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**The effect of the financial crisis on cross-
border equity portfolio diversification**

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Abstract

This thesis investigates the effect of the recent financial crisis on cross-border equity portfolio diversification using the IMF's Coordinated Portfolio Investment Survey (CPIS) data from 2001-2011. The analysis on 27 developed nations shows an increasing trend in the total value of their foreign equity holdings from 2001 to 2007, followed by a sudden drop during the financial crisis in 2008. In contrast, the declining trend observed in home bias during the 2001-2007 period is strengthened during the financial crisis. However, the decomposition of the active and passive components of changes in portfolio holdings reveals that the decrease in home bias during the crisis is mainly due to passive changes in portfolio allocation. This implies that the decline in home bias is not attributable to investors actively seeking low correlation foreign securities. The new measure of financial openness used in this study is found to be highly significant and substantially better than conventional measures. In addition, the results suggest that in the long term, optimal diversification considerations such as initial degree of underweight of a country relative to its weight in the global market portfolio, diversification benefits and a common currency have significant positive impact on investors' international equity portfolio reallocation decisions.

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1. Introduction

Within and across economies, there is a strong tendency for economic phenomena to move together giving rise to periods of relatively high or low general economic activity. This also holds true for individual securities and industries. The model of portfolio selection developed by Harry Markowitz assumes that investors are risk averse and states that investors choose “mean-variance-efficient” portfolios. These portfolios minimize the variance of a portfolio return, given expected return. The relatively low degree of positive correlation between different equity markets indicates the possibility of risk reduction by diversifying portfolios internationally. Further, the International Capital Asset Pricing Model (ICAPM) suggests that international investors should hold assets of each country in proportion to the country’s share in the world market portfolio. However, investors have exhibited a preference to hold domestic securities rather than foreign equities, despite the purported benefits of diversifying into foreign equities. This puzzling fact is called home bias. French and Poterba (1991) find that portfolio patterns implied investors expected returns in their domestic equity market to be several hundred basis points higher than those in other markets. French and Poterba also show that the lack of diversification is largely due to investor choices, rather than institutional constraints. Since then a number of studies have tried to explain the determinants of home bias. Recent studies point to the role of geography, population, information costs, currency unions, and trade relations as determinants of cross-border asset holdings.

Many studies (Coeurdacier and Guibaud 2011, Solnik, 1974b, French and Poterba, 1991) have shown the return and risk advantages resulting from international diversification. Based on data from Canada, Japan, the United Kingdom, the United States and Germany Tesar and Werner (1995) were able to determine that an internationally diversified portfolio can generate substantially higher returns compared to a portfolio including primarily domestic securities. The only exception was Germany. In their 2007 study, Sørensen et al. prove empirically that declining home bias and increasing risk sharing move hand-in-hand. Using a panel of OECD countries they show that when home bias declines, risk sharing across countries increases. Economic theory also argues that international capital mobility allows for savings to be channeled towards the countries with more productive investment opportunities and for a better sharing of macroeconomic risk between countries subject to different shocks (Ferretti and Tille, 2011). Therefore, understanding international capital flows and the effect of crises on cross border portfolio investments is highly relevant for policy-makers.

Although the level of cross-border equity investment is lower than full

international diversification would require, it has been growing over time. The process of ‘financial globalization’ fostered by capital account liberalizations, electronic trading, increasing exchanges of information across borders and falling transaction costs has certainly led to a large increase in cross-border asset trade (Lane and Milesi-Ferretti, 2003). The establishment of the Economic and Monetary Union (EMU) also played a key role in the reallocation of capital among countries worldwide as well as among euro area countries, thereby enhancing financial integration and potentially international risk sharing (De Santis and Gérard, 2009). Investors in most countries can now invest abroad through mutual funds and even direct ownership of foreign shares more easily than they ever could.

This thesis approaches the home bias puzzle in light of the financial crisis and investigates whether cross-border diversification continues to increase after 2001 and through the crisis period for 30 countries¹. Until 1997, the lack of a comprehensive database on cross border holdings presented significant obstacles to researching individual country bilateral investment patterns. Researchers had to use capital flow data to proxy for portfolio holdings and focus on data of one individual country, with most attention paid to the U.S. However, an individual country’s perspective necessarily restricts the analysis of home bias to the characteristics of the investor country. To overcome this obstacle our paper employs data from the International Monetary Fund’s Coordinated Portfolio Investment Survey (CPIS). In this study the countries in the large CPIS dataset are classified following the 2011 definitions of the FTSE Group. The analysis of 27 developed nations shows an increasing trend in the total amount of their foreign equity holdings from 2001 to 2007, followed by a sudden drop with the crisis in 2008. However, this analysis also brings to light the heterogeneity of the impact of the crisis across different sets of countries. The share of equity investment in secondary emerging and frontier markets continues to increase throughout the crisis period while the share of investments in developed markets declines. But the impact of the proxy variables for secondary emerging and frontier markets on equity portfolio reallocation is found to be insignificant. This implies that the heterogeneity is mainly due to differential returns. Looking specifically at the level of home bias across the OECD countries, the declining trend during the 2001-2007 is sustained and even strengthened during the financial crisis in 2008. This finding is in line with the positive relationship observed between the crisis

¹ Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom and the United States.

variable and the total change in the weights of foreign equity holdings in the regression analysis conducted. Theory predicts that the uncertainty created by a financial crisis should lead to an increase in home bias. Contrary to this prediction, the effect of the financial crisis is found to be an increase in the total change in foreign equity holdings for the 30 countries in the sample. However, after decomposing the changes in equity portfolio weights into passive changes and active changes, the analysis of the active portfolio reallocation shows an insignificant relationship with the crisis. On the other hand, the passive portfolio reallocation exhibits a positive relation with the crisis period. Therefore, the positive relationship observed between the crisis and total cross-border equity reallocation is due to passive changes in portfolio allocation and not attributable to active investor reallocation decisions. Consistent with De Santis and Gérard (2009), we find that changes in portfolio weights both in the long term (2001-2011) and short term (annual changes) were affected positively by the initial degree of underweight of a country relative to its weight in the global market portfolio, the diversification benefits in the form of lower portfolio risk from increasing the weight invested in a certain country and a common currency (EMU). Another contribution this paper makes is the use of a new measure of financial openness, which adjusts for the size of a country's equity market in the regressions. The financial openness measure is found to be substantially better than the more widely used economic openness variable (the ratio of imports plus exports to GDP) at explaining the variation in cross-border equity portfolio reallocation.

The outline of this paper is as follows: Section 2 provides the literature review on the studies of home bias before and after the crisis. Section 3 elaborates the methodology used in this paper. In section 4 a description of the data used in this study follows and, finally, part 5 presents the results of the study, while part 6 concludes.

2. Background and literature

French and Poterba's seminal paper published in 1991 documented ownership shares across countries. Using data for the US, Japan, UK, France and Germany, they show that investors hold a disproportionate share of domestic assets in their equity portfolios. The estimated domestic ownership share of the world's five largest stock markets was 92.2% for the U.S., 95.7% for Japan, 92% for the U.K., 79% for Germany, and 89.4% for France in 1989. This portfolio pattern implies that investors expected returns in their domestic stock markets to be several hundred basis points higher than returns in other markets. They label this lack of cross border diversification as equity home bias.

Many explanations have been given for home bias. Some of the most common ones are: hedging possibilities against domestic risks, trading costs and information asymmetries and behavioral biases.

Hedging domestic risks

One potential explanation for the home bias in equity portfolios is that domestic assets serve as a better hedge for risks that are home-country specific, e.g. inflation risk and domestic consumption risk, since investments in domestic assets are likely to follow the performance of the domestic market in general (Sercu, Vanpee, 2007). To hedge future inflation rates, investors in different countries are induced to hold portfolios that differ by a component designed to hedge inflation risk (Adler and Dumas, 1983). Inflation risk can be hedged using domestic stocks if domestic stock returns are positively correlated with inflation rates. However, studies by Dumas (1983) and Cooper and Kaplanis (1997) have shown that the evidence in this sense is weak. Further inflation and other domestic risks can be hedged by investing in foreign riskless securities such as, inflation protected treasury securities and other riskless securities such as T-bills and T-bonds. Therefore, home bias cannot be fully explained by motives for hedging domestic risks.

Costs and barriers for foreign investments

Transaction costs and barriers to foreign investments can include fixed or proportional transaction costs in foreign portfolio investments, difference of tax treatments across domestic and foreign portfolio incomes and other policy induced restrictions on foreign investments (such as limits to foreign investment, capital controls, differences in legal frameworks). Since the early nineties, nearly all countries have liberalized their financial markets, at least to a certain extent. These days, all developed markets and a number of emerging markets are open to foreign investors. In other words, equity home bias, which is highly persistent and still prevalent, cannot be explained by international capital controls (Nicolas Coeurdacier, Hélène Rey, 2011).

Information asymmetries

A very popular potential explanation for home bias is that the preference for domestic assets is driven by information asymmetries between domestic and foreign investors. Indeed, if there is differential information, risk-averse investors prefer the stocks on which they easily have better information – these are typically the domestic stocks – because they perceive them as less risky (Sercu and Vanpee, 2007). The foreign purchases of U.S. investors are positively correlated with the lagged foreign market returns. This is consistent with U.S. investors being at an

information disadvantage relative to foreign investors. Additionally, Brennan et al. (2005) show that there is a link between information disadvantages and the expectations (degree of bullishness) about a market. Foreign investors tend to become more bullish about a certain market following a positive return on that market. Portes and Rey (2005) use portfolio equity flows from Capital Data and show that proxies for informational asymmetries, together with the size of host countries' stock markets, are key determinants of international equity flows.

Home bias is a well-known puzzle in international finance: the International CAPM model predicts that the representative investor of a given country should hold the world market portfolio. In other words, the share of his financial wealth invested in local equities should be equal to the share of local equities in the world market portfolio, a prediction that contradicts the observation of the data on portfolio holdings. Home bias has decreased over the last twenty years with the process of financial globalization, but remains high in most countries. On average, the degree of home bias across the world is 0.63 - lower in Europe where the implementation of the third stage of the Economic and Monetary Union with the introduction of the euro-single monetary policy in 1999 seems to have had an effect. Emerging markets have less diversified equity portfolios than developed countries and do not exhibit any clear downward trend in home bias. The average degree of home bias in these countries is 0.9 (smaller in emerging Asia and larger in Latin America) and investors in these countries hold 1/10 of the amount of foreign equities they should be holding according to the basic International CAPM model (Nicolas Coeurdacier and H el ene Rey, 2011).

More specifically, the study by De Santis and G erard (2009) has documented that during the period 1997-2005, the strongest determinants of the changes in bilateral portfolio weights were expected marginal diversification benefits and the initial degree of underweight, which are optimal diversification considerations. Moreover, they have found that euro area investors have reallocated significantly higher portfolio shares to euro area fixed income and equity assets than investors from all other countries due to the implementation of the third stage of the Economic and Monetary Union in 1999 that eliminated currency risk among these countries. Lane and Milesi-Ferretti (2008) also found higher equity investment among OECD countries using CPIS data only until 2004. They found that bilateral equity investment is strongly correlated with the underlying patterns of trade in goods and informational linkages, such as a common language, which is proof of a decline in home bias.

Studies of the financial crisis

Generally, a reduction in home bias has been observed from the early 1990's to the mid 2000's. However, the 2007 financial crisis saw an unprecedented collapse in international capital flows after years of rising financial globalization (Gian-Maria Milesi-Ferretti and Cedric Tille, 2011). Ferretti and Tille further find that there is a high degree of heterogeneity in the patterns of capital flows, across time, types of flows, and countries and that international banking flows – particularly among advanced economies – played a central role both during the pre-crisis globalization and in the crisis itself. The contraction in flows was found to be more concentrated in banking flows, with smaller declines in portfolio investment and especially FDI.

