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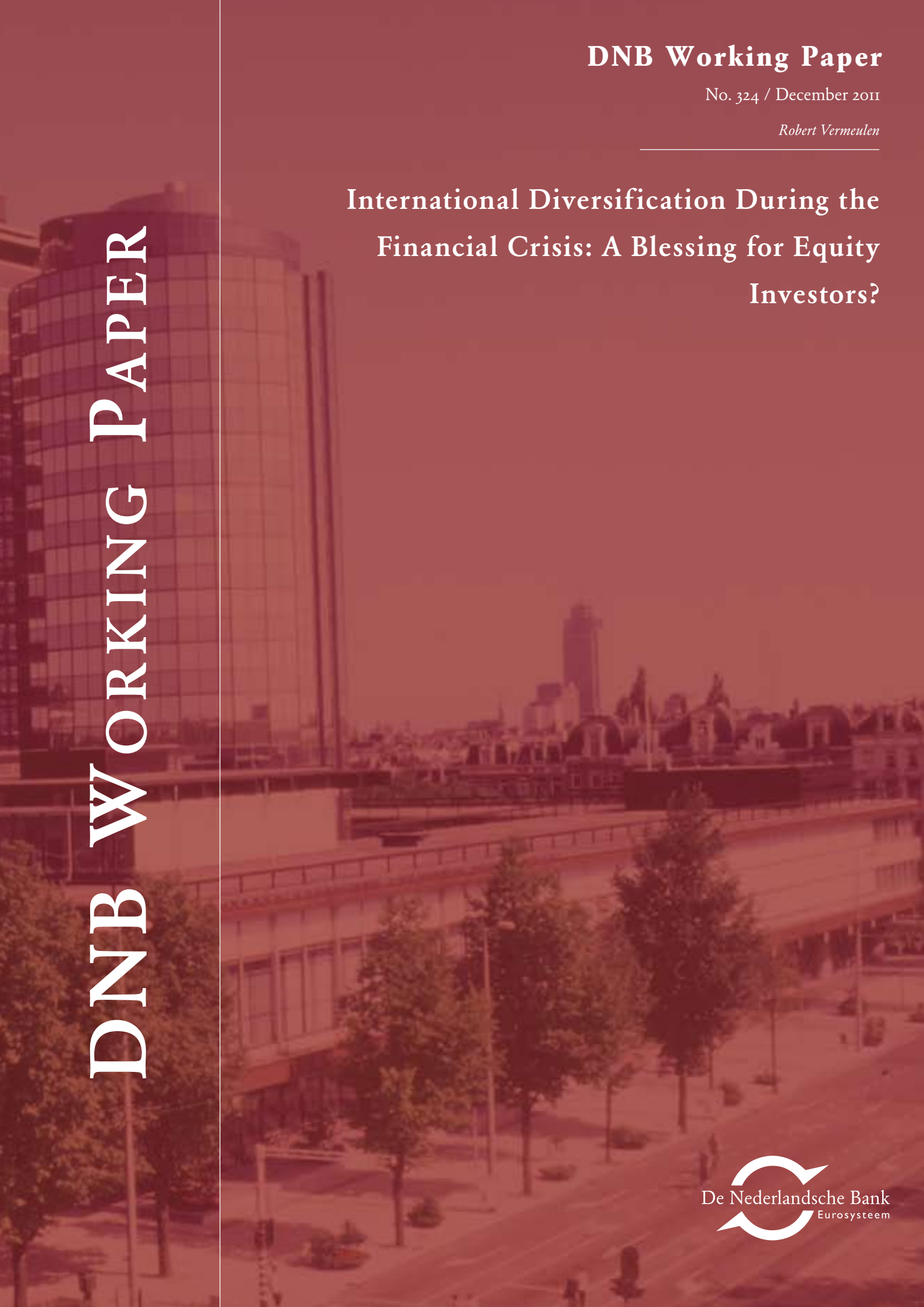

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* Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank.

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International Diversification During the Financial Crisis: A Blessing for Equity Investors?*

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Abstract

This paper empirically investigates international equity investors' foreign portfolios before and during the financial crisis by estimating a gravity model for 22 source and 42 destination countries. The results show that international stock market diversification provides large gains during the financial crisis. This is remarkable because of large stock market correlations. During the financial crisis investors have larger positions in foreign stock markets which are relatively less correlated with the domestic market. However, this relationship is not present before the crisis. Results at the country level show that aggregate portfolio volatility is lower and returns are higher for investors from low home biased source countries during the financial crisis. This result implies that global equity diversification has an important positive effect on stabilizing a country's aggregate equity wealth, especially during periods of stock market stress.

JEL Classification: F41, G11, G15

Keywords: international portfolio choice, financial integration, stock market comovement

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1 Introduction

Already for centuries equity investors know that they can achieve sizable diversification gains by investing in foreign equities. However, despite the financial liberalization waves of the last decades, equity investors still exhibit a strong home bias in their equity holdings. This well known stylized fact contrasts the prediction of the International Capital Asset Pricing Model (I-CAPM) which posits that, in a frictionless world, investors from any country i hold equities in each foreign country j equal to the relative market capitalization of country j. The large deviations of actual portfolios from the theoretical I-CAPM prediction suggest that investors forego the potentially large benefits of international equity diversification.

On the other hand, recent research casts doubt on the size of international diversification benefits. In fact, diversification benefits crucially depend on the correlations between domestic and foreign equities. More specific, from a pure diversification perspective the lower the correlation between two equities is, the better. However, several studies show that correlations between international stock markets increase strongly since the 1970s (Longin and Solnik, 1995; Goetzmann et al., 2005). Indeed, Ang and Chen (2002) show that stock market comovement is larger on the downside than on the upside. Even worse, ongoing trade and financial integration increase the probability that international equity markets jointly crash (Beine et al., 2010). These increasing comovements erode potential diversification gains and cast doubt on the desirability of international equity diversification, especially during bear markets when investors need diversification benefits most.

Despite increasing stock market comovements, investors can still achieve sizeable diversification gains by overweighting foreign equities which exhibit relatively low correlation with the domestic stock market, conditional on existing frictions. This paper extends the literature by explicitly testing to which extent investors tilt their foreign equities towards low correlated foreign stock markets during the financial crisis. In particular, the empirical analysis focuses on actual investor behavior and investment performance during the financial crisis.

It is crucial to understand that holding uncorrelated equities during stressful uncertain

markets is more valuable than holding uncorrelated equities during tranquil markets. Indeed, behavioral studies show that investors have asymmetric utility functions (Levy and Levy, 2009). This implies that the incentive to reduce uncertainty is larger when uncertainty is large, especially on the downside. In such a situation investors have larger hedging demands to reduce volatility. Also, from a macroeconomic stability perspective efficient diversification is important, since lower portfolio volatility stabilizes aggregate household wealth. Stable household wealth in turn has positive effects on private consumption, which is important for economic growth.

This paper follows the existing literature by explaining foreign portfolio equity holdings with an empirical gravity model (Portes and Rey, 2005; Lane and Milesi-Ferretti, 2008; De Santis and Gérard, 2009; Coeurdacier and Guibaud, 2011). An important difference with previous studies is the inclusion of fixed effects for each country pair. The main advantage of this approach is that it is not necessary to explicitly model time invariant variables, such as the effect of the distance between two countries. Moreover, the fixed effects deal with both observed and unobserved time invariant factors. This strongly reduces the possibility of model misspecification bias. Since this paper's main objective is to quantify how equity allocations relate to stock market comovement, including fixed effects is the safest method to single out the impact of the main variable of interest. In fact, the cross sectional determinants as such are not of prime interest to investigate the main research question.

Even though the previously mentioned studies use data from the IMF's Coordinated Portfolio Investment Survey (CPIS), they arrive at different conclusions regarding the sign on correlation. Differences arise due to different samples, model specifications and empirical methodologies. Moreover, all studies assume that the coefficient on correlation is constant over time. This paper questions the validity of this assumption by comparing foreign equity allocations during a relatively stable pre crisis period (2001-2007) to the financial crisis (2008-2009). During the highly volatile financial crisis investors have stronger demands for overexposure to low correlated foreign markets compared to the pre crisis period. More precisely, this paper tests if the coefficient on correlation changes during the financial crisis.

