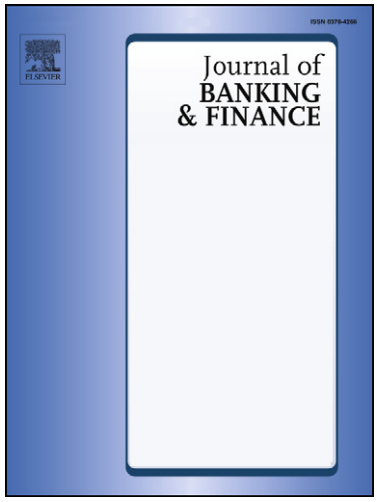

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International equity portfolio allocations and transaction costs

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Abstract

In spite of the critical role of transaction cost, there are not many papers that explicitly examine its influence on international equity portfolio allocation decisions. Using bilateral cross-country equity portfolio investment data and three direct measures of transaction costs for 36 countries, we provide evidence that markets where transaction costs are lower attract greater equity portfolio investments. The results imply that future research on international equity portfolio diversification cannot afford to ignore the role of transaction costs, and policy makers, especially in emerging markets, will have to reduce transaction costs to attract higher levels of foreign equity portfolio investments.

JEL classification: G11; G15; F12
Keywords: Portfolio diversification; International equity allocation; Transaction costs; Developed and emerging markets; Panel data models

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1. Introduction

There is extensive research documenting the gains from the diversification of domestic portfolios internationally. Grubel's (1968) study is accredited as the first to suggest that by including foreign securities, investors are able to achieve a lower variance in returns from the internationally diversified portfolio because of the less than perfect correlations amongst different stock markets around the world. Subsequent research by Solnik (1974) and more recently by Driessen and Laeven (2007) support the view that diversifying internationally helps in improving a portfolio's risk/reward ratio. Although Jorion (1985) challenges the *ex post* gains reported by earlier studies, Eun and Resnick (1988) find that, even after controlling for exchange risk, an internationally diversified portfolio significantly outperforms a portfolio that is invested in only US securities.

However, in spite of the overwhelming evidence on the gains from diversifying internationally, Cooper and Kaplanis (1994) show that investors tend to invest a disproportionately high share in domestic assets. In the literature, the tendency of investors to invest a greater proportion of a portfolio in domestic securities is commonly known as home bias. More recently, Chan et al. (2005) investigate the factors which determine international asset allocations and find that mutual funds demonstrate foreign bias by underweighting and overweighting foreign markets. Further, Gelos and Wei (2005) show that international investment funds display wide variations in allocating weights to foreign markets based on the level of a country's transparency. Evidence of home bias and foreign bias provided by previous research thus far suggests that there are several direct and indirect barriers to international investments. These barriers arise, for instance, from discriminatory taxes, different legal status accorded to foreign investors in terms of ownership restrictions,

differences in accounting and information disclosure standards and investor protection regulations, capital controls and transaction costs.[1]

The consumption and portfolio choice model developed by Rowland (1999) shows that as the magnitude of transaction cost increases, the rate of portfolio diversification decreases. This implies that despite the well known benefits of international diversification, investors may underweight those countries where the transaction costs are high. Of course, the investor's decision to allocate a greater proportion of capital to domestic securities may be influenced by home bias as they may feel that they are informationally disadvantaged while investing in foreign markets. However, if we control for home bias as well as for factors that have been found important in international diversification literature, we should be able to demonstrate whether transaction costs significantly influence the international equity portfolio allocations. By using a comprehensive dataset of bilateral cross-country foreign equity portfolio holdings and four different measures of transaction costs for 36 countries, this paper examines whether different components of transaction cost significantly influence international investors' decisions to underweight or overweight country allocations.

The role and importance of transaction cost in investments is not trivial. Keim and Madhavan (1995) suggest that transaction costs are important in determining investment performance and may significantly diminish or possibly outweigh the expected value generated by an otherwise good investment strategy. Amihud and Mendelson's (1986) suggest that assets with high transaction costs usually trade at a lower price relative to their expected cash flows. Similarly, Green et al. (2000) using a long dataset on the UK stock

[1] Bekaert and Harvey (2003) suggest that despite liberalization of financial markets, there are still many barriers to investing internationally.

market suggest that the increase in transaction costs also generally increases market volatility, which is probably through the thin trading effect. They suggest that emerging markets must get the level of transaction cost right in order to influence their market volatility. Further, they note that emerging markets should not only focus on stamp duty but must also concentrate on other forms of transaction cost. De Roon et al. (2001) find that for US investors investing in emerging markets, the diversification benefits disappear when short selling and transaction costs are incorporated. Solnik and McLeavey (2004) note that the impact of transaction costs is often disregarded in active global portfolio management and to the extent diversification benefits may reduce portfolio risk; the incorporation of transaction costs could reduce the expected returns.

In spite of the critical role of transaction cost acknowledged by previous studies, very few examine its influence on international portfolio investment decisions. Chan et al. (2005) use the transaction cost data of Elkins/McSherry Co. in examining how mutual funds of 26 developed and developing countries allocate their investment between domestic and foreign equity markets. However, they do not analyse the impact of each component (i.e., commission, fees, and market impact) that make up the Elkins/McSherry Co. transaction cost measure. Gelos and Wei (2005) merely control for transaction cost by using average turnover ratio as a proxy in examining how their newly constructed measures of transparency affect the investment choices of the emerging market equity funds. The apparent lack of research on the impact of transaction costs on international portfolio allocations is mainly due to the unavailability of cross-border bilateral portfolio holdings data on a country by country basis. In this research, we use bilateral country by country portfolio holdings data that have recently been made available by the International Monetary Fund (IMF) and provide evidence of the extent to which portfolio allocation choices are influenced by transaction costs.

Our study makes a number of important contributions to the existing literature. First, while controlling for the home bias phenomenon we examine the role of transaction costs in demonstrating why certain countries receive higher or lower levels of foreign equity portfolio allocations than others. Second, unlike previous studies on international portfolio allocations, we control for market microstructure effects by capturing the rate of information flow and industrial diversity of the equity markets. Existing research ignores the role of real effective exchange rates on portfolio investment decisions. In this study, instead of using a bilateral effective exchange rate, we use a broad based trade weighted real effective exchange rate which is a much better measure of exchange rate risk. Third, we use an extensive dataset comprising bilateral portfolio holdings for 36 developed and developing countries over a recent time period of 2001 to 2006 with 562 bilateral cross-sectional units and 3290 observations which enable us to comprehensively examine our research hypotheses. Finally, in contrast to most previous studies that use a cross-sectional approach, we test our hypotheses robustly by using random and fixed effect models within a panel-data framework.

The results show that all three direct measures of transaction cost (commission, fees and market impact) distinctly and significantly affect investment allocation choices, and that countries with lower transaction costs seem to attract greater foreign equity portfolio investment. There are two important implications of this result. First, future research on international portfolio diversification cannot afford to ignore the role of transaction cost in country allocation decisions. Second, national policy makers should aim to reduce transaction costs to attract higher levels of foreign equity portfolio investments.

The rest of the paper is organised as follows. The next section explains the theoretical framework that provides a basis for our empirical work. Section three explains the data,

various controlling variables and methodology used in this study. Section four presents and discusses the results of panel data analysis and section five concludes the paper.

2. Barriers to bilateral cross country equity investments: Theoretical framework

An alternative approach to optimize the country allocation could be based on net equity returns which largely depend on the trading frequency and whether trading costs are stable over time.[2] However, this is not a realistic assumption as the transaction costs would vary significantly over the sample period of six years (2001-2006) used in this paper. For example in the case of Malaysia, we find that there is a considerable temporal variation in transaction costs and these appear to reduce over time.

