How Important Are Foreign Ownership Linkages for International Stock Returns?

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We derive a foreign ownership return as the weighted average return of foreign stocks that are connected to a stock through common ownership. The foreign ownership return is of similar economic significance as traditional country and industry factors in explaining international stock returns. It is not related to omitted fundamentals or wealth effects but shifts substantially around ADR and index listings when the investor habitat changes. A decomposition shows that the foreign ownership return is driven by active reallocations of global institutions as opposed to fund flows from end investors. Our findings have important implications for international portfolio diversification. (*JEL* G3, F4, F3)

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The traditional finance view suggests that international stock returns are mainly driven by their underlying fundamentals proxied by industry and country affiliations.[1] However, there is growing evidence that investor demand can affect security prices beyond the effect of fundamentals (Shleifer 1986; Coval and Stafford 2007; Cohen, Diether, and Malloy 2007).[2] For example, Greenwood (2005, 2008), Kumar and Lee (2006), Boyer (2011), and Hau and Lai (2013) demonstrate that a demand-based view can explain substantial price comovement and even dislocations. We contribute to this literature by creating a summary measure of the influence of investor demand on stock returns and documenting its importance for international stock returns and diversification.

Our work is motivated by behavioral theories that explain stock price comovement. In Barberis and Shleifer (2003) and Barberis, Shleifer, and Wurgler (2005) investors with similar demand-based preferences for certain stocks create comovement in returns when they shift their investment views and trade. They define the group of stocks in which a set of common investors trade as an "investment habitat." In Daniel, Hirshleifer, and Subrahmanyam (2001), overconfident investors create covariation when they react to events in a common manner.[3] Peng and Xiong (2006) show that attention-constrained investors tend to allocate more attention to market-level and sector-level factors than to firm-specific factors. As a result, return correlations between firms can be higher than their fundamental correlations.[4]

The effects of stock ownership can be quantified in a distance-based framework. In the international finance literature, stock returns are often priced by country and industry portfolio returns. Such factor models can be thought of in terms of distance. For the country dimension, a stock has the closest distance to other stocks in the same country. Country portfolio returns are the weighted average return of all stocks that have zero distance from each other by the country dimension, i.e., all stocks that have the same country membership. Similarly, industry portfolio returns are the weighted average return of all stocks that have the same industry classification and thus have zero distance along this dimension.

Applying this approach to the more complex ownership structure of a stock yields an ownership return that summarizes its institutional investor habitat

[1] Papers analyzing country and industry sources of variation include those by Roll (1992), Heston and Rouwenhorst (1994), Griffin and Karolyi (1998), Carrieri, Errunza, and Sarkissian (2004), and Bekaert, Hodrick, and Zhang (2009).

[2] Grinblatt and Han (2005), Pirinsky and Wang (2006), Frazzini and Lamont (2008), Sun (2008), Andrade, Chang, and Seasholes (2008), Green and Hwang (2009), Greenwood and Nagel (2009), Hirshleifer and Jiang (2010), Kumar, Page, and Spalt (2013), Lou (2012), and Hombert and Thesmar (2014) provide evidence that non-informative demand can cause price comovement and dislocations.

[3] This motivation leads Hirshleifer and Jiang (2010) to construct a misvaluation factor that captures sizeable covariation in returns.

[4] Along the same lines, Barberis and Shleifer (2003) note that investors often organize their investment decisions based on style strategies; that is, they categorize securities into exogenous style classes and shift investment in and out of these classes simultaneously.

affecting a stock.[5] In particular, we derive the ownership return of a given stock i as the weighted average return of stocks that are connected to stock i through common ownership, with more weight given to (1) stocks that share a large fraction of common owners with stock i, (2) stocks whose owners hold more of stock i, and (3) stocks that are heavily invested in by stock i's owners. For better identification due to a more dispersed ownership structure, we use an empirical implementation based only on stocks that are foreign to the stock being examined, which we refer to as the foreign ownership return.[6]

We examine the importance of the foreign ownership return for weekly, monthly, and quarterly returns using detailed holding data from the Lionshares Holdings database for 8,791 firms domiciled outside the United States. For stocks with more than 5% foreign ownership, a 1% increase in the foreign ownership return is associated with an economically large 0.311% increase in a firm's stock return, even after controlling for the movements of local market and industry portfolios. In time-series analyses, the covariation in returns attributable to the foreign ownership return is of similar importance as industry and country factors. We also calculate a foreign non-ownership return, where each stock in a stock's foreign ownership return is replaced with a stock with matching country, industry, and size characteristics, but without common ownership. This foreign non-ownership return is completely unrelated to stock returns, indicating that the foreign ownership return is not capturing unobserved country/industry fundamentals.[7]

Having established the importance of the foreign ownership return for stock returns, we provide additional insights into its drivers. In particular, we investigate two quasi-natural experiments. We first look at the shift in the ownership structure of stocks around their American depository receipt (ADR) or global depository receipt (GDR) listing date. Second, we look at the inclusions of stocks into a stock market index. These events represent plausibly exogenous shocks to the ownership of stocks and shifts in the investor habitat. We find that stocks that are cross-listed or added to a market index become more highly associated with the foreign ownership return based on their new owners following the listing/index inclusion, particularly for stocks that experience a large increase in foreign ownership. The covariation of stocks changes in a way that is consistent with the foreign ownership return being driven by a shift in investor habitat.

The common changes in ownership can be discretionary choices or induced by correlated investor flows. An example of discretionary choices is the model

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5 Appendix A illustrates how stocks are linked with each other through common shareholders.

6 We focus on variation due to ownership returns outside of a country because ownership returns within a country are highly correlated with the local market return, making the interpretation more difficult. Nevertheless, we also show economically large effects for domestic ownership returns.

7 The role of the foreign ownership return is also not explained by stock liquidity levels, the level of foreign ownership, market integration channels, or even the change in ownership itself.

of Daniel, Hirshleifer, and Subrahmanyam (2001); in this model, overconfident investors cause covariation as they misinterpret signals arising from economic factors. We decompose the foreign ownership return into a component that is due to passive allocation from fund flows and another component that is due to discretionary choices of funds that are not related to flows. The importance of the foreign ownership return is due to the discretionary stock picking component and is not due to fund flows. We also find little evidence that our findings can be explained by wealth effects. In contrast, we find that the foreign ownership return is mostly driven by funds with high active shares, funds with high turnover, and global funds, as opposed to funds with high or low flows and regional or country funds. The evidence suggests that the importance of the foreign ownership return is primarily driven by global fund investors taking active bets on stocks in different countries.

Finally, we examine the diversification implications of our findings. We assess the incremental diversification benefit of funds when they diversify along the foreign ownership return dimension. In particular, we divide stocks into quintiles based on the correlation between the foreign ownership return of the stock and the return of each fund in the prior year. The diversification limit of the stocks in the lowest correlation quintile is almost half that of stocks in the highest correlation quintile. Moreover, the finding that the foreign ownership return correlation increases after an index inclusion suggests that index holdings reduce diversification through their correlated holdings. Therefore, when seeking international diversification, investors need to consider not just the country and industry composition of the stocks they seek to invest in but also the manner in which stocks are connected to their fund through holdings by global investors.

Our work is related to a growing literature that points to the relevance of stock ownership for explaining comovement in international equities. In a domestic context, Greenwood and Thesmar (2011) show that U.S. mutual funds with highly correlated fund flows exhibit higher volatility and correlations.[8] Anton and Polk (2014) show that covariation between stock pairs is related to their common ownership, which can be used to predict short-term reversals. Internationally, Jotikasthira, Lundblad, and Ramadorai (2012) find that mutual fund flows from domestic markets can drive emerging market returns, and Hau and Lai (2013) provide evidence of fire sales pressuring prices by examining losses of funds holding bank stocks during the financial crisis.[9] Interestingly, the

[8] Frazzini and Lamont (2008) and Lou (2012) find domestic evidence of flows moving prices. Calomiris, Love, and Peria (2012) argue that negative global equity returns during the financial crisis are related to price pressure as proxied for by previous turnover.

[9] Papers examining the behavior of international investing at the fund level include those by Chan, Covrig, and Ng (2005), Ferreira and Matos (2008, 2009), Covrig et al. (2010), Hau and Rey (2011), and Faias et al. (2012). The importance of capital flows at the market level is examined by Froot, O'Connell, and Seasholes (2001), Bekaert, Harvey, and Lumsdaine (2002), Froot and Ramadorai (2008), and Bekaert and Wang (2010), among others, who conclude that global betas are linked to financial openness.

fund flow channel emphasized in many previous studies is not the driver of our findings. More importantly, our paper builds on this literature by creating a new summary measure of how stocks are connected through common ownership and demonstrating its wide-scale economic importance and applicability.

1. Ownership Channels and Testable Implications

In this section we show how country, industry, and ownership returns can be viewed in a common framework as different dimensions of the distance between stocks.[10]

1.1 Fundamentals and ownership linkage through investor habitat

Building on evidence for demand-based pricing, Barberis, Shleifer, and Wurgler (2005) (henceforth, BSW) formalize a "habitat" view of comovement, where investors trade in a limited set of stocks. If investors in a habitat have certain views, they push the prices of stocks in their habitat up or down together. BSW show in their Equation (4) that returns of a stock *i* are driven by two components:

$$R_{i,t} = CF_{i,t} + \Delta u_{Y,t} \quad \text{where} \quad i \in Y. \tag{1}$$

The first driver of variations in returns is news about cash flows ($CF_{i,t}$), which are often quantified through country and industry memberships in the international finance literature.[11] BSW define the second component, $\Delta u_{Y,t}$, as the part of the return of a stock that is affected by the demand of specific investors in a habitat Y, which can arise because of transactions costs, international trading restrictions, or lack of information. As investors' risk aversion, sentiment, or liquidity needs change, they alter their exposure to the securities in their habitat, thereby inducing a common factor in the returns of these securities. This view of comovement predicts that there will be a common factor in the returns of securities that are held and traded by a specific subset of investors who act according to heuristics (Hirshleifer 2014) or whose attention is constrained (Peng and Xiong 2006). As we show in the following sections, our foreign ownership return can be interpreted as the weighted average return of all the stocks traded in a particular habitat.

[10] We examine covariation of realized returns. In the international asset pricing literature, local and global factors depend on the degree of integration/segmentation (Stulz 1981; Errunza and Losq 1985; Dumas, Lewis, and Osambela 2011). This literature is surveyed by Karolyi and Stulz (2003).

[11] It is important to note that variation related to cash-flow news need not be entirely rational. Indeed, in Daniel, Hirshleifer, and Subrahmanyam (2001), trading mistakes are systematically correlated with economic fundamentals. This would also include fundamental shifts in discount rates that affect countries and industries.

1.2 Derivation of factor model with country, industry, and ownership return

A factor model can be interpreted as a metric for linking returns of one stock to other stocks by quantifying the distance to all other stocks along the country, industry, and ownership dimensions.[12]

1.2.1 Country and industry factor model. In the case of country and industry factors, a simple way of measuring the distance between stocks is by the binomial metric of either zero or one. Assume that we have a set of stocks $i=1,2\ldots,N$. For the country dimension, we consider whether or not the company of a stock is incorporated in country l ($l=1$ to L). In particular, for each stock we consider an L by 1 vector q_i^C whose lth element is the indicator variable $q_{i,l}^C$, which takes the value one if a stock is in country l and zero otherwise. The distance between two stocks i and j by country membership can then be captured by the Manhattan distance between two vectors q_i^C and q_j^C:[13]

$$d^C(i,j)=\frac{1}{2}\sum_{l=1}^{L}\left|q_{i,l}^C-q_{j,l}^C\right|. \tag{2}$$

Scaling by two, which is the maximum distance between two stocks, yields $d^C(i,j)=1$ for stocks in different countries and $d^C(i,j)=0$ for stocks in the same country.

