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## Essays on International Portfolio Diversification

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**Ecole Doctorale « Sciences du Management » - ED 533**  
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**ESSAYS ON INTERNATIONAL PORTFOLIO  
DIVERSIFICATION**

THESE  
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## ESSAYS ON INTERNATIONAL PORTFOLIO DIVERSIFICATION

Key words: International diversification, home bias, foreign bias, emerging markets, information asymmetries, geography, information distance, cultural distance

JEL classification codes: G10, G11, G15, F30

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**Résumé de la thèse :** La persistance du biais domestique, malgré les gains de la diversification internationale et la suppression des barrières aux investissements transfrontaliers, est une préoccupation majeure des chercheurs en finance. Tandis que le biais domestique est bien documenté, la géographie des avoirs étrangers actuels des investisseurs est relativement moins connue. Cette thèse est motivée par l'idée qu'une meilleure évaluation des motifs des avoirs bilatéraux en actifs financiers peut améliorer notre compréhension des limitations qui prévalent devant l'intégration financière globale et les sources de la segmentation actuelle entre les marchés financiers.

Les résultats principaux se résument comme suit : premièrement, à côté du biais domestique bien connu, les investisseurs contractent géographiquement leurs avoirs étrangers existants, puisqu'ils ne considèrent qu'un nombre limité de destinations se trouvant dans le voisinage de leur pays source. Ainsi, la distance physique et les corrélations bilatérales entre les marchés nationaux sont les principaux facteurs permettant d'expliquer la géographie des avoirs bilatéraux en actifs financiers, contrairement au paradigme traditionnel moyenne-variance. Deuxièmement, le biais domestique est particulièrement élevé parmi les investisseurs des pays avec des marchés de capitaux moins grands, alors que la diversification internationale s'avère potentiellement plus bénéfique pour ces investisseurs par rapport à ceux des pays développés. Troisièmement, la segmentation actuelle des marchés internationaux de capitaux et l'effet contradictoire de la distance physique sur la géographie des investissements internationaux de portefeuille, sont attribués aux asymétries d'information entre les investisseurs locaux et étrangers.

**Mots clés :** Diversification internationale, biais domestique, biais étranger, marchés émergents, asymétries d'information, géographie, distance informationnelle, distance culturelle.

**Abstract:** The persistence of home bias despite the gains from international diversification and the lifting of explicit barriers to cross-border investments, is an important concern for researchers in finance. While home bias is well documented, relatively little is known on the geography of investors' existing foreign holdings. This thesis is motivated by the idea that examining the patterns of bilateral portfolio holdings would enhance our understanding of the limitations to the global financial integration and the sources of the actual segmentation across financial markets.

The main results are as follows. First, beside the well-known home country bias, investors shrink geographically their existing foreign assets as they only consider a few number of destinations located nearby. Thus, physical distance and bilateral market correlations are important covariates to explain the geography of bilateral holdings in contrast to the traditional mean-variance paradigm. Second, home bias is particularly high among investors in countries with smaller capital markets although international diversification is potentially more beneficial to this group of countries compared to developed ones. Third, the actual segmentation across international capital markets and the puzzling effect of the physical distance on the geography of international portfolio investments can be mostly attributed to information asymmetries between local and foreign investors.

**Keywords:** International diversification, home bias, foreign bias, emerging markets, information asymmetries, geography, information distance, cultural distance.

*To my family, my parents and my wife*

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PART A.  
INTRODUCTION AND OVERVIEW OF THE  
THESIS

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# 1 Overview of the Thesis

This dissertation addresses the international portfolio diversification and home bias puzzle. It builds on a theoretical framework described by the traditional portfolio analysis first developed by Markowitz (1952), which was subsequently extended into an international setting by Grubel (1968), Solnik (1974a) and Adler and Dumas (1983), among others. Either based on the theoretical arguments set up by these pioneering studies or the plentiful empirical evidence provided afterwards, the conventional view considers the international diversification of portfolios as providing better risk-return tradeoffs for investors than a purely domestic diversification practice. This well-known result itself, however, stands precisely on the basis of a larger auxiliary literature dealing with some important and unresolved aspects of the international portfolio diversification, and constitutes the starting point of the thesis.

The “home bias” constitutes undoubtedly the most perplexing as well as the most investigated fact within the ongoing debate on topics surrounding the international portfolio diversification. First highlighted by French and Poterba’s 1991 seminal paper (French and Poterba, 1991), the term *home bias* basically refers to an unjustified preference that investors exhibit for domestically traded assets despite the rapidly grown and integrated international capital markets toward the end of the twentieth century. Such a behavior is typically recognized as “irrational” since it implies that investors overlook considerable potential gains that could be achieved through global diversification of their portfolio investments which are primarily concentrated across home assets. Besides being counter intuitive on the empirical ground, the home bias also runs against the predictions of standard models of international portfolio diversification. Although there are signs that the tendency to invest domestically has regressed during the last decades as documented by, for example, Fidora *et al.* (2007), the actual portfolio assets held abroad are typically below those one would expect to obtain according to a benchmark model such as the international CAPM.

Studies trying to rationalize this phenomenon have so far generated a rich but inconclusive literature with respect to the true origin of the persistent home bias. Available explanations fall into an extensive range of both theoretical and empirical work including direct barriers to international investments in terms of transactions costs or tax discriminations, hedging motives against non-traded goods or assets, information asymmetries, and more recently, psychological factors related to investor behavior. In an extensive review, Lewis (1999) distinguishes three main explanations for home bias, while noting that none of these have delivered a definitive answer: 1) home assets provide better hedges against home country-specific risks, 2) the costs to diversification exceed the gains, and 3) statistical measurement problems imply that there is no real home bias. In their frequently cited paper, French and Poterba (1991), however, proposed to classify the reasons for the home bias into two broad

categories: The first class of explanations called “institutional factors”, focuses on factors that could “reduce returns from investing abroad or explicitly limit investors’ ability to hold foreign stocks” and the second class of explanations focuses directly on investor behavior. Yet, the reasons proposed to rationalize the home bias constitutes an array so large that it appears to be a difficult task to establish a concise classification. Moreover, the scope of the relevant literature is not limited solely to studies dealing directly on the reasons of the home bias itself. Therefore, the next part is devoted to a review of the literature brought together by the subsequent chapters of the dissertation.

The main objective of this thesis is to provide new and suggestive evidence that will shed light on a number of questions with respect to the literature on international diversification and home bias. Thus, the expected contribution stands mostly on the empirical basis. As a short and visual presentation, Figure 1 provides a graphical sketch of the projected work. As shown in this figure, the dissertation consists of four separate, but complementary chapters. The next section provides longer summaries of the essays giving more details on the links and contributions with respect to the previous literature, the methodology, etc.

[Insert Figure 1 here]

The first chapter is a descriptive assessment of the extent of home bias in international equity investments across a large sample of countries. Specifically, I investigate the geographical patterns that would help to characterize the global portfolio allocations using data both on aggregate and bilateral level asset holdings. The analysis points out to a number of stylized facts emerging from the data. First, emerging-market countries exhibit substantially higher home bias than developed-market countries. Second, and more strikingly, the domestic bias coexists with a largely heterogenous cross-border allocation of the equity portfolios: While most of the bilateral asset holdings are below the benchmark proportions, there are several cases where local investors overweight a particular destination. Third, local investors shrink considerably their foreign equity assets into a limited number of destinations. Geographical proximity between the source and the destination countries as well as their respective economic size and development are found to be the key determinants of the observed cross-border portfolio allocations.

Based on these conclusions that further deepen the puzzle by deriving more questions than results, the second chapter deals with a relatively classic question in the field: What are the potential gains from international diversification? This chapter addresses this question via a comparative examination of the gains from international diversification from the viewpoint of local investors in different countries. Doing so, I employ a dataset covering 36 country and 4 regional indices over a twenty-year long period from 1988 to 2007. Using the sample estimates of return expectations and covariances to solve for different international tangency portfolios, I

identify the gains from diversification on the basis of changes in portfolio expected returns, volatilities and Sharpe ratios compared to a purely domestic strategy that local investors are assumed to initially adopt. Meanwhile, the main emphasis of this chapter relies on examining the cross-sectional variation of these changes. Consistent with most of the previous literature, the analysis point out to significant benefits from international diversification regardless of investors' country of residence. Besides, international portfolio diversification is more valuable particularly for local investors in small capitalized emerging markets and in countries with higher country risk and more open to international trade. In contrast to the empirical findings of this chapter and the intuition that emerging countries could potentially benefit more from global diversification, local investors in these countries are also those who exhibit higher degrees of home bias compared to their counterparts in developed countries.

The third chapter addresses the “distance” puzzle in international portfolio investments. As underlined in the first chapter, geography plays an important yet perplexing role in describing the cross-border asset holdings. The tendency to invest abroad decreases in the distance and increases in the market correlations between the source and the destination countries. The third chapter examines these issues within a “gravity model” framework, a model initially used to examine the patterns of international trade in goods and recently implemented to examine transactions in financial assets. The chapter's objective is to investigate whether the intriguing effect of the geographical proximity on bilateral equity holdings goes through an informational or a behavioral channel, which remains a challenge for the empirical literature as noted by Portes and Rey (2005, p. 271). Following this objective, I define two new measures to proxy the physical distance, i.e. the “informational distance” and the “cultural distance”, and estimate gravity models of bilateral equity holdings controlling for other gravity-type variables such as the economic development, foreign openness or transparency. The main results tend to support the asymmetric information-based explanation to describe the observed geographical patterns in international portfolio investments.

The structure of the fourth chapter follows a similar path to the previous one by addressing the following questions: Do foreign investors hold the market portfolio of a country in which they choose to invest? If not, how can we characterize the stocks for which they exhibit an investment bias? Thus, the final chapter has the objective to study foreign investors' firm-level transactions within an emerging stock market, namely, the Istanbul Stock Exchange (ISE). Specifically, I relate transactions issued by non-resident investors on Turkish stocks to an array of firm-specific variables using data from January 1998 to December 2007. Regression analysis show that foreign investors restrict their net purchases or trades in a narrow subset of stocks rather than considering the market portfolio of stocks in contrast to the predictions of the standard international CAPM equilibrium. Non-residents' equity-level transactions volume and their net purchases are found to be simultaneously and positively related to the

corresponding firm's size and the expected stock return: Foreign investors prefer large firms and their portfolio inflows exhibit positive correlation between the return on domestic stocks. Empirical evidence presented in this chapter is consistent with the predictions of previous models based on the asymmetric information hypothesis between foreign and domestic investors (e.g. Brennan and Cao, 1997; Merton, 1987).

## 2 Summaries of the Essays

### 2.1 Chapter 1. Domestic and Foreign Country Bias in International Equity Portfolios

Despite the increasing access to financial markets worldwide investors are still unwilling to take advantage of the alternatives located outside their domestic stock markets. The so-called "home bias" in investment preferences implies that investors irrationally neglect some more or less achievable gains from diversification, which is commonly referred to as one of the unresolved puzzles in international economics and finance literature.

Numerous studies have quantified the extent to which investment portfolios are skewed toward domestically traded securities (see, among others, Sorensen *et al.*, 2007; Baele *et al.*, 2007; Chan *et al.*, 2005). Actually, there exists a well-established case suggesting that the global underdiversification of security portfolios still runs counter to the predictions of the mainstream international asset pricing models. Moreover, despite the frequently claimed "integration" of financial markets worldwide, foreign assets still represent more or less modest parts of investor portfolios, notwithstanding the gradual increase in foreign investment levels starting from the mid 1980's as pointed out by Ahearne *et al.* (2004).

Another line of interest in examining the patterns of international investing concerns whether the suboptimal allocation of investments coexist with a similarly biased investment behavior regarding the existing foreign assets. In other terms, the question can be stated as follows: While investors are clearly home-biased, do they properly diversify the foreign part of their investments? From the traditional perspective of the international CAPM, every rational investor should hold a unique risky portfolio and it is clear that once the domestic allocation is home-biased it is impossible to obtain an adequate diversification scheme for the remaining shares held abroad. However, despite the key results of the portfolio analysis, a simple reasoning would suggest that one should at least invest in markets as weakly correlated as possible with one's home market. In this paper, I show that the geographical structure of international portfolio holdings rejects both of these perspectives: *While the domestic investment proportions are remarkably inefficient from a portfolio diversification standpoint, investors also diversify inadequately abroad in that they include only a limited number of proximate and strongly synchronized foreign markets in their aggregate portfolios.*

The particularity of the paper with respect to the related literature is that existing studies typically focus on aggregate portfolio holdings without explicitly considering the patterns of bilateral foreign holdings (Hau and Rey, 2008). That is, while we well know that local investors allocate trivial portions of their wealth to foreign stocks, we do not know equally well neither on how these foreign assets are allocated across different destinations nor on the determinants of the foreign investment part. This chapter tries to fill this gap by examining the geographical patterns of domestic and foreign portfolio holdings over a large sample of countries using equity holdings data from the IMF's "Coordinated Portfolio Investment Survey". The raw data set is an array showing the bilateral and aggregate foreign portfolio allocations of several source (investor) countries into an identical set of host (destination) markets. Additionally, the availability of bilateral investment positions allows one to distinguish two alternatives measures to account for the home bias puzzle. Namely, a source country's *domestic country bias* ratio measures the extent to which local investors' holdings in their home market deviates from the benchmark portfolio share. On the other hand, the *foreign country bias* ratio measures the deviation of local investors' bilateral holdings within a particular destination from the benchmark portfolio share. A negative (respectively positive) foreign country bias ratio between a given source and host country pair means that the host country is underweighted (respectively overweighted) by local investors in the source country. Therefore, the foreign country bias is a unique measure for every possible pair of source & destination country, which would provide valuable information in figuring out some important features of the existing bilateral foreign investments.

