

Equity Home Bias and the Euro

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Abstract

This paper examines explanations for the equity home bias puzzle by utilizing the introduction of the euro in 1999 as a natural experiment. The introduction of the euro and the coordination of monetary policy across the Euro Area (EA) allows for a closer examination of this puzzle. Optimal foreign equity shares are derived from a version of the CAP-M and then empirically tested using detailed data from the IMF's *Coordinated Portfolio Investment Survey* covering the foreign equity holdings of 23 countries for the years 1997 and 2001-2004. While equity home bias has fallen worldwide over this period, by far the sharpest drop has been for intra-EA equity holdings with home bias falling from 68% to 29% between the pre and post-euro periods. Several explanations for this drop are tested, with the reduction in information asymmetries emerging as the most promising candidate.

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1. Introduction

Why do investors hold so much of their wealth in domestic equity when empirical evidence indicates both higher returns and lower risk through increased international diversification? An influential study by French and Poterba (1991) highlighted this puzzle, finding that to rationalize the dearth of international diversification among investors, expected returns on home-country equity would have to be several hundred basis points greater than those in foreign markets, an expectation far from reality.¹

To put equity home bias in perspective, consider consumption smoothing. In a closed economy, consumption is entirely determined by output. You consume either out of your income or from your savings, which are both functions of domestic output. If output falls, so too does consumption. In an open economy, there is an opportunity to diversify consumption risk across borders. By holding foreign equity, your consumption will depend not only on your own country's output, but also on the output of all foreign countries whose equity you hold. In a complete market, consumption risk will be equally shared across countries and we should observe consumption growth rates equalize across countries (since everyone can diversify consumption risk internationally). While theoretically sound, this argument has not held up empirically, what Lewis (1999) refers to as "Consumption Home Bias." To illustrate, Table 1 shows consumption and output growth rate correlations over the period 1950-2004 for the G-7 countries. Consumption correlations are not significantly different than output correlations, an observation at odds with the concept of consumption risk diversification. Thus, opportunities for lower risk in both savings and in consumption are not being exploited.

Has the formation of the Euro Area (EA) had any effect on home bias? I examine this issue in the context of how the adoption of a common currency and monetary policy has influenced the popular explanations for equity home bias. One prominent explanation is that foreign equity carries additional exchange rate risk. Within the EA, the adoption of a common currency eliminates nominal risk, lowering one of the potential barriers to international diversification. Another posited explanation is that domestic equity serves as a superior inflation hedge. A common monetary policy across the EA, should lead to greater price convergence, reducing the comparative advantage of domestic equity as an inflation hedge. The most successful explanation for equity home bias thus far is that investors only have limited information on foreign equity, causing them to invest in "what they know." As the formation of

¹ French and Poterba estimate the domestic equity share of the total equity portfolio at 79% in Germany, 89.4% in France, 92% in the UK, 92.2% in the U.S., and 95.7% in Japan.

the EA should lead to increased cross-border trade and investment, information flows between EA members should also increase.

Effectively, the EA has reduced the economic significance of national borders between member states. Should we therefore expect to see greater cross-border equity holdings within this area? This is precisely the result I find here. Prior to 1999, intra-EA equity holdings display a 32.3% correlation with the optimal portfolio suggested by the international capital asset pricing model (ICAPM). After the formation of the EA, intra-EA holdings display a 71.0% correlation with this optimal portfolio. While it's true that home biases have declined worldwide over this period, by the declines across the EA have been an order of magnitude larger. This study presents compelling evidence that the adoption of a common currency has led to significant increases in portfolio diversification across the EA.

Several recent studies have examined this issue and found a similar result. De Santis (2006) finds that between 1998 and 2001, the introduction of the euro led to increased portfolio flows of \$22-47 billion in equities and \$32-76 billion in bonds. He argues that while some of this can be attributed to reduced transaction costs of a common currency, the merging of the Amsterdam, Brussels, and Paris stock exchanges into Euronext surely played a role. De Santis and Gerard (2006), using a different methodology, also find evidence of the euro reducing home bias. My paper builds upon the existing literature in several ways. First, my post-1999 sample covers the period 2001-2004. By including a longer post-euro period, there is less of a chance that some idiosyncratic characteristics of 2001 (the year used in both papers discussed above) are being misinterpreted as euro effects. Second, this study breaks down equity holdings into four distinct groups based on a country's membership in the EA. Doing so allows for better identification of the effects of the euro. Finally, whereas the two previous studies focused on monetary aspects of a single currency, my paper focuses on how the formation of a single currency area increases information flows through stronger trade linkages.

2. Are there Gains from International Diversification?

The welfare loss associated with investors' preferences for domestic equity depends on the opportunity cost of equity home bias. What are investors missing out on by not increasing foreign equity exposure? One way to assess the potential gains from international diversification is through mean-variance analysis. This method allows us to examine the both the risk and return on different equity portfolios, comparing a purely domestic equity portfolio to ones with increasing shares of foreign equity. As this study focuses on the effects of the euro on equity

home bias, the analysis in this section will focus on international diversification from the perspective of two investors: one located in the UK and another in Germany.

For the UK investor, the mean-variance analysis is constructed by taking the average monthly returns on both the MSCI UK index and the MSCI Europe excluding the UK index.² A series of 21 portfolios ranging from 100% UK equity (0% European) to 0% UK (100% European) equity are constructed in increasing increments of 5% European equity. Figures 1a and 1b plot the average monthly return and monthly standard deviation for each of these equity portfolios across the time periods 1990-1998 (pre-euro) and 1999-2004 (post-euro) respectively.

Looking at Figure 1a, we see that prior to the introduction of the euro, all portfolios with greater than 50% UK equity are strictly dominated by portfolios with greater foreign equity (i.e. have both lower returns and higher risk).³ The optimal portfolio selected by a hypothetical British investor will depend on their tolerance for risk, with the share of European equity increasing with risk tolerance. The key point, however, is that even the most risk averse British investor should have only held 50% domestic equity in the pre-euro period, a share far smaller than what British investors actually held.⁴

Did the gains from international diversification change for British investors after the introduction of the euro? Figure 1b presents evidence that there remain gains, though a larger domestic equity share may be justified. In the post-euro period, the portfolio composed entirely of British equity actually earns a negative return. It is however, the portfolio with the lowest risk. If we assume that investors at least want a positive return, then they should never have more than 60% British equity in their portfolio, again higher than the observed share (the UK domestic equity share in 2002 was 73%).

Figures 2a and 2b paint an even starker picture. In these graphs, the average return and variance of a range of portfolios for the typical German investor are plotted. The portfolios range from 100% German equity to 100% Euro Area equity. Similarly to the “Europe excluding the UK” portfolio, the composite Euro Area portfolio is constructed as a market capitalization weighted average of the MSCI indexes for the Euro Area countries (excluding Germany). Figure 2a illustrates that a portfolio composed of 95% Euro Area equity strictly dominates any portfolio

² The MSCI Europe ex. UK index is a weighted average of the MSCI country indexes for 15 European countries, where the weights are determined by each country’s share of total European market capitalization.

³ The term “foreign equity” here means European equity. Clearly, UK investors could diversify into non-European markets (such as the US). The empirical methodology will account for truly global diversification.

⁴ French and Poterba (1991) estimate the share of domestic equity in the British investor’s portfolio to be 92%. In 1997, I estimate that the domestic equity share for the UK is 79%. In both cases, the observed portfolio share is strictly dominated in the mean-variance analysis by a smaller domestic equity share.

containing more than 5% German equity. Assuming zero transactions costs between markets and complete information, this result implies that German investors should be nearly completely diversified internationally. After the introduction of the euro (Figure 2b) the portfolio with *zero* German equity dominates all others. The key point is that there are indeed gains to be made, even by diversifying risk across the EA.⁵

3. Explanations for Home Bias

Given the strong incentive for investors to diversify their wealth portfolios across borders, why do they not do so? Various explanations for the home bias puzzle have been offered with varying empirical success. The main explanations for home bias are:

1. Transactions costs limit foreign equity ownership
2. Domestic assets provide a superior hedge against inflation
3. Foreign equities carry additional exchange rate risk
4. International diversification can be indirectly achieved by investing in multinationals
5. Limited information about foreign equity causes investors to stick with what they know in the domestic equity market.