We use the theoretical framework of Cooper and Kaplanis (1986) which suggests that in the presence of deadweight costs international investors do not hold the world market portfolio as is assumed in the International Capital Asset Pricing Model (ICAPM). In the Cooper and Kaplanis (1986) model, each investor is assumed to be a mean-variance risk-averse investor who is interested in maximizing returns for a given level of variance. Therefore, the optimization problem is described as:

$$Max(w_i'R - w_i'c_i), \tag{1}$$

subject to

$w_i'Vw_i = v$

$w_i'I = 1$

[2] We thank the anonymous referee for this point. Chan et al. (2005) assume that transaction costs remain stable over time. However, such an assumption is only valid where cross-sectional data analysis is used. We do not report data showing temporal variations in transaction costs but these can be made available on request.

where w_i is a column vector of foreign portfolio weights whereby the *j*th element corresponds to the weight of individual *i*'s total wealth invested in risky assets of country *j*. *R* denotes the column vector of pre-tax expected returns and c_i is the column vector of the deadweight cost of investor *i*. The *j*th element of c_i is c_{ij} which is the deadweight cost for holding the asset in country *j*. *V* is the variance/covariance matrix of the gross (pre-cost, pre-tax) returns on the risky assets with *v* being the constant variance and *I* is a unity column vector. The objective of the investor is to optimize equation (1) given the two constraints. Equation (1) can be maximized using the Lagrange method:

$$L = (w_i'R - w_i'c_i) - (h/2)(w_i'Vw_i - v) - k_i(w_i'I - 1) \quad (2)$$

where *h* and *k* are the Lagrange multipliers. In order to maximize our objective function in equation (1), we need to set its derivative to zero and solve to get

$$R - c_i - hVw_i - k_iI = 0 \quad (3)$$

Hence, the optimal portfolio for investor *i* is

$$w_i = (V^{-1}/h)(R - c_i - k_iI), \quad (4)$$

where

$k_i = [I'V^{-1}R - I'V^{-1}c_i - h]/I'V^{-1}I.$

Now that we have got the individual weights, the latter can be aggregated to arrive at the world capital market equilibrium. Therefore the market clearing condition is

$$\sum P_i w_i = M, \tag{5}$$

where P_i is the proportion of total world wealth owned by country i, M is a column with the corresponding ith element of which M_i is the proportion of the world market capitalization in country i's market. Substituting equation (4) in equation (5) and subtracting the subsequent equation from equation (3), we get rid of R. Defining z as the minimum variance portfolio $(= V^{-1}I/I'V^{-1}I)$ we can obtain

$$hV(w_i - M) = (\sum P_i c_i - c_i) - z'(\sum P_i c_i - c_i)I \tag{6}$$

If there are no barriers to investing in a foreign or domestic country, then the deadweight costs (c_{ij}) are zero for all i and j. In such a case, the right hand side of (6) is zero. This implies that all investors should hold the world market portfolio. Let us consider a case where the covariance matrix, V, is diagonal with all variances equal to s^2 and the deadweight cost of any country/investor pair is denoted by c, except for the domestic country which is equal to zero. In such a case, the portfolio holdings of investor i in country j are

$$\begin{aligned} w_{ij} &= M_j - (P_j c/hs^2), \qquad i \neq j \\ w_{ij} &= M_j - (P_j c/hs^2) + (c/hs^2), \quad i = j \end{aligned} \tag{7}$$

Equation (7) implies that the larger the deadweight cost, c, the greater should be the deviation of actual portfolio holdings from the world market portfolio. This deviation is negative for foreign investment and positive for the domestic country. The following equations translate the relationship with the objective of assessing the case where the deadweight costs are non-uniform.

$$hs^2(w_{ij} - M_j) = -c_{ij} + b_j + a_i - d, \qquad i \neq j \tag{8}$$

$$hs^2(w_{ij} - M_j) = b_j + a_i - d, \quad i = j \tag{9}$$

where

$a_i = z' c_i$

$b_j = \sum M_k c_{kj}$

$d = z' \sum M_i c_i$

a_i is implied as the weighted average marginal deadweight cost for investor *i*, b_j as the weighted marginal deadweight cost for investors investing in country *j* and *d* the world weighted average marginal cost.

The above relationship suggests that if the marginal deadweight cost, c_{ij}, is large relative to the weighted average marginal deadweight cost for investor *i*, a_i, or the weighted average marginal deadweight cost for investors investing in country *j*, b_j, it is highly likely that the right hand side of equation (8) will be negative, suggesting that investor *i* should underweight in assets of country *j* relative to its weight in the world market portfolio. Similarly, as there are no barriers to investing in the domestic country, the right-hand side of equation (9) should be positive and investors should overweight home securities relative to the domestic proportion of their world market portfolio.

In the light of the above discussion, the bilateral foreign portfolio allocation should depend on the difference between the cost for investor *i* investing in country *j* (c_{ij}) and the weighted average cost for investing in country *j* (b_j). This suggests that that if c_{ij} is greater than b_j, investor *i* should underweight country *j*.

3. Data and methodology

This paper uses bilateral foreign equity portfolio investment holdings data, three direct measures of transaction cost, turnover ratio as an indirect measure of transaction cost, and a host of controlling variables that have been shown to be relevant in international portfolio allocations by previous literature. The following section describes the data used in this study.

3.1. The dependent and independent variables

Following Cooper and Kaplanis (1986), we model the portfolio weights as our dependent variable revealed in the data.[3] The allocation weight of portfolio holdings of country *i* into country *j* is defined as

$$w_{ijt} = \log\left(\frac{FPI_{ijt}}{\sum_{j=1}^{36} FPI_{ijt}}\right) \qquad (10)$$

where w_{ijt} is the weight of foreign equity investment (stock of holdings) from country *i* into country *j* for the year *t* and FPI_{ijt} is the actual foreign equity portfolio investment in USD million.[4] Bilateral investment holdings data are obtained from IMF website. In October 1997 the IMF undertook a Coordinated Portfolio Investment Survey (CPIS) of 29 participating countries and began to annually report portfolio holdings on a bilateral country basis since

[3] We also use a proxy for portfolio flows calculated by taking the first differences of portfolio holdings. We find that none of the regression specifications using flow proxy fit the model adequately as the maximum overall R^2 obtained is around 9%. Results are not reported here but could be obtained from the authors on request. Further, our decision to use holdings data is justified since Fidora et al. (2007) suggest that the proxy portfolio flows constructed by taking the first difference of the holdings data do not fully reflect actual portfolio flows as the change may be caused by changes in valuation of holdings over time.

[4] We also denominate the holdings in investor country's currency but as the results are virtually unchanged we do not report these regression results.

2001.[5] The prime motive of the survey is to have better understanding of the global asymmetries in the reported balance of payment data, particularly those in portfolio investments. All participating countries are required to report a breakdown of their stock of portfolio investments, including portfolio equity investment holdings by the country of residency of the non-resident issuer. The IMF website provides detailed data on a country by country basis. Although data are available from 1997, complete data for all countries are available only from 2001 onwards. Since in the majority of cases, investments originate from developed countries, we consider portfolio weights from the point of view of investors based in developed countries such as the US. Fidora et al. (2007), who also use the same dataset for home bias issues, note that investment from developing countries into developed countries is almost negligible and mostly not reported by IMF. Further, the selection of 16 investor countries and 36 target countries is dictated by data availability. The trading cost data for 36 countries we use in this study are handpicked from Standard and Poor's Global Stock Markets Factbook.[6]

In our analysis, the independent variables are the four different measures of transaction cost in country *j* at time *t*. This includes three measures of trading cost maintained by Elkins/McSherry (E/M) and reported in the Standard and Poor's Global Stock Markets Factbook. E/M analyzes trading costs for 150 global institutions such as pension funds,

[5] The survey includes the financial market participants, the primary end-investors (e.g. banks, security dealers, pension funds, insurance companies, mutual funds, non financial corporations, households), and primary custodians, who hold or manage securities on behalf of others. Some caveats deserve mention. Any investment below USD 500,000 is not reported. Also, some data may not be reported by a country due to confidentiality reasons.