The results can be summarized as follows. First, and unsurprisingly, I find that the home bias in equities is omnipresent over a sample of 36 investor countries, with a large cross-sectional variation, however. *Local investors in developed-market countries exhibit substantially lower domestic bias than do their counterparts in emerging-market countries.* While the average domestic bias across developed-market countries is about 65%, it jumps to 93% for the group of emerging-market countries. For some countries like Turkey or India, almost the whole equity stock is held within the national market. In general, the larger a country's economic mass, the market size or the GDP per capita, the higher is the volume of foreign stocks in the aggregate equity portfolio of the country. The result is visibly in contrast with some recent studies suggesting that international diversification could be more valuable to investors in emerging markets (Campbell and Kraussl, 2007; Driessen and Laeven, 2007).

Second, restricting the focus on a narrower but still representative sample consisting of 24 source countries, I compute a total of 623 pairwise country bias ratios that each investor country exhibits vis-à-vis various destinations found in the foreign portfolio of the corresponding source countries' investors. A big deal of the bilateral positions point out to *negative deviations from the equilibrium* as expected. However, and more interestingly, I also

find 109 positive country bias ratios suggesting that local investors overweight a given host country. While many of the positive deviations stems from positions involving an OFC as the host (due to their small, if not negligible, market capitalizations), I also distinguish a number of country pairs like “Netherlands & UK”, “Finland & Sweden” or “Hungary & Austria” etc. such that the source country is found to *overinvest* in the destination. Geographical proximity plays a key role to describe these country pairs.

Third and in addition to the pervasive heterogeneity regarding the geography of bilateral equity holdings, I also infer from data that foreign portfolio holdings are typically concentrated within a handful of destinations. *The cumulated amount of foreign holdings in the first 10 destinations corresponds to 80% of the sample countries’ total cross-border assets.* I refer to this observation as *the geographic shrinkage in international investments*, suggesting that home bias coexists with an imperfect geographical allocation in that local investors consider only a limited number of host markets when forming the foreign part of their portfolios.

## **2.2 Chapter 2. A Cross-Sectional Analysis of Potential Gains from International Portfolio Diversification**

The question tackled in the second chapter covers a classical topic in the field of international portfolio selection: What are the potential gains from international diversification? Actually, there exists a huge body of literature documenting that geographical diversification of portfolios dominate over industry or within-country diversification in that it provides investors with better risk-return tradeoffs (Baele and Inghelbrecht, 2009; Chiou, 2009; De Santis and Sarno, 2008; Driessen and Laeven, 2007). Moreover, the persistence of the gains from international diversification despite the frequently claimed integration of financial markets suggests that the segmentation of financial markets worldwide is still large enough to justify the imperfect synchronization across national exchanges, which is, in turn, at the root of most of the gains from international portfolio diversification. Controlling for various constraints and market frictions such as transaction costs, other studies find that the benefits from international diversification exhibit significant variability across countries (De Roon *et al.*, 2001; Driessen and Laeven, 2007). That is, the potential gains from global diversification are not homogeneously distributed across investors in various countries, such that “small countries, whose equity comprises a small fraction of the global-mean-variance efficient portfolio, would presumably have the most to gain from international diversification” as underlined by Campbell and Kraussl (2007). Olusi and Abdul-Majid (2008), and Lane and Milesi-Ferretti (2008) state that investors in smaller countries could benefit more from diversification since their local markets are commonly less dependent on the global business cycle and provide weaker scope for diversification at home. A number of arguments can also help one to justify this perspective.



First, as noted by Rowland and Tesar (2004), domestic diversification opportunities should obviously be larger for local investors in mature capital markets than for their counterparts in smaller and less liquid capital markets. For investors in well-developed capital markets such as the US, UK or Japan, home-made international diversification opportunities typically exist by holdings stocks of multinational companies whose cash-flows do not exclusively depend on the domestic business cycle (see, for example, Errunza *et al.*, 1999). Second, investors in developed markets naturally enjoy from some well-established institutional standards and market infrastructure such as more transparent information disclosure, better accounting practices, investor protection rules etc. Consequently, limiting the scope of their investments exclusively to domestic securities would alter the portfolio performance of investors in emerging markets. Third, the market synchronicity, i.e. the tendency of stocks to move in the same direction over a particular period, is substantially higher in emerging markets than for developed markets. For example, comparing the market synchronicity across 21 countries Schill (2006) notes that while about 58% of the US stocks move in the same direction during one week – which is a relatively weak level of synchronicity, the same ratio is up to 75% for Malaysian stocks, and 80% and 83% for Polish and Chinese stocks respectively. Fourth and perhaps more perplexing than the aforementioned statements, is the fact that local investors in emerging markets are also those who concentrate their portfolios towards domestic securities more than do investors in developed markets.

This chapter follows this literature via an empirical analysis of international diversification gains from the viewpoint of local investors in different countries. Doing so, I employ a dataset covering 36 country and 4 regional indices provided by the Morgan Stanley Capital International (MSCI) in monthly frequencies for the period January 1988 to December 2007. The set of countries included into the study comprises 22 developed and 14 emerging markets. Using the sample estimates of return expectations and covariances to solve for different international tangency portfolios, I identify the gains from diversification on the basis of changes in portfolio expected returns, volatilities and Sharpe ratios compared to the parameters resulting from a purely domestic strategy that local investors are assumed to initially adopt. Doing so, I also document how the gains from diversification differ between local investors in various countries through a simple regression analysis whereby I relate the *ex-post* increases in Sharpe ratios and the decreases in portfolio volatilities to an array of country-specific variables. The results can be summarized as follows.

Consistent with most of the previous literature, the mean-variance framework points out to significant benefits from international diversification regardless of investors' country of residence. Assuming that local investors hold an unconstrained tangency portfolio, the average increase in the reward-to-risk ratio is 30% and the average decrease in the portfolio volatility is minus 4.5% over the full sample. Short-sales constraints erode some part of the

diversification benefits, which remain nonetheless large enough to justify the advantage of the global portfolio diversification over domestic investment strategies: Holding a long-only tangency portfolio, local investors can expect, on average, an increase in the Sharpe ratios by about 19% on their portfolio investments.

The second observation is that these benefits exhibit significant heterogeneity across local investors: Concerning an international tangency portfolio with no short-sales, the increase in the Sharpe ratio with respect to a domestic portfolio, ranges from a lower value by 8.4% for Danish investors to higher value by 31.8% for Japanese investors, with a sample standard deviation by 6%. The gains from diversification are particularly important for local investors in smaller capital markets. On average, local investors in emerging and developed countries can decrease the portfolio volatility by about 7.2% and 2.4% respectively. Likewise, the average increase in the Sharpe ratio is also higher for the group of emerging countries (29% against 23% respectively). This finding is also consistent with the view that emerging countries are less dependent on the global business cycle and, therefore, more segmented from the world capital markets than are developed countries. Regression analysis suggest that the country risk (given by the International Country Risk Guide scores) and the level of the economic development (measured by the GDP per capita) are the major correlates of the observed variability in the gains from international diversification for local investors in different countries. Moreover and paradoxically, the magnitude of home bias across investors is inversely related to the benefits achievable via international diversification. The Spearman rank correlation between countries' home bias ratios and the potential increase in Sharpe ratios is about 0.60, significant at the 1% level. Computing the same correlation by using the decrease in portfolio volatilities, I find a higher and significant coefficient by minus 0.70. Overall, the collection of empirical results provided in this chapter confirm the view that local investors in smaller countries have presumably the most to gain from global diversification.

### **2.3 Chapter 3. The Determinants of International Equity Holdings**

In the first chapter of the dissertation, I documented a number of stylized facts regarding the international investment positions in equity holdings. First, despite the potential gains from global diversification, home bias still remains high. Second, home bias is particularly important among emerging-market countries although investors in smaller capital markets have presumably the most to gain from international diversification. Third, investors shrink their existing cross-border assets in physically proximate geographies and countries which typically consist of mature and developed markets. Fourth, geographical proximity is a key determinant of the international investment patterns in that investors hold more assets in less distant markets and in markets strongly correlated with their own home market. These observations makes it hard to justify an investor portrait as depicted in the standard asset

pricing models developed by Adler and Dumas (1983) or Solnik (1974a), and suggest that there exist still other forms of barriers to international capital market integration process. So far several explanations have been advanced to rationalize this puzzling geography of investment portfolios. Excellent surveys of the literature include, among others, Karolyi and Stulz (2003), Strong and Xu (2003) or Lewis (1999). Since direct barriers to cross-border asset holdings should be less of a problem actually (see Lucey and Zhang, 2010; Hau and Rey, 2008; Cooper and Kaplanis, 1994), the ongoing debate mainly contrasts explanations based on informational asymmetries and those stemming from the “behavioral finance school”.

In this chapter, I develop the fourth topic by addressing the geographical structure of bilateral cross-border investment portfolios. The central objective of the paper is to separate out the “familiarity effects” due to behavioral biases from those due to informational asymmetries, which remains a challenge for the empirical literature as pointed out by Portes and Rey (2005). Hence, the baseline argument is that the preference toward geographical proximity would undergo two different but complementary aspects. It is known from prior studies that the geography determines portfolio selection either domestically (Huberman, 2001; Coval and Moskowitz, 1999) or internationally (Lane and Milesi-Ferretti, 2008; Chan *et al.*, 2005). Intuitively, however, distance should not proxy for the costs of holding or trading in securities since, unlike physical goods, financial assets are *weightless*. So, why this is not the case and where does this obvious effect of the distance comes from? According to Portes and Rey (2005, p. 270), “the most natural explanation is that informational frictions are positively correlated with distance” which “is a barrier to interaction among economic agents and [...] to cultural exchange”. From this perspective, the preference for closer geographies can be related to an asymmetric information phenomenon, implying that “investors buy [...] securities about which they have enough information” as proposed by Merton (1987).

The distance puzzle could also be part of investors’ *cultural* or *familiarity* bias as documented by, among others, Lütje and Menkhoff (2007), Strong and Xu (2003), Huberman (2001) or Grinblatt and Keloharju (2001). Ricciardi (2008, p. 101) defines the familiarity bias simply as an inclination that alters individuals’ risk perception such that individuals feel more comfortable with familiar risks and use heuristic simplifications in their decision-making process. According to Stulz and Williamson (2003, p. 347), if individuals have psychological biases that matter for finance, we must clearly expect that their own view of the world as determined by their culture, affect the way they act in financial markets.<sup>1</sup> Contrasting the information-driven with the behavioral-based familiarity hypotheses, Massa and Simonov (2006) note that familiarity mostly affects less informed investors and that the higher the degree of investor sophistication is the weaker the impact of behavioral familiarity on

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<sup>1</sup> For a brief discussion on the economic consequences of culture, see Lucey and Zhang (2009).

investment decision-making. Thus, in addition to information-based explanations, the tendency to invest in proximate markets would also capture such mental shortcuts due to cultural or familiarity biases that affect investor behavior in global portfolio selection.

This paper links these two strands of literature on the international portfolio investment patterns by means of an empirical study and employs *two direct quantitative measures of the distance concept other than the geographical distance*. Specifically, I construct two artificial distance proxies – the *information distance* and the *cultural distance* – to gauge for the respective effects of information exchange and cultural affinities on the geographical spread of bilateral equity investments. The motivation to introduce these alternative distance measures mainly follows Massa and Simonov's (2006) inquiry on the competing hypothesis of *familiarity vs. informational channel of the geography*. Doing so, I employ a micro-founded theoretical model of international capital market equilibrium recently proposed by Martin and Rey (2004). The model serves as the basis for a simple gravity-style equation that I estimate using bilateral equity holdings data obtained from the IMF for the end-2006. Recent literature has shown that a gravity model can explain the patterns of international trade in securities as good as it does in physical goods (see Papaioannou, 2009; Portes and Rey, 2005). The gravity model postulates that the volume of bilateral transactions (or holdings) between two countries is an increasing function of their respective economic masses and a decreasing function of the bilateral trading cost among them. In practical work, the term for trading cost is generally substituted by the geographical distance between countries and in this paper, unlike from existing studies, I propose to introduce two other distance proxies directly measuring informational and cultural frictions prevailing between countries. While investigating the relative effects of geographical, information and cultural distance measures on bilateral equity investments, I subsequently add to the baseline empirical specification a number of control variables mainly drawn from previous studies. Namely, I control if destination countries' economic development, openness to foreign trade, transparency, and the degree of familiarity with the source country affect the dependent variable. I also check if there exist any portfolio diversification motives within the observed geography of international equity investments.