Explanations for home bias can be put into perspective by examining a theoretical model derived by Michaelides (2003). In the presence of liquidity constraints and undiversifiable labor income risk, any positive correlation between domestic asset returns and income shocks may lead to portfolios completely composed of foreign equity (consumption smoothing). However, equity home bias may actually be justified as optimal behavior in the presence of market imperfections such as transaction costs, premiums on domestic assets, or exchange rate risk.

While theoretically appealing, explanations for home bias have not performed well in empirical tests. The argument that transactions costs limit foreign equity ownership is strongly refuted by Tesar and Werner (1995), who find that the turnover rate on foreign equity is much higher than that on domestic equity, a result suggesting *lower* transactions costs. On the other hand, Amadi and Bergin (2006) argue that while turnover rates are high for investors who have already taken the plunge into foreign markets, they ignore the potentially high fixed costs of foreign market entry. These fixed costs prevent a subset of investors from any international diversification. Cooper and Kaplanis (1994) examine the superiority of domestic equity as an inflation hedge and find that while domestic equity does perform well in this regard, this alone is

⁵ While not depicted, a similar analysis reveals gains to be made for the other EA nations as well, though not quite as dramatic as those for German investors.

not enough to justify the missed gains from international diversification unless investors are significantly more risk averse than what has been empirically measured.

Exchange rate volatility clearly adds an extra element of risk to international diversification. Fidora, Fratzscher, and Thimann (2006) look at the impact of real exchange rate volatility on equity home bias. They find that currency risk is of secondary importance, having only pronounced effects for assets with low volatility in local currency returns. Their study suggests that the elimination of exchange rate volatility would reduce home bias in bonds (low return volatility) by 60%, but only reduce home bias in equities (high return volatility) by 20%. Currency risk matters, but it alone cannot explain the observed massive home biases in equities.

Can investors achieve international diversification indirectly through multinationals? Early work by Jacquillat and Solnik (1978) demonstrated that this channel cannot provide much diversification, finding that only 2% of the variance in US multinational equity returns can be attributed to the foreign markets they operate in. More recent evidence is given by Rowland and Tesar (1998) and Cai and Warnock (2006). In both studies, investing in multinationals does provide some international diversification, reflecting the expansion of multinational activity over the past 20 years, but there are still significant gains to be made from direct diversification.

One explanation that has had some empirical success is the existence of informational asymmetries between domestic and foreign assets. While Jeske (2001) finds that information asymmetries alone cannot explain away the puzzle, numerous studies have found that asymmetric information is a critical consideration. Coval and Moskowitz (1999) find that even within the same country, home bias exists. Matching the location of a mutual fund manager with the headquarters of the firms held by the fund, the authors find that managers exhibit a strong preference for locally headquartered firms. Strong and Xu (2003) approach this issue with survey data, finding that mutual fund managers in the US, UK, continental Europe, and Japan all display significant optimism toward the performances of their home country markets. Faruquee, Li, and Yan (2004) estimate an augmented gravity model of equity holdings and find that one of the variables that performs remarkably well is information asymmetry as proxied for by distance. Portes and Rey (2005) proxy information asymmetries with telephone traffic between countries, foreign bank branches in a country, and the number overlap hours in equity trading markets. All of these variables prove to significantly affect bilateral equity flows. Barber and Odean (2005) provide more evidence for the information argument, finding that institutional investors tend to trade in only a small subset of equities, generally those they already own. Fellner and Maciejovsky (2003) use experimental methods to find that social identification with an equity can lead to domestically biased portfolios. Grinblatt and Keloharju (2001) find that these information

asymmetries may be present, even between neighboring and fairly culturally similar nations, with Finnish investors displaying a strong preference for Finnish firms over Swedish firms and vice versa.

With the asymmetric information argument, aren't we just replacing the puzzle of capital immobility across borders with one of information immobility? If the returns to greater international diversification are so large, then why aren't investors breaking down information barriers? This is the argument made by Van Nieuwerburgh and Veldkamp (2007). They argue that investors have a comparative advantage in processing information about local assets and maximize this advantage by investing in local assets. It's not that information is immobile across borders, but that investors purposefully (and perhaps rationally) choose to ignore it. In either case, equity home bias results from domestic investors having different information sets than foreign investors (whether by individual choice or by market imperfection).

How has the adoption of a common currency and a single monetary policy across the EA affected equity home bias? To answer this question, we must look at how the euro has affected the five explanations for home bias outlined above. The merging of the Amsterdam, Brussels, and Paris stock exchanges into Euronext certainly reduced variable transaction costs. The adoption of a common currency may also reduce fixed entry costs. For example, if setting up an optimal exchange rate hedging strategy prevented some investors from entering foreign markets before, this barrier is eliminated with the adoption of a common currency. Similarly, the additional nominal exchange rate risk carried by foreign assets is eliminated within the EA, lowering one of the costs of international diversification. The presence of a common monetary policy and increased trade within the union should lead to price convergence. As a result, the superiority of domestic assets as an inflation hedge is reduced. Finally, greater economic integration should lead to more information flows across borders, reducing asymmetric information (or information advantages) between domestic and foreign equity. Therefore, we should expect equity home bias within the EA to fall after the introduction of the euro.

These arguments depend on there still being a motivation to diversify intra-EA. If equity markets within the EA are perfectly correlated, then there is no incentive to diversify. Frankel and Rose (1998) argue that the increased coordination of business cycles necessary for an optimal currency union is itself a self-fulfilling prophecy. Do increased output correlations lead to greater equity market correlations? Several studies have examined this issue and while it appears that equity markets have become more synchronized since 1999, this result is highly dependent on the sample period being studied. Rouwenhorst (1998) looks at equity market correlations from 1993-1998 (the convergence period for the EA) and finds little evidence that correlations increased

during this period. Hardouvelis, Malliaropulos, and Priestly (2001) allow for a time-varying degree of integration and find that the equity markets that are the most integrated over this period are those that have the smallest forward interest rate differentials with Germany, as these markets were perceived to be the ones most likely to adopt the euro. Adjaoute and Danthine (2000) confirm the increase in EA equity market correlations using Box and Jenrich tests of the stability of the intra-EA return correlation matrix. In a later paper that extends the sample through mid-2001, however, Adjaoute and Danthine (2001) find that in fact, return correlations have fallen. They argue that their conflicting results may be due to a cyclical trend in equity market correlations, and filtering out the trend would reveal a long-run increase in EA correlations.

The central question asked by this study is whether or not a common currency reduces equity home bias. If in fact equity market correlations have increased since the introduction of the euro, then the incentive to diversify across the EA is reduced. In this case, any evidence that home bias fell following the adoption of the euro is likely to be a lower bound estimate of how a common currency can increase diversification through eliminating currency risk and increasing information flows.

4. The Optimal Share of Foreign Equity

In this section, a simplified version of the ICAPM is used to construct a model in which the adoption of a common currency affects the share of foreign equity held in domestic portfolios. Using the framework in Lewis (1999), assume that there are two countries in the world: home (h) and foreign (f). From the point of view of a home investor, the share of foreign equity in her wealth portfolio is given by χ^f and the share of domestic equity is $1 - \chi^f$. The investor's utility is increasing in expected wealth, but decreasing in the variance of wealth. Her objective function is given by:

$$U = U\left(E[W_{t+1} | I_t^h], \text{Var}[W_{t+1} | I_t^h]\right) \quad (1)$$

$$\text{with } \frac{\partial U}{\partial E[W_{t+1} | I_t^h]} > 0 \text{ and } \frac{\partial U}{\partial \text{Var}[W_{t+1} | I_t^h]} < 0$$

W_t is the investor's real wealth at time t , I_t^h is the home investor's information set at time t , while $E[\]$ and $\text{Var}[\]$ are the expectations and variance operators respectively. Without loss of generality, assume that the investor's wealth is composed entirely of the value of her portfolio. Under this assumption, we may derive the following expressions:

$$E[W_{t+1} | I_t^h] = W_t \left(1 + \chi_t^f E[r_{t+1}^f | I_t^h] + (1 - \chi_t^f) E[r_{t+1}^h | I_t^h]\right) \quad (2)$$

$$Var(W_{t+1}) = W_t^2 \chi_t^{f^2} Var(r_{t+1}^f) + W_t^2 (1 - \chi_t^f)^2 Var(r_{t+1}^h) + 2W_t^2 \chi_t^f (1 - \chi_t^f) Cov(r_{t+1}^h, r_{t+1}^f) \quad (3)$$