The results show that foreign equity holdings have no relationship with stock market correlations pre-crisis. However, during the crisis there is a significant negative relationship between both variables, in line with the theoretical prediction. This result implies that during the crisis investors have overexposure to equities which comove less with the domestic market, conditional on existing bilateral frictions. Therefore, the actual foreign equity positions help to stabilize household wealth during the financial crisis. These findings are encouraging and suggest that investors diversify their equities in a rational direction. As stated earlier, the insignificant relationship between comovement and foreign equity allocations pre-crisis is not worrying, because the need for diversification is smaller pre-crisis.

Results at the individual country level show that the actual international portfolio holdings decrease volatility between 2 and 36 percent compared to a portfolio consisting only of domestic equities.[1] Two general patterns emerge: Investors from countries with smaller home bias have 1) a larger decrease in volatility and 2) a relatively better return performance during the crisis. These results provide supporting evidence that global diversification helps investors to stabilize their equity portfolios and aggregate equity wealth at the country level. Moreover, the results suggest that policymakers will benefit by reducing the barriers to foreign equity investments and should not impose barriers for their residents and financial institutions, such as pension funds, to hold well diversified global equity portfolios.

The outline of the paper is as follows. Section 2 discusses the related literature. Section 3 presents the empirical methodology and the data. Section 4 presents the results of the gravity model on investor behavior and Section 5 documents investment performance at the individual country level. Finally, Section 6 concludes.

2 Related literature

There is a long standing consensus among practitioners and academics alike that international asset diversification provides large benefits. In the academic literature Merton (1973) and

[1] Chile is the exception with a higher volatility on the international portfolio than the domestic equity index.

Solnik (1974) formally show this in the I-CAPM, where the global factor determines systematic risk. The investor cannot diversify away this risk. Merton assumes that the remaining idiosyncratic risk is uncorrelated across countries. Hence, investors can fully eliminate the idiosyncratic risk by holding an internationally diversified portfolio. Similar to the domestic CAPM, every investor holds positions in foreign countries equal to the proportion of the foreign market's share in global equity market capitalization.

As already mentioned in the introduction, the actual benefits of global diversification depend crucially on the correlations between stock markets. Taking two extremes, investing in two perfectly correlated markets provides no risk reduction, whereas a correlation of -1 fully eliminates risk. In the latter case volatility is zero and the payoff perfectly predictable.

There are several empirical studies showing that correlations exhibit a secular increase during last 40 years (among others Longin and Solnik, 1995). Quinn and Voth (2008) attribute this increase to capital account openness as the most important variable driving global correlations. Free capital flows allow capital to move to where it is most productive, a process which equalizes returns in perfectly integrated capital markets. Research by among others Ang and Chen (2002) shows that comovement among equities is higher on the downside than the upside. Moreover, recent research by Beine et al. (2010) shows that the ongoing globalization process also increases the probability that two markets simultaneously crash. Hence, diversification is most challenging during a market crash. These developments erode the potential international diversification benefits and investors may seriously question the desirability of holding international equities.

Since the seminal paper of Portes and Rey (2005), the gravity model is the workhorse model to empirically estimate bilateral equity allocations in the international finance literature. The gravity model earned its popularity because of its good fit of the data. Researchers use the gravity model to identify the frictions explaining equity allocations at the country level. For example, Portes and Rey (2005) point out that distance has strong explanatory power, where distance captures many frictions between markets. Recently, Okawa and Van Wincoop (2010) provide a formal theoretical framework to justify the use of the gravity model in international

finance. In their model investors deviate from CAPM due to multilateral resistance.[2] This multilateral resistance quantifies the relative financial friction for each country pair. For example, distance creates frictions between country pairs, where investors favor country pairs with smaller distances.

Without claiming to be complete, the empirical literature finds a large set of important explanatory variables beyond the simple distance between countries. Aviat and Coeurdacier (2007) and Lane and Milesi-Ferretti (2008) find that bilateral trade increases cross border asset holdings. Daude and Fratzscher (2008) point at the importance of the destination country's institutional quality, i.e. better institutional quality increases asset holdings. Related to this result, Dahlquist et al. (2003) show that investments are larger in countries with better shareholder rights. Desai and Dharmapala (2011) find that US investors shift their equity portfolios to countries with more favorable dividend tax treatment.

Despite the liberalization of international capital markets Chan et al. (2005) and Bekaert and Wang (2009) still find an important role for capital controls in shaping international equity holdings. This finding is surprising because capital controls have been abandoned or at least reduced for most countries nowadays. Finally, Andrade and Chhaochharia (2009) show that past FDI flows increase future portfolio equity positions. The mechanism at work is that past investments create familiarity with a country. This in turn stimulates future equity holdings. In sum, many variables explain the cross section of bilateral equity holdings. Naturally this increases the risk of model misspecification. Therefore, to avoid misspecification biases this paper estimates bilateral fixed effects to keep the focus on the main variable of interest: stock market comovement.

Turning to stock market comovement - measured by bilateral correlations - the literature provides mixed results. Using data on bilateral pairs for 38 countries from the 1997 and 2001 vintages of the CPIS, Berkel (2007) finds no relationship between correlations and equity positions. Lane and Milesi-Ferretti (2008) use bilateral pairs on 50 source and 132 destination countries from the 2001 vintage and find a significantly positive coefficient. Note that data is

[2]The model set-up is similar to the bilateral trade model in Anderson and Van Wincoop (2003).

only available for about 1700 bilateral pairs out of a potential 6500.

Bekaert and Wang (2009) confirm the significant positive coefficient. They base the analysis on the 1997 and 2001-2006 annual vintages for 27 source and 65 destination countries. Using a comparable sample of 27 source and 41 destination countries from the 2001-2005 CPIS annual vintages, but with an instrumental variables estimator, Coeurdacier and Guibaud (2011) find a significantly negative relationship. De Santis and Gérard (2009) take a portfolio approach and show that investors increase the share of foreign equities which have larger marginal diversification benefit and thereby improve diversification. These authors consider the period from 1997 to 2005 for a sample of 30 countries. Since all studies use different samples and methodologies, a direct comparison is difficult.

The results of this paper add to the literature by focussing specifically on changes in investor behavior during the financial crisis. While international investors may not be overexposed to less correlated markets during tranquil times, it is important to acknowledge that the investort's desire to do so is smaller during tranquil periods. Actually, effective diversification, which reduces portfolio uncertainty, is important when markets are in stress, because of the investor's asymmetric utility function. This paper goes beyond the existing literature by quantifying diversification gains, measured by excess return and volatility reduction, at the individual country level.

3 Empirical methodology and data

3.1 Estimation method

The gravity model is the workhorse model to empirically estimate bilateral portfolio equity allocations (Portes and Rey, 2005). There is no consensus on a (structural) theoretical model of international portfolio equity allocations.[3] Therefore, this paper follows the empirical literature by adopting a flexible empirical methodology without ex-ante restrictions derived

[3]See Okawa and Van Wincoop (2010) for a recent contribution.

from theoretical models.

The I-CAPM is the starting point of the empirical model to explain country i residents' foreign equity holdings. It is the international extension of the CAPM and predicts that, in a frictionless world, investors from country i hold equities in country j equal to the relative market capitalization of country j. Define country i as the source country and country j as the destination country. While the I-CAPM also predicts the domestic equity holdings, this paper only considers the investors' foreign equity allocations.[4]

$$s_{ij,t} = w_{ij,t} = \frac{MCAP_{j,t}}{MCAP_{world,t} - MCAP_{i,t}} \qquad \forall i, j, i \neq j, \tag{1}$$

where $s_{ij,t}$ is the share of country j equities in country i residents' equity portfolio and $w_{ij,t}$ is the share of country j's market capitalization as a fraction of total world market capitalization excluding country i. $MCAP_{i,t}$, $MCAP_{j,t}$ and $MCAP_{world,t}$ are country i's, country j's and global stock market capitalization, respectively.

Investors deviate from the weights in Equation (1) because of two main factors: 1) Factors specific to country j, which make an investment in country j either more or less attractive and 2) Bilateral frictions specific to the i,j country pair. Many bilateral frictions between two countries remain constant over time, such as the distance between countries. The panel dimension of the data set, to be discussed in more detail in the next section, enables the use of fixed effects to capture all observed and unobserved bilateral frictions. Previous studies introduce fixed effects at the source or destination country level (e.g. Lane and Milesi-Ferretti, 2008), while this paper introduces the fixed effects at the country-pair level and thereby captures both country specific and country pair observed and unobserved effects.