[6] Following Fidora et al. (2007), we also do not include offshore financial centres (Luxembourg and others) as recipient countries because of third-country holdings and round-tripping issues. For example, for the year 2003 the total holding reported by German investors alone in Luxembourg was USD 152 billion whereas Luxembourg's total market capitalization was less than USD 40 million.

investment managers, banks and brokers and their measures comprise three components. The first is the average commission paid (TC1). According to Solnik and McLeavey (2004) this represents commission paid to the brokers for allowing access to brokerage services and research resources. The second is the average fee (TC2) which includes costs incurred for obtaining additional services such as the post-trade settlement. It is worth mentioning that for the UK, the buying fee is significantly higher because of the stamp duty. We have taken average of buy and sell costs as investors pay more for buying but are compensated by paying significantly less for selling.

The third measure is the average cost of market impact (TC3). The Standard and Poor's Global Stock Markets Factbook defines market impact as the difference between the price at which a trade is executed and the average of the stock's high, low, opening and closing prices during the trade. More precisely, it is the average cost of trade versus the average price. Market impact is hence defined as the difference between the actual execution cost and the price that would have been availed had the investor not been involved in the trading. All three costs are denominated in basis points. Finally, following previous literature, we use turnover ratio (TC4) as a proxy measure of transaction cost. The turnover ratio is the average value traded divided by average market capitalization. This measure indicates the relative level of liquidity and, following Amihud and Mendelson (1986), the turnover ratio is expected to be negatively related to transaction costs. The turnover data have been collected from annual issues of Standard and Poor's Global Stock Markets Factbook.

3.2. Control variables

We have used a number of control variables.[7] The first is to control for the home bias phenomenon. French and Porteba (1991), and more recently Karlsson and Nordén (2007), show that despite the risk reduction benefits that foreign securities offer, investors tend to overweight domestic securities. Chan et al. (2005) note that if foreign investors exhibit home bias and overweight their domestic market, the allocation to foreign markets would be disproportionately lower. Following Fidora et al. (2007), we construct the measure of bilateral home bias ($HBIAS_{ijt}$) as follows:

$$HBIAS_{ijt} = 1 - \log\left(\frac{w_{ijt}}{BWT_{jt}}\right) \tag{11}$$

where $HBIAS_{ijt}$ is bilateral home bias observed by the host or investor country i for country j at time t. BWT_{jt} is defined as the benchmark weight and is computed as

$$BWT_{jt} = MC_{jt} / \left(\sum_{j=i}^{36} MC_{jt}\right) \tag{12}$$

where MC_{jt} is the market capitalization of the issuer j country at time t.

The second control variable we use is the investor protection measure. Aggarwal et al. (2005) suggest that the US funds tend to invest in open market economies where stronger shareholders' rights and legal frameworks are present. We use the investor profile measure provided by the ICRG Political Risk Services Group as a proxy for the quality of investor

[7] However, we do not include withholding taxes following French and Poterba (1991) who show that there is no significant relationship between taxes and international investment.

protection available in each country. The investor profile measure is constructed on a scale of 0 to 12 and reflects government's attitude towards inward investment. The investor profile measure is further divided into three sub-components: (i) contract viability or risk of expropriation, (ii) payment delays, and (iii) repatriation of profits. Each subcomponent is scored on a scale of 0 to 4 where 4 reflects a very low potential risk. This variable is expected to be positively related to portfolio weights as investors would prefer investing in those countries which provide better investor protection. La Porta et al. (1998) show that the English common law system provides better legal protection to shareholders compared to the German and French civil law systems. As an additional measure of investor protection, we use a legal dummy which takes a value of 1 for common law countries and 0 otherwise.

Further, we include two variables to control for economic development and economic growth. In order to control for the level of economic development we use the log value of per capita GDP denominated in USD. For economic growth, we use the GDP growth rate. Both variables are expected to show a positive relationship since investors should prefer to invest in countries that demonstrate higher economic development and growth. Data for both variables are obtained from world development indicator (WDI) of the World Bank.

A commonly used proxy in the previous literature is the capital control intensity used by Edison and Warnok (2003). This measure is constructed by taking a ratio of market capitalization represented by S&P/IFC Investable Indices to the market capitalization of S&P/IFC Global Indices. This variable ranges from 0 to 1 with 1 indicating completely open markets to foreign investors. Since these indices are mostly available for developing countries in the Standard and Poor's Global Stock Markets Factbook and most developed markets have open economies, the ratios have been set to 1 for all developed countries. The

equity market openness variable also measures the time variation in the financial liberalization process and is expected to have a positive sign.[8]

Following Dahlquist et al. (2003), since only a small portion of the market capitalization in most countries may be available to international investors, we use an additional proxy for capital control which is calculated as a percentage of closely held shares of the total market capitalization. This measure is expected to capture the prevalence of closely held firms and expected to carry a negative coefficient.

Chan et al. (2005) show that the level of stock market development affects international portfolio investments. We use the ratio of stock market capitalization to GDP as a measure of stock market development obtained from WDI. Additionally, we use cross-sectional standard deviation of stock returns (based on monthly data) for each country to control for market micro-structure effects. Ross (1989) models cross-sectional standard deviation as a direct measure for the rate of information flow which also reflects the diversity of the industrial sector. A low cross-sectional standard deviation would suggest that the economy is not well developed and industries represented on its stock market are not diversified. Following equation (4) in section 2, we expect this variable to be negatively correlated to international portfolio investments. We also use an emerging market dummy to further control for the level of stock market development since it is well known that emerging markets are not as well developed as stock markets in developed countries.

Foreign investors are generally concerned about exchange rate movements since they directly affect returns measured in domestic currencies. Therefore, foreign investors require a

[8] See De Jong and Roon (2005), Panchenko and Wu (2009) and Lagoarde-Segot (2009)

currency risk premium for bearing systematic risk which they cannot diversify. In order to control for exchange rate risk, we use a three year moving average standard deviation of the trade weighted Real Effective Exchange Rate (REER) sourced from the Bank of International Settlement (BIS).

Carrieri et al. (2006) note that it is more appealing to use REER than the nominal exchange rate because inflation rates are generally non-random and hence the nominal exchange rate may not reflect the true effect of exchange rate risk. Since the REER measure is based on the combined effect of changes in the inflation differential and changes in nominal currency value, it is a better measure because it captures the true effect of exchange rate risk arising from deviations from the Purchasing Power Parity (PPP). Further, Carrieri et al. (2006) provide evidence that the nominal exchange rate index may be confounded with other information and may not capture deviations from PPP or other factors. Hence, by using the REER we are able to adjust the inflation rate differentials.[9] The REER is calculated by adjusting the nominal effective exchange rate (NEER) for the relative consumer prices levels. The BIS REER basket includes 52 economies, including the emerging countries.

All control variables discussed so far are country specific variables. It is highly likely that international portfolio investments may be influenced by long term bilateral relationship, geographic proximity and market familiarity. In order to control for these factors, we employ a language dummy which takes the value of 1 if a pair country shares a common language. Similarly, we also add the log of the distance between capital cities of pair countries. Both these variables are obtained from the NBER website and have been used previously by

[9] Akram et al. (2009) demonstrate numerous economically significant violations of the law of one price. Although the use of REER could be justified in the light of the existing studies, we also use NEER calculated as the geometric weighted average of a basket of bilateral exchange rates. However, our results remain unchanged.