Similarly, we utilize a vector for each stock that describes whether or not it is in an industry p; that is, the pth element of the vector q_i^I takes the value of one if stock i is in industry p and zero otherwise ($p=1$ to P). The distance $d^I(i,j)$ between two stocks i and j by industry membership is then defined as the scaled Manhattan distance between two vectors q_i^I and q_j^I:

$$d^I(i,j)=\frac{1}{2}\sum_{p=1}^{P}\left|q_{i,p}^I-q_{j,p}^I\right|. \tag{3}$$

The distance between two stocks i and j is one for stocks in different industries and zero for stocks in the same industry. A proximity vector $X(i)$ for stock i is then defined as one minus the stacked distances with respect to all stocks:

$$\mathbf{X}(i)=\begin{bmatrix}1-d(i,1)\\1-d(i,2)\\\vdots\\1-d(i,N)\end{bmatrix}. \tag{4}$$

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[12] We thank an anonymous referee for detailed suggestions on the derivation of the factors.

[13] Although there exist many possible distance metrics, the following derivation makes use of the Manhattan distance (a version of the Euclidean distance) because it provides particularly intuitive interpretations. As detailed below, we combine this metric with market capitalization weights to obtain economically meaningful measures of stock linkages along the country, industry, and ownership dimension.

A stock return vector R for all N stocks is similarly defined as the stacked returns of all stocks:

$$\mathbf{R}_t = \begin{bmatrix} R_{1t} \\ R_{2t} \\ \vdots \\ R_{Nt} \end{bmatrix}. \tag{5}$$

A common risk factor $F(i)_t$ with respect to a distance metric d is the set of OLS coefficients in a regression of the return vector R on a stock's proximity vector:

$$\mathbf{R}_t = F(i)_t \mathbf{X}(i) + \epsilon. \tag{6}$$

Thus, the return factor $F(i)_t$ minimizes (for every stock i) the quadratic deviation between the stock's proximity vector to all other stocks $X(i)$ and its stock return R_t. In the context of country and industry dimensions, X takes values of one for stocks in the same country (industry), and thus $F(i)$ is the equally weighted return of stocks in the same country (industry). However, value-weighted portfolios are often more common, and regressions typically have been estimated using weighted least squares based on stock market capitalization weights (e.g., Heston and Rouwenhorst (1994)). Using the country and industry distance metrics d^C and d^I and the respective proximity vectors X^C and X^I, the country and industry factors are simply the value-weighted mean country or industry returns:

$$\begin{aligned} F^C(i)_t &= \left[\mathbf{X}^C(i)' \Omega^M(i)^{-1} \mathbf{X}^C(i)\right]^{-1} \mathbf{X}^C(i)' \Omega^M(i)^{-1} \mathbf{R}_t \\ &= \sum_j m^C_{i,j} \left(1 - d^C(i,j)\right) R_{j,t} = R^C_t(i), \end{aligned} \tag{7}$$

$$\begin{aligned} F^I(i)_t &= \left[\mathbf{X}^I(i)' \Omega^M(i)^{-1} \mathbf{X}^I(i)\right]^{-1} \mathbf{X}^I(i)' \Omega^M(i)^{-1} \mathbf{R}_t \\ &= \sum_j m^I_{i,j} \left(1 - d^I(i,j)\right) R_{j,t} = R^I_t(i), \end{aligned} \tag{8}$$

where $\Omega^M(i)^{-1} = \begin{bmatrix} M_1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & M_N \end{bmatrix}$ is a diagonal matrix with market capitalizations of all firms in the world. The market capitalization weights for country and industry factors are $m^C_{i,j} = \frac{X^C(i)_j M_j}{\sum_j X^C(i)_j M_j}$ and $m^I_{i,j} = \frac{X^I(i)_j M_j}{\sum_j X^I(i)_j M_j}$, respectively.

The expressions for $R^C_t(i)$ and $R^I_t(i)$ effectively capture the market capitalization-weighted return of stocks conditional on them being in the same country or industry (i.e., their distance being zero). Note that for the country and industry dimensions, the distance metric is either zero or one, and every stock is only part of exactly one country and industry portfolio.[14]

A linear two-factor model with just country and industry factors can then be specified as

$$R_{i,t}=\beta^C F^C(i)_t+\beta^I F^I(i)_t+\epsilon=\beta^C R_t^C(i)+\beta^I R_t^I(i)+\epsilon, \tag{9}$$

where β^C and β^I are the loadings on the country and industry factors.

1.2.2 Ownership return. A similar approach as for country and industry factors can be applied to quantify the level of connectedness between stocks based on common institutional ownership. In particular, the ownership structure of stock i with regards to all funds $k=1$ to K can be described by a K by 1 vector whose kth element is the indicator variable $q_{i,k}^O$ that takes the value one if stock i is held by fund k and zero otherwise. The distance $d^O(i,j)$ between two stocks i and j along the ownership dimension can be measured by the scaled Manhattan distance between vectors q_i^O and q_j^O:

$$d^O(i,j)=\frac{1}{s_{i,j}}\sum_{k=1}^{K}\left|q_{i,k}^O-q_{j,k}^O\right|, \tag{10}$$

where $s_{i,j}$ is the number of funds holding either stock i or stock j. Scaling by $s_{i,j}$ yields $d^O(i,j)=1$ for stocks for which all owners are different, and $d^O(i,j)=0$ for stocks for which all owners are the same. For all other cases with partial overlap of the owners, $d^O(i,j)$ takes values between zero and one. The distance measure $d^O(i,j)$ can be interpreted as the percentage of owners that are different between stocks i and j. We define the proximity metric to be one minus the distance metric: $x^O(i,j)=1-d^O(i,j)$. Stacking the proximity metrics for a stock i with regard to all other stocks yields the proximity vector $X^O(i)$.

In addition to the ownership distance metric, the ownership return should quantify the combined effect of all ownership-linked securities in a value-weighted fashion. To do so, we consider two weights: (1) the percentage $w_{i,k}$ of market capitalization of stock i held by institution k and (2) the percentage $v_{k,j}$ of institution k's equity portfolio that is invested in stock j. Both weights are constructed from data available at the previous quarter's end. The weights w and v measure the relative strength of the linkages of stocks i and j with a fund k. Portfolio theory suggests that stocks with a larger portfolio weight v are more important for portfolio return and risk. In addition, the fraction w captures the extent to which stock i is owned by fund k and represents the importance

14 Since every stock is only part of exactly one country (industry) portfolio, we do not need a subindex l (p) for the weight $m_{i,j}^C$ ($m_{i,j}^I$).

of fund k to stock i. The product of the two weights, $w_{i,k}v_{k,j}$, summarizes how strong the linkage is between the two stocks via institution k. The linkage between two stocks can be represented by the sum of the products across all institutions, $\sum_{k=1}^{K} w_{ik}v_{kj}$.

The ownership weights of stock i with regards to all other stocks can be summarized in the diagonal weighting matrix $\Omega^{O}(i)^{-1} = \begin{bmatrix} h_{i,1} & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & h_{i,N} \end{bmatrix}$ where $h_{i,j} = \sum_{k=1}^{K} w_{ik}v_{kj}$ and $j = 1, 2, \ldots, N$. Using this weighting matrix and the proximity matrix X^{O} yields the ownership return as[15]

$$F^{O}(i)_t = \left[\mathbf{X}^{O}(i)' \, \Omega^{O}(i)^{-1} \mathbf{X}^{O}(i)\right]^{-1} \mathbf{X}^{O}(i)' \, \Omega^{O}(i)^{-1} \mathbf{R_t}$$

$$= \frac{1}{C} \sum_{j=1}^{N} \left(1 - d^{O}_{i,j}\right) \sum_{k=1}^{K} w_{i,k} v_{k,j} R_{j,t} = R^{O}_{t}(i). \qquad (11)$$

Thus, the ownership return quantifies the linkage between stocks due to institutional ownership via the number (fraction) of common owners and also the size of the stock holdings and corresponding significance of common ownership. Note that in contrast to country and industry factors, the ownership return is stock specific and in that sense is not a "factor" in the traditional asset pricing sense. The weights and the distance are measured at the end of the last quarter, whereas the returns are measured over the course of the current period.[16] The ownership return can be thought of as a weighted average of the habitats in which the investors trade; that is, it is a measure of the return of the portfolios of institutional owners.

For additional intuition of how the ownership return reflects investor habitat, consider the case of one single (common) investor ($K = 1$). Suppose the investor holds all stocks ($i = 1, \ldots, N$). Here, the ownership distance of all stocks is zero with regard to all other stocks:

$$d^{O}(i,j) = \frac{1}{s_{i,j}} \sum_{k=1}^{K} \left|q^{O}_{i,k} - q^{O}_{j,k}\right| = \frac{1}{1} \sum_{k=1}^{1} \left|q^{O}_{i,k} - q^{O}_{j,k}\right| = 1\,|1 - 1| = 0. \qquad (12)$$

As a result, the proximity between all stocks (i.e., one minus the distance) is one for all stocks. If the investor holds all stocks in proportion to their market

15 The number of stocks is N and $C = \mathbf{X}^{O}(i)' \Omega^{O}(i)^{-1} \mathbf{X}^{O}(i) = \sum_{j=1}^{N} \left(1 - d^{O}_{i,j}\right)^2 \sum_{k=1}^{K} w_{i,k} v_{k,j}$. Yet in the empirical implementation, we use $C' = \sum_{j=1}^{N} \left(1 - d^{O}_{i,j}\right) \sum_{k=1}^{K} w_{i,k} v_{k,j}$ so that the weights of $R_{j,t}$ sum to one.

16 Note that for all distance metrics (country, industry, ownership), the distance of a stock with itself is always zero.

capitalization, then $R_t^O(i)$ is simply

$$R_t^O(i)=\frac{1}{C}\sum_{j=1}^{N}(1-0)\sum_{k=1}^{K}w_{i,k}v_{k,j}R_{j,t}, \tag{13}$$

that is, the market capitalization-weighted average return of all stocks in the habitat.

If the single investor holds only some of the stocks in the universe, then the distance between all stocks held by the investor will be zero, while their distance with all stocks not held by the investor will be one. Since stocks with a distance of one drop out in the ownership return calculation (one minus the distance is zero), the return of the stocks in the habitat of the investor is the weighted average of the returns of the stocks held by the investor. This is what BSW refer to as the return on stocks in the habitat where stocks are either in or out of the habitat (which means in or out of the index in the case of BSW).

