

Country and Industry Concentration and the Performance of International Mutual Funds

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Takato Hiraki, Ming Liu, and Xue Wang¹

Abstract

We examine the relationship between portfolio country versus industry concentration and performance using a hand-matched data set of international equity funds. When sorted by concentration measures, funds in the most concentrated quintile outperform the diversified quintile by 0.16% and 0.30% monthly in country and industry dimensions, respectively. Further analysis shows that the superior performance of concentrated funds is largely driven by industry rather than country concentration, suggesting the existence of global industry private information. Finally, we show that industry-concentrated funds rotate top-holding industries less frequently than their diversified counterparts and the industries they purchase subsequently outperform the industries they sell.

JEL Classification: G11; G23

Keywords: Portfolio Concentration; International Mutual Funds

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1 Introduction

U.S.-based international equity mutual funds provide investors opportunities to gain exposure to foreign stocks. The total net assets of World equity funds (defined as funds that “invest primarily in non-U.S. corporations” by Investment Company Institute (ICI)) have increased from US\$28 billion in 1990 to US\$1,502 billion in 2010 (ICI Fact Book (2011)). The increasing trend is most likely driven by increased investor interest in diversification benefits and growth opportunities available outside the U.S., and is fueled by reduced investment barriers in international financial markets. International funds may diversify in two dimensions: country and industry. In this paper, we examine the performance implications of portfolio country versus industry concentration using a sample of U.S. international equity mutual funds.

Classical finance theory suggests that diversification improves the investment opportunity set for investors in the risk-return plane (Markowitz (1952, 1959)). Therefore, investors should diversify their portfolios broadly across industries and, if possible, across countries, to gain diversification benefits up to the point where the marginal benefit equals the marginal cost of diversification. However, in practice, a large proportion of institutional and individual investors hold highly concentrated portfolios (e.g., Kacperczyk et al. (2005) and Polkovnichenko (2005)).

The literature has proposed various explanations for portfolio concentration by institutional and individual investors. Institutional investors as agents may concentrate their portfolios to take advantage of the asymmetric relation between fund flows and performance by

betting on a small number of stocks or industries (i.e., agency conflicts in delegated investment management).¹ Investors may also concentrate due to specialization, or access to private information (Levy and Livingston (1995) and Van Nieuwerburgh and Veldkamp (2009)). Alternatively, investors may concentrate for behavioral reasons, such as overconfidence (Goetzmann and Kumar (2008)) and familiarity (e.g., Huberman (2001) and Pool et al. (2012)).² These explanations have different implications on performance of concentrated portfolios. Only the private information (and specialization) hypothesis predicts a purely positive relationship between portfolio concentration and performance, while others predict an opaque result, either a negative, positive or neutral relation.

Several papers examine the relationship between portfolio concentration and performance empirically but document mixed results. Kacperczyk et al. (2005) find that U.S. domestic equity funds that concentrate on industries outperform their diversified counterparts, suggesting that some fund managers have industry-specialized superior knowledge. Brands et al. (2005) find a positive relationship between concentration and performance in Australian equity funds. Fedenia et al. (2011) find that foreign and U.S. institutional investors who concentrate on industries outperform less concentrated investors. Moreover, some recent papers focus on portfolio concentration of individual rather than institutional investors. For example, Ivkovic et al. (2008) find evidence that some individual investors with concentrated portfolios earn higher returns than those with diversified portfolios. These papers attribute the outperformance of concentrated portfolios to investors' information advantages. By contrast, Sapp and Yan (2008) find no positive relationship between concentration and performance among U.S. domestic equity funds.

¹There are many papers on the flow-performance relation, including Ippolito (1992), Brown, Harlow and Starks (1996), Gruber (1996), Chevalier and Ellison (1997), Goetzmann and Peles (1997), Sirri and Tufano (1998), Del Guercio and Tkac (2002), and Nanda et al. (2004). If we assume that fund managers with low ability tend to take high risks, there should be a negative relationship between fund concentration and performance.

²Familiarity does not necessarily mean information advantage. See Korniotis and Kumar (2013).

Goetzmann and Kumar (2008) find that the least diversified group of individual investors earns 2.4% lower return than the most diversified group.

While previous papers focus only on investors' domestic portfolios, the present paper investigates the portfolio concentration–performance relationship in the context of active international equity funds.³ International stock markets provide a unique opportunity to examine this relationship in two dimensions of concentration: country and industry, as well as the interaction between the two. Specifically, this paper examines a sample of 389 actively managed international equity funds domiciled in the U.S. over the period 1993 to 2008. The investment strategy of these funds is to invest non-U.S. common stocks. We hand-collect the country and industry information for the stock holdings of these funds.

We make several contributions to the literature. First, given the mixed findings from previous studies, this paper provides new evidence on the portfolio concentration–performance relationship, using holdings data of international mutual funds. We find that when funds are sorted into quintiles by level of country and industry concentration individually, concentrated funds outperform their diversified counterparts by 0.16% and 0.30% per month, net of expense, in the country and industry dimensions, respectively. This outperformance is robust to various performance benchmarks and adjustments for risk factors. Our findings are consistent with the private information (and specialization) hypothesis. Moreover, the outperformance is stronger for smaller funds than for larger funds in the industry concentration dimension. However, this is not the case for the country concentration dimension. More interestingly, the differential performance between concentrated and diversified funds becomes smaller in the more recent

³An exception is Huij and Derwall (2011), who study this portfolio concentration-performance relationship in U.S. global equity funds. However, they do not use holdings data to study the interaction between country and industry concentration, which is a primary focus of our paper.

subsample period – 2001 to 2008, in which technological advances have made information more readily available to investors. The results suggest that international mutual fund managers hold concentrated portfolios because of information advantage, and that this advantage may decrease with fund size and information technology advancement.

Second, the paper contributes to better understanding of the asset allocation practices of active international portfolios. Both academics and practitioners have shown interest in which factor, country or industry, dominates in returns of global stock markets and in performance of international equity portfolios. Following the early work by Lessard (1974), Roll (1992), Heston and Rouwenhorst (1994), and Griffin and Karolyi (1998), among others, sparked renewed attention to this issue. Roll (1992) shows that industrial structure plays a more important role than country in explaining the returns of equity indices from 24 countries. By contrast, Heston and Rouwenhorst (1994) find that country-specific variation, rather than industrial structure, explains the low correlation among 12 European country equity indices. Griffin and Karolyi (1998), using the Dow Jones World Stock Index database, which includes emerging markets, confirm the results of Heston and Rouwenhorst that little of the variation in country index returns is due to industry composition. The relative importance of country to industry factors is confirmed in recent studies. For example, Bekaert, et al. (2009) decompose global market total risk in a conditional asset pricing model and find that the increasing importance of industry factors relative to country factors is a short-lived and temporary phenomenon. Brown, et al. (2009), using the conditional global asset pricing model and a similar variance decomposition technique, find that the increase in international variance and covariance of realized excess returns can be attributed to systematic variations in global risk premia more correlated with country than with industry factors.

This debate is ongoing and has important implications for international asset allocation strategies. For instance, if country (industry) is the major source underlying global market returns, international investors should diversify across countries (industries) instead of industries (countries) for more risk reduction. At the same time, active international portfolio managers may tilt their portfolios toward countries or industries for which the managers hold proprietary information.⁴ Therefore, the portfolio manager faces tradeoffs between the *relative* diversification benefit derived from country and industry factors and the *relative* value of information she holds on country and industry. Hence, the portfolio manager's best asset allocation strategy becomes a complex empirical question. We provide one possible answer to this question by carefully disentangling the effect of country versus industry concentration on portfolio performance.⁵ We conduct both portfolio-sorting and regression analyses. The results show that when controlling for the country concentration effect, industry-concentrated funds still outperform industry-diversified funds. However, if we control for the industry concentration effect, country-concentrated funds show no superior performance compared to country-diversified funds. In other words, the superior performance of country-concentrated funds can be explained by industry concentration, but not vice versa. This result suggests that industry-specific rather than country-specific information helps international equity fund managers improve their performance, consistent with the notion that there exists global industry private information (e.g., Albuquerque et al. (2009)), which benefits U.S. international mutual fund performance. Our finding also lends support to the view that the industry factor does not drive

⁴ Portfolio concentration can be rationalized when information is costly. See, for example, Van Nieuwerburgh and Veldkamp (2009).

⁵ There are two caveats when we differentiate the effect of country versus industry on portfolio's performance. First, some countries are predominately occupied by few industries, so concentrating on these industries may automatically result in overweighting these countries. Second, within a country, the growth opportunities of an industry may be hinged on the institutional environment of the country, therefore the industry and country information may be linked. In effect, we find that fund's country and industry concentration measures are positively correlated (0.33).

international stock return variation as much as the country factor, thereby industry may be a better dimension for concentration rather than diversification.