Define real returns as r_t^i , where the superscript i refers to the asset's country of origin (e.g. an equity issued by a firm located in country i) The real return on an asset is a function of its nominal return R_t , inflation in the investor's home country π_t , and the nominal exchange rate expressed in units of foreign currency per home currency s_t . The real returns on various assets are given by:

$$\begin{aligned} \text{Home Investor:} \quad r_t^h &= R_t^h - \pi_t \\ r_t^f &= R_t^f - \pi_t - s_t \end{aligned} \quad (4)$$

$$\begin{aligned} \text{Foreign Investor:} \quad r_t^{*h} &= R_t^h - \pi_t^* + s_t \\ r_t^{*f} &= R_t^f - \pi_t^* \end{aligned}$$

Home investors have limited information about foreign assets and foreign investors have limited information on home assets. Assume that the return on a foreign asset is predicted with a greater degree of uncertainty by a home investor than one living in the foreign country:

$$\begin{aligned} r_{t+1}^f &= r_{t+1}^{f*} + u_t; \quad u_t \sim (0, \eta) \\ E(r_{t+1}^f | I_t^h) &= E(r_{t+1}^f | I_t^f) + E(u_t) = E(r_{t+1}^f | I_t^f) \\ Var(r_{t+1}^f | I_t^h) &= Var(r_{t+1}^f | I_t^f) + \eta \end{aligned} \quad (5)$$

Both home and foreign investors form the same expectation about the foreign equity, but the foreign investors are able to form this prediction with greater certainty than the home investor due to asymmetric information. For symmetry, note that:

$$\begin{aligned} r_{t+1}^{h*} &= r_{t+1}^h + u_t; \quad u_t \sim (0, \eta) \\ E(r_{t+1}^{h*} | I_t^f) &= E(r_{t+1}^{h*} | I_t^h) + E(u_t) = E(r_{t+1}^{h*} | I_t^h) \\ Var(r_{t+1}^{h*} | I_t^f) &= Var(r_{t+1}^{h*} | I_t^h) + \eta \end{aligned} \quad (6)$$

The home country asset is predicted with greater error by foreign investors due to their limited information set compared to home country investors. To determine optimal portfolio shares, the investor will maximize the objective function given by 1 with respect to χ^f , substituting in the definitions given by 2, 3, and 5. The resulting first order condition is:

$$\frac{\partial U}{\partial \chi_t^f} = \frac{\partial U}{\partial E[W_{t+1} | I_t^h]} \frac{\partial E[W_{t+1} | I_t^h]}{\partial \chi_t^f} + \frac{\partial U}{\partial Var[W_{t+1} | I_t^h]} \frac{\partial Var[W_{t+1} | I_t^h]}{\partial \chi_t^f} = 0 \quad (7)$$

Assuming a utility function with constant relative risk aversion, equation 7 can be expressed as:

$$2W_t * \frac{\partial E[W_{t+1} | I_t^h] / \partial \chi_t^f}{\partial \text{Var}[W_{t+1} | I_t^h] / \partial \chi_t^f} = \gamma \quad (8)$$

Where $\gamma = -2W_t * \frac{\partial U / \partial \text{Var}[W_{t+1} | I_t^h]}{\partial U / E[W_{t+1} | I_t^h]}$ is the coefficient of relative risk aversion. Using these

conditions, the optimal share of foreign equity is given by:⁶

$$\chi_t^f = \frac{(E_t r_{t+1}^f - E_t r_{t+1}^h) / \gamma + \text{Var}(r^h) - \text{Cov}(r^h, r^f)}{\text{Var}(r^f - r^h) + \eta} + \frac{\text{Var}(r^h) - \text{Cov}(r^h, r^f)}{\text{Var}(r^f - r^h) + \eta} \quad (9)$$

The optimal foreign equity share is a function of the expected excess return of foreign equity, the degree of risk aversion, the variability of home returns, the correlation between home and foreign returns, the volatility of excess foreign returns, and the added uncertainty due to asymmetric information. The first term is fairly straightforward, stating that investors should increase their foreign equity exposure if foreign equity is expected to outperform domestic equity. This is tempered, however, by the investor's risk tolerance. The greater the investor's risk aversion, the lower the weight she places on equity performance.

The second additive term deals with relative uncertainty in home and foreign equity, what Lewis (1999) refers to as "the portfolio share that minimizes the variance of the wealth portfolio." Let us rewrite 9 to give an easier interpretation:

$$\chi_t^f = \frac{(E_t r_{t+1}^f - E_t r_{t+1}^h) / \gamma + \frac{\sigma_h^2 (1 - \rho \frac{\sigma_f}{\sigma_h})}{\text{Var}(r^f - r^h) + \eta}}{\text{Var}(r^f - r^h) + \eta} \quad (9')$$

The standard deviations of home and foreign equity returns are given by σ_h and σ_f , while the correlation between home and foreign returns is ρ . As home returns become more volatile relative to foreign returns, the optimal share of foreign equity rises. This dynamic is mitigated, however, by the correlation between home and foreign returns. In the extreme case where the returns are perfectly positively correlated, then there is no diversification benefit from foreign returns and investors only care about the expected return differential. When home and foreign returns are perfectly negatively correlated, foreign returns are perfect for diversification and the optimal share increases with the volatility of *both* home and foreign returns. Finally, zero correlation between returns implies that the risk incentive to diversify into foreign equity is entirely determined by the volatility of home returns. Each of the additive terms in the numerator is deflated by both the variance of excess foreign returns and the prediction error due to

⁶ Note that we have dropped the conditional notation for ease of exposition. Throughout the paper, assume that all expectations are formed using information available to the investor at time t .

asymmetric information. When excess foreign returns are more volatile, investors reduce their foreign asset position. The same is true when information about foreign markets is limited.

How is the optimal share of foreign equity affected within a currency union? To examine this issue, we must first deconstruct the optimal foreign equity share (9) into nominal returns, inflation, and exchange rates, the components of real returns. Our analysis will be simplified by making two assumptions:

1. Expected inflation is built into the nominal returns of all assets. Thus the real return is a function of *unanticipated* inflation, which has an expected value of zero: $E(\pi) = 0$.
2. Nominal exchange rate movements cannot be predicted, making the expected change in the nominal exchange rate equal to zero: $E(s) = 0$.⁷

Using these assumptions, we can derive the following results for the variance and covariance of home and foreign asset returns:

$$Var(r^h) = Var(R^h) + Var(\pi) - 2Cov(R^h, \pi) \quad (10a)$$

$$Var(r^f) = Var(R^f) + Var(\pi) + Var(s) - 2Cov(R^f, \pi) - 2Cov(R^f, s) + 2Cov(\pi, s) \quad (10b)$$

$$Cov(r^h, r^f) = Cov(R^h, R^f) - Cov(R^h, \pi) - Cov(R^f, \pi) - Cov(R^h, s) + Cov(\pi, s) + Var(\pi) \quad (10c)$$

Substituting 10a-10c into 9 yields:

$$\chi_t^f = \frac{(E_t r_{t+1}^f - E_t r_{t+1}^h) / \gamma}{Var(r^f - r^h) + \eta} + \frac{Var(R^h) - Cov(R^h, R^f)}{Var(r^f - r^h) + \eta} + \frac{Cov(R^f - R^h, \pi)}{Var(r^f - r^h) + \eta} - \frac{Cov(r^h, s)}{Var(r^f - r^h) + \eta} \quad (11)$$

The second additive term in this expression is analogous to the second term in equation 9, only using nominal as opposed to real returns. The third term is an inflation hedge term. If foreign excess returns are highly correlated with inflation, then foreign equity serves as an effective hedge against inflation. If, on the other hand, domestic equity returns tend to increase more with inflation, then this term will cause the optimal foreign share to fall. The fourth term captures the depreciation risk of foreign equity. As the nominal exchange rate rises, the real return on foreign equity falls. If domestic returns and the nominal exchange rate are highly correlated, it is more likely that domestic real returns will outperform foreign real returns.

⁷ Validation for this assumption can be found in the empirical success of the random walk model for exchange rates. If exchange rates follow a random walk, the best prediction for the exchange rate tomorrow is the exchange rate today, making the expected change in exchange rates equal to zero.