The estimation of the gravity model is slightly different from the standard approach in the literature in another dimension. Similar to De Santis and Gérard (2009), this paper starts from the investor's portfolio decision making and explains the log of the share investors from country

[4]The evidence on the equity home bias is well documented in the literature and this overexposure to the domestic equity market is implicitly taken as given. See Van Nieuwerburgh and Veldkamp (2009) and Coeurdacier (2009) for two recent contributions.

i invest in country j. Other studies explain the absolute *level* of bilateral equity investments (e.g. Lane and Milesi-Ferretti, 2008; Coeurdacier and Guibaud, 2011). By directly explaining shares this paper connects with the literature on portfolio allocations. Analyzing shares instead of levels circumvents a possible size bias when including large and small countries in a pooled sample. In addition, the log transformation brings the distribution of $s_{ij,t}$ closer to a normal distribution, which better satisfies the assumptions of a least squares fixed effects estimation.

These considerations result in the following gravity model:

$$ln(s_{ij,t}) = \beta_1 * ln(w_{ij,t}) + \beta_2 * \rho_{ij,t} + \boldsymbol{\gamma} * \mathbf{z_{ij,t}} + \mu_{ij} + d_t + d_t R_{ij} + \epsilon_{ij,t} \qquad \forall i, j, i \neq j, \quad (2)$$

where $ln(w_{ij,t})$ is the log of the market capitalization weight of country j as a fraction of global market capitalization minus country i, $\rho_{ij,t}$ the correlation between country i's and country j's stock market during year t, $\mathbf{z_{ij,t}}$ consists of control variables, either specific to country j or the county pair i,j, μ_{ij} accounts for time invariant frictions, while $\mathbf{d_t}$ captures time dummies and $\mathbf{d_t R_{ij}}$ time*region dummies. In particular, the equation includes two time*region dummies: Asia ($d_t * ASIA$) and Latin America ($d_t * LATIN$), where ASIA and LATIN are dummy variables with value one when country j is in Asia or Latin America, respectively, and zero otherwise. The data section provides more details on the variables included in $\mathbf{z_{ij,t}}$.

The coefficients β_1, β_2 and γ can change during the crisis due to the indicator variable I(c=1), which takes the value 1 during 2008 and 2009 and zero otherwise:

$$\begin{aligned} ln(s_{ij,t}) = \beta_1 * ln(w_{ij,t}) + \beta_1^c * I(c=1) * ln(w_{ij,t}) + \beta_2 * \rho_{ij,t} + \beta_2^c * I(c=1) * \rho_{ij,t} + \\ \boldsymbol{\gamma} * \mathbf{z_{ij,t}} + \boldsymbol{\gamma^c} * I(c=1) * \mathbf{z_{ij,t}} + \mu_{ij} + \mathbf{d_t} + \mathbf{d_t R_{ij}} + \epsilon_{ij,t} \qquad \forall i, j, i \neq j, \end{aligned} \quad (3)$$

A significant break takes place when one or more coefficients of β_1^c, β_2^c and γ^c are significantly different from zero. This paper investigates in particular whether β_2^c is significantly negative, since this signals a change in the degree to which portfolio allocations relate to stock market correlations during the financial crisis. Note that both coefficients (β_2 + β_2^c) need to be added to obtain the full crisis coefficient. We estimate (3) with a fixed effect estimator

and standard errors clustered at the bilateral pair level. Clustering is necessary to account for cross-sectional dependence and heteroskedasticity.

3.2 Data

The International Monetary Funds's Coordinated Portfolio Investment Survey (CPIS) records aggregate bilateral portfolio equity allocations. In particular, it records the amount of portfolio equity (in US$ at market prices) that country i's residents own in country j at the end of December in year t. Even though the full data set contains annual data from 75 source countries and about 240 destination countries during 2001-2009, it suffers from many missing observations. Due to these data limitations this paper considers a restricted sample of 22 source and 42 destination countries. Despite the high attrition this sample accounts for the vast majority of global bilateral equity holdings (over 80%), which makes it representative of overall global equity allocations.[5]

The high quality of the CPIS database explains its popularity. Hau and Rey (2009) confirm the representativeness of the aggregate CPIS database with micro data at the firm level. However, a careful treatment is still necessary. Lane and Milesi-Feretti (2007) point at four important issues. First, the country coverage is incomplete (e.g. no source country data for China and India). Second, there is underreporting for some countries (e.g. for some Latin American countries). Third, some countries classify data as confidential and consequently this data is missing (e.g. Australia and New Zealand do not report asset holding for a large number of countries). Fourth, there is overreporting due to third party holdings, which is particularly present in the data of financial centers, such as the Cayman Islands, Ireland, the Isle of Man and Luxembourg. Basically, funds are invested from an outside country into a financial center, while this financial center in turn channels the investments to other countries. Hence, the portfolio equity allocations to financial centers does not solely reflect investment in these countries' companies. Therefore, the empirical analysis excludes financial centers both

[5] A large chunk of the missing equity positions are due to offshore financial centers, such as Bermuda and the Cayman Islands. It is unfortunately not possible to assess the final destination of equity investments channeled through a financial center.

as source and as destination country.

These concerns guide the sample choice. First, for both source and destination country daily stock market index data needs to be available from 2001-2009. This paper selects Datastream country stock market indexes because these are both broad indexes at the country level and constructed using the same methodology across countries. Second, source countries need a minimum of at least US$ 10 billion in foreign equity holdings. Third, exclusion of financial centers as source and destination countries (Ireland and Luxembourg). Finally, most bilateral pairs of Australia and New Zealand are missing because of confidentiality, which results in the exclusion of these countries. Hence, the final sample consists of 22 source and 42 destination countries.

[Table 1 about here.]

Table 1 summarizes the main characteristics of the 22 source countries. The table reports variable averages during 2001-2009. In terms of size the US stock market accounts for close to 40% of global stock market capitalization. The 42 destination countries comprise all 22 source countries and Argentina, Australia, Brazil, China, Colombia, Czech Republic, Greece, Hungary, India, Indonesia, Israel, Malaysia, Mexico, New Zealand, Peru, Philippines, Poland, Russia, Thailand and Turkey. Taken together, the 42 destination account for close to 100% of global stock market capitalization.

The third column shows that the source countries hold large volumes of foreign equities. Column (4) shows that the share of foreign equities in the total equity portfolio is large for many countries and for some European countries even above 50%.[6] Several countries exhibit a strong home bias, e.g. Korea and Japan. In sum, there is quite some heterogeneity in the foreign equity holdings across countries, but all countries have large overexposure to the domestic market. This observed home bias is taken as given throughout the paper.

It is necessary to take a stance on using either local currency returns or US$ returns for calculating stock market correlations. The baseline specifications contain annual bilateral

[6]The share of foreign equities in total equity holdings is calculated as Foreign Equities/(Market value of domestic stock market + Foreign equities owned - Domestic Equities owned by foreigners)

correlations based on daily local currency returns.[7] However, robustness checks show that the results are immaterial to choosing US$ returns for calculating correlations. Most control variables are relatively standard in the literature. However, the calculation of foreign weight and bilateral trade deserves a more detailed exposition. The Appendix provides a full overview of the data sources for all control variables.

Datastream provides stock market capitalization data for its country stock market indexes. The variable foreign weight$_{ij,t}$ ($w_{ij,t}$ in Equation (3)) captures the weight of a foreign country from the viewpoint of country i. This variable represents the I-CAPM prediction and we expect a coefficient equal to one in a frictionless world.

The "strength" of bilateral trade relationships is captured using an indicator of Frankel and Rose (1998): bilateral trade$_{ij,t}$ = (export$_{ij,t}$ + import$_{ij,t}$)/(gdp$_{i,t}$ + gdp$_{j,t}$). The IMF's Direction of Trade Statistics and the World Bank's World Economic Outlook provide data on bilateral trade and gdp, respectively, in US$. Robustness checks consider a second indicator of bilateral trade: bilateral trade 2$_{ij,t}$ = (export$_{ij,t}$ + import$_{ij,t}$)/(total export$_{i,t}$ + total exports$_{j,t}$).

[Table 2 about here.]

Table 2 provides summary statistics on the dependent variable and explanatory variables across all country pairs during 2001-2009. The equity weights show a large variation, ranging from -1.6% to 88.5%. A negative number indicates that investors are short on equities in a foreign country. There are only a few negative holdings in the data set and these are rather small in magnitude. The 88.5% represent Chilean holdings of US equities in 2002, i.e. only 11.5% of Chilean foreign equities were non US in 2002. The foreign weights, based on the relative market value of a stock market, range from 0.03% to 55.7%.

