to have a stronger effect on the portfolio choice of Global funds than on the portfolio of Specialized funds. But no such heterogeneity is expected from private issues.

Our second set of controls is related to direct measures of restrictions to foreign investments: investability and closely held. Investability is a firm-level variable from EMDB capturing the legal availability of a firm's stocks to foreigners. Closely held, a more indirect measure, compute the percentage of outstanding shares that are held by large shareholders, and thus are not practically available to foreigners.

The results are shown in Tables 3.5A and 3.5B for the logit and negative binomial models, respectively. As expected, the estimated coefficients on investability are significantly positive in all specifications for both investor types. As more shares become legally available to foreigners, larger the probability of being held by a mutual fund and possibly larger the number of funds with positive holdings. Our other measure of direct restrictions on foreign holdings, closely held, is mostly not significant.

Regarding our hypothesis that Global funds are more prone to information asymmetries than Specialized funds, the evidence in these tables provides strong support. We capture these effects with two variables this time: firm size and ADRs. Firm size measured by a firm's market capitalization and ADR dummies are always significant at 1% significance level for the estimated models. For both firm size and Public ADR, the estimated coefficients are significantly larger for Global funds than for Specialized funds, suggesting that greater effects of these variables on the portfolio choice of Global funds. Furthermore, we cannot reject the hypothesis that the coefficient on Private ADRs is equal for both mutual fund types, with the exception of one specification. These results also corroborate the hypothesis analyzed in this chapter, since private listings do not affect the informational environment for these firms and therefore should not necessarily have different effects across investors' mandates.

3.4.2.3. Information Asymmetries across Mutual Fund Mandates

In this sub-section, we include all the controls analyzed in the previous sections in our estimations. Thus, we estimate both logit and negative binomial models with controls for transaction costs, for liquidity, and for other barriers to international capital flows. Although not essential to the main argument of the chapter because it is purely related to information asymmetries, we also try to disentangle whether firm size is capturing Merton's (1987) familiarity effect. The argument is that investors hold shares in firms with which they are familiar and that investors are more likely to be familiar with large firms. Similarly, Falkenstein (1996) shows that mutual funds tend to hold more shares in firms that have a lot of news stories associated with them. Firm size can thus be a proxy for visibility through their positive correlation with exports: larger firms would also be more well-known.[20] Most importantly, any residual effect of firm size on mutual fund portfolio choices is interpreted as evidence of information asymmetries. For example, there are no controls in the analysis that allow us to identify, or even capture, differences in costs related to information acquisition and information processing across investors types. Firm size still captures these effects. We thus test whether these residual effects are significant and different across mutual fund mandates. We also perform the same test on the Public ADR variable, as it does capture a particular feature of information asymmetries, as explained in the previous sub-section.

The estimated regressions are shown in Tables 3.6A and 3.6B for the logit and negative binomial models, respectively. All the results previously reported are robust to the extra controls added here. Firm size and Public ADR are always significant at 1% confidence level, independent of the type of regression or mutual fund mandate. Furthermore, in all of them, the coefficients on for Global funds are significantly larger than the ones for the Specialized funds. For the logit regressions, a larger estimated coefficient means than a unit increase in a firm's market capitalization is associated with

[20] Some might argue that exports might be indirectly capturing the fear of capital controls as firms with export sales do have a source of income in foreign exchange. Although important in debt markets, we believe that the argument has limited scope for equity markets.

an increase in the odds that a firm is held by a certain mutual fund type. In the case of the ADR dummy, an estimated positive coefficient measures the increase in the odds ratio for the case in which the dummy equals one relative to the case in which the dummy equals zero. In other words, as firms issue ADRs publicly, they increase their probability of being held by a Global fund. In the poisson regressions with over-dispersion, a unit increase in a firm's market capitalization is associated with an increase in the log of number of funds holdings assets from this firm. In either case, the implications are similar: firm size and the issuance of Levels II and III ADRs have a greater impact on the portfolio choice of Global funds than on the portfolio choice of Specialized funds.

The evidence based on the estimated coefficients on Private ADRs suggests a slightly mixed picture, not as consistent as found in the previous section. Although not a robust result, Private ADRs might also have a larger impact for the decisions of Global funds than for those of Specialized funds. The effect of firm-level turnover is contradictory as well. In some specifications, turnover is significant and positive, while in others significantly negative. Once more, this is consistent with previous findings in the literature. The effects of transaction costs are unchanged and also somewhat mixed. Transaction costs always affect more negatively Global funds than Specialized funds; however, the coefficients are not always significant. These results are consistent with the fact that Global funds are considerably larger than Specialized funds. Therefore, transaction costs related to market impact might be more relevant for them. Investability also seems to affect the odds of being held by mutual funds, independent of their mandate.