We then suppose that there are two investors ($K=2$) who both hold a particular stock i. Each investor also holds other stocks, some of which are the same, whereas others are not. The ownership distance of stock i to the other stocks held by both investors is zero:

$$d^O(i,j)=\frac{1}{s_{i,j}}\sum_{k=1}^{K}|q_{i,k}^O-q_{j,k}^O|=\frac{1}{2}\sum_{k=1}^{2}|q_{i,k}^O-q_{j,k}^O|=0.5(|1-1|+|1-1|)=0. \tag{14}$$

If one of the two owners holds stock i and j and the other only holds stock i, then stock i shares partial overlap in ownership (and habitat) with the other stock. In this example, $s_{i,j}$ is two since the number of investors holding either stock is two, and the ownership distance is one-half:

$$d^O(i,j)=\frac{1}{s_{i,j}}\sum_{k=1}^{K}|q_{i,k}^O-q_{j,k}^O|=\frac{1}{2}\sum_{k=1}^{2}|q_{i,k}^O-q_{j,k}^O|=0.5(|1-1|+|1-0|)=0.5. \tag{15}$$

Now suppose each of the two stocks is held by only one of the two investors. This indicates no overlap in ownership (and habitat) of the two stocks, and this is reflected in the ownership distance between the two stocks; that is, the ownership distance between the two stocks is one:

$$d^O(i,j)=\frac{1}{s_{i,j}}\sum_{k=1}^{K}|q_{i,k}^O-q_{j,k}^O|=\frac{1}{2}\sum_{k=1}^{2}|q_{i,k}^O-q_{j,k}^O|=0.5(|0-1|+|1-0|)=1. \tag{16}$$

The above intuition generalizes across multiple habitats, whether they are partially overlapping or completely disjoint, and demonstrates how the ownership return is a summary measure of the habitats in which stocks trade.

We further incorporate the information on the magnitude of ownership by considering the percentage $w_{i,k}$ of market capitalization of stock i that is held by the two institutions and the percentage $v_{k,j}$ of institution k's equity portfolio that is invested in stock j.

With BSW's habitat measure, stocks are either in or out of the habitat. Our generalization provides a continuous summary measure of investor habitat that gives more weight to stocks that share a large number of common owners with stock i, stocks whose owners hold more of stock i and stocks that are heavily invested in by stock i's owners.

We can now augment the simple two-factor model featuring country and industry factors by adding the ownership return:

$$R_{i,t}=\beta^C F^C(i)_t+\beta^I F^I(i)_t+\beta^O F^O(i)_t+\epsilon=\beta^C R^C(i)_t+\beta^I R^I(i)_t +\beta^O R^O(i)_t+\epsilon. \quad (17)$$

In the setting of BSW, country and industry portfolios $\beta^C F^C(i)+\beta^I F^I(i)$ proxy for fundamentals (cash flows) and $\beta^O F^O(i)$ proxies for the habitat component of a stock return. We will explicitly address the potential concern that the ownership return may simply capture omitted fundamentals in our empirical work.

2. Empirical Implementation and Data

2.1 Constructing the foreign ownership return

While the derivation of the ownership return in Section 1.2.2 is general, our empirical implementation constructs this variable using only foreign stocks, yielding a foreign ownership return. In particular, we construct the foreign ownership return as

$$R_t^O(i)=\sum_{j=1}^{N_i}\left(1-d_{i,j}^O\right)\sum_{k=1}^{K} w_{i,k} v_{k,j} R_{j,t}, \quad (18)$$

where $N_i < N$ is the number of foreign stocks relative to the country of incorporation of stock i (regardless of the location of institution k owning the stock). The fact that the foreign stocks come from a diverse set of countries leads to clear identification, whereas the returns of domestic stocks can be highly correlated with the return of the local market. In addition, the coverage of domestic holdings in the Lionshares database is low for funds in many countries.[17] We include all institutional investors, both domestic and foreign,

[17] Nevertheless, we will also examine a domestic ownership return for robustness. Out of sixty-five countries for which Lionshares has institutional ownership coverage, only eight countries (Canada, Denmark, Finland, Norway, Sweden, the United Kingdom, the United States, and Poland) have average local institutional ownership of stocks above 10% across different size quintiles.

and do not take the perspective of an investor in a particular country.[18] We also exclude stock i from its foreign ownership (as well as country and industry) return to avoid a mechanical relation. To allow the foreign ownership returns of different stocks to be comparable, we impose the normalization that $\sum_{j=1}^{N_i}\left(1-d_{i,j}^{O}\right)\sum_{k=1}^{K} w_{i,k} v_{k,j}=1$; that is, the observed ownership weights sum to one. This makes it easier to interpret our results since foreign ownership returns of different stocks will be comparable.

The foreign ownership return captures the composition of the holdings of the owners of a stock, but not the level of foreign institutional ownership. However, we expect the foreign ownership return to be more important for stocks for which the holders represent a large fraction of the shares. Therefore, we focus on examining securities with more than 5% foreign ownership. The foreign ownership return can be constructed for higher frequencies than the quarterly changes in foreign ownership by combining previous quarter's holdings weights with the updated weekly and monthly stock returns.

2.2 Data sources

Our international institutional holdings are from Factset/Lionshares. We follow many data cleaning procedures described by Ferreira and Matos (2008), augmented with other standard checks for 13F filings as described in Section A of the Internet Appendix. We obtain the historical Lionshares database that is free from survivorship bias. Factset/Lionshares do not provide detailed disclosure of their sources, but they do use data from public filings obtained in various countries supplemented by companies' annual reports. Their coverage appears to be lacking in capital originating outside of the United States. Wei (2011) finds that the United States and the United Kingdom account for slightly over 70% of Lionshares' non-domestic capital.

Lionshares contains two main databases: the aggregate institutional filings (similar to 13F in the United States) and the mutual fund database (similar to N-CSR mutual fund filings in the United States). To maximize data coverage, we use the institutional database as our primary source but add additional ownership information from the fund database if the parent institution's holdings are not in the institutional ownership database.

For returns and market value data, we use Thomson Financial's Datastream total return indices and market values, which we convert into U.S. dollars using exchange rates from Datastream. We use filters for common equity, as well as for reversion and extreme return filters, to smooth potential data errors as described with other details in Section A of the Internet Appendix. To ensure

[18] For example, when we construct the foreign ownership return for Samsung, we use holdings from both Korean and non-Korean institutional investors of Samsung that hold stocks from outside of Korea.

that our results are not driven by infrequent trading, we require stocks to trade on at least 30% of the days in the previous year.[19]

Table IA.3 shows that overall our sample includes a total of 13,101 firms, 8,791 of which are from outside of the United States. Our main tests focus on stocks with more than 5% foreign ownership. Table IA.3 indicates that this sample is tilted toward large stocks, but still includes many stocks in the bottom three size bins.

3. Cross-Sectional and Time-Series Importance of Foreign Ownership Returns

To examine the economic and statistical importance of the foreign ownership return, we first evaluate the relation between stock returns and foreign ownership returns with cross-sectional and time-series tests.

3.1 Cross-sectional regressions

Table 1 reports results from cross-sectional Fama-MacBeth (1973) regressions for quarterly frequencies for all non-U.S. stocks with more than 5% foreign ownership. In the univariate specification, we find that a 1% increase in contemporaneous foreign ownership returns is associated with a 0.56% increase in a stock's return. To control for the expected local and global cost of capital changes due to both returns and betas, we use prior estimated betas times the contemporaneous local or global stock return movement. After controlling for the local and global cost of capital, a 1% increase in the foreign ownership return is associated with a 0.364% return increase. After controlling for industry returns in addition to the local and global cost of capital, a 1% increase in the foreign ownership return is associated with an economically large 0.311% return increase.

3.2 Time-series regressions

Next, we examine the explanatory power of the foreign ownership return using the time-series approach of Bekaert, Hodrick, and Zhang (2009); this is advantageous in that we can control for multiple forms of risk in the standard time-series regression framework. A traditional, fundamentals-based factor model would feature country and industry portfolios to capture stock fundamentals. We augment this model with the foreign ownership return. In particular, we examine if the foreign ownership return factor from Equation (17) is important beyond the simple country and industry model in Equation (9) or, alternatively, whether the non-fundamental components in Equation (1) are relevant. For the coefficient estimates to vary fully across stocks, we estimate

[19] The percentage of zero returns is the main measure of liquidity used by Bekaert, Harvey, and Lundblad (2007). This measure is similar to Lesmond, Ogden, and Trzcinka's (1999) transactions costs measure but is less subject to estimation problems. Higher trading filters of 50% and 75% yield similar results.

Table 1
Cross-sectional regressions with foreign ownership return

	(1)	(2)	(3)	(4)
Foreign ownership return	0.560	0.364	0.468	0.311
	(9.15)	(9.25)	(9.74)	(8.87)
Local beta × Local market		0.790		0.773
		(18.96)		(17.69)
World beta × World market		−0.199		0.239
		(−0.25)		(0.59)
Industry			0.443	0.334
			(11.57)	(8.47)
Adjusted R^2	0.019	0.123	0.048	0.137
Number of observations	87,045	65,519	86,914	65,515
Number of firms	2,353	1,985	2,349	1,985

This table shows the results of Fama-MacBeth regressions of quarterly stock returns on an intercept (not reported), the foreign ownership return, and expected returns from a CAPM with local and world market index and global industry index returns excluding the industry in the local market (Industry). Local Beta and World Beta are first estimated from rolling regressions using weekly returns over the prior two years, where the returns of each stock are regressed on the returns on the value-weighted local market index, and the returns of the MSCI world market index: $R_{i,t} = \alpha_j + \beta_L R_{L,t} + \beta_W R_{MSCI,t} + \varepsilon_{j,t}$. The Local Beta is then multiplied with the contemporaneous local market return (Local beta × Local market), and the World Beta is multiplied with the contemporaneous MSCI world market return (World beta × World market) to construct CAPM expected returns. The sample period is 01/01/2000–03/31/2009. The sample consists of non-U.S. stocks with at least 30% non-zero trading days in the previous year as well as at least 5% lagged foreign institutional ownership. It reports the average coefficients, associated t-statistics, as well as the average adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Ownership data are from Lionshares, and return data for individual stocks, market indices, and industry indices are from Datastream.

regressions at the weekly frequency with individual stock level data and then aggregate the coefficients. Panel A of Table 2 shows the regressions estimates over the most recent three-year period from 2006 to the first quarter of 2009 (results in other sub-periods are similar) for stocks with more than 5% foreign ownership.

We first examine the importance of the foreign ownership return beyond the local market return. The average coefficient on the foreign ownership return (specification 3) is 0.279. A coefficient of 0.279 indicates that a weekly stock return increases by 28 basis points when the foreign ownership return increases by 100 basis points, even after controlling for variation in the local market. This coefficient is slightly larger in size than that of the world market return (0.175 in specification 2) or global industry return (0.238 in specification 4). Comparing the incremental adjusted R^2 in specifications 2–4 to specification 1 shows that the incremental explanatory power of the foreign ownership return is higher than that of the world return, although not quite as large as that of the global industry return.