Correlation is the main variable of interest. Table 2 shows that correlations differ greatly across country pairs, ranging from -0.23 to 0.97. This indicates that foreign investments can offer large diversification gains. Further note that exchange rate volatility is zero for a large

[7] Since different stock market closing times invoke the non-synchronous trading problem, this paper follows Bae et al. (2003) and Beine et al. (2010) by matching day t return from the Americas with day t+1 returns in Asia and Europe. Calculate daily returns on stock index i by $r_{i,t,d} = [ln(p_{i,t,d}) - ln(p_{i,t,d-1})] * 100$.

number of country pairs, i.e. for all pairs where both countries are in the euro area.

[Table 3 about here.]

Table 3 displays the bilateral correlation matrix comprising all variables. The correlation between the actual weights and the weights based on the I-CAPM is around 0.55. This suggests that investors track the I-CAPM, at least to some degree. Most correlations between variables are quite low. However, the correlations between gdp per capita, stock market liquidity and foreign weight are relatively large.

4 Empirical results

4.1 Baseline results

Table 4 contains the estimation results from several variations of Equation (3). All estimations throughout the paper include country pair fixed effects, time dummies and time*region dummies. However, the tables do not report these for brevity. Column (1) presents the most basic specification, with only foreign weight and correlation included. The coefficient on foreign weight is economically large and statistically significant. When the foreign weight increases by 10% the investor increases his holdings by 9%. Put differently, when the foreign weight of country j increases from 20% to 22% (=10% increase) and the investor currently holds 10%, he will increase his holdings of country j equities to 10.9%. Therefore, conditional on existing frictions, investors follow changes in the relative market value almost one to one. However, during the full 2001-2009 period investors do not significantly shift their portfolio holdings to less correlated equity markets. There is at this stage no evidence pointing at effective portfolio diversification.

[Table 4 about here.]

Column (2) allows the coefficients on foreign weight and correlation to change during the financial crisis (2008-2009). While the coefficient on foreign weight does not change, the

coefficient on correlation decreases significantly during the financial crisis. This implies that during the crisis investors obtain overexposure to foreign equities which have relatively low correlation with the domestic market. It also indicates that foreign portfolio holdings turn out to be effective in reducing portfolio volatility.

The size of the coefficient on correlation is economically important. When the correlation between country i's and j's stock markets increases by 0.1, then country i investors decrease their holdings of country j stocks by 5%. This finding is important, because it suggest rational investment behavior, at least to some degree, for foreign equity allocations. Moreover, the result is in line with behavioral evidence, which shows that investors are more risk averse during bad states of the world, compared to good states of the world (Levy and Levy, 2009). Hence, the hedge needs to work during bad states of the world and this is exactly what happens.

Columns (3) and (4) include several control variables. Bilateral trade is not significant pre-crisis nor during the crisis. This result seems surprising at first sight, given the important explanatory power of trade in earlier studies (e.g. Lane and Milesi-Ferretti, 2008). However, trade relationships are persistent across time, which implies that the fixed effects account for these bilateral trade patterns to a very large extent. The gdp per capita of the destination country has a positive impact on the equity holdings. This coefficient does not change during the crisis and its sign is in line with Coeurdacier and Guibaud (2011). Ceteris paribus, investors prefer to hold equities in richer foreign countries.

The positive sign on exchange rate volatility indicates that investors shift towards markets with higher exchange rate volatility. This contrasts the common notion that investors prefer less volatile assets, ceteris paribus. Apparently, exchange rate volatility does not deter investors, conditional on the already modeled fixed effects. This is perhaps surprising given the important role Fidora et al. (2007) and De Santis and Gérard (2009) attach to exchange rate volatility in shaping international equity portfolios. However, it is possible that the fixed effects already account for the largest chunk of the exchange rate effect. Moreover, because the sample starts in 2001 all countries in the eurozone have the euro during the full sample period. Next, stock market liquidity does not have a significant impact, which implies that either (relative)

liquidity does not change much across countries or investors are not deterred by lower liquidity. International investors also predominantly buy large cap assets, which are already very liquid, even if an aggregate stock exchange is not.

Next, keeping only the significant coefficients in column (4) and the full period correlation coefficient, column (5) includes a different bilateral trade indicator, to investigate the sensitivity of the trade indicator. However, the results do not change because the alternative bilateral trade indicator is also insignificant. Finally, column (6) adds trade and financial openness indicators. Since trade and financial restrictions hinder international portfolio flows, these barriers can shape actual portfolio allocations. For example, financial restrictions can result in a relatively low holding of equities in a country which is financially closed. The openness indicators turn out to be insignificant, suggesting no role for trade and financial openness to shape portfolio holding during the observed sample period. This conclusion would be too strong since most likely the fixed effects fully account for existing openness effects. Column (7) keeps only the significant variables, which does not change the results. Therefore, we regards (7) as the benchmark specification.

4.2 Robustness

Table 5 tests for the robustness of the benchmark specification along different dimensions. First, throughout the paper all stock prices are denominated in local currencies, thereby implicitly assuming that investors fully hedge exchange rate risk. However, most likely investors do not fully hedge all exchange rate risk. To assess the importance of the currency denomination column (1) includes correlations based on US$ stock prices for all countries. The results barely change and the currency denomination does not appear to be important. One reason for this is that in general stock market volatility is larger than exchange rate volatility.

[Table 5 about here.]

The estimation sample is an unbalanced sample, which potentially biases the results. Therefore, column (2) only considers country pairs with full data availability throughout 2001-

2009. This slightly decreases the crisis coefficient on correlation (in absolute terms), but the coefficient remains significantly negative.

The baseline specification considers only 2008 and 2009 as crisis years. However, the first signs of the financial crisis already emerge during 2007, with all the write downs related to subprime mortgages. Therefore, column (3) adds 2007 to the crisis period (I(c=1)=1 if year $\geq$ 2007). When singling out on the coefficient on correlation the evidence for diversification is remarkably similar. While the results are robust to this difference in specification, two factors favor the choice for 2008 and 2009 as crisis years. First, the coefficient on correlation is larger in magnitude in this specification. Second, the crisis only becomes a global crisis during 2008. In fact, during 2007 many investors and policy makers firmly believed in decoupling of emerging markets. Third, global stock market capitalization increased in 2007, which would hardly justify treating 2007 as a crisis year in this study.

Coeurdacier and Guibaud (2011) propose to estimate the model using an instrumental variable estimator "to deal with (...) the common impact of financial integration on holdings and returns correlations." They propose to instrument current correlations with past correlations based on equity returns during 1950-1975. Note that their instrument does not vary across the time-dimension (2001-2005 in their study). This implies that this instrument cannot be used here, because the fixed effects directly wipe out the instrument itself. Moreover, the fixed effects deal directly with the unobserved time invariant effect of financial integration on equity holdings and correlations. Therefore, instrumentation to account for the unobserved impact of financial integration on bilateral correlations is not necessary anymore.

However, to investigate the sensitivity of the results to instrumentation, columns (4) and (5) present results of two IV estimations of Equation (3) using two different instrument sets. Column (4) includes trade openness, capital account openness and stock market liquidity as instruments, while column (5) only uses capital account openness and stock market liquidity as instruments. Specification tests indicate that the instruments in both sets are strong and

the first set also passes the overidentification restriction test.[8] The results confirm and even strengthen the significant negative sign on correlation during the financial crisis. Again, the coefficient is not significantly different from zero pre-crisis.

4.3 Country heterogeneity

The previous analysis shows the estimates of the gravity model when pooling all 22 source countries into one sample. This section uses specific country characteristics to split the 22 source countries into two subsamples of 11 source countries each. Both subsamples consider the pairs of their respective source countries vis-à-vis all destination countries First, columns (1) and (2) in Table 6 show the estimates for countries with high and low home bias, respectively. Second, columns (3) and (4) show the coefficients for countries with the largest absolute foreign equity portfolios (in US$) and those with the lowest foreign equity portfolio, respectively. Both country characteristics are determined on 31 December 2007. Finally, columns (5) and (6) distinguish between European source countries (column (5)) and non-European source countries (column (6)).

[Table 6 about here.]