The results are as follows. First and consistent with previous studies such as Papaioannou (2009), Lane and Milesi-Ferretti (2008) or Portes *et al.* (2001), regressions show that a gravity model of international trade in financial assets performs fairly well in explaining the observed geographical patterns of bilateral equity holdings. This finding is also robust to various estimations run either with the information and cultural distance, while variation in data is better captured when I use geographical distance to proxy for transaction costs in international financial markets. For emerging markets subsample, when geographical distance is cut by 50%, emerging countries' foreign equity assets is more than doubled.

Second, beside the systematic effect of geographical distance on bilateral equity holdings,

information and cultural distance measures also perform quite well within the baseline gravity model. Given the lack of correlation between these two alternative distance measures and the standard geographical distance, one could deduce these proxies can also account for other aspects of international market frictions along with physical distance. In particular, when the information and cultural distance between two countries decrease by 10% bilateral equity assets held by source countries' investors in the corresponding host are expected to increase by about 5.4 and 3.5% respectively. In fact, both the relative impacts of coefficient estimates on distance proxies obtained using standardized data and the results derived from first-stage regressions under 2SLS and IV specifications, collectively suggest that *the impact of the physical proximity on the geography of asset holdings is likely to undergo an informational channel rather than being a behavioral issue related to the investment behavior*. This result is robust to various samples and estimation techniques including non-linear panel Tobit regressions, and brings empirical support to Massa and Simonov's (2006) view that familiarity-driven investment is a response to information constraints as opposed to a behavioral heuristic (p. 634).

The third important finding relates to the important effect of bilateral trade on portfolio holdings. Indeed, the bilateral trade variable always enters the regressions with positive and very-well determined coefficients regardless of the estimation technique or the sample employed. Previous studies such as Aviat and Coeurdacier (2007) suggested that part of the effect of geographical distance on bilateral asset holdings could be related to bilateral trade relations between countries. In this paper, I check if the effect of trade on portfolio holdings undergoes the information or culture-based story since these two alternative variables appear also good proxies for the geographical distance. Evidence is mostly consistent and provides empirical support to previous studies such as Lane and Milesi-Ferretti (2008) or Portes and Rey (2005) who also underline the importance of goods trade in explaining the puzzling geography of international portfolio holdings via its potential value as an information variable.

## **2.4 Chapter 4. Foreign Equity Flows and the “Size Bias”: Evidence from an Emerging Stock Market**

The final chapter of the dissertation follows the path adopted in the third chapter in that I further investigate the *asymmetric information hypothesis* as the main reason that hinders the cross-border portfolio investments from the theoretical predictions. The paper's *objective is to provide additional insights into the home bias phenomenon through an empirical analysis of foreign investors' portfolio equity flows toward an emerging stock market*. Namely, I examine the determinants of the stock market transactions issued by non-resident investors in the Istanbul Stock Exchange (Turkey) over a twelve-years long period between January 1997 and December 2008. The paper's two main questions are 1) Do foreign investors hold the market

portfolio of a country in which they choose to invest? If not, how are characterized the stocks for which they exhibit a preference?

Unlike the remaining parts of the dissertation where the emphasis was mostly put on holdings of assets between countries, the focus of the fourth chapter is on firm-level implications of the vast literature on home bias. Indeed, most of the existing studies focus on a country-level analysis, documenting that investors allocate too much of domestic assets within their aggregate portfolio. On the contrary, as emphasized in the first chapter, local investors' portfolio holdings and trading patterns when they choose to diversify abroad remains a relatively less investigated issue. Yet, understanding the behavior of investors in such a context (e.g. when they invest or trade in a foreign market) can also enlarge our understanding of the home bias puzzle. For instance, if foreigners do concentrate their activity into a subset of securities instead of considering the market as a whole, one would conclude, at a first stage, that they behave in contrast to the conventional international CAPM equilibrium. Second, examining the patterns of non-residents' holdings (or trades) would also help to uncover the nature of barriers they face within the destination market in question. Finally, such an attempt would also prove useful to draw conclusions on market imperfections currently prevailing in an international setting as well.

Specifically, the empirical analysis I conduct in this chapter relates the transactions issued by non-residents investors on Turkish stocks to an array of firm-specific variables. Doing so, I choose foreign investors' *purchases*, *net purchases* and their *traded value* on a stock-level as the dependent variables. While raw data on foreign investors' transactions are on monthly frequencies, most of the firm-specific variables (e.g. valuation or profitability ratios, leverage indicators etc.) are available on annual frequencies. Therefore, regressions are run using yearly cumulated data (obtained by aggregating across months of the year) of foreign investors' purchases and sales on each stock included into the analysis. Mainly motivated by Kang and Stulz's (1997) closely related paper, the analysis conjectures that foreign investors' decisions to trade into a particular stock can be explained by the corresponding firm's size (market capitalization), market characteristics (return, beta), leverage (total debt / total capital ratio), valuation (price / book ratio), profitability (return on assets), and the dividend yield (dividend payout ratio). While there are on average more than 300 firms whose stocks are exchanged by non-resident investors each year, I collect data for these explanatory variables for a smaller but comprehensive subset of 84 firms on an annual frequency from 1997 to 2008. Nevertheless, the data loss due to this elimination remains trivial such that this subset represents on average 88% of foreign investors' total transactions volume or 86% of the total market capitalization throughout the sample period.

The results indicate that firm characteristics like the dividend payout ratio, return on assets have little, if not negligible, explanatory power as suggested by weak and mostly

insignificant coefficients. For others variables like the debt to capital ratio, the results remains mostly inconclusive. The results are invariant whether one takes foreign investors' purchases, net purchases or traded value as the dependent, or the specification of the regression model used for estimating the parameters (e.g. year-by-year OLS, robust and quantile regressions, and the time-series cross-section approach). *The stock's beta and expected excess return perform better when regressed on purchases and net purchases; and both of them are statistically significant when regressed on the traded value.* Splitting the data set into a subset of years (2003-2008) or across firms' sector of activity (financial vs. industrial stocks) does not affect much the overall significance of the parameters. *The most striking result concerns the market capitalization, used to proxy the firm's size, which enters the regressions with economically and statistically significant coefficients across all specifications.* Unsurprisingly, the effect of the firm's size on foreign investors' tendency to trade on the corresponding firm's stocks is even more emphasized when one takes the "traded value" as the dependent variable.

The evidence presented in this chapter brings empirical support to a number of previous studies which emphasizes the role of informational asymmetries between domestic and foreign investors. First, the positive relationship between Turkish firms' market capitalization and foreign investors' (net) purchases is consistent with Kang and Stulz' (1997) finding that foreign investors in Japan hold disproportionately more shares of larger firms in the Japanese stock market. Second, panel regressions show that the expected return on individual stocks is positively correlated with foreign investors' net inflows into the corresponding stock. The same result holds on a market level since foreigners are consistently net purchasers in Turkish stocks during bullish markets. Griffin *et al.* (2002) argue that under the hypothesis of perfect information across locals and foreigners, it is not possible to capture such a contemporaneous relationship between net foreign equity flows and returns. By means of a noisy rational expectations model, Brennan and Cao (1997) propose that purchases of foreign equities is a positive linear function of returns on the domestic (as well as foreign) equity markets provided that domestic investors are better informed about the payoffs on stocks than are foreign investors. Third, to the extent that local investors enjoy an informational advantage, they also should be able to materialize it against their foreign counterparts in their own market. Hence, one would expect local investors to obtain higher returns than foreign investors. While existing evidence regarding the performance of foreigners vs. locals is generally mixed (see Lütje and Menkhoff, 2007; Malloy, 2005; Dvorak, 2005; Hau, 2001), preliminary results obtained from the "Association of Capital Market Intermediary Institutions of Turkey" indicate that local investors obtain higher performance than non-residents over the period 1997-2008.

### 3 General Conclusion

Theoretical research has successfully shown that all investors could make their investment decisions based on a single identical portfolio of risky securities regardless of the investor's country of residence. This proposition is also supported on the empirical basis by a voluminous literature documenting the benefits of international diversification of portfolio investments. Yet, both perspectives are seriously challenged when confronted to the data from which emerge several intriguing and counter-intuitive stylized facts related to the geography and/or composition of cross-border holdings or flows in financial assets: Investors restrict their assets across those traded in domestic markets giving rise to a noticeable lack of global diversification (*home bias*) and risk sharing. The picture is not so different when one examines the geography of the existing foreign asset holdings (*geographical shrinkage*) or the international transactions in securities (e.g. Cooper and Kaplanis' (1994) findings on higher turnover rates than those observed in domestic transactions; or Lucas' (1990) note on the absence of capital flows from developed to developing countries). Thus, the distinguishing feature of the international finance is not only the existence of different currencies in different countries, but other sources of partial segmentation continue to prevail on markets worldwide. Therefore, this dissertation is mainly driven by the idea that understanding the geographical structure of international portfolio investments would provide insights into possible sources of the current limitations on the integration and globalization processes of financial markets.

The anticipated contributions are essentially empirical with respect to the previous literature on international portfolio diversification and the home bias puzzle. The first chapter is an exploratory work on international investments in equities. In this chapter, I essentially document that the overweighting of domestic stocks (*domestic country bias*) is associated with a highly imperfect diversification of investors' existing foreign assets as shown by the apparent heterogeneity in the *foreign country bias* ratios. Investors concentrate their foreign holdings within a small number of geographically close destinations although distant and less synchronized markets could be potentially better hedges for regional risks. The second chapter deals with a classic question in the field and attempts to reveal out that the gains from international diversification are potentially more important for local investors in emerging markets than those in developed markets. Given the well-known result set forth by previous studies suggesting that international portfolio diversification provides better risk-return tradeoffs to investors in all countries, the analysis conducted in the second chapter shows that local investors in countries with smaller capital markets and higher country risk could potentially benefit more from cross-border diversification while they are paradoxically those who stick more to domestic securities than do their counterparts in more developed countries.



The third chapter deals with the determinants of bilateral equity holdings within a gravity model which provides a simple yet coherent framework to gauge for the observed geography of international portfolio investments highlighted in the first chapter. Distinguishing two possible components to disaggregate the effect of the geography on asset holdings – the “informational” vs. the “cultural” distance, the results show that the physical distance act as a proxy for the information asymmetries across local investors in different countries. The fourth chapter, in turn, provides some indirect but consistent empirical support in favor of the impact of information asymmetries on cross-border portfolio decisions. By examining non-residents’ portfolio equity inflows into an emerging stock market, I show that 1) foreigners concentrate their trades across large capitalization stocks, and 2) their purchases are positively correlated with the return on the corresponding stock in particular, or the market in general. Theoretically, the empirical evidence presented in the final chapter support the hypothesis that local investors have an information advantage compared to foreign investors.

Overall, the collection of results obtained in these essays raise up a number of implications and questions. First, international capital markets are still subject to important frictions in contrast to what is frequently portrayed in discussions on the globalization of financial markets, and *information asymmetries appears to be the main source of the segmentation across markets*. The role of the information in explaining the stylized facts on international capital markets emerging from the data can be attributed to a number of reasons. For instance, the presence of differential information across investors can be a straightforward justification of the home bias to the extent that less well-informed investors would be ultimately crowded-out from the domestic market. Moreover, foreign investors making out their informational disadvantage against their domestic counterparts will also balance their cross-border assets from equities to less volatile assets such as debt securities. This could also provide a direct and simple reason to explain the higher volume of international flows in debt instruments compared to the volume of international flows in equities. Additionally, asymmetric information between domestic and foreign investors turns out to be a necessary component to explain one of the important stylized fact in international finance – the positive contemporaneous relationship between net portfolio flows and returns.