Giannetti and Laeven's (2011) results indicate that the home bias of international capital allocation tends to increase in the presence of adverse economic shocks affecting the net wealth of international investors and that home bias of lenders' loan origination increases by approximately 20 percent if the bank's country of origin experiences a banking crisis. This flight home effect is distinct from a *flight to quality* effect because borrowers of different quality (or from countries with different degree of investor protection) are similarly affected by lenders rebalancing their loan portfolios in favor of domestic borrowers (Giannetti, Laeven, 2011).

Broda et al. (2009) focus on the determinants of US flows and the external value of the dollar and stress the role of a flight to the safety of US assets such as Treasury bills in response to an increase in perceived risk of other assets.

3. Methodology

Measuring home bias

Several methods have been used to measure home bias. The measure of equity home bias (EHB) that is most commonly used is the difference between actual holdings and optimal holdings of domestic equity and the share of domestic equity in the world market portfolio:

$$EHB_i = 1 - \frac{\text{Share of foreign equity in country } i \text{ equity holdings}}{\text{Share of foreign equity in the world market portfolio}}$$

When the home bias measure for country i , EHB_i , is equal to one, there is full equity home bias; when it is equal to zero, the portfolio is optimally diversified according to the basic International CAPM.

Portfolio weights and degree of underweight

The actual country k equity holdings of country c are found using:

$$w_{ck,t} = \frac{Inv_{ck,t}}{\sum_k Inv_{c,k,t}}$$

Where $w_{ck,t}$ denotes the weight of country c's investment in country k holdings out of its total foreign investments.

A change in portfolio reallocation can be decomposed into a passive component resulting from differential returns and an active component due to trades by investors. The total change in portfolio weights is computed as follows:

$$\Delta w_{ck,t}^T = w_{ck,t} - w_{ck,t-1}$$

To disentangle the active component of the change in portfolio, the method used by De Santis and Gerard (2009) is adopted:

$$\Delta w_{ck,t}^A = w_{ck,t} - w_{ck,t-1} \frac{(1+r_c)}{\sum_k (1+w_{ck,t-1}r_{k,t}^c)} = w_{ck,t} - w_{ck,t-1} \frac{(1+r_{k,t}^c)}{(1+r_{Pc,t}^c)}$$

Hence the passive change in portfolio reallocation is the difference between the total change and the active change:

$$\Delta w_{ck,t}^P = \Delta w_{ck,t}^T - \Delta w_{ck,t}^A = w_{ck,t-1} \frac{(1+r_{k,t}^c)}{(1+r_{Pc,t}^c)} - w_{ck,t-1}$$

where $r_{k,t}^c$ is the return on investment k and $r_{Pc,t}^c$ is the total return on country c's foreign portfolio.

Both active and passive changes in portfolio weights are used in the analysis under section 5.3.

Following the empirical approach used by De Santis and Gerard (2009), we used the portfolio approach and optimal portfolio weights for a country are computed as a proportion of the country's share in the international financial market. The difference between the optimal weights and the actual weights reveals the initial misallocation in the destination country. Portfolio rebalancing that takes place to correct this initial misallocation and to shift the weights towards the optimal portfolio weights is one of the rational investment decisions made by investors, therefore the initial degree of underweight (DW) is included as an independent variable. To disentangle portfolio re-balancing towards the optimal weight from irrational home bias, the initial misallocation from the optimal weight can then be computed as:

$$DW_{ck,t} = w_{ck,t}^* - w_{ck,t}$$

Where $DW_{ck,t}$ is the degree of underweight, $w_{ck,t}^*$ is the optimal share that should have been invested by country c in country k equities according to the ICAPM and $w_{ck,t}$ is the actual weight invested.

Marginal diversification benefits

Another rational consideration by investors that needs to be disentangled from the effect of the recent financial crisis is diversification benefits. The measure of diversification benefits (DB) defined by De Santis and Gerard (2009), computes the marginal impact on portfolio risk of increasing or decreasing a position in a particular asset using the foreign investment portfolio variance.

$$\sigma_{Pct}^2 = w'_{c,t} \Sigma_{c,t} w_{c,t}$$

$$DB_{ck,t} = -\frac{\partial}{\partial w_{ck,t}} \left[w'_{c,t} \sum_{c,t} w_{c,t} \right]$$

$$DB_{ck,t} = -2 \sum_{l=1}^k w_{cl,t} \sigma_{lk,t}$$

Where $DB_{ck,t}$ is the measure of diversification benefits obtained by country c from increasing its holdings of country k 's equity.

Since markets are becoming increasingly correlated, the covariance matrices (Σ) which are used to compute diversification benefits are estimated annually using weekly equity returns on the MSCI country indices from Datastream.

The impact of the EMU

De Santis and Gerard (2009) find a significant increase in cross-border portfolio diversification among European countries due to the elimination of currency risk by the EMU. Therefore a binary variable (EMUD), which equals 1 when both the investing and the host country are from the EMU, is used to account for the impact of the EMU.

Economic openness

The economic openness (EO) index measures the ratio of imports plus exports to GDP and gives an indication of the degree of openness of an economy. The existence of capital controls is a potentially first-order determinant of investment. The trend towards economic openness should therefore lead to smaller foreign investment biases (Bekaert, Wang, 2009). Thus this variable is expected to be negatively related to home bias.

Financial openness

The trend towards financial openness, which has been observed since the 1990's should be associated with lower home bias. Previous studies have used economic openness (the ratio of imports plus exports to GDP), which is widely used in the trade literature, as a proxy for financial openness. However, the focus of this

paper is specifically on portfolio investments and not of foreign direct investments or international trade. Therefore, a new and more accurate measure of financial openness adjusted for the size of the equity markets is included in the regressions. The fraction of an equity market held by foreigners adjusted for the relative size of the home equity market in the world equity market capitalization is used as a measure of financial openness (FO):

$$FO = 1 - \left(\frac{\text{Domestic holdings in domestic markets}}{\text{Total value of domestic market}} \right)$$

If no foreigners hold domestic equity, then the domestic holdings in the domestic market is equal to the total value of the domestic market and FO is zero. But FO as currently defined does not take into account the relative size of the home market in the world market and results in higher openness measures for smaller markets. Therefore, we use the adjusted financial openness (AdjFO) which accounts for the size of the domestic market as follows:

$$\text{AdjFO} = \frac{FO}{\left[1 - \left(\frac{\text{Total market value of domestic market}}{\text{Total value of world market}} \right) \right]}$$

Investor protection

The investor protection index (IPI) from the database of the International Finance Corporation's Doing Business Project is used to investigate whether the level of investor protection had an impact on how investors reacted during the crisis. Investors could have only avoided investing in markets where they are more likely to face expropriation. The strength of investor protection index is the average of the extent of disclosure index, the extent of director liability index and the ease of shareholder suits index. The index ranges from 0 to 10, with higher values indicating more investor protection. This methodology was developed by Djankov, La Porta and others (2008).

Financial difficulty

In order to incorporate country specific indicators of financial difficulty into the analysis, the spread of the 10 year sovereign debt rate from the ECB rate is used to proxy for nations under financial difficulty. This measure gives an idea of the ability of a country to make future payments on its debt.

Returns

Previous research has shown that international portfolio flows have a positive relationship with lagged returns. To test this relationship and the predictive power of cross-border portfolio reallocation on returns, both current and lagged returns are included as explanatory variables.

The impact of the financial crisis

To understand the impact of the financial crisis on cross border diversification decisions of investors, binary variables are constructed for each year from 2002 to 2011.

The following equation is estimated and the resulting coefficients are reported and interpreted in section 5.3:

$$\begin{aligned} \Delta w_{ck,t} = & \alpha_0 + \alpha_1 DW_{ck,t-1} + \beta DB_{ck,t-1} \\ & + \gamma EMUD + \theta_1 EO + \theta_2 FD + \theta_3 GDP + \theta_4 IPI + \theta_5 AdjFO + \delta_1 Ret_{k,t} \\ & + \delta_2 Ret_{k,t-1} + \lambda_1 D2003 + \lambda_2 D2004 + \lambda_3 D2005 + \lambda_4 D2006 \\ & + \lambda_5 D2007 + \lambda_6 D2008 + \lambda_7 D2009 + \lambda_8 D2010 + \lambda_9 D2011 \\ & + \phi W_RW_{c,t} \end{aligned}$$

Where DW represents the initial degree of underweight, DB is the measure of diversification benefits, EMUD is the EMU dummy, EO is a measure of economic openness, FD denotes financial difficulty and IPI is the investor protection index. AdjFo is the adjusted measure of financial openness. Ret and Ret_{t-1} denote current and lagged returns consecutively. The variables D2003-D2011 are year dummies used to capture the impact of the crisis, while $W_RW_{c,t}$ measures the weight of country c's portfolio invested in the rest of the world. GDP (the logarithm of GDP in millions of U.S. dollars) is a country specific control variable used to account for the size of the economy of the countries in the sample.

4. Data

In existing literature, it has been difficult to analyze in depth the international investment and cross-border portfolio diversification due to the lack of consistent data on international portfolio allocation. This paper is based on a dataset from the only global survey of portfolio investment holdings, IMF's Coordinated Portfolio Investment Survey (CPIS). Additional data on other variables, such as risk free rates, exchange rates and world equity returns, necessary to construct the regressors is collected from data sources of the World Bank and Thomson Reuters DataStream.

The CPIS provides information on individual economy year-end holdings of portfolio investment securities - equity securities and debt securities - valued at market prices denominated in US dollar, cross-classified by the country of issuer of the securities. In the period 2001-2011, 73 of the world's economies

participated in the CPIS survey, comprising all major international investors.

The CPIS Cross-Economy Tables contain, in matrix form, data from the individual economy tables of residents' holdings of securities issued by nonresidents (reported data) and the derived data for nonresidents' holdings of securities issued by residents (derived data).

Unlike many other datasets used in the existing literature, the CPIS dataset has the advantage of consistency:

- The dataset is based on a portfolio survey taken by the participating economies at the same time.
- Although self-reported, data on the investment portfolio of each participating country follows IMF's methodology and recommendations contained in the CPIS guide.
- In addition to self-reported data on each of the participating economies, the dataset includes data collected from individual economies' monetary authorities through the Survey of Securities Held as Reserve Assets (SEFER) and data reported by international organizations through the Survey of Securities Held by International Organizations (SSIO).
- All participating countries report data on their end-of-year individual equity and (short and long term) debt securities holdings issued by nonresidents.

Therefore, the IMF CPIS dataset allows us to investigate in a comprehensive manner whether the cross-border equity diversification continued to increase after 2005 and to explore the effect of the 2008-2010 Financial Crisis on cross-border equity portfolio diversification.

5. Empirical Analysis

5.1. Total Foreign Equity Holdings

The CPIS database for the period 2001-2011 contains, among others, the international equity and debt securities portfolio holdings of 11 euro zone countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain, 6 countries from the European Union that have not adopted the euro currency: Denmark, Sweden, United Kingdom, Hungary (joined EU in 2004) and Bulgaria and Romania (joined EU in 2007) and other 10 developed countries: Australia, Canada, Hong Kong, Israel, Japan, New Zealand, Norway, Singapore, Switzerland and USA.

Based on the beginning-of-period data, all the countries listed in the CPIS database invested internationally 12.7 trillions of US dollars representing 50% of

the 2001 GDP of the OECD countries. 59.1% of this investment was in debt securities and 40.9% in equities.

At the end of the period (2011), the countries participating in the CPIS invested internationally 38.9 trillions of US dollars, 36.4% in equity and 63.6% in short and long term debt securities. This is equivalent to 91.7% of the 2011 GDP of the OECD countries.

Looking at the United States, the main portfolio investor in other countries, a growing preference for equity investments can be noticed for 2001-2007, with 70% to 73% of all portfolio holdings being equity holdings. However, at the end of 2008, following Lehman Brothers' default the United States' international equity investments dropped to 64% of all its international portfolio holdings. This was followed by a slow increase to 66% in 2011. The decrease in equity holdings might indicate the existence of a flight to the safety of debt instruments in response to an increase in the perceived risk of other assets, assuming that debt securities were marked to market with the same speed and accuracy as equity investments.