Subramanian and Wei (2007). The bilateral trade data are obtained from the Bilateral Trade Statistics of IMF and calculated by taking the log of total exports and imports of the pair country. The bilateral measure explained above captures the informational asymmetries that might exist between foreign and domestic investors. This may also help in predicting the probability of information flow as well as measuring the barriers that foreign investors encounter in seeking information overseas.

It is widely known that greater portfolio diversification is achieved by adding foreign securities that have a lower return correlation with the returns from home securities (Solnik, 1974). Thus to control for diversification potential between the pair countries, we use a correlation coefficient based on the six years' monthly return data. We expect that lower correlations should positively influence international portfolio investments and vice versa. The final set of control variables we include are historical returns and country risk. We calculate the three year moving average of historical returns as it has been shown that investors prefer to invest in countries with higher historical returns. This investor tendency is commonly referred to in the literature as the return chasing hypothesis or feedback hypothesis (see Bohn and Tesar, 1996; Asem, 2009). We also include the composite country rating produced by the PRS group, popularly known as the International Country Risk Guide (ICRG) rating which comprises 22 variables in three subcategories of risk: political, financial, and economic. A separate index is created for each of the subcategories. The Political Risk index is based on 100 points, Financial Risk index on 50 points, and Economic Risk index on 50 points. The aggregate country risk is computed by multiplying the aggregate 200 points by 0.5.

It is possible that our model may suffer from over-correction. For instance, the inclusion of bilateral variables and the equity market openness along with the bilateral home bias measure may cause the model to over-correct in controlling the bilateral and equity market openness as these variables are modelled against home bias in existing studies (see Fidora et al. 2007). When we run a simple regression to explain home bias using bilateral familiarity variables (trade, distance, language and correlation) and equity market openness, we find that all variables are statistically significant with an adjusted R^2 of 20%.[10] This shows that home bias captures a significant effect of these variables. In order to address this issue we follow the approach of Fama and French (1993) and orthogonalize these five variables (trade, distance, language, correlation and equity market openness) by deducting the fitted value from the home bias measure. This approach does not affect the coefficient and test-statistic for home bias and neither does it affect the relationship of transaction cost measures on any of the bilateral and equity openness variables. It simply orthogonalizes the effect of the bilateral variables from the home bias measure resolving the over-correction problem. Further, La Porta et al. (1998) suggest that investor protection is a major determinant of stock market development. As such, we run a simple regression of investor protection on stock market development and find that the coefficient for investor protection is 11.02 with a test-statistic of 12.93, confirming the strong effect of investor protection on stock market development. Hence we orthogonalize the effect of investor protection from the stock market development measure.

3.3. Methodology

Our data include bilateral portfolio investments for 36 recipient countries and 16 investor countries over a period of six years (2001-2006) providing us with a total of 562 cross-

[10] The coefficients and their test-statistic are not reported here to save space but can be obtained from the authors on request.

section units and a total of 3290 observations. Not every regression uses all observations as for a few countries some variables are not available. For example, no bilateral trade data are available for Taiwan. Also, no transaction cost data are available for China, Poland and Russia.

Given the wide cross-sectional differences and temporal variations, we employ panel data regression models using random and fixed effect estimations across different specifications. Since our analysis includes a number of dummies and rarely changing variables, this leaves us with little choice but to use the random effect model in most of our specifications. In our random effect models, although we are unable to control time invariant pair country effects, we are able to include all observed country specific and bilateral controls and the time dummies. Since the random effect model utilizes both 'within' and 'between' country variations, it is more efficient than the fixed effect model. However, since all our key variables are time varying, we also use the fixed effect model to control for unit specific effects.

4. Empirical findings

We first present the univariate average values of our dependent and independent variables. Although not as robust as panel regressions, univariate analysis does provide useful information.

4.1. Statistics on portfolio weights and transaction costs

Table 1 presents the averages of foreign equity portfolio investment and the transaction costs (in basis points) for all countries (*j*) for the entire sample period 2001-2006. It is worth noting from the figures in the second column that Peru receives the lowest average foreign

equity portfolio allocation (0.02%), whereas the US receives the highest portfolio investments (37.76%).[11] In terms of the top ten ranking, most countries are developed countries (US, UK, Switzerland, Sweden, Japan, Italy, Germany, France, Finland and Canada). Eight out of the ten countries that received lowest international portfolio allocation are developing countries (Argentina, Chile, Czech Republic, Malaysia, Peru, Philippines, Thailand and Turkey).

(Insert Table "1" here)

Columns 3, 4 and 5 of Table 2 show the average of various components of transaction costs (i.e., commission, fees and market impact cost, respectively). Column 6 shows the total transaction costs (sum of commission, fees and market impact cost) and column 7 provides the average turnover ratio for each country (*j*). In terms of total cost (column 6), it is evident that Japan has the lowest total transaction cost followed by US, Austria, Belgium, Canada, Australia, France, Germany, Italy, Sweden and Switzerland. Not surprisingly, all of these countries are developed countries, although when turnover ratios are compared, the order alters a little. Developed countries still dominate the rankings with the exception of Korea, Taiwan and India. The univariate analysis provides prima facie evidence that generally lower transaction costs are associated with higher foreign portfolio allocations.

Table 2 shows the correlation coefficients between different components of transaction costs. Except for TC1 (commission) and TC2 (fees) that are somewhat correlated (0.40), other combinations have lower or negative correlations. Also, as expected, the turnover ratio

[11] Despite lower market capitalization of their equity markets, UK, France and Germany rank higher than Japan in terms of portfolio allocation for our sample period. We find that this is on account of home bias and other factors. For example, Japan has the highest home bias (1.47) compared to 0.49, 0.42 and 0.51 for France, Germany and UK respectively.

is negatively correlated with all other measures of transaction cost. This suggests that multicollinearity is not a significant problem among the various measures of transaction costs.

(Insert Table "2" here)

4.2. Regression analysis

The univariate analysis of the summary statistics presented in previous sub-sections provides a good indication that countries with relatively lower transaction costs seem to attract higher equity portfolio allocation. To confirm this, we employ a number of regressions by including different variables that could potentially explain variations in portfolio allocations.[12] All significant coefficients are shown with asterisks and the test-statistics are shown in parenthesis. Regression specification (13) includes the home bias (HBIAS) variable besides each of the different components of transaction cost (TC1, TC2, TC3 and TC4) as independent variables. The results of the regression are presented in Table 3.

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Transaction\ Cost_{jt} + \epsilon_{ijt} \quad (13)$$

As expected HBIAS is highly significant and bears the expected negative sign. Estimations show that a 1% increase in home bias decreases bilateral portfolio holdings by nearly 1%. This finding is consistent with evidence provided by previous studies and confirms the existence of home bias in international portfolio allocations. However, after controlling for the home bias, all transaction cost measures are highly significant at the 5% level of significance.

[12] We also run regressions using bilateral 16 by 16 source-host countries (i.e. excluding the emerging markets) and find that our results are robust. To save space we do not report the results here but these can be obtained from the authors on request.

(Insert Table "3" here)

The results presented in Table 3, however, may be biased since specification (13) excludes macroeconomic, institutional and bilateral control variables. Thus in regression (14), we include macroeconomic, institutional and bilateral variables, and time dummies.

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Transaction\ Cost_{jt} + \beta_3' . Controls\ and\ Time\ dummies + \epsilon_{ijt} \quad (14)$$

The results in Table 4 show that the coefficient for HBIAS is still negative and statistically significant. Although the magnitude of transaction cost coefficients is somewhat reduced, they remain statistically significant. The changes in magnitude of the coefficients of transaction cost measures are not surprising since inclusion of the control variables and time dummies mitigates any bias inherent in regression (13).