This last term addressed the co-movement between domestic returns and the exchange rate, but what about standalone exchange rate risk? To assess this, let us decompose the common denominator in 11. With some manipulation, this can be re-written as:

$$Var(r^f - r^h) = Var(R^f - R^h) + Var(s) + 2Cov(R^h - R^f, s) \quad (12)$$

Thus, any increase in exchange rate volatility will cause 12 to increase, in turn lowering the optimal share of foreign equity. To summarize these relations, we define and sign the optimal foreign equity share as:

$$\chi_t^f = f \left[\begin{array}{cccccccc} E_t r_{t+1}^f, & E_t r_{t+1}^h, & \gamma, & Var(R^h), & Cov(R^h, R^f), & Cov(R^f - R^h, \pi), & Cov(r^h, s), & Var(s) \\ (+) & (-) & (-) & (+) & (-) & (+) & (-) & (-) \end{array} \right] \quad (13)$$

What effect, if any, will the formation of the EA have on the optimal share of foreign equity in a wealth portfolio? To answer this question, we must see how the formation of the EA affected the determinants of optimal foreign holdings given in 13. We can divide the impact of the EA into four categories of foreign equity holdings:

1. The share of foreign EA equity in a domestic EA portfolio
2. The share of foreign non-EA equity in a domestic EA portfolio
3. The share of foreign EA equity in a domestic non-EA portfolio
4. The share of foreign non-EA equity in a domestic non-EA portfolio.

An example of case 1 would be the share of French equity in a German investor's portfolio, while case 2 would be the share of British equity held by the German investor. Case 3 could represent the share of German equity in a British investor's portfolio, while case 4 could be the share of Swedish equity held by the British investor.

First examine case 1. There is no a priori reason to believe that the EA has fundamentally changed expected asset returns across the union, investors' risk tolerance, or the idiosyncratic variance of nominal returns. Within the EA, the correlation between equity returns has increased with economic integration, implying that intra-EA foreign holdings should fall. However, this same process of economic integration should reduce asymmetric information within the EA, increasing the optimal foreign equity share. The elimination of multiple currencies causes nominal exchange rate volatility to fall to zero, again increasing the optimal

foreign share.⁸ Furthermore, the coordination of monetary policy across the union should lead to a harmonization of inflation rates, reducing the comparative advantage of domestic equity as an inflation hedge. Summarizing the above discussion:

$$\text{The EA reduces } \chi^f : \frac{\partial \text{Cov}(R^h, R^f)}{\partial EA} > 0$$

$$\text{The EA increases } \chi^f : \frac{\partial \text{Cov}(R^f - R^h, \pi)}{\partial EA} > 0, \frac{\partial \text{Var}(s)}{\partial EA} < 0, \frac{\partial \eta}{\partial EA} < 0$$

Whether or not the formation of the EA causes equity holdings across the currency union to increase will depend on which set of effects dominates. If markets have become so highly correlated that the benefits of diversification are washed out, then intra-EA holdings should fall. If there are still benefits to diversifying intra-EA, then reduced risk on foreign equity brought about by the adoption of a single currency and coordinated monetary policy should lead to greater equity holdings across the currency union. It is difficult to make similar prediction regarding cases 2-4, as much will depend on how non-EA markets responded to the formation of the EA. The rest of the paper empirically estimates these effects.

5. The Data

Domestic holdings of foreign equity are obtained from the IMF's *Coordinated Portfolio Investment Survey* (CPIS). The IMF first instituted this survey in 1997 in response to global inconsistencies in balance of payments data, especially in portfolio investment flows. Twenty-seven countries participated in the 1997 study, with coverage increasing to over 60 countries in the annual surveys beginning in 2001. The foreign equity holdings of 23 reporting countries that hold assets issued by 43 partner countries for the years 1997 and 2001 – 2004 are sampled. Only those nations that have significant foreign equity holdings spread over a fairly wide range of countries were selected as reporters. The 43 partner countries were selected on the basis of market capitalization, representing the most likely destinations for foreign capital.

The CPIS dataset and market capitalization data are used to construct equity portfolios for each reporter country. The reporter's equity portfolio is defined as the total value of domestic equity (as measured by market capitalization) less those held by foreigners plus the total value of foreign assets held at home. These portfolios are computed as:

⁸ This will also cause the covariance between real domestic returns and the nominal exchange rate to fall to zero, increasing the optimal foreign share.

$$D_i = M_i - \sum_{j \neq i}^K e_{j,i} + \sum_{j \neq i}^K e_{i,j} \quad (14)$$

For example, the equity portfolio for reporter “1” is equal to the total market capitalization in country 1 (M_1), less the total value of country 1 equity held by foreign countries ($e_{2,1} + e_{3,1} + \dots + e_{K,1}$), plus the total value of foreign equity held by country 1 ($e_{1,2} + e_{1,3} + \dots + e_{1,K}$). The share of a particular foreign country j 's equity in the reporter's portfolio is given by:

$$\chi_i^j = e_{i,j} / D_i \quad (15)$$

While the total share of foreign equity in the reporter's portfolio is given by:

$$\chi_i^f = \frac{\sum_{j \neq i}^K e_{i,j}}{D_i} \quad (16)$$

Foreign equity shares can thus be expressed in terms of a particular foreign country or across all foreign countries (as has been the case in the existing literature). The added flexibility of this approach is one of the key contributions of this study. Summary statistics on foreign equity holdings are given in Table 2. As can be seen, nearly all the reporter countries in the sample have equity portfolios heavily weighted towards domestic assets. As an illustration, compare each country's domestic equity share with that country's share of world market capitalization. Assuming uniform risk between domestic and foreign equity, zero transaction costs, and perfect information, a country's share of world market cap should match their domestic equity share. The difference between the weight a country places on its own equity and that implied by its share of world market cap can be thought of as a rough estimate of home bias. The summary statistics in Table 2 indicate significant home bias across Europe and the rest of the world.

Although this hypothesis will be formally tested later in the next section, it is useful to look at how foreign equity holdings have changed across countries over time. In particular, did the formation of the EA in 1999 have any impact on home bias? Table 2 splits the reporter countries in the sample into three groups: EA Members, Non-EA Europe, and Non-Europe. For each region, the average domestic equity share and the region's total share of world market cap is computed. To get a sense of the home bias in each region, the ratio of domestic equity share to world market cap share for each region is computed. In 1997, this ratio is equal between EA members and non-EA European countries. Contrast this with the post-1999 period and we see a sharp drop in “home bias” for the EA members with little change for the non-EA nations. While seeming to confirm the theoretical predictions from the last section, we must be cautious as much of this result is driven by Ireland's short position in domestic equity. Omitting this case reduces,

but does not entirely eliminate, the difference between EA and non-EA countries after 1999. Formally testing the impact of the euro on equity home bias will be the focus of the rest of the paper.

6. Equity Home Bias and the Euro

If purchasing power parity holds and financial markets are globally integrated, then the ICAPM predicts that all investors should hold portfolios with national weights equal to each country's share of world market capitalization.⁹ The existing literature has commonly measured home bias by comparing the actual share of domestic equity in a country's wealth portfolio to that country's share of world market capitalization. Home bias is tested by estimating the following relation:

$$\chi_{i,t}^j = \beta(M_{j,t} / M_t) + Z_{i,j,t}\Gamma + u_{i,j,t} \quad (17)$$

The foreign equity share held by country i is regressed on the foreign country's (country j) share of world market capitalization and a vector of domestic and foreign country specific control variables $Z_{i,j,t}$. A liberal definition of home bias would be to estimate β and see how close it is to unity. If investors in country i are truly following the global portfolio, then a 1% increase in country j 's share of world market capitalization should induce a 1% increase in country i 's holdings of foreign equity. Any estimate less than 1 suggests a bias against foreign equity (relative to the global investor) and any estimate greater than 1 suggests a bias in favor of foreign equity. Note that this is a liberal definition of home bias since it does not require investors to actually hold weights equal to the market portfolio, only to adjust their position in tandem with the portfolio. Home biases estimated using this method are likely to be lower bounds, since they allow for absolute deviations from the global portfolio, only requiring that local portfolio weights are *correlated* with global weights.