We have introduced a new control in Tables 3.6A and 3.6B. We have added a variable to capture familiarity effects – foreign sales to total sales. In order to support our argument that informational asymmetries have become more pronounced as investor mandate becomes broader, we expect foreign sales to total sales ratio to have a higher estimated coefficient for Global funds than for Specialized funds. However, the results are somewhat mixed. In the logit regressions, we find that its effects on Global funds are not significant, but depending on the specification we cannot reject the hypothesis that it affects both fund types symmetrically. In the negative binomial regressions, the results are more interesting, with the familiarity variable being even significantly larger for Global funds than for Specialized funds. Once liquidity effects are considered, we do not obtain such a positive outcome anymore, although the sample size is reduced considerably. It should be noted though that exports is not the only variable capable of capturing the familiarity effects. Participation in standard indexes such as the MSCI and the number of analysts following a given firm have been used in the literature and might actually be better measures. Thus, we believe that firm size might still capture part of the familiarity effects, not completely covered by the control used here.

With respect to the other firm-level attributes, these tables suggest that their impact on mutual fund portfolios is not robust across different specifications. This finding has support on the literature. Depending on the sample used and the type of investor analyzed, the effects of firm attributes, other than the ones described above, on portfolio choices are not consistent.

Lastly, our results in the previous sections have suggested that information asymmetries were becoming worse over time. It is interesting to analyze whether the same pattern emerges in this version of the analysis, where several controls have been added. We have performed the same tests as before: we compare the coefficient on firm size for each investor type in 1997 and in 2004. The results are reported in the last line of Tables 3.6A and 3.6B. With the exception of one negative binomial model specification, our tests indicate that the effects of firm size on mutual fund portfolio choices have increased significantly over time. We have also compared the coefficients on the ADR dummies. However, their impact on portfolio choice has not changed over time.

In sum, the main argument in this chapter relies on managers with different mandates facing different costs and benefits in gathering and processing information. As the investment mandate becomes broader, informational costs for a specific region becomes higher and benefits lower. Therefore, Global fund managers would prefer to invest in firms less prone to information asymmetries than Specialized fund managers. We do find strong evidence that there is indeed such a heterogeneous effect across investor mandates. Hence, our results suggest that information asymmetries vary across institutional investor mandates, being significantly more pronounced for funds with broader mandates. Moreover, we also find some evidence that information asymmetries might have become considerably worse in recent years, especially in the last two years of our sample.

3.5. Conclusion

The literature on home bias and portfolio choice has identified both a foreign bias and an institutional investor bias. The first bias is characterized by foreign investors holding assets from larger firms than domestic investors, whereas the second one goes one step further and state that this is actually a feature of the portfolio choice of institutional investors, independent of their nationality. In this chapter, we further analyze the institutional investor bias. The hypothesis is that there is actually heterogeneity in this bias across institutional investors with different investment mandates. Our main argument relies on managers with different mandates facing different costs and benefits in gathering and processing information. As the investment mandate becomes broader, informational costs for a specific region becomes higher and benefits lower. Therefore, Global fund managers would prefer to invest in firms less prone to information asymmetries than Specialized fund managers.

We focus on the U.S. mutual fund industry, where managers have their mandates clearly defined. Mutual funds are classified as Global or Specialized funds according to the regions they are allowed to invest in. In the first part of the chapter, we study bivariate relationships between mutual fund holdings and firm-level attributes, such as firm size, leverage, and return on assets. We show that the average firm in the portfolio of Global funds is significantly larger than that on the portfolio of Specialized funds. Following the literature, we interpret firm size as a proxy for information asymmetries – the larger the firm, the less prone to informational related-frictions a firm is.

However, firm size, through its correlations with other variables, might be capturing other effects not purely related to information asymmetries, and therefore need to be controlled for. In the second part of the chapter, we present a multivariate analysis using controls for transaction costs, liquidity, and other direct and indirect barriers to international capital flows. The residual effect of firm size on mutual fund portfolio choices is interpreted as evidence of information asymmetries. We do find strong evidence that there is a heterogeneous firm size effect across investor mandates. Hence, our results suggest that information asymmetries vary across institutional investor mandates, being significantly more pronounced for funds with broader mandates.

The analysis sheds light on the extent that information asymmetries affect the portfolio decisions of different institutional investors. However, it does not address the consequences of these market frictions, especially once the growing importance of Global funds is taken into consideration. Although, there is some preliminary evidence shown in Chapter 2 of this thesis that Global funds do perform worse than Specialized funds within the same family of funds. Moreover, we have shown some evidence that these frictions became more pronounced in recent years. Understanding the causes of such phenomenon is also left for future research.

