International Diversification through iShares and Their Rivals*

Jie Cao, Rao Fu, and Yong Jin

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JEL Classification: G11; G15

Keywords: International diversification; Mean variance spanning tests; Exchange traded funds; Closed-end country funds; ADRs

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1. Introduction

Numerous studies on international diversification, such as Levy and Sarant (1970) and Solnik (1974), reveal that U.S. investors can benefit from investing directly in foreign stock markets. Chang, Eun, and Kolodny (1995) argue that in reality U.S. investors may find it difficult to invest directly in certain foreign markets due to various barriers to international capital flows such as capital market and exchange regulations and excessive transaction and information costs. These barriers have encouraged the innovation of many financial products to facilitate international investment. These products include international mutual funds, closed-end country funds (CECFs), American Depository Receipts (ADRs), and newly developed iShares (formerly known as WEBS), which were introduced in April 1996 and have experienced the most rapid growth since then.

iShares have recently emerged as a popular alternative to their rivals: closed-end country funds and ADRs for international diversification. Unlike international mutual funds, which typically provide exposure to a basket of countries, iShares, CECFs and ADRs can be country-specific securities. In addition, all of them can be traded and sold short like common U.S. stocks.

As unit investment trusts, iShares are listed on the American Stock Exchange (AMEX) as traded securities. iShares track specific Morgan Stanley Capital International (MSCI) country indices and are expected to provide superior diversification benefits than close-end country funds and ADRs. In this paper, we investigate the diversification benefits of country-specific securities: iShares, CECFs and value-weighted ADR portfolios. iShares' great potential in international diversification lead to two interesting issues. First, iShares may become dominant in the investment opportunity set and completely replace the role of other financial instruments for international diversification. The result can help forecast the development and coexistence of iShares and their rivals. Second, iShares could make it more feasible to form optimal home-made portfolios that can exhaust the diversification gains from unattainable direct foreign investment.

Specifically, we address three questions. First, how effective are iShares and their rivals in providing international diversification benefits? To answer this question, we examine 1) the correlations and risk exposures of iShares and their net asset values, CECFs and ADR portfolios, and 2) the diversification gains under portfolio optimization. Though iShares track MSCI country indices and have a great potential in diversification gains, the tracking errors, transaction costs, various expense fees and the limits of international arbitrage make the returns on iShares deviate from the underlying indices. For example, Zhong and Yang (2005) argue that the international diversification benefits of iShares are questionable because iShare returns are significantly influenced by and sensitive to the U.S. market risk. The empirical results on other financial instruments are also mixed. For example, Bailey and Lim (1992) find that closed-end country funds have no diversification gains but Chang, Eun, and Kolodny (1995) provide the opposite evidence. Therefore, one contribution of this paper is to revisit the international diversification benefits of all these financial instruments within the same sample period.

Second, have iShares made CECFs and ADRs become redundant for international diversification? The rapid growth of iShares has generated competition to other financial instruments, which may become less attractive to U.S. investors. In reality, U.S. investors face the opportunity set including both iShares and their rivals: CECFs and ADRs. Even if iShares could offer the largest diversification benefits as a single investment method, other financial instruments can still play a role if they can provide supplemental diversification benefits over iShares. On one hand, iShares track the foreign country indices, so iShares may already cover all the diversification benefits generated by their rivals. On the other hand, ADR portfolios and

CECFs generally hold different underlying assets from iShares, hence combining iShares and their rivals may generate higher diversification gains than using iShares alone. We study this issue within the mean-variance spanning framework of Huberman and Kandel (1987), Ferson, Foerster and Keim (1993) and Bekaert and Urias (1996).

Finally, can iShares alone or combing them with their rivals achieve the same diversification gains from unattainable foreign direct investment? Errunza, Hogan, and Hung (1999) find that domestically traded securities can mimic foreign market indices by including closed-end country funds and ADRs into the home-made diversification portfolio. Assuming that iShares are highly correlated with foreign market indices, it will be more feasible to reach that goal by including iShares into the diversification portfolio. If that is the case, then investing in assets that trade only abroad would not be necessary to obtain the benefits from international diversification.

The main empirical results of the paper can be summarized as follows. First, iShares, CECFs and ADR portfolios all maintain statistically significant exposure to the U.S. market factor. CECFs and ADR portfolios have higher U.S. betas than their corresponding home market betas and thus behave more like common U.S. stocks than iShares. However, iShares tend to have substantially higher U.S. market betas and lower home market beta than their underlying assets. This could decrease the power of iShares in providing diversification benefits.

Second, despite their exposure to U.S. market factor, iShares, CECFs and ADR portfolios still retain significantly exposure to their home market factors and provide U.S. investors with important diversification gains by forming optimal international portfolios. However, the results of change in Sharpe ratios do not support the hypothesis that iShares can afford higher diversification gains than CECFs and ADR portfolios.

Third, the results of three mean-variance spanning tests provide strong evidence that iShares cannot completely replace CECFs or ADR portfolios. This result shows that CECFs and ADRs do not become redundant as international diversification tools after the emergence of iShares. It also tends to validate the coexistence of iShares, CECFs, and ADRs in the future.

Fourth, a combination of iShares, CECFs, and ADR portfolios could exhaust the gains from direct foreign investment. Although iShares fail to span the foreign market indices in the mean-variance spanning framework, adding CECFs and ADR portfolios into the benchmark set increases the likelihood that foreign market index returns are spanned. The extra gains offered by direct foreign investment diminish as the benchmark set gets augmented. This result suggests that U.S. investors no longer need to trade abroad to achieve an internationally mean-variance efficient portfolio.

The rest of the paper is organized as follows. Section 2 provides a brief overview of iShares, CECFs, and ADRs and reviews related literatures. Section 3 describes data and methodology. Section 4 reports and discusses the empirical results. Conclusions are presented in Section 5.

2. Background and Literature Review

2.1. iShares

iShares (formerly known as World Equity Benchmark Shares) were introduced in 1996 and renamed as iShares MSCI Index Fund by Barclays Global Investors in May 2000. iShares are listed on the American Stock Exchange (AMEX) as traded securities. Each iShare is constructed as an optimized portfolio that tracks the underlying Morgan Stanley Capital International (MSCI) index in a foreign country. They are denominated in U.S. Dollars, traded close to Net Asset Values (NAVs), can be bought, sold short, and yield passive returns based on the index. Like open-end funds, iShares can be created or redeemed at will and thus experience much less premium and discount fluctuation than close-end country funds.

Khorana, Nelling, and Trester (1998) study the performance and tracking ability of WEBS for the first six month after issuance. Using a single index-model, they document the indexing efficiency of WEBS. Pennathur, Delcoure, and Anderson (2002) study the performance and diversification gains of iShares and CECFs from 1996 to 1999. They find that iShares outperform CECFs in weekly returns. The two factor model shows that though iShares have some diversification benefits, they still maintain substantial exposure to U.S. market. Zhong and Yang (2005) find that iShare returns are significantly influenced by and sensitive to the U.S. market risk and that the U.S. market appears to be the key permanent driving factor. Thus the international diversification benefits of iShares are questionable. On the other hand, Miffre (2007) shows that iShares enhance global asset allocation strategies. Investing in iShare generates efficient gains that cannot be achieved by country-specific open and closed-end funds.

2.2. Closed-end country funds

A closed-end country fund is an investment company listed on a U.S. exchange but actively invests in the securities of a particular foreign country. The funds trade at market prices that are determined in the U.S. secondary market, while their NAVs are determined in the home countries. Closed-end funds normally sell at a premium or discount from their NAVs.

Bailey and Lim (1992) find that the CECFs returns tend to co-move with U.S. market returns and suggest that CECFs do not provide as great international diversification benefits as direct investment in foreign equities. Chang et al. (1995) using a sample of 15 CECFs, document that CECFs exhibit significant exposure to the U.S. market factor and act more like U.S. securities than their underlying foreign assets. However, CECFs retain significant exposures to home-country market factors and still provide substantial diversification benefits for U.S. investors. Bekaert and Urias (1996) use the mean-variance spanning tests to examine U.S. and U.K. traded country funds. They find the diversification benefits for U.K. funds but not for U.S. funds.

2.3. American depository receipts

American Depositary Receipts (ADRs) were developed as a method of enabling U.S. investors to trade in international securities within the U.S. without the need to deal directly in unknown foreign capital markets. Issued by U.S. banks, ADRs represent shares of stock in a foreign company and are listed on NYSE, AMEX, and NASDAQ.[1] ADRs are subject to SEC regulation. Generally, ADRs tend to represent larger, more mature foreign firms and may be over concentrated in certain industry sectors; therefore, it may not be possible to duplicate a well-diversified foreign market portfolio with a basket of ADRs. Like CECFs, ADRs also can be traded at a premium or discount to the market value of their underlying securities.

Recent studies support the diversification benefits of ADRs. Jiang (1998) studies the diversification gains and the dynamic pricing of ADRs. He finds that the ADR portfolios provide better diversification benefits than the broad foreign market index in a short term. Errunza et al. (1999) employ country funds and ADRs to mimic foreign indices. They find that it is possible to achieve international diversification by only using ADRs.

3. Data and Methodology

3.1. Data

The dataset contain weekly returns for iShares and their net asset values, CECFs, ADR portfolios

[1] Some ADRs were traded over the counter as "Pink Sheet".

and MSCI indices. The sample includes 17 countries for which 17 corresponding iShares were originally introduced by Barclays in March 1996. These 17 countries are Australia, Austria, Belgium, Canada, France, Germany, Hong Kong (China), Italy, Japan, Malaysia, Mexico, Netherlands, Singapore, Spain, Sweden, Switzerland, and United Kingdom. Based on the history of iShares, the sample covers the period between April 2, 1996 and December 31, 2013, resulting in 926 weekly observations. The sources for foreign stock market indices are the Morgan Stanley Capital International (MSCI) country indices. The Standard & Poor 500 Composite Index is used as a proxy for the U.S. stock market.