This argument presupposes that the optimal share of domestic equity is given by the country's share of world market capitalization. While this is a very strong assumption, we can proceed with the test if we are able to control for reasons why the world market cap share would not be optimal. We do this by including in the regression the variables derived in equation 13:

$$\begin{aligned} \chi_{i,t}^j = & \beta_1(M_{j,t} / M_t) + \beta_2 E_t(r_{t+1}^j - r_{t+1}^i) + \beta_3 Var_t(R^i) + \beta_4 Cov_t(R^i, R^j) \\ & + \beta_4 Cov_t(R^j - R^i, \pi) + \beta_5 Var_t(s_i^j) + \beta_7 Trade_{i,t}^j + \beta_8 Dist_i^j + \beta_9 Lang_i^j + u_{i,t}^j \end{aligned} \quad (18)$$

The share of equity issued by country j in country i 's wealth portfolio is a function of country j 's share of world market capitalization, the expected excess return of country j over country i , the

⁹ See Solnik (1974) or Sercu (1980)

variance of nominal domestic (i) returns, the covariance between domestic and foreign (j) returns, the inflation hedging ability of domestic returns, nominal exchange rate volatility, and three variables designed to capture limited information on country j by country i investors: total bilateral trade as a share of country i GDP, the physical distance between countries i and j , and an indicator variable for common language. If β_1 is equal to 1, country i is holding the optimal share of country j equity. If β_1 is less than 1, they are underweight in country j equity. One way to measure home bias is $\varphi = 1 - \beta_1$. The larger this number is, the greater the degree of home bias.

Expected returns are measured as the average annualized monthly return over the preceding year. For example, the real return on German equity from the perspective of a British investor in 2001 is measured as the average monthly real return on German equity in the UK (as given by equation 4) in 2000. Nominal returns are from the Morgan Stanley Capital International (MSCI) for each country, while inflation and exchange rate data are from the *International Financial Statistics*. The variances and covariances of returns, inflation rates, and exchange rates are all computed concurrently with the share year.

Inclusion of the trade variable presents a potential simultaneity problem. While increased trade between nations is likely to lead to greater information flow, might it also be possible that countries trade more because of a high degree of cross-border equity flows? For example, suppose a French retailer were to acquire a minority equity stake in an Italian wholesale firm. As a result, the retailer has an added incentive to do business with the wholesaler, as the performance of their equity portfolio will be correlated with the wholesaler's profitability. To control for this potential endogeneity, trade flows are instrumented with a gravity equation. Specifically, assume that total trade flows can be modeled as:

$$Trade_{i,t}^j = \alpha_0 + \alpha_1 y_{i,t} + \alpha_2 y_{j,t} + \alpha_3 Dist_i^j + \alpha_4 Border_i^j + \alpha_5 Lang_i^j + u_{i,t}^j \quad (19)$$

Trade flows between countries i and j are a function of market sizes (proxied for by log GDP in both countries), physical distance between countries i and j , an indicator variable equal to one if countries i and j are contiguous, and a common language dummy variable. The distance variable is defined as the log physical distance in kilometers between the two largest cities in each country, taken from the CEPII Geodesic Distances Database. The border variable is self explanatory, with the only exceptions being the presence of a border between countries that while not technically contiguous, have many of the features common to borders.¹⁰ The language variable is fairly inclusive, with two countries being defined to have a common language if at

¹⁰ Examples of these include a border between France and the UK (thanks to the Chunnel), and between Denmark and Sweden (a high number of ferry crossings)

least 10% of the population in each country speaks the same language.¹¹ To estimate (18), we conduct a two-stage least squares regression, using the instruments given in (19) for the trade variable.

Table 2 suggested that home bias fell over time for countries both inside and out of the EA, but most strongly for the EA members. How much of this decline is due to the adoption of a common currency and how much is due to other factors? Do the causes of the decline vary when looking at different categories of foreign equity holdings? One way to test this is to augment the benchmark model with interaction terms for both the EA membership and the post euro-period. Specifically, define a new variable “Euro” equal to one if both the domestic and foreign country adopted the euro in 1999. The change over time is captured by the variable “Post” equal to 1 for all observations from 2001 onward.

$$X_{i,t}^j = \beta_{11} \left[\frac{M_{j,t}}{M_t} \right] + \beta_{12} \left[Euro * \frac{M_{j,t}}{M_t} \right] + \beta_{13} \left[Post * \frac{M_{j,t}}{M_t} \right] + \beta_2 E_t(r_{t+1}^j - r_{t+1}^i) + \beta_3 Var_t(R^i) \\ + \beta_4 Cov_t(R^i, R^j) + \beta_5 Cov_t(R^j - R^i, \pi) + \beta_6 Var_t(s_i^j) + \beta_7 Trade_{i,t}^j + \beta_8 Dist_i^j + \beta_9 Lang_i^j + u_{i,t}^j$$

The new measure of bias is given by $\varphi = 1 - \beta_{11} - \beta_{12} - \beta_{13}$. The lower this number, the closer the alignment between a country’s foreign equity share and that predicted by theory. Home bias is defined across categories as:

$$\varphi = \begin{cases} 1 - \beta_{11} & \text{if Euro} = 0 \text{ and Post} = 0 \\ 1 - \beta_{11} - \beta_{12} & \text{if Euro} = 1 \text{ and Post} = 0 \\ 1 - \beta_{11} - \beta_{13} & \text{if Euro} = 0 \text{ and Post} = 1 \\ 1 - \beta_{11} - \beta_{12} - \beta_{13} & \text{if Euro} = 1 \text{ and Post} = 1 \end{cases}$$

A test of the impact of the euro on intra-EA home bias would be $\beta_{12} = 0$. Similarly, a test of home bias falling in the post-1999 period would be $\beta_{13} = 0$. If both coefficients are significantly positive, then there is compelling evidence that home bias has not only fallen between 2001-2004 relative to 1997, but also that the biggest decline in home bias has been for intra-EA equity holdings.

The estimates in Table 3 confirm this hypothesis. The first column presents benchmark estimates from running a regression on equation 17 with instrumented trade flows. The coefficient on foreign market capitalization is 0.158, indicating a substantial home bias across the entire sample. To interpret this coefficient, suppose that a foreign country’s share of world

¹¹ For example, Switzerland shares a common language with Canada, France, Germany, and Italy (among others)

market capitalization increased by 1%. The benchmark estimate implies that the average response across the sample would be to increase that foreign country's equity share in domestic portfolios by only 0.158%, holding all other factors (i.e. barriers to diversification) constant.

Each of the variables derived from the theoretical model in section 4 are presented as standardized values.¹² Interestingly, none of the coefficients are significantly different from zero, although nominal exchange rate risk is nearly so at the 10% level. On the other hand, the information variables all have strong and significant effects on foreign equity holdings. A 1% increase in foreign trade share leads to a 0.144% increase in foreign equity share, suggesting that countries that trade together tend to invest more heavily in one another. Physical distance has a strong negative effect on equity holdings, with a 1% increase in physical distance leading to 0.002 percentage point decrease in foreign equity share.¹³ Whether or not two countries share a common language is also a key determinant, with foreign equity shares 0.0064 percentage points higher on average when the foreign country shares a common language.

The benchmark results indicate that home bias is prevalent across the sample, and that information variables such as trade flows, distance, and common language can explain much of the variation in foreign equity shares. The results in the second column of table 3 differentiate between EA members and outsiders as well as between the pre and post-euro periods. Intra-EA equity holdings display a much stronger correlation with the global equity portfolio than equity holdings involving multiple currencies. For non-EA countries, home bias is 91.1%, compared to 69.8% home bias within the EA. Is the difference in home bias simply across countries or has there been a fundamental change since the introduction of the euro? The significant coefficient on the Post interaction effect supports the latter. Controlling for EA membership or time period does not meaningfully change any of the other coefficients in either magnitude or significance, although the explanatory power of the regression does rise slightly.

The third column in table 4 addresses the issue of whether or not investors can diversify risk internationally through multinationals.¹⁴ If so, then some home bias may be justified. To assess this claim, the outward direct investment position of the home country in the foreign country is included as a regressor. If the home country has a large outward FDI position in the foreign country, then domestic investors could just invest in their native multinationals to achieve foreign diversification. As such, we would expect the FDI variable to be negatively related to

¹² The variables are standardized by subtracting the mean and dividing by the standard deviation of each across the entire sample. The coefficients for the return and exchange rate variables as well as those on log distance and common language have all been multiplied by 100.

¹³ While this number seems small, consider that the average foreign equity share in the sample is 0.0071.

¹⁴ The impact of multinationals on home bias is estimated separately due to gaps in the outward FDI position database.

foreign equity shares. In fact, the coefficient on FDI is negative, but insignificant. This may be due to the fact that a large multinational presence increases information flow about a foreign country, offsetting the negative effect of multinational presence on diversification.