The apparent preference that average investors exhibit vis-à-vis physically proximate geographies should not be viewed as a bias, a term which generally connotes some kind of “irrationality” behind the investment behavior. Indeed, the distance puzzle and the geographical shrinkage of cross-border equity holdings which both complicate the home bias, can be considered as a rational response of investors who simply prefer countries they feel more *familiar* with. In the context of international capital markets, it is straightforward to think that investors may have easier access to information about countries located in the neighborhood of one’s own as long as the intensity of the bilateral exchange between countries

is likely to be amplified as the physical distance gets smaller. Such an exchange, in turn, can have several facets attributable to economic, cultural or politic relationships; so, the physical distance cannot be the unique source for information to flow across boundaries. It is also plausible to think that the process of international portfolio selection typically involves investors (either individual or institutional) with higher levels of sophistication and investment knowledge, rather than an average household investor with limited sources and experiment. For such a group of sophisticated investors, however, it can be claimed that poorly diversified portfolios would constitute an opposition vis-à-vis the very nature of the investment practice. Therefore, the appropriate question should be to determine whether the true origin of these observed “bias” in international portfolio selection comes from a purely psychological aspect of the investor behavior or some drawbacks in accessing the information relevant to decision-making in global marketplaces. While an attempt has been made here to disaggregate the overall impact of physical distance into an informational and a cultural component, separating out the respective effects on global portfolio selection of information asymmetries from investors’ own psychological & behavioral biases is an open issue.

Another issue worth to discuss concerns the way the home bias itself is quantified. In studies of international portfolio diversification, home bias is characterized with respect to a presumably optimal benchmark portfolio weights that investors of a particular country should have invested in. The extent of the home bias is then computed by comparing the actual investment shares with those derived from the benchmark model. Therefore, depending on the degree of precision with which the benchmark weights are obtained, the resulting measures of home bias can either exaggerate or mitigate the phenomenon. The international CAPM with either deviations from purchasing power parity or stochastic inflation, provides the most frequently used framework for purposes of comparability in studies involving many countries in particular. The model predicts that every investor must hold his own domestic market portfolio in proportion of its respective weight in the world portfolio. Obviously, the international CAPM provides an elegant and simple framework to assess the extent of home bias in studies involving many countries, although the model relies on a series of more or less unrealistic assumptions. The benchmark weights to which actual holdings of a country are compared can also be obtained using, for example, a mean-variance procedure with estimates of the expected returns vector and the covariance matrix of returns, or the more recently implemented Bayesian portfolio selection techniques. Depending on the way the benchmark international portfolio weights are chosen, one would obtain different measures of home bias across countries; however, the “bias” connotation can still be justified on the basis of potentially advantageous risk-return tradeoffs from global diversification compared to industry or regional diversification of portfolios.

This argument brings one to an additional question: How and to which extent these *potential* gains from international diversification are truly achievable? Can international diversification be advocated solely on the basis of low correlations across national markets and the resulting risk-reduction gains? Indeed, unlike a purely domestic diversification strategy, there are a number of other risk factors that could intervene in the context of global portfolio selection. Exchange risk is one kind of such a risk. Indeed, currency fluctuations constitute additional sources of variability for the risk-return parameters of an international portfolio. Concerning the portfolio return, exchange rate changes can either alleviate or increase the domestic currency return on foreign investments. Concerning the variability of return, exchange rate changes contribute to the portfolio variance both through the variance of the currency fluctuations and the covariance of these fluctuations with the market returns. Another source of concern relates to political risk involved in investing abroad. Political risk, which is a source of uncertainty difficult to introduce into the calculations, may be an important factor preventing investors from holdings securities in distant and less familiar markets. Finally, according to a stream of papers, the gains from international diversification can also be achievable through domestic diversification such that investors do not have to cross over boundaries to reach the potential welfare gains from diversification. Yet, this argument would be conceivable if the domestic market provides investors with a sufficiently diversified and large domestic market where one would expect an important weight associated to multinational companies whose cash-flows do not solely depend on domestic factors.

Finally, it is also a point of interest to note the differences between *flows* and *holdings* of securities. The home bias puzzle, that is the observation that investors allocate disproportionately high portions of their wealth to *domestic holdings*, is still a foremost feature that characterize the international capital markets. Moreover, numerous developments like the progress in information processing technologies or the lifting of different forms of barriers to cross-border investing seem to have little effect on the evolution of home bias phenomenon. On the other hand, this is obviously less of a problem once we consider the cross-border *flows* in securities whose volume have greatly increased from 1980's onwards. The huge volumes of transactions in financial assets and the high turnover rates on foreign holdings together, have collectively broken down the validity of the transactions costs as a possible explanation of the home bias. From a theoretical perspective, building up models that would consistently capture the high turnover rates in international transactions in securities and the high home bias simultaneously, is a major challenge for future work.

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Figure 1. Overview of the thesis

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**PART A: INTRODUCTION AND OVERVIEW OF THE THESIS**

- Overview of the thesis
- Summaries of the essays
- General conclusion



**PART B: LITERATURE REVIEW**



**PART C: ESSAYS**



**CHAPTER 1. DOMESTIC AND FOREIGN COUNTRY BIAS IN INTERNATIONAL EQUITY PORTFOLIOS**

- Objectives: An exploratory analysis of the domestic and cross-border portfolio investments across 36 countries, data from the IMF's "Coordinated Portfolio Investment Survey" (CPIS), identification of some stylized facts through "domestic bias" and "country bias" ratios,
- Results: (1) Home-bias substantially higher among emerging countries than developed countries; (2) Beside the fact that the domestic bias implies bilateral allocations below the benchmark proportions, some destinations are surprisingly overweighted by local investors; (3) A few destinations generate a large part of countries' total foreign assets, an observation dubbed by the term "geographical shrinkage"; (4) Distance plays a key role in explaining the geography of international portfolio holdings.



**CHAPTER 2. A CROSS-SECTIONAL ANALYSIS OF POTENTIAL GAINS FROM INTERNATIONAL PORTFOLIO DIVERSIFICATION**

- Objectives: To analyze the potential gains from international diversification for local investors in 36 countries using MSCI data over 1988-2007; to check whether investors in smaller capital markets have the most to gain from international diversification compared to investors in developed-market countries.
- Results: (1) Mean-variance investors are substantially better off by international diversification; (2) paradoxically, local investors' home bias is inversely related to the potential benefits from international diversification; (3) these gains are more important for investors in countries with higher country risk and smaller capital markets.



**CHAPTER 3. THE DETERMINANTS OF INTERNATIONAL EQUITY HOLDINGS**

- Objectives: To examine whether the puzzling effect of the physical distance on the geography of international portfolio investments undergoes an "informational" or a "cultural" channel, by means of a gravity model based analysis of 24 countries' cross-border equity holdings using CPIS data.
- Results: (1) The magnitude of the bilateral equity holdings between two countries is a decreasing function of the physical distance between them; (2) the puzzling effect of the physical distance on the geography of international portfolio investments is likely to be part of the "informational distance" rather than that of the "cultural distance" between countries.



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#### CHAPTER 4. FOREIGN EQUITY FLOWS AND THE “SIZE BIAS”: EVIDENCE FROM AN EMERGING STOCK MARKET

- Objectives: To examine whether foreigners hold the market portfolio of a country in which they choose to invest, and, if not, to find out factors helpful to characterize the stocks preferred by foreign investors; analysis of a data set on equity-level transactions issued by non-resident investors' on Turkish stocks between 1997 and 2008.

- Results: (1) Foreign investors prefer large firms; (2) their portfolio inflows are highly correlated with both the expected return on the market and the stock; (3) thus, combining (1) and (2), evidence is mostly consistent with theoretical models supporting the informational advantage hypothesis of local investors over foreign investors.

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#### CONCLUSION

- International capital markets are still segmented as opposed to the popular view of financial globalization,

- Information asymmetries are likely to be the principal source for the current segmentation,

- Therefore, international portfolio diversification remain beneficial compared to industry and/or regional diversification, and this is particularly so for local investors in emerging markets,

- An important direction and challenge for future research is to build up a theoretical model which will reproduce simultaneously the high volume of international *flows* and the *home bias* in securities.

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PART B.  
LITERATURE REVIEW

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# 1 Introduction

This part is devoted to a review of the literature related to various topics covered in the dissertation. First, I provide a short review of both theoretical and empirical work upon which international portfolio diversification is grounded. Second, I define the home bias puzzle that constitutes a major question for researchers in international economics and finance given the strong evidence in favor of the potential gains from international diversification and the rapid growth of international capital markets toward the close of the twentieth century. I provide an overview of the literature trying to rationalize the home bias phenomenon and distinguish three broad class of studies. The first group of papers mainly reviews the case for international diversification since home bias is more of a puzzle as long as global diversification is more beneficial than intra-country or industry diversification. The second group of studies addresses the home bias puzzle on the axis of several institutional explanations, namely, investors' hedging demand for domestic risks, information asymmetries, and other forms of indirect barriers such as country or firm-level differences in corporate governance, transparency, accounting practices etc. The third broad group of studies related to home bias encompasses a voluminous literature whereby academics make use of several concepts and tools drawn from the behavioral finance. In the final section, I briefly introduce the "gravity model" recently implemented in the context of international trade in securities, and that is shown to effectively capture a large variety of indirect barriers and frictions shaping the observed geographical patterns of cross-border portfolio holdings and flows.

## 2 International Portfolio Diversification

### 2.1 Theory

Harry Markowitz's work (1952) marks up the very beginning of the modern finance theory. In his 14 pages-long article, Markowitz argued that investors should not only care about the risk of a security, but also the risk due to the covariance of that security with other securities in the portfolio. His analysis resulted into the so-called *efficient frontier*, defined as the locus of all mean-variance efficient portfolios that rational investors should select given the objective of minimizing the risk of the portfolio for a given level of expected return or maximizing the expected return of the portfolio for a given level of risk. Tobin (1958) has further improved this framework by introducing the opportunity to invest into a *riskless asset* and, as a result, the crucial *two-fund separation theorem*: Any mean-variance optimal portfolio could be constructed by combining the riskless asset with a unique efficient portfolio of risky securities on the efficient frontier, i.e. the *tangency portfolio*. This is precisely the point where the Capital Asset Pricing Model developed almost simultaneously by Sharpe (1964), Lintner (1965) and Mossin (1966), and further extended by Black (1972), has stepped in. The model is based on the key

assumptions that price taker investors are rational mean-variance optimizers and have homogeneous expectations with respect to the distributional properties of the assets' returns. Under the absence of any market frictions (e.g. absence of transactions costs or taxes, no bindings on short-sales etc.), the CAPM postulates that the *risk premium* of a security is a function of the security's sensitivity to the overall market movements, which is its *beta* coefficient. That is said, the most revolutionary proposition of the CAPM was undoubtedly to show that the tangency portfolio previously highlighted by Tobin (1958), was the *market* itself: Investors should hold a portfolio of risky securities in which every asset was represented in his respective weight within the total market value.

Introducing a series of additional assumptions, researchers have shown that the CAPM can be extended into an international setting. Among these assumptions are the absence of barriers to international investments, perfect integration of capital and goods markets, and access to identical consumption opportunity sets across investors in different countries and the validity of purchasing power parity (PPP). Therefore, different extensions of the domestic CAPM according to the set of assumptions hold, have had different implications for international portfolio selection. For example, under the hypothesis of the validity of the PPP relation, Grauer *et al.* (1974) showed that asset pricing relationships that are found to be optimal in a domestic setting hold exactly in an international setting too. In another important extension, Solnik (1974a) and Sercu (1980) have shown that a nominal CAPM can also be obtained in an international setting relaxing two assumptions, i.e. allowing for differential consumptions sets across investors in different countries and deviations from PPP with no inflation uncertainty. The normative result is that investors still hold the world-market portfolio of risky assets in which every asset is represented in proportion to its relative world-market capitalization weight, plus a portfolio of risk-free assets to hedge the resulting exchange rate risk. In a comprehensive synthesis, Adler and Dumas (1983) developed a model of international asset pricing with deviations from PPP and stochastic inflation. They obtain a single international CAPM pricing relationship for all investors irrespective of their country of residence, with the difference that required rate of return on a risky security includes both an inflation risk premium and an equity risk premium, and the hedge portfolio includes domestic equities as well as domestic bonds. That is said, Adler and Dumas (1983) note that, as long as the variability of equities is higher than that of the inflation, domestic bonds will continue to constitute the largest part of the hedge portfolio.

In light of the studies above, two points should be underlined. First, this body of earlier theoretical efforts have successfully shown that the required rate of returns on international assets are a function of a single international asset pricing model as in the case of Sharpe, Lintner and Mossin's domestic CAPM. Second, in the spirit of the domestic CAPM portfolio selection, an important – and perhaps theoretically the most important – implication of these

international asset pricing models is that all mean-variance rational investors regardless of their country of residence and their risk aversion, should hold the same portfolio of risky assets, i.e. the *global world-market portfolio*, in which the percentage share of each individual country's market portfolio corresponds to the relative world-market capitalization weight of the country of interest.

