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Abstract

This paper investigates a new explanation for the international equity home bias puzzle based on an endogenous asymmetric information model. Using a cross-sectional mutual fund data set, it is found that the degrees of home bias across fund managers are negatively correlated to the asset sizes under their management. This result is consistent with the theoretical prediction in the endogenous asymmetric information model--the portfolio managers with the larger assets tend to acquire more information regarding foreign equity and, hence, hold more foreign equity holdings.

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1. Introduction

Equity home bias, the observation that individuals hold too little of their fund size in foreign assets, is one of the major puzzles in international finance. The standard capital asset pricing model suggests that investors should diversify their fund size across countries, yet the observed data indicate that investors seem to largely forgo this gain to diversification. Previous literatures have demonstrated theoretically the sizeable advantage of international diversification (Levy and Sarnat, 1970; Solnik, 1974). In particular, simulations in Lewis (1999) predict that American investors' portfolios should have at least 40 percent in foreign assets. However, the actual proportion of foreign assets held by American investors is only about 10 percent (French and Poterba, 1991; Cooper and Kaplanis, 1994; Tesar and Werner, 1995; Ahearne, Griever and Warnock, 2004).

In an effort to understand how asymmetric information leads to international equity home bias, Gehrig (1993) and Brennan and Cao (1997) show that the investors will have more home equity holdings if the investors are assumed to have a static information advantage over foreign investors about domestic markets.[1] Kang and Stulz (1997) present some indirect evidence that foreign investors primarily invest in stocks of Japanese companies that are more familiar to them, even when the expected returns are lower than the returns on other Japanese stocks. Portes, Rey and Oh (2001) use the volume of telephone calls as a proxy for information costs and finds positive contribution to the gross flow of equity transactions. The countries with a greater share of firms that have public U.S. listings (which mitigates information costs) tend to be less severely underweighted in U.S. equity portfolios (Ahearne et al., 2004; Edison and Warnock, 2004; Aggarwal, Klapper and Wysocki, 2005, for US mutual funds; Chan, Covrig and Ng, 2005, for 26 countries).[2] Ferreira and Miguel (2007) use industry concentration as a proxy for

information and find a positive correlation between industry concentration and the domestic and foreign equity biases. Lütje and Menkhoff (2007) use mutual fund survey data from a German questionnaire and find that informational and behavioral determinants of home bias hold simultaneously.[3] These papers establish the important role that asymmetric information can play in explaining the home bias puzzle.

Different from earlier theoretical work on home bias, Barron and Ni (2006) present a home-bias model that relies on asymmetric information and explain differences in the extent of home bias across portfolio managers. Their rational expectation model includes an information acquisition process in which heterogeneous domestic portfolio managers (in terms of portfolio size) decide whether to acquire costly information on foreign assets. The analysis adds to Gehrig's (1993) finding that informed portfolio managers have higher demands for foreign assets by linking the acquisition of information by portfolio managers in each country directly to their portfolio size. The simulations based on the model illustrate the effect of asymmetric information on the home bias. First, the simulation shows that portfolio managers with larger initial assets will have a higher proportion of assets in foreign securities (less equity home bias). Second, fewer portfolio managers are informed when the information cost increases, and thus the home bias is more pronounced. This provides explanation to size effects on home bias found in recent research (Karlsson and Norden, 2007; Graham, Harvey and Huang, 2005).[4]

The objective of this paper is to shed additional light on the role of asymmetric information on equity home bias based on Barron and Ni's model. Following Barron and Ni (2006), we focus on the institutional investors who have relatively more information (Bushee and Goodman, 2007; Lütje and Menkhoef, 2007) and investigate the different degrees of home bias across them. Using cross-sectional mutual fund data, we indicate that the home bias exists even

for this relatively informed group. However, the degree of the home bias is less than the observed national aggregate level. Most importantly, the regression results show that foreign asset holdings are positively and significantly associated with the portfolio sizes of the managers, which is consistent with the theoretical model. This conclusion is robust among the subgroups (whole sample, single manager group, domestic equity fund group, and domestic equity funds with a single manager) after controlling the other variables such as fund concentration, manager tenures, total number of holdings, fund categories and objectives, number of funds, expense ratios, dummies for team management and dummies for close-ended funds.

This paper is organized as follows. The next section briefly introduces the endogenous asymmetric information theory and sets up the hypothesis. Section 3 discusses the data source and regression analysis. Conclusions follow in the final section.