In the second column of table 3, the impact of EA membership on home bias was larger in magnitude than that of the post-euro period. This would seem to indicate that the EA countries simply have more diversified portfolios and that the introduction of the euro is not necessarily responsible. However, the post-1999 interaction term covers all types of foreign equity holdings, including countries both inside and out of the EA. To differentiate the effects of the euro, we refer back to the four classes of equity defined in section 4:

1. The share of foreign EA equity in a EA portfolio
2. The share of foreign non-EA equity in a EA portfolio
3. The share of foreign EA equity in a non-EA portfolio
4. The share of foreign non-EA equity in a non-EA portfolio.

Table 4 presents estimates across these four equity classifications. By far, the largest decrease in home bias since 1999 was for intra-EA equity holdings. EA members displayed a 67.7% home bias toward foreign EA equity before the introduction of the euro. After banding together in a monetary union however, intra-EA home bias fell all the way down to 29%. No other class of equity experienced as large a drop in home bias in the post-euro period. Consider the “control” group: home bias in the foreign non-EA equity of non-EA countries (case 4 above). Prior to 1999, we estimate that the non-euro foreign equity holdings of non-euro countries display a 7.8% correlation with the global equity portfolio, a home bias of 92.2%. After 1999, home bias falls, but only to 84.9%. Thus, the formation of the EA had the largest impact on equity holdings within the monetary union. Looking at equity holdings between EA members and countries outside the monetary union confirms this. While home bias in EA holdings of non-EA equity fell after 1999, the estimated drop was less than a third as large as that for intra-EA equity holdings. The estimated fall in home bias for non-EA holdings of EA equity was even smaller and in fact not statistically significant.

In all four equity classifications, information specific variables continue to be important determinants of foreign equity holdings. The existence of a common language between countries tends to raise equity holdings, while countries that are closer together tend to invest in one another more than those that are distal. Instrumented trade flows continue to have a positive effect on foreign equity holdings for all equity classifications except intra-EA holdings. This is

an interesting result perhaps implying that the formation of a monetary union trumps the positive information flows generated by trade between two nations.

7. Conclusion

The central question this paper sought to address was whether or not the creation of a monetary union reduced equity home bias. The answer is a resounding yes. Since the introduction of the euro in 1999, equity portfolios across the Euro Area have become much more closely aligned with those that would exist in a borderless world. While investors across the world have begun to see the merits of increased international diversification, the decrease in home bias has been nowhere near as pronounced as across the Euro Area.

This should not be a surprise, however. The equity home bias puzzle asks why the presence of national borders prevents investors from exploiting welfare improving opportunities. The formation of a single currency area and the coordination of monetary policy between nations reduce the economic significance of national borders within the monetary union. The “thinning” of borders happens both directly through the elimination of multiple exchange rates and indirectly through greater information flow through trade. While certain characteristics such as different languages, cultures, and regulations remain to separate EA countries into distinct entities, the lines have become blurred. Investors within the EA no longer see their fellow member states as quite so foreign. Thus, the reduction in equity home bias across the Euro Area may simply be a re-definition of “home” for Euro Area investors.

Regardless of the motivation behind increased diversification across the Euro Area, the decrease in home bias has been welfare improving. The mean variance analysis in section 2 indicated gains to be made from German diversification and similar (though less dramatic) gains hold for the other EA countries. That these gains have become increasingly realized since the introduction of the euro indicates that greater risk sharing opportunities need to be considered alongside increased trade as one of the benefits of monetary union.

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Table 1: Consumption and Output Growth Rate Correlations across the G-7 Countries

		<i>Consumption Correlations</i>							
		Canada	France	Germany	Italy	Japan	UK	USA	<i>Average</i>
<i>Output Correlations</i>	Canada	-	0.63	0.59	0.45	0.32	0.63	0.79	<i>0.57</i>
	France	0.65	-	0.91	0.83	0.77	0.72	0.61	<i>0.75</i>
	Germany	0.77	0.89	-	0.91	0.85	0.74	0.73	<i>0.81</i>
	Italy	0.58	0.82	0.86	-	0.77	0.62	0.50	<i>0.69</i>
	Japan	0.37	0.72	0.87	0.72	-	0.49	0.45	<i>0.60</i>
	UK	0.68	0.52	0.63	0.46	0.23	-	0.68	<i>0.53</i>
	USA	0.82	0.67	0.81	0.57	0.39	0.69	-	<i>0.66</i>
	<i>Average</i>	<i>0.64</i>	<i>0.71</i>	<i>0.78</i>	<i>0.65</i>	<i>0.55</i>	<i>0.65</i>	<i>0.63</i>	

* Original data is from the Penn World Tables covering the period 1950 – 2004. Correlations cover both consumption and output growth rates.

Table 2: Domestic Equity and World Market Capitalization Shares

Country	1997		2001		2002		2003		2004	
	DES	WMCP	DES	WMCP	DES	WMCP	DES	WMCP	DES	WMCP
<u>EA Members</u>										
Austria	76.45%	0.16%	43.26%	0.09%	51.90%	0.14%	55.17%	0.17%	78.90%	0.23%
Belgium	82.66%	0.60%	70.05%	0.61%	64.84%	0.55%	64.92%	0.55%	89.66%	2.03%
Finland	94.78%	0.32%	82.63%	0.70%	76.14%	0.60%	71.51%	0.54%	81.23%	0.48%
France	86.13%	2.96%	82.60%	4.30%	81.18%	4.21%	77.59%	4.33%	80.20%	4.90%
Germany	n.a.	3.63%	74.56%	3.93%	70.28%	2.98%	73.66%	3.45%	74.47%	3.15%
Ireland	38.47%	0.22%	-9.66%	0.28%	-38.19%	0.26%	-33.58%	0.27%	8.72%	0.30%
Italy	84.55%	1.52%	74.24%	1.93%	75.96%	2.08%	74.91%	1.96%	80.41%	2.08%
Netherlands	71.80%	2.06%	45.51%	1.68%	46.73%	1.75%	37.94%	1.56%	49.73%	1.64%
Portugal	92.93%	0.17%	87.09%	0.17%	87.94%	0.19%	87.10%	0.19%	93.70%	0.19%
Spain	93.35%	1.28%	87.44%	1.71%	89.83%	2.01%	90.09%	2.32%	92.08%	2.48%
Average	80.12%	12.91%	63.77%	15.39%	60.66%	14.76%	59.93%	15.35%	72.91%	17.48%
"Home Bias"	6.2		4.1		4.1		3.9		4.2	
<u>Non-EA Europe</u>										
Denmark	78.85%	0.41%	63.27%	0.35%	64.25%	0.33%	68.29%	0.41%	77.44%	0.40%
Norway	86.25%	0.29%	58.10%	0.25%	50.98%	0.29%	50.95%	0.30%	69.62%	0.37%
Sweden	83.53%	1.20%	64.71%	0.85%	63.27%	0.77%	65.55%	0.92%	72.95%	0.99%
Switzerland	n.a.	2.53%	70.61%	1.91%	76.69%	2.41%	75.25%	2.32%	81.24%	2.18%
U.K.	78.85%	8.78%	75.23%	8.12%	73.10%	8.11%	70.96%	7.71%	72.02%	7.43%
Average	81.87%	13.21%	66.38%	11.48%	65.66%	11.91%	66.20%	11.65%	74.66%	11.37%
"Home Bias"	6.2		5.8		5.5		5.7		6.6	
<u>Non-Europe</u>										
Australia	88.36%	1.30%	83.36%	1.37%	83.30%	1.66%	83.98%	1.87%	87.88%	2.05%
Canada	81.13%	2.50%	75.86%	2.57%	73.32%	2.50%	75.30%	2.86%	77.85%	3.11%
Hong Kong	n.a.	1.82%	89.66%	1.85%	90.36%	2.01%	89.55%	2.28%	89.60%	2.27%
Japan	92.85%	9.74%	90.23%	8.25%	90.78%	9.25%	91.17%	9.71%	90.77%	9.70%
Korea	98.17%	0.20%	99.48%	0.85%	99.38%	1.08%	99.41%	1.05%	99.06%	1.13%
Singapore	85.11%	0.47%	75.35%	0.43%	70.75%	0.44%	77.42%	0.46%	82.85%	0.45%
South Africa	n.a.	1.02%	75.39%	0.32%	84.48%	0.80%	85.01%	0.86%	91.67%	1.20%
U.S.A.	90.65%	49.71%	90.20%	50.58%	89.44%	48.08%	87.72%	45.57%	87.37%	43.05%
Average	89.38%	66.76%	84.94%	66.22%	85.23%	65.83%	86.19%	64.67%	88.38%	62.96%
"Home Bias"	1.3		1.3		1.3		1.3		1.4	

* DES is "Domestic Equity Share," defined as the percentage of a country's equity portfolio that is made up of domestic equity. WMCP is "World Market Capitalization Share," defines as each country's contribution to total world market capitalization (where the world is defined as all 41 countries in this sample). The row "Average" gives the average domestic share for each region and the region's *total* share of world market capitalization. Home Bias is defined here as the ratio of the domestic equity share to market capitalization share for each region. Equity shares are tabulated from CPIS data, while market capitalization is from the *World Development Indicators* database.