To simplify the initial data analysis, the countries in large CPIS dataset are classified following the 2011 definitions of the FTSE Group into *developed markets* (Australia, Austria, Belgium/ Luxemburg, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, UK and US), *advanced emerging markets* (medium income countries with advanced market infrastructures or high income countries with less developed market infrastructures: Brazil, Czech Republic, Hungary, Malaysia, Mexico, Poland, South Africa, Taiwan and Turkey), *secondary emerging markets* (countries with reasonable market infrastructures: Chile, China, Colombia, Egypt, India, Indonesia, Morocco, Pakistan, Peru, Philippines, Russian Federation, Thailand and UAE) and *frontier markets* (lower market capitalization and liquidity than the emerging markets, typically followed by investors wanting long-term returns and low correlations with other markets: Argentina, Bahrain, Bangladesh, Botswana, Bulgaria, Cote d'Ivoire, Croatia, Cyprus, Estonia, Ghana, Jordan, Kenya, Lithuania, Macedonia, Malta, Mauritius, Nigeria, Oman, Qatar, Romania, Serbia, Slovakia, Slovenia, Sri Lanka, Tunisia and Vietnam).

The following countries have been classified in the analysis as '*tax haven*' territories, where certain taxes are levied at a low rate or not at all: Andorra, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Curacao, Guernsey, Jersey, Isle of Man, Lichtenstein, Monaco, Panama, San Marino, Seychelles and Turks & Caicos Islands.

Analyzing the total value of equity holdings of the 27 developed countries, one can

see that between 2001 and 2007, it exhibited an upward trend, increasing from 5 trillion US dollars in 2001 to 13.5 trillion US dollars in 2006, followed by a sudden drop to 9 trillion US dollars at the end of 2008.

Table 1. International equity holdings of developed countries in million US dollars.²

Year	Total equity holdings of developed markets	Equity holdings in other developed markets	Equity holdings in advanced emerging markets	Equity holdings in secondary emerging markets	Equity holdings in frontier markets	Equity holdings in tax havens	Equity holdings in other markets*
2001	5003449	4424177	146314	54320	4840	263703	110096
2006	13548579	11211641	593344	559214	17212	934943	232225
2008	9197258	7373067	371761	398897	15949	762657	274928
2011	13603282	10325426	731490	759044	35599	1459691	292031

From 2009 to 2011 the equity holdings of the developed countries in our sample gradually increased to reach 13.6 trillion US dollars. The decline in equity holdings during 2008 might indicate investors' reaction to an increase in the perceived risk of equity, suggesting a flight to other assets perceived as safer than equity during crises (real assets or debt instruments). A similar pattern also characterizes the equity holdings of the developed countries in other developed countries (figure 1).

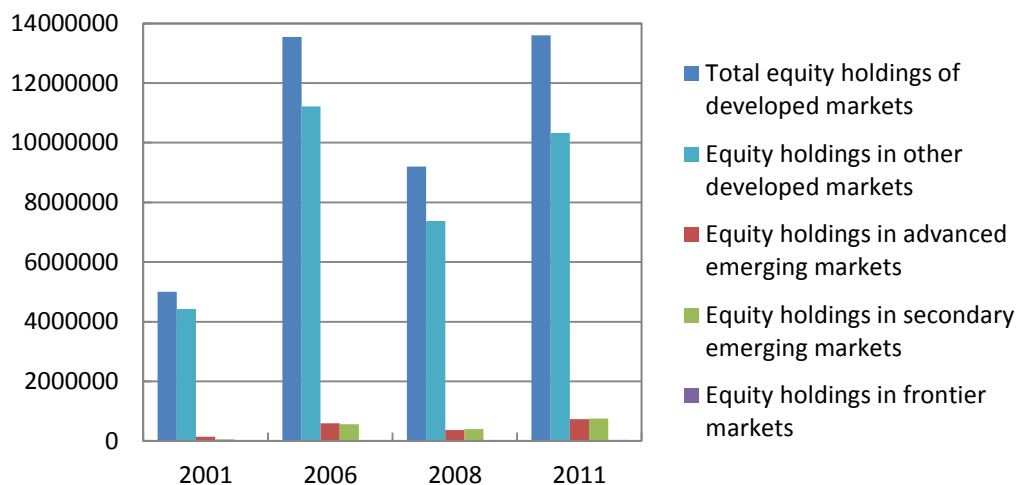


Figure 1. International equity holdings of developed countries, in million US Dollars.

The most striking trend to emerge from Table 2 is the near threefold increase in the share of the developed countries' equity portfolios invested in advanced and secondary emerging markets. This share rose from 4.01% in 2001 to 10.96% in 2011. The financial crisis seems to have had little effect on these holdings, as the percentage of equity investments into emerging markets out of total international

² "Other markets" are 156 territories in the CPIS study not classified by investment companies under developed, emerging and frontier markets nor tax havens.

equity holdings went from 8.5% in 2006 to 8.3% in 2008.

The equity holdings of investors from developed countries into secondary emerging and frontier markets gradually increased during the pre crisis period between 2001 and 2008, as they become more of interest for investors seeking high, long-term returns.

Table 2. International equity holdings of developed countries in percentages.

Year	Equity holdings in other developed markets	Equity holdings in advanced emerging markets	Equity holdings in secondary emerging markets	Equity holdings in frontier markets	Equity holdings in tax havens	Equity holdings in other markets
2001	88.42 %	2.92 %	1.09 %	0.10 %	5.27 %	2.20 %
2006	82.75 %	4.38 %	4.13 %	0.13 %	6.90 %	1.71 %
2008	80.17 %	4.04 %	4.34 %	0.17 %	8.29 %	2.99 %
2011	75.90 %	5.38 %	5.58 %	0.26 %	10.73 %	2.15 %

More interestingly, Table 2 shows that the percentage of equity investments into secondary emerging and frontier markets out of total international equity holdings did not decline like other investments during the crisis. This may be because investors expected these markets to be less affected due to their historically low correlation with other markets and their market infrastructure. This idea will be explored further in section 5.3. Fratzscher (2011) explores whether the European sovereign debt crisis in 2009 and 2010 has played a relevant role in the surge in capital flows to emerging market economies and finds a slight positive effect of key events of the European sovereign debt crisis on capital flows to emerging markets, but the coefficient is neither economically nor statistically significant.

Also striking is the more than doubling of the share of developed country investors' equity portfolio investments channeled through vehicles in tax haven countries. That share increased from 5.27% of the total holdings of developed countries in 2001 to 10.73% in 2011. The financial crisis seems to have had little or no effect on equity holdings in tax havens; however, this topic should be fully explored in future studies regarding tax havens. As a simplifying assumption, we will assume that the implicit allocations made through tax haven domiciled investments vehicles is identical to the explicit allocation of the remainder of each country's equity portfolio.

The equity holdings of investors from developed countries into the 156 'other markets' (territories in the CPIS study not classified by investment companies under developed, emerging and frontier markets nor tax havens) remain generally

stable during 2001-2011: around 2%, with a minimum level of 1.7% of the total equity investments of the developed countries in 2006 and a maximum of 2.9% of the total equity holdings of the developed countries in 2008.

5.2. Equity Home Bias

The following approach was followed to measure the equity home bias of the countries in the CPIS survey:

On each country X participating in the survey, the CPIS data contains information on the (A) Total Foreign Holdings in Country X (horizontal dimension) and (B) Total Holdings Abroad by Country X (vertical dimension).

This allows computing the (C) Total Capital Portfolio of Country X as:
 (Total Market Capitalization of Country X – Foreign Holdings in Country X) +
 Total Holdings Abroad by Country X = Holdings of Country X in Country X +
 Total Holdings Abroad by Country X .

Using (B) and (C), the fraction held abroad by Country X can be computed as:

$$W(\text{foreign } X) = \frac{(B)}{(C)} = \frac{\text{Total Holdings Abroad by Country } X}{\text{Total Capital Portfolio of Country } X}$$

And the weight in the world market portfolio:

$$W^*(\text{for Country } X) = 1 - \frac{\text{Market Capitalization of Country } X}{\text{Total World Market Capitalization}}$$

Therefore, the degree of home bias for country X can be measured as:

$$HB = 1 - \frac{W}{W^*}$$

When the home bias measure for country X is equal to one, there is full equity home bias; when it is zero, the portfolio is optimally diversified according to the basic International CAPM.

The above procedure was followed on the 80 countries in the CPIS survey that had both the vertical and horizontal dimensions available, for the period 2001-2011.

The analysis of the average home bias across the OECD countries shows a declining trend during the 2001-2007 period, both for EMU and OECD countries.

In 2007-2008, there is a sharp decline in home bias in all subsamples, coinciding with the beginning of the financial crisis. This indicates that home bias decreased in the recent financial crisis, contrary to the hypothesis that investors fled foreign

markets for home emphasized in the existing literature based on capital flows and investors' transactions data (Giannetti and Laeven, 2011; Milesi-Feretti and Tille, 2011; Fratzscher, 2012).

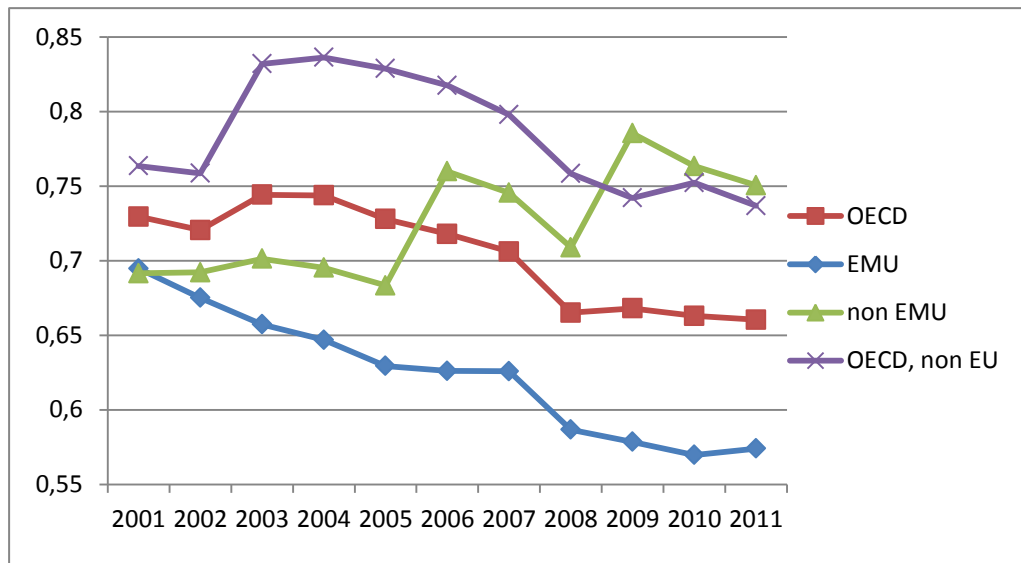


Figure 2. The evolution of average home bias across the countries of OECD, European Union and the Economic and Monetary Union of the EU (EMU), during 2001-2011, using the member countries at January 2011.

This evidence that equity home bias fell, on average, during the financial panic of 2008 also appears to be opposite to the flight home effect and investors' retrenchment strategies described by existing literature. However, according to Wynter (2012), as investors' sale of foreign stock across the world (active component) increased the home bias, differential returns and exchange rates (passive component) were significantly greater than the active changes and, overall, reduced the home bias.

After 2008, the average level of home bias became relatively stable for the EMU and OECD countries. In 2008-2009, the average level of home bias in non-EMU countries increased from 0.7 to 0.78, gradually declining in the following years. The rest of OECD countries, not members of The European Union, experience a relatively stable average level of home bias after the financial crisis, with a slight increase in 2010.