24 close-end country funds exist in the sample period for 13 of these 17 countries.[2] If a country has multiple funds listed, then we combine these funds form a value-weighted portfolio. We exclude United Kingdom since the only corresponding close-end fund exited in 1999.

The information of included closed-end country funds is given in the appendix. Only ADRs listed on the NYSE, AMEX, or traded on NASDAQ are included to form country-specific value-weighted ADR portfolios. If new ADRs were listed in the sample period, they are also included. Qualified ADRs are identified from the ADR directory provided by Bank of New York.[3] Finally, 225 ADRs are employed to form 11 country-specific ADR portfolios.[4] Among these 17 countries, 9 have all iShares, CECFs, and ADR portfolios available.

We gather weekly prices of 17 MSCI indices and the U.S. S&P 500 index from *DataStream*. Corresponding weekly prices of iShares, CECFs, and ADRs are taken from *CRSP*. iShares NAVs are obtained from iShares website.[5] Weekly returns are calculated by compounding daily returns with dividends. All prices and returns are dollar denominated.

[2] Qualified closed-end country funds are identified from Yahoo Finance (finance.yahoo.com) or Close-End Fund Forum (www.closedendfundforum.com).
[3] The address of ADR directory is www.adrbny.com/dr_directory
[4] The numbers of included ADRs for each country are listed in the Appendix.
[5] The website address is www.iShares.com

3.2. *Portfolio optimization under modern portfolio theory*

For investors facing K risky assets, the investment opportunity set is described by the vector of expected return on the K assets, $\bar{r}$, and by $\sum$, the covariance matrix. Modern portfolio theory assumes that the investors' preference can be represented by a utility function defined over mean and variance of a portfolio's return. Mean-variance efficient frontier that constructed by K risky assets consists of portfolios that have the smallest variance for every level of expected returns. For a given expected return, μ , $x_p(\mu)$ is a mean-variance frontier portfolio if

$$x_p = ArgMin_x \frac{1}{2} x' \sum x \tag{1}$$

$$\text{s.t.} \quad x' l = 1$$

$$x' \bar{r} = \mu$$

Vector x_p is the vector of weights of K risky assets in the portfolio. If short sales are restricted, $x_p \geq 0$ is imposed.

When a risk-free asset is available, Capital Allocation Line (CAL) is a straight line which intersects the risk-free rate and is tangent to the mean-variance efficient frontier that constructed by K risky assets. Generally, the tangency point is defined as market portfolio. Sharpe ratio of the market portfolio equals the slope of the CAL and is calculated as

$$SHP = \frac{r_p - r_f}{\sigma_p}, \tag{2}$$

where r_p is the expected return of the market portfolio; r_f is the risk-free rate; σ_p is the standard deviation of the return of the market portfolio. Among mean-variance frontier portfolios, the market portfolio has the largest Sharpe ratio and thus offers best risk-return trade-off. In practice, given $\bar{r}$ and $\sum$ of the K assets, the market portfolio and its Sharpe ratio can be easily found by numerical optimization methods.

The change in the Sharpe ratios can be used to quantify the diversification gains. Adding N diversification risky assets into the K existing assets will construct a new mean-variance efficient frontier and result in a new market portfolio. The difference between the Sharpe ratio of the new market portfolio and that of the old one exhibits the improvement: the larger the difference, the better the improvement.

3.3. Mean-variance spanning tests

In portfolios analysis, whether one set of risky assets can improve the investment opportunity set of another set of risky assets has received considerable attention. Under the assumption that investors are only concerned with the mean and variance of assets, the question becomes whether an investor can extend his mean-variance efficient frontier by including additional assets into his portfolio. This question addresses the diversification benefits and is first discussed by Huberman and Kandel (1987, HK hereafter) in which they proposed a regression-based test of the hypothesis that the mean-variance frontier of a set of K benchmark assets is the same as the mean-variance frontier of the K benchmark assets plus N additional test assets. Subsequent to HK's study, Ferson, Foerster, and Keim (1993, FFK hereafter) developed the regression-based mean-variance spanning test under nonnomarlity and conditional herteroskedasticity. Exploiting the duality between Hansen-Jagannathan bounds (1991) and mean-variance frontier, De Santis (1993) and Bekaert and Urias (1996, BU hereafter) design equivalent mean-variance spanning tests under stochastic discount factor (SDF) approach.

In the literature, the first set of K assets is called benchmark assets and the set of N additional assets is called test assets. The HK test involves estimating the following equation:

$$R_{B,t} = \alpha + \beta \cdot R_{A,t} + \varepsilon_t , \qquad t = 1, 2, \ldots, T \tag{3}$$

where $R_{B,t}$ are the returns on *N* test assets at time *t*; $R_{A,t}$ are the returns on *K* benchmark assets at time *t*; α is the $1 \times N$ vector and β is the $N \times K$ matrix. Huberman and Kandel show that $R_{B,t}$ is spanned by $R_{A,t}$ if and only if the following conditions hold:

$$H_0: \quad 1) \ \ \alpha = 0_N , \tag{4}$$

$$2) \ \ \beta \cdot 1_K = 1_N , \tag{5}$$

where 0_N is an *N*-vector of zeros; 1_N and 1_K are an *N*-vector and *K*-vector of ones, respectively. Assuming that α and β are constant over time, Huberman and Kandel test these restrictions by using *likelihood ratio test* based on OLS estimates of equation (3).

One crucial assumption of HK test is that conditional on $R_{A,t}$, the disturbance ε_t are independent and identically distributed as multivariate normal with mean zero and variance $\sum$. However, if ε_t is nonnormal and exhibits conditional heteroskedasticity, the *likelihood ratio test* will no longer be asymptotically χ^2_{2N} distributed under the null hypothesis. In this case, a common alternative is Hansen's (1982) GMM method that depends on the moment conditions. Ferson et al. (1993) present the GMM tests of spanning under the regression approach. Assuming $R_{A,t}$ and $R_{B,t}$ are stationary with finite fourth moments, FFK applies *GMM Wald test* to test the linear restrictions of the null hypothesis.[6]

Other than regression-based approach, Bekaert and Urias project a stochastic discount factor m_t with mean α on the returns of *N* + *K* assets as

$$m_t = \alpha + [R_t - E(R_t)]' \cdot \beta(\alpha) + \varepsilon_t , \tag{6}$$

6 Newey and West (1987) show that the GMM likelihood ratio test and the Lagrange multiplier test have the same form as the Wald test.

where $R_t = [R_{A,t}, R_{B,t}]'$ and α is a constant.

Recall the general conditional asset pricing restriction:

$$E[(1_{N+K} + R_t) \cdot m_t] = 1_{N+K}, \tag{7}$$

hence $$\beta(\alpha) = \Sigma_R^{-1} \cdot [(1-\alpha) \cdot 1_{N+K} - \alpha \cdot \mu] ,$$

(8)

where μ and Σ_R are mean returns and covariance matrix of R_t.

In order to test Hansen and Jagannathan (1991) mean-variance spanning restrictions, BU pre-specify two values for α, α_1 and α_2, and test

$$H_1: \; C \cdot \beta(\alpha_i) = 0_N, \qquad i = 1,2 \tag{9}$$

where $C = [0_{N \times K}, I_N]$.[7] In fact, BU test examines whether the *N* test assets can help to explain the variance of the stochastic discount factor. BU prove that H_1 is equivalent to H_0 for both unconditional and conditional mean-variance spanning test. They test the restrictions of the null hypothesis with *GMM Wald test* and make corrections for serial correlation.[8]

4. Empirical Tests

4.1. Descriptive statistics

4.1.1. Mean and standard deviation

Table I presents the mean weekly returns and standard deviations for iShares and their underlying assets, CECFs, ADR portfolios, and MSCI indices between April 2, 1996 and December 31, 2013. Several observations can be made. Although iShares are designed to mimic MSCI indices, MSCI indices have a higher mean return than iShares for all 17 countries. The

[7] The model follows the simplified and earlier version of Kan and Zhou (2012)
[8] This paper uses the MV_3 statistic in Bekaert and Urias (1996)

difference between iShares and MSCI indices, if exists, could be composed into two parts: the difference between MSCI indices and the iShares NAVs and the difference between iShares and iShares NAVs. The former is caused by tracking errors and transaction costs, and the latter is due to the trading premiums or discounts.[9] Table I shows that the average weekly returns on MSCI indices are 0.142% and very close to 0.141% for iShares, though there exists significant difference for few countries such as Austria. However, the average of weekly returns on iShares NAVs are 0.129%, which is lower than 0.142% of MSCI indices and 0.141 of iShares. We cannot exclude the possibility that the tracking errors between iShares NAVs and MSCI indices could offset the trading premiums between iShares and their NAVs.

Though the creature and redemption feature of iShares can help reduce the trading premiums or discounts, the limits of international arbitrage make the returns of iShares more volatile than those of iShares NAVs.[10] Also noteworthy is that iShares NAVs have a similar standard deviation with MSCI indices. However, the average of standard deviations on iShares is 3.610%, which is slightly higher than 3.551% of MSCI indices and 3.533% of iShares NAVs. Therefore, evidence above suggests that iShares have different risk/return characteristics from MSCI indices because of tracking errors, transaction costs, and the limits of international arbitrage.