## 2.2 Empirics

The emergence of the empirical research on international diversification of portfolios is parallel with these theoretical attempts undertaken to generalize the MPT and the CAPM internationally. Grubel's (1968) paper is typically recognized as the departure point of the (empirical) literature on international portfolio diversification, where the author notes that the *international diversification of portfolios is the source of an entirely new kind of world welfare gains*. Subsequent early work in favor of the gains from international diversification includes Levy and Sarnat (1970), Grubel and Fadner (1971), Agmon (1972), Lessard (1974), Solnik (1974b) and Bergstrom (1975) among others. The gains from international diversification are mainly advocated on the basis of higher positive correlations within an economy which suggests that significant risk reduction gains could be achieved by diversifying securities portfolio internationally (Levy and Sarnat, 1970), or the dominance of country-specific factors as the root of the segmentation across national markets and thus the justification of the international diversification vs. the domestic diversification (Lessard, 1974). In fact, as long as the risk-reduction gains from diversification are due to the imperfect correlation structure between assets, it is fairly intuitive to think that the correlation between two securities tend to be lower, *ceteris paribus*, across markets in two distinct countries than it would be when they were traded within the same national market. Thus, following this simple argument, a voluminous literature have since then documented the gains from international portfolio diversification using different datasets and from the viewpoint of investors in different countries not only restricted to investor in developed countries. A comprehensive yet not complete list of other studies documenting the international diversification gains may include Eun and Resnick (1988), Bailey and Stulz (1990), Eun and Resnick (1994), Heston and Rouwenhorst (1994), Bekaert and Urias (1996), Michaud *et al.* (1996), Liljebloom *et al.* (1997), de Santis and Gerard (1997), Griffin and Karolyi (1998), Pastor and Stambaugh (2000), De Roon *et al.* (2001), Gilmore and McManus (2002), Heimonen (2002), Ehling and Ramos (2003), Wilson *et al.* (2003), Li *et al.* (2003), Thomas *et al.* (2004), Das and Uppal (2004), Arouri (2005, 2006), Fletcher and Marshall (2005), D'Ecclesia and Costantini (2006), Driessen and Laeven (2007), Chiou *et al.* (2008), Olusi and Abdul-Majid (2008), De Santis and Sarno (2008), Baele and Inghelbrecht (2009), Gupta and Donleavy (2009), and Chiou (2009), among others.

It is also important to realize that the potential improvement in terms of the risk-return

tradeoff of an international portfolio is not stable overtime. First, to the extent that international diversification is justified on the basis of lower correlations across national markets than those observed across securities within a national market, whether or not the correlation structure between international markets changes through time is an important point to be investigated. Erb *et al.* (1994) study the cross-equity correlations in the G-7 countries and find that correlations are mainly affected by the business cycle and asymmetric in up and down markets being significantly high during bearish markets. Longin and Solnik (1995) note that international correlations between markets increased over the period 1960-1990, in particular, in periods of high volatility. However, Solnik *et al.* (1996) find that despite the internationalization of companies between the period 1958-1995, correlations between international returns have increased only slightly over time. Using the common trends and common cycles approach, D'Ecclesia and Costantini (2006) examine the relationship between Canadian, Japanese, UK and US stock markets and show that country-specific shocks are the most important source of international return variation. Second, the degree and the factor of the market segmentation may also change over time implying that international diversification potential may have reduced as a result of a higher degree of integration across markets. Harvey (2000) notes that the extent of the market integration has significantly reduced the international diversification potential across developed countries but not emerging countries, an observation consistent with the less-than-complete integration structure of emerging markets with world capital markets. Bekaert and Harvey (1995) show that in many developing countries, the stock markets are not well integrated into world capital markets, which would suggest that there are still substantial benefits to international diversification for investors in emerging countries with less developed and integrated capital markets. Likewise, Schmukler (2004) and Li *et al.* (2003) argue that global financial markets are not fully integrated, suggesting that the benefits from international diversification are still sizeable.

### **3 Home Bias**

In their extensive survey paper, Obstfeld and Rogoff (2000) note that “despite the rapid growth of international capital markets toward the close of the twentieth century and a much expanded world market for equities, stock market investors maintain a puzzling preference for home assets”. Indeed, the “home bias puzzle” remains one of the major preoccupations for researchers in economics and finance to the extent that it represents an unresolved question presenting many facets to be addressed. First, the home bias is problematic with respect to the voluminous body of theoretical and empirical research on international asset pricing and portfolio diversification. The overweighting of domestic assets is basically a violation of the normative prediction that mean-variance rational investors should hold an identical global portfolio of risky assets. One may claim that theory represents only a benchmark and it is

based upon unrealistic and strong assumptions. Nonetheless, the home bias also runs counter to the empirical predictions according to which international diversification improves the risk-return tradeoff of investment portfolios more than a purely domestic or industrial diversification strategy. Second, the home bias is problematic once we consider the actual context of the global financial markets. The rapid progress in information processing technologies, the introduction of new and sophisticated financial instruments worldwide, the collapse of fixed exchange rate regimes, the policy choice of countries promoting the deregulation of the capital markets etc., make it even more difficult to rationalize the preference that investors exhibit toward domestic assets.

The magnitude of the home bias can be assessed by means of asset holdings data with respect to a predetermined benchmark. In applied work, researchers generally employ the international CAPM or the mean-variance analysis to derive the optimal portfolio weights.<sup>2</sup> For example, when they first highlighted the phenomenon, French and Poterba (1991) report that investors in US, Japan and the UK hold respectively 94, 98 and 82% of their portfolio holdings in domestic stocks. Using a mean-variance framework, Lewis (1999) suggests that the optimal share an average US investor should allocate in foreign equities varies between 43% and 76%. Chan *et al.* (2005) note that the US mutual funds invest 85% of their portfolio assets to domestic securities although the share of US market in the world is 47%. Mishra (2008) reports that the domestic equity holding of Australian investors in 2002 was 81.67 percent, whereas the international CAPM benchmark share of Australian market was 1.84 percent. Sorensen *et al.* (2007) note that the home bias in equity, debt and foreign direct investments have slightly declined over the period 1993-2003 for 24 OECD countries, while the observed levels of foreign assets are still largely below those predicted by the theory. Similarly, Ahearne *et al.* (2004) report that US investors' foreign equity holdings have increased from their 2% level in late 1980s to about 10%, although the actual share is still behind the share of non-US equities in the world portfolio. Balli *et al.* (2010) note that following the launch of the Euro in 1999, portfolio home bias declined across European financial markets, but generated the Euro bias, a situation where Euro investors concentrate their assets within the Euro region. Thus, despite the commonly claimed integration of the financial globe, investors are still qualified as underdiversified with respect to standard models of international portfolio choice, so that the home bias still constitutes a challenge for research.

### **3.1 International Portfolio Diversification Revisited**

Unsurprisingly, the literature surrounding the home bias puzzle is well-diversified and quite large. A first group of indirectly related studies revisits the gains from international

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<sup>2</sup> Baele *et al.* (2007) provide a short review of the methodologies used to calculate theoretically optimal portfolio weights.

diversification. In fact, cross-border investing cannot be completely analogue to domestic investing since investing in foreign markets can induce additional sources of risk arising from different political or institutional regimes, currency fluctuations, instability of correlations etc. Moerman (2008) argue that the economic and fiscal integration within the European Monetary Union had a negative impact on the potential benefits from diversification over countries. Eun and Resnick (1988) show that “exchange rate uncertainty is a largely nondiversifiable factor adversely affecting the performance of international portfolios”. Glen and Jorion (1993) find that the risk-return performances of international portfolios are significantly improved by hedging exchange rate risk through inclusion of forward contracts over the period 1974-1990. However, Solnik (1998) notes that currency risk is low in the long term since exchange rates tend to revert to fundamentals. The time variation of return correlations also matters for the performance of international portfolios. For instance, researchers have found evidence that correlations between national markets are unstable overtime and tend to increase particularly during periods of high volatility (Erb *et al.*, 1994; Longin and Solnik, 1995; Goetzmann *et al.*, 2005; Krishnan *et al.*, 2009). In practice, the convergence of correlations during market downturns or periods of high volatility is quite undesirable phenomenon since it translates into the fact that the potential risk-reduction gains from international diversification reduce just when they are most needed most (Butler and Joaquin, 2002).

A second group of study revisiting the case for international diversification reverses the viewpoint by looking for whether international diversification strategies can be replicated by solely investing into the domestic market. According to Rowland and Tesar (2004) multinational corporations could have presented global diversification benefits for German and U.S. investors over the period 1984-1995. Errunza *et al.* (1999) note that, “during the period from 1976 to 1993, as the availability of multinationals corporations, closed-end country funds and American depository receipts rose, U.S. investors could mimic foreign market returns with domestically traded securities”. However, Babilis and Fitzgerald (2005) argue that investing in the domestic equity of large multinational companies cannot provide the desired international diversification gains since these stocks typically move together with domestic markets and have betas close to unity. In the end, the opportunity to replicate an international diversification scheme through home-made diversification relies heavily on the availability of multinationals corporations in the domestic market whose cash-flows depend on international factors beside domestic ones. Therefore, mimicking international diversification strategies by investing in domestically traded stocks is a hardly achievable option for investors in emerging countries who operate in relatively less liquid and diversified local markets.

The presumed gains from international diversification can also be unachievable because of explicit barriers to foreign investing in terms of transaction costs, restrictions on foreign holdings or differential taxation between domestic and foreign investors. Although such



explanations could make sense particularly before the 1980s they are unlikely to reconcile with the current state of financial markets. For example, Black (1974) or Stulz (1981) develop models with fixed transaction costs of international diversification. In subsequent work, researchers developed models incorporating transaction costs proportional to the size of the portfolio rebalancing (Constantinides, 1986; Davis and Norman, 1990; Rowland, 1999). In a general equilibrium model where investors are restricted to consume from their domestic capital stock, Uppal (1993) shows that conventional degrees of risk aversion is sufficient to generate home bias under the hypothesis of proportional transaction costs to cross-border transferring of the capital. On the other hand, using Adler and Dumas' (1983) international CAPM framework, Cooper and Kaplanis (1994) rules out the transactions costs or inflation hedging as plausible explanations of the home bias for investors' level of risk aversion that are consistent with standard estimates of the domestic equity market risk premium. Glassman and Riddick (2001) conclude that an average risk-averse US investor should face a transaction cost level by more than 12% in order to justify the observed home bias that US investors exhibit vis-à-vis their home market. In summary, the literature actually tend to dismiss the transaction costs argument as a plausible explanation of the home bias (Hau and Rey, 2008). Yet, perhaps the soundest argument against the transaction costs explanation of the home bias comes from Tesar and Werner (1995) study, in which the authors show that the turnover rates on foreign holdings are substantially higher than those on domestic holdings.

A joint set of studies through which international portfolio diversification is revisited deals with the effect of parameter uncertainty inherent to the estimation of inputs, namely, the vector of expected returns and the variance-covariance matrix of returns. For example, concerning the mean-variance portfolio selection, common practice consists of the use of historical data to estimate the inputs and acting as if they are the true parameter values although they comprise considerable sampling errors. This procedure involves at least two major statistical problems regarding the adequacy of the model. The first relates to the large variability of the future returns' estimates so that in-sample efficient portfolios often leads to extreme and practically irrelevant asset weights as shown by, among others, Britten-Jones (1999) or Best and Grauer (1991). The second problem concerns the robustness property of parameter estimates given the classic assumption that the observed returns follow a multivariate normal probability law. Jobson and Korkie (1980) study the sampling properties of the conventional parameter estimators for mean-variance portfolios and show that the classical maximum likelihood procedure do not allow making reliable inferences for small samples (p. 553-554). Best and Grauer (1991) find that the out-of-sample accuracy of in-sample mean-variance efficient portfolios are extremely sensitive to changes in asset means. Victoria-Peser (2000) shows that the presence of only 1% of extreme observations in the data is enough to generate irrelevant portfolio weights derived from the mean-variance procedure. In

addition, while the sample covariance matrix of returns is generally more stable through time and consistent to data outliers as suggested by, for example, Prigent (2007), Sercu and Vanpée (2007) or Stevens (1998), the estimation of the expected returns is a difficult, yet crucial step. For instance, Jorion (1985) notes that the out-of-sample performance of ex-post optimal portfolios using the sample mean as input are significantly outperformed even by an equally-weighted portfolio strategy, and proposes the use of shrinkage estimators for the sample mean (p. 260). Merton (1980) argues that the estimators making use of historical return data should take into account the heteroskedasticity problem.

Although the hypothesized gains from international portfolio diversification could not be easily achievable for one or more of the reasons mentioned above, it is equally true that the literature typically recognizes the potential benefits of global portfolio strategies over domestic strategies. Therefore, this general agreement on the benefits from international diversification makes the home bias phenomenon further puzzling and motivates the researchers to provide reasonable explanations for the observed preference that investors exhibit for domestic securities. Given the voluminous mass of studies trying to rationalize the home bias puzzle, it is convenient to propose a categorization for the possible reasons of the home bias. French and Poterba (1991) suggest two broad categories: those focusing on institutional factors and those focusing on investor behavior.<sup>3</sup> The following subsection reviews each of these categories separately.