2. The Theory and Hypothesis

Following Barron and Ni (2006), we assume two symmetric markets: the home market A and the foreign market B. Each market has a large number of portfolio managers (including fund managers and individual investors) so that each investor has an infinitesimal effect on the market. The portfolio managers are uniformly distributed over the range [0, 1] according to the levels of their initial portfolio size W_0, i.e. $f(W_0) = 1,\ W_0 \in [0,1]$

To each portfolio manager, there are three available assets in the market: a risky asset with return R_A issued by the home market, a risky asset with return R_B issued by the foreign market, and a risk-free asset with return *r:*

$$R_j = \theta_j + \varepsilon_j, \qquad j = A, B \tag{1}$$

where the random variable θ_j has a normal distribution with mean $\overline{\theta_j}$ and variance ϕ_j, the error term ε_j is an i.i.d. variable and has normal distribution with mean 0 and variance σ_j^2, and jointly, θ_j and ε_j have a multivariate normal distribution with $E(\theta_j \varepsilon_j) = 0$ and $Var(R_j \mid \theta_j) = \sigma_j^2$. θ_j is observable to all portfolio managers in their own country j at no cost, and is observable to the informed portfolio managers in the other country at a cost of c. To keep things concise, we also assume that the observed returns of the risky assets are uncorrelated.

Each portfolio manager makes two sequential decisions: strategic information acquisition and investment. All portfolio managers are assumed to have information about the home market at zero cost. On the other hand, they need to decide whether to acquire information by paying a cost c or to remain uninformed about the foreign market. In order to focus on the information acquisition decision, we further assume in the model that there are no barriers to investment other than the cost of information, no currency and political risk, no deviations from purchasing power parity, and no interest rate differentials on average.

The decision to acquire information on foreign assets is based on a comparison of the expected utility when informed and the expected utility when uninformed. The maximization of expected utility for portfolio managers in each country is now characterized in detail. Bagnoli and Watts (2000) indicate that for funds that had more than 50% of their assets invested in stocks in 1995, a majority set the future compensation of their managers equal to a constant percentage of the future value of the managed assets.[5] It is assumed that as the initial portfolio size W_o increases, the proportion of the future value of the portfolio that is paid as compensation to one of the managers of the fund decreases. That is, let *t* denote the proportion of the fund's future value paid as compensation to one of its fund managers, it is assumed that $t'(W_o) < 0$.

A simple expression can be obtained for the proportion of the fund's future value paid as compensation to each manager as follows. Assuming that there are constant returns to scale in portfolio management, then the ratio of the total number of portfolio managers to total initial portfolio size, denoted by *n*, is a positive constant, and the total number of portfolio managers at a fund with initial portfolio size W_o equals nW_o. Further, assume the total future compensation across all managers of a fund is a constant proportion v of the total future value of the fund. Then, the future compensation to one of these fund managers, tW_1^{kj}, equals $(v/(nW_0))W_1^{kj}$, such that $t'(W_o) < 0$.

Assuming an exponential utility function for compensation, a representative portfolio manager (one of nW_o managers) of type k ($k = I,U$) with initial total asset value W_o in country j ($j = A,B$) anticipates utility $V(W_1^{kj})$ in the form:

$$V(W_1^{kj}) = -\exp(-aW_1^{kj}) \tag{2}$$

where $a = a'v/(nW_0)$ and a' is the coefficient of absolute risk aversion of a portfolio manager, which is assumed to be the same across portfolio managers. Without loss of generality, Barron and Ni (2006) show that the units of portfolio size are set such that $a'v/n = 1$ and thus $a = 1/W_o$.[6]

It is further assumed that portfolio managers have access to a risk-free asset available in limitless supply. Then portfolio manager of type k who lives in country l will have a future fund size equal to $W_1^{kl} = (W_0 - \rho c)r + X_A^{kl}(R_A - rP_A) + X_B^{kl}(R_B - rP_B)$, where X_j^{kl} is the demand for country j's ($j = A,B$) risky asset by individual of type k ($k = I,U$) who lives in country l ($l = A,B$). ρ is a function that equals 0 if the portfolio manager is uninformed ($k = U$) and 1 if

the portfolio manager is informed ($k = I$), P_j is the price of country j 's risky asset, and c is the total information cost. Note that the price of the risk-free asset is normalized to 1.

The information acquisition decision leads to two types of portfolio managers in each market: the informed portfolio managers (I) with information on their home and foreign markets, and the uninformed portfolio managers (U) with home market information only. Barron and Ni (2006) proved that there exists a cutoff portfolio size level, $\bar{W}$, such that portfolio managers with larger initial asset size than the cutoff asset size become informed, and the portfolio managers with less initial asset size than the cutoff asset size remain uninformed. Given the distribution of portfolio managers $f(W_0)$, note that a higher cutoff $\bar{W}$ implies that the proportion of informed portfolio managers is lower.