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Table 3.1. Sample Description

	Average No. of Funds per Year	Average Fund Size	Average No. of Holdings	Average No. of Holdings in Developing Countries
Fund Type:				
All Funds	727	598	159	43
Global Funds	471	802	179	21
Specialized Funds	256	222	122	72
t-statistic:				
Ho: Global = Specialized		8.8	11.4	23.0

This table describes our sample of mutual fund portfolios. We report the average number of funds per year, the average fundsize, captured by their net asset under management, the average number of holdings in mutual fund portfolios, and the average number of holdings in assets from developing countries in mutual fund portfolios. The table also reports the t-statistic of a hypothesis test that a given fund characteristic is equal across mutual fund types. Mutual funds are classified as either Global or Specialized funds. Global funds include both World Stock and Foreign Stock funds. Specialized funds include: Emerging Market funds, Regional funds, and Country funds. Data on net assets under management is in US$ million. The source of the mutual fund holdings data is Morningstar International Equity Mutual Funds.

Table 3.2A. Characteristics of Firms in Mutual Fund Portfolios

	Universe of Firms	Global Funds	Specialized Funds	t-statistic
No. of Firms	9,501	1,982	3,710	.
Firm-Level Characteristics:				
Size Variables:				
Market Capitalization	417	1,460	1,013	7.66
Total Assets	1,062	3,592	2,611	7.37
Total Sales	385	1,292	983	7.12
Performance Variables:				
Price-to-Book Value Ration	2.5	2.0	1.6	1.58
Price-Earnings Ratio	14.8	14.8	13.3	0.42
Prudence Variables:				
Dividend Yield	5.9	3.6	4.8	0.87
Financial Health Variables:				
Return on Assets	3.0	5.3	5.3	0.01
Leverage	32.5	30.3	27.6	1.46
Current Ratio	3.4	1.9	2.1	1.22

This table reports the average values of characteristics of firms in mutual fund portfolios as well as the averages for all firms in our sample (called the universe of firms). The table also shows the total number of firms in our sample, the total number of firms actually held by Global funds, and the total number of firms in the portfolios of Specialized funds. We perform a hypothesis test that average firm characteristics are equal across portfolios of different mutual fund types. The t-statistic of this test is reported. We divide mutual funds into two categories: Global and Specialized funds. Global funds include both World Stock and Foreign Stock funds. Specialized funds include: Emerging Market funds, Regional funds, and Country funds. See main text for a detailed description of firm characteristics. Data on firm size is in US$ million. The data sources are Worldscope for firm characteristics and Morningstar International Equity Mutual Funds for mutual fund holdings.

Table 3.2B. Average Size of Firms in Mutual Fund Portfolios

	Market Capitalization			
	Universe of Firms	Global Funds	Specialized Funds	t-statistic
1997	613	1,020	724	3.31
1998	472	774	695	0.39
1999	528	1,486	997	3.22
2000	395	1,316	955	2.12
2001	334	1,345	943	2.60
2002	299	1,320	827	3.88
2003	425	2,289	1,156	5.57
2004	541	2,937	2,724	0.63
Total	436	1,492	1,037	7.16
	Total Assets			
	Universe of Firms	Global Funds	Specialized Funds	t-statistic
1997	1,577	2,607	1,992	2.63
1998	1,392	2,532	2,055	2.00
1999	1,010	2,853	2,105	3.07
2000	959	3,277	2,584	2.31
2001	850	3,334	2,645	2.19
2002	930	4,065	2,650	3.80
2003	1,039	5,259	2,738	5.84
2004	1,206	6,606	6,173	0.42
Total	1,063	3,670	2,670	7.05
	Total Sales			
	Universe of Firms	Global Funds	Specialized Funds	t-statistic
1997	512	851	670	2.86
1998	488	884	718	2.14
1999	358	975	731	2.96
2000	351	1,192	969	1.82
2001	310	1,373	1,104	1.88
2002	319	1,494	1,032	3.18
2003	368	1,992	1,106	5.36
2004	465	2,374	2,467	0.34
Total	381	1,331	1,014	6.73

This table reports the average size of firms in mutual fund portfolios. Averages are shown across mutual fund types and over time. The table also shows the average firm size for the universe of firms in our sample on a yearly basis. Three proxies for firm size are analyzed: market capitalization, total assets, and total sales. Lastly, we perform a hypothesis test that the average firm in the portfolio of Global funds is larger than the average firm in the portfolio of Specialized funds. The t-statistic of this one-sided test is reported. We divide mutual funds into two categories: Global and Specialized funds. Global funds include both World Stock and Foreign Stock funds. Specialized funds include: Emerging Market funds, Regional funds, and Country funds. Data on firm size is in US$ million. The data sources are Worldscope for firm characteristics and Morningstar International Equity Mutual Funds for mutual fund holdings.