Figure 3 presents the changes in average home bias for the 80 countries analyzed, classified into developed, advanced emerging, secondary emerging and frontier markets, following the FTSE Group's country classification:

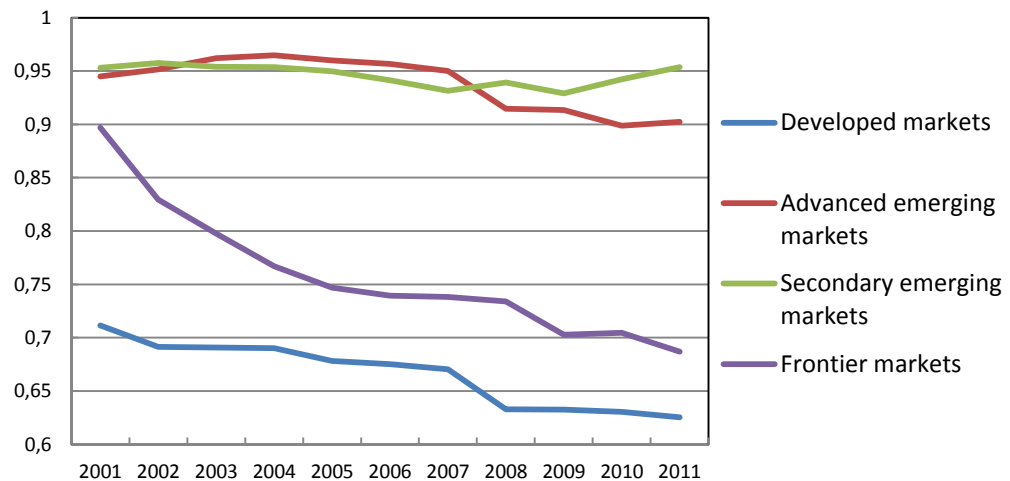


Figure 3. The evolution of average home bias across developed, advanced emerging, secondary and frontier markets, during 2001-2011.

The results are consistent with the previous findings, showing a 1.6% annual average decrease in the home bias in developed markets and a 4.4% annual average decrease in frontier markets, for the 2001-2007 period. For the same period, the advanced emerging markets experienced on average a 0.12% annual increase in home bias, while secondary emerging markets showed a 0.05% annual average decrease in home bias, but these changes are not statistically significant.

Compared to 2007, average home bias fell by 4.77% in developed markets and by 1.47% in frontier markets in 2008. In advanced emerging countries it fell by less (4.29%) than it did in developed countries, while in secondary emerging markets it increased with 0.9%.

Figure 2 shows a stable average home bias for the EMU and OECD countries after the crisis period (2008). Figure 3 similarly shows the home bias was relatively stable in developed markets (approx. 0.61), advanced emerging markets (approx. 0.89) and secondary emerging markets (approx. 0.95, with a surprising increase to 0.97 in 2011) during the same period. Equity home bias continued to fall after 2008 in frontier markets (from 0.68 in 2008 to 0.61 in 2011), as these capital markets develop and investors become more open to international diversification.

5.3. The Impact of the Financial Crisis

The results of the main pooled cross-sectional regression (C) as specified under section 3 and two other regressions used for checking robustness (A and B) are presented in Table 3 below.

Table 3. Determinants of total cross-border equity portfolio reallocation

	A		B		C	
	Coef	t-stat	Coef	t-stat	Coef	t-stat
Cnst	-0.00842	-1.03	-0.0102	-2.97***	0.00167	1.02
DW	0.261	9.44***	0.124	10.3***	0.0988	19.4***
DB	6.46	2.31**	0.437	0.428	1.4	3.18***
EMUD	0.00997	2.7***	0.0014	0.852	0.0025	3.36***
EO	-0.00045	-0.348	0.00141	2.3**	0.000352	1.33
FD	-1.1E-05	-0.0149	0.000344	0.845	0.000114	0.552
GDP	-7.5E-15	-11.8***	-2.7E-15	-9.76***	-1.5E-15	-11.2***
IPI	0.0024	2.02**	0.000123	0.284	-4.7E-05	-0.243
Ret	-0.0304	-2.27**	0.0272	6.12***	0.00738	4.59***
Lag_ret	0.00595	0.632	-0.00163	-0.483	0.000378	0.231
AdjFO	0.00634	16.1***	0.00282	10.9***	0.00151	14.2***
D08-09			0.0236	5.27***		
D10-11			0.00677	3.22***		
D2003					-0.00091	-0.599
D2004					-0.00294	-1.73*
D2005					-0.0018	-1.14
D2006					-0.0027	-1.8*
D2007					-0.00089	-0.595
D2008					0.0047	2.99***
D2009					0.0037	1.78*
D2010					0.00229	1.4
D2011					0.00299	2.15**
w_rw	-0.0158	-1.5	0.000742	0.156	-0.0104	-5.24***
R ²	0.339		0.0924		0.0583	
F stat	40		19.8		25.7	
Observations	900		2700		9000	

DW = initial degree of underweight. DB = diversification benefits. EMUD = 1 if both investor and host countries are in the EMU. EO = economic openness. FD = financial difficulty. GDP = the logarithm of GDP in millions of U.S. dollars. IPI = investor protection index. AdjFo = adjusted financial openness. Ret and Ret_{t-1} denote current and lagged returns consecutively. The variables D2003-D2011 are year dummies used to capture the impact of the crisis. W_RW_{c,t} measures the weight of country c's portfolio invested in the rest of the world. * indicates statistical significance at 10% significance level, ** at 5% statistical significance level and *** statistical significance at 1% significance level.

Regression A evaluates the long term determinants of total cross-border portfolio diversification and has the total overall change in the portfolio weight of country k holdings in country c's portfolio from 2001 to 2011 ($w_{ck,2011} - w_{ck,2001}$) as a dependent variable. The significance at 1% and 5% respectively of the estimated coefficients for initial degree of underweight and diversification benefits indicates that these optimal diversification considerations, consistent with theory predictions, have a positive relationship with portfolio weight reallocation in the long-term (2001-2011). Such reallocation decisions need to be disentangled from irrational home bias since it is rational for investors to take into consideration the

initial underweight or overweight of a country in the portfolio and correct the allocation towards the optimal weights. Rational investors also account for diversification benefits attainable through selecting assets with low correlation and thereby lowering the overall portfolio risk. The EMU dummy also has a highly significant positive coefficient, consistent with the positive impact of the elimination of currency risk among EMU member countries. Another result in line with theory is the highly significant positive impact that the new adjusted financial openness measure has on cross-border portfolio weight reallocation. The investor protection index exhibits a positive relationship significant at the 5% level. Although the financial difficulty measure has an estimated negative coefficient, it is not significant. As it can be seen from the R^2 , about 34% of the variation in long term total cross-border portfolio reallocation is explained by the regression.

Regression B is specified by dividing the period from 2001 to 2011 into three periods, namely the pre crisis period (2001-2007), the crisis period (2007-2009) and the post crisis period (2009-2011). In order to evaluate the impact of the crisis and to make regression B comparable to regression C we use a crisis dummy (D08-09) which becomes 1 during the 2007-2009 period and a post crisis period dummy variable (D10-11), which becomes 1 during the 2010-2011 period.

The initial degrees of underweight and adjusted financial openness maintain their positive relations with equity portfolio reallocation, with coefficient estimates that are significant at the 1% level. A similarly significant positive relation is also seen with returns that can imply either an active reallocation by investors to markets with higher current year returns or a passive increase in allocation due to the differential returns. More interestingly, the crisis dummy has a positive relationship with equity portfolio reallocation that is significant at the 1% level. Due to the uncertainty and information asymmetry associated with financial crises, it has been expected that home bias would increase during the crisis period. But the positive relationship between portfolio reallocation and the crisis period implied by regression B is consistent with the results presented in section 5.2 showing a decline in home bias during the crisis period for developed countries. Further, this significant positive relationship with portfolio reallocation continues during the post crisis period, with a positive coefficient significant at the 1% level estimated for the post crisis dummy. Regression B explains about 9.2 % of the variation in the total cross-border portfolio reallocation.

Regression C is described in section 3 and its results are presented under column C of Table 3. In this specification the total annual change in portfolio weight is the dependent variable and each year is assigned a dummy variable to capture the impact of the financial crisis more specifically. Changes in portfolio weights were

positively affected by the initial level of underweight of a country relative to its weight in the global market portfolio, the diversification benefits in the form of lower portfolio risk and a common currency (EMU). The aforementioned three variables are significant at 1% level. The new measure of adjusted financial openness maintains its highly significant and positive coefficient estimates in this specification. The year dummies for regression C were negative and mostly insignificant until 2008 (Table 3). But in 2008 a shift in the sign and significance of coefficient estimates for the year dummies is observed as shown by the positive coefficient estimate significant at the 1% level. The dummy variables for 2009 and 2011 are also positive and significant at 10% and 5% respectively implying a significant positive relationship between the crisis period and the total annual change in cross-border portfolio weights. Therefore, the analysis using specification C leads to a similar conclusion as in regression B regarding the significant positive effect of the financial crisis on total cross-border equity portfolio diversification for the 30 countries in the sample. The variables used to proxy for financial difficulty and investor protection index³ are found to be insignificant. In their 2012 study on the syndicated loan market, Giannetti and Leaven find that the home bias of lenders' loan origination increases if the bank's country of origin experiences a crisis. But their finding that the flight home effect of international lenders does not appear to be limited to countries with weak investor protection nor to borrowers with lower credit ratings is similar to our insignificant estimates for the financial difficulty and investor protection measures.

Since this paper has adopted the portfolio approach and the specification of some of the explanatory variables from De Santis and Gerard (2009), it is relevant to mention that diversification benefits and the initial degree of underweight, which are rational portfolio optimization reasons, continue to have a significant positive relationship with international equity portfolio reallocation. The impact of the EMU in encouraging cross-border equity portfolio diversification among member countries has also persisted during and after the crisis period. Due to the difference in the type of data used and the emphasis on different types of capital flows, many studies conducted after the financial crisis came to different conclusions about the impact of the financial crisis. For instance, Ferretti and Tille (2011) focus generally on capital flows, which include FDI, banking and portfolio flows etc. and find that global capital flows were significantly negatively affected resulting in an increase in home bias during the crisis. They also infer that international banking flows played a central role in the process of retrenchment. Although our analysis of total amounts of investments in equity holdings shows a

³Substituting shareholders rights index instead for investor protection index did not change the results of the regressions.

decline in foreign equity investment, the level of equity home bias has still declined. Such differences may arise due to the difference in the types of capital flows studied, which in our case is confined to equity portfolio flows.

In order to show the explanatory power of the new financial openness measure, regressions A, B and C were run without the financial openness variable. The results of these regressions are presented in Table 4. The financial openness variable is significant at 1% level and it also increases the explained variation substantially across all three regressions. It solely accounts for about 58%, 46% and 39% of the R^2 of regressions A, B and C respectively. Further the economic openness variable becomes insignificant in regressions A and C after the inclusion of financial openness variable in the regressions.

Table 4. Determinants of total cross-border equity portfolio reallocation excluding the financial openness variable

	A		B		C	
	Coef	t-stats	Coef	t-stats	Coef	t-stats
Cnst	0.005726	0.635	-0.00804	-2.29**	0.002393	1.45
DW	0.108017	3.63***	0.0577	5.42***	0.064814	14.2***
DB	10.74826	3.41***	2.1	2.03**	1.832044	4.13***
EMUD	0.011212	2.68***	0.00274	1.64*	0.002399	3.18***
EO	0.004443	3.1***	0.00287	4.68***	0.00128	4.92***
FD	-0.00095	-1.13	0.00003	0.0722	-0.00012	-0.557
GDP	-6.2E-15	-8.65***	-2.2E-15	-8.1***	-1.2E-15	-9.32***
IPI	0.00134	1.14	3.74E-05	0.0845	-3.7E-05	-0.193
Ret	-0.02053	-1.46	0.021	4.66***	0.007046	4.33***
Lagg_ret	-0.00513	-0.481	0.00197	0.574	-0.0003	-0.18
D08-09			0.0222	4.84***		
D10-11			0.00758	3.53***		
D2003					-0.00089	-0.583
D2004					-0.00267	-1.55
D2005					-0.00163	-1.02
D2006					-0.0029	-1.91*
D2007					-0.00133	-0.876
D2008					0.004161	2.61***
D2009					0.004738	2.26**
D2010					0.003533	2.14**
D2011					0.003576	2.54**
w_rw			0.00533	1.1	-0.01011	-5.04***
R^2	0.137		0.0502		0.0355	
F Stat	15.2		11.2		16.1	

The findings presented in Table 2 on the heterogeneity of the impact of the crisis on cross-border equity portfolio diversification with the share of equity investment towards developed economies being more negatively affected than emerging and frontier countries are consistent with Ferretti and Tille's 2011

findings. Nevertheless, it raises the question whether the increased share of investment in secondary emerging and frontier markets observed during the crisis was due to active investor reallocation or due to differential returns. To explore this issue, 3 more dummy variables (one for advanced emerging markets, one for secondary emerging countries, and one for frontier markets) were added to the regressions in Table 3, based on the FTSE's 2011 country classification. The coefficient estimates for the other explanatory variables and their significance level are mostly unaffected by the inclusion of the country classification dummy variables. The same is true for the R^2 in all the 3 specifications.