Both informed and uninformed portfolio managers make decisions about the demand for assets. In particular, the maximization of expected utility yields the following demands by informed portfolio managers ($k = I$) in either country:

$$X_A^{Il} = \frac{\theta_A - rP_A}{a\sigma_A^2}; \qquad X_B^{Il} = \frac{\theta_B - rP_B}{a\sigma_B^2}, \quad l = A, B; \; a = \frac{1}{W_0} \quad . \tag{3}$$

Similarly, the demands for uninformed portfolio managers (k=U) in country A are

$$X_A^{UA} = \frac{\theta_A - rP_A}{a\sigma_A^2}; \qquad X_B^{UA} = \frac{E(R_B \mid P_B^* = P_B) - rP_B}{a\, Var(R_B \mid P_B^* = P_B)}, \qquad a = \frac{1}{W_0} \quad . \tag{4}$$

and for uninformed portfolio managers in country *B*, the demand functions for the two assets are

$$X_A^{UB} = \frac{E(R_A \mid P_A^* = P_A) - rP_A}{aVar(R_A \mid P_A^* = P_A)}; \qquad X_B^{UB} = \frac{\theta_B - rP_B}{a\sigma_B^2}, \quad a = \frac{1}{W_0} \tag{5}$$

where $E(R_j \mid P_j^*)$ denotes the expected return on asset j for an uninformed portfolio manager living in country $l \neq j$ based on the observed price.

The demand of informed portfolio managers depends on the revealed information on asset returns and the asset prices. The demand of uninformed portfolio managers depends on the asset prices only. The larger the portfolios are, the larger are the risky asset investment. For the case where the portfolio is determined by a set of managers, the above demands represent the consensus among these managers with respect to the optimal fund portfolio.[7] This consensus has a scaling property that the managers' view of the optimal proportion of the fund's portfolio allocated to risky-assets (domestic and foreign) is invariant to portfolio size. However, each fund manager's loss in compensation from the acquisition of information on foreign assets is less because information costs are shared across a number of fund managers. The resulting lower average information cost per fund manager (economies of scale) means that the management teams are more likely to acquire the costly information on foreign assets (become informed).

Under the assumption of rational expectation, prices have a certain relationship with the underlying asset return and supply, such that at equilibrium the prices clear the international capital market by equating total asset supply to total asset demand.

$$\int_0^{\bar{W}} X_A^{UA} f(W_0)dW_0 + \int_{\bar{W}}^1 X_A^{IA} f(W_0)dW_0 + \int_{\bar{W}}^1 X_A^{IB} f(W_0)dW_0 + \int_0^{\bar{W}} X_A^{UB} f(W_0)dW_0 = 2\int_0^1 x_A f(W_0)dW_0;$$

i.e.:

$$\int_0^{\bar{W}} X_B^{UA} f(W_0)dW_0 + \int_{\bar{W}}^1 X_B^{IA} f(W_0)dW_0 + \int_{\bar{W}}^1 X_B^{IB} f(W_0)dW_0 + \int_0^{\bar{W}} X_B^{UB} f(W_0)dW_0 = 2\int_0^1 x_B f(W_0)dW_0;$$

where x_A and x_B are per capita supply of the risky asset *A* and *B* with mean $\overline{x_A}$, $\overline{x_B}$ and variance $\overline{\chi_A}$, $\overline{\chi_B}$, respectively. Note the density function $f(W_0) = 1, \forall\ W_0 \in [0,1]$.

With the above setup, it is shown that, holding other things constant, the gain to becoming informed is an increasing function of the initial asset size and a decreasing function of the cost of information.[8] Given the uniform distribution of the portfolio managers in terms of portfolio size, this result means that information cost ratios are monotonically decreasing over

the range [0, 1]. There exists a cutoff information ratio, $c/\bar{W}$, such that each portfolio manager purchases information if and only if $c/W_0 \le c/\bar{W}$.

Hypothesis 1: The fund managers with larger portfolios will be more likely to become informed.

Hypothesis 1 predicts that those managers with larger assets will acquire information concerning foreign assets; those portfolio managers with asset size $W_0 > \bar{W}$ become informed and the other portfolio managers remain uninformed.

Now the information content is connected to home bias by comparing various demands in equilibrium. Under the assumption of symmetric countries, the informed portfolio managers have the same expected demand for domestic assets as the expected demands for foreign assets, i.e., $E(X_A^{IA}) = E(X_B^{IA})$ and $E(X_B^{IB}) = E(X_A^{IB})$. There is no home bias. The home bias arises due to the existence of the uninformed portfolio managers in each country. The expected demand for the foreign asset by an uninformed portfolio manager is less than his expected demand for the home asset. The latter is less than the expected demand for risky assets (foreign or domestic) of informed portfolio managers. That is, $E(X_B^{UA}) \le E(X_A^{UA}) \le E(X_A^{IA}) = E(X_B^{IA})$, where the strict inequality holds if and only if the information cost is positive ($c > 0$).