Columns (1) and (2) illustrate that the degree of home biasedness matters for foreign equity investments. Ex ante, we expect countries with strongly home biased investors to have a more negative coefficient on correlation, since these countries' investors have larger hedging demands, due to their larger exposure to domestic risk. Define home bias as one minus the ratio of the share of foreign equities in country i's and world portfolios (Ahearne et al., 2004):

$$HB_i = 1 - \frac{\frac{FA_i}{FA_i + MCAP_i - FL_i}}{1 - \frac{MCAP_i}{MCAP_{world}}},$$

where FA_i are country i's foreign equity assets, FL_i country i's foreign equity liabilities, $MCAP_i$ country i's domestic stock market capitalization and $MCAP_{world}$ global stock market

[8] Note that we need to instrument both the correlation variable and the I(c=1)*correlation variable. Hence, it is not possible to conduct an overidentification test with two instruments and two endogenous variables.

capitalization.[9]

The results show a larger coefficient, in absolute terms, on the correlation for large home biased countries during the crisis. For low home biased countries there is still a significantly negative crisis coefficient on correlation albeit smaller in magnitude.

While the estimations in columns (1) and (2) consider relative measures of home bias, source countries also differ in the absolute size of their foreign equity portfolios. Column (3) shows the results for the 11 countries with the largest total foreign equity portfolio and column (4) the 11 lowest.[10] Both country groups have a significantly negative coefficient on correlation during the crisis, but there are differences in magnitude. Countries with a large foreign equity portfolio have a smaller coefficient compared to countries with a small foreign equity portfolio.

Finally, columns (5) and (6) distinguish between European and non-European source countries. Both country groups have a significantly negative coefficients on crisis correlation. However, the magnitude of the coefficient is much larger for non-European countries. This result relates to the relative home bias of both country groups. Table 2 shows that the percentage of foreign equity is higher for European countries. Hence, the same reasoning applies as in columns (1) and (2). The smaller hedging demands can explain the lower coefficient observed for European countries. In sum, even though countries are heterogeneous along different dimensions, the baseline result of a significantly negative coefficient on correlation during the crisis remains valid when estimating the model for subsamples.

[9]Table 7 shows the degree of home bias for each source country. The high home bias group consists of Austria, Canada, Chile, France, Hong Kong, Japan, Korea, Singapore, South Africa, Spain and Switzerland. The low home bias group consists of Belgium, Denmark, Finland, Germany, Italy, the Netherlands, Norway, Portugal, Sweden, the United Kingdom and United States.

[10]The countries with the largest foreign portfolios (in absolute size) are Canada, France, Germany, Hong Kong, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and United States. Those with the smallest are Austria, Belgium, Chile, Denmark, Finland, Italy, Korea, Portugal, Singapore, South Africa and Spain.

5 Individual country investment performance

This section zooms in on diversification performance at the country level and conducts the following exercise. Consider the aggregate portfolio equity holdings of a country's residents, including domestic equities, on 31 December 2007. Next, investigate how this portfolio performs relative to a domestic equities only portfolio from 1-1-2008 up to 31-12-2009. The exercise assumes that the portfolio weights remain fixed during the two year period. While this assumption is to some extent restrictive, it does provide useful insights on the relative merits of aggregate international equity diversification across countries.

[Table 7 about here.]

Table 7 reports the degree of home bias as calculated by the aforementioned home bias measure of Ahearne et al. (2004). The values range between zero and one, where a smaller number indicates that a country has a smaller home bias in equity holdings. Columns (3), (4), (6) and (7) show the return and volatility of both the domestic and actual country portfolio, based on local currency denominated stock prices.[11] Naturally, for some countries' investors the total equity portfolio performs better than the domestic market. However, a key objective of portfolio diversification is to reduce uncertainty, i.e. decreasing the variance of the equity portfolio. Indeed, residents from virtually all countries decrease aggregate portfolio volatility, but there is a large degree of heterogeneity between the achieved reductions.[12] Investors from Hong Kong only decrease their volatility by 2%, whereas investors from the Netherlands decrease it by 36%. Given the global nature of the financial crisis the latter volatility reduction is remarkable.

The theoretically optimal I-CAPM portfolio benchmark has a return of -28.8% (-30.9% in US$) and a volatility of 27.1% (30.8% in US$). The volatility for the Netherlands and Switzerland is around 36% and relatively close to this I-CAPM portfolio. Note however, that

[11] The table with US$ denominated stock prices is available upon request.

[12] Investors from Chile face a larger volatility on the total portfolio including foreign equities. The main reason for this is that about 80 percent of the Chilean foreign portfolio is invested in US equities. This high concentration in and large volatility of US equities raises total portfolio volatility beyond the very low volatility of the Chilean equity index.

the I-CAPM portfolio is not necessarily the minimum variance portfolio, since the I-CAPM assumes that the common market factor captures all systematic risk and the idiosyncratic risk is uncorrelated across markets. Despite the possible violation of this assumption, the I-CAPM is a useful benchmark to compare the relative country performances with.

[Figure 1 about here.]

Next, Figures 1 and 2 present a graphical analysis on the presence of a systematic pattern in the relative investment performance across countries. Figure 1 plots the degree of home bias against the volatility ratio. The top figure considers local currency stock prices and the bottom figure US$ prices. Both figures confirm the earlier results and show that the smaller the home bias the larger the reduction in volatility. This is strong evidence in favor of the desirability of international equity diversification, even during a global financial crisis.

[Figure 2 about here.]

Figure 2 plots the return during the crisis against the degree of home bias. The top figure considers local currency returns, while the bottom figure is based on US$ returns. Investors from countries with a smaller home bias experience a boost in their portfolio return relative to less diversified countries. The observed relationship is invariant to the currency denomination of stock prices. This result is possibly even a stronger justification for investors to hold well diversified international equity portfolios. Countries where investors have the smallest home bias experience the largest reduction in volatility and have had the largest excess return.

It is possible to combine the above results and discuss their implications for the well known Sharpe ratio. Since ex post returns are higher and volatility lower in countries with low home biased investors, these investors strictly improve their Sharpe ratio. Unfortunately, a quantification of the Sharpe ratio is not possible, because the Sharpe ratio needs positive expected excess returns to have a useful interpretation. This is certainly not the case with the large stock price deceases during the financial crisis. For example, high volatility improves the Sharpe ratio with negative returns, which would lead to strange and undesirable conclusions.

6 Conclusion

In conclusion, this paper shows that international equity diversification brings large benefits to investors during the financial crisis, despite increasing stock market comovements. By using the IMF's CPIS data set for 22 source and 42 destination countries during 2001-2009, the results show that investors hold larger positions in relatively less correlated foreign equity markets during the financial crisis. This is especially important for risk averse and loss averse investors because of their larger hedging demands for decreasing portfolio uncertainty during the volatile crisis markets. On the other hand, during the relatively tranquil pre-crisis period investors have no overexposure to relatively uncorrelated assets. This latter result is not necessarily a worrysome, because investor demands to hold uncorrelated assets in a bull market are smaller.

Detailed results at the country level indicate that investors from countries with the lowest degree of home bias enjoy the largest benefits during the financial crisis. First, these investors have a relatively better return performance and second, they experience the largest decrease in the volatility of their total equity portfolio. These results suggest that policymakers will benefit by reducing the barriers to foreign equity investments and should not impose barriers for their residents and financial institutions, such as pension funds, to hold well diversified global equity portfolios. It is important to stress, however, that diversification per se should not be an objective. What counts is effective diversification, where investors have overexposure to relatively less correlated equities, not per se during tranquil times, but the equities need to be uncorrelated when market circumstances are very volatile.

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Appendix

• Actual portfolio weight ($s_{ij,t}$): Foreign portfolio equities held by source country residents and issued by destination country residents per 31 December of year t. The weight is calculated by dividing country i's holdings of country j's equities by country i's total foreign equity holdings. Source: IMF Coordinated Portfolio Investment Survey, 2001-2009, values in US$.

• Foreign weight ($w_{ij,t}$): World portfolio weight measures country j's global stock market capitalization from country i's perspective, with country i excluded in % (calculated as described in Equation (1)). Source: Thomson Datastream.

• Equity returns: Daily local currency and US$ prices for national stock market indexes. Source: Thomson Datastream.

• Bilateral trade indicators: Annual trade between source county i and destination country j measured in US$. Source: IMF Direction of Trade Statistics. GDP is measured in US$. Source: World Bank World Development Indicators.

• GDP per capita: Measured in US$. Source: World Bank World Development Indicators.

• Exchange rates: Single country exchange rates vis-à-vis the US$. Source: Global Financial Data.

• Stock market liquidity: Ratio of total traded volume in year t divided by market capitalization per 31 December of year t. Source: World Bank Financial Structure dataset.

• Capital account openness: Chinn and Itô (2008) KAOPEN indicator. Source: Hiro Itô's website.