## **3.2 Institutional Explanations**

### **A. HEDGING DOMESTIC RISKS**

A first category of explanations of home bias is that domestic assets serve as a better hedge for home-country specific risks due to their high correlation with the overall movements of the domestic market in general. Sercu and Vanpée (2007) distinguish four types of home-country specific risk which could lead agents to invest more into domestic assets: inflation risk, real exchange risk, domestic consumption risk, and the risk from non-tradable factors such as human capital.

The validity of the purchasing power parity (PPP) relation is one of the crucial assumptions in the development of the international CAPM. In practice, possible violations from the PPP have two implications for international asset pricing. The first implications is that the real returns on investments will differ across foreign and domestic investors within the same local

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<sup>3</sup> Sercu and Vanpée (2007) distinguish between five theories, namely, i) hedging domestic risk, ii) implicit and explicit costs of foreign investments, iii) information asymmetries, iv) corporate governance and transparency, and v) behavioral biases. Explicit costs of foreign investments in terms of barriers to capital flows or direct costs to cross-border investing have been discussed previously. Moreover, information asymmetries, corporate governance and transparency related issues can also be included within the “institutional” group of the explanations for home bias. Therefore, I adopt the more parsimonious approach proposed by French and Poterba (1991).

market. For example, in Adler and Dumas' (1983) model, investors are expected to hold an identical risky portfolio partly hedged against the exchange risk arising from stochastic inflation. Only the hedge part of the portfolio differ across investors worldwide, and the inflation risk can be hedged by domestic stocks to the extent that returns on the domestic market and the domestic inflation are positively correlated. However, as indicated by, among others, Cooper and Kaplanis (1994), there is weak evidence in favor of such a positive and strong correlation between the inflation rates and the domestic market return. Second, deviations from the PPP also create a real exchange rate risk for international investors. It can be claimed that currency risk is lower in particular for long-term investment periods due to mean-reverting exchange rates, or in a well-diversified international portfolio, the risk arising from currency fluctuations will also be well-diversified. However, the literature has shown that the performance of international portfolios can be substantially improved by appropriately hedging the currency risk (Eun and Resnick, 1988; Glen and Jorion, 1993). More recently, for example, Fidora *et al.* (2007) find that real exchange rate volatility explains 20 to 30% of the cross-country variation in the magnitude of home bias in equities (and a larger part for home bias in bonds) across a sample of 40 countries.

Non-tradable factors such as non-financial income or human capital constitute a second class of source of the domestic risk in an internationally diversified portfolio. Intuitively, if investors overweight domestic stocks following such a motivation to hedge non-financial income risks, one should expect a positive relationship between non-financial and financial income. Examining four OECD countries, Baxter and Jermann (1997) find that while growth rates of labor and capital are not highly correlated, the returns to human capital and physical capital are very highly correlated. The direct implication is that a diversified portfolio involves a negative position in domestic assets, further deepening the home bias puzzle. More recently, Massa and Simonov (2006) show that although investors' portfolios are positively correlated to non-financial income, the latter is not strongly correlated with the market portfolio of securities. This finding clearly suggests that investors do not consider to hedge the non-financial income risk since they form their portfolio in such a way that they are positively correlated with this source of risk.

A final category within this strand of literature concerns whether the home bias can be explained by a motive to hedge against the price uncertainty due to nontraded consumption goods or factors of production in the economy. Eldor *et al.* (1988) analyze the necessary conditions for the domestic investor to hold disproportionately large shares of domestic assets in a general equilibrium framework of products and assets markets. They conclude that hedging against the price uncertainty due to productivity shocks in the nontraded goods industries is neither necessary nor sufficient condition for home asset preference. Stockman and Dellas (1989) develop a model of exchange rate with nontraded goods which implies

incomplete international portfolio diversification. The idea that domestic investment may serve as a hedge for large and frequent shocks to domestic income is also presented by Tesar and Werner (1995). On the other hand, Baxter *et al.* (1998) reject the hypothesis that the presence of nontraded consumption goods or nontraded factors of production can explain the home bias to the extent that individuals have access to free international trade in financial assets, an assumption easier to support within the actual context of a globalized market.

## B. INFORMATION ASYMMETRIES

Information asymmetries constitute probably the most popular class of explanations of the home bias puzzle. It provides a direct and simple understanding as to why investors prefer domestic assets when forming their portfolios. For example, domestic investors can have access to a wide array of local information sources that could be relevant for decision-making and that are not easily accessible to foreign investors. Home bias can also be linked to information asymmetries so long as geographical proximity allows more intensive and frequent economic exchange opportunities across corporations and individuals. If there is differential information, risk-averse investors would rationally prefer domestic assets since they would perceive investments in these assets less risky as a result of the superior information they possess or they feel so. In a frequently cited paper, Merton (1987) develops a capital market equilibrium model under imperfect information. In Merton's model, a rational home bias arises under the assumption that domestic investors are better informed about the future evolutions of local firms. As noted by Merton (1987) *an investor uses security k in constructing his optimal portfolio only if the investor knows about security k*, an assumption justified by the fact that investor portfolios contain *only a small fraction of the thousands of traded securities available*. In brief, investors invest in firms they know about.

Theoretical literature linking the home bias puzzle to information asymmetries covers a large scope. Van Nieuwerburgh and Veldkamp (2009) examine why domestic investors don't choose to acquire foreign information to reduce the uncertainty about foreign payoffs. They find that investors with rational expectations reinforce informational asymmetries and that even small initial information advantages of local investors can lead to a home bias of the magnitude observed in the data. Using survey data as of the year 2003 from *Pensions & Investment*, Barron and Ni (2008) show that managers having larger portfolios under their management are more likely to gather information on foreign assets, which implies a negative relationship between the portfolio size and the home bias that the portfolio managers exhibit. In their framework, the information set between portfolio managers differs as a function of the portfolio size under control. Brennan *et al.* (2005) develop a noisy rational expectations models (see Admati, 1985; Gehrig, 1993) with private and public signal streams to domestic and

foreign investors and where the private signal about the future asset payoffs comes with less precision to foreign investors. The model predicts that foreign investors' perceptions about the future market returns differ from those of the domestic investors depending on the differential information. Hatchondo (2008) proposes a theoretical model where domestic investors outperform foreigners in identifying the correct ranking of investment opportunities (and not in terms of possessing superior information about the performance of the market), an assumption that also implies a home bias for domestic stocks. Ueda (1999) relates investors' imperfect information about foreign assets to the incompleteness of observation in a two-country model. According to Zhou (1998) better informed domestic investors tend to focus on domestic assets because the information advantage implies a weaker conditional variance on domestic assets, therefore, a weaker perceived risk. Brennan and Cao (1997) develop and test a model of portfolio flows with differences in information endowments between domestic and foreign investors. Consistent with the view that foreign investors are at an information disadvantage relative to domestic investors, the main empirical implication of their model is the contemporaneous positive correlation between foreign investors' purchases of stock and the returns on the domestic market. Indeed, this trend-following behavior by foreign investors is also documented in other papers like Dahlquist and Robertsson (2004), Kim and Wei (2002), Karolyi (2002), Froot *et al.* (2001) or Grinblatt and Keloharju (2000) among others.

If information accounts for portfolio selection, then one should ask what is the relevant information? Portes and Rey (2005) note that the relevant information set includes several factors like accounting practices, corporate culture, political events, or the structure of asset markets and their institutions. Indeed, many studies document the relationship between information asymmetries and international portfolio selection by linking the data on investors' portfolio holdings (or deviations from benchmark holdings) to an array of variables likely to substitute for the asymmetric information across investors in different countries (Sercu and Vanpée, 2007). Using data on non-Japanese investors' stock ownership on Japanese firms, Kang and Stulz (1997) underline that the effect of the asymmetric information between domestic and foreign investors goes through a "size bias" in that foreign investors mostly prefer larger firms in the Japanese market. Other evidence on the effect of size as an accurate proxy of the information is presented by Faruqee *et al.* (2004) or Chan *et al.* (2005) who show that the countries' economic mass measured by the (log of the) GDP or the number of publicly listed companies can affect international portfolio holdings. Ahearne *et al.* (2004) point out to the information content inherent in US investor protection regulations, i.e. accounting standards, disclosure requirements and regulatory environment, as an important factor to explain the home bias. Cultural and social affinities like speaking a common language, sharing common religious beliefs or institutional backgrounds can also proxy for information asymmetries across borders. Grinblatt and Keloharju (2001) find that investors are more likely

to hold the stocks of Finnish firms that communicate in the investor's native tongue, and that have chief executives of the same cultural background.

A second and frequently mentioned channel through which asymmetric information can account for the home bias puzzle is the concept of *proximity* or the *distance*. The idea is that information asymmetries become more important as the distance separating investor's home and foreign market grows; an insight that makes it easy to understand the reason for which investors prefer locally traded securities. Just like for the case of finding out the relevant information to portfolio selection, one can distinguish a number of dimensions proposed to assess the effect of distance on (international) portfolio selection and home bias. The direct measure for distance is geographical. Hence, for example, Lane and Milesi-Ferretti (2008), Aviat and Coeurdacier (2007), Portes and Rey (2005), Coval and Moskowitz (2001) and Portes *et al.* (2001), among others, use directly the *physical (geographical) distance* to control for information asymmetries across countries. Sarkissian and Schill (2004) note that *economic distance* can help to explain overseas listing decisions of firms, and that cross-listing is more frequent across markets that are geographically, culturally and industrially proximate. Massa and Simonov (2006) suggest that investors show biases toward *professionally close* investment alternatives. Aggarwal *et al.* (2009), and Lucey and Zhang (2010) propose that geography can substitute for *cultural proximity* between investors and countries. Ivkovic and Weisbenner (2005) and Coval and Moskowitz (1999) provide evidence that the effect of distance can also play an important within a country itself. Using data on US mutual funds' domestic portfolio allocations, Coval and Moskowitz (1999) find that US investment managers exhibit a strong preference for locally headquartered firms. Documenting a positive effect of the distance in a domestic setting is further puzzling since the domestic investment context within the US should involve no regulatory, taxation, language or cultural differences unlike other studies examining the home bias in an international setting. The authors note that this "points directly towards an information-rooted explanation for the local equity preference".

One important implication of the asymmetric information hypothesis is that domestic investors should perform better than foreigners since the latter group is less well informed about the payoffs of domestic assets than are local investors. However, the results of the empirical literature on this topic is quite mixed, raising doubts on the validity of the asymmetric information hypothesis to explain the home bias. For example, using data on Korean stock market, Choe *et al.* (2005) note that foreign investors buy when prices are high and sell when prices are low, therefore, they are overperformed by domestic investors. Using data on Indonesian and German stock markets respectively, Dvorak (2005) and Hau (2001) also conclude that domestic investors realize higher profits than foreign investors, pointing out to the informational disadvantage of foreigners compared to locals. Comparing the performance of UK mutual funds investing in the US market, Shukla and van Inwegen (1995)

conclude that foreign mutual funds perform worse than US-based funds. Hendricks *et al.* (2010), Bae *et al.* (2008) and Malloy (2005) also suggest that local equity analysts possess an information advantage over other analysts which translates into better investment performance and forecasting ability. In a within-country setting, Ivkovic and Weisbenner (2005) find that local investors are able to generate an additional return of 3.7% per year from their local holdings relative to their non-local holdings. In contrast, Huang and Shiu (2009) and Seasholes (2000) using data on Taiwanese market as well as Grinblatt and Keloharju (2000) using data on Finnish market, find that foreign investors perform better than locals. Using data on equity flows from US institutional investors into a cross-section of 25 countries, Froot and Ramadorai (2001) find that foreign purchases predict prices in foreign markets, a result consistent with foreigners being at an informational advantage than locals. Kang and Stulz (1997) note that there are not significant differences between the performance of domestic and foreign investors using data on Japanese market. That is said, the evidence of the relatively better performance of foreigners presented in these studies concerns professional investors that are also expected to have easier access to relevant information about the foreign market of interest given their investment experience and information processing capabilities. In fact, as noted by Sercu and Vanpée (2007), *although there seems to be no real consensus on whether domestic investors outperform foreign investors, the empirical evidence of superior performance by domestic investors is more convincing* (p. 23).

### C. OTHER INSTITUTIONAL FACTORS

Another set of papers within the institutional explanations category addresses the home bias puzzle in terms of barriers due to governance, transparency, and a number structural features both on the firm and country level. If such barriers are not directly linked to explicit barriers such as transaction costs or tax discriminations on foreign investors, one can claim that they ultimately lead to some form of informational frictions across investors in different countries and therefore, could be mentioned within asymmetric information subsection. Yet, the objective to distinguish this category from the information based explanations of the home bias can be justified by the very nature of the factors investigated.