Table 5. Determinants of total cross-border equity portfolio reallocation, including country classification dummy variables

	A		B		C	
	Coef	t-stat	Coef	t-stat	Coef	t-stat
Cnst	-0.01	-1.21	-0.0108	-3.09***	0.00196	1.19
DW	0.259	9.35***	0.124	10.3***	0.0989	19.4***
DB	8.24	2.84***	0.701	0.675	1.44	3.24***
EMUD	0.0115	3.03***	0.00117	0.693	0.00248	3.26***
EO	-0.00085	-0.637	0.00131	2.12**	0.000328	1.23
FD	0.000242	0.263	0.000748	1.57	0.000222	0.96
GDP	-7.5E-15	-11.7***	-2.7E-15	-9.73***	-1.5E-15	-11.2***
IPI	0.00289	2.34**	0.000119	0.271	-6.2E-05	-0.321
Ret	-0.0366	-2.68***	0.03	6.37***	0.00769	4.68***
Lag_ret	0.00919	0.761	-0.00033	-0.0947	0.000708	0.423
AdjFO	0.0064	16.3***	0.00281	10.8***	0.0015	14.1***
D08-09			0.0273	5.56***		
D10-11			0.00672	3.17***		
D2003					-0.00111	-0.729
D2004					-0.00343	-1.94*
D2005					-0.00221	-1.35
D2006					-0.00296	-1.94*
D2007					-0.00112	-0.737
D2008					0.00484	3.06***
D2009					0.00403	1.93*
D2010					0.00192	1.13
D2011					0.00277	1.96**
w_rw	-0.0203	-1.89*	-0.00058	-0.12	-0.0104	-5.26***
Adv_em	0.00314	0.686	-0.00147	-0.655	-0.00069	-0.674
Sec_em	-0.00994	-1.04	-0.00711	-1.83*	-0.00232	-1.14
Front_mk	-0.0125	-1.63*	-0.00158	-0.466	-0.00117	-0.776
R^2	0.343		0.0936		0.0585	
F stat	31.9		16.3		22.4	
Observations	900		2700		9000	

Adv_em = 1 if the host country is advanced emerging. Sec_em = 1 if the host country is secondary emerging. Front_mk = 1 if the host country is frontier. * indicates statistical significance at 10% significance level, ** at 5% significance level and *** statistical significance at 1% significance level.

As shown in Table 5 that the 3 dummy variables are mostly found to be insignificant. The dummy variables for frontier markets and advanced emerging markets are negative and significant at the 10% level in specifications A and B respectively. This is contrary to the increase in share of investment towards secondary emerging and frontier markets observed in section 5.1. Overall, the type of the host country does not seem to significantly affect the magnitude of the change in portfolio weights. The insignificance of the type of the host country implies that the increase in the share of investment in secondary emerging and frontier markets was due to differential returns.

A more informative way to investigate the positive relationship observed between the financial crisis and home bias is to decompose the change in portfolio weights into active and passive changes and check if the active changes in portfolio weights have a similar relationship with the crisis. This process allows us to disentangle changes in portfolio allocation that are due to active investor decisions from passive changes due to differential returns. The methodology for the decomposition is described in section 3. Table 6 below shows the descriptive statistics for the active and passive changes in portfolio weights for A and B. The results of regressions A and B with the passive and active cross-border equity reallocation as dependent variables are presented in Tables 7 and 8.

Table 6. Descriptive statistics of active and passive changes in portfolio weights for specifications A and B

	A		B	
	Passive	Active	Passive	Active
Mean	0.0001	-0.0015	0	-0.0005
Median	0	0	0	0
Max	0.092	0.5264	0.5356	0.6208
Min	-0.0938	-0.3052	-0.6356	-0.3645
StDev	0.01	0.0501	0.0406	0.0304

The highly significant positive coefficient estimates in Table 7 for the returns variable are consistent with the expected positive relationship between returns and the passive change in equity portfolio reallocation. Similar to the results observed for total changes in equity portfolio allocation, the crisis and post crisis dummy variables have highly significant positive relationships with the passive changes equity portfolio allocation.

Table 7. Determinants of passive cross-border equity portfolio reallocation

	A		B	
	Coef	t-stat	Coef	t-stat
Cnst	0.00143	0.967	-0.00708	-1.47
DW	0.0539	10.8***	0.0786	4.62***
DB	-1.08	-2.15**	0.81	0.568
EMUD	0.00047	0.702	-0.00084	-0.36
EO	0.000242	1.04	0.00122	1.42
FD	0.000849	6.25***	-0.00044	-0.763
GDP	9.77E-16	8.47***	-1.2E-15	-3.22***
IPI	-0.00065	-3***	0.000127	0.21
Ret	0.0218	9.01***	0.0178	2.87***
Lag_ret	0.00108	0.635	0.000231	0.0492
AdjFO	-0.00073	-10.2***	0.000519	1.42
D08-09			0.0188	3.01***
D10-11			0.00993	3.39***
w_rw	0.00598	3.14***	-0.00158	-0.237
R ²	0.553		0.0168	
F stat	96.4		3.22	
Observations	900		2700	

Table 8. Determinants of active cross-border equity portfolio reallocation

	A		B	
	Coef	t-stat	Coef	t-stat
Cnst	-0.00986	-1.13	-0.0034	-0.972
DW	0.208	7.01***	0.0533	4.32***
DB	7.54	2.53**	-0.439	-0.425
EMUD	0.0095	2.4**	0.00267	1.59
EO	-0.00069	-0.501	0.000213	0.341
FD	-0.00086	-1.07	0.000667	1.61*
GDP	-8.5E-15	-12.5***	-1.6E-15	-5.63***
IPI	0.00305	2.39**	1.65E-06	0.00375
Ret	-0.0522	-3.65***	0.00949	2.11**
Lag_ret	0.00487	0.484	-0.00182	-0.535
AdjFO	0.00707	16.8***	0.00241	9.12***
D08-09			0.00495	1.09
D10-11			-0.00269	-1.26
w_rw	-0.0218	-1.94*	0.00257	0.532
R ²	0.385		0.0547	
F stat	48.7		10.9	
Observations	900		2700	

* indicates statistical significance at 10% significance level, ** at 5% significance level and *** statistical significance at 1% significance level.

Regression A in Table 8 shows that in the long term the degree of initial underweight, diversification benefits and a common currency have significant

positive relations with investors' active changes in portfolio allocation. The same is true for the positive impacts of investor protection and financial openness on active portfolio reallocation. With a higher R^2 of 38.5% the variables in regression A are better able to explain the variation in the active portfolio weight changes than the total portfolio weight changes used in Table 3.

Similar to the results in Table 3, the initial degree of underweight, returns and financial openness remain significantly positively related to active portfolio reallocation in regression B. There is a striking difference in the sign and significance of the coefficient estimates for the crisis and post-crisis periods between the active and passive changes in reallocation. The crisis and post crisis dummy variables become statistically insignificant with positive and negative coefficient estimates respectively. This is a clear departure from the highly significant positive relationship observed in Table 7 between the crisis period and the passive changes in portfolio weights. Therefore, the positive relation between the crisis and portfolio reallocation was mainly due to return differentials and not a result of active investor reallocation. This implies that during the financial crisis the passive changes in portfolio allocations outweighed the active changes leading to a positive relationship between total change in equity portfolio allocation and the proxy variable for the crisis.

Using the same data as this study, Wynter (2012) created a global sample of multilateral equity holdings of 45 countries. Wynter finds that across countries the foreign portfolio share rose by an average of 3.62%, its largest increase since 2000, implying a decrease in the home bias during the recent financial crisis. This result is similar to our findings of a sharp decline in home bias and a positive relationship between the crisis dummy and the change in foreign equity holdings during the same period. According to Wynter (2012) disentangling the active and passive component of portfolio holdings shows that investors actively executed trades that increased the home bias, but the passive changes due to returns and exchange rates outweighed the active changes and resulted in lower home bias.

So far the direct impact of the crisis on portfolio reallocation has been explored. In order to fully assess the impact of the crisis and post crisis period, the change in the relationship between portfolio reallocation and the other explanatory variables due the crisis is investigated. A modified version of regression B was run on the total, passive and active changes in equity portfolio weights. Including interaction terms between the crisis and post crisis dummies and the explanatory variables in specification B enables us to observe changes in relationships during the crisis and post crisis period.

Table 9. The impact of the crisis on the relationship between the explanatory variables and portfolio reallocation.

	Total		Passive		Active	
	Coef	T stat	Coef	T stat	Coef	T stat
Cnst	0.00325	0.446	0.00297	0.278	0.000306	0.0388
D0809	-0.00115	-0.122	0.00197	0.144	-0.00301	-0.297
D1011	-0.0112	-1.23	-0.0101	-0.761	-0.00156	-0.159
DW	0.307	14.7***	0.242	8.05***	0.0752	3.38***
DW*D0809	-0.2	-6.99***	-0.238	-5.76***	0.031	1.01
DW*D1011	-0.269	-9.24***	-0.142	-3.3***	-0.132	-4.14***
DB	5.3	1.39	1.05	0.19	4.82	1.19
DB*D0809	-6.94	-1.73*	-0.889	-0.153	-6.67	-1.55
DB*D1011	-4.59	-1.07	-1.63	-0.263	-3.58	-0.783
EMU	0.00236	0.779	-0.00051	-0.114	0.00249	0.754
EMU*D0809	-0.00408	-1.02	-0.00315	-0.532	-8.7E-05	-0.0199
EMU*D1011	-0.00098	-0.248	0.000437	0.0754	-0.00097	-0.227
EO	0.00147	1.46	0.00216	1.49	-0.00047	-0.438
EO*D0809	-0.00215	-1.38	-0.00317	-1.41	0.000653	0.392
FO*D1011	-0.00133	-0.956	-0.00188	-0.927	0.000331	0.221
FD	-0.00202	-1.92*	-0.00316	-2.06**	0.000475	0.419
FD*D0809	0.00257	1.99**	0.00312	1.65*	5.31E-05	0.038
FD*D1011	0.00267	2.26**	0.00326	1.88*	0.000117	0.0916
GDP	-9E-15	-15.9***	-8.5E-15	-10.3***	-7.4E-16	-1.22
GDP*D0809	7.94E-15	10.9***	9.54E-15	9.04***	-1.5E-15	-1.87*
GDP*D1011	9.23E-15	13.1***	1E-14	9.75***	-6.2E-16	-0.814
IPI	0.000686	0.921	0.00122	1.12	-0.0004	-0.49
IPI*D0809	-0.00108	-1.03	-0.00192	-1.26	0.000653	0.58
IPI*D1011	0.000292	0.282	-0.00036	-0.236	0.000578	0.515
Ret	0.00824	0.605	0.00551	0.279	0.00362	0.248
Ret*D0809	0.0101	0.642	-5.2E-05	-0.00226	0.00914	0.541
Ret*D1011	-0.00335	-0.213	-0.00297	-0.13	-0.00146	-0.0869
Lagret	0.00322	0.431	-0.00073	-0.0671	0.00265	0.328
Lagret*D0809	0.0103	0.986	0.0126	0.829	2.22E-05	0.00198
Lagret*D1011	-0.00412	-0.44	-0.00031	-0.0224	-0.00285	-0.283
AdjFO	0.00904	11.8***	0.0032	2.89***	0.00586	7.17***
AdjFO*D0809	-0.00475	-5.15***	-0.00241	-1.82*	-0.00231	-2.36**
AdjFO*D1011	-0.00849	-10***	-0.00302	-2.46**	-0.00547	-6.04***
w_rw	-0.0107	-1.35	-0.0173	-1.52	0.00652	0.773
w_rw3*D0809	0.0175	1.52	0.0228	1.38	-0.00572	-0.466
w_rw3*D1011	0.00689	0.635	0.0145	0.916	-0.00773	-0.661
R ²	0.22		0.0847		0.0869	
F stat	20.3		6.42		6.6	

Table 9 presents the results of these regressions. For total and passive reallocation the interaction variables between the degree of underweight and the crisis and post crisis have highly significant coefficient estimates. This implies the positive relationship between the initial degree of underweight and portfolio reallocation

was significantly reduced during the crisis and post crisis period. While the crisis period did not have a significant impact on active reallocation,, the post crisis period significantly reduced the positive relationship between initial under weight and portfolio reallocation. Similarly, during the crisis and post crisis periods the positive impact of the adjusted financial openness variable on total, passive and active reallocation was significantly reduced. The estimates for the interaction variables of financial difficulty with the crisis and post crisis periods are significant at 5% level for total reallocation and at 10% for passive reallocation. Thus the negative impact of the financial difficulty variable on total and passive reallocation has increased significantly during the crisis and post crisis periods.