Table 3.3A. Determinants of Mutual Fund Holdings

	Logit Model		Negative Binomial Model	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	1.187	0.950	1.089	0.95
	[0.029]	[0.020]	[0.077]	[0.018]
Price-to-Book Value Ratio	-0.007	-0.010	-0.009	-0.012
	[0.003]	[0.005]	[0.006]	[0.007]
Price-Earnings Ratio	0.000	0.000	0.000	0.000
	[0.0001]	[0.0003]	[0.0001]	[0.0001]
Dividend Yield	0.000	0.000	0.000	0.000
	[0.00007]	[0.0002]	[0.0001]	[0.0001]
Return on Assets	0.000	0.000	0.000	0.000
	[0.0001]	[0.00004]	[0.0001]	[0.0001]
Leverage	-0.001	0.000	-0.006	0.000
	[0.002]	[0.00003]	[0.003]	[0.001]
Current Ratio	-0.001	-0.002	-0.003	-0.002
	[0.003]	[0.002]	[0.002]	[0.001]
Pseudo R2	0.41	0.35	0.22	0.24
No. Obs.	34,449		34,445	
Chi2-statistic:				
Market Capitalization	89.35		4.75	
Price-to-Book Value Ratio	0.64		0.26	
Price-Earnings Ratio	2.32		0.02	
Dividend Yield	0.11		0.56	
Return on Assets	1.32		10.41	
Leverage	0.85		5.15	
Current Ratio	0.37		0.23	

This table reports the estimation results of multivariate logit and negative binomial models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable is binary: it equals one if a firm belongs to the portfolio of a certain mutual fund type in a given year, and zero otherwise. We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include country and year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.

Table 3.3B. Determinants of Mutual Fund Holdings: Cross-Sectional Logit Estimations

	1997		1998		1999		2000		2001		2002		2003		2004	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	0.644	0.484	0.718	0.651	0.943	0.819	0.896	0.997	0.963	0.812	1.043	0.652	1.196	0.642	1.336	1.286
	[0.037]	[0.031]	[0.047]	[0.037]	[0.053]	[0.037]	[0.037]	[0.041]	[0.036]	[0.029]	[0.039]	[0.027]	[0.046]	[0.034]	[0.048]	[0.048]
Price-to-Book Value Ratio	-0.004	-0.035	-0.046	-0.034	-0.012	-0.040	-0.015	-0.009	-0.005	-0.002	-0.006	-0.011	-0.008	-0.030	0.002	0.002
	[0.008]	[0.013]	[0.019]	[0.017]	[0.026]	[0.014]	[0.006]	[0.009]	[0.006]	[0.001]	[0.004]	[0.012]	[0.0049]	[0.040]	[0.005]	[0.002]
Price-Earnings Ratio	0.000	0.000	0.000	0.000	0.000	0.000	-0.002	-0.003	-0.001	-0.001	-0.003	-0.004	0.000	0.000	-0.001	-0.001
	[0.001]	[0.001]	[0.0002]	[0.0002]	[0.0001]	[0.0001]	[0.001]	[0.001]	[0.0002]	[0.001]	[0.002]	[0.002]	[0.0001]	[0.0003]	[0.001]	[0.0008]
Dividend Yield	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.0001]	[0.0001]	[0.00003]	[0.0001]	[0.0001]	[0.0001]	[0.001]	[0.001]	[0.0003]	[0.0002]	[0.0001]	[0.0002]	[0.0001]	[0.0003]	[0.0001]	[0.0001]
Return on Assets	0.001	0.004	0.002	-0.001	0.000	0.000	0.000	0.001	-0.001	0.001	0.000	0.000	0.000	-0.001	0.000	0.000
	[0.003]	[0.004]	[0.003]	[0.003]	[0.0001]	[0.0001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.0001]	[0.0002]	[0.00002]	[0.0003]	[0.000]	[0.000]
Leverage	0.010	0.008	0.002	0.000	-0.007	0.002	-0.002	0.003	-0.006	0.000	-0.008	0.001	-0.013	-0.004	-0.016	-0.015
	[0.003]	[0.003]	[0.002]	[0.002]	[0.003]	[0.001]	[0.003]	[0.001]	[0.003]	[0.00002]	[0.004]	[0.001]	[0.003]	[0.002]	[0.003]	[0.004]
Current Ratio	-0.004	-0.003	0.013	-0.023	-0.017	-0.003	0.004	-0.002	0.003	0.001	-0.007	-0.012	-0.007	0.008	0.000	-0.003
	[0.018]	[0.014]	[0.018]	[0.027]	[0.009]	[0.004]	[0.002]	[0.006]	[0.002]	[0.002]	[0.009]	[0.008]	[0.012]	[0.003]	[0.002]	[0.007]
Pseudo R2	0.17	0.11	0.20	0.17	0.32	0.26	0.30	0.33	0.32	0.26	0.29	0.16	0.36	0.16	0.42	0.42
No. Obs.	2,069		2,318		2,707		3,692		4,397		6,062		6,421		6,786	
Chi2-statistic:																
Market Capitalization	18.45		2.79		5.89		4.78		15.67		107.87		145.97		0.97	
1997 vs. 2004	.		.		.		.		.		.		.		134.07	201.52
Price to Book Value	4.28		0.40		1.30		0.38		0.29		0.20		0.36		0.04	
Price Earnings Ratio	0.27		0.03		6.11		1.01		0.21		0.41		1.69		0.59	
Dividend Yield	13.40		4.00		2.07		5.09		1.94		0.22		0.00		0.69	
Return on Assets	0.53		0.59		13.85		1.86		0.67		1.53		2.47		3.11	
Leverage	0.62		2.60		10.57		2.34		3.26		6.23		9.19		0.05	
Current Ratio	0.00		2.20		1.99		1.67		1.41		0.25		1.55		0.20	