We now turn to a more formal evaluation of the various models. Bekaert, Hodrick, and Zhang (2009) convincingly argue that comparing models with the mean squared error of correlations is appropriate for examining which model best characterizes the covariance matrix of returns.[20] We follow their

[20] The approach involves determining which model provides the best fit for the sample covariance structure. If a factor model is true, the common factors should explain the sample covariance matrix and the residual covariance

Table 2
Time-series regressions with foreign ownership return

Panel A: Results for 2006Q1–2009Q1

	(1)	(2)	(3)	(4)
Foreign ownership return			0.279	
Local market	0.987	0.874	0.752	0.816
World market		0.175		
Industry				0.238
Adjusted R^2	0.340	0.350	0.356	0.357
Number of firms	3,125	3,125	3,125	3,125

Panel B: MSE, 2000Q1–2009Q1

	Reg #	MSE
Incremental contribution of foreign ownership return		
Base model	(1)	0.036
Base model with foreign ownership return	(3)	0.025
Difference		0.011
p-value		<0.0001
Incremental contribution of industry return		
Base model	(1)	0.036
Base model with industry return	(4)	0.026
Difference		0.010
p-value		<0.0001
Incremental contribution of world market		
Base model	(1)	0.036
Base model with world market	(2)	0.025
Difference		0.011
p-value		<0.0001

This table shows the results of time-series regressions of weekly stock returns on an intercept (not reported), the local market index excluding own stock (Local Market), the foreign ownership return (Foreign Ownership Return), the world market index excluding the local market (World Market), and global industry index returns, excluding the industry in the local market (Industry). The sample period is 01/01/2000–03/31/2009. The sample consists of non-U.S. stocks with at least 30% non-zero trading days in the previous year as well as at least 5% lagged foreign institutional ownership. The regression models are as follows:

1. $R_{j,t} = \alpha_j + \beta_j R_{LocalMarket,t} + \varepsilon_{j,t}$
2. $R_{j,t} = \alpha_j + \beta_j R_{LocalMarket,t} + \chi_j R_{WorldMarket,t} + \varepsilon_{j,t}$
3. $R_{j,t} = \alpha_j + \beta_j R_{LocalMarket,t} + \delta_j R_{ForeignOwnership,t} + \varepsilon_{j,t}$
4. $R_{j,t} = \alpha_j + \beta_j R_{LocalMarket,t} + \phi_j R_{Industry,t} + \varepsilon_{j,t}$.

Panel A reports the mean coefficients and adjusted R^2 across firms, as well as the number of firms for the sub-period 2006Q1–2009Q1. Results for all sub-periods and for more specifications are reported in Table IA.4. Panel B shows the average mean squared error (MSE) of correlations following Bekaert, Hodrick, and Zhang (2009) for each of the models (1)–(4) as well as the difference in the MSE. Tests of significance of differences in MSE are based on bootstrapped standard errors using 1,000 randomly drawn samples with replacement. Ownership data are from Lionshares. Return data for individual stocks, market indices, and industry indices are from Datastream.

procedures, except that we use individual stocks rather than portfolios.[21] We follow Bekaert, Hodrick, and Zhang (2009) and estimate the regressions over six-month periods to allow for possible time variation. Bootstrapped p-values

components should be small. A mean squared error criterion, which is the time series mean of a weighted average of squared errors, compares the performance of alternative models.

21 In the context of standard asset pricing tests, Ang, Liu, and Schwartz (2010) propose that using individual stocks is more efficient than using portfolios.

are computed following their procedure, where we bootstrap from the time series of our MSEs to compute an empirical distribution.

Panel B shows that the MSE with only the local market is 0.036, whereas it improves to 0.025 when the foreign ownership return is added. Interestingly, the improvement due to adding the global industry or world market return to the local market factor is extremely similar. Overall, the MSE tests provide support that the foreign ownership return is a statistically and economically important driver of stock returns beyond traditional country and industry factors.

3.3 Omitted fundamentals

Institutional shareholders may specialize in country and industry characteristics beyond what linear country and industry classifications can capture. Therefore, we create a foreign non-ownership return that has the exact same country, industry, and size composition as our foreign ownership return, except that we sever the foreign ownership link. The results, reported in Appendix B, show that the coefficient on the foreign non-ownership return is close to zero, indicating that foreign ownership returns are not simply proxying for stocks of similar country and industry characteristics. We consider whether the importance of the foreign ownership return can be explained by industrial country versus emerging market stocks, large versus small stocks, or liquid versus illiquid stocks. Results in Table A2 (in Appendix B) and Table IA.5 (in the Internet Appendix) show that none of these issues are driving the findings. Additionally, we also use a domestic ownership return that is constructed in the same way as the foreign ownership return, except that it is based on the domestic stock holdings. We find that both the domestic and foreign ownership returns are important (Table A2), highlighting the generalizability of our approach and findings.

4. Drivers of the Foreign Ownership Return

While our results so far have documented an economically and statistically important relation between stock returns and the foreign ownership return, we now seek to investigate why the foreign ownership return is important. To this end, we investigate shifts in the investor base around ADR/GDR listings and stock index inclusions, as well as the role of different types of investors, common flows from investors, active decisions of fund managers, and wealth effects as drivers of the foreign ownership return.

4.1 An ADR/GDR test

BSW and Greenwood (2005) use index additions and deletions to examine whether a shift in investor demand or investor habitat (from habitat Y to Z) leads to changes in stock comovement as predicted by the habitat hypothesis. In an international setting, Foerster and Karolyi (1999) show that the foreign ownership composition of a stock often shifts around the listing of an ADR/GDR. If the explanatory power of the foreign ownership return is driven by investor habitat and not some omitted firm characteristic that foreign ownership proxies for, then stock returns should become more correlated with the new ownership structure after the ADR/GDR listing. To implement the suggested approach, we investigate how the changes in the ownership distances and ownership weights after the listing of an ADR or GDR of a stock affect the foreign ownership return and its relation to stock returns.

Assume a non-U.S. stock i is listing an ADR in the United States. As a result, its ownership structure will change and its average ownership distance with stock j in the United States decreases from $\bar{d}^{O}_{i,j}$ to $\bar{d}^{OO}_{i,j}$. We denote the values before and after the listing by "O" and "OO" in superscript. We can measure the difference vector Δ with the following elements:

$$\Delta_{i,j} \equiv (1-\bar{d}^{OO}_{i,j}) \sum_{k=1}^{K} \bar{w}^{OO}_{i,k} \bar{v}^{OO}_{k,j} - (1-\bar{d}^{O}_{i,j}) \sum_{k=1}^{K} \bar{w}^{O}_{i,k} \bar{v}^{O}_{k,j}. \tag{19}$$

We then use the difference vector, Δ, to investigate how changes in the average ownership distance and the average ownership weights after the cross-listing of a stock affect the foreign ownership return:

$$\Delta F^{O}(i)_t \equiv \sum_{j=1}^{N_i} \Delta_{i,j} R_{j,t}. \tag{20}$$

The new foreign ownership factor becomes

$$F^{OO}(i)_t = F^{O}(i)_t + \Delta F^{O}(i)_t. \tag{21}$$

We measure the average ownership distance $\bar{d}^{O}_{i,j}$ and the average ownership weights ($\bar{w}_{i,k}$, and $\bar{v}_{k,j}$) over the four quarters before and after the ADR/GDR listing date for each firm i with an ADR/GDR.[22] Consequently, we estimate

$$R_{i,t} = \beta^{C} R^{C}(i)_t + \beta^{I} R^{I}(i)_t + \beta^{O} F^{O}(i)_t + \beta^{\Delta} \Delta F^{O}(i)_t + \epsilon. \tag{22}$$

We use the change in the foreign ownership return, $\Delta F^{O}(i)_t$ to investigate the effect of changes in the ownership structure after the listing on the relation between the foreign ownership return and stock returns.

We show the results in Table 3, panel A. We perform panel regressions of stock returns on the foreign ownership return, the local market, and the world market, as well as on interaction terms with an indicator variable that takes the value of one after the ADR/GDR listing (and zero otherwise). We interact the change in the foreign ownership return, $\Delta F^{O}(i)_t$ with the listing dummy. The results show an economically and statistically significant relation between

22 Note that $\bar{d}^{O}_{i,j}$, $\bar{w}_{i,k}$, and $\bar{v}_{k,j}$ are properly scaled so that $\sum_{j=1}^{N_i} \left(1-\bar{d}^{O}_{i,j}\right) \sum_{k=1}^{K} \bar{w}_{i,k} \bar{v}_{k,j}$ is one.

stock returns and the foreign ownership return (coefficient of 0.194 with a t-statistic of 6.21 for all firms). Importantly, the incremental effect of the foreign ownership return after the ADR/GDR listing is also important, with a coefficient of 0.134 (t-statistic of 2.75). In line with our hypotheses, the effects are economically larger for firms with increased foreign ownership (0.161) and increased foreign ownership by more than 5% (0.171).

4.2 Index inclusions

Similar to the ADR/GDR listing experiment, the ownership distance may change after the inclusion of a stock into a market index. Hau (2011) and Hau, Massa, and Peress (2010) examine the impact of MSCI global market index constitution changes and show that benchmark effects are extremely important for global portfolio allocation, because institutional investors care about tracking errors of their portfolios vis-à-vis the indices. In the context of our paper, the inclusion of a stock in a market index shortens the ownership distance of a stock relative to stocks in the index.

We obtain global stock level index inclusion data for MSCI indices from Claessens and Yafeh (2012), who hand-collect the data for a large set of international stocks and examine the implications of index inclusion for the relation between foreign ownership returns and stock returns. Similar to Equations (19) to (21), we measure the average foreign ownership distance $\bar{d}^O_{i,j}$ and the average foreign ownership weights ($\bar{w}_{i,k}$, and $\bar{v}_{k,j}$) over the four quarters before and after the index inclusion date for each firm i and construct foreign ownership returns before and after index inclusion. As in Equation (22), we compute the difference between the foreign ownership returns before and after the index inclusion.

We report the results for index inclusions in panel B of Table 3.[23] The results show that the coefficient on the change of the foreign ownership return is positive and significant. In other words, after a stock is included into a major stock market index, the foreign ownership return coefficient increases significantly, indicating that the new ownership structure strengthens the link to returns of connected stocks. This supports the thesis that the explanatory power of the foreign ownership return is driven by a shift in investor habitat.

4.3 Different types of institutional owners

While the foreign ownership return is constructed as a summary measure of investor habitat, it may be the case that certain habitats or investor groups drive its importance. Our hypothesis is that active, global funds are driving the foreign ownership returns effect through their correlated trading activities. Therefore, we split the foreign ownership return by different subgroups of owners.[24] In

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[23] The sample is again restricted to firms whose foreign ownership was above 5% after its index inclusion.

[24] We thank an anonymous referee for this suggestion.