Intuitively, there are two factors that lead to the above results. First, the uninformed foreign portfolio managers can only infer partial market information through the asset prices, which obviously results in a large potential risk hindering their investments. Second, the uninformed portfolio managers have smaller assets and thus have less risky asset holdings than informed portfolio managers (see demand function (4) – (5)).

If we consider the ratio of portfolios in foreign assets for both types of portfolio managers, the ratio of portfolios in foreign assets of the uninformed portfolio managers is lower than that of the informed portfolio managers. This leads to our second hypothesis:

Hypothesis 2: The informed portfolio managers will have less home bias.

The two hypotheses predict a different degree of home bias across portfolio managers. Hypothesis 1 presumes that the portfolio managers with a lower information cost ratio (larger asset under management given the fixed information cost) will be informed. Hypothesis 2 further induces that these informed portfolio managers will have more foreign equity holdings. Thus we anticipate that portfolio managers with larger investment size will be less home biased.

In summary, the model provides testable hypotheses regarding the extent of home bias across portfolio managers. Namely, we anticipate that portfolio managers with a relatively low information cost ratio will be less home biased. This suggests a comparison of the degree of home bias across portfolio managers relative to their total assets under management. Corresponding empirical work is done in the next section.

3. Data and Empirical Analysis

This section turns to some empirical tests of the major implications of the model. The theoretical model implies that informed portfolio managers are less home biased. We test the hypothesis in the data regression by using the funds allocated to each of the portfolio managers as a proxy for information asymmetries, controlling many other factors.

3.1. Data and Variable Statistics

The cross-sectional mutual fund equity data are obtained from Morningstar's Mutual Funds CD ROM for the year 2005. The dataset contains 12,159 equity funds with 10,131

domestic equity funds and 2,028 international equity funds. The international equity funds include Europe, Japan, International Hybrid, Latin America, Diversified Pacific, Pacific excluding Japan, Specialty Precious Metals, Diversified Emerging Markets, World Stock, and Foreign Stock. For the regression analysis, we first focus on the whole sample since the portfolio manager may diversify through the international equity funds, and then focused on domestic funds only to consider a more homogeneous fund group.

From the CD, total net assets under management, expense ratios, front load fees, and back load fees, total number of different holdings of a fund, manager names, manager tenures, and the composition of the asset as a percentage of total net asset were obtained, which included the percentage of fund assets in Domestic Equity, Foreign Equity, Bonds, Cash, and Others. There is another composition reported as percent of funds assets in developed countries and emerging countries. Table 1 summarizes the above variables.

(Table 1 about here)

As shown in Table 1, the majority of the portfolio is domestic equity (72.57%) and the average foreign holdings of the equity mutual funds are 19.51%. In an unreported summarized table for the domestic equity funds only, the average foreign asset holdings are only 6.34% (86.51% at domestic asset, 4.51% at bonds and 2.64% at cash). This is consistent with Chan et al. (2005) that mutual funds, in aggregate, allocate a disproportionately larger fraction of investment to domestic stocks. However, compared with the average American foreign asset holdings of about ten percent (Lewis, 1999; French and Poterba, 1991; Cooper and Kaplanis, 1994; Tesar and Werner, 1995; Ahearne et al., 2004), the US mutual funds, as institutional investors, have less home bias.

In line with the theoretical model, the assets allocated to each of the portfolio managers

are used as a proxy of information acquisition. The names of managers who are directly responsible for managing the fund's portfolio are taken directly from the fund's prospectus. Other terms that appear in this column include "Multiple Managers" and "Management Team". The "multiple managers" appears when more than two persons are involved in the fund management and they manage independently. The management team is used when there are more than two persons involved in fund management and they manage together, or when the fund strongly promotes its team-managed aspect. In the data, there are 4,485 cases of individual managers, 5,202 cases of multiple managers and 2,472 cases of management teams. A dummy variable, *GroupDummy*, is generated to be 0 if it is an individual manager, 1 if it is a management team, and 2 if it is multiple managers.

For each manager (or multiple managers or management team), the assets are aggregated into total *Assets* by the manager name. Similarly, we created a total number of holdings in average for manager i as $Ttlhold_i$ and total number of funds for manager i as $NumFunds_i$. To characterize the transaction cost effect on the foreign asset holdings, expense ratio, front load and back load fees are summed into a total cost and Exp_i is used to measure the mean expense for manager i. The variable *Tenure* measures the years that a manager has been in charge of the funds, which measures how experience a manager is. In addition, $CatDummies$ is used to control for different fund categories and fund objectives. Finally, a dummy variable *Closeend* is set to be 1 if the fund is a closed-end fund, 0 if it is an open-end fund.

Two measurements of concentration are defined based on the stock class allocation and the regional allocation. The Herfindal Index was adopted to measure the concentration of the funds (see similar applications at Kacperczyk, Sialm and Zheng, 2005; Ferreira and Miguel,

2007), which is defined as $HI = \sum_{n=1}^{N} w_n^{\,2}$.