This table reports the estimation results of cross-sectional multivariate logit models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable is binary: it equals one if a firm belongs to the portfolio of a certain mutual fund type in a given year, and zero otherwise. We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets

Table 3.4A. Logit Model: Controlling for Liquidity and Transaction Costs

	(1)		(2)		(3)	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	1.188	1.002	1.062	0.736	1.040	0.801
	[0.032]	[0.023]	[0.049]	[0.039]	[0.055]	[0.047]
Transaction Costs: Mkt. Impact	-0.003	0.001			-0.004	-0.002
	[0.002]	[0.001]			[0.002]	[0.002]
Turnover			0.226	0.183	0.225	0.194
			[0.034]	[0.031]	[0.038]	[0.035]
Price-to-Book Value Ratio	-0.006	-0.010	-0.004	-0.015	0.000	-0.010
	[0.006]	[0.006]	[0.006]	[0.030]	[0.000]	[0.012]
Price-Earnings Ratio	0.000	0.000	-0.001	-0.001	0.000	0.000
	[0.0001]	[0.0001]	[0.0002]	[0.001]	[0.0001]	[0.0002]
Dividend Yield	0.000	0.000	0.000	-0.002	0.000	-0.003
	[0.0001]	[0.0002]	[0.0001]	[0.003]	[0.0001]	[0.004]
Return on Assets	0.000	0.000	0.002	0.002	0.001	0.002
	[0.00004]	[0.0001]	[0.002]	[0.002]	[0.003]	[0.003]
Leverage	0.000	0.000	-0.004	-0.003	-0.003	-0.001
	[0.0002]	[0.00002]	[0.003]	[0.002]	[0.003]	[0.001]
Current Ratio	-0.001	-0.003	0.007	0.000	0.006	-0.001
	[0.004]	[0.003]	[0.005]	[0.002]	[0.005]	[0.002]
Pseudo R2	0.43	0.37	0.31	0.26	0.30	0.25
No. Obs.	28,413		7,753		6,019	
Chi2-statistic:						
Market Capitalization	46.23		57.01		28.00	

This table reports the estimation results of multivariate logit models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable is binary: it equals one if a firm belongs to the portfolio of a certain mutual fund type in a given year, and zero otherwise. We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include country and year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.

Table 3.4B. Negative Binomial Model: Controlling for Liquidity and Transaction Costs