Table 3: The Determinants of Home Bias

Variable	Benchmark	Interactions	Diversification with Multinationals
Foreign Share of Market Cap (FMC) (A)	0.158 [0.000]	0.089 [0.000]	0.076 [0.000]
EA*FMC (B)	-	0.213 [0.001]	0.248 [0.017]
Post*FMC (C)	-	0.090 [0.000]	0.150 [0.000]
FDI	-	-	-0.0001 [0.683]
$E(r^h - r^f)$	-0.043 [0.179]	-0.020 [0.532]	-0.032 [0.516]
$V(R^h)$	-0.025 [0.501]	-0.047 [0.195]	0.008 [0.888]
$Cov(r^h, r^f)$	0.059 [0.119]	0.047 [0.205]	-0.018 [0.759]
$Cov(r^f - r^h, \pi)$	0.028 [0.356]	0.037 [0.215]	-8.362 [0.022]
Var(s)	-0.052 [0.102]	-0.023 [0.458]	-0.014 [0.750]
Trade	0.144 [0.000]	0.117 [0.046]	0.129 [0.004]
Log Distance	-0.226 [0.000]	-0.229 [0.000]	-0.269 [0.000]
Common Language	0.636 [0.000]	0.671 [0.000]	0.929 [0.000]
Constant	0.017 [0.000]	0.018 [0.000]	0.021 [0.001]
Sample Size	3968	3968	2098
R^2	0.366	0.400	0.407
Home Bias ($1 - A$)	0.842	0.911	0.924
EA before 1999 ($1 - A - B$)	-	0.698	0.677
EA after 1999 ($1 - A - B - C$)	-	0.608	0.527
F-statistic ($B = C = 0$)	-	113.5 [0.000]	116.8 [0.000]

* OLS Estimations of equations 18 and 19 in the text. Robust p-values are given in brackets. The dependent variable in each case is the share of a particular foreign country equity (on a country by country basis) in a domestic equity portfolio. Foreign Share of Market Cap is defined as the foreign country's share of world market capitalization. EA is a dummy variable equal to one if both the domestic and foreign countries use the euro after 1999. Post is a dummy variable equal to 1 for all observations after 1999. All other variables are defined in sections 5 and 6 of the text. Home Bias is defined as 1 minus the coefficient on foreign market cap, with zero indicating no home bias and 1 representing a completely closed economy. All equity return and exchange rate variables have been standardized and the coefficients have been multiplied by 100 for ease of interpretation (as have those on distance and language).

Table 4: Home Bias across Equity Categories

Variable	Home: EA Foreign: EA	Home: Non-EA Foreign: Non-EA	Home: EA Foreign: Non-EA	Home: Non-EA Foreign: EA
Foreign Share of Market Cap (FMC)	0.323 [0.038]	0.078 [0.000]	0.074 [0.000]	0.131 [0.001]
Post*FMC	0.386 [0.000]	0.073 [0.000]	0.124 [0.000]	0.038 [0.209]
$E(r^h - r^f)$	-0.252 [0.037]	-0.021 [0.444]	0.007 [0.934]	-0.025 [0.427]
$V(R^h)$	-0.050 [0.406]	-0.064 [0.175]	-0.103 [0.203]	-0.118 [0.000]
$Cov(r^h, r^f)$	0.110 [0.081]	0.048 [0.254]	-0.038 [0.672]	0.110 [0.000]
$Cov(r^f - r^h, \pi)$	0.040 [0.648]	0.054 [0.062]	0.072 [0.275]	0.016 [0.505]
Var(s)	1.738 [0.495]	-0.036 [0.169]	-0.172 [0.051]	0.046 [0.236]
Trade	-0.004 [0.924]	0.082 [0.000]	0.465 [0.000]	0.030 [0.091]
Log Distance	-0.391 [0.002]	-0.234 [0.000]	-0.003 [0.977]	-0.260 [0.000]
Common Language	0.864 [0.004]	0.120 [0.140]	2.390 [0.000]	0.333 [0.000]
Constant	0.037 [0.010]	0.020 [0.000]	-0.007 [0.519]	0.022 [0.000]
Sample Size	438	1602	1336	592
R ²	0.435	0.594	0.417	0.554
<i>Home Bias Before 1999</i>	<i>0.677</i>	<i>0.922</i>	<i>0.926</i>	<i>0.869</i>
<i>Home Bias After 1999</i>	<i>0.290</i>	<i>0.849</i>	<i>0.803</i>	<i>0.831</i>

* OLS Estimation of equations 18 and 19 by regional equity classification. Heteroskedasticity consistent p-values are given in brackets. The dependent variable in each case is the share of a particular foreign country equity (on a country by country basis) in a domestic equity portfolio. Home refers to the classification of the domestic country, either in or out of the EA. Foreign is the classification of the country issuing the foreign equity. For example, “Home: EA, Foreign: Non-EA” limits the sample to just those observations in which the reporting country uses the euro, but the partner country does not. An example of this would be the share of Swiss equity in an Italian investor’s portfolio. The return and exchange rate variables have been standardized and their coefficients multiplied by 100 for clarity. All other variables are defined in sections 5 and 6. Home Bias is defined as one minus the coefficient on foreign market cap, with zero indicating no home bias.