(Insert Table "4" here)

Next we run a number of different specifications of the model to ensure that our estimates are robust. The outputs of different specifications of the model are shown in Table 5. We first discuss the results of the transaction cost measures followed by the discussion about the impact of control variables.

4.3. All in one

As multicollinearity amongst the different transaction cost measures is not a significant problem, we include all four transaction cost variables in a single regression and jointly estimate their significance via the following regression:

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Transaction\ Costs_{jt} + \beta_3' . Controls\ and\ Time\ dummies + \epsilon_{ijt} \quad (15)$$

The findings reported in Table 5 (specification 15) show that not only are the coefficients for transaction cost measures highly significant, but they also carry expected signs. Also the model yields an improved R^2 of 83%. This suggests that each transaction cost measure has a distinct and statistically significant influence on foreign portfolio allocations.

(Insert Table "5" here)

4.4. Free float home bias

As discussed earlier, the home bias (HBIAS) variable that we use is based on the assumptions that all countries follow an open market policy allowing free entry and exit of foreign investors. However, despite vigorously pursuing the liberalization of financial markets, many emerging markets in developing countries have regulations that impede the free inflow and outflow of portfolio investments. In order to address this issue we include two additional variables which could potentially control for this deficiency. The first is the equity market openness and the second is the extent of the existence of closely held firms. In order to further substantiate the issue of free float securities, we construct a free float HBIAS measure using the S&P IFC's freely investable market value index. However, a caveat is worth noting here. The HBIAS measure is only available for the markets in developing

countries and therefore in our analysis we assume that developed markets are completely open for foreign investors. However, even if this is not the case for some developed countries, the *closely held* variable included in our model should be able to capture the effects of investment restrictions, if any. We run the regression specified in equation (16) with a freely floated home bias (F_HBIAS) variable. The regression outputs are reported in Table 5 (Specification 16).

$$w_{ijt} = \alpha + \beta_1 . F\_HBIAS_{ijt} + \beta_2' . Transaction\ Costs_{jt} + \beta_3' . Controls\ and\ Time\ dummies + \epsilon_{ijt} \quad (16)$$

Results suggest that the magnitude of the *F_HBIAS* coefficient is slightly lower than in specification 15. However, it is still statistically significant. The transaction cost coefficients remain highly significant without any material change in their estimated coefficients except for liquidity measure (TC4).

4.5. Unit specific effect and reverse causality

Our regression coefficients may still be suspected of bias, since it is possible that each country may have its individual effect through the time invariant variables, and also due to time invariant pair country bilateral effects, such as common colonization history, special bilateral treaty, favourite partner nation status, etc. If this is the case then the unobserved time invariant variables may be correlated with the regressors and the estimates may be biased. We use the fixed effect model to address this issue. As discussed earlier, that although the fixed effect model is not as efficient as the random effect model, it does account for all country specific and bilateral cross-country time invariant effects. As our transaction cost and most of the other control variables have a time dimension, we are able to employ the fixed

effect model using only the time variant variables. We run regression specification 17 using a fixed effect model.

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Transaction\ Costs_{jt} + \beta_3' . Controls + \epsilon_{ijt} \quad (17)$$

The results reported in Table 5 (Specification 17) show that the explanatory power of the model is somewhat reduced since all time invariant variables are not used. However, the reported goodness-of-fit of the fixed effect model is explained by the 'within transformation' of the independent variables and cannot be interpreted in the usual way (see Wooldridge, 2003). All key variables, i.e., commission, fees, and market impact cost variables, remain statistically significant without any major change in either their statistical significance or signs.

In our regressions, reverse causality may also be a potential problem. To overcome this, we use one year lagged value of all four transaction cost measures in regression 18.

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt-1} + \beta_2' . Tran.\ Costs_{jt-1} + \beta_3' Controls\ \&\ Time\ dummies + \epsilon_{ijt} \quad (18)$$

As can be observed from the estimates in Table 5 (Specification 18), the regression coefficients of the lagged values of transaction costs remain statistically significant. The magnitude of the estimates does change as they reflect the lagged effect rather than the level. However, despite using lagged values, the transaction cost measures remain statistically significant, confirming that the transaction cost variables used in our estimations do not appear to suffer from reverse causality problems.

4.6. Major financial centres

We consider the possibility of international investors buying depositary receipts listed in major financial centres instead of investing directly in shares trading in the foreign equity markets. International investors may be tempted to use major financial centres because of the lower transaction costs (Aggarwal et al. 2007). If this is the case then our transaction cost estimates may be affected because our sample includes US, UK and Japan which are major financial centres where depositary receipts are listed and actively traded. In order to address this issue, we exclude US, UK and Japan as investor countries from the sample and run the following specification (19).

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Transaction\ Costs_{jt} + \beta_3' . Controls\ and\ Time\ dummies + \epsilon_{ijt} \quad (19)$$

As seen in Table 5 (Specification 19), despite excluding US, UK and Japan, the coefficients of all transaction cost measures remain highly significant. This confirms that even after removing the effects of the major financial centres, transaction costs do seem to matter in the international portfolio allocations.

4.7. Practical significance

In order to explain the practical importance of transaction costs in attracting international portfolio investments, we generate a dummy for an arbitrarily chosen country, Portugal, and examine its interaction with commission cost (TC1) via the following specification:

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Tran\ Costs_{jt} + \beta_3 . Int.Var + \beta_4' . Ctrls\ \&\ Time\ dum. + \epsilon_{ijt} \quad (20)$$

The regression results in Table 5 (Specification 20) show that the coefficient of TC1 for Portugal is -5.47 [i.e. (-0.89) + (-4.58)]. This indicates that on average a 1% decrease in transaction cost could lead to a 5.47% increase in Portugal's weightings in the international portfolio. This illustrates that the estimated effects of transaction costs demonstrated in this paper are not trivial.

4.8. Nominal effective exchange rate

As discussed earlier, we also test the model by including a volatility measure based on the nominal effective exchange rate (NEER) obtained from BIS and run the following specification.

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Transaction\ Costs_{jt} + \beta_3' . Controls\ and\ Time\ dummies + \epsilon_{ijt} \quad (21)$$

As shown in Table 5 (specification 21) the coefficients of transaction costs remain statistically significant. This indicates that the effect of transaction costs on portfolio allocations remains unchanged irrespective of the choice of exchange rate volatility measure.

4.9. Investor country's perspective

Hitherto the specifications used have included all investor countries' bilateral foreign equity portfolio holdings data. In specification 22, we examine year by year regression for each investor country. Since we run 96 regressions (16 countries × six years), it is practically not feasible to report all 384 coefficients (96 × four transaction cost measures). Instead we provide a summary of regression results in table 6 which shows the number of countries for which we find TC1-TC4 significant at 1%, 5% and 10% significance levels.[13]

[13] We thank the anonymous referee for this suggestion.

$$w_{ij} = \alpha + \beta_1 . HBIAS_{ij} + \beta_2' . Transaction\ Cost_j + \epsilon_{ij} \quad (22)$$

The results in Table 6 show that out of the total number of regressions, TC1 is highly significant in 98% cases, TC2 in 79%, TC3 in 90% and TC4 in 88% cases. We relate this result to our univariate analysis. The lower percentage of cases for TC2 may be attributed to its relatively lower share in the total transaction costs. TC1 (commission) and TC3 (market impact) constitute more than 90% of the trading costs for all countries, except for the UK, Philippines, Taiwan and Greece. This suggests that even from an individual investor country's perspective, transaction costs remain a very important factor for international investments.