Table 1: Source country summary statistics

Source country	Domestic MCAP (Bn US$)	% Share in total World MCAP	Foreign Equity (Bn US$)	% Foreign Equity in Portfolio
North America				
Canada	1038.1	3.2	374.0	32.6
United States	12600.0	39.5	3030.8	20.9
Europe				
Austria	100.7	0.3	60.1	50.4
Belgium	230.7	0.7	193.4	55.5
Denmark	142.2	0.4	87.3	45.3
Finland	203.1	0.6	67.0	43.2
France	1604.4	5.0	481.6	31.2
Germany	1196.0	3.7	593.9	45.8
Italy	712.5	2.2	379.5	43.3
Netherlands	550.1	1.7	426.3	64.9
Norway	168.2	0.5	154.6	54.8
Portugal	83.7	0.2	29.2	43.5
Spain	640.6	2.0	114.1	20.1
Sweden	334.1	1.0	194.1	46.7
Switzerland	881.3	2.8	344.7	41.3
United Kingdom	2678.4	8.3	947.5	37.2
Asia				
Hong Kong, China	931.8	2.8	285.5	26.1
Japan	3372.6	10.5	395.9	12.7
Korea, Rep.	496.6	1.5	39.8	8.3
Singapore	227.3	0.7	92.4	36.2
Latin America				
Chile	111.8	0.3	30.3	19.0
Africa				
South Africa	248.3	0.8	55.8	23.2

Note: Domestic MCAP represents the domestic market capitalization of the respective source country, measured in billion US$. The column % Share in total world MCAP reports the weight of the source country's stock market in global stock market capitalization. Foreign equity is the total amount of foreign equity a source country's residents hold (measured in billion US$). Finally, % Foreign equities in portfolio summarizes the percentage of foreign equities in a certain source country's total equity portfolio. All summary statistics represent averages during 2001-2009. Source: IMF Coordinated Portfolio Investment Survey and Datastream. Based on the author's own calculations.

Table 2: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
log(weight$_{ij,t}$)	2.70	7.20	-1.60	88.52
log(foreign weight$_{ij,t}$)	-0.25	1.48	-3.67	4.02
correlation$_{ij,t}$	0.35	0.28	-0.24	0.96
bilateral trade$_{ij,t}$	5.53	11.96	0.00	230.26
log(gdp per capita$_{j,t}$)	9.53	1.19	6.14	11.46
exchange rate volatility$_{ij,t}$	10.21	6.94	0.00	56.68
stock market liquidity$_{j,t}$	0.89	0.72	0.01	5.79
bilateral trade 2$_{ij,t}$	14.75	25.62	0.00	298.60
trade openness$_{j,t}$	0.89	0.75	0.20	4.32
capital account openness$_{j,t}$	1.48	1.34	-1.84	2.48

Note: The descriptive statistics comprehend all bilateral pairs of the included source and destination countries during 2001-2009. Log(weight) measures the log of the actual weight of country j equities in country i's foreign portfolio, log(foreign weight) measures country j's global stock market capitalization weight from country i's perspective, with country i excluded in % (calculated as described in Equation (1)). Correlation between stock markets i and j is based on local currency index prices. Bilateral trade and bilateral trade 2 are two bilateral trade measures as described in Section 3.2. Log(gdp per capita) is the natural logarithm of country j's gdp per per capita in current US$. Exchange rate volatility is the annual realized volatility of the exchange rate between countries i and j. Share of offshore deposits is the ratio of foreigner's deposits over domestic resident's deposits in country j. Stock market liquidity is the turnover rate of country j's stock market (total trade volume during year t / stock market capitalization of country j). Capital account openness is the KAOPEN measure of Chinn and Itô (2008).

Table 3: Correlation matrix of the explanatory variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(2) log(foreign weight$_{ij,t}$)	0.55								
(3) correlation$_{ij,t}$	0.09	0.13							
(4) bilateral trade$_{ij,t}$	0.24	0.10	0.35						
(5) log(gdp per capita$_{j,t}$)	0.25	0.50	0.33	0.08					
(6) exchange rate volatility$_{ij,t}$	-0.14	-0.10	-0.42	-0.26	-0.23				
(7) stock market liquidity$_{j,t}$	0.30	0.48	0.27	0.09	0.41	-0.08			
(8) bilateral trade 2$_{ij,t}$	0.43	0.26	0.36	0.69	0.13	-0.26	0.17		
(9) trade openness$_{j,t}$	-0.14	-0.09	0.11	0.11	0.14	-0.13	-0.09	-0.04	
(10) capital account openness$_{j,t}$	0.21	0.30	0.23	0.05	0.77	-0.31	0.23	0.09	

Note: (1) is the variable log(weight$_{ij,t}$). The other numbers refer to the the number of the variable in the left column.

Table 4: Baseline regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log(foreign weight$_{ij,t}$)	0.905***	0.892***	0.841***	0.811***	0.826***	0.800***	0.831***
	(0.047)	(0.047)	(0.062)	(0.064)	(0.061)	(0.061)	(0.061)
I(c=1)*log(foreign weight$_{ij,t}$)		-0.003		0.020			
		(0.019)		(0.027)			
correlation$_{ij,t}$	-0.194	0.070	-0.143	0.050	0.078	0.094	0.082
	(0.139)	(0.139)	(0.138)	(0.144)	(0.141)	(0.139)	(0.139)
I(c=1) * correlation$_{ij,t}$		-0.607***		-0.451***	-0.541***	-0.542***	-0.551***
		(0.116)		(0.136)	(0.113)	(0.113)	(0.114)
bilateral trade$_{ij,t}$			0.001	0.001			
			(0.007)	(0.007)			
I(c=1) * bilateral trade$_{ij,t}$				-0.001			
				(0.002)			
log(gdp per capita$_{j,t}$)			0.279**	0.273**	0.270**	0.305**	0.281**
			(0.131)	(0.134)	(0.128)	(0.130)	(0.126)
I(c=1) * log(gdp per capita$_{j,t}$)				-0.069			
				(0.048)			
exchange rate volatility$_{ij,t}$			0.014***	0.010**	0.011***	0.012***	0.012***
			(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
I(c=1) * exchange rate volatility$_{ij,t}$				0.005			
				(0.005)			
stock market liquidity$_{j,t}$			-0.049	-0.008			
			(0.032)	(0.048)			
I(c=1) * stock market liquidity$_{j,t}$				-0.018			
				(0.050)			
bilateral trade 2$_{ij,t}$					0.003		
					(0.003)		
trade openness$_{j,t}$						0.041	
						(0.135)	
capital account openness$_{j,t}$						0.109	
						(0.068)	
Observations	7,316	7,316	7,175	7,175	7,224	7,260	7,316
R-squared	0.196	0.203	0.193	0.199	0.208	0.207	0.206
Country pairs	881	881	881	881	881	881	881

Note: Columns (1)-(7) show different variations of Equation (3), $ln(s_{ij,t}) = \beta_1 * ln(w_{ij,t}) + \beta_1^c * I(c=1) * ln(w_{ij,t}) + \beta_2 * \rho_{ij,t} + \beta_2^c * I(c=1) * \rho_{ij,t} + \boldsymbol{\gamma} * \mathbf{z_{ij,t}} + \boldsymbol{\gamma^c} * I(c=1) * \mathbf{z_{ij,t}} + \mu_{ij} + \mathbf{d_t} + \mathbf{d_t R_{ij}} + \epsilon_{ij,t}$, with variation in the matrix $\mathbf{z_{ij,t}}$ and the presence of a crisis coefficient on specific variables. The model is estimated using fixed effects with standard errors clustered at the country pair level. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 5: Robustness

	(1)	(2)	(3)	(4)	(5)
log(foreign weight)$_{ij,t}$	0.833***	0.898***	0.833***	0.969***	0.946***
	(0.061)	(0.058)	(0.061)	(0.112)	(0.117)
correlation$_{ij,t}$		0.094	0.154	-2.598	-2.317
		(0.126)	(0.148)	(1.739)	(1.859)
I(c=1) * correlation$_{ij,t}$		-0.286***		-2.417***	-3.020**
		(0.081)		(0.906)	(1.254)
correlation US$$_{ij,t}$	0.047				
	(0.113)				
I(c=1) * correlation US$$_{ij,t}$	-0.539***				
	(0.112)				
I(c=1) * correlation [I(c=1)=1 if year$\geq$2007]$_{ij,t}$			-0.417***		
			(0.087)		
log(gdp per capita$_{j,t}$)	0.285**	0.181	0.280**	0.255*	0.255*
	(0.127)	(0.117)	(0.126)	(0.133)	(0.135)
exchange rate volatility$_{ij,t}$	0.011***	0.008*	0.013***	-0.004	-0.007
	(0.004)	(0.004)	(0.004)	(0.008)	(0.010)
Observations	7,316	6,309	7,316	7,103	7,159
R-squared	0.206	0.263	0.204	-	-
Country pairs	881	701	881	865	865