The characteristics of CECFs and ADR portfolios are also provided in Table I. Since CECFs are actively managed and often include assets not represented in the underlying index, CECFs could either outperform or underperform the underlying index and counterpart iShares.[11] Among 13 countries with CECFs, CECFs have a higher mean return than iShares and MSCI indices for 5 countries. The averages of weekly returns on CECFs are 0.142%, very close to 0.141% of

[9] iShares do not invest in every security in the target market indices, but in a basket of securities closely representing the target market.
[10] Please refer to Zhang and Yang (2005)
[11] CECFs have higher expense ratios than iShares. Chang and Swales (2005) report that the average expense ratio on iShares is only 0.87%, while the average expense ratio on country closed-end funds is 1.59%.

iShares and 0.142% of MSCI indices. It could suggest the lack of outperformance for close-end

Table I

Summary Statistics

This table reports the mean weekly returns and standard deviations for iShares and their net asset values (NAVs), closed-end country funds (CECFs), ADR portfolios, and MSCI indices. The sample period is from April 2, 1996 to December 31, 2013. MSCI indices data are from DataStream. iShares NAVs data are from iShares website. The data of iShares, closed-end country funds, and ADRs are taken from CRSP.

Country	*MSCI Indices*		*iShares*		*iShares NAVs*		*CECFs*		*ADR Portfolios*	
	Mean (*in* %)	*Std. Dev.* (*in* %)	*Mean* (*in* %)	*Std. Dev.* (*in* %)	*Mean* (*in* %)	*Std. Dev.* (*in* %)	*Mean* (*in* %)	*Std. Dev.* (*in* %)	*Mean* (*in* %)	*Std. Dev.* (*in* %)
Australia	0.151	3.381	0.149	3.387	0.152	3.383	-0.001	2.560	0.235	3.834
Austria	0.097	3.886	0.136	3.615	0.127	3.594	-0.047	4.034	na	na
Belgium	0.109	3.467	0.089	3.418	0.068	3.385	na	na	na	na
Canada	0.197	3.220	0.203	3.254	0.165	3.261	0.171	3.580	na	na
France	0.147	3.375	0.149	3.464	0.139	3.381	0.144	3.278	0.235	3.834
Germany	0.170	3.578	0.171	3.576	0.156	3.589	0.231	3.922	0.156	4.875
Hong Kong	0.125	3.794	0.116	3.746	0.114	3.732	0.270	4.443	0.092	5.784
Italy	0.107	3.737	0.106	3.681	0.084	3.750	0.257	3.457	0.263	5.622
Japan	0.019	3.108	0.022	3.233	0.019	3.073	0.082	3.772	0.214	3.532
Malaysia	0.106	4.463	0.087	4.74	0.105	4.367	0.088	4.740	na	na
Mexico	0.274	4.029	0.298	4.291	0.280	4.057	0.254	4.013	0.382	4.285
The Netherlands	0.127	3.266	0.116	3.309	0.100	3.260	na	na	0.213	2.962
Singapore	0.091	3.527	0.076	3.739	0.078	3.789	0.085	3.688	na	na
Spain	0.188	3.810	0.192	3.786	0.179	3.710	0.133	4.128	0.214	3.937
Sweden	0.232	4.172	0.223	4.256	0.193	4.209	na	na	na	na
Switzerland	0.161	2.718	0.155	2.988	0.141	2.672	0.180	2.685	0.229	3.549
United Kingdom	0.109	2.840	0.110	2.890	0.096	2.857	na	na	0.196	2.729
Average	0.142	3.551	0.141	3.610	0.129	3.533	0.142	3.715	0.221	4.086
U.S. S&P 500 Index	0.145	2.496								

higher mean return than iShares and MSCI indices for 8 of 11 countries with ADRs. The averages of weekly returns on ADR portfolios are 0.221%, higher than 0.141% of iShares and 0.142% of MSCI indices. Moreover, the standard deviations of CECFs and ADR portfolios are greater than those of iShares for most countries, which indicates that CECFs and ADR portfolios are not as well diversified as iShares.[12]

4.1.2. Unconditional correlations

The return correlation between the U.S. market index and a target foreign market index is a traditional measure of the benefits of international diversification: the lower the correlation, the greater the potential gains. Column 2 of Table II shows the correlations between MSCI indices and the S&P 500 Index. All 17 MSCI indices are positively correlated with the S&P 500 Index with an average correlation of 0.589. Malaysia has the lowest correlation of 0.242, and Canada has the highest correlation of 0.757, which indicates that the stock market of Canada is highly integrated with that of U.S. Generally, the correlations of most countries are greater than the corresponding results documented in previous research.[13] It suggests that the international financial markets have become more integrated in the recent thirty years.

Table II also reports the correlations with the U.S. S&P 500 Index and with home country MSCI indices for iShares and their NAVs, CECFs, and ADR portfolios. In the majority of cases, all these securities have lower correlations with the U.S. market than with their home country market. Except Mexico, all other iShares correlate more closely with the U.S. market than do their NAVs. On the other hand, all iShares NAVs correlate more closely with the home country market than iShares. This finding can also be attributed to the limits of international arbitrage.

[12] Another possible reason is that CECFs and ADRs are traded at greater premiums and discounts than iShares.
[13] For example, see Table IV in Errunza, Hogan, and Hung (1999). Their sample is from 1976 to 1993.

Table II

Unconditional Correlations

This table reports the correlations with U.S. S&P 500 Index and with home country MSCI indices for iShares and their net asset values (NAVs), closed-end country funds (CECFs) and ADR portfolios. The sample period is from April 2, 1996 to December 31, 2013.

Country	*MSCI Indices Correlations*	*iShares Correlations*		*iShares NAVs Correlations*		*CECFs Correlations*		*ADR Portfolios Correlations*	
	w/U.S.	*w/U.S.*	*w/Home*	*w/U.S.*	*w/Home*	*w/U.S.*	*w/Home*	*w/U.S.*	*w/Home*
Australia	0.578	0.660	0.866	0.572	0.990	0.401	0.577	0.723	0.533
Austria	0.506	0.552	0.917	0.505	0.984	0.315	0.418	na	na
Belgium	0.612	0.693	0.894	0.644	0.947	na	na	na	na
Canada	0.757	0.749	0.953	0.740	0.964	0.092	0.325	na	na
France	0.725	0.772	0.937	0.724	0.992	0.604	0.775	0.723	0.813
Germany	0.748	0.789	0.944	0.745	0.987	0.726	0.791	0.696	0.779
Hong Kong	0.467	0.600	0.826	0.479	0.993	0.536	0.704	0.390	0.409
Italy	0.631	0.673	0.940	0.630	0.982	0.476	0.732	0.674	0.535
Japan	0.412	0.560	0.867	0.409	0.997	0.546	0.668	0.601	0.734
Malaysia	0.242	0.400	0.766	0.263	0.946	0.422	0.593	na	na
Mexico	0.687	0.682	0.955	0.689	0.990	0.655	0.896	0.670	0.929
The Netherlands	0.712	0.764	0.934	0.710	0.987	na	na	0.659	0.790
Singapore	0.461	0.582	0.851	0.447	0.973	0.563	0.720	na	na
Spain	0.605	0.662	0.938	0.608	0.987	0.553	0.681	0.634	0.927
Sweden	0.690	0.755	0.934	0.690	0.980	na	na	na	na
Switzerland	0.653	0.704	0.904	0.655	0.983	0.654	0.796	0.474	0.612
United Kingdom	0.723	0.787	0.898	0.722	0.987	na	na	0.699	0.783
Average	0.589	0.659	0.898	0.591	0.979	0.505	0.673	0.608	0.685

The average of correlations of iShares, CECFs, and ADR portfolios with the U.S. market are 0.659, 0.505 and 0.608, respectively. All these numbers are close to but still different from 0.589 of MSCI indices, to some extent. It may suggest that these U.S. traded securities can provide different diversification gains from the direct investment in the foreign markets indices.

The average of correlations of iShares, CECFs, and ADR portfolios with the home country market are 0.898, 0.673 and 0.685, respectively. iShares mimic MSCI indices and thus have the highest correlations; Most of ADRs are large foreign companies that included in MSCI indices, so ADR portfolios also exhibit high correlations. The high correlations of these domestically traded securities with home country markets question the necessity of costly direct foreign investment. Errunza et al. (1999) state that correlations with respect to the U.S. index overstate the gains from investing in securities that only trade abroad, because investors can use CECFs and ADRs to form home-made diversification portfolios.

4.2. Risk exposures from two factor market model

Some previous studies suggest that the returns of securities may be affected not so much by where the cash flows are generated as by where the securities are traded. Russell (1998) examines various U.S. exchange-listed investment instruments and concludes that these securities behave more like their host exchange than their home exchange.

iShares, CECFs, and ADRs are traded in the U.S., but the cash flows from their underlying assets are generated in their home countries. Since iShares have much less premium and discount fluctuation than CECFs and ADRs, CECFs and ADRs may behave more like common U.S. traded stocks than iShares. Moreover, iShares may behave more like U.S stock than their NAVs due to the limits of international arbitrage. If they do, one would question the effectiveness of iShares on international diversification.