Pagano *et al.* (2001) examine the cross-listing decisions of European companies between 1986 and 1997. In particular, they find that European companies are more likely to cross-list in liquid and large markets with better investor protection and more efficient courts and bureaucracy and in markets where several companies from their industry are already cross-listed. Examining US investors' foreign portfolio allocations, Ahearne *et al.* (2004) underline the importance of barriers resulting from different national accounting practices, disclosure requirements, and regulatory environment. The authors note that *the larger the share of a*

country's firms that publicly lists securities in the United States, the larger is its relative weight in the US equity portfolio, and the less is US investors' bias against its stocks (p. 316). Over a sample of 38 countries, Lau *et al.* (2009) report that the magnitude of a country's home bias has a significant impact on the firms' cost of capital. For example the authors find that if US investors held domestic stocks in the proportion implied by standard portfolio theory, the cost of capital in the US would fall by about 12 basis points. In an earlier study, Diamond and Verrechia (1991) report a similar link between informational asymmetries and the firm's cost of capital arguing that weaker differential information between various investors is likely to increase the holdings of large investors and therefore, reduce the cost of capital for the firm.

Kho *et al.* (2009) merge standard portfolio theories of home bias with corporate finance theories of insider ownership. They show that in countries with poor governance, it is optimal for insiders to hold large shares in their own corporations, implying that foreign investors exhibit a large home bias against such countries. Using country-level U.S. data, they find that US investors' home bias decreased mostly towards countries in which the ownership by corporate insiders decreased. The authors suggest that decentralization of ownership and the development of institutions with enhanced governance practices can erode home bias to the extent that in countries with weak governance and institutions overweighting of domestic securities can be optimal. Dahlquist *et al.* (2003) focus on divergences in corporate governance across countries to gauge for portfolios held by investors. They show that the economic importance of controlling shareholders outside the US helps explain the home bias of US investors and leads non-US investors to weight US stocks more in their portfolios. Also, the share of a country's in US investors' stock portfolio is negatively related to the share of the stock market capitalization of the country held by large shareholders. The authors conjecture that their estimate of shares held by controlling shareholders can serve as a proxy for investors rights, and that investors can be reluctant to invest in countries with poor investor protection where financial markets are less developed.

In connection with the argument of corporate governance and firm structure as a likely determinant of diversification practices, La Porta *et al.* (2000, 1999, 1998, 1997) argue through a series of paper, that the differences in the institutional quality and the size, structure and effectiveness of financial systems between countries can be explained by the differences in investor protection standards, as imposed by legal rules and the quality of enforcement.<sup>4</sup> They state that, in contrast to the conventional distinction between bank-centered and market-centered financial system, focusing on the origin of a country's law system and the enforcement and effectiveness of the legal apparatus is a more useful way to describe differences in corporate governance regimes and the organization of financial markets (see La

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<sup>4</sup> In their 2008 paper, the authors provide a summary of their findings regarding the effects of the historical origin of a country's law on a broad range of legal rules, regulations, and several economic outcomes. See La Porta *et al.*, 2008.



Porta *et al.*, 2000). They show that countries with weaker investor protection standards tend to have smaller capital markets (La Porta *et al.*, 1997), and that common law countries provide the strongest, while French civil law countries the weakest legal protection to investors and creditors (La Porta *et al.*, 1998). Further, since the quality of investor protection standards is inversely related to the concentration of ownership of shares in largest public companies, it is unlikely to find well diversified shareholders in countries failing to protect their rights.

Giannetti and Simonov (2006) examine the link between the quality of a company's corporate governance and investors' stock portfolios. They find that the quality of a company's governance affect the decision of new investors to buy shares of the company of interest. In fact, to the extent that insiders who can access to private information in companies with poor corporate governance standards, can extract substantial private benefits, foreign investors will be more reluctant to hold shares in these companies. The result is that foreign investors who systematically underperform their local counterparts, will be ultimately crowded out from the investor base and will choose to avoid firms with poor corporate governance practices, a mechanism leading to home bias in investors' portfolios. Using a large sample consisting of US investors' foreign holdings in 4409 firms from 29 countries, Leuz *et al.* (2009) study whether and why concerns about corporate governance affect portfolio holdings. They find that foreigners invest systematically less in firms whose ownership structures are more prone to corporate governance problems, located in countries with poor outsider protection and disclosure. They argue that *poorly governed firms [...] are likely to be more taxing to foreign investors in terms of their information and monitoring costs, which in turn explain why foreign investors shy away from these firms* (p. 3280).

Gelos and Wei (2005) examine whether the holdings of international investors are affected by country transparency and whether this effect becomes more pronounced during crises. Their insight is that improving a country's transparency could lead to an increase in investment flows, implying weaker home bias against by foreign investors within the country of interest. They distinguish between government and corporate opacity. Government opacity covers data transparency and macroeconomic policy transparency while corporate opacity includes survey results about the level of financial disclosure and the availability of information about companies, produced by the World Economic Forum. Gelos and Wei find clear evidence that both government and corporate transparency have positive effects on investment flows from international funds into a particular country. Moreover, capital outflows are larger for countries with less transparency scores, suggesting that *becoming more transparent can be an effective way for countries to benefit from international financial integration while avoiding excessive volatility during turbulent times* (p. 3012).

### 3.3 Behavioral Explanations

Dissatisfaction with – if not the failure of – institutional explanations to provide a fully account of the persistent home bias in investor portfolios have generated an additional strand of literature focusing on factors directly linked to investor psychology. The final class of research that will summarized encompasses a large body of studies whereby academics employ several concepts and tools drawn from the behavioral finance, defined as a *science that strives to give explanation and improve insight into the overall judgment process of investors. This includes the cognitive biases and the affective (emotional) aspects of the decision-making process of novice and expert investors* (Ricciardi, 2008b, 2006).<sup>5</sup>

Indeed, the collection of explanations set forth so far assumes rationally behaving individuals who seek to maximize some form of Von-Neumann – Morgenstern utility defined over wealth or consumption (see von Neumann and Morgenstern, 1944). This normative approach to financial decision-making typically emphasizes the concept of rationality as the main building block of standard finance theories such as the efficient market hypothesis, modern portfolio theory, the CAPM, the Black-Scholes option pricing model etc. Ricciardi (2008a) notes that *the standard finance investor makes judgments within a clearly defined set of circumstances, knows all possible alternatives and consequences, and selects the optimum solution, and standard finance assume that all individuals are wealth maximizers* (p. 92). Possessing the necessary mental and computational skills, rationally behaving decision maker searches for all relevant information and makes his judgments by considering all possible outcomes of non-determinist experiment. In these terms, the decisional outcome of any uncertain situation faced by individuals or firms, is unbiased with respect to a correctly processed set of relevant information to the event under consideration. On the other hand, behavioral decision making provides an alternative framework that helps one to understand why and under which circumstances individuals can deviate from normative behavioral patterns implied by the economic rationality. Rationally bounded decision makers (see Kahneman, 2003; Simon, 1982) are limited by their values, skills, habits, display cognitive and affective biases, which strongly restrict the information processing abilities of the individual during the judgment process under conditions of risk and uncertainty (Ricciardi, 2008a, p. 93).

Within the ongoing discussion between the proponents of the traditional vs. behavioral decision making and finance theories, perhaps the most relevant dissimilarity is related to the notion of risk, a distinction upon which most of the contributions of the behavioral finance school on the international lack of portfolio diversification is likely to rely. Ricciardi (2008b)

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<sup>5</sup> In a comprehensive survey of behavioral finance, Barberis and Thaler (2003) underline two building blocks for the field, namely, i) limits to arbitrage, a concept arguing that it is not always possible for rational traders to take profit of and, thus, cancel out mispricing effects caused by less rational traders, and ii) psychology, which allows one to consider individual's potential deviations from the traditional view of fully rational economic agent.

provides a thorough discussion as well as a literature review of the topic. Risk is a concept with many facets depending on the discipline, context or the objective involved. Hence, although the very formulation of risk varies according to the theoretical outline involved (variance for the Modern Portfolio Theory or beta for the CAPM), under the tenets of the traditional finance school, risk is typically treated as a one-dimensional concept that can be objectively measured by the decision makers. The objective nature of risk implies that it is observable and quantifiable based on a set of available observations or calculations regarding the past occurrences of the event of interest. In contrast, behavioral finance involves a different view of the concept. As opposed to the objective aspect of the risk emphasized by the traditional finance, the central premise of behavioral approach is that the individuals' risk assessment inherently includes a subjective component so that the risk perceived given an uncertain situation may easily differ across a set of decision makers. With this respect, risk is no more one-dimensional, involves several elements such as feelings of control, influenced by social and cultural factors, and always contains an affective component (Olsen, 2001). Moreover, as noted by Ricciardi (2008b), recognizing *the "subjective nature" of an individual's own perception of risk as a supplement to the traditional measures of "objective risk" broadens the understanding and improves the overall area of risk judgment* (p. 28).

Given these useful insights into the very notion of risk, academics are provided with a broad and fruitful collection of concepts and tools to explain the home bias puzzle. For example, Ricciardi (2008b) offers an extensive list of behavioral characteristics revealed out by risk perception researchers and accounting within a financial setting: The author notes 111 behavioral risk indicators identified within the field of behavioral finance and 12 behavioral risk attributes within the behavioral accounting (p. 97). As such, the literature dealing with portfolio selection and asset pricing topics in general, and with the reasons of imperfect international diversification and home bias puzzle in particular, have so far made use of a number of these risk concepts and theories such as overconfidence (Daniel and Titman, 2000; Barberis *et al.*, 1998; Daniel *et al.*, 1998), prospect theory, loss aversion (Coval and Shumway, 2005; Barberis *et al.*, 2001; Barberis and Huang, 2001; Kahneman and Tversky, 1979), representativeness (Tversky and Kahneman, 1971), framing (Tversky and Kahneman, 1981), rational inattention (Sims, 2003), familiarity bias, heuristics (Kahneman *et al.*, 1982), relative optimism (Shiller *et al.*, 1991) etc. For instance, in an early contribution, French and Poterba (1991) suggest that *investors may impute extra "risk" to foreign investments because they know less about foreign markets, institutions, and firms* (p. 225), distinguishing factors related to investor behavior as a separate and plausible class of explanations for imperfect international diversification. Consistent with the subjective nature of risk, behavioral models of international portfolio diversification rationalize the home bias puzzle essentially through the assumption that investors consider foreign markets as more risky simply because they are

foreign (Sercu and Vanpée, 2007).

Barberis *et al.* (2006) emphasize that narrow framing can be an important feature of decision-making. Narrow framing occurs when an agent evaluates a new gamble in isolation, without taking into account other risks or opportunities. Such a behavior in turn is in contrast with traditional models of decision making since the individual derives utility directly from the outcome of the gamble and not indirectly via its contribution to total wealth (p. 1078). Magi (2009) develops a model of international portfolio choice similar to that developed by Barberis *et al.* (2006), where the representative agent derive utility not only from consumption but also from risky financial wealth fluctuations. In Magi's (2009) model, home bias arises as a result of investors' suboptimal information processing skills and narrow framing preferences, making foreign assets less attractive than they would truly be if investors behaved as depicted in traditional models. Nocetti (2006) provides a "limited attention" framework where investors allocate different levels of mental effort to learn about the mean return of assets. Under the hypothesis of scarce cognitive resources, he solves for optimal portfolios where home bias arises due to endogenous parameter uncertainty.

Investors' tendency to invest in familiar stocks is another frequently employed argument within the behavioral explanations of home bias. In a survey-based study where respondents are asked to evaluate a variety of investment products, Wang *et al.* (2009) report that *the degree of self-reported understanding and the perceived prevalence were highly correlated with perceived uncertainty of the financial products, whereas the correlations of perceived risk with the objective risk measures from historical data are much lower* (p. 5), a finding that supports the hypothesis of familiarity heuristic. Li (2004) examines the role of investors' perception of the country-specific risk of foreign investment on their portfolio choices. She makes use of Pastor's (2000) domestic CAPM to specify the expected returns and risk of foreign investment, where the domestic portfolio is the benchmark asset and around which investors can center their prior beliefs about the risk-adjusted mean excess return and the country-specific risk in each foreign market. Consistent with the literature on the confidence in the familiar, using data on G7 equities over 1971-2000, she finds home bias can be justified among G7 investors if their perceived risk of foreign equities is several times higher than the actual risk or if the risk-adjusted mean excess return on the foreign market of interest is small. Examining the geographical distribution of shareholders of the seven US Regional Bell Operating Companies, Huberman (2001) notes the following: *It seems that the bias favoring the familiar does not reflect the exploitation of an information advantage – real or imagined. Rather, it reflect people's tendency to be optimistic about and charitable toward what they feel affinity with the comfortable and the familiar.* He concludes that the lack of international portfolio diversification is only one of the implications of the tendency to invest in the familiar.