Third, this paper contributes to the literature on the performance of international mutual funds, which is sparse compared to studies on domestic mutual funds.⁶ With the fast growing interest in international investment, we attempt to fill this gap by investigating the performance implications of country versus industry concentrations of international equity funds using holdings data in recent times. We find that, on average, international mutual fund in our sample do not earn positive risk-adjusted returns (alphas) after expenses, and that fund returns have significantly different loadings on various U.S. and international risk factors. These results confirm findings in the literature examining international fund performance (Cumby and Glen (1990)) and the importance of choosing benchmarks for international portfolio evaluation (Comer and Rodriguez (2012)). The innovation of our paper is that we document the performance dispersion of active international equity funds and the source of heterogeneous skills among managers. We show that industry-concentrated funds have industry timing ability. The industries they purchase outperform the industries they sell in the following 12 months. Interestingly, industry-concentrated funds hold their top-holding industries longer than diversified funds. We interpret this as resulting from the international market providing a unique opportunity for fund managers to capitalize their information advantage in industry.

Lastly, this paper also sheds light on how international mutual fund managers should allocate resources toward country versus industry research. In a somewhat similar setting, Sonney (2009) finds that in European brokerage houses, financial analysts who specialize in individual countries provide more accurate and timelier forecasts than analysts specializing in

⁶ See Elton and Gruber (2011) for a survey on research papers of mutual funds.

industries, suggesting that country-specific rather than industry-specific research is more valuable for equity analysts. By contrast, we find that, within the broader international investment opportunity set, industry information is most important for fund managers to deliver higher returns.

This paper proceeds as follows. In Section 2, we describe the data and methodology. In Section 3, we present empirical results for the relation between portfolio concentration and performance. We disentangle the effect of country and industry concentration on portfolio performance and examine the industry timing ability of concentrated funds in Section 4. In Section 5, we investigate the determinants of fund concentration to differentiate the information hypothesis from the risk-taking hypothesis. We conclude the study in Section 6.

2 Data and methodology

2.1 Data and sample

Our data come mainly from three sources. The asset holdings of U.S. international equity mutual funds are from Morningstar for the period of 1984 to 2008. This data set includes fund identifiers, fund report dates, fund holding stock company names, number of shares, market capitalization, and portfolio weights. Our second data source, the Center for Research in Security Prices (CRSP) Mutual Fund Database, provides fund attributes, including returns, net asset values, expense ratios, turnover ratios, load fees, etc. We merge Morningstar and CRSP data sets by fund ticker, CUSIP, and fund name, and we manually verify funds with different names or total net assets. Next, we hand-match the funds not matched in the preceding steps by examining fund

names and prospectuses. We exclude all fixed income, hybrid, index, sector, global, country, and regional funds, as well as funds of funds from our sample. We also remove funds investing only in developed or emerging markets. The investment strategy of the funds in our sample is to invest in non-U.S. common stocks. As we show below, our benchmark for international diversification consists of the market capitalizations of 50 international markets outside the U.S.; it covers developed, emerging, and major frontier markets. Finally, we require that our sample maintain at least 50 actively managed international equity funds each year. Our sample period is set from 1993 to 2008.

We collect country and industry information on international stocks from our third data source, Datastream. We match the individual holdings of each fund with the common stock attribute information from Datastream. Country and industry information of American depository receipts (ADRs) held by each fund, however, is retrieved from the CRSP stock database. Finally, we search online for industry and country information for stocks that cannot be matched via the above steps.⁷ The Industry Classification Benchmark (ICB) of Financial Times Stock Exchange (FTSE) industry classification from Datastream is used to categorize stocks into ten industries.⁸ We classify ADR stocks into one of these 10 ICB industries via a link table, which converts their Standard Industrial Classification (SIC) codes from CRSP to ICB industries.⁹

⁷ Some of these holdings are securities of private companies, which comprise less than 1% of the holdings.

⁸ Following Kacperczyk et al. (2005), we use 10 main industry groups.

⁹ The link table is available upon request from the author.

2.2 Concentration measures

We follow the literature (e.g., Kacperczyk et al. (2005) and Brands et al. (2005)) to calculate fund's country and industry concentration indices. To construct an international diversification benchmark, we collect market capitalization information for all common stocks in each global market at the end of each year from Datastream.¹⁰ We include 50 countries in our final sample, which accounts for approximately 99% of the international market, excluding the U.S., in terms of market capitalization. We calculate year-end country and industry market weights from 1993 to 2008 as the two diversification benchmarks. Panel A of Table 1 reports country weights for the 50 markets in 2008. There is one emerging market, China, within the top ten markets, and there are seven emerging markets ranked between 11 and 20 in market size: India, Taiwan, Brazil, Russia, South Korea, South Africa, and Mexico. Total market share of the top 20 markets is 88.37%, and the eight emerging markets, including China, account for 21.92%. A snapshot of market share in 2008 would be quite different from one taken in 1998, as no emerging market appears in the top 10 in 1998. For example, the five emerging markets in the top 20 represent only 5.09%, and the top 20 markets account for 92.24% of total market size of the 50 markets in 1998.¹¹ Since the late 1990s, global stock markets have become less concentrated, while emerging markets have become larger in terms of market capitalization, and have played a more important role in global diversification.

Panel B of Table 1 shows industry weights in 2008. Even in this year of financial crisis, the financial sector is still the largest in the international market, accounting for 19.83%,

¹⁰ We follow prior studies (Griffin et al. (2010), Ince and Porter (2006)) to filter out non-common stocks from the sample.

¹¹ The tables for the country and industry weights from 1993 to 2008 are available upon request.

followed by the oil and gas sector at 11.75%. Throughout the sample period, 1993 to 2008, the financial sector maintains the largest, while other sectors change rankings over time.

Following previous papers, we calculate the country and the industry concentration index as the sum of squared deviations of portfolio component weights from the international market benchmarks shown for 2008 in Table 1. We calculate this measure for every fund at the end of each year from 1993 to 2008. The formula for the country concentration index (*CCI*) for each fund is

$$CCI = \sum_{k=1}^{50} (WC_{k,t} - WC_{kb,t})^2 \quad (1)$$

where $WC_{k,t}$ is the portfolio weight of country k at the end of year t , and $WC_{kb,t}$ is the market weight benchmark of country k at the end of year t , as shown in Panel A of Table 1.

Similarly, the formula for industry concentration index (*ICI*) of each fund is

$$ICI = \sum_{j=1}^{10} (WI_{j,t} - WI_{jb,t})^2 \quad (2)$$

where $WI_{j,t}$ is the portfolio weight of industry j at the end of year t , and $WI_{jb,t}$ is the benchmark weight of industry j at the end of year t , as shown in Panel B of Table 1. We then sort our sample funds into quintiles by their concentration index at the end of each year, and measure the performance of the equally weighted fund portfolios for the next year. These ranked portfolios are rebalanced annually at the end of each calendar year. During our sample period, 1993 to 2008, emerging countries open their capital markets to foreign investors gradually. We recognize that investability restrictions play an important role in international investment practice and asset pricing models (e.g., Karolyi and Wu (2012)). However, since all the international mutual funds in our sample are domiciled in the U.S., we can safely assume that all funds, at any time, have

the same access (or restrictions) to all the markets. Thus, the investability restrictions will not affect the results of sorting.

2.3 Performance measures

Fund returns, net of expense, are directly derived from the CRSP Mutual Fund Database. Net fund returns are then converted into gross returns using the expense ratio of each fund. To calculate risk-adjusted fund returns, we use both U.S. domestic and international factors. The U.S. market, size, book-to-market (B/M), and momentum factors are retrieved from Professor Ken French's website.¹² We construct the international market factor using the MSCI All Country World Index (ACWI) Ex. U.S. index returns in U.S. dollars from the MSCI website.¹³ The global market returns are adjusted into an excess form by subtracting the U.S. risk-free rates. We calculate the international B/M factor by taking the difference between the MSCI ACWI Value and Growth index return series. Finally, we obtain the international size factor as the difference between the MSCI ACWI Large Cap and MSCI ACWI Small Cap index returns in a similar fashion. Note that all international factors are in U.S. dollars and measured on a monthly basis. The three models used to calculate the risk-adjusted returns are as follows:¹⁴

$$R_{it} - R_{ft} = \alpha_i + \beta_{i1}MKT_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + \varepsilon_{it} \quad (3)$$

$$R_{it} - R_{ft} = \alpha_i + \beta_{i1}Intl_MKT_t + \beta_{i2}Intl_SMB_t + \beta_{i3}Intl_HML_t + \varepsilon_{it} \quad (4)$$

$$R_{it} - R_{ft} = \alpha_i + \beta_{i1}MKT_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}MOM_t + \beta_{i5}Intl_MKT_t + \beta_{i6}Intl_SMB_t + \beta_{i7}Intl_HML_t + \varepsilon_{it} \quad (5)$$

¹² http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

¹³ http://www.msci.com/legal/index_data_additional_terms_of_use.html?/products/indices/performance.html

¹⁴ We also derive risk-adjusted returns using global factors calculated from MSCI ACWI indices. The results using these performance benchmarks are quantitatively similar to the seven-factor model.

where R_{it} is the return of fund portfolio i based on sorting by concentration measures, R_{ft} is the one-month Treasury bill rate (also from Professor Ken French's data library), and MKT , SMB , HML , and MOM correspond to the Carhart (1997) four factors. As described above, $Intl_MKT$, $Intl_SMB$, and $Intl_HML$ are the international market, size, and B/M factors. $(R_{it} - R_{ft})$ and $(\alpha_i + \varepsilon_{it})$ indicate excess return and factor risk-adjusted return for fund i during month t , respectively. In addition to these mean returns, we compute the Sharpe ratio of fund portfolios as an alternative risk-adjusted performance measure.