The first measurement, ($HI1$), is the regional concentration where $w_n (n = 1, 2)$ are the weights of the total assets allocated to developed markets and emerging markets, respectively. The second measurement, ($HI2$), is a measure of portfolio concentration where $w_n (n = 1, 2, 3, 4)$ are the weights of domestic, foreign, bonds and others, respectively. The smaller the Herfindal Index, the more diversified across regions or across asset categories. The summarized statistics are listed in Table 1. As can be seen, the percentage of assets in developed countries is more than 97 percent and the corresponding concentration index $HI1$ is close to 1, which implies that the assets are more concentrated in developed countries. $HI2$ is 0.84, together with the fact that domestic assets are 73 percent, which implies that the assets are more concentrated in domestic assets.

3.2. Regression Model and Analysis

Following the above variable definition, the regression model can be written as:

$$ForeignEquity_i = a_0 Asset_i + a_1 Exp_i + a_2 Ttlhold_i + a_3 Tenure_i + a_4 NumFunds_i + a_5 GroupDummy_i + a_6 HI_i + a_7 CatDummies + a_8 Closeend_i + \gamma_i .$$

The dependent variable, $ForeignEquity$, is the share of the foreign equity holdings for manager $\boldsymbol{i}$. Two measures are used in the regression. First, the percentage of foreign asset for each manager at each fund is used. Then, the average percentage of foreign assets for each manager across all the funds under his name is used. $Asset_i$ is the log of size of the assets allocated to manager i, which is the aggregated funds' Net Asset Value allocated to the same manager. From the hypothesis, it is expected that a_0 will be positive. The variable Exp_i measures the average expense for the manager $\boldsymbol{i}$. The expense could be part of transaction costs or the

expenses to acquire information. The expected sign will be ambiguous. On one hand, according to transaction cost explain (see Cooper and Kaplanis, 1994), the higher the transaction cost, the lower the foreign equity holdings. On the other hand, the higher the information acquisition expenditure, the higher the foreign equity holdings. Variable $Tenure_i$ measures how many years the fund manager(s) has been in charge of the fund. The longer the tenure, the more experienced the manager. As Karlsson and Norden (2007) suggests, it is expected that the coefficient will be positive. For the dummy variable, $GroupDummy_i$, it is expected that, compared with the individual managers, the shares of foreign assets for both the management team and multiple managers are higher.

The model controls other variables that measure the diversification. $Ttlhold_i$ is log of the average number of different holdings of a fund for manager $\boldsymbol{i}$. This figure is meant to be a measure of portfolio risk. Specifically, the lower the figure, the more concentrated the fund is in a few companies or issues, and the more the fund is susceptible to the market fluctuations in these few holdings. It would be expected that the coefficients would be negative as the more diversified portfolios across the companies may need less international diversification. $NumFunds_i$ is the log of the average number of funds under managed by fund manager $\boldsymbol{i}$. Based on the same reason as $Ttlhold_i$, it is expected that the coefficient for $NumFunds_i$ would be negative. HI_i measures the concentration across the asset class -- the smaller the Herfindal Index, the more diversified across regions or across asset categories. As previously analyzed, the fact that two measurements of HI_i (*HI1* and *HI2*) are close to 1 indicates that the portfolio managers are concentrated in developed countries (including the US) and in domestic funds. Therefore, it is expected that the coefficients for them would be negative as they know less about

foreign assets, implied by Kacperczyk et al. (2005).

Cross-sectional OLS regressions are performed at the manager level. Table 2 estimates the regression model with the whole sample. All regressions are controlled for the fund category and objective dummies. The overall fitness for the model is good as the adjusted R-square is about 90 percent. The dependent variable in the first two columns is the percentage of the foreign asset holdings for each manager at each fund. The last two columns use the average percentage of foreign assets for each manager across all the funds under his/her management. For all the cases, the coefficients for the asset size of the portfolio managers are positive and statistically significant at a one percent level. The results indicate that the proportion of foreign equity holdings will increase with the asset size allocated to the portfolio manager. Therefore, the portfolio will be less home biased when the fund managers manage a larger size of the assets. This is consistent with the model prediction -- the larger the investment, the less expensive the information cost per investment. The portfolio managers will acquire more information about foreign markets and hold more foreign assets.

(Table 2 about here)

The results for the $GroupDummy_i$ indicate that the management team significantly holds more foreign equity shares than the individual, while the multiple managers hold less foreign equity shares with a significance level of 10% for the first two columns and 5% for the last two columns. This is consistent with the model discussion that the management team is more likely to acquire information because the information cost is divided among several managers. We expected to see larger shares of foreign assets for multiple managers than those of the individual manager. However, Morningstar defined the multiple managers as “more than two persons are involved in the fund management, and they manage independently. Where this term is used,

quite often the fund has divided net assets in set amounts among the individual managers".[9] Therefore, multiple managers are seen to hold less foreign equity shares since they divided the total assets. Interestingly, Baer, Kempf and Ruenzi (2005) find that funds managed by team exhibit significantly lower risk than single manager funds and more persistent in their performance over time. This is related to our findings that management teams have more diversified portfolios.