(Insert Table "6" here)

4.10. Control variables

Most of the control variables have expected and consistent signs in the different specifications except for GDP growth and country risk. As seen from the reported statistics in Table 6, both investor protection measures are significant and bear expected signs consistently in all regressions. The *GDP growth,* although significant in most cases, is not consistent in terms of expected signs which may suggest that investors may be more concerned with the level of economic development captured by *GDP per capita* which is highly significant and generally consistent across all specifications in terms of its expected signs. Further, *Equity market openness* and *Closely held firm* variables are also significant and carry the expected signs indicating that investors tend to underweight those countries which have high restrictions on foreign investment and where ownership is not dispersed.

As far as the three equity market related variables, i.e., *Stock market development*, *Equity market volatility* and *Exchange rate volatility* are concerned, they carry expected signs and are highly significant across all specifications, except specification 18 where equity market volatility is insignificant. The results make sense since they indicate that foreign investors are keen to invest in countries where stock markets are large, volatility of equity returns is lower and where there is less uncertainty with regard to exchange rates. Following Ross's (1989) model, the significance of cross-sectional standard deviation (equity market volatility) illustrates that investors prefer countries with a well developed market microstructure and where the rate of information flow and industrial diversity of the equity market are high.

As expected, the *Emerging market dummy* coefficient is negative and statistically significant in all specifications confirming that stock market development is indeed a key factor influencing the international portfolio allocations. *Bilateral trade* too is highly significant in all regressions. Good trade relations between countries seem to positively influence the international portfolio investments. This is also consistent with evidence provided by Chan et al. (2005) who report that bilateral trade plays a significant part in portfolio allocation choice. Finally, we find the coefficients on common language, distance historical return and equity return correlation to be consistent and carrying expected signs. We find that the broad measure of country risk either changes signs or becomes insignificant under different specifications. Similar results of the insignificance or inconsistencies of some of the control variables are also reported by previous studies when modelling foreign portfolio investments (see Gelos and Wei, 2005).

Overall, the dominance of the market specific variables such as stock market development, equity market volatility, exchange rate volatility, emerging market dummy and bilateral

information asymmetry variables shows that investors prefer to invest in markets which are well developed and have lower transactions costs.

4.11. Relative measure of transaction cost and volatility measures

We further discuss the importance of our transaction cost measures relative to volatility measures. We follow two methods to identify the relative importance. Following Gelos and Wei (2005), the first method we use is to study the relative size of adjusted R^2. We run two regressions. In the first regression, we include only four transaction cost proxies and in the second, we include only volatility measures. The results in Table 7 show that the adjusted R^2 of the first regression is 45% and 7% for the second regression. The results confirm that transaction cost measures are more important compared to volatility measures.

In order to ensure the robustness of the results reported in Panel A, we run an OLS regression (23), where Vol are the volatility measures.

$$w_{ijt} = \alpha + \beta_1 . HBIAS_{ijt} + \beta_2' . Tran\ Costs_{jt} + \beta_3 . Vol. + \beta_4' . Ctrls\ \&\ Time\ dum. + \epsilon_{ijt} \quad (23)$$

We report the standardized beta (ranked highest to lowest) of the transaction cost and volatility measures in panel 2 of Table 7. Once again standardized betas for all four transaction cost measures are much larger relative to the volatility measures.

5. Summary and concluding remarks

In spite of the critical role of transaction cost, there is relatively much less research on its influence on international equity portfolio investment decisions. In this study, we use hand collected data on different components of transaction cost (commission, fees and market

impact) and country by country portfolio investment holdings for 36 countries over the 2001-2006 period and examine whether portfolio allocation choices are influenced by levels of transaction costs.

Using the random and fixed effect models, and after controlling for a host of other variables including a measure that captures the home bias effect, we find a robust and significant impact of transaction cost on international equity portfolio investments. The results show that the three direct measures of transaction cost and in particular commission and market impact, which make up a significant proportion of transaction cost in most countries, have a distinct and statistically significant impact on investment allocation choices. The findings show that countries with lower transaction costs seem to attract greater foreign equity portfolio investments.

There are two important implications of our results. First, future research on international portfolio diversification cannot afford to ignore the role of transaction cost in country allocation decisions. Second, policy makers, especially in developing countries, should implement measures to reduce transaction costs in order to attract higher levels of foreign equity portfolio investments.

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Table 1
Statistics on foreign portfolio weights and transaction cost measures.

Country	Portfolio allocation	Commission	Fees	Market Impact	Total Cost	Turnover Ratio
Argentina	0.0005	32.77	3.12	37.67	73.56	10.67
Australia	0.0146	23.13	2.08	8.85	34.06	76.70
Austria	0.0045	17.43	0.43	12.78	30.63	76.70
Belgium	0.0108	18.49	0.38	10.47	29.34	25.13
Brazil	0.0054	26.41	1.92	17.66	45.99	35.50
Canada	0.0171	18.78	0.51	13.05	32.35	66.50
Chile	0.0004	41.80	8.03	23.60	73.43	11.68
China	0.0041	NA	NA	NA	NA	88.30
Czech Republic	0.0009	41.39	6.57	10.09	58.05	68.27
Denmark	0.0056	19.38	0.22	15.92	35.52	75.23
Finland	0.0210	18.20	0.75	24.21	43.16	116.67
France	0.1081	17.90	0.64	9.44	27.98	83.83
Germany	0.0882	17.88	0.62	9.02	27.53	131.00
Greece	0.0028	31.77	15.35	12.45	59.57	40.17
Hungary	0.0020	42.36	4.99	11.17	57.96	63.35
India	0.0031	41.38	2.88	18.65	62.92	133.07
Indonesia	0.0101	45.53	10.80	15.96	72.29	43.82
Italy	0.0343	18.00	0.58	12.78	31.36	120.50
Japan	0.0794	13.53	0.20	6.42	20.15	97.50
Korea	0.0107	30.01	13.19	16.40	59.61	247.97
Malaysia	0.0015	34.75	6.63	15.49	56.87	27.87
Mexico	0.0042	27.30	0.27	10.48	38.04	26.52
New Zealand	0.0015	22.49	0.24	14.85	37.58	41.83
Norway	0.0057	19.00	0.25	13.26	32.51	103.17
Peru	0.0002	36.46	8.01	22.07	66.54	7.50
Philippines	0.0004	47.83	30.13	12.25	90.20	13.03
Poland	0.0017	NA	NA	NA	NA	31.83
Portugal	0.0027	18.53	0.67	14.74	33.94	50.83
Russia	0.0058	NA	NA	NA	NA	45.98
Sweden	0.0209	18.33	0.47	12.29	31.10	117.33
Switzerland	0.0533	17.74	0.95	10.42	29.11	93.00
Taiwan	0.0058	25.85	13.04	14.69	53.58	181.62
Thailand	0.0018	43.27	1.79	13.26	58.33	100.98
Turkey	0.0019	33.66	2.80	20.61	56.51	45.00
UK	0.1573	14.40	24.77	14.14	53.31	112.83
US	0.3776	15.47	0.41	9.19	25.07	160.50

Table 2
Correlation among different transaction measures.

	TC1	TC2	TC3	TC4
TC1	1.00			
TC2	0.40	1.00		
TC3	0.20	0.05	1.00	
TC4	-0.29	-0.06	-0.13	1.00

Table 3
Base model regression.
In all regressions the dependent variable is the log value of country wise bilateral foreign portfolio allocation from country *i* in country *j* at time t $(w_{i,j,t})$. The independent variables are home bias (HBIAS) and the four measures of transaction cost in basis points (scaled by 100). TC1 denotes commission, TC2 fees, TC3 market impact and TC4 average turnover ratio. Test-statistics are given in parentheses (based on robust standard error allowing for clustering within the bilateral asset allocation). All the coefficients are interpreted as elasticity.