Note: The columns show different variations in the model with regard to the benchmark specification (Table 4, column (7)) of Equation (3), $ln(s_{ij,t}) = \beta_1 * ln(w_{ij,t}) + \beta_1^c * I(c = 1) * ln(w_{ij,t}) + \beta_2 * \rho_{ij,t} + \beta_2^c * I(c = 1) * \rho_{ij,t} + \boldsymbol{\gamma} * \mathbf{z_{ij,t}} + \boldsymbol{\gamma^c} * I(c = 1) * \mathbf{z_{ij,t}} + \mu_{ij} + \mathbf{d_t} + \mathbf{d_t R_{ij}} + \epsilon_{ij,t}$. Column (1) uses correlations based on US$ stock prices instead of local currency prices. Column (2) restricts the sample to a balanced sample. Column (3) allows the crisis to start in 2007, i.e. $I(c = 1) = 1$ if t is larger or equal to 2007. Columns (4) and (5) represent IV estimations of the benchmark model using two different sets of instrumental variables. The model is estimated using fixed effects with standard errors clustered at the country pair level. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 6: Different country characteristics

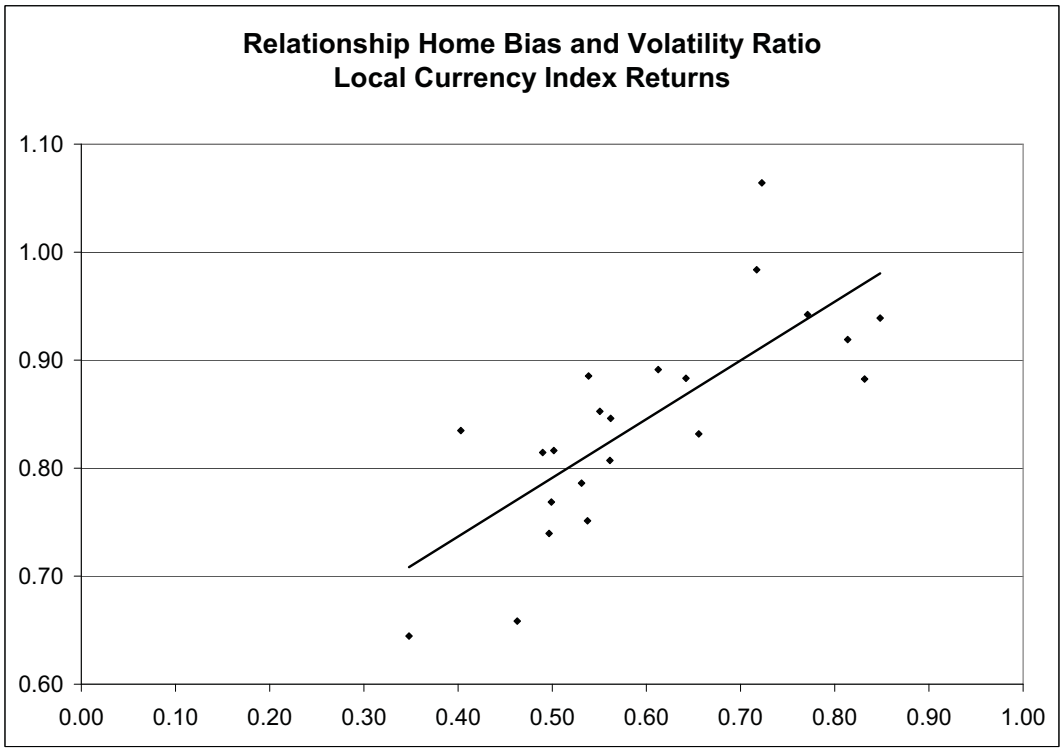
	(1)	(2)	(3)	(4)	(5)	(6)
log(foreign weight$_{ij,t}$)	0.863***	0.799***	0.862***	0.780***	0.796***	0.874***
	(0.096)	(0.076)	(0.070)	(0.105)	(0.070)	(0.110)
correlation$_{ij,t}$	-0.011	0.186	-0.033	0.317	0.124	0.045
	(0.229)	(0.160)	(0.156)	(0.246)	(0.164)	(0.247)
I(c=1) * correlation$_{ij,t}$	-0.913***	-0.238***	-0.178***	-1.263***	-0.338***	-1.224***
	(0.215)	(0.078)	(0.065)	(0.310)	(0.098)	(0.225)
log(gdp per capita$_{j,t}$)	0.249	0.275*	0.296**	0.226	0.258*	0.247
	(0.204)	(0.154)	(0.140)	(0.222)	(0.147)	(0.236)
exchange rate volatility$_{ij,t}$	0.021***	0.002	0.003	0.020**	0.002	0.035***
	(0.006)	(0.006)	(0.004)	(0.009)	(0.006)	(0.007)
Observations	3,588	3,728	3,922	3,394	4,760	2,556
R-squared	0.181	0.286	0.384	0.134	0.271	0.177
Country pairs	441	440	448	433	563	318

Note: The columns represent the estimation of the benchmark specification (Table 4, column (5)) of Equation (3), $ln(s_{ij,t}) = \beta_1 * ln(w_{ij,t}) + \beta_1^c * I(c=1) * ln(w_{ij,t}) + \beta_2 * \rho_{ij,t} + \beta_2^c * I(c=1) * \rho_{ij,t} + \boldsymbol{\gamma} * \mathbf{z_{ij,t}} + \boldsymbol{\gamma^c} * I(c=1) * \mathbf{z_{ij,t}} + \mu_{ij} + \mathbf{d_t} + \mathbf{d_t R_{ij}} + \epsilon_{ij,t}$ for specific source country subsamples. Column (1) pools the 11 countries with the highest home bias, while column (2) pools those with the lowest degree of home bias. Column (3) pools those 11 source countries with the highest absolute amount of foreign portfolio equities and column (4) the 11 lowest. Column (5) pools all European source countries, while column (6) shows the results when pooling all non-European source countries. The model is estimated using fixed effects with standard errors clustered at the country pair level. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 7: Aggregate country performance during the financial crisis

country	home bias	return			volatility		
		domestic (%)	portfolio (%)	difference (% points)	domestic (%)	portfolio (%)	ratio
Austria	0.56	-54.6	-45.2	9.4	49.4	39.9	0.81
Belgium	0.40	-45.0	-38.9	6.1	43.1	36.0	0.83
Canada	0.66	-16.1	-20.2	-4.1	45.5	37.9	0.83
Chile	0.72	8.2	-0.8	-9.0	26.5	28.2	1.06
Denmark	0.50	-37.5	-33.6	3.9	45.1	34.6	0.77
Finland	0.50	-62.8	-45.1	17.7	49.6	40.5	0.82
France	0.64	-35.8	-35.0	0.8	43.0	38.0	0.88
Germany	0.49	-40.1	-37.0	3.1	42.5	34.6	0.81
Hong Kong	0.72	-31.1	-27.5	3.6	53.3	52.5	0.98
Italy	0.55	-48.6	-42.1	6.4	44.5	37.9	0.85
Japan	0.83	-48.1	-44.9	3.2	47.5	41.9	0.88
Korea	0.85	-11.1	-13.1	-1.9	47.5	44.6	0.94
Netherlands	0.35	-44.3	-34.2	10.2	47.1	30.3	0.64
Norway	0.46	-35.5	-32.3	3.1	59.2	39.0	0.66
Portugal	0.54	-43.4	-37.9	5.5	37.5	33.2	0.89
Singapore	0.61	-17.6	-20.4	-2.8	39.1	34.8	0.89
South Africa	0.81	-11.1	-12.9	-1.8	39.7	36.5	0.92
Spain	0.77	-34.4	-34.1	0.3	41.1	38.8	0.94
Sweden	0.50	-16.9	-24.6	-7.7	49.6	36.7	0.74
Switzerland	0.56	-25.6	-28.4	-2.8	36.4	30.8	0.85
United Kingdom	0.53	-17.8	-23.8	-6.0	43.1	33.9	0.79
United States	0.54	-26.4	-27.1	-0.7	48.8	36.6	0.75

Note: Home bias is calculated using the Ahearne et al. (2004) indicator as described in the text. The returns under the heading domestic show the returns of the country's domestic stock market during 1/1/2008 - 31/12/2009, while the returns under portfolio report the returns of the respective country's domestic and foreign asset allocation as of 31/12/2007 during the same time frame. The same applies to volatility. The column difference reports the difference between both returns with Volatility^{portfolio} - Volatility^{domestic}. The column ratio calculates the volatility ratios by $R^{portfolio}$ / $R^{domestic}$.