2.4 Fund characteristics

All fund characteristics data are from the CRSP Mutual Fund Database. We require that the funds included in our sample have at least ten different foreign stocks and a minimum total net asset value (TNA) of US\$1 million. Table 2 presents the summary statistics of our sample. There are 389 funds across the sample period. The number of stock holdings ranges from 17 to 1,193, with a mean holding of 143. The number of countries invested in the international equity funds ranges from 5 to 45, with a mean of 21. A majority of funds hold assets in all ten industries, though there is a wide spread in portfolio concentration among the international equity funds, as the country concentration index (calculated as the sum of squared deviations) ranges from 0.20%-squared to 25.44%-squared, while the industry concentration index ranges from 0.09%-squared to 19.90%-squared.

The largest fund in our sample has a TNA of US\$29.6 billion, while the mean expense ratio is 1.43%. The average monthly return is 0.58%.¹⁵ International equity funds have an average age of 8.15 years, which is younger than an average U.S. domestic equity fund according to previous studies.¹⁶ The mean annual turnover ratio of the funds is 78.54%, and the average monthly flow rate is 1.72%.

Panel B of Table 2 displays the correlations among the variables used in our empirical investigation. The country and industry concentration indices are positively correlated (0.33), which seems natural. Both indices have the same signs on correlations with other fund attribute variables, such as fund size, age, and turnover ratio. Small and young funds tend to be more concentrated, especially with respect to industry dimension. Industry-concentrated funds tend to charge higher fees, but this is not true for country-concentrated funds. This observation has interesting implications if the expense ratio is a good proxy for information costs. While both country and industry concentration indices are negatively correlated with turnover and total load, they are positively correlated with fund flows.

3 Relation between portfolio concentration and performance

3.1 Raw and risk-adjusted returns

In Table 3, we show the basic sorting results of fund portfolios on concentration and performance. The two types of concentration measure are calculated using equations (1) and (2) for each fund. We sort the sample funds into quintiles at the end of each year based on the

¹⁵ Monthly returns from CRSP are dollar denominated, net of management fees including loads.

¹⁶ For example, Kacperczyk et al. (2005) report an average age of 14.58 years for a sample of actively managed U.S. domestic equity funds from 1984 to 1999.

calculated concentration index number, and we measure the equally weighted returns of each quintile portfolio for the following year and rebalance the portfolio annually. Panel A reports the results based on country concentration index. The first two columns display gross and net returns of each portfolio before adjusting for risk factors. We report the Newey-West adjusted t -statistics in parentheses. Concentrated funds outperform their diversified counterparts by 0.16% per month. This spread return remains unchanged after controlling for the four U.S. factors (column three), the three international factors (column four), and all seven factors (column five). Thus, the result is robust.

The abnormal returns for each portfolio are quite different depending on the benchmark models for performance. For example, the alphas of the concentrated funds are -0.06% and 0.23% when adjusted by U.S. four-factor and the international three-factor models, respectively. However, the spread return is largely unaffected by selection of the risk-adjusting model. The last column is the time-series average of the portfolio's annual Sharpe ratio. The concentrated quintile exceeds the diversified quintile by 0.03.

Panel B of Table 3 reports results for portfolios sorted by industry concentration. The spread between the highest and lowest industry-concentrated quintiles is much larger than that using country concentration. For example, industry-concentrated funds outperform industry-diversified funds by 0.30% per month in net-of-expense returns, almost twice as large as the spread return derived from the country concentration index (0.16%). The return difference again remains similar after controlling for the risk factors. An interesting finding here is that, when controlling for the U.S. four factors, all funds have negative alphas, a finding consistent with studies reporting that net-of-expense U.S. mutual funds underperform various benchmarks. We also test whether the alphas of all fund portfolios are jointly zero for each risk adjustment model

using the Gibbons, Ross, and Shanken (1989, GRS) test. As shown at the bottom of Panels A and B of Table 3, the GRS test statistics reject the hypothesis that the alphas are all equal to zero at the 1% level.

In sum, in both country and industry dimensions, concentrated funds outperform diversified funds, consistent with the hypothesis that fund managers invest more in countries or industries in which they have superior information. In addition, this information advantage seems more pronounced in the industry than in the country concentration dimension. The difference in average annual Sharpe ratio between concentrated and diversified fund portfolios in the industry dimension is 0.06, twice as large as in the country dimension. Returns on fund portfolios increase monotonically from diversified to concentrated quintiles when sorted by industry concentration. This contrasts with the result in the country dimension in which the returns for quintile one (most diversified) to quintile four are similar, but quintile five (most concentrated) outperforms all other quintiles by a wide margin.

The positive relation between concentration and performance is more evident in the industry dimension than in the country dimension. This raises the question of what factors cause this difference in performance with respect to country and industry concentration. We address this issue in Section 4.

The finding that alphas vary significantly with different risk factor models echoes the view that benchmark selection is important when measuring abnormal performance of mutual funds (Comer and Rodriguez (2012) and Hunter et al. (2013)). Table 4 displays the loadings when running regressions of excess fund portfolio returns on all seven factors.¹⁷ Each fund portfolio has its highest loading on the international market factor, measured by MSCI ACWI Ex.

¹⁷ As shown in Table 3, the returns adjusted by all seven U.S. and international factors give the most conservative results. To save space, in Table 4, we report only risk-adjusted returns from the seven-factor model.

U.S. index return in excess of U.S. risk-free rate. When comparing the magnitude of the factor loadings on the return difference between the most and the least concentrated portfolios, we find that in the country dimension, this spread has the largest (negative) loading (-0.12) on the international market factor, while in the industry dimension, the same spread has the largest loading on the international size factor (0.32). The large negative exposure of performance differential on international market factor in the country dimension is intuitive because the concentrated funds, by construction, do not diversify across the international market. In the industry dimension, however, exposure to the international size factor has significant contributions to the performance differential between concentrated and diversified funds.

3.2 Fund size and performance of concentrated funds

Kacperczyk et al. (2005) find that the abnormal performance of industry-concentrated funds is mainly attributable to a group of smaller funds. If our findings that country- and industry-concentrated funds outperform diversified funds are due to an information advantage for concentrated funds, it is necessary to examine whether this advantage declines with fund size. The information advantage (disadvantage) of smaller (larger) funds is likely due to a diseconomy of scale (Berk and Green (2004)). In this section, we use a double-sort technique to sort funds into terciles by size at the end of each year, while within each size group, we further divide funds into terciles based on country or industry concentration index.¹⁸ We then measure the performance of fund portfolios with different concentration rankings.

¹⁸ We use terciles instead of quintiles in the double sort to ensure that each intersecting cell has a sufficient number of funds each year.

Table 5 displays the results of the double-sorted fund portfolios by size and by country/industry concentration. The first three columns show net returns in each size group, and the last three columns show abnormal returns derived from the seven-factor model. Panel A shows that when funds are sorted by size and then by country concentration, the return differences between the concentrated and diversified funds in all three size groups remain positive, but are no longer economically or statistically significant. For instance, in the small, medium, and large fund groups, the monthly return differences between concentrated and diversified funds are 0.09%, 0.06%, and 0.08%, respectively; however, none is statistically significant, a strong contrast with the results presented in Table 3. One reason for this finding may be that we sort funds into terciles rather than quintiles. However, it is more plausible that the performance difference between country-concentrated and diversified funds found to be significant in Table 3 may simply be an artifact of the return difference caused by other fund characteristics, such as fund size.

Panel B of Table 5 shows performance of industry-concentrated funds in various size groups. In contrast to the findings in the country dimension, industry-concentrated funds outperform diversified funds in all size groups. For instance, the average portfolio return difference between industry-concentrated and diversified funds is 0.33%, 0.17%, and 0.19% per month in the small, medium, and large fund groups, respectively. Results for risk-adjusted returns remain unchanged, along with the relation among the three: the outperformance of concentrated funds is higher among small funds than large funds, which is consistent with the literature.¹⁹

¹⁹ While untabulated, we also perform an independent sorting on fund size and country/industry concentration index. The result is similar.

In summary, the outperformance of country-concentrated funds over their diversified counterparts in all fund size groups becomes weak and shows little variation in magnitude in different fund size groups. In contrast, in the industry dimension, the return difference retains its significance in each size group. In addition, consistent with findings with respect to U.S. domestic equity funds, the outperformance of industry-concentrated funds declines with fund size, most likely due to decreasing returns to scale when managers of concentrated funds utilize their information advantage (Berk and Green (2004)). We interpret the result in Table 5 as evidence that the relationship between fund concentration and performance is much less obvious in the country dimension than in the industry dimension.