Figure 1a: UK vs. Europe, 1990 – 1998

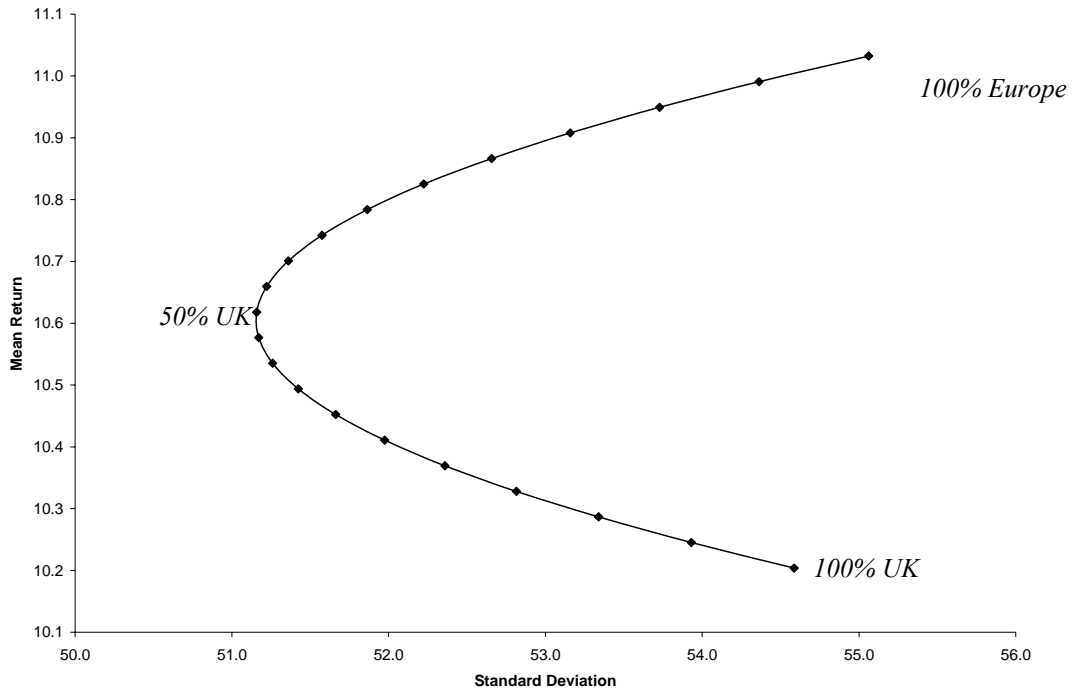
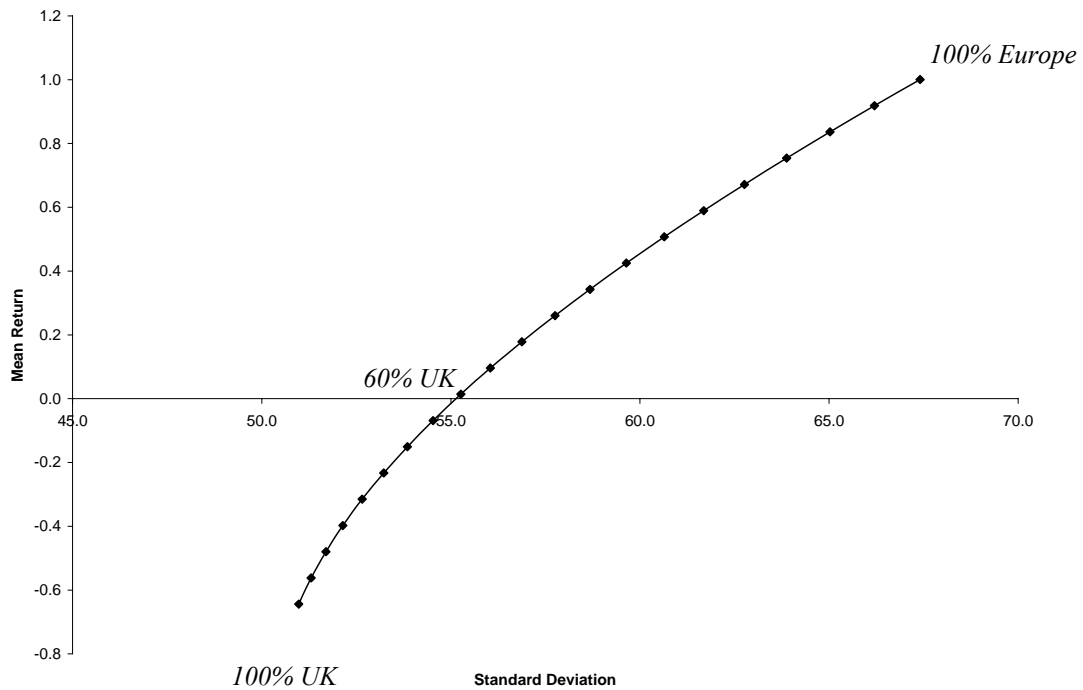


Figure 1b: UK vs. Europe, 1999 – 2004



* Risk-return tradeoff for portfolios ranging from 100% UK equity to 100% foreign equity, where “foreign” is defined as a market cap weighted European index fund excluding the UK. All returns and standard deviations are annualized monthly returns from the Morgan Stanley Capital Indexes (MSCI)

Figure 2a: Germany vs. Euro Area, 1990 – 1998

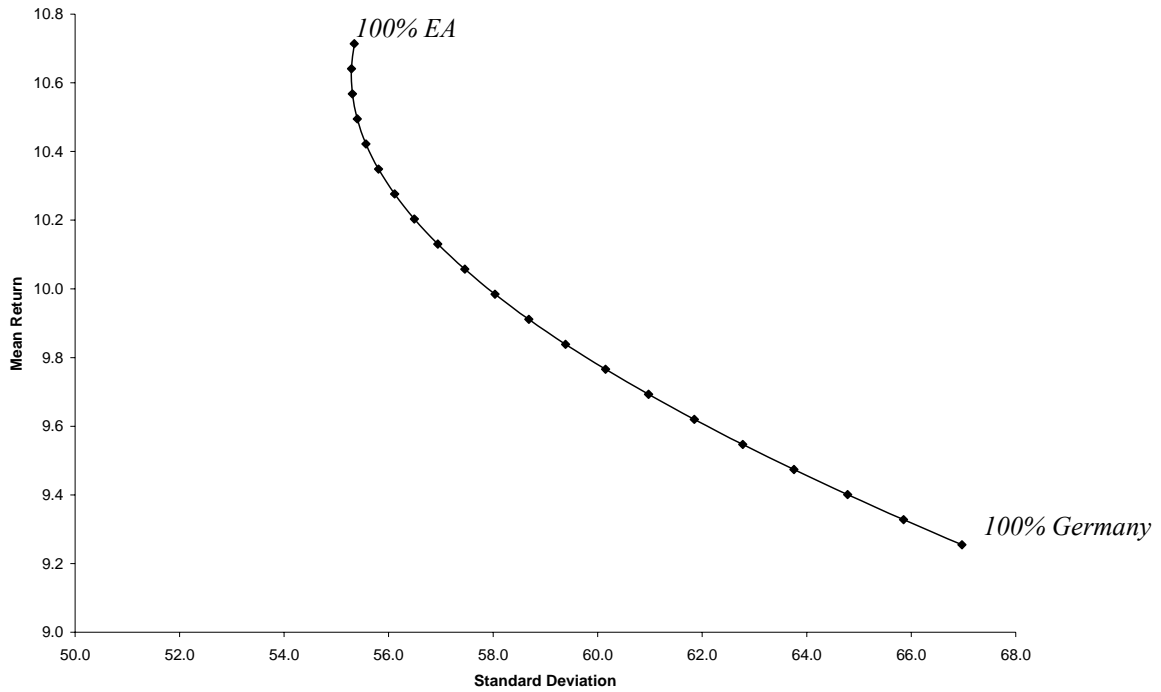
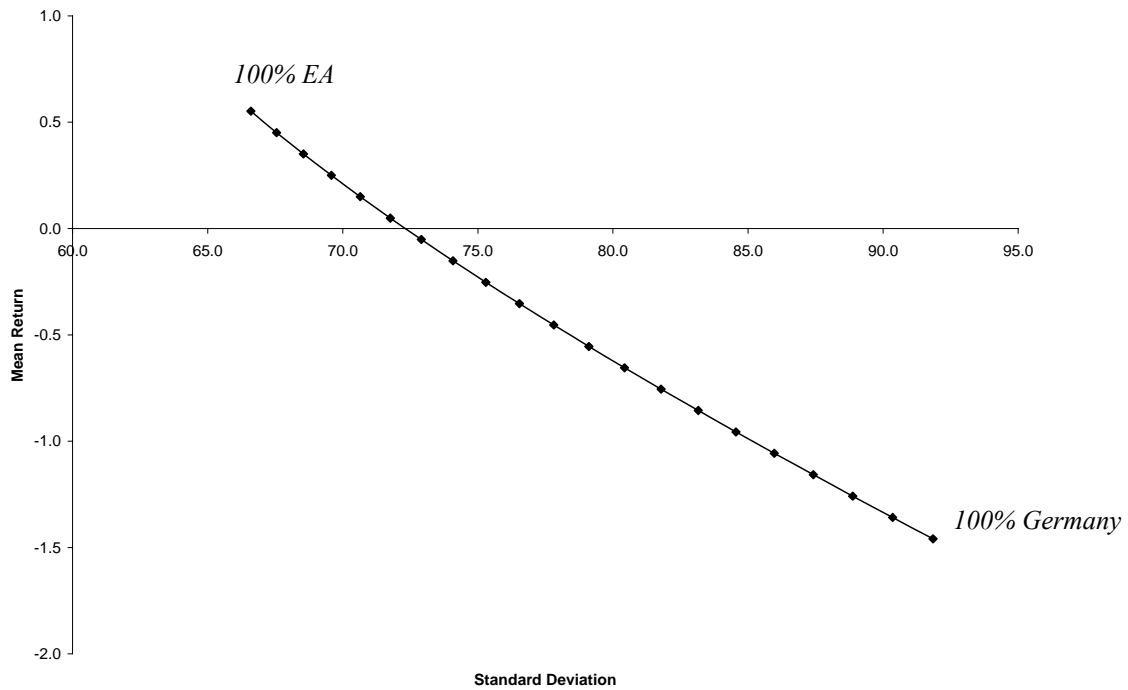


Figure 2b: Germany vs. Euro Area, 1999 – 2004



* Risk-return tradeoff for portfolios ranging from 100% German equity to 100% foreign equity, where “foreign” is defined as a market cap weighted average of the equity indexes of Austria, Belgium, Finland, France, Ireland, Italy, the Netherlands, Portugal and Spain. All returns and standard deviations are annualized monthly MSCI returns.