To evaluate the U.S. market risk exposure and the home-country market risk exposure for iShares and their NAVs, CECFs, and ADR portfolios, we use a two-factor model that accounts for both U.S. market risk and home country specific risk. The model can be written as:

$$R_{i,t} = \alpha_i + \beta_{US,i} \cdot R_{US,t} + \beta_{Home,i} \cdot R_{Home,t} + \varepsilon_{i,t}, \qquad (10)$$

where $R_{i,t}$ is the return on security i at time t; $R_{US,t}$ is the return on U.S. market index proxied by the S&P 500 Index; Following Chang et al. (1995), $R_{Home,t}$ is derived as the residual from a regression of the respective MSCI index returns on the S&P 500 Index return; $\varepsilon_{i,t}$ is the error item. $\beta_{US,i}$ and $\beta_{Home,i}$ are parameters representing the sensitivities of security i to the U.S. market return and home country market return. α_i is the intercept.

If these securities facilitate effective diversification, one would expect their returns to exhibit significant exposure to home-country specific market risk. Table III reports the estimation results for the entire sample period. It shows that all iShares, CECFs, and ADR portfolios have significant home market betas at the 5% level. The average home market beta measure is 0.789 for iShares, compared with 0.633 for CECFs, and 0.613 for ADR portfolios. On the other hand, all these securities also have significant U.S. betas. The average U.S. beta is 0.935 for iShares, compared with 0.792 for CECFs and 0.991 for ADR portfolios.

In the majority of cases, CECFs tend to have a higher U.S. beta than the home country beta. Their average U.S. beta of 0.792 is larger than the average home country beta of 0.633. The result is also true for ADR portfolios, which have the average U.S. beta of 0.991 versus the average home country beta of 0.613. It could suggest that CECFs and ADRs behave more like common U.S. stocks.

Table III

Risk Exposure from the Two Factor Model

This table shows the estimates from the two factor model. The model is defined as

$$R_{i,t} = \alpha_i + \beta_{US,i} R_{US,t} + \beta_{Home,i} R_{Home,t} + \varepsilon_{i,t}$$

where $R_{i,t}$ is the return on security i at time t; $R_{US,t}$ is the return on the U.S. S&P 500 Index; $R_{Home,t}$ is a residual from a regression of the respective MSCI index returns on the U.S. S&P 500 Index return; $\varepsilon_{i,t}$ is the error item. The *t*-stats are reported in parenthesis. All coefficients are significant at the 5% level.

Country	*iShares*		*iShares NAVs*		*CECFs*		*ADR Portfolios*	
	β_{US}	β_{home}	β_{US}	β_{home}	β_{US}	β_{home}	β_{US}	β_{home}
Australia	0.912	0.709	0.838	0.993	0.436	0.395	1.120	0.198
	(45.35)	(38.93)	(129.27)	(169.21)	(15.75)	(15.76)	(32.50)	(6.35)
Austria	0.844	0.799	0.778	0.908	0.825	0.547	na	na
	(45.73)	(58.01)	(90.70)	(141.75)	(8.89)	(7.04)	na	na
Belgium	0.944	0.741	0.868	0.863	na	na	na	na
	(51.08)	(43.88)	(62.08)	(67.63)	na	na	na	na
Canada	0.856	0.917	0.841	0.961	0.040	0.670	na	na
	(65.20)	(59.40)	(72.49)	(70.51)	(0.91)	(12.98)	na	na
France	0.933	0.791	0.847	0.988	0.781	0.722	1.013	0.695
	(64.21)	(51.10)	(152.11)	(166.43)	(21.03)	(16.48)	(35.91)	(23.11)
Germany	0.947	0.799	0.847	0.976	0.996	0.614	1.167	0.800
	(64.07)	(52.74)	(108.18)	(121.56)	(32.40)	(19.48)	(28.91)	(19.32)
Hong Kong	0.988	0.692	0.842	0.971	1.040	0.682	0.963	0.440
	(38.76)	(36.52)	(140.95)	(218.89)	(26.19)	(23.13)	(14.09)	(8.68)
Italy	0.910	0.844	0.850	0.974	0.711	0.713	1.491	0.274
	(57.43)	(61.89)	(90.55)	(120.52)	(15.70)	(15.60)	(27.48)	(5.86)
Japan	0.925	0.748	0.830	0.989	1.038	0.650	1.068	0.666
	(49.49)	(47.17)	(256.11)	(359.70)	(29.20)	(21.55)	(36.80)	(27.07)
Malaysia	1.030	0.738	0.843	0.920	1.007	0.538	na	na
	(28.05)	(34.51)	(43.77)	(84.93)	(20.43)	(19.54)	na	na
Mexico	0.883	0.942	0.852	0.974	0.822	0.836	0.893	0.935
	(53.65)	(68.59)	(109.19)	(149.45)	(34.42)	(41.94)	(42.29)	(53.03)
The Netherlands	0.943	0.799	0.843	0.971	na	na	0.726	0.593
	(65.70)	(51.23)	(119.56)	(126.73)	na	na	(30.86)	(23.21)
Singapore	1.022	0.787	0.881	1.050	0.946	0.614	na	na
	(42.38)	(41.26)	(75.48)	(113.85)	(29.73)	(24.39)	na	na
Spain	0.919	0.828	0.828	0.952	0.869	0.608	0.927	0.888
	(57.00)	(62.30)	(106.19)	(148.34)	(21.37)	(17.25)	(48.90)	(56.85)
Sweden	1.016	0.784	0.867	0.968	na	na	na	na
	(55.67)	(53.46)	(76.37)	(106.17)	na	na	na	na
Switzerland	0.891	0.794	0.826	0.950	0.788	0.636	0.762	0.695
	(59.73)	(44.30)	(126.86)	(121.45)	(37.73)	(25.37)	(20.32)	(15.40)
United Kingdom	0.926	0.701	0.847	0.978	na	na	0.774	0.562
	(61.96)	(36.77)	(138.98)	(125.86)	na	na	(36.10)	(20.52)
Average	0.935	0.789	0.843	0.964	0.792	0.633	0.991	0.613

Table III also shows that iShares have higher U.S. beta values than iShares NAVs. The average U.S. beta measure is 0.843 for iShares NAVs, compared with 0.935 for iShares. In addition, iShares have lower home country betas than iShares NAVs. The average home country beta value for iShares is 0.789 whereas the average home country beta value for iShares NAVs is 0.964. These results support the finding that in comparison with their underlying assets, iShares behave more like U.S. stocks. These results are also consistent with the previous findings of Pennathur et al. (2002) and Zhang and Yang (2005).

4.3. Diversification gains from optimal asset allocation

In reality, it is very costly or impossible for U.S. investors to directly invest in certain foreign stock markets. Even in the markets open to foreign investors, securities eligible for investment often are limited. Therefore, it is difficult to invest a portfolio which is equivalent to the market index of foreign countries.

iShares, CECFs, and ADRs provide the U.S. investors the opportunity to obtain international diversification gains without trading abroad. Section 4.2 shows that all these securities have statistically significant risk exposures to home country markets. In this sub-section, we examine the diversification gains via iShares, CECFs, and ADR portfolios through portfolio optimization (the methodology is described in section 3.2). Since iShares track the MSCI indices and behave less like U.S. stocks than CECFs and ADR portfolios, one may expect iShares to provide better gains than CECFs and ADRs. However, the fact that iShares behave more like U.S. stocks than do their underlying assets potentially limits the power of iShares for international diversification.

First, for each country we solve for the optimal tangent portfolio comprised of the U.S. market index and the corresponding iShare. Second, we solve for the optimal tangent portfolio comprised of the U.S. market index and all 17 iShares in the sample. Then the diversification gains are measured by change in Sharpe ratios, which is calculated as the Sharpe ratio of the optimal tangent portfolio minus the Sharpe ratio of the U.S market. We repeat the steps above to CECFs and ADR portfolios. For comparison purpose, we redo step two for iShares for 13 countries in which CECFs exist and for 11 counties in which ADR portfolios exist.

In solving for the optimal tangent portfolio, the weekly risk-free rate is set to be zero and the short-sales are allowed.[14] Table IV presents the change in Sharpe ratios for iShares, CECFs, and ADR portfolios, for the entire sample period and for two subperiods: April 1996 – December 2004 and January 2005 – December 2013.

For the entire sample period, Mexico provides the highest gain of 0.0144 for iShares; Canada provides the highest gain of 0.0141 for CECFs; so does Mexico for ADR portfolios with the gain of 0.0315. Diversifying the U.S. market index by adding 17 iShares increases the weekly excess return per unit of risk of 0.0571. 13 CECFs and 11 ADR portfolios also help increase the weekly excess return per unit of risk of 0.0627 and 0.1020, respectively. These results indicate that iShares, CECFs, and ADRs do provide diversification gains.

It is surprising that among 13 countries with CECFs, iShares underperform CECFs for 8 countries except for Japan, Mexico, Singapore, Spain, and Switzerland. Among 11 countries with ADRs, ADR portfolios outerperform iShares for 10 countries except for Italy. The gain by iShares from 13 countries with CECFs is 0.0466, smaller than the counterpart of 0.0627. Also, the gain by iShares from 11 countries with ADRs is 0.0478, much smaller than the counterpart of 0.1020.

The results above also hold for two subperiods. The diversification gains are much higher (lower) in the second subperiod than the first period for iShares and CECFs (ADR portfolios).

[14] iShares, CECFs and ADRs all are exchange-traded securities and can be sold short.

Table IV

Change in Sharpe Ratios

This table reports the changes in Sharpe ratios for iShares, closed-end country funds, and ADR portfolios for the period of entire sample and two subperiods. The weekly risk-free rate is set to be zero and short-sales are allowed. The optimal international portfolios consist of corresponding securities and the S&P 500 Index under numerical optimization. ΔSHP represents the Sharpe ratio (SHP) of international optimal portfolio minus that of the S&P 500 Index. The weekly Sharpe ratios of S&P 500 Index are 0.0580, 0.0647 and 0.0497 for the entire sample period and two subperiods, respectively.