3.3 Performance of concentrated funds in subperiods

There are at least two reasons to evaluate the robustness of the results over different subsample periods. First, it is worthwhile to examine the issue of cross-border investment concentration by time period because this issue may be affected by various global macro events, such as regional economic integration, IT and financial bubble bursts, and crises. In particular, the information environment has changed dramatically over the past 20 years due to advancements in technology. Accordingly, information collection has become less costly. If the explanation for the return difference between concentrated and diversified funds is the information advantage of particular fund managers, we would expect to observe smaller risk-adjusted performance difference in more recent time periods. Second, with the opening and development of emerging markets over the past 20 years, investment opportunities for U.S. international equity funds have increased, which brings both opportunities and challenges to fund

managers. It would be interesting to examine how this change might affect the relation between fund concentration and performance. This section examines the relative performance of concentrated funds in two equal-length subperiods: 1993 to 2000 and 2001 to 2008.

Panel A of Table 6 shows abnormal returns (alphas) of the fund portfolios sorted by country concentration for the two subperiods. As expected, the alphas of the long-short portfolio (quintile 5 – quintile 1) derived from the U.S. four-factor, the international three-factor, and the seven-factor models become smaller in the second subperiod. For example, the U.S. four-factor alpha of the long-short portfolio decreases from 0.21% in the early subperiod to 0.11% in the later subperiod. Panel B of Table 6 sets forth subperiod abnormal returns for the various industry concentration groups of funds. The results are similar to those in the country concentration dimension. Particularly, the alphas of the long-short portfolio become much smaller during the second subperiod when adjusted by international risk factors. In effect, the alphas of all portfolios become negative when adjusted by international risk factors in the later subperiod, while they are positive in the preceding subperiod. For instance, when adjusted by international three-factor model, the alpha of most diversified fund (quintile 1) drops from 0.08% in the first subperiod to -0.25% in the second subperiod.

Our analysis shows that concentrated funds perform better than diversified funds in both subperiods, although the difference is smaller in the most recent period. It may be that changes in the information environment and investment opportunities cause this time-varying relative performance of the concentrated funds.²⁰ In addition, with the global market becoming more integrated, international risk factors derived from the MSCI indices explain more of the returns of U.S. international funds during the subperiod 2001 - 2008 than during the subperiod 1993 -

²⁰ In unreported tables, we exclude the period of global financial crisis, 2008 and 2009, from our sample and examine the returns of concentrated and diversified funds. The result is similar to that of the whole period.

2000. The results suggest that investors should take into considerations both the model and sample period when evaluating the performance of international equity funds.

4 Relationship between country versus industry concentration and performance

It is well-known that the stocks of some countries concentrate in specific industries. For example, firms in basic materials dominate the Australian stock market. Thus, investing heavily in Australia consequently means tilting toward basic materials stocks. As shown in Table 2, the correlation between country and industry concentration indices by fund is positive (0.33) and statistically significant. In an unreported table, we document that on average, 33% of funds in the country-diversified group (quintile 1) are also in the industry-diversified group (quintile 1), and that 43% of funds in the country-concentrated group (quintile 5) belong to the industry-concentrated group (quintile 5).²¹ Accordingly, one may ask what the real relationship is between these two seemingly interacting concentration dimensions and, more importantly, whether one of the two dimensions partially or even entirely dominates the other. We attempt to answer these questions below.

4.1 Evidence from portfolio sorting

We use a double sorting methodology to examine whether the effect of industry (country) concentration on fund performance remains after controlling for country (industry) concentration. In Panel A of Table 7, we first sort funds into terciles by country concentration, then further divide the funds of each country concentration group into terciles by industry concentration. The

²¹ The table is available upon request from the author.

first three columns display the results of the net returns, and the last three columns show abnormal returns adjusted by all seven factors. We find that industry-concentrated funds outperform industry-diversified funds in all country concentration groups. For instance, in the country-diversified group (group 1), the funds of the concentrated tercile in the industry outperform those of the diversified tercile by 0.14% per month. This outperformance is greater in the two most concentrated fund groups in the country dimension.²² Risk-adjusted returns yield nearly the same results. For example, in the country-concentrated group (group 3), the spread return between industry-concentrated and industry-diversified fund groups is 0.24% per month, similar to the unadjusted spread return (0.23%).

Panel B of Table 7 indicates the effect of country concentration on performance after controlling for industry concentration. In contrast with the results in Panel A, the return differences between country-concentrated and diversified funds disappear for each fund group sorted by industry concentration. For example, in the group of industry-concentrated funds, the country-concentrated funds outperform diversified funds by 0.04% per month; this is not statistically significant. The risk-adjusted returns remain similar in value.

To confirm the findings of this dependent two-way sorting, we perform an independent sorting test, the results of which are reported in Panel C of Table 7. For each year, we sort funds separately into terciles based on their industry and country concentration measures. We then form portfolios based on intersections of the rankings and calculate equally weighted fund portfolio returns in the following year.²³ The results are similar to those from a dependent two-way sorting. The return difference between concentrated and diversified funds remains

²² One explanation for this finding is that some fund managers have specialized knowledge regarding certain countries; thus, they concentrate their portfolios on these countries. Additionally, their private industry information allows them to deliver the highest returns by investing heavily in a few industries within these countries.

²³ The numbers of funds in each intersecting cell may not be the same under this sorting method.

unchanged in the industry dimension, but disappears in the country dimension. The highest return appears in the group of funds with the highest country and industry concentration measures.

The results set forth in Table 7 suggest that the effect of country concentration on fund returns can be subsumed by that of industry concentration, but not vice versa. Therefore, these results support the industry specialization hypothesis in the context of international markets (Albuquerque et al. (2009)), while they diminish to some extent (see footnote 5 and 22) the importance of country-specific knowledge in international asset management. This result differs from findings for financial analysts who specialize in European countries or industries (Sonney (2009)).

4.2 Evidence from regressions

The previous tests focus on the performance of fund portfolios. Regression analysis allows us to directly identify the pure relationship between fund performance and concentration, controlling other fund characteristics in a multivariate context. The dependent variable is the monthly risk-adjusted returns (alphas) estimate from the fund's actual returns and the returns of the seven factors in year $t+1$, as well as the estimated coefficients for the seven-factor model over the previous 36 months. The independent variables include the fund's country and industry concentration measures, along with other characteristic variables, such as fund size, age, expense, turnover and flows in year t . We run monthly panel regression and adjust standard errors by fund and time clustering following Petersen (2009). Table 8 reports the coefficient of the regressions.

The first two columns of Table 8, models (1) and (2), show the univariate regression results when either the country or the industry concentration measure is included. The coefficient for the country concentration measure is positive but not statistically significant, confirming that the effect of country concentration on fund performance is weak. On the other hand, the coefficient for industry concentration is positive and statistically significant, indicating that a 1% increase in the fund's industry concentration measure contributes a 0.05% risk-adjusted return per month. Models (3) and (4) show the coefficient estimates when other fund characteristics are included. The coefficients for the concentration measure are similar to those in models (1) and (2). For instance, the coefficients for country and industry concentrations are 0.005 and 0.05, with t -statistics of 0.2 and 2.68, respectively. The rightmost column shows the result for model (5), in which country and industry concentration measures are included simultaneously, together with all control variables. The pattern of this coefficient estimate is consistent across the models. The contribution of industry concentration to fund performance remains positive and significant, while the contribution of country concentration disappears altogether. These findings suggest that, for the most part, fund abnormal performance thought to be due to country concentration can be explained by industry concentration.

4.3 Industry timing ability of concentrated funds

The result that industry concentration subsumes country concentration in explaining the good performance of concentrated international equity funds is interesting. It echoes the global private information hypothesis (Albuquerque et al. (2009)) as well as the growing interest in global industry rotation in the asset management industry (Weiss (1998)). We examine industry

timing ability of concentrated funds in this section. In particular, we focus on industry-concentrated funds and their industry rotation and trade performance.

As mentioned above, our concentration measure is calculated as the sum of squared deviation of fund portfolio weights from those in the international market benchmark. Compared with the benchmark, a fund may overweight (underweight) in some industries with positive (negative) deviation. Within each fund, we sort industries every year based on the deviation, and calculate fund portfolio weight of the top (most overweighted) and bottom (most underweighted) two industries. The mean portfolio weights are displayed in the first two columns of Table 9. On average, 54% of fund capital is allocated to the top two overweighted industries for the concentrated funds, while 32% is so allocated for the diversified funds. On the other end, 13% and 15% of fund capital is allocated to the two most underweighted (i.e., unfavored by fund managers) industries for the concentrated and diversified funds, respectively.