	TC1	TC2	TC3	TC4
HBIAS	-0.926***	-0.931***	-0.937***	-0.938***
	(-60.50)	(-59.95)	(-61.14)	(-64.50)
Transaction Cost	-2.864***	-0.664**	-0.639***	13.19***
	(-14.74)	(-2.46)	(-7.51)	(3.90)
Overall adjusted R^2	0.46	0.30	0.30	0.32
Number of Observations	3011	3011	3011	3290

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Table 4
Regression with all control variables and time dummies.
In all regressions the dependent variable is the log value of country wise bilateral foreign portfolio allocation from country *i* in country *j* at time t *($w_{i,j,t}$).* The independent variables are home bias (HBIAS), the four measures of transaction costs in basis points (scaled by 100), all control variables and time dummies. TC1 denotes commission, TC2 fees, TC3 market impact and TC4 average turnover ratio. Test-statistics are given in parentheses (based on robust standard error allowing for clustering within the bilateral asset allocation). All the coefficients are interpreted as elasticity.

	TC1	TC2	TC3	TC4
HBIAS	-0.926***	-0.925***	-0.930***	-0.922***
	(-95.48)	(-93.89)	(-95.86)	(-102.60)
Transaction Cost	-0.689***	-0.978***	-0.407***	2.770*
	(-6.06)	(-5.17)	(-4.02)	(1.82)
Investor Protection	4.218***	4.611***	2.885***	5.143***
	(4.87)	(5.24)	(3.43)	(6.10)
Legal Dummy	0.460***	0.477***	0.442***	0.311***
	(5.73)	(5.48)	(5.56)	(3.64)
GDP Per Capita	0.514***	0.587***	0.515***	0.445***
	(9.11)	(9.82)	(9.63)	(7.39)
GDP Growth	0.867***	0.761**	0.237	0.494
	(2.70)	(2.37)	(0.83)	(1.54)
Equity Market Openness	1.236***	1.357***	1.298***	0.716***
	(9.06)	(10.06)	(8.81)	(6.52)
Closely Held Firm	-2.714***	-2.743***	-2.760***	-2.590***
	(-12.92)	(-12.59)	(-13.94)	(-12.62)
Stock Market Development	0.603***	0.624***	0.639***	0.601***
	(23.67)	(23.38)	(27.83)	(24.09)
Equity Market Volatility	-0.148***	-0.149***	-0.127***	-0.153***
	(-5.91)	(-5.94)	(-4.89)	(-6.92)
Exchange Rate Volatility	-2.358***	-2.119***	-2.152***	-2.305***
	(-7.33)	(-6.40)	(-6.54)	(-7.12)
Emerging Market Dummy	-0.549***	-0.459***	-0.643***	-0.845***
	(-3.52)	(-2.78)	(-4.52)	(-5.56)
Common Language Dummy	0.426***	0.453***	0.415***	0.374***
	(5.53)	(5.41)	(5.50)	(4.54)
Bilateral Trade	2.365***	2.279***	2.405***	2.465***
	(12.75)	(12.28)	(13.03)	(13.59)
Distance	-0.186***	-0.193***	-0.183***	-0.188***
	(-4.45)	(-4.44)	(-4.64)	(-4.55)
Equity Return Correlation	-1.152***	-1.240***	-1.138***	-1.575***
	(-4.44)	(-4.59)	(-4.76)	(-6.29)

Table 4, Continued

Historical Return	0.315***	0.303***	0.299***	0.326***
	(7.76)	(6.96)	(7.20)	(7.78)
Country Risk	-0.199	-0.155	-0.342**	-0.0448
	(-1.35)	(-1.02)	(-2.32)	(-0.27)
Year 1 Dummy	0.167***	0.134***	0.131***	0.116***
	(6.37)	(5.76)	(5.36)	(5.15)
Year 2 Dummy	0.332***	0.313***	0.329***	0.296***
	(14.12)	(14.13)	(13.87)	(13.89)
Year 3 Dummy	0.156***	0.151***	0.151***	0.128***
	(9.13)	(9.40)	(8.91)	(8.29)
Year 4 Dummy	0.0556***	0.0573***	0.0607***	0.0428***
	(4.54)	(4.74)	(4.95)	(3.51)
Year 5 Dummy	0.0113	0.00526	0.0198	0.000974
	(0.91)	(0.42)	(1.48)	(0.08)
Overall adjusted R^2	0.80	0.79	0.80	0.79
Number of observations	2915	2915	2915	3101

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Table 5

Regression output with different specifications.

In all regressions the dependent variable is the log value of country wise bilateral foreign portfolio allocation from country *i* in country *j* at time t *($w_{i,j,t}$)*. The independent variables are home bias (HBIAS), the four measures of transaction costs in basis points (scaled by 100), control variables and time dummies. TC1 denote commission, TC2 fees, TC3 market impact and TC4 average turnover ratio.

Specification 15 includes transaction cost, control variables, time dummies and uses random effect model.

Specification 16 includes free flow home bias, transaction cost, all control variables, time dummies and uses random effect model.

Specification 17 includes home bias, transaction costs, all time variant control variables, time dummies and uses fixed effect model.

Specification 18 includes home bias, lagged transaction costs, all control variables, time dummies and uses random effect model.

Specification 19 includes home bias, transaction costs, all control variables, time dummies and uses the random effect model but the sample excludes US, UK and Japan as investor countries to address the effect of major financial centres.

Specification 20 includes home bias, transaction costs, all control variables, Portugal dummy interacted with TC1, time dummies and uses the random effect model.

Specification 21 includes home bias, transaction costs, all control variables, employs the random effect model but uses a nominal effective exchange rate instead of REER as the exchange rate volatility measure.

Test-statistics are given in parentheses (based on robust standard error allowing for clustering within the bilateral asset allocation). All the coefficients are interpreted as elasticity.

	Specification 15	Specification 16	Specification 17	Specification 18	Specification 19	Specification 20	Specification 21
HBIAS	-0.927***	-0.826***	-0.921***	-0.963***	-0.933***	-0.928***	-0.926***
	(-95.59)	(-67.76)	(-83.28)	(-103.85)	(-89.14)	(-94.49)	(-95.51)
TC1	-0.808***	-0.809***	-0.283**	-0.795***	-0.817***	-0.893***	-0.783***
	(-6.46)	(-5.36)	(-2.23)	(-7.75)	(-5.81)	(-6.82)	(-6.28)
TC2	-1.026***	-1.081***	-1.136***	-0.919***	-1.018***	-1.038***	-1.013***
	(-4.99)	(-4.70)	(-5.18)	(-5.09)	(-4.42)	(-5.07)	(-4.96)
TC3	-0.519***	-0.426***	-0.459***	-0.179**	-0.498***	-0.553***	-0.523***
	(-5.08)	(-3.50)	(-4.16)	(-2.48)	(-4.36)	(-5.30)	(-5.12)
TC4	5.004***	3.291	7.756***	5.285***	4.980***	5.776***	4.908***
	(3.02)	(1.45)	(4.54)	(3.25)	(2.73)	(3.29)	(2.95)