Table 3
ADR/GDR listings and index inclusions

	All firms		Firms with increased foreign ownership		Firms with increased foreign ownership by more than 5%	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: ADR/GDR listings						
Foreign ownership return		0.194		0.321		0.318
		(6.21)		(7.57)		(6.69)
ΔForeign ownership return × ADR dummy		0.134		0.161		0.171
		(2.75)		(2.28)		(2.20)
Local market	1.022	0.986	1.058	1.008	1.060	0.991
	(55.02)	(43.08)	(44.60)	(37.18)	(43.32)	(31.94)
Local market × ADR dummy	−0.014	0.001	−0.046	0.030	−0.061	0.025
	(−0.56)	(0.04)	(−1.45)	(0.81)	(−1.88)	(0.59)
World market	0.068	−0.115	0.057	−0.216	0.041	−0.177
	(2.25)	(−2.41)	(1.49)	(−3.55)	(1.01)	(−2.57)
World market × ADR dummy	0.076	0.083	0.161	0.088	0.168	0.065
	(1.83)	(1.65)	(3.12)	(1.47)	(3.09)	(0.93)
Adjusted R^2	0.232	0.250	0.243	0.287	0.267	0.280
Number of observations	38,349	24,307	24,430	15,362	19,749	11,830
Number of firms	354	354	230	230	189	189
Panel B: Index inclusions						
Foreign ownership return	1.087	0.416	1.115	0.400	1.150	0.392
	(69.37)	(19.72)	(55.82)	(14.73)	(50.08)	(12.34)
ΔForeign ownership return × Inclusion dummy	0.952	0.367	0.905	0.249	0.909	0.230
	(17.87)	(6.97)	(12.70)	(3.54)	(11.61)	(2.97)
Local market		0.839		0.870		0.926
		(35.51)		(29.90)		(26.27)
Local market × Inclusion dummy		0.017		0.021		0.022
		(0.64)		(0.63)		(0.56)
Adjusted R^2	0.186	0.259	0.180	0.253	0.184	0.257
Number of observations	21,106	21,103	14,212	14,210	11,124	11,122
Number of firms	254	254	177	177	142	142

This table shows results from regressions that investigate the effect of cross-listing (panel A) and index inclusion (panel B) events on the relation between stock returns and foreign ownership returns. In particular, panel A reports results of pooled regressions of weekly stock returns of companies that listed an ADR/GDR on an intercept (not reported), the foreign ownership return (Foreign Ownership Return), the return on the local market index excluding own stock (Local Market), and the return on the World market index. The change in the Foreign Ownership Return is calculated based on the average foreign ownership distance and the average foreign ownership weights over the four quarters before and after the listing date for each firm with an ADR/GDR. Panel B shows results of pooled regressions of weekly stock returns of stocks that were included in a major country index (see Claessens and Yafeh 2012). The change in the Foreign Ownership Return is calculated based on the average foreign ownership distance and the average foreign ownership weights over the four quarters before and after the index inclusion date for each firm that is being included in an index. The sample is limited to non-U.S. stocks. The table reports the coefficients, associated t-statistics, as well as the adjusted R^2. Results are shown separately for all firms, firms with an increase in foreign ownership, and firms with an increase in foreign ownership of more than 5%. Ownership data are from Lionshares, whereas data on returns for individual stocks and market indices are from Datastream. ADRs/GDRs are identified based on Lionshares and Datastream information. Effective dates for ADRs/GDRs are identified through the Bank of New York Web site (www.adrbnymellon.com/dr_directory.jsp) as well as through CRSP. We take the first listing date. Effective dates of index inclusions are taken from Claessens and Yafeh (2012).

particular, we classify institutions by their level of active shares, turnover, and geographic styles. In addition, we also include classifications by fund type, momentum exposure, and fund flows. In each case, institutions are sorted into several groups, and we compute foreign ownership returns separately for each of these groups. We then compare the Fama-MacBeth regression coefficients across groups.

First, we investigate whether the activeness of the portfolio allocation of funds is related to the strength of the association between the foreign ownership return and stock returns. We construct the active shares measure for each fund in a similar fashion as Cremers and Petajisto (2009) and sort institutions into those that are above the median active share (high active share) and below the median active share (low active share).[25] Specification 1 in Table 4 shows that while both foreign ownership return coefficients are significant, the coefficient of institutions with high active share has higher economic and statistical significance than that of institutions with low active share. The difference between the two is statistically significant (t-statistic=5.32).

We also examine fund turnover as an alternative measure of fund activeness and divide funds into those with high (above median) and low (below median) turnover. Specification 2 shows that the habitat formed by high turnover funds is economically and statistically more important than that formed by low turnover funds. Thirdly, we classify funds as global, regional, or country funds based on their holdings.[26] In specifications 3 and 4, we find that foreign ownership returns of global institutions are more important in affecting a stock's returns than those of country-specific institutions. Compared to regional funds, the foreign ownership return coefficient for global funds is larger (0.010 vs. 0.008) but is not statistically different.

In specification 5, we run multivariate regressions in which we incorporate all three sets of foreign ownership returns to see which foreign ownership grouping has the strongest relation with returns. Consistent with the first three specifications, we find that the foreign ownership return effects are the strongest for high active share, high turnover, and global funds. Foreign ownership return effects for regional funds become small and insignificant. Specification (5) also includes additional control variables based on several other classifications of foreign ownership returns. In particular, we separate funds into hedge funds and mutual funds (independent) versus banks, insurance companies, and pension funds (gray). We also split institutions into two groups by sorting on their portfolio return loadings on the Fama-French global momentum

25 We use a market capitalization-weighted index constructed for each geographical region and the world using the stocks in our data sample. For regional funds (as defined in the following footnote), we rank institutions according to their active shares relative to the regional market capitalization-weighted benchmark. For global funds (also defined in the following footnote), we rank institutions according to their active share relative to the global market capitalization-weighted benchmark.

26 We calculate for each fund the percentage of its holdings that are in a country and a region in a quarter. If the maximum average percentage of the holdings in a country over the previous twelve quarters is more than 90% of the fund's total holdings, the fund is classified as a country fund. Otherwise, if the maximum average percentage in a region is more than 80%, it is a region fund. Otherwise, it is a global fund. Depending on country, region, or global classification, the respective monthly country, region, or global index return is selected for a fund in the following quarter.

Table 4
Foreign ownership returns from different groups of investors

	(1)	(2)	(3)	(4)	(5)
Foreign ownership return					
Funds with high active share	0.013				0.009
	(9.16)				(2.97)
Funds with low active share	0.005				0.002
	(3.85)				(0.83)
Funds with high turnover		0.012			0.006
		(7.63)			(2.49)
Funds with low turnover		0.005			0.001
		(3.08)			(0.30)
Global funds			0.010	0.011	0.006
			(6.12)	(7.55)	(2.75)
Regional funds			0.008		0.001
			(5.07)		(0.42)
Country funds				0.004	0.001
				(3.07)	(0.49)
Mutual and hedge funds					−0.002
					(−0.80)
Pension funds, banks, insurance companies					−0.003
					(−1.15)
High momentum funds					0.002
					(1.10)
Low momentum funds					0.001
					(0.89)
High flow funds					−0.001
					(−0.63)
Low flow funds					−0.003
					(−1.32)
Local beta × Local market	0.063	0.063	0.063	0.063	0.061
	(10.45)	(10.28)	(10.28)	(10.17)	(9.89)
World beta × World market	0.024	0.024	0.024	0.024	0.024
	(4.36)	(4.23)	(4.42)	(4.20)	(4.05)
Industry	0.021	0.021	0.021	0.021	0.021
	(5.80)	(5.84)	(6.13)	(6.32)	(6.25)
Adjusted R^2	0.144	0.145	0.144	0.149	0.164
Number of observations	63,121	61,525	61,803	55,539	52,717
Number of firms	1,913	1,864	1,873	1,683	1,597
Difference between groups	0.008	0.007	0.002	0.008	
	(5.32)	(3.47)	(0.98)	(4.57)	

This table shows the results of Fama-MacBeth regressions of quarterly stock returns on an intercept (not reported), alternative versions of the foreign ownership return (Foreign Ownership Return), expected returns from a CAPM with local and world market index, and global industry index returns, excluding the industry in the local market (Industry). There are 6,300 institutions with holdings information, of which 3,796 are mutual funds and investment advisors and 1,185 are hedge fund companies. Across specifications, foreign ownership returns are constructed for different groups of institutions. In particular, institutions are split into two groups by different characteristics or particular types of institutions are selected: specification (1) splits institutions into those with high active share vs. those with low active share; specification (2) splits institutions into those with high turnover vs. those with low turnover; and specifications (3) and (4) split institutions into country funds, regional funds and global funds. (If the maximum average percentage of the holdings in a country over the previous four quarters is more than 90% of a fund's total holdings, the fund is classified as a country fund. Otherwise, if the maximum average percentage in a region is more than 80%, it is a region fund. Otherwise, it is a global fund.) Specification (5) further includes foreign ownership return splits for mutual and hedge funds versus pension funds, banks, and insurance companies; splits for institutions with high momentum exposure versus those with low momentum exposure, as well as splits for institutions with high net fund flows versus those with low net fund flows. The sample period is 01/01/2000–03/31/2009. The sample consists of non-U.S. stocks with at least 30% non-zero trading days in the previous year as well as at least 5% lagged foreign institutional ownership. The table reports the average coefficients and associated t-statistics, as well as the average adjusted R^2, the number of observations, and the average number of firms. The different foreign ownership return variables as well as all other independent variables are standardized to have zero mean and unit variance within each quarter. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Differences and associated t-statistics between the coefficients on the two foreign ownership return variables in each specification are reported in the bottom of the table. Ownership data are from Lionshares, and return data for individual stocks, market indices, and industry indices are from Datastream.

factor.[27] Moreover, funds with low net flows may engage mostly in regular (discretionary) rebalancing activities, while funds with large inflows or outflows will have to make (forced) net new purchases/sales. To investigate this effect, we split the foreign ownership return for each stock into two components based on funds with net flows in the top or bottom quartiles across institutions (high flows) and funds in the middle two quartiles (low flows).

The foreign ownership returns created from all these subgroups (independent vs. grey, high vs. low momentum, and high vs. low flows) are not significant in the presence of the active, high turnover, and global fund classification. The fact that these are institutions that are active traders and have global presence is consistent with the derivation of the foreign ownership return as a weighted average summary measure of investor demand quantifying the extent to which the owners of a stock affect its comovement.

4.4 Funds flows versus discretionary trading

To investigate the role of fund flows in the foreign ownership return, we split the return into different components to isolate a flow-related part. The decomposition proceeds in several steps. First, we follow the standard approach in the literature and infer fund flow as the difference between the total net asset value of fund k at the end of quarter t ($TNA_{k,t}$) and the value at the end of the quarter to which the assets of the fund at the beginning of quarter ($TNA_{k,t-1}$) had grown to had they been invested passively at the return of fund k during quarter t ($R_{k,t}$):

$$Flow_{k,t} = \frac{TNA_{k,t} - TNA_{k,t-1}(1+R_{k,t})}{TNA_{k,t-1}}. \tag{23}$$

If funds passively allocate new inflows to existing portfolio holdings in proportion to the existing portfolio weights, an $x\%$ increase in total net assets due to a fund inflow increases the fraction of market capitalization that a fund holds of each stock by $x\%$. Thus, the change in the share of market capitalization that fund k holds in stock j due to the passive allocation of fund flows $\Delta H^{Flow}_{j,k,t}$ is[28]

$$\Delta H^{Flow}_{j,k,t} = Holdings_{j,k,t-1} Flow_{k,t}, \tag{24}$$

$$Holdings_{j,k,t} = \frac{MVH_{j,k,t}}{MktCap_{j,t}}, \tag{25}$$

[27] We regress the past 24 months' institutional returns on the Fama-French global momentum factor to obtain the momentum loadings. High (low) momentum funds are institutions whose factor loading is above (below) the median.

[28] When there is an inflow of funds, and the inflow is distributed passively according to portfolio weights in the previous period, the flow measured as rate of change should be equal to the rate of change of funds available for each invested stock. For example, $FundFlow_{n,t} = 1$ means a 100% increase in total net assets due to new flow. If the price of a stock that the fund holds does not change, the fund should increase the holding of the stock by 100%.

where $MVH_{j,k,t}$ is the market value of the holdings of stock j by fund k at time t, and $MktCap_{j,t}$ is the market capitalization of stock j at time t.