Country	*Change in Sharpe Ratios: ΔSHP = SHP(Securities + S&P 500) - SHP(S&P 500)*								
	April 1996 – December 2013			*April 1996 – December 2004*			*January 2005 - December 2013*		
	iShares	*CECFs*	*ADRs*	*iShares*	*CECFs*	*ADRs*	*iShares*	*CECFs*	*ADRs*
Australia	0.0007	0.0053	0.0065	0.0042	0.0027	0.0192	0.0000	0.0089	0.0010
Austria	0.0004	0.0014	na	0.0277	0.0030	na	0.0138	na	na
Belgium	0.0032	na	na	0.0003	na	na	0.0210	na	na
Canada	0.0068	0.0141	na	0.0142	0.0059	na	0.0026	0.0257	na
France	0.0000	0.0002	0.0065	0.0046	0.0001	0.0192	0.0071	na	0.0010
Germany	0.0001	0.0052	0.0010	0.0000	0.0029	0.0004	0.0017	0.0108	0.0016
Hong Kong	0.0003	0.0100	0.0004	0.0030	0.0079	0.0362	0.0040	0.0163	0.0488
Italy	0.0016	0.0069	0.0011	0.0140	0.0122	0.0136	0.0348	na	0.0166
Japan	0.0075	0.0013	0.0085	0.0119	0.0007	0.0116	0.0024	0.0031	0.0047
Malaysia	0.0001	0.0004	na	0.0068	0.0089	na	0.0276	0.0177	na
Mexico	0.0144	0.0093	0.0315	0.0098	0.0069	0.0406	0.0252	0.0142	0.0224
The Netherlands	0.0017	na	0.0153	0.0027	na	0.0099	0.0005	na	0.0259
Singapore	0.0020	0.0012	na	0.0115	0.0133	na	0.0082	0.0085	na
Spain	0.0028	0.0000	0.0044	0.0237	0.0146	0.0338	0.0023	0.0184	0.0024
Sweden	0.0022	na	na	0.0037	na	na	0.0013	na	na
Switzerland	0.0039	0.0123	0.0134	0.0006	0.0150	0.0129	0.0163	0.0103	0.0220
United Kingdom	0.0013	na	0.0152	0.0006	na	0.0362	0.0121	0.0089	0.0006
All Countries	0.0571	na	na	0.0962	na	na	0.1534	na	na
All Countries with CECFs	0.0466	0.0627	na	0.0837	0.0762	na	0.1296	0.1402	na
All Countries with ADRs	0.0478	na	0.1020	0.0680	na	0.1204	0.1281	na	0.1037

CECFs are more likely to outperform iShares in the second subperiod than in the first one. However, ADR portfolios are more likely to outperform iShares in the first subperiod than the second one.

Though hard to interpret, these results are consistent with the previous findings of Jiang (1998). He finds that ADR portfolios provide better diversification gains than foreign market indices. It may suggest that ADR portfolios and actively managed CECFs concentrate on better than average firms from their respective markets, while iShares contain more extensively value-weighted assets. The inferior results for iShares may suggest that value-weighting within a country does not guarantee mean-variance efficiency of a portfolio comprised of value-weighted iShares.

4.4. Mean-variance spanning tests

4.4.1. iShares versus closed-end country funds

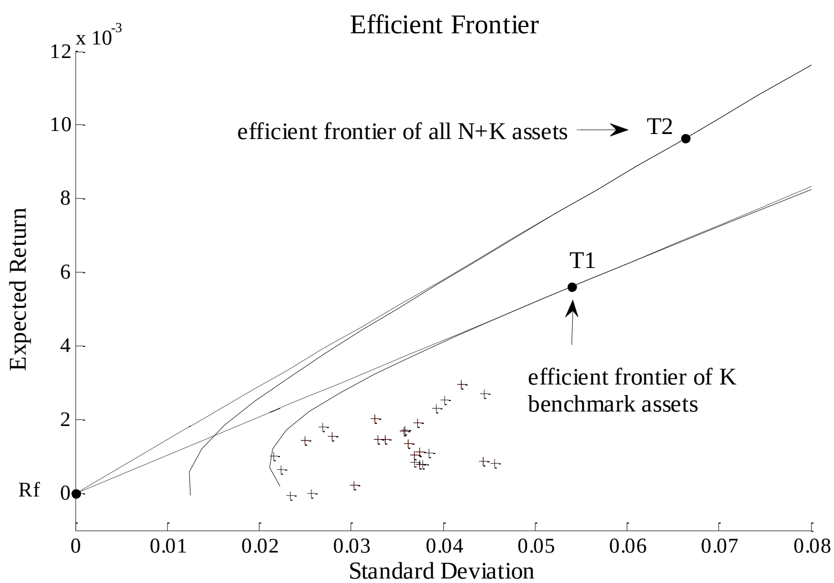
The rapid growth of iShares has generated competition to other financial instruments, which may become less attractive to investors. However, as shown in the previous section, iShares do not always excel CECFs and ADRs as anticipated. From another aspect, one would ask whether iShares are able to completely replace CECFs and ADRs in terms of diversification. In reality, the U.S. investors face the opportunity set including both iShares and their rivals: CECFs and ADRs. Even if iShares could offer the best diversification benefits as a single investment tool, CECFs and ADRs could still play a role if they provide supplemental diversification benefits over iShares.

In this sub-section, we apply three spanning tests (described in section 3.3) to investigate whether there are additional diversification gains for adding CECFs into the existing opportunity set that consists of the S&P 500 index and iShares. In other words, it tests whether adding CECFs can significantly extend the mean-variance efficient frontier constructed by the S&P 500 Index and iShares. For the comparison purpose, only 13 counties for which CECFs exist are included in this test.

Figure 1A plots the shift of the mean-variance efficient frontier after adding 13 CECFs into the benchmark set comprised of the S&P 500 Index and 13 iShares. Although all assets including 13 CECFs lie within the original frontier formed by the S&P 500 Index and 13 iShares, the U.S. investors still can expand the efficient frontier by adding these CECFs into their portfolios. The

Figure 1A

Shift of Mean-Variance Frontier after Adding Closed-end Country Funds



This figure plots the efficient frontiers of two assets sets. The sample consists of twelve countries where corresponding closed-end country funds are available. The benchmark assets set include the U.S. S&P 500 Index and iShares. The augmented assets set combine the closed-end country funds and the benchmark assets set. Weekly risk free rate is set to be zero and short-sales are allowed. T1 and T2 denote two corresponding tangency portfolios, respectively. “+”s denote the positions of all *N+K* assets.

optimal tangent portfolio moves up from T1 to T2 and the corresponding Sharpe ratio also increases.

Table V reports the *p*-values associated with HK, FFK, and BU test statistics on each of the 13 CECFs as well as a joint test on all 13 CECFs.[15] The value is explained as the degree to which one can reject mean-variance spanning test. HK test (Huberman and Kandel (1987)) is the likelihood ratio test under OLS regression. FFK test (Ferson, Foerster and Keim (1993)) is the regression based GMM Wald test under conditional heteroskedasticity. BU test (Bekaert and Urias (1996)) is the GMM Wald test under stochastic discount factor approach.[16] All three tests are performed over the whole sample period as well as two subperiods. Table V also reports the associated change in Sharpe ratios (*ΔSHP*), which can be used to demonstrate the economic significance. The results from the entire period show that the HK test rejects spanning at the 5% level for all 13 countries except for German, Hong Kong, and Malaysia. The joint test also rejects spanning and the change of Sharpe ratios is 0.0414.

If returns exhibit conditional heteroskedascity, the HK test, which relies on normality assumption, may not be appropriate. For robustness of the results, we also applied two GMM Wald tests: FFK and BU. The results of these two tests are similar to those of HK test for the entire period. Generally, the *p*-values of FFK and BU tests are slightly higher than that of HK test, which indicates that HK test may incur over-rejection problem under the assumption of nonnormality.

The results of two sbuperiods are similar. In both subperiods, the three joint tests all reject spanning for all CECFs. In the first subperiod with 13 countries, the HK (FFK / BU) test rejects spanning for 10 (9 / 9) countries. In the second subperiod there are only 10 countries with

[15] In the joint test, the benchmark set includes the S&P 500 Index and 13 iShares; the test set includes 13 CECFs.
[16] Please refer to section 3.3 for details.

Table V

Mean-Variance Spanning Test of iShares over Closed-End Country Funds

This table reports the p-values of three mean-variance spanning tests and the associated change in Sharpe ratios for the period of entire sample and two subperiods. The sample consists of twelve countries for which closed-end country funds exist. The test assets are closed-end country funds and the benchmark assets include iShares and the S&P 500 Index. HK test (Huberman and Kandel (1987)) is the likelihood ratio test under OLS regression. FFK test (Ferson, Foerster and Keim (1993)) is the GMM Wald test under conditional heteroskedasticity. BU test (Bekaert and Urias (1996)) is the GMM Wald test under stochastic discount factor approach.