Table 5, continued

Investor Protection	2.848*** (3.41)	0.844 (0.79)	1.977*** (2.99)	2.372*** (3.48)	-0.733 (-0.61)	2.758*** (3.25)	2.260*** (2.66)
Legal Dummy	0.354*** (4.98)	0.603*** (5.94)	NA	0.481*** (6.73)	0.310*** (3.87)	0.262*** (3.98)	0.357*** (5.01)
GDP Per Capita	0.319*** (6.61)	0.385*** (5.85)	2.722*** (13.90)	0.228*** (4.68)	0.324*** (6.06)	0.183*** (4.00)	0.330*** (6.85)
GDP Growth	0.583* (1.93)	1.002*** (2.75)	-0.849*** (-3.01)	2.359*** (6.67)	0.531 (1.57)	0.805** (2.56)	0.499* (1.65)
Equity Market Openness	1.472*** (10.28)	1.696*** (9.85)	0.968*** (5.02)	2.474*** (17.01)	1.563*** (9.70)	1.591*** (10.95)	1.435*** (9.98)
Closely Held Firm	-2.638*** (-14.55)	-3.017*** (-11.74)	NA	-2.959*** (-16.39)	-2.658*** (-13.01)	-2.760*** (-16.40)	-2.652*** (-14.59)
Stock Market Development	0.691*** (29.44)	0.691*** (23.19)	0.654*** (22.62)	0.545*** (22.77)	0.682*** (25.89)	0.698*** (29.54)	0.696*** (29.58)
Equity Market Volatility	-0.165*** (-6.10)	-0.183*** (-6.17)	-0.128*** (-4.44)	-0.0119 (-0.67)	-0.165*** (-5.52)	-0.165*** (-5.93)	-0.162*** (-5.98)
Exchange Rate Volatility	-2.237*** (-6.80)	-1.808*** (-5.01)	-1.620*** (-7.80)	-2.230*** (-7.92)	-2.192*** (-5.96)	-2.303*** (-6.85)	-2.025*** (-6.68)
Emerging Market Dummy	-0.745*** (-6.07)	-0.662*** (-4.11)	NA	-0.957*** (-7.92)	-0.789*** (-5.61)	-1.007*** (-8.95)	-0.741*** (-6.04)
Common Language Dummy	0.416*** (6.02)	0.270*** (2.72)	NA	0.483*** (6.70)	0.437*** (5.80)	0.373*** (5.74)	0.417*** (6.02)
Bilateral Trade	2.586*** (15.05)	3.202*** (22.37)	1.271*** (6.20)	2.529*** (18.18)	2.325*** (11.00)	2.685*** (16.75)	2.594*** (14.97)

Table 5, continued

Distance	-0.167*** (-4.93)	-0.123*** (-2.78)	NA	-0.192*** (-5.69)	-0.196*** (-4.84)	-0.155*** (-5.05)	-0.169*** (-4.96)
Equity Return Correlation	-1.027*** (-4.85)	-1.217*** (-4.72)	NA	-1.067*** (-4.93)	-1.234*** (-4.96)	-0.970*** (-5.03)	-1.033*** (-4.86)
Historical Return	0.257*** (6.33)	0.311*** (6.19)	0.261*** (7.62)	0.0331 (0.90)	0.265*** (5.85)	0.242*** (5.86)	0.269*** (6.71)
Country Risk	-0.361** (-2.15)	-0.272 (-1.30)	-0.419** (-2.39)	0.409** (2.41)	-0.297 (-1.62)	-0.499*** (-2.83)	-0.381** (-2.24)
Portugal_TC1	NA	NA	NA	NA	NA	-4.576*** (-12.22)	NA
Year 1 Dummy	0.225*** (8.11)	0.460*** (14.59)	0.321*** (10.62)	0.309*** (7.41)	0.234*** (7.30)	0.236*** (8.42)	0.228*** (8.22)
Year 2 Dummy	0.394*** (15.60)	0.562*** (18.46)	0.478*** (18.78)	0.221*** (11.53)	0.402*** (13.94)	0.396*** (15.31)	0.400*** (15.83)
Year 3 Dummy	0.200*** (10.94)	0.322*** (14.64)	0.288*** (14.96)	0.0920*** (6.57)	0.204*** (9.86)	0.201*** (10.76)	0.203*** (11.12)
Year 4 Dummy	0.0973*** (7.70)	0.194*** (11.63)	0.174*** (10.27)	0.0340*** (3.06)	0.0989*** (6.98)	0.100*** (7.78)	0.0987*** (7.74)
Year 5 Dummy	0.0540*** (3.85)	0.103*** (5.71)	0.0870*** (6.65)	0.0283** (2.44)	0.0514*** (3.31)	0.0589*** (4.05)	0.0538*** (3.87)
Overall adjusted R^2	0.83	0.68	0.54	0.82	0.83	0.84	0.82
Number of observations	2915	2910	2915	2390	2368	2915	2915

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

Table 6

Each investor country and each year cross-sectional regressions.

In all regressions the dependent variable is the log value of country wise bilateral foreign portfolio allocation from country *i* in country *j*. The independent variables are home bias (HBIAS) and the four measures of transaction costs in basis points (scaled by 100). TC1 denotes commission, TC2 fees, TC3 market impact and TC4 average turnover ratio. Each regression represents one investor country and 35 recipient countries for each year totalling 96 regressions for the period of 6 years. Significant coefficients of transaction cost measures are reported in numbers at 10%, 5% and 1% statistical significance levels.

	TC1				**TC2**				**TC3**				**TC4**			
Investor countries	1%	5%	10%	Total	1%	5%	10%	Total	1%	5%	10%	Total	1%	5%	10%	Total
Australia	4	2		6	2	2		4	2	2	1	5		4	2	6
Austria	5	1		6	1	1	4	6	1	1	2	4	1	3	2	6
Belgium	6			6		2	2	4	1	1	3	5	1	2	2	5
Canada	4	2		6	3	1	1	5	3	1		4	3	1	1	5
Denmark	6			6	2	1	2	5	2	2		4	2	1	2	5
France	6			6	2	3	1	6	1	1	3	5		2	4	6
Germany	6			6	1	2	2	5	4	1	1	6	1	3	`	4
Ireland	5	1		6	2	2		4	2	1	3	6	4		2	6
Italy	6			6	1	1	2	4	2	1	3	6	4		2	6
Japan	6			6	2	1	1	4	3	2	1	6	2		1	3
Netherlands	3	2		5	2	2	1	5	3	3		6	3		2	5
Norway	6			6	1	2	1	4	3	2	1	6	3	1	2	6
Sweden	6			6	3	1	1	5	3	1	2	6	1	2	2	5
Switzerland	3	2		5	1	2	2	5	2	4		6	3		2	5
United Kingdom	5		1	6	1	3		4	3	2	1	6	2	4		6
United States	6			6	5	1		6	4	2		6	4	1		5
Total number of significant coefficients	83	10	1	94	29	27	20	76	39	27	21	87	34	24	26	84
Percentage of significant coefficients relative to 96 regressions				**98%**				**79%**				**91%**				**88%**

Table 7

Relative importance of trading cost and volatility measures.

For regression outputs of both tables (panels A and B), the dependent variable is the log value of country wise bilateral foreign portfolio allocation from country *i* in country *j* at time t ($w_{i,j,t}$). The independent variables in the first regression of Panel A (Transaction cost measures) include the four measures of transaction costs in basis points (scaled by 100) and the second regression includes the two volatility measures (equity market volatility and exchange rate volatility) For panel A test-statistics are given in parentheses (based on robust standard error allowing for clustering within the bilateral asset allocation). All the coefficients are interpreted as elasticity. Panel B presents standardized beta metrics.

Panel A: R^2 based metric

	Transaction cost measures	Volatility measures
TC1	-4.202***	
	(-16.84)	
TC2	-1.791***	
	(-4.04)	
TC3	-0.497***	
	(-3.12)	
TC4	7.441***	
	(5.66)	
Equity market volatility		-0.0724**
		(-2.15)
Exchange rate volatility		-5.069***
		(-10.86)
Adjusted overall R^2	0.45	0.07
Number of observations	3009	3288

Panel B: Standardized beta based metric

Variables	**Standardized Beta**
TC4	0.2091
TC1	0.1799
TC3	0.1774
TC2	0.0229
Equity market volatility	0.0109
Exchange rate volatility	0.0047

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level