Since the superior performance of concentrated funds comes from industry-specific information, it would be interesting to determine for how long fund managers hold their favored industries (or how frequently they rotate top-holding industries). On the one hand, industries may go up and down because of business cycles or technological innovation, as witnessed in the Internet bubble of the late 1990s and the global financial crisis of 2008. Fund managers need to rotate in and out of industry sectors quickly to ride the waves. On the other hand, learning is costly; hence, it is rational for fund managers to hold longer (and possibly trade more frequently within) the industries for which they have built an information advantage. International markets give more flexibility to fund managers to do this, so long as the same industries in different countries do not co-move perfectly. Intuitively, compared to oil and gas companies, which may be affected by the global business condition and therefore tend to commove globally, industries

such as retail and technology may be largely affected by domestic economic conditions and therefore do not co-move globally. Thus, fund managers who have private information on these industries may apply their information advantage in different countries individually. Thus, it is an empirical question as to how soon fund managers rotate between industries. Since, on average, a concentrated fund manager allocates more than half its capital to the top two overweighted industries, we calculate a rotation score for the top (bottom) two industries of each fund for each year. The score is set to 0 if the fund holds the same two most favored (unfavored) industries as in the previous year, 0.5 if the fund changes one of the two industries in the current year, and 1 if the fund changes both the two industries in the current year.²⁴ Columns three and four of Table 9 show that concentrated funds do not rotate as frequently as diversified funds. The average rotation score of concentrated funds is 0.29, compared to 0.56 for diversified funds. Roughly speaking, this score can be interpreted as a turnover measure. It takes more than three years ($1/0.29$) for a typical concentrated fund to completely change its two most overweighted (i.e., most favored by fund managers) industries, but it takes less than two years ($1/0.56$) for a diversified fund to do so. This suggests that the expanded investment opportunity set provided by international markets may allow mutual fund managers to hold their favored industries longer while still achieving good performance.

Next, we examine the industry timing ability of fund managers. We compare the performance of industries heavily purchased and sold by industry-concentrated and diversified funds. As a result of fund purchasing or selling stocks across industries, industry deviation (portfolio weight on the industry minus benchmark weight) may change from year to year. We define the industries with the largest increase (decrease) in deviation from year $t-1$ to year t as

²⁴We do not consider the order of the two most favored (unfavored) industries. We also calculate the scores for the top (bottom) one and three industries. The results remain qualitatively the same.

the heavily purchased (sold) industries by the fund in year t . The last three columns of Table 9 show the equal-weight portfolio returns of the two industries in year $t+1$ that the fund has purchased or sold most heavily in year t , and the spread return between the portfolios. The t -statistics are Newey–West adjusted. The spread return between the two industries purchased and the two industries sold for the diversified fund quintile is 0.02% per month but it increases to 0.21% per month (with 10% significance level) for the concentrated fund quintile. When we compare the returns of the industries purchased (sold) between the fund quintiles, we find that there is only a small return difference (0.79% vs. 0.74% per month) on the purchased industries between concentrated and diversified funds. However, the two industries heavily sold by concentrated funds in year t significantly underperform the two industries heavily sold by diversified funds (0.58% vs. 0.72% per month) in the following year. The outperformance of the concentrated funds seems to stem mainly from the sale of industries that perform poorly subsequently.

We generate evidence on the information advantage of industry-concentrated funds. Specifically, such funds invest in the two most favored industries with more than half of their capital, a much larger proportion than diversified funds. They hold these industries longer than do diversified funds. These findings are consistent with our conjecture that fund managers with concentrated portfolios maximize their information advantage, and that the expanded investment opportunity set in international stock markets allows them to do so. Our findings on trades by industry show that managers of concentrated funds have some industry timing ability. The industries they purchase outperform the industries they sell in the following 12 months. But there is little spread return for the diversified fund. When comparing the purchased and sold industries

between concentrated and diversified funds, we find that concentrated funds' superior ability over diversified funds arises mainly from the sell side.

5 Causes of portfolio concentration

In this section, we examine the causes of portfolio concentration using fund-level variables in the context of multivariate regression analysis. By so doing, we are able to test the private information and risk-taking hypotheses of portfolio concentration more directly.

We have shown that concentrated funds outperform their diversified counterparts. We argue that this outperformance is likely caused by the information advantage of fund managers who specialize in specific industries. Private information is costly. If the information advantage is derived only from fund managers' relentless effort to collect and process information, these information-savvy managers should be compensated with higher fund fees. Indeed, as shown in Table 2, expense ratio is positively correlated with the concentration measures. However, the positive correlation of the expense ratio is statistically significant only with the industry concentration index. In this section, we examine this relationship more closely through multivariate regression analysis focusing on the expense ratio as a proxy for information cost.

The second goal of this section is to test an alternative hypothesis for portfolio concentration—agency theory. The option-like relation between fund performance and fund flow provides incentives to fund managers to take high risks by concentrating their portfolios in a small number of holdings. Under this hypothesis, fund managers are more likely to take greater risk when there are fund outflows, and to take advantage of the observed asymmetric relation between fund performance and flow.

We examine whether expense ratio and past fund flows explain fund concentration using the following regression model:

$$CI_{i,t} = \alpha + \beta_{Exp}Exp_{it} + \beta_{Flow}Lag(Fund\ Flow)_{it} + \sum \beta_i X_{i,t} \quad (6)$$

where $CI_{i,t}$ is the industry or country concentration index of fund i at the end of year t , Exp_{it} and $Lag(Fund\ Flow)_{it}$ are expense ratio in year t and average monthly flow in the 9-month period from January to September in year t , respectively.²⁵ X represents all other fund-level variables, including fund size, fund family size, fund age, and turnover. We follow Petersen (2009) to adjust the standard errors of the coefficients for this annual panel regression on both fund and time clustering.

Table 10 reports the results. Expense ratio and past flows are the key variables to test the private information and risk-taking hypotheses, respectively. The information hypothesis predicts a positive relationship between expense ratio and concentration. In columns one and four, we examine this relationship for country and industry concentrations separately. We find a positive and statistically significant relationship (at the 5% level) between expense ratio and industry concentration. This result, combined with previous findings that industry-concentrated funds outperform their diversified counterparts, consistently supports our conjecture that some fund managers make greater effort (thus charge higher fees) to build their information advantage, and they realize this advantage by focusing on particular industries. The effort by industry-information-savvy managers is reflected in higher realized net-of-expense returns to investors. On the other hand, we find no relation between expense ratio and country concentration, which is not surprising as we show that the outperformance of country-concentrated funds is weaker and can be explained by industry concentration.

²⁵ We also look at alternative definitions of lag flows, which is the flow from July of year $t-1$ to June of year t , and add the fund's past-year concentration index, $CI_{i,t-1}$, in the regressions. The results are qualitatively the same.

In columns two and five, the univariate regressions of the concentration index on lagged fund flows show no significant negative relationship. The coefficient estimate is statistically significant, but the sign is positive and is opposite to the prediction of the risk-taking hypothesis, according to which negative past fund flows represent the incentive of fund managers to take high risk.

In columns three and six, we add to the regressions all fund characteristic variables, including expense ratio and lagged fund flows. In column three, we find evidence to support neither the information nor the risk-taking hypotheses for country concentration. Column six shows the result of the multivariate regression for the industry concentration index. The coefficient of past fund flows becomes statistically insignificant, with a t -value equal to -0.15. The coefficient of the expense ratio, 0.345, has a t -value of 1.67 (significant at the 10% level). Overall, the evidence supports the view that concentration is related to information, especially in the industry dimension, and that the risk-taking incentive has no explanatory power with regard to fund concentration.²⁶

6 Conclusion

We study the relationship between portfolio concentration and performance at country and industry levels using a sample of actively managed U.S. international equity mutual funds. To our knowledge, this is the first paper to examine this relation for both country and industry dimensions using asset holdings data. We find that both country- and industry-concentrated

²⁶ We recognize that even though there is a positive relation between previous fund flow and fund concentration, we cannot exclude the risk-taking explanation completely. To be precise, our results can reveal, at a particular level of confidence, whether fund managers who fail to attract flows in the past take high risks by concentrating on a small number of stocks.

funds perform better than their diversified counterparts when sorted individually by the corresponding concentration index, although it is more economically and statistically significant in industry dimension. The outperformance is robust to different risk-adjustment methods, including the standard U.S. domestic and international factor models. Moreover, the outperformance of industry-concentrated funds over diversified funds is economically more significant among small funds. However, this is not the case for country-concentrated funds.

Analyzing the roles of country and industry concentration on portfolio performance, we find that industry concentration dominates country concentration. Specifically, conditional on industry concentration, country-concentrated funds do not outperform their diversified counterparts. However, industry-concentrated funds outperform industry-diversified funds, conditional on country concentration. Both the double-sort portfolio and regression analysis confirm this result. This finding supports the notion that the global industry private information, rather than country-specific knowledge, helps international mutual fund managers deliver higher returns.

We then look in detail at how fund managers utilize their information advantage in industry. We find that industry-concentrated funds on average put 54% of their capital in the top two (overweighted) holding industries. These fund managers do not turn over their top-holding industries as frequently as do managers of diversified funds. In other words, managers of concentrated funds tend to hold top-holding industries over a longer time horizon. When comparing returns of industries purchased and sold by funds, we find that for the concentrated funds, the industries they purchase outperform the industries they sell, while there is little return difference between the industries purchased and sold by diversified funds. We further compare industries heavily purchased (sold) by concentrated and diversified funds, but find that there is

little difference in returns with regard to the industries these two groups purchase. However, industries sold by concentrated funds underperform industries sold by diversified funds significantly, indicating that the better industry timing ability of concentrated funds compared to diversified funds, if any, is mainly on the sell side.