Country with CECFs	*April 1996 – December 2013*				*April 1996 – December 2004*				*January 2005 - December 2013*			
	HK	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*
Australia	0.0000	0.0000	0.0000	0.0086	0.0000	0.0000	0.0000	0.0064	0.0000	0.0000	0.0000	0.0101
Austria	0.0000	0.0000	0.0000	0.0016	0.0000	0.0000	0.0003	0.0088	na	na	na	na
Canada	0.0000	0.0000	0.0000	0.0085	0.0000	0.0000	0.0000	0.0025	0.0000	0.0000	0.0000	0.0245
France	0.0000	0.0000	0.0000	0.0002	0.0002	0.0067	0.0093	0.0012	na	na	na	na
Germany	0.1004	0.3971	0.3569	0.0059	0.0000	0.0050	0.0128	0.0052	0.0000	0.0008	0.0000	0.0091
Hong Kong	0.2052	0.2277	0.2152	0.0186	0.2119	0.2204	0.2139	0.0236	0.0023	0.0014	0.0027	0.0124
Italy	0.0000	0.0000	0.0000	0.0093	0.0000	0.0000	0.0002	0.0022	na	na	na	na
Japan	0.0242	0.1134	0.1118	0.0008	0.0003	0.0005	0.0005	0.0035	0.5434	0.7266	0.7284	0.0009
Malaysia	0.4754	0.6430	0.6578	0.0003	0.2737	0.3441	0.3933	0.0028	0.2919	0.5830	0.5637	0.0006
Mexico	0.0285	0.0533	0.0668	0.0000	0.0884	0.1262	0.1326	0.0000	0.4200	0.5227	0.5539	0.0000
Singapore	0.0220	0.0974	0.1093	0.0000	0.0001	0.0026	0.0079	0.0036	0.7320	0.8033	0.8022	0.0013
Spain	0.0000	0.0031	0.0058	0.0008	0.0211	0.1135	0.1242	0.0032	0.0031	0.0199	0.0366	0.0162
Switzerland	0.0000	0.0000	0.0000	0.0084	0.0000	0.0000	0.0000	0.0187	0.0010	0.0702	0.0927	0.0006
All Countries	0.0000	0.0000	0.0000	0.0414	0.0000	0.0000	0.0000	0.0454	0.0000	0.0000	0.0000	0.0401

CECFs because the CECFs of Australia, French, and Italy no long exist after 2004. In the second subperiod, the HK (FFK / BU) test rejects spanning for 6 (5 / 5) countries. The economic significance is also similar in both subperiods, with a change in Sharpe ratios of 0.0454 and 0.0401, respectively.

4.4.2. iShares versus ADR portfolios

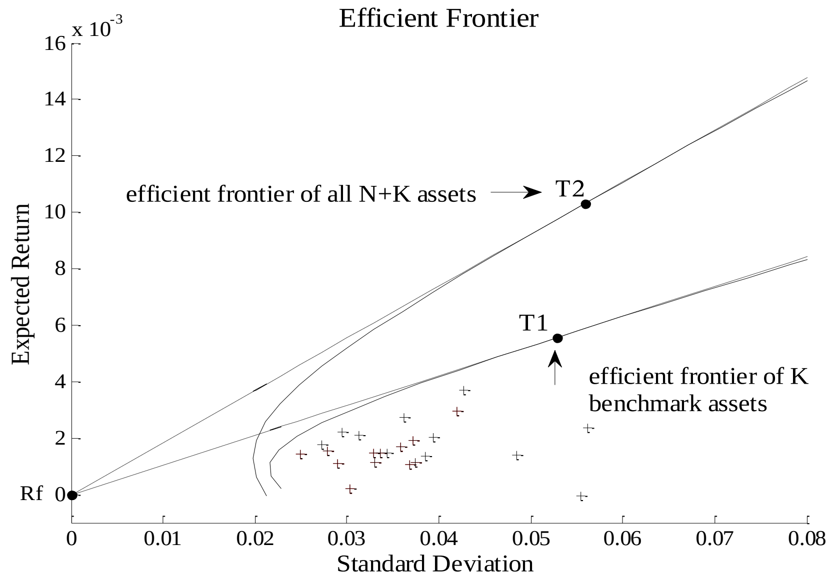
We further apply the same spanning tests to investigate whether there are extra diversification gains for adding ADR portfolios into the existing opportunity set that consists of the S&P 500 index and iShares. For the comparison purpose, only 11 counties for which ADR portfolios are available are included in this test.

Figure 1B plots the shift of the mean-variance efficient frontier after adding 11 ADR portfolios into the benchmark set comprised of the S&P 500 Index and 11 iShares. The U.S. investors can also expand the efficient frontier by adding ADR portfolios into the benchmark set. The optimal tangent portfolio moves up from T1 to T2 and the corresponding Sharpe ratio is also increased.

Table VI reports the *p*-values associated with HK, FFK, and BU test statistics on each of the 11 ADR portfolios as well as a joint test on all ADR portfolios. All three tests are performed over the whole sample period and two subperiods. The results from the entire period show that the HK, FFK, and BU test consistently reject spanning at the 5% level for all 11 countries except for France, Hong Kong, Mexico, Spain and Switzerland. The joint test also rejects spanning. The change of Sharpe ratio is 0.0794 for the joint test, which indicates that adding ADR portfolios generates significant extra gains of diversification.

Figure 1B

Shift of Mean-Variance Frontier after Adding ADR Portfolios



This figure plots the efficient frontiers of two assets sets. The sample consists of eleven countries where corresponding ADR portfolios are available. The benchmark assets set include the U.S. S&P 500 Index and iShares. The augmented assets set combine the ADR portfolios and the benchmark assets set. Weekly risk free rate is set to be zero and short-sales are allowed. T1 and T2 denote two corresponding tangency portfolios, respectively. "+"s denote the positions of all *N+K* assets.

The results of two sbuperiods do not vary much. In both subperiods, the three joint tests all reject spanning for all ADR portfolios. The HK (FFK / BU) test rejects spanning for 7 (7 / 6) countries in the first subperiod and rejects spanning for 8 (6 / 6) countries in the second period. Further, the economic significance is stronger in the first subperiod than the second subperiod, with a change in Sharpe ratios of 0.1421 and 0.0548, respectively.

4.4.3. Domestically traded securities versus direct foreign investment

Section 4.4.2 and 4.4.3 come to the conclusion that iShares cannot totally replace CECFs and

Table VI

Mean-Variance Spanning Test of iShares over ADR Portfolios

This table reports the *p*-values of three mean-variance spanning tests and the associated change in Sharpe ratios for the period of entire sample and two subperiods. The sample consists of eleven countries for which ADR portfolios exist. The test assets are ADR portfolios and the benchmark assets include iShares and the S&P 500 Index. HK test (Huberman and Kandel (1987)) is the likelihood ratio test under OLS regression. FFK test (Ferson, Foerster and Keim (1993)) is the GMM Wald test under conditional heteroskedasticity. BU test (Bekaert and Urias (1996)) is the GMM Wald test under stochastic discount factor approach.

Country with ADR Portfolios	*April 1996 – December 2004*				*April 1996 – December 2004*				*January 2005 - December 2013*			
	HK	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*
Australia	0.0000	0.0004	0.0005	0.0138	0.0004	0.0006	0.0007	0.0494	0.1139	0.2159	0.2248	0.0012
France	0.0097	0.1465	0.1272	0.0011	0.0000	0.0141	0.0094	0.0062	0.0439	0.1137	0.1119	0.0024
Germany	0.0000	0.0001	0.0000	0.0038	0.3631	0.3495	0.3383	0.0026	0.0000	0.0009	0.0000	0.0054
Hong Kong	0.5105	0.5584	0.5702	0.0055	0.0422	0.0429	0.0541	0.0682	0.0958	0.1202	0.0986	0.0449
Italy	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0003	0.0039	0.0000	0.0000	0.0002	0.0024
Japan	0.0000	0.0005	0.0003	0.0188	0.0011	0.0050	0.0036	0.0172	0.0244	0.0806	0.0686	0.0230
Mexico	0.1431	0.1543	0.1491	0.0185	0.1590	0.1494	0.1422	0.0398	0.7788	0.8559	0.8538	0.0002
The Netherlands	0.0000	0.0000	0.0000	0.0360	0.0000	0.0004	0.0009	0.0285	0.0000	0.0000	0.0000	0.0453
Spain	0.6447	0.7539	0.7538	0.0005	0.1477	0.2380	0.2397	0.0051	0.0001	0.0098	0.0105	0.0002
Switzerland	0.3051	0.2907	0.2764	0.0161	0.4314	0.4619	0.4482	0.0215	0.0011	0.0095	0.0157	0.0063
United Kingdom	0.0000	0.0000	0.0000	0.0221	0.0000	0.0001	0.0002	0.0285	0.0000	0.0007	0.0022	0.0147
All Countries	0.0000	0.0000	0.0000	0.0794	0.0000	0.0000	0.0000	0.1421	0.0000	0.0000	0.0000	0.0548

ADR portfolios. Therefore, both CECFs and ADRs can maintain their roles as international diversification tools, even facing the competition from iShares. In this sub-section, we examine the cooperation of these domestically traded securities to substitute for costly direct foreign investment. Errunza et al. (1999) find that domestically traded securities can mimic foreign market indices by using closed-end country funds and ADRs. Since Table II shows that iShares are highly correlated with foreign market indices, it will be more feasible to reach that goal with the help of iShares.[17] Moreover, combining iShares with CECFs and ADRs should increase that likelihood because they provide extra gains over iShares.

We construct three benchmark sets comprised of domestically traded securities. Set I consists of the S&P 500 Index and the corresponding iShares for all 17 countries in the sample. Set II includes the S&P 500 Index and the corresponding iShares and CECFs for all 13 countries with CECFs. Set III includes the S&P 500 Index and the corresponding iShares, CECFs, and ADR portfolios for all 9 countries for which both CECFs and ADRs are available. Further, we apply the mean-variance spanning tests to examine if there are extra diversification gains for adding MSCI indices into three sequentially augmented benchmark sets.