6. Conclusion

This paper makes use of IMF's Coordinated Portfolio Investment Survey (CPIS) to empirically investigate the impact of the financial crisis on cross-border equity portfolio reallocation. The decline in total amount of investment in foreign equity holdings in 2008 seems to justify the theories of home bias and of portfolio choice under uncertainty, which predict that the home bias should increase during a financial crisis. However, the home bias computation does not support this view, showing a sharp decline in home bias in 2008. The regression analysis on the total and passive changes in portfolio weights also confirms the highly significant positive relationship between the proxy variable for the crisis and the change in international equity portfolio reallocation. The decomposition of active and passive portfolio reallocations reveals that the decrease in home bias observed during the crisis is due to passive changes in portfolio allocation and not attributable to investors actively seeking low correlation foreign securities. The new adjusted financial openness measure has a significant positive impact on total, passive and active cross-border equity portfolio diversification in all the specifications. But other country specific variables measuring financial difficulty and investor protection were mostly found to be insignificant. Further investigation of the heterogeneity of the impact of the crisis among different groups of countries does not justify the initial results, which showed that investments towards developed countries were more affected than investments towards secondary emerging and frontier market investments. In addition, optimal diversification considerations had significant impact on investors' international equity portfolio reallocation decisions. Namely, investors rebalanced their

portfolios in order to correct initial misallocation towards the optimal allocation and also considered the possible diversification benefits due to risk reduction.

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Appendices

Appendix 1. Average values of the home bias and procentual changes in home bias relative to the previous year in developed, advanced emerging, secondary emerging and frontier markets, period 2001-2011.

Markets	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Developed	0.715	0.691	0.687	0.680	0.664	0.654	0.649	0.618	0.619	0.615	0.607
Advanced	0.932	0.942	0.955	0.958	0.951	0.947	0.939	0.899	0.894	0.876	0.890
Secondary	0.954	0.963	0.969	0.967	0.964	0.958	0.950	0.959	0.955	0.957	0.976
Frontier	0.917	0.801	0.764	0.732	0.710	0.703	0.696	0.686	0.658	0.642	0.616
Relative changes											
Developed	-3.30 %	-0.69 %	-0.98 %	-2.33 %	-1.50 %	-0.84 %	-4.77 %	0.21 %	-0.68 %	-1.24 %	
Advanced	1.03 %	1.44 %	0.26 %	-0.65 %	-0.46 %	-0.90 %	-4.19 %	-0.61 %	-2.01 %	1.67 %	
Secondary	0.97 %	0.65 %	-0.17 %	-0.39 %	-0.60 %	-0.78 %	0.92 %	-0.37 %	0.15 %	1.98 %	
Frontier	-12.58 %	-4.64 %	-4.26 %	-2.89 %	-1.03 %	-0.97 %	-1.48 %	-4.04 %	-2.42 %	-4.04 %	

Appendix 2. Values of the home bias of the 80 countries analyzed in this paper

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Argentina	0.97	0.94	0.84	0.85	0.87	0.87	0.85	0.87	0.82	0.86	0.81
Aruba	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Australia	0.85	0.84	0.86	0.87	0.85	0.85	0.83	0.81	0.84	0.83	0.81
Austria	0.44	0.51	0.55	0.61	0.66	0.68	0.69	0.57	0.42	0.44	0.53
Bahamas, The	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bahrain	0.68	N/A	N/A	0.75	0.72	0.71	0.75	0.78	0.83	0.84	0.88
Barbados	N/A	N/A	0.85	0.92	0.89	0.88	0.67	0.76	0.56	0.52	0.60
Belgium	0.61	0.54	0.55	0.63	0.59	0.59	0.55	0.45	0.52	0.54	0.54
Bermuda	0.07	0.07	0.04	0.03	0.02	0.02	0.02	0.02	0.01	0.02	0.06
Bolivia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00
Brazil	0.98	0.98	0.99	0.99	0.99	0.99	1.00	0.99	0.99	0.99	0.99
Bulgaria	1.00	1.00	1.00	0.99	1.00	0.98	0.98	0.98	0.94	0.90	0.94
Canada	0.75	0.73	0.76	0.78	0.79	0.77	0.77	0.73	0.77	0.78	0.76
Cayman Islands	1.00	0.03	0.02	0.07	0.06	0.09	0.07	N/A	N/A	N/A	N/A
Chile	0.93	0.91	0.89	0.88	0.86	0.80	0.77	0.80	0.75	0.78	0.78
China, Hong Kong	0.84	0.83	0.81	0.76	0.77	0.88	0.92	0.91	0.91	0.89	0.87
China, Macao	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Colombia	0.98	0.96	0.95	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.96
Costa Rica	1.00	1.00	1.00	0.99	0.99	0.99	0.97	0.97	0.85	0.81	0.80
Curacao & S. Martaan	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cyprus	0.86	0.82	0.80	0.72	0.73	0.78	0.83	0.85	0.61	0.69	0.53
Czech Republic	0.83	0.85	0.91	0.90	0.87	0.83	0.84	0.83	0.84	0.80	0.80
Denmark	0.65	0.68	0.70	0.69	0.67	0.63	0.64	0.61	0.61	0.63	0.58
Egypt	0.73	0.80	0.82	0.77	0.78	0.82	0.79	0.83	0.81	0.85	0.88
Estonia	0.98	0.98	0.95	0.92	0.77	0.77	0.67	0.63	0.63	0.51	0.44
Finland	0.90	0.86	0.82	0.78	0.76	0.73	0.75	0.71	0.49	0.48	0.56
France	0.85	0.82	0.79	0.77	0.76	0.75	0.76	0.76	0.76	0.73	0.75
Germany	0.73	0.67	0.70	0.69	0.69	0.64	0.68	0.64	0.64	0.65	0.64
Gibraltar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Greece	0.98	0.96	0.96	0.95	0.95	0.94	0.93	0.85	0.79	0.85	0.73
Guernsey	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hungary	0.98	0.98	0.98	0.96	0.95	0.90	0.86	0.75	0.75	0.72	0.74
Iceland	0.70	0.77	0.73	0.77	0.75	0.73	0.66	0.45	0.16	0.29	0.30
India	N/A	N/A	N/A	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Indonesia	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ireland	0.36	0.28	0.27	0.27	0.23	0.22	0.18	0.10	0.10	0.09	0.16

Isle of Man	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Israel	0.97	0.96	0.96	0.96	0.94	0.93	0.93	0.91	0.87	0.86	0.80
Italy	0.68	0.65	0.64	0.67	0.65	0.65	0.64	0.62	0.45	0.41	0.51
Japan	0.90	0.90	0.91	0.90	0.91	0.89	0.88	0.88	0.84	0.85	0.83
Jersey	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kazakhstan	0.99	0.81	0.79	0.79	0.87	0.93	0.89	0.90	0.93	0.92	0.89
Korea, Republic of	0.99	0.99	0.99	0.98	0.98	0.96	0.91	0.91	0.92	0.92	0.93
Kosovo	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kuwait	N/A	N/A	0.93	0.92	0.94	0.89	0.89	0.76	0.76	0.79	0.77
Latvia	N/A	N/A	N/A	N/A	N/A	0.90	0.85	0.76	0.70	0.55	0.48
Lebanon	0.72	0.81	0.76	0.74	0.84	0.88	0.87	0.83	0.83	0.88	0.76
Lithuania	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.78	0.77	0.72
Luxembourg	0.07	0.07	0.07	0.07	0.06	0.06	0.10	0.08	0.09	0.07	0.06
Malaysia	0.99	0.99	0.99	0.99	0.99	0.98	0.97	0.94	0.93	0.94	0.94
Malta	0.99	0.95	0.90	0.83	0.84	0.81	0.81	0.76	0.62	0.66	0.75
Mauritius	0.70	0.09	0.08	0.07	0.05	0.05	0.04	0.03	0.03	0.06	0.06
Mexico	N/A	N/A	1.00	0.98	0.99	0.98	0.99	0.99	0.99	1.00	0.99
Mongolia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.89
Netherlands	0.66	0.64	0.57	0.54	0.55	0.57	0.58	0.47	0.48	0.50	0.49
Netherlands Antilles	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New Zealand	0.70	0.70	0.69	0.69	0.67	0.66	0.63	0.57	0.71	0.67	0.68
Norway	0.62	0.55	0.55	0.60	0.60	0.61	0.59	0.38	0.39	0.38	0.35
Pakistan	N/A	1.00	1.00	1.00	0.99	0.99	1.00	1.00	1.00	1.00	1.00
Panama	0.98	0.85	0.79	0.76	0.78	0.78	0.89	0.99	0.99	0.98	0.98
Philippines	1.00	1.00	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Poland	1.00	0.99	0.99	0.99	0.98	0.97	0.95	0.95	0.95	0.95	0.95
Portugal	0.85	0.84	0.84	0.81	0.71	0.72	0.72	0.68	0.72	0.69	0.69
Romania	1.00	1.00	1.00	1.00	0.99	0.98	0.98	0.96	0.98	0.98	0.96
Russian Federation	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99
Singapore	0.78	0.69	0.72	0.72	0.71	0.61	0.58	0.50	0.52	0.48	0.41
Slovak Republic	0.97	0.98	0.85	0.86	0.87	0.83	0.84	0.88	0.85	0.75	0.79
Slovenia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.78	0.72	0.68
South Africa	0.83	0.87	0.87	0.91	0.90	0.91	0.92	0.89	0.88	0.84	0.81
Spain	0.89	0.90	0.90	0.90	0.88	0.88	0.90	0.91	0.92	0.90	0.91
Sweden	0.69	0.65	0.67	0.67	0.66	0.68	0.66	0.57	0.61	0.63	0.61
Switzerland	0.71	0.71	0.71	0.70	0.72	0.74	0.71	0.72	0.72	0.73	0.68
Thailand	1.00	1.00	1.00	0.99	0.99	0.99	0.98	0.98	0.98	0.98	0.98
Turkey	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ukraine	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
United Kingdom	0.78	0.77	0.77	0.74	0.72	0.71	0.70	0.67	0.70	0.71	0.72
United States	0.79	0.79	0.77	0.76	0.73	0.71	0.70	0.71	0.69	0.69	0.66
Uruguay	N/A	N/A	0.27	0.37	0.57	0.56	0.53	0.41	0.33	0.15	0.27
Vanuatu	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Venezuela	1.00	1.00	0.94	0.97	0.93	0.92	N/A	N/A	0.95	0.99	0.99

Preliminary Thesis Report

Introduction

Within an economy, a strong tendency usually exists for economic phenomena to move more or less together giving rise to periods of relatively high or low general economic activity. This also holds true for individual securities and industries. The existence of a relatively low degree of positive correlation between different equity markets suggests the possibility of risk reduction might be facilitated by diversifying portfolios internationally. The model of portfolio selection developed by Harry Markowitz assumes investors are risk averse and states that investors choose “mean-variance-efficient” portfolios, which minimize the variance of a portfolio return, given expected return. The International Capital Asset Pricing Model (ICAPM) suggests that international investors should hold assets of each country in proportion to the country’s share in the world market portfolio. However, investors have had a tendency to invest in a large amount of domestic equities, despite the purported benefits of diversifying into foreign equities; this puzzling trend is called home bias. French and Poterba (1991) found that, portfolio patterns implied that investors expected returns in their domestic equity market to be several hundred basis points higher than those in other markets. They have also confirmed that the lack of diversification is largely due to investor choices, rather than institutional constraints.