Finally, we test the information hypothesis against the risk-taking hypothesis using two fund-level variables: expense ratio and lag flows. The logic is that (1) if some fund managers exert more effort to collect information to concentrate their portfolios, they should be compensated by higher fund expense; (2) the fund outflows can incentivize fund managers to take high risks by betting on a small number of stocks or industries. Using the regression analysis, we reject the risk-taking or agency hypothesis that fund managers intentionally concentrate their portfolios because of the option-like relationship between fund performance and flows, but support the information advantage hypothesis.

Our findings have important implications for practitioners in the asset management industry. We find little support for the idea that fund managers perform better than others by specializing in country knowledge only. However, international equity fund managers who specialize in particular industries outperform other fund managers, suggesting that private information in industries is similarly as important in the global market as in domestic market, and can help fund managers improve their performance. The widely-held notion of outperformance by country-concentrated funds seems to be an artifact of industry concentration.

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Table 1. Country and industry weights as of year 2008

This table reports the country and industry weights of the international market portfolio consisting of the 50 national markets excluding the U.S. market as of the end of 2008. The 50 markets include all MSCI developed and emerging markets, and major frontier markets. We calculate these market weights from 1993 to 2008 and use them as the benchmark for international diversification. At the end of each year, we collect market capitalization (in U.S. dollars) of all common stocks for the 50 markets. In Panel A, we calculate total weight for each country, and in Panel B, we classify stocks into the Industry Classification Benchmark (ICB) ten industries and calculate weight as the industry diversification benchmark. The figures are percentages.

Panel A: Country weight (%)									
Country	Weight	Country	Weight	Country	Weight	Country	Weight	Country	Weight
Japan	16.02	Italy	2.69	Sweden	1.17	Indonesia	0.42	Morocco	0.22
UK	10.59	India	2.63	Finland	0.79	Greece	0.41	Philippines	0.20
France	8.35	Taiwan	2.47	Norway	0.74	Colombia	0.40	Argentina	0.19
China	7.34	Netherlands	2.42	Malaysia	0.67	Poland	0.39	Czech Republic	0.17
Germany	5.95	Brazil	2.33	Thailand	0.62	Austria	0.38	Peru	0.16
Switzerland	5.01	Russia	2.28	Denmark	0.61	UAE	0.35	Croatia	0.09
Hong Kong	4.37	South Korea	2.22	Chile	0.59	Portugal	0.35	New Zealand	0.08
Spain	3.40	South Africa	1.37	Israel	0.58	Egypt	0.27	Pakistan	0.08
Canada	3.20	Singapore	1.29	Belgium	0.57	Ireland	0.26	Bangladesh	0.04
Australia	3.17	Mexico	1.28	Turkey	0.55	Hungary	0.25	Romania	0.03

Panel B: Industry weight (%)	
Industry	Weight
Financials	19.83
Oil & gas	11.75
Industrials	11.63
Consumer goods	11.63
Consumer services	8.41
Health care	8.16
Basic materials	7.98
Telecommunications	7.66
Utilities	6.54
Technology	6.40

Table 2. Summary statistics

This table reports summary statistics of international mutual funds. Fund characteristics data are from CRSP. Fund holdings are from Morningstar. We merge these two data sets and require at least 50 funds each year. Our sample period for asset holdings is 1993 to 2008 and fund returns data are from 1994 to 2009. We require minimum total net assets to be US\$1 million and the minimum number of stock holdings to be 10. Panel A displays summary statistics of fund variables and Panel B shows the variable correlations. ** and * represent 1% and 5% significance levels, respectively.

		Panel A: Fund characteristics							
		Mean	Median	Min	Max				
Total number of funds		389							
Number of stocks held by funds		143.44	95	17	1193				
Number of countries held by funds		21.38	21	5	45				
Number of industries held by funds		9.72	10	5	10				
Country concentration index (% ²)		2.57	1.87	0.20	25.44				
Industry concentration index (% ²)		2.61	1.70	0.09	19.90				
Total net asset (millions)		779.53	203.40	1.00	29,613.80				
Fund family total net asset (millions)		45,646.20	10,713.50	1.60	1,085,997.30				
Expense ratio (%)		1.43	1.40	0	3.92				
Fund age (years)		8.15	7.25	0	47.00				
Turnover ratio (%)		78.54	62.00	1.00	655.00				
Total load (%)		2.89	3.53	0	7.58				
Monthly flows (%)		1.72	0.54	-8.94	45.42				
Monthly returns (%)		0.58	1.21	-30.61	36.96				
		Panel B: Variable correlations							
	Country CI	Industry CI	Total net asset	Fund age	Family total net asset	Expense ratio	Turnover ratio	Total load	Monthly flows
Country CI	1.00								
Industry CI	0.33**	1.00							
Total net asset	-0.02	-0.06**	1.00						
Fund age	-0.10**	-0.18**	0.37**	1.00					
Fund family total net asset	-0.05*	-0.03	0.42**	0.19**	1.00				
Expense ratio	0.01	0.08**	-0.29**	-0.24**	-0.16**	1.00			
Turnover ratio	-0.05**	-0.06**	-0.14**	-0.08**	0.00	0.24**	1.00		
Total load	-0.21**	-0.28**	-0.12**	0.08**	-0.09**	0.32**	0.15**	1.00	
Monthly flows	0.12**	0.09**	-0.06**	-0.36**	0.01	0.09**	-0.01	-0.14**	1.00

Table 3. Performance of fund portfolios sorted by concentration index

This table displays raw and risk-adjusted returns as well as the Sharpe ratios of fund portfolios sorted by country and industry concentration indices. At the end of each year, we sort international equity funds into quintiles based on country or industry concentration measures. Then, we calculate equal-weighted portfolio returns for each quintile in the following year. The sample period for the asset holdings is 1993 to 2008 and for fund returns is 1994 to 2009. Fund net returns are average monthly returns net of expenses directly retrieved from the CRSP Mutual Fund Database. Gross returns are average monthly gross returns recovered from net returns and the fund's expense ratio. We show fund portfolio alphas adjusted by U.S. four factors, international three factors developed from MSCI indices, and all seven factors. The last column shows average annual Sharpe ratio for the portfolios. Raw and risk-adjusted returns are in percentage. GRS is the test statistics of the Gibbons, Ross and Shanken (1989) joint test that all alphas of the five portfolios are zero. The *t*-statistics are in parentheses and the ones for raw returns are Newey-West adjusted. ** and * represent 1% and 5% significance levels, respectively.

Concentration index	Panel A: Performance of fund portfolio sorted by country concentration						
	Gross return (%)	Net return (%)	U.S. 4-factor	Intl. 3-factor	All 7-factor	Sharpe ratio	Alphas of excess net returns (%)
1 - diversified	0.69 (1.53)	0.57 (1.25)	-0.25 (-1.35)	0.01 (0.24)	-0.04 (-0.87)	0.12 (1.46)	
2	0.68 (1.46)	0.55 (1.20)	-0.27 (-1.41)	0.04 (0.62)	-0.05 (-0.86)	0.13 (1.47)	
3	0.66 (1.46)	0.54 (1.19)	-0.27 (-1.47)	0.02 (0.24)	-0.06 (-0.91)	0.12 (1.51)	
4	0.66 (1.43)	0.53 (1.15)	-0.29 (-1.64)	0.04 (0.48)	-0.09 (-1.15)	0.13 (1.58)	
5 - concentrated	0.85 (1.93)	0.73 (1.64)	-0.06 (-0.33)	0.23* (2.48)	0.14 (1.54)	0.16 (1.89)	
Quintile 5 - Quintile 1	0.16* (2.00)	0.16* (2.00)	0.19** (2.71)	0.22** (3.19)	0.18** (2.70)	0.03 (1.76)	
GRS			3.49**	4.22**	3.78**		

Panel B: Performance of fund portfolio sorted by industry concentration

Concentration index	Gross return (%)	Net return (%)	Alphas of excess net returns (%)				Sharpe ratio
			U.S. 4-factor	Intl. 3-factor	All 7-factor		
1 - diversified	0.59 (1.31)	0.47 (1.05)	-0.34 (-1.87)	-0.06 (-1.03)	-0.13** (-2.12)	0.11 (1.23)	
2	0.64 (1.44)	0.51 (1.15)	-0.29 (-1.62)	-0.01 (-0.14)	-0.08 (-1.39)	0.12 (1.35)	
3	0.69 (1.51)	0.57 (1.25)	-0.26 (-1.40)	0.05 (0.73)	-0.04 (-0.62)	0.13 (1.53)	
4	0.74 (1.66)	0.60 (1.34)	-0.20 (-1.07)	0.10 (1.42)	0.00 (0.04)	0.13 (1.65)	
5 - concentrated	0.90 (1.88)	0.77 (1.62)	-0.06 (-0.30)	0.27** (3.10)	0.15 (1.92)	0.17* (2.14)	
Quintile 5 - Quintile 1	0.31** (3.12)	0.30** (3.13)	0.28** (3.82)	0.33** (5.52)	0.28** (4.80)	0.06* (2.31)	
GRS			3.35**	7.55**	6.39**		

Table 4. Factor loadings of fund portfolio excess net returns

This table displays the factor loadings of the excess net returns of the fund portfolios on all seven factors: U.S. market, size, book-to-market (B/M), momentum and international market, size and B/M. The last column reports the adjusted *R-square*. The *t*-statistics are in parentheses. ** and * denote 1% and 5% significance levels, respectively.