Table VII reports the *p*-values associated with HK, FFK, and BU test statistics on each MSCI index as well as a joint test on all MSCI indices for three benchmark sets. All three spanning tests are performed over the entire sample period and two subperiods. Panel A shows the results from the entire period. For the first set of benchmark assets, HK test rejects spanning at the 5% level for all 17 countries except for Austria, Canada, and Mexico. FFK and BU tests provide the consistent results while the p-values are much higher for Germany, Italy, and Spain. All three joint tests reject spanning. The change in Sharpe ratio is as low as 0.0217 for the joint test. These findings indicate that though iShares cannot mean-variance span MSCI indices, the

[17] In Table II, The average correlation of iShares with MSCI indices is 0.898.

Table VII

Mean-Variance Spanning Test of Domestically Traded Securities over MSCI Indices

This table reports the *p*-values of three mean-variance spanning tests and the associated change in Sharpe ratios for the entire sample and two subperiods. The test assets are MSCI indices. Benchmark set I includes iShares and the S&P 500 Index. Set II includes iShares, closed-end country funds, and the S&P 500 Index. Set III includes iShares, closed-end country funds, ADR portfolios and the S&P 500 Index. HK test (Huberman and Kandel (1987)) is the likelihood ratio test under OLS regression. FFK test (Ferson, Foerster and Keim (1993)) is the GMM Wald test under conditional heteroskedasticity. BU test (Bekaert and Urias (1996)) is the GMM Wald test under stochastic discount factor approach.

Panel A: April 1996 – December 2013

Country	*Benchmark Set I iShares and S&P 500*				*Benchmark Set II iShares, CECFs and S&P 500*				*Benchmark Set III iShares, CECFs, ADRs and S&P 500*			
	HK	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*
Australia	0.0000	0.0109	0.0193	0.0010	0.5645	0.8174	0.8199	0.0023	0.6793	0.8743	0.8755	0.0013
Austria	0.3784	0.5973	0.5997	0.0045	0.7082	0.7381	0.7392	0.0043	na	na	na	na
Belgium	0.0000	0.0243	0.0242	0.0031	na	na	na	na	na	na	na	na
Canada	0.5788	0.6780	0.6821	0.0000	0.6854	0.7647	0.7627	0.0000	na	na	na	na
France	0.0002	0.0240	0.0544	0.0003	0.1415	0.2207	0.2306	0.0003	0.0114	0.0276	0.0341	0.0005
Germany	0.0024	0.0496	0.0570	0.0004	0.0004	0.0235	0.0240	0.0000	0.0000	0.0079	0.0083	0.0001
Hong Kong	0.0000	0.0000	0.0199	0.0025	0.0000	0.0000	0.0093	0.0002	0.0000	0.0000	0.0101	0.0002
Italy	0.0036	0.0959	0.1527	0.0002	0.0805	0.1718	0.1837	0.0001	0.1951	0.3177	0.3410	0.0001
Japan	0.0000	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000	0.0008	0.0000	0.0000	0.0000	0.0001
Malaysia	0.0000	0.0000	0.0015	0.0028	0.0000	0.0000	0.0009	0.0032	na	na	na	na
Mexico	0.4498	0.5742	0.5820	0.0000	0.8754	0.9085	0.9088	0.0000	0.4640	0.5719	0.5630	0.0020
The Netherlands	0.0000	0.0032	0.0081	0.0025	na	na	na	na	na	na	na	na
Singapore	0.0000	0.0000	0.0000	0.0030	0.0000	0.0000	0.0000	0.0033	na	na	na	na
Spain	0.0003	0.0446	0.0744	0.0002	0.0100	0.1975	0.2296	0.0004	0.0006	0.0671	0.0922	0.0001
Sweden	0.0000	0.0024	0.0043	0.0019	na	na	na	na	na	na	na	na
Switzerland	0.0000	0.0000	0.0002	0.0027	0.0000	0.0087	0.0144	0.0006	0.0000	0.0068	0.0128	0.0000
United Kingdom	0.0000	0.0003	0.0096	0.0004	na	na	na	na	na	na	na	na
All Countries	0.0000	0.0000	0.0000	0.0217	0.0000	0.0000	0.0002	0.0114	0.0058	0.9704	0.1088	0.0018

Table VII - Continued

Panel B: April 1996 – December 2004

Country	*Benchmark Set I iShares and S&P 500*				*Benchmark Set II iShares, CECFs and S&P 500*				*Benchmark Set III iShares, CECFs, ADRs and S&P 500*			
	HK	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*
Australia	0.0010	0.0251	0.1019	0.0008	0.3535	0.5568	0.6067	0.0013	0.4211	0.4648	0.5244	0.0020
Austria	0.0002	0.0011	0.0021	0.0013	0.0031	0.0083	0.0128	0.0021	na	na	na	na
Belgium	0.0000	0.0009	0.0007	0.0122	na	na	na	na	na	na	na	na
Canada	0.0522	0.0906	0.1197	0.0052	0.6792	0.7399	0.7445	0.0046	na	na	na	na
France	0.0002	0.0070	0.0016	0.0089	0.0035	0.0533	0.0206	0.0106	0.0002	0.0080	0.0013	0.0125
Germany	0.1309	0.3656	0.3387	0.0080	0.4977	0.6942	0.6753	0.0058	0.4812	0.6736	0.6530	0.0058
Hong Kong	0.0001	0.0020	0.1927	0.0053	0.0001	0.0022	0.1916	0.0006	0.0001	0.0030	0.1967	0.0013
Italy	0.0001	0.0091	0.0026	0.0118	0.0042	0.0758	0.0382	0.0106	0.0054	0.0646	0.0320	0.0101
Japan	0.0000	0.0000	0.0000	0.0007	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000
Malaysia	0.0000	0.0000	0.0075	0.0026	0.0000	0.0000	0.0059	0.0038	na	na	na	na
Mexico	0.0774	0.1739	0.2038	0.0039	0.2731	0.3790	0.4058	0.0047	0.1356	0.2924	0.3324	0.0001
The Netherlands	0.0000	0.0074	0.0060	0.0130	na	na	na	na	na	na	na	na
Singapore	0.0000	0.0000	0.0002	0.0040	0.0000	0.0000	0.0005	0.0056	na	na	na	na
Spain	0.0002	0.0181	0.0057	0.0058	0.0019	0.0272	0.0113	0.0041	0.0000	0.0018	0.0004	0.0015
Sweden	0.0015	0.0096	0.0077	0.0100	na	na	na	na	na	na	na	na
Switzerland	0.0000	0.0000	0.0000	0.0116	0.0087	0.0631	0.0505	0.0023	0.0038	0.0381	0.0277	0.0003
United Kingdom	0.0000	0.0000	0.0000	0.0074	na	na	na	na	na	na	na	na
All Countries	0.0000	0.0000	0.0000	0.0203	0.0002	0.0037	0.0349	0.0140	0.0298	0.2321	0.0814	0.0136

Table VII - Continued

Panel C: January 2005 – December 2013

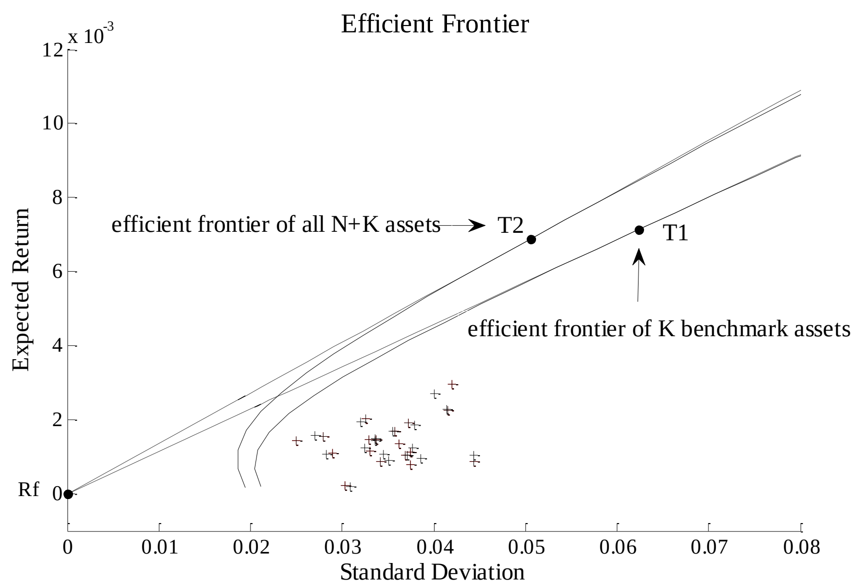
Country	*Benchmark Set I* *iShares and S&P 500*				*Benchmark Set II* *iShares, CECFs and S&P 500*				*Benchmark Set III* *iShares, CECFs, ADRs and S&P 500*			
	HK	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*	*HK*	*FFK*	*BU*	*ΔSHP*
Australia	0.0000	0.0063	0.0109	0.0016	0.0708	0.4730	0.4789	0.0045	0.0730	0.4767	0.4820	0.0044
Austria	0.1594	0.3039	0.2809	0.0086	na	na	na	na	na	na	na	na
Belgium	0.0001	0.1261	0.0768	0.0008	na	na	na	na	na	na	na	na
Canada	0.0409	0.0984	0.0548	0.0098	0.0624	0.1981	0.1280	0.0068	na	na	na	na
France	0.0346	0.2136	0.2831	0.0012	na	na	na	na	na	na	na	na
Germany	0.0025	0.0391	0.0717	0.0039	0.0000	0.0002	0.0009	0.0074	0.0000	0.0000	0.0004	0.0042
Hong Kong	0.0000	0.0001	0.0020	0.0002	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0003	0.0000
Italy	0.1714	0.4220	0.4795	0.0011	na	na	na	na	na	na	na	na
Japan	0.0000	0.0014	0.0048	0.0011	0.0000	0.0013	0.0050	0.0013	0.0000	0.0006	0.0027	0.0002
Malaysia	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0006	na	na	na	na
Mexico	0.8155	0.7767	0.7500	0.0055	0.7859	0.7620	0.7275	0.0059	0.7602	0.7130	0.6657	0.0074
The Netherlands	0.0001	0.0161	0.0330	0.0001	na	na	na	na	na	na	na	na
Singapore	0.0000	0.0004	0.0032	0.0004	0.0000	0.0002	0.0013	0.0002	na	na	na	na
Spain	0.0102	0.1605	0.2166	0.0004	0.0736	0.4351	0.4631	0.0001	0.6601	0.8741	0.8775	0.0002
Sweden	0.0002	0.0255	0.0327	0.0002	na	na	na	na	na	na	na	na
Switzerland	0.0001	0.0406	0.0779	0.0007	0.0004	0.0780	0.1211	0.0009	0.0025	0.1156	0.1659	0.0016
United Kingdom	0.0481	0.3333	0.4208	0.0004	na	na	na	na	na	na	na	na
All Countries	0.0000	0.0162	0.0004	0.0327	0.0000	0.0000	0.0001	0.0186	0.0000	0.0177	0.0103	0.0127