This effect can be aggregated across all the funds that hold a particular stock j; that is, the change in holdings of stock j due to passive allocation from fund flow is

$$\Delta H_{j,t}^{Flow} = \sum_{k=1}^{K} Holdings_{j,k,t-1} Flow_{k,t} = \sum_{k=1}^{K} \Delta H_{j,k,t}^{Flow}. \tag{26}$$

Using changes in holdings due to fund flows, Greenwood and Thesmar (2011) decompose stock returns into a fund flow related part ($R_{j,t}^{CHF}$) and a residual part ($R_{j,t}^{R}$) by regressing stock returns on the changes in holdings (Eq. (5) in their paper). Yet, we are also interested in returns related to changes of holdings that are unrelated to flows. Hence, we extend this approach and decompose returns into three parts, that is, a fund flow-related component ($R_{j,t}^{CHF}$), changes in holdings that are not related to fund flows ($R_{j,t}^{CHNF}$), and a residual part ($R_{j,t}^{R}$):

$$\begin{aligned} R_{j,t} &= \lambda_{j,0} + \lambda_{j,1} \Delta H_{j,t}^{Flow} + \lambda_{j,2} \Delta H_{j,t}^{NonFlow} + e_{j,t} \\ &= \lambda_{j,1} \Delta H_{j,t}^{Flow} + \lambda_{j,2} \Delta H_{j,t}^{NonFlow} + \left(\lambda_0 + e_{j,t}\right) \\ &= R_{j,t}^{CHF} + R_{j,t}^{CHNF} + R_{j,t}^{R}, \end{aligned} \tag{27}$$

where

$$\Delta H_{j,t}^{NonFlow} = \Delta H_{j,t} - \Delta H_{j,t}^{Flow}, \tag{28}$$

$$\Delta H_{j,t} = \sum_{k=1}^{K} \left(Holdings_{j,k,t} - Holdings_{j,k,t-1}\right). \tag{29}$$

The decomposition splits changes of holdings of funds into those that are the result of passive allocations due to fund flows and those that are discretionary choices by the funds.

We can use the decomposition of stock returns in order to decompose the foreign ownership return in Equation (18) into three parts by substituting $R_{j,t}$ with its three components: (1) the change of holding due to passive allocation from fund flow, (2) the change of holding not due to passive allocation, and (3) returns not due to changes of holdings:

$$R_t^O(i) = \sum_{j=1}^{N_i} \left(1 - d_{i,j}^O\right) \sum_{k=1}^{K} w_{i,k} v_{k,j}$$

$$R_{j,t} = \sum_{j=1}^{N_i} \left(1 - d_{i,j}^O\right) \sum_{k=1}^{K} w_{i,k} v_{k,j} \left(R_{j,t}^{CHF} + R_{j,t}^{CHNF} + R_{j,t}^{R}\right). \tag{30}$$

We standardize all three components of the foreign ownership return.

Table 5
Decomposition of foreign ownership return

	(1)	(2)	(3)
Foreign ownership return	0.013		
	(6.47)		
Foreign ownership return (change of holdings due to flow)		−0.002	0.000
		(−0.76)	(−0.05)
Foreign ownership return (change of holdings due to non-flow)			0.003
			(2.36)
Foreign ownership return (residual)		0.009	0.009
		(4.15)	(3.76)
Local beta × Local market	0.064	0.064	0.064
	(10.44)	(10.50)	(10.39)
World beta × World market	0.024	0.024	0.024
	(4.47)	(4.42)	(4.41)
Industry	0.021	0.021	0.021
	(5.93)	(5.82)	(5.76)
Adjusted R^2	0.137	0.137	0.138
Number of observations	65,515	65,508	65,508
Number of firms	1,985	1,985	1,985

This table shows results of Fama-MacBeth regressions of quarterly stock returns on an intercept (not reported), the foreign ownership return or its components, expected returns from a CAPM with local and world market index, and global industry index returns excluding the industry in the local market (Industry). The returns of stock j, $R_{j,t}$, are assumed to be related to the change of holdings due to the passive allocation of fund flow $\Delta H_{j,t}^{Flow}$ and the change of holdings not due to the passive allocation $\Delta H_{j,t}^{NonFlow}$:

$$R_{j,t}=\lambda_{j,0}+\lambda_{j,1}\,\Delta H_{j,t}^{Flow}+\lambda_2\,\Delta H_{j,t}^{NonFlow}+e_{j,t}=R_{j,t}^{CHF}+R_{j,t}^{CHNF}+R_{j,t}^{R}.$$

Feeding these return components into the foreign ownership return similarly decomposes it into three parts: one due to changes of holding from passive allocation of fund flows, one due to changes of holding that are not from passive allocation, and the residual:

$$R_t^O(i)=\sum_{j=1}^{N_i}\left(1-d_{i,j}^O\right)\sum_{k=1}^{K}w_{i,k}v_{k,j}\,R_{j,t}=\sum_{j=1}^{N_i}\left(1-d_{i,j}^O\right)\sum_{k=1}^{K}w_{i,k}v_{k,j}\,\left(R_{j,t}^{CHF}+R_{j,t}^{CHNF}+R_{j,t}^{R}\right).$$

The different foreign ownership return variables, as well as other independent variables, are standardized to have zero mean and unit variance within each quarter. The sample period is 01/01/2000–03/31/2009. The sample consists of non-U.S. stocks with at least 30% non-zero trading days in the previous year as well, as at least 5% lagged foreign institutional ownership. The table reports the average coefficients and associated t-statistics, as well as the average adjusted R^2, the number of observations, and the average number of firms. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Ownership data are from Lionshares, and return data for individual stocks, market indices, and industry indices are from Datastream.

Table 5 presents results of the decomposition. Column (1) shows the original results. In Column (2), stock returns are regressed on the flow component and the residual component of the foreign ownership return. We find that the flow component is not significant; that is, stock returns are only related to the non-flow part of foreign ownership returns. In Column (3), we regress stock returns on the foreign ownership return due to flows, foreign ownership return from discretionary changes of holdings, and the residual foreign ownership return. The flow part remains insignificant, while the discretionary change of holdings and the residual foreign ownership return are both significant determinants of stock returns.

4.5 Wealth effects

A possible alternative explanation to habitat investing is that the foreign ownership return captures wealth effects of funds, where funds adjust the ownership in the stocks they hold when they had high returns (an increase in wealth). A simple implication of portfolio rebalancing that plays a role in many theoretical investment models is that if stock prices increase in one group of securities, investors may want to diversify away from this group and increase their holdings in other securities.[29] To illustrate, a fund might hold three stocks in its portfolio: Samsung, Nissan, and Microsoft. Samsung and Nissan experience a sudden rise in stock value. A wealth effect implies that the fund is suddenly wealthier from the rises in stock values and may need to reduce holdings in Samsung and Nissan (perhaps to avoid being disproportionately weighted in these stocks) and invest more in Microsoft. Thus, an empirical test of the wealth effect involves testing whether funds that have experienced a rise in the value of their portfolio increase their ownership in the stocks they hold. As a measure of the increase in wealth, we use the return of a fund over the quarter. We do not consider fund flows since they were analyzed in the previous section.

Our level of analysis is the change of ownership in each stock by each fund. We regress the change of ownership of each fund in each stock on contemporaneous and lagged quarterly returns of each fund. If wealth effects are important, then for each stock, the funds with high fund returns (and an increase in wealth) should be increasing their holdings in a stock, whereas the funds with the lowest returns should decrease their ownership in a stock. The regression results in Table 6 show that funds' changes in holdings are statistically and economically unrelated to contemporaneous fund returns. This result is independent of whether we measure fund performance based on just foreign stocks (specification 1) or all stocks (specifications 2 and 3) and whether the fund return is contemporaneous or lagged. In addition, we examine results based on sorting evidence. For each stock in a quarter, we sort the stocks' institutional owners into five quintiles according to the institutions' average holding returns. In each quintile, we report the average change of holdings of the stocks by the institutions in the current and over the next four quarters. Similar to the regression results, we find that institutions that experience the largest returns on their holdings are not increasing their institutional holdings in the stocks they already hold (as reported in Table IA.9).

An alternative way to investigate the role of wealth effects as a driver of the foreign ownership return is to exploit the fact that the wealth of investors may be tied to the return of the country in which the fund is based. Similar

[29] See, for example, Bohn and Tesar (1996, Equation (4)), Griffin, Nardari, and Stulz (2004, Equation (6)), Goldstein and Pauzner (2004, Figure 5), and Kyle and Xiong (2001, p. 1,412). For example, Hau and Rey (2004) propose that when an international investor's domestic holdings increase, the investor has more wealth and is more likely to move capital to the United States.

Table 6
Wealth effects

	(1)	(2)	(3)
Foreign owner fund return	0.050		
	(0.64)		
Foreign owner fund return (lagged)	0.136		
	(1.50)		
Owner fund return		−0.005	−0.027
		(−0.06)	(−0.28)
Owner fund return (lagged)		0.080	0.054
		(0.80)	(0.51)
Percentage change in holdings (lagged)			0.035
			(6.89)
Adjusted R^2	0.000	0.001	0.006
Number of firms	2,150	2,184	2,150

This table shows results of Fama-MacBeth regressions of quarterly changes in holdings on an intercept (not reported), variables capturing wealth effects, and control variables. In particular, the table shows the results from regressions of changes in holdings at the stock-fund level on the portfolio return of institutional owners, and the lagged dependent variable. The dependent variable is the change of holdings from the previous quarter to the current quarter of a stock by a fund. The regressors are the fund return (Owner Fund Return), the fund return in the previous quarter (Owner Fund Return (lagged)), the fund return on foreign holdings (Foreign Owner Fund Return), the fund return on foreign holdings in the previous quarter (Foreign Owner Fund Return (lagged)), and the percentage change in holdings lagged by one quarter (i.e., the lagged dependent variable). All variables are standardized. Results are based on new and existing holders of a stock. The sample period is 01/01/2000–03/31/2009. The sample is limited to non-U.S. stocks with at least 30% non-zero trading days in the previous year. The table reports the coefficients, associated t-statistics, as well as the average adjusted R^2. Ownership data are from Lionshares. Returns data for individual stocks, market indices, and industry indices are from Datastream.

to our foreign ownership return, we compute an institutional owners' home market return that is based on the country in which the institution is domiciled (which is often different from the country in which the capital is deployed). The owners' home market return is calculated as the weighted average of the index returns of the home country (country of incorporation) of the fund, where the weights are based on the relative size of the fund's holdings in the stock. The results (reported in Table IA.8, panel A) show that the importance of the foreign ownership return is unaffected by the owners' home market return.

A related test is to examine the importance not of the country in which the capital is domiciled but of the country in which the capital is deployed. We estimate time-series regressions of the return of each ownership connected stock on its local country market return to obtain the fitted value as well as the residual. We then feed these two return components into the foreign ownership return calculation in Equation (6) to obtain two foreign ownership return components:

$$R_t^O(i) = \sum_{j=1}^{N_i} \left(1 - d_{i,j}^O\right) \sum_{k=1}^{K} w_{i,k} v_{k,j} \left(R_{j,t}^{country} + R_{j,t}^{residual}\right)$$
$$= R_{j,t}^{O,country} + R_{j,t}^{O,residual}. \quad (31)$$

The results (reported in Table IA.8, panel B) show that the residual effect is economically and statistically significant in all specifications. The country market component coefficient is neither statistically significant (in the univariate regression) nor economically significant (and only about one-fourth of the coefficient on the residual effect). The decomposition is interesting in that it shows that it is the specific composition of stocks that a portfolio manager holds and not predominantly the country composition of the portfolio that drives the explanatory power of the foreign ownership return. Overall, this section provides little empirical support for wealth effects.