Although the level of cross-border equity investment is lower than rational expectations, it has been growing over time. Different techniques, country samples and time periods have yielded results showing the return and risk advantages resulting from international diversification. The process of ‘financial globalization’ fostered by capital account liberalizations, electronic trading, increasing exchanges of information across borders and falling transaction costs has certainly led to a large increase in cross-border asset trade (Lane and Milesi-Ferretti, 2003). The establishment of the Economic and Monetary Union (EMU) also played a key role in the reallocation of capital among countries worldwide as well as among euro area countries, thereby enhancing financial integration and potentially international risk sharing (De Santis and Gérard, 2009). Investors in most countries can now invest abroad through mutual funds and even direct ownership of foreign shares more easily than they ever could.

The change in cross-border equity investment and in home bias provides important insights into how investors value risk and how they select portfolios. In addition, Tesar and Werner (1995) study the excess return on a portfolio of

foreign securities compared with a portfolio including primarily domestic securities and find that there are significant gains to be made from international diversification in all countries of their sample (Canada, Japan, the United Kingdom and the United States), except Germany. A number of studies have tried to explain the determinants of home bias. Recent studies point to the role of geography, population, information costs, currency unions, and trade relations as determinants of cross-border asset holdings. But previous studies have used capital flow data to proxy for portfolio holdings and focused on data of one individual country, with most attention paid to the U.S. However, an individual country's perspective necessarily restricts the analysis of home bias to the characteristics of the investor country.

Understanding international capital flows is highly relevant for policy-makers. Economic theory argues that international capital mobility allows for savings to be channeled towards the countries with more productive investment opportunities and for a better sharing of macroeconomic risk between countries subject to different shocks. (Ferretti and Tille, 2011)

This thesis investigates whether cross-border diversification continues to increase after 2005 using CPIS data for 26 developed countries⁴. The effect of the recent financial crisis, which has not been studied yet, may have altered the declining trend in home bias. By incorporating recent surveys and data, we aim to update the analysis and add to the existing literature by assessing the effect of the recent financial crisis on cross border equity portfolio diversification.

Background and literature

French and Poterba's seminal paper published in 1991 documented ownership shares across countries. Using data for the US, Japan, UK, France and Germany, they show that investors hold a disproportionate share of domestic assets in their equity portfolios. The estimated domestic ownership share of the world's five largest stock markets was 92.2% for the U.S., 95.7% for Japan, 92% for the U.K., 79% for Germany, and 89.4% for France in 1989. This portfolio pattern implies that investors expected returns in their domestic stock markets to be several hundred basis points higher than returns in other markets. They label this lack of cross border diversification as equity home bias.

Many explanations have been given for home bias. Some of the most common

⁴ Following the classification of the FTSE Group from September 2012, the developed markets are: Australia, Austria, Belgium/ Luxemburg, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, UK and US.

ones are: hedging possibilities against domestic risks, trading costs and information asymmetries and behavioral biases.

Hedging domestic risks

One potential explanation for the home bias in equity portfolios is that domestic assets serve as a better hedge for risks that are home-country specific, e.g. inflation risk and domestic consumption risk, since investments in domestic assets are likely to follow the performance of the domestic market in general. (Sercu, Vanpee, 2007). To hedge future inflation rates, investors in different countries are induced to hold portfolios that differ by a component designed to hedge inflation risk (Adler and Dumas, 1983). Inflation risk can be hedged using domestic stocks if domestic stock returns are positively correlated with inflation rates. But studies by Dumas, 1983 and Cooper and Kaplanis, 1997 have shown that the evidence in this sense is weak. Further inflation and other domestic risks can be hedged by investing in foreign riskless securities such as, inflation protected treasury securities and other riskless securities such as T-bills and T-bonds. Therefore home bias cannot be fully explained by motives for hedging domestic risks.

Costs and barriers for foreign investments

Transaction costs and barriers to foreign investments can include fixed or proportional transaction costs in foreign portfolio investments, difference of tax treatments across domestic and foreign portfolio incomes and other policy induced restrictions on foreign investments (such as limits to foreign investment, capital controls, differences in legal frameworks). Since the early nineties, nearly all countries have liberalized their financial markets, at least to a certain extent. These days, all developed markets and a number of emerging markets are open to foreign investors. In other words, equity home bias, which is highly persistent and still prevalent, cannot be explained by international capital controls. (Nicolas Coeurdacier, H el ene Rey, 2011)

Information asymmetries

A very popular potential explanation for home bias is that the preference for domestic assets is driven by information asymmetries between domestic and foreign investors. Indeed, if there is differential information, risk-averse investors prefer the stocks on which they easily have better information – these are typically the domestic stocks – because they perceive them as less risky (Sercu and Vanpee, 2007). The foreign purchases of U.S. investors are positively correlated with the

lagged foreign market returns. This is consistent with U.S. investors being at an information disadvantage relative to foreign investors. Additionally, Brennan et al. (2005) show that there is a link between information disadvantages and the expectations (degree of bullishness) about a market. Foreign investors tend to become more bullish about a certain market following a positive return on that market. Portes and Rey (2005) use portfolio equity flows from Capital Data and show that proxies for informational asymmetries, together with the size of host countries' stock markets, are key determinants of international equity flows.

Home bias is a well-known puzzle in international finance: the International CAPM model predicts that the representative investor of a given country should hold the world market portfolio. In other words, the share of his financial wealth invested in local equities should be equal to the share of local equities in the world market portfolio, a prediction that contradicts the observation of the data on portfolio holdings. Home bias has decreased over the last twenty years with the process of 'financial globalization' but remains high in most countries. On average, the degree of home bias across the world is 0.63 - lower in Europe where the implementation of the third stage of the Economic and Monetary Union with the introduction of the euro-single monetary policy in 1999 seems to have had an effect. Emerging markets have less diversified equity portfolios than developed countries and do not exhibit any clear downward trend in home bias. The average degree of home bias in these countries is 0.9 (smaller in emerging Asia and larger in Latin America) and investors in these countries hold 1/10 of the amount of foreign equities they should be holding according to the basic International CAPM model (Nicolas Coeurdacier and H el ene Rey, 2011). More specifically, the study by De Santis and G erard (2009) has documented that the strongest determinants of the changes in bilateral portfolio weights were expected marginal diversification benefits and the initial degree of underweight. Moreover, they have found that euro area investors have reallocated significantly higher portfolio shares to euro area fixed income and equity assets than investors from all other countries due to the implementation of the third stage of the Economic and Monetary Union in 1999, which is proof of a decline in home bias. Lane and Milesi-Ferretti (2008) also found higher equity investment among OECD countries using CPIS data only until 2004. They found that bilateral equity investment is strongly correlated with the underlying patterns of trade in goods and informational linkages, such as a common language.

Studies of the financial crisis

Generally, a reduction in home bias has been observed from the early 1990's to the mid 2000's. However, the 2007 financial crisis saw an unprecedented collapse

in international capital flows after years of rising financial globalization (Gian-Maria Milesi-Ferretti and Cedric Tille, 2011). Ferretti and Tille further find that there is a high degree of heterogeneity in the patterns of capital flows, across time, types of flows, and countries and that international banking flows – particularly among advanced economies – played a central role both during the pre-crisis globalization and in the crisis itself. The contraction in flows was found to be more concentrated in banking flows, with smaller declines in portfolio investment and especially FDI.

Giannetti and Laeven's (2011) results indicate that the home bias of international capital allocation tends to increase in the presence of adverse economic shocks affecting the net wealth of international investors and that home bias of lenders' loan origination increases by approximately 20 percent if the bank's country of origin experiences a banking crisis. This flight home effect is distinct from a *flight to quality* effect because borrowers of different quality (or from countries with different degree of investor protection) are similarly affected by lenders rebalancing their loan portfolios in favor of domestic borrowers (Giannetti, Laeven, 2011).

Broda et al. (2009) focus on the determinants of US flows and the external value of the dollar and stress the role of a flight to the safety of US assets such as Treasury bills in response to an increase in perceived risk of other assets.

Methodology

Several methods have been used to measure home bias. The measure of equity home bias (EHB) that is most commonly used is the difference between actual holdings and optimal holdings of domestic equity and the share of domestic equity in the world market portfolio:

$$EHB_i = 1 - \frac{\text{Share of foreign equity in country } i \text{ equity holdings}}{\text{Share of foreign equity in the world market portfolio}}$$

When the home bias measure for country i , EHB_i , is equal to one, there is full equity home bias; when it is equal to zero, the portfolio is optimally diversified according to the basic International CAPM.

The actual country k equity holdings of country c can be found using:

$$w_{ck,t} = \frac{Inv_{ck,t}}{\sum_k Inv_{c,k,t}}$$

Following the empirical approach used by De Santis and Gerard (2009), we will

be using the portfolio approach. The effects of portfolio rebalancing towards the optimal portfolio weights, diversification benefits and other major events will be disentangled from the effect of the recent financial crisis using binary variables in the regressions. Optimal portfolio weights for a country will be computed as a proportion of the country's share in the international financial market. This reveals the initial misallocation in the destination country. Assuming investors face no constraints on foreign holdings and financial markets are perfectly integrated, mean-variance optimization implies the following portfolio allocation:

$$w^*_{c,t} = \sum_{c,t}^{-1} \mu_{c,t},$$

where $w^*_{c,t}$ is the $(N \times 1)$ -vector of optimal weights for the $N = K + 1$ risky assets, with K being the number of foreign risky assets.

In this respect, to estimate the covariance matrix we use weekly equity returns on the DataStream total market index. DataStream also provides weekly bilateral exchange rates.

To disentangle portfolio re-balancing towards the optimal weight from irrational home bias, the initial misallocation from the optimal weight can then be computed as:

$$DW_{ck,t} = w^*_{ck,t} - w_{ck,t},$$

Where $DW_{ck,t}$ is the degree of underweight, $w^*_{ck,t}$ is the optimal share that should have been invested by country c in country k equities and $w_{ck,t}$ is the actual weight invested.

The two aspects of diversification benefits defined by De Santis and Gerard (2009), the benefits from the currency component and those from foreign asset returns, will be computed and used in the regressions.

$$DB_{ck}^{Agg} = DB_{ck}^{Curr} + DB_{ck}^{FH},$$

Where DB_{ck}^{Agg} is the aggregate measure of diversification benefits denominated in the investor's currency and DB_{ck}^{FH} is the fully hedged asset risk.

The investor protection index from the database of the Doing Business Project is used to investigate whether the level of investor protection had an impact on how investors reacted during the crisis. Investors could have only avoided investing in markets where they are more likely to face expropriation. The index ranges from 0 to 10, with higher values indicating more investor protection.

The Debt-to-GDP ratio is used to proxy nations under financial difficulty. This measure gives an idea of the ability of a country to make future payments on its debt.

The following equation will be estimated and the significant coefficients will help us understand the impact of the financial crisis on cross border diversification decisions of investors:

$$\Delta w_{ck,t} = \alpha_0 + \alpha_1 + DW_{ck,t-1} + \alpha_3 DB_{ck,t-1} + \beta_1 Ret_{k,t} + \beta_2 Ret_{k,t-1} + \beta_3 IP + \beta_4 FD + \Phi Z_{ck,t-1} ,$$

Where DW is a vector of the initial degree of underweight, DB a vector of the diversification benefits, IP is the investor protection index and FD denotes the Debt-to-GDP ratio used to measure financial difficulty.