extra gains are relatively small.

As expected, the *p*-values increase as moving sequentially from Set I to Set III. Take Set II fro example, HK test fails to reject spanning for three more countries: Australia, France, and Italy. Though most of the joint tests still reject spanning, both FFK and BU joint test fail to reject spanning at the 5% level for Set III. The results indicate that adding CECFs and ADR portfolios into the benchmark set increases the likelihood that foreign market index returns are mean-variance spanned by U.S. traded assets.

Figure 2A

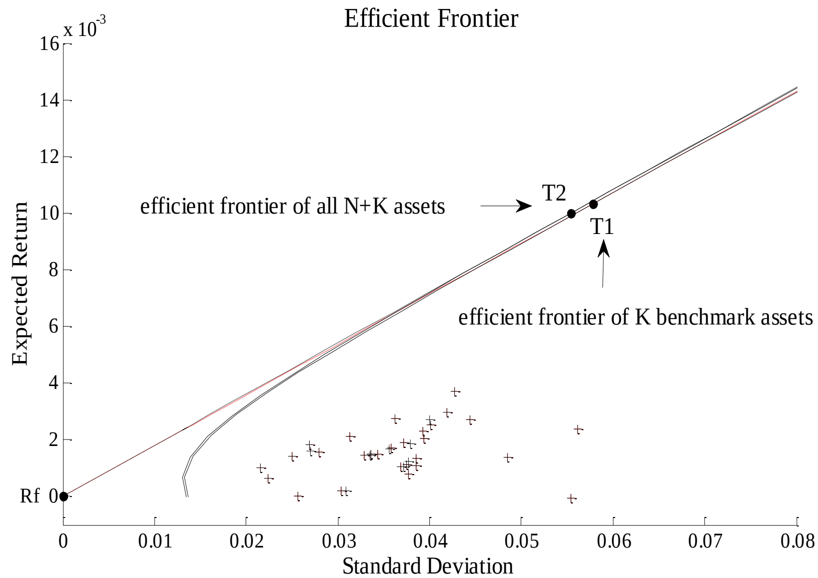
Shift of Mean-Variance Frontier after Adding MSCI Indices into Domestic Benchmark Set I



This figure plots the efficient frontiers of two assets sets. The sample consists of all seventeen countries. The benchmark assets set include the U.S. S&P 500 Index and iShares. The augmented assets set combine the seventeen MSCI indices and the benchmark assets set. Weekly risk free rate is set to be zero and short-sales are allowed. T1 and T2 denote two corresponding tangency portfolios, respectively. "+"s denote the positions of all *N+K* assets.

Figure 2B

Shift of Mean-Variance Frontier after Adding MSCI Indices into Domestic Benchmark Set III



This figure plots the efficient frontiers of two assets sets. The sample consists of nine countries where both corresponding closed-end country funds and ADR portfolio are available. The benchmark assets set include the U.S. S&P 500 Index, iShares, closed-end country funds and ADR portfolios. The augmented assets set combine the nine MSCI indices and the benchmark assets set. Weekly risk free rate is set to be zero and short-sales are allowed. T1 and T2 denote two corresponding tangency portfolios, respectively. "+"s denote the positions of all $N+K$ assets.

Figure 2A and 2B illustrate the result above. Figure 2A plots the shift of the efficient frontier after adding 17 MSCI indices into the benchmark set comprised of the S&P 500 Index and 17 iShares. Figure 2B plots the shift of the efficient frontier after adding 9 MSCI indices into the benchmark set comprised of the S&P 500 Index and all iShares, CECFs, and ADR portfolios for 9 countries. The shift of efficient frontiers is far greater in Figure 2A than in Figure 2B. Consistent with the result of mean-variance spanning test, the two efficient frontiers almost overlap in Figure 2B. Based on these results, we conclude that though iShares alone fail to replace the foreign market indices, a combination of iShares, CECFs, and ADR portfolios could exhaust the gains from unattainable direct foreign investment. Therefore, investing in assets that trade only abroad would not be necessary to obtain the benefits from international diversification.

For robustness check, Panel B and C report the results for two subperiods. Similar with the results of Panel A, tests for Set I reject spanning for most countries and the *p*-values increase as moving sequentially from Set I to Set III for both 1996–2004 and 2005–2013.

5. Conclusion

iShares have become one of the most popular international diversification instruments in the U.S. This article investigates the diversification benefits of iShares and their rivals: closed-end country funds and American Depository Receipts between April 1996 and December 2004. Three important issues relating to these securities and international investment are addressed.

First, do iShares and their rivals provide effective diversification gains? We find that iShares, CECFs and ADR portfolios all exhibit significant exposure to the U.S. market factor. Because of the open-end nature of iShares, CECFs, and ADRs behave more like U.S. stocks than iShares. However, the limits of international arbitrage make iShares behave more like U.S. stocks than their NAVs. Despite their exposure to U.S. market factor, iShares, CECFs and ADR portfolios all maintain significant exposure to their home country market factors. Based on correlations and portfolio optimization, we confirm that all these securities provide important diversification gains. However, the results do not support the hypothesis that iShares can excel CECFs and ADRs.

Second, can iShares replace CECFs and ADRs for international diversification? The results of three mean-variance spanning tests provide strong evidence that iShares are not able to totally replace CECFs and ADR portfolios. Therefore, both CECFs and ADRs can maintain their roles as international diversification tools, even facing the competition from iShares. This result also tends to forecast the coexistence of iShares, CECFs and ADRs in the future.

Third, can these domestically traded securities achieve the same diversification gains of costly direct foreign investment? The results of mean-variance spanning tests show that though highly correlated with the foreign market indices, iShares fail to substitute for them. However, a combination of iShares, CECFs, and ADR portfolios could exhaust the gains from direct foreign investment. Therefore, the necessity of investing in assets that trade only abroad is questionable.

One unsolved issue needs further study. It is not clear why iShares provide lower diversification gains than CECF and ADRs. One possible reason is that ADR portfolios and actively managed CECFs concentrate on better than average firms from their respective markets, while iShares contain more extensively value-weighted assets. Another reason could be that belonging to the same fund family, iShares may have higher correlations between each other than the relatively independent CECFs and ADRs.

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Appendix: List of Eligible Securities

Period: April 2, 1996 – December 31, 2013

Country	*iShares*	*Close-End Country Funds*			*ADR Portfolios*
	Ticker	*Fund name*	*Ticker*	*Period*	*Number of ADRs*
Australia	EWA	First Australia Fund	IAF	1985-	25
		First Australia Prime Income	FAX	1986-	
Austria	EWO	Austria Fund	OST	1989-2002	
Belgium	EWK				
Canada	EWC	Central Fund of Canada	CEF	1986-	
France	EWQ	France Growth Fund	FRF	1990-2004	25
Germany	EWG	Germany Fund	GER	1986-2005	21
		New Germany Fund	GF	1990-	
		Future Germany Fund	FGF	1990-1995	
		Emerging Germany Fund	FRG	1990-1999	
Hong Kong	EWH	China Fund	CHN	1992-	9
		Great China Fund	GCH	1992-	
		Jardine Fleming China Fund	JFC	1992-	
Italy	EWH	Italy Fund	ITA	1986-2003	12
Japan	EWJ	Japan Equity Fund	JEQ	1992-	27
		Japan Smaller Capitalization Fund	JOF	2002-	
Malaysia	EWM	Malaysia Fund	MF	1987-2012	
Mexico	EWW	Emerging Mexico Fund	MEF	1990-1999	21
		Mexico Equity & Income	MXE	1990-	
		Mexico Fund	MXF	1981-	
The Netherlands	EWN				17
Singapore	EWS	Singapore Fund	SGF	1990-	
Spain	EWP	Spain Fund	SNF	1988-2010	7
		Growth Fund of Spain	GSP	1990-1998	
Sweden	EWD				
Switzerland	EWL	Swiss Helvetia Fund	SWZ	1987-	7
United Kingdom	EWU		UKM	1987-1999	54
Total Units	17	24			225

Source: iShares, Inc.
Yahoo Finance & Close-End Fund Forum
The Bank of New York - ADR Director