		Panel A: Country concentration index							
	U.S. market	U.S. size	U.S. value	U.S. momentum	Intl. market	Intl. size	Intl. value	Adj. <i>R</i> ²	
1 - diversified	0.07** (3.21)	0.02 (1.41)	0.07** (3.44)	0.03** (3.11)	0.93** (46.54)	-0.12** (-4.16)	-0.03 (-0.87)	98%	
2	0.09** (3.43)	0.06** (3.53)	0.08** (3.49)	0.05** (4.20)	0.92** (41.34)	-0.09** (-2.88)	-0.10* (-2.55)	98%	
3	0.10** (3.67)	0.07** (3.25)	0.09** (3.39)	0.02 (1.96)	0.89** (35.40)	-0.13** (-3.62)	-0.11* (-2.42)	97%	
4	0.18** (5.68)	0.10** (4.12)	0.11** (3.63)	0.04** (3.12)	0.81** (28.19)	-0.03 (-0.74)	-0.18** (-3.42)	96%	
5 - concentrated	0.16** (4.07)	0.09** (3.23)	0.13** (3.48)	0.02 (1.01)	0.80** (22.84)	-0.05 (-1.01)	-0.14* (-2.15)	94%	
Quintile 5 - Quintile 1	0.09** (2.99)	0.07** (3.24)	0.06* (2.04)	-0.01 (-1.00)	-0.12** (-4.73)	0.07 (1.80)	-0.11* (-2.21)	15%	
		Panel B: Industry concentration index							
	U.S. market	U.S. size	U.S. value	U.S. momentum	Intl. market	Intl. size	Intl. value	Adj. <i>R</i> ²	
1 - diversified	0.12** (4.48)	0.03 (1.34)	0.10** (4.04)	0.02 (1.68)	0.87** (37.27)	-0.16** (-4.84)	-0.10* (-2.43)	97%	
2	0.10** (3.93)	0.05** (2.75)	0.10** (4.07)	0.03* (2.41)	0.87** (37.70)	-0.16** (-4.97)	-0.10* (-2.42)	97%	
3	0.11** (4.04)	0.08** (3.79)	0.10** (3.88)	0.03** (2.77)	0.88** (34.82)	-0.17** (-4.81)	-0.14** (-3.04)	97%	
4	0.12** (4.19)	0.08** (3.99)	0.07** (2.77)	0.04** (3.24)	0.88** (34.35)	-0.08* (-2.33)	-0.04 (-0.93)	97%	
5 - concentrated	0.15** (4.33)	0.10** (4.06)	0.10** (3.18)	0.04* (2.57)	0.85** (27.13)	0.16** (3.72)	-0.17** (-3.07)	95%	
Quintile 5 - Quintile 1	0.03 (1.34)	0.08** (4.20)	0.01 (0.22)	0.02 (1.81)	-0.02 (-0.98)	0.32** (10.06)	-0.07 (-1.72)	51%	

Table 5. Performance of fund portfolios in different size groups

This table shows fund performance when funds are double sorted for 9 (3x3) fund portfolios. In Panel A, we first sort funds into terciles by size, then subdivide funds into terciles by country concentration index within each size tercile. In Panel B, we sort funds by size then by industry concentration. We measure fund portfolio returns sorted by industry or country concentration measures within each size group. The first three columns display the portfolio net returns. The last three columns show fund portfolios returns adjusted by all seven factors: U.S. market, size, B/M, momentum, international market, size, and B/M. All numbers are in percentage. The *t*-statistics are in parentheses and the ones for raw returns are Newey-West adjusted. ** and * denote 1% and 5% significance levels, respectively.

Panel A: Funds sorted by size then country concentration						
Country concentration	Net returns			Alphas of excess net returns adjusted by 7 factors		
	1 - small	2	3 - large	1 - small	2	3 - large
1 - diversified	0.56 (1.22)	0.55 (1.21)	0.58 (1.29)	-0.04 (-0.63)	-0.05 (-0.86)	-0.04 (-0.63)
2	0.55 (1.17)	0.51 (1.10)	0.57 (1.28)	-0.02 (-0.25)	-0.11 (-1.82)	-0.04 (-0.63)
3 - concentrated	0.65 (1.41)	0.61 (1.34)	0.66 (1.53)	0.08 (0.91)	0.00 (0.04)	0.03 (0.40)
Tercile 3 - Tercile 1	0.09 (1.40)	0.06 (0.80)	0.08 (1.19)	0.11 (1.76)	0.05 (0.83)	0.07 (1.20)

Panel B: Funds sorted by size then industry concentration						
Industry concentration	Net returns			Alphas of excess net returns adjusted by 7 factors		
	1 - small	2	3 - large	1 - small	2	3 - large
1 - diversified	0.44 (0.98)	0.47 (1.05)	0.51 (1.15)	-0.15* (-2.37)	-0.14* (-2.33)	-0.09 (-1.29)
2	0.55 (1.19)	0.54 (1.19)	0.61 (1.39)	-0.01 (-0.21)	-0.06 (-0.96)	0.01 (0.11)
3 - concentrated	0.76 (1.61)	0.65 (1.38)	0.70 (1.56)	0.18* (2.00)	0.03 (0.44)	0.04 (0.50)
Tercile 3 - Tercile 1	0.33** (3.88)	0.17 (1.93)	0.19* (2.27)	0.33** (4.73)	0.17** (2.92)	0.12* (2.37)

Table 6. Fund portfolio performance in subperiods

This table displays risk-adjusted returns of fund portfolios sorted by country and industry concentration indices in two subsample periods: 1993 to 2000 and 2001 to 2008. At the end of each year, we sort international equity funds into quintiles based on their country or industry concentration indices. We calculate equally weighted portfolio returns for each quintile. The portfolio returns are then adjusted by U.S. four factors, international three factors developed from MSCI indices, and all seven factors. All numbers are in percentage. The *t*-statistics are in parentheses. ** and * denote 1% and 5% significance levels, respectively.

Concentration index		Panel A: Performance of fund portfolio sorted by country concentration						
		1993 - 2000			2001-2008			
		U.S. 4-factor	Intl. 3-factor	All 7-factor	U.S. 4-factor	Intl. 3-factor	All 7-factor	
1 - diversified		-0.56*	0.13	0.01	0.26	-0.17**	-0.17**	
		(-2.04)	(1.52)	(0.11)	(1.14)	(-3.07)	(-2.96)	
2		-0.58*	0.22*	0.02	0.25	-0.17**	-0.17**	
		(-2.08)	(2.01)	(0.24)	(1.10)	(-2.89)	(-2.85)	
3		-0.55	0.20	0.03	0.21	-0.21**	-0.20**	
		(-1.92)	(1.67)	(0.26)	(0.94)	(-3.29)	(-3.22)	
4		-0.55*	0.33*	0.02	0.15	-0.27**	-0.26**	
		(-2.05)	(2.22)	(0.12)	(0.69)	(-3.78)	(-3.76)	
5 - concentrated		-0.35	0.45*	0.20	0.37	-0.05	-0.05	
		(-1.19)	(2.54)	(1.12)	(1.71)	(-0.58)	(-0.59)	
Quintile 5 - Quintile 1		0.21	0.32*	0.19	0.11	0.13*	0.12*	
		(1.63)	(2.45)	(1.45)	(1.97)	(2.24)	(2.19)	

Panel B: Performance of fund portfolio sorted by industry concentration

Concentration index	1993 - 2000			2001-2008		
	U.S. 4-factor	Intl. 3-factor	All 7-factor	U.S. 4-factor	Intl. 3-factor	All 7-factor
1 - diversified	-0.61* (-2.27)	0.08 (0.78)	-0.06 (-0.56)	0.14 (0.66)	-0.25** (-3.62)	-0.23** (-3.45)
2	-0.58* (-2.15)	0.14 (1.35)	-0.03 (-0.28)	0.19 (0.89)	-0.20** (-3.04)	-0.19** (-2.93)
3	-0.56 (-1.94)	0.24 (1.89)	0.01 (0.11)	0.21 (0.98)	-0.19** (-3.11)	-0.18** (-3.01)
4	-0.48 (-1.74)	0.31* (2.42)	0.09 (0.68)	0.28 (1.26)	-0.14* (-2.07)	-0.14* (-2.22)
5 - concentrated	-0.35 (-1.23)	0.55** (3.48)	0.28 (1.80)	0.42 (1.71)	-0.10 (-1.46)	-0.10 (-1.51)
Quintile 5 - Quintile 1	0.26* (2.19)	0.47** (4.22)	0.34** (3.04)	0.28** (3.10)	0.15** (3.14)	0.13** (2.97)