The large matrix dataset will be handled using Matlab, which simplifies data preparation and the regressions necessary for our analysis.

Data

In existing literature, it has been difficult to analyze in depth the international investment and cross-border portfolio diversification due to the lack of consistent data on international portfolio allocation. This paper is based on a dataset from the only global survey of portfolio investment holdings, IMF's Coordinated Portfolio Investment Survey (CPIS). Additional data on other variables, such as risk free rates, exchange rates and world equity returns, necessary to construct the regressors is collected from data sources of the World Bank and Thomson Reuters DataStream.

The CPIS provides information on individual economy year-end holdings of portfolio investment securities - equity securities and debt securities - valued at market prices denominated in US dollar, cross-classified by the country of issuer of the securities. In the period 2001-2011, 73 of the world's economies participated in the CPIS survey, comprising all major international investors.

The CPIS Cross-Economy Tables contain, in matrix form, data from the individual economy tables of residents' holdings of securities issued by nonresidents (reported data) and the derived data for nonresidents' holdings of securities issued by residents (derived data).

Unlike many other datasets used in the existing literature, the CPIS dataset has the advantage of consistency:

- The dataset is based on a portfolio survey taken by the participating economies at the same time.
- Although self-reported, data on the investment portfolio of each participating country follows IMF's methodology and recommendations contained in the CPIS guide.

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- In addition to self-reported data on each of the participating economies, the dataset includes data collected from individual economies' monetary authorities through the Survey of Securities Held as Reserve Assets (SEFER) and data reported by international organizations through the Survey of Securities Held by International Organizations (SSIO).
 - All participating countries report data on their end-of-year individual equity and (short and long term) debt securities holdings issued by nonresidents.

Therefore, the IMF CPIS dataset allows us to investigate in a comprehensive manner whether the cross-border equity diversification continued to increase after 2005 and to explore the effect of the 2008-2010 Financial Crisis on cross-border equity portfolio diversification.

The CPIS database for the period 2001-2011 contains, among others, the international equity and debt securities portfolio holdings of 11 euro zone countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain, 6 countries from the European Union that have not adopted the euro currency: Denmark, Sweden, United Kingdom, Hungary (joined EU in 2004) and Bulgaria and Romania (joined EU in 2007) and other 10 developed countries: Australia, Canada, Hong Kong, Israel, Japan, New Zealand, Norway, Singapore Switzerland and USA.

Based on the beginning-of-period data, all the countries listed in the CPIS database invested internationally 12.7 trillions of US dollars (representing 50% of the 2001 GDP of the OECD countries), in debt securities (59.1%) and equity (40.9%). The 10 most developed countries (the United States, the United Kingdom, Japan, Switzerland and six euro area countries) held 72.2% of all international portfolio holdings, while just a few countries (Canada, Japan, UK, US, five euro area members and the tax havens of Bahamas, Bermuda and Cayman Islands) were the recipients of 74% of all the international investments in equity and debt securities.

At the end of the period, the countries participating in the CPIS invested internationally 38.9 trillions of US dollars (that is, 91.7% of the 2011 GDP of the OECD countries), 36.4% in equity and 63.6% in short and long term debt securities. Again, the 10 most developed countries (USA, Japan, UK, Switzerland and six euro-countries) held 67.5% of the international portfolio, with just a handful of developed countries (Canada, the Cayman Islands, Japan, UK, US and six euro-countries) as the main recipients of 70.5% of all the international investments.

When looking at the United States, the main portfolio investor in other countries, a growing preference for equity investments can be noticed for 2001-2007, with

70% to 73% of all portfolio holdings being equity holdings. However, at the end of 2008, following Lehman Brothers' default on September 15, 2008, the United States' international equity investments had dropped to 64% of all its international portfolio holdings, with a slow increase to 66% in 2011. This is evidence of the existence of a flight to the safety of debt instruments in response to an increase in the perceived risk of other assets.

To simplify the initial data analysis, the countries in large CPIS dataset are classified following the September 2012 definitions of the FTSE Group into *developed markets* (Australia, Austria, Belgium/ Luxemburg, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, UK and US), *advanced emerging markets* (medium income countries with advanced market infrastructures or high income countries with less developed market infrastructures: Brazil, Czech Republic, Hungary, Malaysia, Mexico, Poland, South Africa, Taiwan, Thailand and Turkey), *secondary emerging markets* (countries with reasonable market infrastructures: Chile, China, Colombia, Egypt, India, Indonesia, Morocco, Pakistan, Peru, Philippines, Russian Federation and UAE) and *frontier markets* (lower market capitalization and liquidity than the emerging markets, typically followed by investors wanting long-term returns and low correlations with other markets: Argentina, Bahrain, Bangladesh, Botswana, Bulgaria, Cote d'Ivoire, Croatia, Cyprus, Estonia, Ghana, Jordan, Kenya, Lithuania, Macedonia, Malta, Mauritius, Nigeria, Oman, Qatar, Romania, Serbia, Slovakia, Slovenia, Sri Lanka, Tunisia and Vietnam). 'Tax haven' countries like Bahamas, Bermuda, Cayman Islands or Netherlands Antilles have been excluded from the analysis to avoid biased results.

Year	Total equity holdings of developed countries	Equity holdings in other developed markets	Equity holdings in advanced emerging markets	Equity holdings in secondary emerging markets	Equity holdings in frontier markets
2001	5 005 524	4 375 328	131 141	46 806	1 958
2006	28 778 020	23 845 541	927 560	677 868	71 687
2008	25 704 106	21 337 301	685 484	517 517	86 383
2011	13 603 282	8 749 832	784 707	705 827	35 688

Table 1. International equity holdings of developed countries

Analyzing the total equity holdings of the 26 developed countries, it can be noticed that between 2001 and 2007 the data exhibited an upward trend, increasing from 5 trillion US dollars in 2001 to 28.7 trillion US dollars in 2006, followed by a sudden drop to 25.7 trillion US dollars at the end of 2008. After this, the data exhibits a downward trend, the equity holdings of the developed countries in our sample reaching 13.6 trillion US dollars at the end of 2011. This pattern shows investors' reaction to an increase in the perceived risk of equity,

suggesting a flight to other assets perceived as safer than equity during crises (real assets or debt instruments). A similar pattern also characterizes the equity holdings of the developed countries in other developed countries (figure 1).

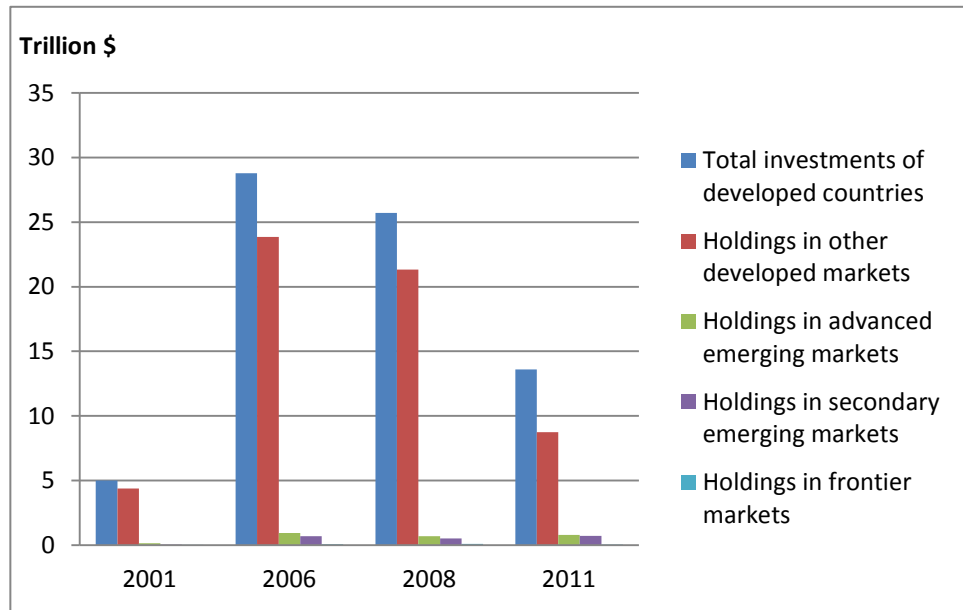


Figure 1. International equity holdings of developed countries

However, when analyzing the equity holdings of the developed countries in emerging markets, it seems that investors from developed countries are becoming gradually more interested in equity from both advanced and secondary emerging markets, due to their rapid growth and industrialization, with 11% of their total international equity holdings being in emerging markets in 2011 (table 2). The financial crisis has had an effect on these holdings, as the percentage of equity investments into emerging markets out of total international equity holdings went from 5.5% in 2006 to 4.6% at the end of 2007.

Year	Equity holdings in other developed markets	Equity holdings in advanced emerging markets	Equity holdings in secondary emerging markets	Equity holdings in frontier markets
2001	87,41 %	2,62 %	0,94 %	0,04 %
2006	82,86 %	3,22 %	2,36 %	0,25 %
2008	83,01 %	2,67 %	2,01 %	0,34 %
2011	64,32 %	5,77 %	5,19 %	0,26 %

Table 2. International equity holdings of developed countries in other developed countries, emerging markets and frontier markets as percentages of the total international equity investments of developed countries.

The equity holdings of investors from developed countries into frontier markets gradually increase between 2001 and 2008, as they become more of interest for investors seeking high, long-term returns. Given the low correlation of these frontier markets with other markets due to their market infrastructure,

international investors did not adjust their equity holdings immediately after the beginning of the crisis. The percentages in Table 2 might even suggest a flight of some of the investors from other markets into the frontier markets. However, gradually, the equity holdings in frontier markets declined, showing at the end of 2011 a percentage of international equity investments from developed countries in frontier markets out of the total equity holdings of developed countries equal to the value in 2006 (table 2).

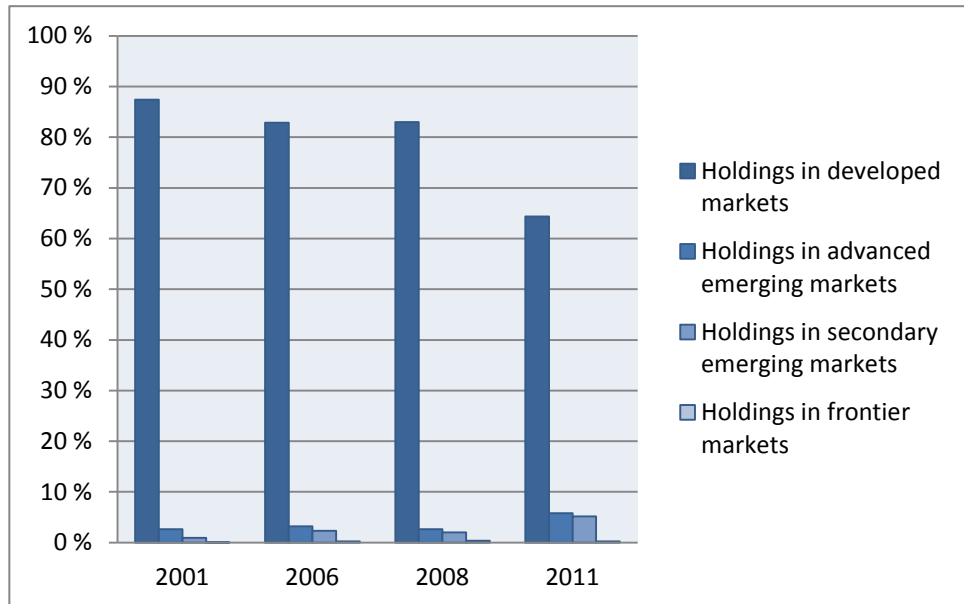


Figure 2. International equity holdings of developed countries in other developed countries, emerging markets and frontier markets as percentages of the total international equity investments of developed countries.