The estimates of other variables being proxy for information not attributed to sizes explain part of the foreign equity holdings. The coefficients for the expenses (*Exp)* are not significant which indicate the ambiguous effect discussed earlier. That is, the transaction cost explains that high transaction costs lead to more home bias, while the information cost explains that the higher expenditure of information acquisition leads to higher foreign equity holdings. The coefficients of total numbers of different holdings of the funds ($Ttlhold_i$) are significantly and negatively related to the foreign equity holdings. The reason may be that the larger total number of holdings implies that the assets are more diversified within domestic countries, and thus there is less need to hold foreign assets. As expected, the coefficients for $NumFunds_i$ are significantly negative, which implies that the more funds a manager is in charge of, the less that are foreign assets holdings. Both Herfindal Indexes are significantly and negatively associated with the foreign assets, which are consistent with our expectation. The results for the dummy C*loseend* indicate that foreign equity holdings are indifferent between open-end funds and close-ended funds. The coefficients for manager *Tenure* are not consistent with the expectations and are not significant. This may be due to the fact that the model was tested with the whole sample and the tenures for management teams are not meaningful. The further subgroup analysis is conducted as following.

To test the robustness of size effect on foreign asset holdings, different groups of managers were further examined. First, the management team is a large group where the members cannot be identified. Therefore the assets allocated to management teams are large and may reflect false size effect. Table 3 reports the results for the subgroup sample of single managers only. As shown in Table 3, the results are similar to Table 2 in that the proportions of foreign equity holdings are significantly increasing with the size of assets allocated to the portfolio managers. There is some evidence that management tenure is significantly and positively related with foreign equity holdings at 5% in column (2).

(Table 3 about here)

Second, some portfolio managers can easily choose to acquire information about a subset of foreign assets either by focusing on the asset class or by focusing on specific countries. Therefore, we specifically examined domestic equity funds as a single group in Table 4 and domestic equity funds with single manager in Table 5. Not surprisingly, the summarized statistics for the domestic equity funds indicate that the average foreign asset holdings are only 6.34% (86.51% at domestic asset, 4.51 % at bonds and 2.64% at cash). Similarly, the regression results at both Table 4 and Table 5 show that, controlling all other effects, the foreign equity shares are significantly increasing with the size of the portfolio.

(Tables 4 and 5 about here)

4. Conclusion

This paper investigates the different degrees of home bias across the portfolio managers. The theoretical discussion based on Barron and Ni (2006) captures the cause of the informational differences across the domestic portfolio managers by introducing the information acquisition process. This distinguishes the paper from the rest of the literature in that it demonstrates a direct

link between the information cost and home bias. Given the constant information cost, the model predicts that there exists a proportion of uninformed portfolio managers in the domestic country because they have relatively high information cost per unit of asset investment. Furthermore, the model provides testable hypotheses that the portfolio managers with a relatively low information cost ratio will be less home biased.

The paper finds that mutual fund managers (especially domestic equity fund managers) reveal home biases, which are consistent with the observations for other groups in previous literature such as Chan et al. (2005). Most importantly, the regression results show that foreign asset holdings are positively and significantly associated with the portfolio sizes of the managers, which is consistent with the theoretical model. This conclusion is robust among the subgroups (whole sample, single manager group, domestic equity fund group, and domestic equity fund with single manager) after controlling the other variables such as fund concentration, manager tenures, total number of holdings, fund categories and objectives, number of funds, expense ratios, dummies for team management, and dummies for close-ended funds.

In future empirical research, one avenue is to investigate how principle-agent problems affect the extent of the home bias across institutional investors. As the referee pointed out, the larger the fund, the less likely the manager is to take risk because it increases the likelihood of losing his/her position. One conjecture is that the home bias may be aggravated by this conservative strategy. Correspondingly, the numbers of independent directors affect both future fund performance and the likelihood of underperforming manager replacement (Ding and Wermers, 2005), it will be interesting to see how governance structure affects the home bias.