Table 7. Relations between country vs. industry concentration and performance—double-sorted portfolios

This table shows fund performance when funds are double sorted by country and industry concentration measures. Panels A and B display the results of dependent sorting. Panel C displays the results of independent sorting. In Panel A, we first sort funds into terciles by country concentration index and then subdivide funds into terciles by industry concentration index. Within each country concentration group, we measure the returns of fund portfolios formed by industry concentration index and compare the performance between the concentrated (Tercile 3) and diversified funds (Tercile 1). In Panel B, we first sort funds by industry concentration then by country concentration index. We measure fund portfolio returns grouped by country concentration measure within each industry concentration level. In Panel C, we sort funds by country and industry concentration measures independently, then measure the returns of the intersect portfolios. Different from Panels A and B, the numbers of funds in each intersection of cells may not be equal. The first three columns display portfolio net returns. The last three columns show returns of the fund portfolios adjusted by all seven factors: U.S. market, size, B/M, momentum, international market, size, and B/M. All numbers are in percentage. The *t*-statistics are in parentheses and the ones for raw returns are Newey-West adjusted. ** and * denote 1% and 5% significance levels, respectively.

		Panel A: Funds sorted by country then by industry concentration					
		Net returns			Country concentration		
Industry concentration		1 - diversified	2	3 - concentrated	1 - diversified	2	3 - concentrated
1 - diversified		0.50 (1.12)	0.40 (0.90)	0.56 (1.28)	-0.09 (-1.83)	-0.19** (-2.98)	-0.03 (-0.39)
2		0.54 (1.20)	0.55 (1.23)	0.60 (1.33)	-0.06 (-1.05)	-0.04 (-0.69)	-0.02 (-0.29)
3 - concentrated		0.64 (1.37)	0.65 (1.37)	0.79 (1.71)	0.02 (0.35)	0.03 (0.44)	0.20* (2.06)
Tercile 3 - Tercile 1		0.14* (2.08)	0.25** (3.31)	0.23* (2.04)	0.12* (2.38)	0.22** (3.71)	0.24** (2.92)

Panel B: Funds sorted by industry then by country concentration

Country concentration	Industry concentration					
	Net returns			Alphas of excess net returns adjusted by 7 factors		
	1 - diversified	2	3 - concentrated	1 - diversified	2	3 - concentrated
1 - diversified	0.54 (1.22)	0.59 (1.31)	0.71 (1.47)	-0.06 (-1.11)	-0.01 (-0.24)	0.08 (1.16)
2	0.42 (0.93)	0.55 (1.25)	0.66 (1.41)	-0.17** (-3.00)	-0.05 (-0.71)	0.04 (0.49)
3 - concentrated	0.47 (1.06)	0.54 (1.20)	0.75 (1.66)	-0.13 (-1.59)	-0.05 (-0.65)	0.17 (1.71)
Tercile 3 - Tercile 1	-0.07 (-1.20)	-0.05 (-0.82)	0.04 (0.49)	-0.07 (-1.28)	-0.04 (-0.69)	0.08 (1.05)

Panel C: Independent sorting

Industry concentration	Country concentration					
	Net returns			Alphas of excess net returns adjusted by 7 factors		
	1 - diversified	2	3 - concentrated	1 - diversified	2	3 - concentrated
1 - diversified	0.52 (1.15)	0.40 (0.89)	0.49 (1.12)	-0.08 (-1.52)	-0.19** (-2.93)	-0.11 (-1.23)
2	0.58 (1.29)	0.56 (1.25)	0.53 (1.18)	-0.02 (-0.36)	-0.03 (-0.54)	-0.04 (-0.60)
3 - concentrated	0.68 (1.44)	0.64 (1.34)	0.73 (1.61)	0.05 (0.64)	0.04 (0.57)	0.13 (1.46)
Tercile 3 - Tercile 1	0.16* (2.18)	0.24** (3.02)	0.24* (2.15)	0.12* (2.39)	0.23** (3.58)	0.24** (3.16)

Table 8. Relations between country vs. industry concentration and performance—regression analysis

This table reports the coefficients of the monthly panel regressions of fund abnormal returns (alphas) on fund variables from previous year, including concentration index, fund size, age, expense ratio, turnover and average monthly flow. Fund alphas are calculated from fund actual returns, returns from the seven factors, and the coefficient estimates of the seven factors. The seven factors include U.S. market, size, B/M and momentum, and international market, size, and B/M factors. The factor coefficients are estimated using previous 36-month returns. Standard errors are adjusted by both fund and time clustering using the method from Petersen (2009). The *t*-statistics are in parenthesis. ** and * denote 1% and 5% significance levels, respectively.

	Dependent variable: Alphas from the seven-factor model				
	(1)	(2)	(3)	(4)	(5)
Intercept	-0.163*	-0.270**	-0.224	-0.368*	-0.337*
	(-2.32)	(-3.67)	(-1.43)	(-2.52)	(-2.29)
Country concentration	0.003		0.005		-0.019
	(0.13)		(0.20)		(-0.62)
Industry concentration		0.048*		0.050**	0.055**
		(2.59)		(2.68)	(2.60)
Log TNA			0.021	0.02	0.021
			(1.33)	(1.29)	(1.33)
Log Age			-0.048	-0.024	-0.025
			(-0.90)	(-0.50)	(-0.52)
Expense ratio			0.004	-0.009	-0.010
			(0.08)	(-0.18)	(-0.19)
Turnover			0.000	0.000	0.000
			(0.50)	(0.81)	(0.81)
Fund flows			0.015	0.015	0.015
			(1.62)	(1.63)	(1.63)
<i>Number of Obs.</i>	26,294	26,294	25,875	25,875	25,875

Table 9. Industry rotation and trade performance

This table shows statistics on funds' industry rotation and trade performance. We calculate the deviation of a fund's industry weight from the benchmark each year from 1993 to 2008 and focus on the top (most overweighted) two and bottom (most underweighted) two industries. The first two columns display average portfolio weight (in percentage) of the top/bottom two industries for each fund quintile grouped by industry concentration index. Columns three and four show the rotation score, which is set as 0 if neither of the top (bottom) two industries change from the preceding year, 0.5 if only one of the two industries changes, and 1 if both industries change in the current year. The last three columns show average monthly returns (in percentage) for the top two industries that the funds buy and sell in the preceding year and the spread return. Newey-West adjusted *t*-statistics for the industry returns are in parentheses. ** and * denote 1% and 5% significance level, respectively.

Industry CI	Average portfolio weight for top/bottom two industries (%)		Rotation scores of top/bottom two industries		Average monthly returns for top two purchased/sold industries (%)		
	Most overweighted	Most underweighted	Most overweighted	Most underweighted	Buy	Sell	Buy - Sell
1 - diversified	32	15	0.56	0.45	0.74* (2.05)	0.72 (1.72)	0.02 (0.15)
2	36	14	0.50	0.44	0.66 (1.85)	0.72 (1.73)	-0.06 (-0.55)
3	38	14	0.41	0.44	0.73* (1.99)	0.70 (1.73)	0.04 (0.44)
4	42	14	0.40	0.42	0.75* (2.11)	0.67 (1.57)	0.08 (0.52)
5 - concentrated	54	13	0.29	0.32	0.79* (2.09)	0.58 (1.39)	0.21 (1.68)
Quintile 5 - Quintile 1	22**	-3**	-0.26**	-0.13**	0.05 (0.75)	-0.14* (-2.01)	0.19 (1.75)

Table 10. Determinants of fund concentration

This table displays the estimates of the annual panel regression of portfolio concentration indices on fund variables. The fund characteristic variables include expense ratio, lagged average monthly flows, natural log of fund TNA, fund family TNA, fund age, and turnover. Lagged average monthly flows are calculated based on the flows from January to September of each year. All fund variables are from the same year as the concentration indices. Standard errors are adjusted on both fund and time-level clustering following Petersen (2009). The *t*-statistics are in parentheses. ** and * denote 1% and 5% significance level, respectively.

	Dependent variable: Concentration Index		
	Country CI	Industry CI	Industry CI
Intercept	0.024** (6.48)	0.034** (5.65)	0.020** (7.28)
Expense Ratio	0.023 (0.14)	0.071 (0.39)	0.353* (2.15)
Lag Flows	0.047* (2.17)	0.006 (0.30)	0.052** (2.63)
Log TNA		0.001 (0.92)	0.000 (0.51)
Log Family TNA		-0.001 (-1.03)	0.000 (0.03)
Log Age		-0.004** (-2.26)	-0.006** (-4.01)
Turnover		-0.002 (-1.28)	-0.004** (-2.90)
<i>Number of Obs.</i>	2,522	2,607	2,522
			2,607
			2,350
			2,350