5. Diversification Implications

Next, we briefly explore the consequences for portfolio diversification implied by the systematic relation between stock returns and foreign ownership returns. A simple but useful practical diagnostic is to compare the return covariance of firms within a population relative to the return variance of a representative firm in a given country. Solnik (1974) uses this approach to compare the power of portfolio diversification in the United States and internationally.

We examine the reduction in the standard deviation of the equity portfolio of a fund if it moves from country and industry diversification to diversification along country, industry, and the foreign ownership return dimension. We focus this analysis on funds that are well diversified across countries and industries, that is, those that hold more than 50% of non-domestic stocks and have non-zero investment in all ten Fama-French industries. For these funds, we assess the incremental diversification benefit when diversifying along the foreign ownership return dimension. In particular, we divide stocks into quintiles based on the correlation between the foreign ownership return of the stock and the return of each fund in the prior year. We then calculate the diversification benefit that each group of stocks provides each fund in terms of reduction in volatility.

We first assume that a fund is increasing its existing portfolio with the original fund portfolio constituting half of its holdings and new stocks constituting the other half. The new stocks are drawn from either the high or low quintiles based on the correlation of their foreign ownership return with fund returns. Figure 1 shows the reduction in volatility (i.e., portfolio return variance divided by average stock return variance) as more stocks are added to the portfolio. Stocks that have the lowest (highest) foreign ownership return correlation with the fund return provide the largest (smallest) reduction in volatility as the number of stocks increases. As shown in Table 7, the diversification limit of the stocks in the lowest correlation quintile is 18% compared with 28% for the stocks in the highest correlation quintile. Alternatively, we build equally weighted portfolios from scratch using stocks with different quintiles of foreign ownership return correlations. Table 7 shows that portfolios drawn from stocks with the lowest foreign ownership correlations again achieve a much lower diversification limit (11%) compared with portfolios drawn from stocks with the highest foreign ownership correlations (19%).

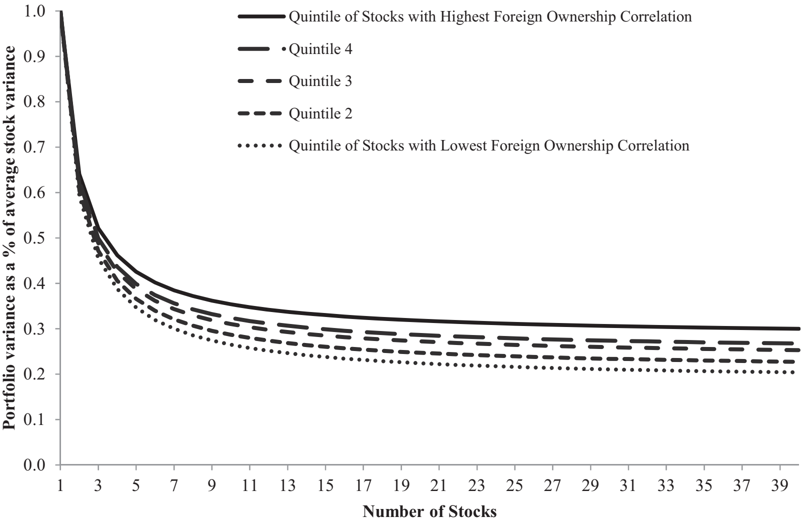

Figure 1
Portfolio diversification
This figure shows the effect of portfolio diversification for funds investing in stocks with different levels of foreign ownership correlation. In particular, for each fund and year, stocks that are not held by the fund are sorted into quintiles based on the correlation between their foreign ownership returns and fund returns in the prior year. Quintile 1 is the group of stocks with the lowest correlation, and quintile 5 is the group of stocks with the highest correlation. Funds are required to have at least 50% of their holdings in nonlocal stocks and to have holdings in all ten Fama-French industries in order to ensure they are considerably diversified along the country and industry dimensions We restrict the grouped stocks to be non-U.S. with at least 30% nonzero trading days in the previous year and to have more than 5% foreign ownership before sorting. We look at the diversification benefits of investing 50% in an equally weighted portfolio of the stocks in a quintile and the rest in the fund in the following year. When we calculate the equally weighted portfolio return for a quintile, we first take averages within a country and then take the average across countries, in order to avoid a dominating effect of countries with many stocks. The figure shows the diversification limits (variance of portfolio return divided by the average of the variance of individual stock returns and the variance of the fund return) when investing 50% in the fund and 50% in the stocks in each quintile.

A related question is whether fund size matters for the ease of diversification based on foreign ownership returns. Building on the above analysis, we examine the unrealized diversification potential of funds as a function of fund size. To this end, we consider funds that invest 50% of their portfolio in stocks with alternatively high and low foreign ownership return correlation (top and bottom quintile). For each fund, the difference in diversification benefits between the top and bottom quintiles of stocks represents the unrealized diversification benefit for that fund. We plot this unrealized diversification benefit as a function of fund size (log assets in USD). The unrealized diversification benefits are higher for small funds compared to large funds, as shown in Figure 2. We also conduct an analysis (in Internet Appendix Section C) that measures the importance of the foreign ownership return in capturing systematic portfolio risk and reach similar conclusions.

Table 7
Portfolio diversification and foreign ownership linkage

Limit value of portfolio return variance as a % of the average stock return variance

Correlation quintile	Add stocks to fund	Build new stock portfolio
Low	0.1832	0.1098
2	0.2074	0.1262
3	0.2337	0.1490
4	0.2487	0.1617
High	0.2820	0.1893

This table examines how foreign ownership linkage is related to portfolio diversification. It shows the portfolio diversification effects for different funds when they add stocks with different foreign ownership return correlations into the portfolios. In particular, for each fund and year, stocks that are not held by a fund are sorted into quintiles based on the correlation between their foreign ownership return and fund returns in the prior year. Quintile 1 is the group of stocks with the lowest correlation, whereas quintile 5 is the group of stocks with the highest correlation. We restrict the stocks to be non-U.S. and to have more than 5% foreign ownership before the sorting. We look at the diversification benefits of stocks from a quintile in the following year. When we calculate the equal weighted portfolio return for a quintile, we first take averages within a country and then take average across countries, in order to avoid a dominating effect of countries with many stocks. The numbers presented here are diversification limits (variance of portfolio return divided by average variance of individual stock returns). Column 1 shows results for diversification effects when investing 50% in the fund and 50% in the stocks in each quintile. Column 2 shows results for diversification effects for investments in just the stocks in the quintile. The sample consists of all non-U.S. stocks with data between 01/01/2000 and 03/31/2009 with at least 30% non-zero trading days in the previous year. Firms are also required to have at least thirty non-missing observations over the sample period.

6. Conclusion

The international finance literature has predominantly considered comovement in terms of two components of economic fundamentals, industry, and country factors. Motivated by Froot and Dabora (1999), Chan, Hameed, and Lau (2003), and Foerster and Karolyi (1999), who show in different contexts that covariation is related to a firm's investor clientele associated with its listing location, we develop a new, parsimonious measure of linkages between stocks based on their ownership structure and document its pervasiveness and importance. Griffin (2002) and Fama and French (2012) find that local factors are relatively more important than global ones, but Karolyi and Wu (2012) show that the degree to which a stock is global depends on the cross-listed trading venue. In a broadly consistent manner, we find that a more explicit measure of the linkages of a stock to foreign stocks due to common institutional ownership can explain substantial return variation beyond local and global factors.

The foreign ownership return is of similar economic importance as country and industry fundamentals, and it is not proxying for omitted fundamentals, investment style, or wealth effects. Consistent with investor habitat, the foreign ownership return is more important after a stock lists an ADR/GDR or is added to a market index, and it is stronger for active global funds with high turnover. A decomposition shows that the foreign ownership return is not due to common fund flows but rather is due to discretionary stock trades by fund management. The importance of the foreign ownership return is driven by active trading decisions of fund managers as they buy and sell securities in a similar fashion as other fund managers around the globe.

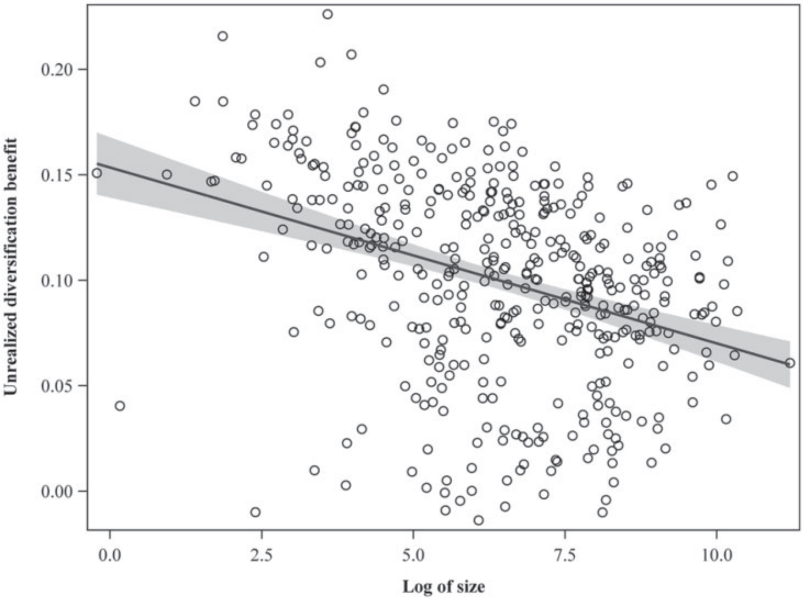

Figure 2
Fund size and diversification benefits
This figure plots the unrealized diversification benefit against fund size (log assets in U.S. dollars). For each fund and calendar year, quintile groups of stocks are formed according to the correlation between their foreign ownership return and the fund return in the previous year. The unrealized diversification benefit is defined as the difference between the diversification limit from investing in stocks that have the highest quintile versus the lowest quintile of ownership correlations. The diversification limit is the ratio of portfolio return variance to average stock return variance where half of the portfolio is invested in a fund's original assets and the other half in an equally weighted portfolio of stocks in the quintile. Funds are required to have at least 50% of their holdings in nonlocal stocks and to have holdings in all ten Fama-French industries in order to ensure they are considerably diversified along the country and industry dimensions. The sample consists of non-U.S. stocks with at least thirty weekly observations in a calendar year, 30% nonzero trading days in the previous year as well as at least 5% foreign institutional ownership in the beginning of a calendar year. The sample period is 01/01/2000–03/31/2009. Ownership data are from Lionshares, and return data for individual stocks, market indices, and industry indices are from Datastream.

Our results have important practical implications for investors. We show that stocks with a foreign ownership return similar to a portfolio manager's existing portfolio provide considerably less diversification benefits compared to stocks with an unrelated foreign ownership return. In fact, the indices and mutual funds that are popular vehicles to obtain international diversification become, over time, the least efficient tools given that they hold highly overlapping portfolios. Thus, international fund managers should pay close attention both to the level of foreign ownership and to whether a stock is held by unrelated or competing shareholders. We believe these findings are of broad academic and practical relevance for a variety of domestic and international portfolio and risk management applications. More research is needed to further understand the important role of financial institutions in international financial markets.

Appendix

Appendix A. Example of Ownership Linkage

Figure A1 illustrates a hypothetical example of a stock (Samsung) that is held by two shareholders (Capital World Investors and Korea Retirement Fund). This figure demonstrates how Samsung is linked to other securities through common shareholders.