	(1)		(2)		(3)	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	1.040	0.900	0.875	0.694	0.848	0.691
	[0.069]	[0.015]	[0.116]	[0.027]	[0.113]	[0.028]
Transaction Costs: Mkt. Impact	-0.006	-0.002			-0.004	-0.002
	[0.002]	[0.001]			[0.002]	[0.001]
Turnover			-0.051	-0.015	-0.059	-0.020
			[0.020]	[0.006]	[0.020]	[0.007]
Price-to-Book Value Ratio	-0.003	-0.006	-0.017	-0.022	-0.007	-0.011
	[0.005]	[0.003]	[0.025]	[0.012]	[0.018]	[0.004]
Price-Earnings Ratio	0.000	0.000	0.000	0.000	0.000	0.000
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Dividend Yield	0.000	0.000	0.000	-0.001	0.000	-0.001
	[0.0001]	[0.0001]	[0.0001]	[0.001]	[0.0002]	[0.001]
Return on Assets	0.000	0.000	-0.002	0.003	-0.007	0.001
	[0.0001]	[0.0001]	[0.003]	[0.001]	[0.003]	[0.001]
Leverage	-0.004	0.000	-0.001	0.000	-0.002	0.000
	[0.003]	[0.00002]	[0.002]	[0.001]	[0.003]	[0.001]
Current Ratio	-0.003	-0.002	0.001	-0.001	0.000	-0.002
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Pseudo R2	0.21	0.24	0.12	0.13	0.12	0.14
No. Obs.	28,407		7,759		6,022	
Chi2-statistic:						
Market Capitalization	5.22		3.45		2.83	

This table reports the estimation results of poisson models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable (count data) is: the number of funds within a given mutual fund type with positive holdings in a given firm in a given year . We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.

Table 3.5A. Logit Model: Controlling for Other Barriers to International Capital Flows

	(1)		(2)		(3)		(4)	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	1.102	0.885	1.036	0.669	1.161	0.918	0.979	0.625
	[0.030]	[0.021]	[0.050]	[0.035]	[0.023]	[0.031]	[0.050]	[0.040]
ADR Dummy: Public	2.879	1.911					2.382	1.589
	[0.267]	[0.179]					[0.321]	[0.240]
ADR Dummy: Private	1.131	1.108					0.515	0.585
	[0.099]	[0.094]					[0.144]	[0.138]
Investability			2.057	1.888			1.788	1.653
			[0.156]	[0.133]			[0.179]	[0.141]
Closely Held Shares					-0.004	-0.014	0.038	0.044
					[0.005]	[0.005]	[0.030]	[0.033]
Price-to-Book Value Ratio	-0.005	-0.008	-0.003	-0.009	-0.013	-0.020	-0.001	-0.007
	[0.003]	[0.004]	[0.008]	[0.008]	[0.011]	[0.014]	[0.007]	[0.005]
Price-Earnings Ratio	0.000	0.000	0.000	-0.001	0.000	-0.001	-0.001	-0.001
	[0.0001]	[0.0004]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]	[0.0002]
Dividend Yield	0.000	0.000	0.000	-0.003	0.000	0.000	0.002	-0.001
	[0.0001]	[0.0002]	[0.0001]	[0.004]	[0.0001]	[0.0003]	[0.003]	[0.001]
Return on Assets	0.000	0.000	0.000	0.002	0.000	-0.001	0.002	0.003
	[0.0001]	[0.00004]	[0.003]	[0.002]	[0.0002]	[0.0005]	[0.003]	[0.003]
Leverage	-0.004	0.000	-0.001	-0.001	-0.002	0.001	-0.004	-0.005
	[0.002]	[0.00002]	[0.003]	[0.001]	[0.002]	[0.0003]	[0.003]	[0.002]
Current Ratio	-0.001	-0.002	0.010	0.001	-0.001	-0.001	0.006	0.001
	[0.003]	[0.002]	[0.007]	[0.002]	[0.003]	[0.002]	[0.004]	[0.002]
Pseudo R2	0.44	0.37	0.34	0.30	0.37	0.30	0.36	0.31
No. Obs.	34,452		7,856		22,196		5,960	
Chi2-statistic:								
Market Capitalization	69.77		72.80		65.54		47.51	
ADR Dummy: Public	14.08		.		.		7.25	
ADR Dummy: Private	0.06		.		.		0.23	

This table reports the estimation results of multivariate logit models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable is binary: it equals one if a firm belongs to the portfolio of a certain mutual fund type in a given year, and zero otherwise. We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include country and year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.

Table 3.5B. Negative Binomial Model: Controlling for Other Barriers to International Capital Flows