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Footnotes

[1] The other previous explanation to the equity home bias includes the hedging theory (Lewis 1999) that was not supported by empirical evidence (Cooper and Kaplanis, 1994; Eldor, Pines and Schwartz, 1988; Stockman and Dellas, 1987; Baxter and Jermann, 1997; Jacquillat and Solnik, 1978; Heston and Rouwenhorst, 1994), and international tax and transaction cost barriers in international capital markets (Black, 1974; Stulz 1981a, 1981b). The empirical tests found that international taxes and government restrictions can affect the equity home bias among developed countries (Bonser-Neal, Brauer, Neal and Wheatley, 1990; Hardouvelis, La Porta and Wizman, 1994; Claessens and Rhee, 1994; Errunza and Losq, 1985), but not for less developed countries (Lewis 1995, 1999). Tesar and Werner (1995) argue that transaction cost cannot explain the home bias based on the high turnover rate of foreign assets. However, recent works reinforce the role of transaction cost on home bias and it can coexist with the high turnover rate (Rowland, 1999; Amadi and Bergin, 2006).

[2] Some related studies find that home bias phenomena exist not only internationally but also regionally (Coval and Moskowitz, 1999; Grinblatt and Keloharju, 2001).

[3] Their further examinations indicate that more can be explained by behavioral determinants. Also see Strong and Xu (2003) for a behavioral explanation.

[4] Karlsson and Norden (2007) find that in Sweden the likelihood of home bias increases on smaller wealth, higher ages and less experienced persons. Graham et al. (2005) find that the share of home investments for a sample of US investors is positively related to lower income, higher age, less education, and being female.

[5] The most popular alternative was future compensation based on piecewise linear (and concave) functions of the future value of the managed assets. Bagnoli and Watts (2000) noted that these compensation forms reflect Securities and Exchange Commission (SEC) regulations for fund manager compensation, and in particular, the *Investment Company Amendments Act of 1970*, amended section 205.

[6] In the rational expectation model setting, a constant absolute risk aversion (CARA) utility function for the portfolio manager allows for an explicit demand function solution. Assuming the special inverse function of initial portfolio size simplifies calculations for the market clear condition.

[7] This follows as managers of a fund have identical preferences and compensation package, and thus will agree on the optimal portfolio that maximizes the expected utility derived from compensation.

[8] The proof is available upon request.

[9] 2004 Morningstar, Inc.

Table 1: Summarized Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Asset Allocation					
as % of domestic assets	11761	72.57	35.48	0.00	100.00
as % of foreign assets	11761	19.51	32.12	0.00	100.00
as % of bonds	11761	5.04	14.12	0.00	98.94
as % of other	11761	2.89	11.80	0.00	100.00
Total	11761	100.0			
as % of Assets at developed Countries	11579	97.43	9.36	0.00	100.00
as % of Assets at emerging Countries	11579	2.54	9.32	0.00	100.00
Total	11761	100.0			
Size (Unit: Million dollars)	12159	79,527.06	150,559.50	0.00	383,977.20
Expense Ratio	10967	1.54	0.71	0.00	10.00
Front Load Fee	12159	1.07	2.13	0.00	8.50
Deferred Load Fee	12159	0.92	1.72	0.00	6.00
Average Total Number of Holdings	11811	169.54	299.54	1.00	6211.00
Manage Tenure	9745	4.68	3.88	0.00	46.50
Average Number of Funds	12159	433.51	878.90	1.00	2268.00
HI1	11579	0.97	0.08	0.50	1.00
HI2	11761	0.83	0.19	0.28	1.00

Table 2: Effect of Portfolio Size on Foreign Equity Holdings (Whole Sample)

(Dependent Variable: Percentage of Foreign Assets)

	(1)	(2)	(3)	(4)
Asset Size	0.431	0.329	0.456	0.372
	(0.053)***	(0.056)***	(0.065)***	(0.067)***
Expense	-0.016	0.113	0.065	0.118
	(0.096)	(0.101)	(0.067)	(0.068)*
Log of Total Number of Holdings	-0.957	-0.795	-0.858	-0.789
	(0.098)***	(0.100)***	(0.123)***	(0.123)***
Manager Tenure	0.001	0.019	-0.029	-0.013
	(0.023)	(0.024)	(0.029)	(0.029)
Number of Funds	-0.053	-0.041	-0.069	-0.059
	(0.009)***	(0.009)***	(0.010)***	(0.011)***
Dummy for Team Management (=1)	9.724	9.685	11.722	12.134
	(2.206)***	(2.316)***	(2.682)***	(2.750)***
Dummy for Multiple Managers (=2)	-0.313	-0.311	-0.544	-0.512
	(0.181)*	(0.189)*	(0.222)**	(0.226)**
Dummy for Close-ended Funds (=1)	-0.312	-0.306	-0.256	-0.334
	(0.412)	(0.430)	(0.508)	(0.519)
HI1	-50.977		-46.825	
	(1.684)***		(2.055)***	
HI2		-23.067		-21.107
		(0.796)***		(0.950)***
Constant	56.578	26.584	51.975	24.444
	(1.813)***	(1.054)***	(2.231)***	(1.306)***
Observations	8688	8813	9187	9312
Adjusted R-squared	0.94	0.93	0.89	0.89

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Fund category and objective dummies are included in the regression but not reported for space efficiency.