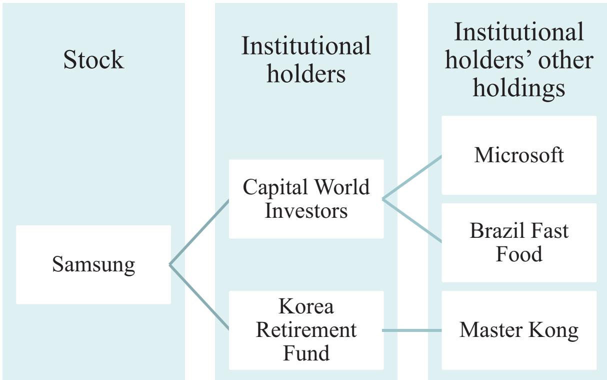

Figure A1
Example of ownership linkage

Appendix B. Robustness Tests

Table A1 shows results from regressing quarterly returns on the foreign ownership return for different regression samples based on domicile market development, market capitalization, and liquidity levels. In particular, we run regressions separately for the sample of stocks in developed markets and emerging markets. We also run regression based on the stocks' market capitalization buckets (small, medium, and large) in the previous quarter. Stocks that are below the 40th percentile are classified as small; the next 30% are classified as medium; and the rest are classified as large. Finally, we divide stocks into liquid versus illiquid according to the percentage of non-zero return days in the previous year. We use the median value of the percentage of zero returns to divide stocks into the two groups. In all specifications, we find that stock returns are significantly related to the foreign ownership return.

Tables A2 and A3 show results of tests with the foreign non-ownership return. The results reported in Table A2 (specification 1) show that the coefficient on the foreign non-ownership return is close to zero. We repeat this process with two-digit SIC industries that are potentially more precise. We also perform an analysis in which we always pick the largest foreign non-ownership stock within the country-industry bucket to ensure the foreign non-ownership return is of similar or larger size composition. Alternatively, we combine the industry and large stocks analyses. All of the coefficients on these alternative foreign non-ownership returns in specifications 1–5 are close to zero and statistically insignificant, indicating that foreign ownership returns are not simply proxying for stocks of similar country and industry characteristics. We also create 200 simulated datasets of foreign non-ownership returns. The simulation regression coefficients have a mean of 0.0034 and range from 0.0018 to 0.061 (panel A of Table A3), which is never anywhere close to that of the actual foreign ownership return of 0.56 (in Table 1).

Table A1
Cross-sectional regressions with foreign ownership returns

	Market development		Market capitalization			Trading	
	Emerging	Developed	Small	Medium	Large	Illiquid	Liquid
Foreign ownership return	0.128	0.354	0.210	0.259	0.524	0.225	0.440
	(2.59)	(4.78)	(5.80)	(2.84)	(4.80)	(8.03)	(9.11)
Local beta × Local market	0.806	0.662	0.778	0.754	0.811	0.758	0.786
	(23.52)	(7.27)	(11.91)	(18.88)	(31.79)	(16.71)	(15.60)
World beta × World market	−0.755	0.313	1.025	−1.216	−0.776	1.478	−0.750
	(−0.74)	(0.79)	(2.45)	(−0.80)	(−0.71)	(2.81)	(−0.77)
Industry	0.358	0.352	0.293	0.284	0.400	0.324	0.349
	(5.54)	(8.69)	(5.56)	(5.77)	(10.72)	(6.80)	(8.75)
Adjusted R^2	0.190	0.106	0.102	0.164	0.240	0.117	0.163
Number of firms	605	1,380	795	596	595	986	999
Number of observations	19,962	45,553	26,219	19,656	19,640	32,550	32,965

This table shows the results of Fama-MacBeth regressions of stock returns on an intercept (not reported), the foreign ownership return (Foreign Ownership Return), the expected returns from a CAPM with local and world market index (Local Beta*Local Market and World Beta*World Market), and global industry index returns, excluding the industry in the local market (Industry). The table shows results broken down by degree of market development (Emerging, Developed), market capitalization size (Small, Medium, Large), and trading activity (High, Medium, Low). Stocks are classified into emerging and developed markets based on the MSCI classification as of June 2006. Stocks are classified into market capitalization buckets on the basis of lagged market capitalization in U.S. dollars, where small is the bottom 40%, medium is the next 30%, and large is the top 40%. Stocks are classified according to trading activity on the basis of the number of trading days in the prior year as liquid (stocks with many trading days, i.e., top half) or illiquid (stocks with few trading days, i.e., bottom half). The sample consists of non-U.S. stocks with at least 30% non-zero trading days in the previous year, as well as at least 5% lagged foreign institutional ownership. The sample period is 01/01/2000–03/31/2009. The table reports the average coefficients, associated t-statistics, as well as the average adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Ownership data and information on investment styles are from Lionshares, whereas data on returns for individual stocks, market indices, and industry indices are from Datastream.

Table A2
Foreign non-ownership return and domestic ownership return

	(1)	(2)	(3)	(4)	(5)	(6)
Foreign ownership return					0.309	0.205
					(9.88)	(5.55)
Foreign non-ownership return (Avg Stock)	0.019				−0.064	
	(0.51)				(−1.65)	
Foreign non-ownership return (Avg Stock) (SIC2)		0.016				
		(0.41)				
Foreign non-ownership return (Largest Stock)			−0.023			
			(−0.72)			
Foreign non-ownership return (Largest Stock) (SIC2)				−0.010		
				(−0.22)		
Domestic ownership return						0.598
						(11.98)
Local beta × Local market	0.789	0.786	0.788	0.786	0.773	0.429
	(16.71)	(16.53)	(16.42)	(16.56)	(17.35)	(6.98)
World beta × World market	0.225	0.195	0.198	0.145	0.240	−0.127
	(0.55)	(0.45)	(0.45)	(0.31)	(0.62)	(−0.21)
Industry	0.350	0.350	0.350	0.349	0.334	0.328
	(8.15)	(8.12)	(8.07)	(8.16)	(8.48)	(9.39)
Adjusted R^2	0.133	0.132	0.132	0.132	0.138	0.157
Number of observations	65,514	65,508	65,514	65,508	65,514	65,444
Number of firms	1,985	1,985	1,985	1,985	1,985	1,983

This table shows the results of Fama-MacBeth regressions of quarterly stock returns on the foreign ownership return and various control variables. Returns are regressed on an intercept (not reported), the foreign ownership return, one of four alternative versions of a Foreign Non-Ownership return, the domestic ownership return, expected returns from a CAPM with local and world market index, and global industry index returns, excluding the industry in the local market (Industry). For each stock, the Foreign Non-Ownership Return variable is constructed in a similar way as the foreign ownership return, except we use uniform ownership distance and we replace returns of the actual, ownership connected stocks with that of comparable stocks not held by any owner of the stock in question. We take two approaches in sampling comparable stocks. First, we take the average of stocks in the same country, industry, and size bucket. Second, because stocks that are less likely to be held by investors tend to be smaller, we sample the largest stock in the same country and industry that is not owned by any existing shareholder. When there are fewer than five stocks in the country, industry, and size bucket not owned by any existing shareholder, which happens in 44% of the cases, we pick stocks from the same country bucket. The four alternative versions of the Foreign Non-Ownership return are based on either using the average return of all stocks in the same country and industry (based on 48 Fama-French classifications) that are not held by any other institution owning the stock (Foreign Non-Ownership Return (Average Stock)), or by using the average return of all stocks in the same country and industry (based on two-digit SIC code classifications) that are not held by any other institution owning the stock (Foreign Non-Ownership Return (Average Stock) (two-digit SIC)), or by using the return of the largest stock in the same country and industry (based on 48 Fama-French classifications) that are not held by any other institution owning the stock (Foreign Non-Ownership Return (Largest Stock)), or by using the return of the largest stock in the same country and industry (based on two-digit SIC code classifications) that are not held by any other institution owning the stock (Foreign Non-Ownership Return (Largest Stock) (two-digit SIC)). The Domestic Ownership Return is constructed using only domestic stocks and uniform ownership distance. Local Beta and World Beta are first estimated from rolling regressions using weekly returns in the prior two years, where the return of each stock is regressed on the return on the value-weighted local market index, and on the returns of the MSCI world market index: $R_{i,t} = \alpha_j + \beta_L R_{L,t} + \beta_W R_{MSCI,t} + \varepsilon_{j,t}$. The sample period is 01/01/2000–03/31/2009. The sample consists of non-U.S. stocks with at least 30% non-zero trading days in the previous year, as well as at least 5% lagged foreign institutional ownership. The table reports the average coefficients, associated t-statistics, as well as the average adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Ownership data are from Lionshares, and return data for individual stocks, market indices, and industry indices are from Datastream.

Table A3
Foreign ownership return and foreign non-ownership return with simulation

Panel A: Simulation exercise 1

	Mean coef.	Min coef	Max coef.	Iterations
Foreign non-ownership return	0.034	0.0018	0.061	200

Panel B: Simulation exercise 2

	Coef.	p-value	Iterations
Foreign ownership return	0.850	0.00	1,000
Foreign non-ownership return	−0.086	0.40	1,000

This table shows results from the following simulation exercises. In simulation exercise 1 (panel A), for each stock held by a foreign investor, we randomly draw another stock from the same country, industry, and size bin that is not held by any of the stock's shareholders. We then create a foreign non-ownership return. This foreign non-ownership return is added to an artificial dataset that also includes the original foreign ownership return and other control variables. We create 200 such datasets based on alternative random draws of foreign non-ownership returns. We then estimate the following univariate regression: $R_i = a + b R_{foreign\ non\text{-}ownership,i} + \varepsilon_i$. We generate regression coefficients for each of the datasets to obtain an empirical distribution of regression statistics. Size groups are defined using cutoff points among U.S. stocks. Firms without ownership linkage must have market capitalization greater than USD 100 million. In simulation exercise 2 (panel B), we conduct a bootstrap. For each stock, we have the Foreign Ownership Return ($R_{foreign\ ownership,i}$) and the Foreign Non-Ownership Return ($R_{foreign\ non\text{-}ownership,i}$) constructed from the value-weighted mean returns of the largest non-owned stock in the same industry and country as the linked stocks. Each quarter we run a cross-sectional regression of the stock return (R_i) on the Foreign Ownership Return and the Foreign Non-Ownership Return: (1) $R_i = a + b\ R_{foreign\ non\text{-}ownership,i} + c\ R_{foreign\ ownership,i} + \varepsilon_i$. We keep the parameter estimates for a, b, and c, as well as the residuals. We take the time-series average of a, b, and c to get the Fama-MacBeth estimates and associated standard errors (corrected with Newey West (1987) with three lags). Under the null hypothesis, the foreign ownership return is not a driver of stock returns. Therefore, we set the coefficient c estimated in (1) to zero, that is, c = 0. Subsequently, we perform the following steps 1,000 times: for each firm in each quarter, we take a random draw (with replacement) from the residuals for that quarter. We impose the null hypothesis and create returns for each firm and quarter by multiplying the estimated coefficients (b and c, with c set to zero) with the Foreign Non-Ownership Return and the Foreign Ownership Return and adding the intercept, a, as well as the residual (from the prior step). Using these constructed return series instead of the actual returns, we estimate regression (1) for each quarter. We take the time-series average of a, b, and c to get the Fama-MacBeth estimates and associated standard errors (corrected with Newey West (1987) with three lags). From each of the 1,000 iterations, we obtain a time-series average of a, b, and c, as well as associated t-statistics/standard errors, which yield an empirical distribution. We calculate p-values as the proportion of t-statistics that are greater than the t-statistic from the original Fama-MacBeth regression.

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