	(1)		(2)		(3)		(4)	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	0.930	0.799	0.831	0.662	1.060	0.852	0.891	0.625
	[0.056]	[0.018]	[0.114]	[0.027]	[0.063]	[0.014]	[0.036]	[0.023]
ADR Dummy: Public	2.145	1.010					0.938	0.578
	[0.590]	[0.170]					[0.122]	[0.089]
ADR Dummy: Private	1.004	0.742					0.381	0.438
	[0.120]	[0.065]					[0.095]	[0.069]
Investability			1.522	1.035			1.213	0.875
			[0.185]	[0.084]			[0.123]	[0.084]
Closely Held Shares					-0.007	-0.012	0.004	0.001
					[0.005]	[0.003]	[0.004]	[0.003]
Price-to-Book Value Ratio	-0.004	-0.008	-0.005	-0.012	-0.012	-0.010	-0.003	-0.007
	[0.004]	[0.004]	[0.007]	[0.006]	[0.011]	[0.006]	[0.005]	[0.004882]
Price-Earnings Ratio	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Dividend Yield	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	-0.001
	[0.0001]	[0.0001]	[0.0001]	[0.001]	[0.0002]	[0.0002]	[0.0001]	[0.0001]
Return on Assets	0.000	0.000	-0.001	0.003	-0.001	0.000	0.005	0.004
	[0.0003]	[0.0001]	[0.003]	[0.001]	[0.0003]	[0.0003]	[0.003]	[0.001]
Leverage	-0.007	0.000	0.000	0.000	-0.005	0.000	0.003	0.001
	[0.003]	[0.0002]	[0.002]	[0.001]	[0.003]	[0.001]	[0.001]	[0.001]
Current Ratio	-0.002	0.000	0.002	0.000	-0.002	0.000	0.002	0.000
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Pseudo R2	0.21	0.23	0.13	0.14	0.20	0.21	0.18	0.16
No. Obs.	34,445		7,857		22,235		5,980	
Chi2-statistic:								
Market Capitalization	8.04		114.31		112.84		69.21	
ADR Dummy: Public	6.55		.		.		24.28	
ADR Dummy: Private	8.17		.		.		0.73	

This table reports the estimation results of poisson models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable (count data) is: the number of funds within a given mutual fund type with positive holdings in a given firm in a given year . We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.

Table 3.6A. Logit Model: The Heterogeneous Size Effect Across Mutual Fund Types

	(1)		(2)		(3)		(4)	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	1.116	0.952	0.951	0.702	1.052	0.898	0.970	0.691
	[0.033]	[0.025]	[0.053]	[0.043]	[0.046]	[0.034]	[0.070]	[0.058]
ADR Dummy: Public	2.744	1.493	2.523	1.059	2.513	1.370	2.308	1.070
	[0.320]	[0.214]	[0.342]	[0.280]	[0.402]	[0.309]	[0.394]	[0.350]
ADR Dummy: Private	0.934	0.862	0.570	0.424	0.962	0.767	0.597	0.469
	[0.113]	[0.102]	[0.140]	[0.133]	[0.132]	[0.120]	[0.180]	[0.182]
Transaction Costs: Mkt. Impact	-0.004	0.001	-0.003	0.000	-0.002	0.003	-0.001	0.001
	[0.002]	[0.001]	[0.002]	[0.002]	[0.003]	[0.003]	[0.004]	[0.004]
Turnover			0.084	0.079			0.030	0.105
			[0.037]	[0.035]			[0.054]	[0.049]
Investability			1.531	1.405			1.787	1.397
			[0.190]	[0.155]			[0.296]	[0.211]
Foreign Sales to Total Sales					0.002	0.005	0.004	0.008
					[0.001]	[0.001]	[0.003]	[0.003]
Price-to-Book Value Ratio	-0.004	-0.009	0.000	-0.009	-0.022	-0.030	-0.006	-0.001
	[0.004]	[0.005]	[0.000]	[0.009]	[0.009]	[0.015]	[0.007]	[0.006]
Price-Earnings Ratio	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
	[0.0001]	[0.0001]	[0.0002]	[0.0002]	[0.0003]	[0.0002]	[0.0002]	[0.0003]
Dividend Yield	0.000	0.000	0.000	-0.003	0.000	0.000	0.000	-0.003
	[0.0001]	[0.0002]	[0.0001]	[0.003]	[0.0002]	[0.0002]	[0.004]	[0.004]
Return on Assets	0.000	0.000	0.003	0.003	0.000	0.000	0.003	0.005
	[0.0001]	[0.00004]	[0.003]	[0.003]	[0.00002]	[0.0003]	[0.004]	[0.004]
Leverage	-0.001	0.000	-0.004	-0.002	-0.003	0.002	-0.001	0.001
	[0.002]	[0.00003]	[0.003]	[0.002]	[0.003]	[0.001]	[0.004]	[0.001]
Current Ratio	-0.001	-0.003	0.007	0.000	-0.014	0.000	-0.007	0.023
	[0.003]	[0.003]	[0.004]	[0.002]	[0.012]	[0.002]	[0.023]	[0.020]
Pseudo R2	0.45	0.38	0.35	0.28	0.40	0.32	0.35	0.27
No. Obs.	28,413		6,019		11,831		2,906	
Chi2-statistic:								
Market Capitalization	34.57		29.93		14.65		19.19	
ADR Dummy: Public	20.83		24.14		17.13		11.20	
ADR Dummy: Private	0.41		0.84		1.94		0.36	
Foreign Sales to Total Sales	.		.		3.63		1.85	
Market Capitalization: 1997 vs. 2004	51.52	76.04	8.38	10.48	30.06	36.85	12.20	9.93

This table reports the estimation results of multivariate logit models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable is binary: it equals one if a firm belongs to the portfolio of a certain mutual fund type in a given year, and zero otherwise. We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include country and year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.