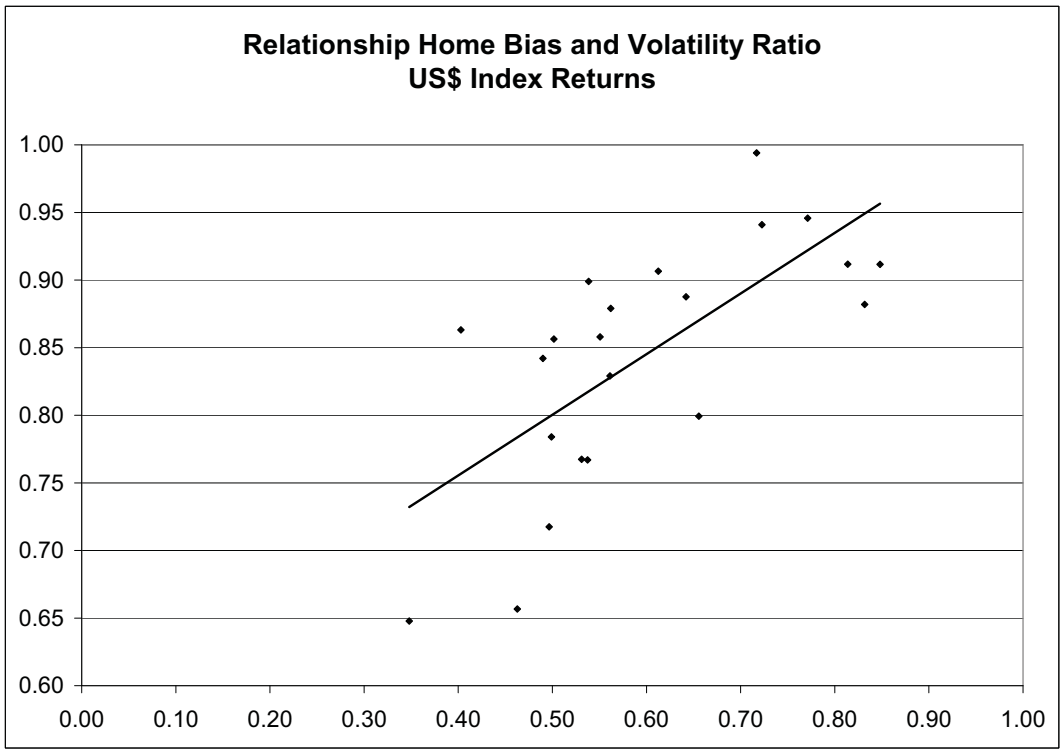
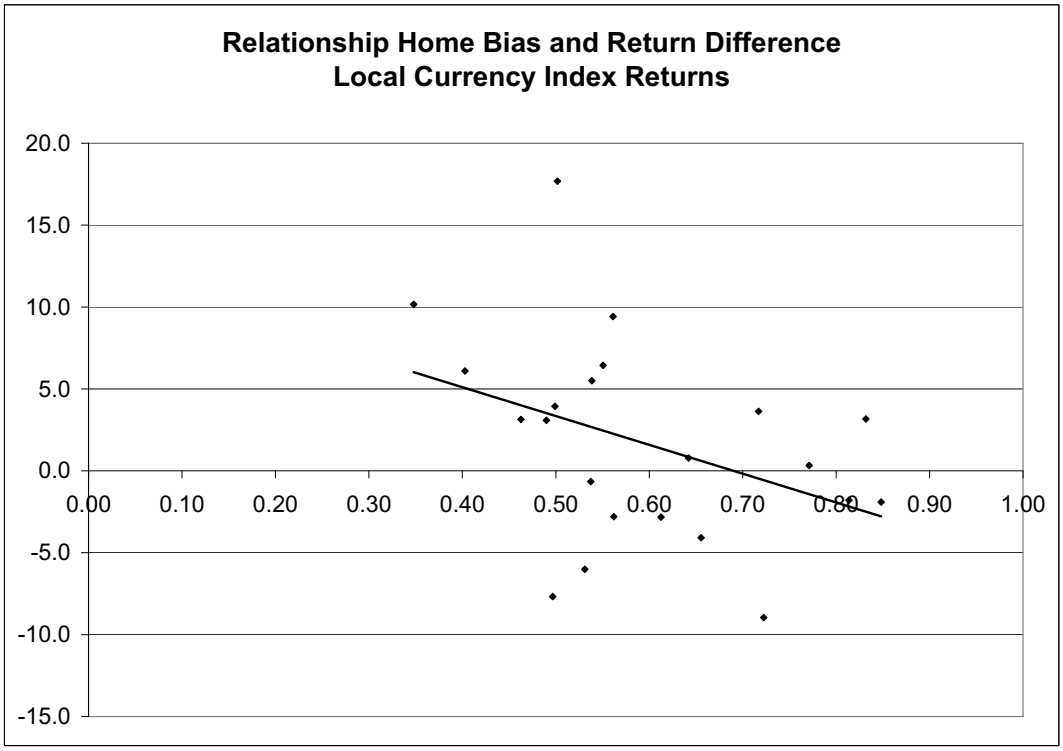


Figure 1: The scatter plots show the relation between the degree of home bias (horizontal axis) and the volatility ratio of the actual equity portfolio vs. a domestic equities only portfolio (vertical axis) including all 22 source countries. See also Table 7.



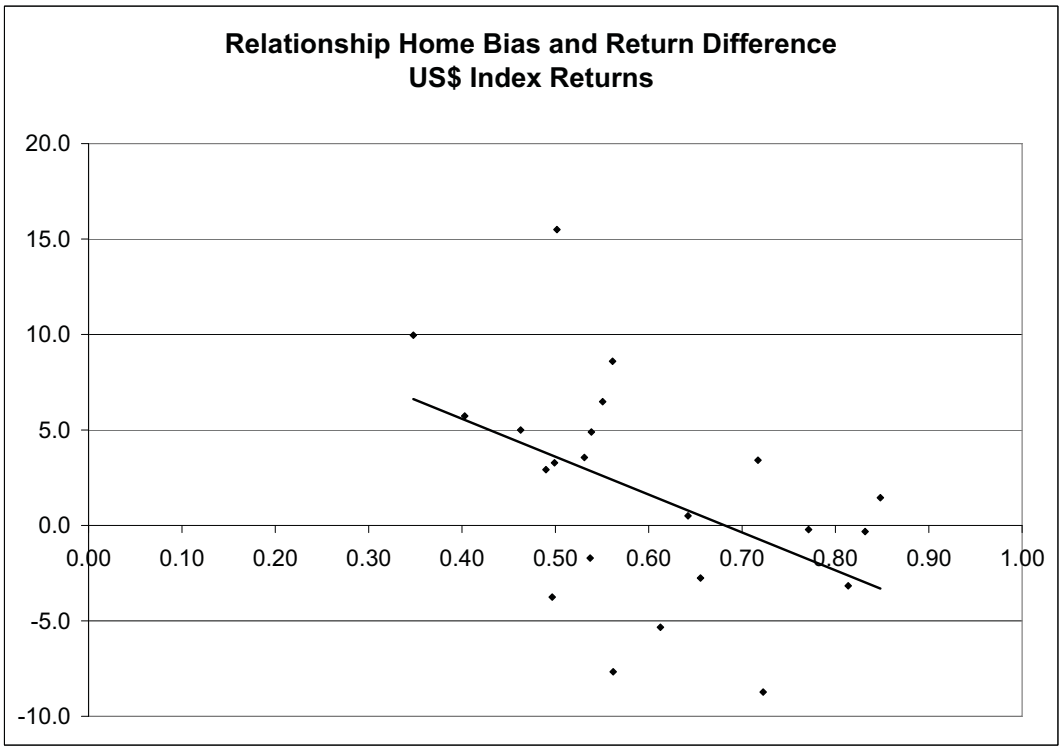


Figure 2: The scatter plots show the relation between the degree of home bias (horizontal axis) and the return difference of the actual equity portfolio and a domestic equities only portfolio in percentage points (vertical axis) including all 22 source countries. See also Table 7.

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