Table 3: Effect of Portfolio Size on Foreign Equity Holdings (Single Manager Group)

(Dependent Variable: Percentage of Foreign Assets)

	(1)	(2)	(3)	(4)
Asset Size	0.439	0.377	0.470	0.426
	(0.076)***	(0.085)***	(0.103)***	(0.108)***
Expense	-0.203	0.157	0.075	0.313
	(0.135)	(0.150)	(0.108)	(0.113)***
Log of Total Number of Holdings	-1.442	-0.861	-1.039	-0.605
	(0.147)***	(0.161)***	(0.205)***	(0.211)***
Manager Tenure	0.004	0.068	-0.031	0.032
	(0.030)	(0.034)**	(0.042)	(0.044)
Number of Funds	-0.062	-0.051	-0.071	-0.063
	(0.010)***	(0.011)***	(0.013)***	(0.014)***
Dummy for Close-ended Funds (=1)	0.484	0.590	0.541	0.780
	(0.634)	(0.711)	(0.870)	(0.914)
HI1	-48.313		-47.660	
	(2.272)***		(3.076)***	
HI2		-23.576		-21.707
		(1.185)***		(1.502)***
Constant	56.667	27.433	53.293	23.046
	(2.430)***	(1.554)***	(3.329)***	(2.049)***
Observations	3968	4044	4209	4285
Adjusted R-squared	0.94	0.92	0.87	0.85

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Fund category and objective dummies are included in the regression but not reported for space efficiency.

Table 4: Effect of Portfolio Size on Foreign Equity Holdings (Domestic Manager Group)

(Dependent Variable: Percentage of Foreign Assets)

	(1)	(2)	(3)	(4)
Asset Size	0.545	0.121	0.557	0.176
	(0.043)***	(0.034)***	(0.041)***	(0.033)***
Expense	-0.027	-0.013	-0.026	-0.020
	(0.078)	(0.060)	(0.042)	(0.034)
Log of Total Number of Holdings	-0.736	-0.317	-0.718	-0.409
	(0.080)***	(0.060)***	(0.078)***	(0.061)***
Manager Tenure	0.002	0.034	-0.003	0.032
	(0.019)	(0.015)**	(0.018)	(0.014)**
Number of Funds	-0.048	-0.016	-0.049	-0.021
	(0.007)***	(0.005)***	(0.006)***	(0.005)***
Dummy for Team Management (=1)	7.759	7.242	4.066	3.793
	(1.853)***	(1.438)***	(1.762)**	(1.418)***
Dummy for Multiple Managers (=2)	0.026	-0.457	-0.233	-0.499
	(0.149)	(0.115)***	(0.142)	(0.114)***
Dummy for Close-ended Funds (=1)	-0.103	-0.381	0.218	-0.242
	(0.334)	(0.258)	(0.319)	(0.256)
HI1	-124.530		-110.285	
	(2.376)***		(2.278)***	
HI2		-48.251		-43.455
		(0.492)***		(0.484)***
Constant	127.507	49.149	113.307	44.730
	(2.390)***	(0.628)***	(2.294)***	(0.640)***
Observations	7147	7260	7598	7711
Adjusted R-squared	0.46	0.67	0.42	0.62

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Fund category and objective dummies are included in the regression but not reported for space efficiency.

Table 5: Effect of Portfolio Size on Foreign Equity Holdings (Domestic Single Manager Group)

(Dependent Variable: Percentage of Foreign Assets)

	(1)	(2)	(3)	(4)
Asset Size	0.492	0.092	0.492	0.145
	(0.064)***	(0.051)*	(0.061)***	(0.050)***
Expense	-0.096	0.027	-0.099	0.027
	(0.115)	(0.089)	(0.066)	(0.054)
Log of Total Number of Holdings	-1.338	-0.354	-1.325	-0.527
	(0.125)***	(0.096)***	(0.122)***	(0.098)***
Manager Tenure	-0.002	0.106	-0.017	0.087
	(0.026)	(0.021)***	(0.025)	(0.021)***
Number of Funds	-0.050	-0.022	-0.044	-0.020
	(0.008)***	(0.007)***	(0.008)***	(0.006)***
Dummy for Close-ended Funds (=1)	0.484	-0.437	0.636	-0.026
	(0.541)	(0.424)	(0.520)	(0.424)
HI1	-114.880		-99.522	
	(3.004)***		(2.918)***	
HI2		-50.037		-43.838
		(0.735)***		(0.723)***
Constant	120.912	50.600	105.890	45.249
	(3.031)***	(0.915)***	(2.952)***	(0.938)***
Observations	3329	3393	3543	3607
Adjusted R-squared	0.51	0.69	0.45	0.63

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: Fund category and objective dummies are included in the regression but not reported for space efficiency.