Table 3.6B. Negative Binomial Model: The Heterogeneous Size Effect Across Mutual Fund Types

	(1)		(2)		(3)		(4)	
Fund Type:	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**	**Global**	**Specialized**
Market Capitalization	0.924	0.839	0.712	0.612	0.968	0.780	0.869	0.618
	[0.058]	[0.019]	[0.071]	[0.033]	[0.032]	[0.020]	[0.042]	[0.029]
ADR Dummy: Public	2.065	0.759	1.723	0.572	1.326	0.662	1.133	0.452
	[0.602]	[0.190]	[0.412]	[0.159]	[0.300]	[0.220]	[0.207]	[0.171]
ADR Dummy: Private	0.907	0.508	0.534	0.318	0.722	0.506	0.395	0.363
	[0.138]	[0.071]	[0.162]	[0.079]	[0.108]	[0.077]	[0.130]	[0.093]
Transaction Costs: Mkt. Impact	-0.008	-0.002	-0.005	-0.003	-0.009	-0.002	-0.008	-0.004
	[0.002]	[0.001]	[0.002]	[0.001]	[0.003]	[0.001]	[0.002]	[0.002]
Turnover			-0.039	-0.020			-0.054	-0.031
			[0.013]	[0.006]			[0.018]	[0.012]
Investability			0.911	0.588			1.099	0.595
			[0.183]	[0.087]			[0.206]	[0.122]
Foreign Sales to Total Sales					0.009	0.004	0.001	0.002
					[0.002]	[0.001]	[0.002]	[0.002]
Price-to-Book Value Ratio	-0.002	-0.004	0.001	-0.007	-0.008	-0.004	-0.017	-0.008
	[0.001]	[0.003]	[0.007]	[0.003]	[0.011]	[0.005]	[0.010]	[0.002]
Price-Earnings Ratio	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.00005]
Dividend Yield	0.000	0.000	0.000	-0.002	0.000	0.000	-0.001	-0.001
	[0.0001]	[0.0001]	[0.0001]	[0.001]	[0.0002]	[0.0001]	[0.002]	[0.002]
Return on Assets	0.000	0.000	0.000	0.002	-0.001	0.000	0.000	0.003
	[0.0001]	[0.0001]	[0.002]	[0.001]	[0.0003]	[0.0005]	[0.003]	[0.002]
Leverage	-0.004	0.000	0.001	0.001	-0.001	0.002	0.005	0.002
	[0.003]	[0.00002]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]
Current Ratio	-0.003	-0.002	0.001	-0.001	-0.003	0.001	0.010	0.004
	[0.002]	[0.001]	[0.001]	[0.001]	[0.005]	[0.001]	[0.023]	[0.013]
Pseudo R2	0.23	0.25	0.16	0.15	0.23	0.22	0.19	0.16
No. Obs.	28,407		6,022		11,829		2,911	
Chi2-statistic:								
Market Capitalization	3.23		4.76		61.38		67.90	
ADR Dummy: Public	8.45		16.40		35.41		62.09	
ADR Dummy: Private	13.41		3.33		5.27		0.13	
Foreign Sales to Total Sales	.		.		19.31		0.29	
Market Capitalization: 1997 vs. 2004	21.35	24.94	0.29	0.32	45.80	67.38	21.48	17.69

This table reports the estimation results of poisson models of the determinants of mutual fund holdings. Firm characteristics are the explanatory variables. See main text for more details. The dependent variable (count data) is: the number of funds within a given mutual fund type with positive holdings in a given firm in a given year . We divide mutual funds into two categories: Global and Specialized funds. Thus, one regression for each fund type is estimated. This multivariate regression accounts for the residual correlation between the equations for different investor types. The table also reports the Chi2-statistic of a hypothesis test that the coefficients associated with a firm characteristic are equal across mutual fund types. The table shows the pooled results over the 1997-2004 sample. The regressions include year dummies. Standard errors are clustered at the industry level. Heteroskedasticity-consistent standard errors are reported in brackets.