Regarding the familiarity bias in portfolio selection and home bias, Demarzo *et al.* (2004)

suggest that the role of familiarity in investors' portfolio decisions is inversely related to the degree to which investors are informed. In these terms, familiarity stands as a substitute for better information and therefore, it should be less of a bias for better informed investors. Indeed, unlike novice investors with relatively weaker investment experience and capabilities to search for and process relevant information about markets and stocks, one would expect the preference for familiar firms to be less of an issue in particular for professional investors. However, there is substantial evidence that this is not always the case. Lütje and Menkhoff (2007) note that *professional managers are well informed nowadays on financial market theory [...]. Moreover, they are technically able to implement international investment strategies* (p. 22). However, it is interesting that the hypothesis to invest into the familiar and the tendency to hold fewer stocks abroad equally holds even for the group of institutional and professional investors. Lütje and Menkhoff (2007) report that even sophisticated professionals exhibit considerable home bias in an unrestricted international asset allocation setting. Hiraki *et al.* (2003) examine how domestic and foreign money managers invest in Japanese firms over the period 1985-1998. The authors use the firm's size measured by the market capitalization of stocks as proxy for familiarity. Over a sample of 938 firms averaged over years, they show that either domestic and foreign institutional investors over-invest in well-known and prudent companies, and relate their findings to the investor familiarity regardless of the market condition or the location of their clients. Huberman (2001) also provides some examples that professional investors exhibit preference towards firms they feel familiar with. He notes that *the presumably sophisticated employees of J.P. Morgan invest 19% of their 401(K) plan money in Morgan's stock, although the firm offers no incentive to make this particular choice. [...] in some companies, even when employees have the choice of other investment options, they tend to go for what they know* (p. 663).

Studies making use of survey data also prove useful for behavioral explanations of home bias and portfolio selection (see, among others, Graham *et al.*, 2009; Wang *et al.*, 2009; Lütje and Menkhoff, 2007; Dorn and Huberman, 2005; Suh, 2005; Strong and Xu, 2003). Suh (2005) employs data on international portfolio compositions recommended by ten large global institutional investors that participate to *Economist's Quarterly Portfolio Poll* from the first quarter of 1989 to the second quarter of 1999. He notes that these international portfolios *provide an interesting research opportunity because transaction costs and other observable barriers in cross-border portfolio investments do not interfere with asset allocation decisions of the polled institutions* (p. 73). Finding that institutions recommend their home markets more, relative to the weight in the world portfolio and relative to the weight recommended by other institutions in other countries, Suh (2005) attribute a certain part of the observed home bias in these recommended portfolio to investors' optimism about home markets. Using data from UBS/Gallup investor survey, Graham *et al.* (2009) define investor competence as *investor's*

*perceived financial skill or knowledge* (p. 1099) and report that investors' who claim themselves as being more competent tend to trade more frequently and hold less home-biased portfolios. To investigate the role of asymmetric expectations and relative optimism towards home markets, Kilka and Weber (2000) make use of survey data obtained from students participating into graduate level investment courses in Germany and the US among students. They find that each control group exhibits a systematic feeling of being more competent about local stocks surveyed in the questionnaire: US group judges its competence for US stocks significantly higher than for German stocks, and, vice versa for German group. Moreover, controlling their findings by asking survey participants about their competence judgments on two aggregate domestic market indices (DAX for Germany and the Dow Jones for the US), they report that the differences in participants' price and probability judgments about market indices are not significantly different from their judgments about stocks.

Falling into the behavioral biases class, investors' optimism towards their home market can also be at the root of poorly diversified portfolios. Strong and Xu (2003) distinguish between investors' relative and absolute optimism. Relative optimism refers to the fact that investors are more optimistic about their home market than are investors from other countries, while absolute optimism refers to the fact that investors are more optimistic about their home market than they are about foreign markets (p. 308). Strong and Xu (2003) use data from the Merrill Lynch Fund Manager survey carried out around 250 large fund managers around the world, and they find that *whatever be their domicile, fund managers are on average relatively more optimistic about their home market* (p. 310). Shiller *et al.* (1996) examine market participants' expectations in both Japan and the United States over 1989-1994 to explain the crash of the Japanese stock market between 1989 and 1992. They note that there exists substantial variability in expectations within countries and notable differences across countries over the period of interest. Overall, the authors point out to significant optimism towards one's home market in each market. To highlight the effect of optimistic expectations on US, UK and Japanese investors' domestic and foreign asset holdings, French and Poterba (1991) derive the expected returns needed to justify observed international portfolio weights assuming a CRRA utility defined over wealth for investors in each country. Their results suggest that in order to justify the actual holdings, expected domestic returns must be systematically higher than those implied by a diversified portfolio: *Explaining the behavior of both Japanese and British investors requires more "optimism" regarding their own markets: 250 basis points for the Japanese, and over 400 basis points in the United Kingdom* (p. 224).

Beside these aforementioned explanations, the scope of the reasons set forth by studies within the behavioral approach to the topics of portfolio selection and home bias presents a rich diversity. In fact, as pointed out by Tesar and Werner (1995), other factors such as geographic proximity, trade linkages, language barriers, cultural affinities, gender differences

can also matter for international portfolio choice. For example, to gauge for familiarity bias between investors in different countries, a number of studies suggested the strength of bilateral trade linkages as a plausible factor that captures the extent of the familiarity (see, among others, Chan *et al.*, 2005; Tesar and Werner, 1995). Examining individual investors pension plans in Sweden, Karlsson and Norden (2007) find that men are relatively more home-biased than women and relates it to the fact that men are generally more overconfident than women (see also Barber and Odean, 2001). Investors' *feeling of competence* can also matter for portfolio selection. Graham *et al.* (2009) find that male investors and investors with large portfolios or more education perceive themselves as more competent, and therefore, hold more diversified portfolios. Using a panel of World Values Survey over 53 countries, Morse and Shive (2006) suggest that magnitude of home bias is positively linked to investors' patriotism. Cohen (2009) examines the role of loyalty using a dataset on retirement contributions. By differentiating between stand-alone employees who can invest directly in their division and conglomerate employees who must invest in the entire firm, he states that, consistent with loyalty hypothesis, employees of stand-alone firms invest 75% more in company stock than conglomerate employees.

In the conclusion of their 2003 paper, Stulz and Williamson note the following: *If, as argued by the practitioners of behavioral finance, individuals have psychological biases that matter for finance, it would be surprising that individuals' view of the world as determined by their culture does not matter for how they view and act in financial markets* (p. 347).<sup>6</sup> Indeed, culture can be an important component that matter for investors at least for three reasons (see Stulz and Williamson, 2003): i) a country's predominant values depend on its culture; ii) culture shapes out institutions; and iii) culture determines how resources are allocated in an economy (p. 316-317). Then the relevant question relates to finding out how one can integrate a society's cultural affinities in the context of portfolio selection and home bias? The literature has so far employed different attributes as proxies for a country's or society's culture such as language, religion, origin of the judiciary system etc. For example, Grinblatt and Keloharju (2001) analyze Finnish investors' shareownership and trade data and state that *investors whose native tongue is Finnish prefer to hold and trade in Finnish companies that publish their annual reports in Finnish to Finnish companies that publish their reports in Swedish and vice versa* (p. 1054). Stulz and Williamson (2003) find that religion is a predominant factor that explains the cross-sectional variation in investor protection standards among countries. Lucey and Zhang (2010) find that religion and cultural distance are useful to explain the stock market comovements. To measure the cultural distance between countries, they use a metric

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<sup>6</sup> In fact, the recognition that culture affects finance and economy is not a recent phenomenon. In the beginning of the twentieth century, German sociologist Max Weber (1905) points out to the positive effect of Protestant thought on the development and emergence of capitalism in northern Europe. For more recent work on culture and its economic consequences see, among others, Hilary and Hui (2009), Puri and Robinson (2007), Guiso *et al.* (2003), Chui *et al.* (2002).

proposed by Kogut and Singh (1988) who built on Geert Hofstede's work on cultural dimensions.<sup>7</sup>

Although explanations drawn from the behavioral finance school for different issues related to portfolio selection in general, and to home bias in particular, have so far gained significant credit among academics, a question is left unanswered to date: How one could be able to separate out the respective effects of the information and individual's purely behavioral aspects? The main weakness of the asymmetric information based scenario relies on the empirical ambiguity with respect to the comparative performances of domestic and foreign investors. It is known from earlier studies that local investors are not always able to materialize their informational advantage over foreign investors. This raises important doubts about the very nature of investors' presumed informational advantage and leads one to ask whether individuals (or institutions) typically maintain some kind of feeling instead of a more or less mindful economic behavior guided by the differential information in financial markets. For example, contrasting the information-driven with the behavioral hypotheses, Massa and Simonov (2006) conclude that *familiarity-driven investment is a rational response to information constraints as opposed to a behavioral heuristic* (p. 634) and that the effect of behavioral familiarity responds negatively to the degree of investor's sophistication. Testing whether the bias for local stocks is driven by information or by simple familiarity, Ivkovic and Weisbenner (2005) support the information-based hypothesis given the superior performance of investors' on their nearby stock holdings. On the other hand, Grinblatt and Keloharju (2001) underline their skepticism *about superior information as the source of the influence of familiarity* (p. 1072) although they find that *the influence of distance and culture on stockholdings and trades is smaller [...] for more sophisticated household investors* (p. 1054). Similarly, analyzing the equity holdings of more than 3,000 mutual funds from 22 countries, Ke *et al.* (2010) report that the home bias behavior of mutual fund managers is independent of the differences in the cultural background, country of location, and spoken language. They conclude fund managers' preference for closer investments is mostly driven by psychological familiarity issues rather than the information-based scenario of the home bias. DeMarzo *et al.* (2004) argue that familiarity bias can be considered as investors' natural response to incomplete information such that more informed investors are less prone to psychological biases. In summary, to the extent that the ongoing controversies are unlikely to exclude them each other, as noted by Portes and Rey (2005), separating out *familiarity* effects from pure informational asymmetries remains a challenge for academics and for future research (p. 271).

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<sup>7</sup> "Cultural distance" is defined over four cultural dimensions proposed by Hofstede to describe a society's culture, namely, i) individualism, ii) masculinity, iii) power distance, and iv) uncertainty avoidance. For more details, see Lucey and Zhang (2009), Hofstede (1983), [www.geert-hofstede.com](http://www.geert-hofstede.com).



## 4 The Geography of International Portfolios: Learning from the “Gravity Model”

One of the main implications of the voluminous literature on home bias is the robust impact of the geography on portfolio selection. Not only international portfolios violate considerably the well-known normative conclusion of major international asset pricing models according to which all mean-variance rational investors should hold the world market portfolio, systematic geographical biases in portfolio selection are also well-documented. Investors prefer to hold or trade in geographically closer investment alternatives, either on a domestic or an international level. This result is shown by, for example, Lane and Milesi-Ferretti (2008), Grinblatt and Keloharju (2001), and Coval and Moskowitz (1999). Besides, a secondary impact of the preference for geographical is that investors are unlikely to be motivated by any diversification motive when constructing their portfolios. Indeed, investing within closer geographies typically involves highly correlated business cycles across countries (or within regions), higher comovements across portfolio constituents and, consequently, limited risk diversification associated to investment portfolios.

An additional and rather indirectly related literature helps one to account for these controversial effects of geographical biases on portfolio selection and home bias through a simple theoretical model initially derived from Newtonian physics. Namely, in its well-known original setup, the *gravity model* postulates an equilibrium relationship between two distinct objects' masses and the square of the physical distance between them. Since the first time it had been implemented into the economic theory by Tinbergen (1962), the gravity model constitutes an important toolbox in international trade. Theoretical work such as Anderson and van Wincoop (2003), Eaton and Kortum (2002), Deardorff (1995), and Bergstrand (1989, 1985), among others, have successfully shown that different models of international trade can be used to derive gravity-style equations. Anderson and van Wincoop (2004) provide a comprehensive review of these theoretical foundations proposed for the use of gravity model in international economics. The model is also well supported on the empirical ground as shown by Kandilov and Grennes (2010), Trotignon (2008), Lee *et al.* (2008), Kimura and Lee (2006), and Frankel and Rose (2002), among others.

The basic theoretical form of the gravity equation can be written as follows;

$$Y_{ij} = c \left( \frac{M_i M_j}{D_{ij}} \right)$$

where  $Y_{ij}$  is the outcome of interest,  $M_i$  and  $M_j$  are measures of entities'  $i$  and  $j$ 's respective economic masses,  $D_{ij}$  is the distance between  $i$  and  $j$ , and  $C$  a constant. Taking logs, one obtains the following linear equation,

$$\log(Y_{ij}) = c + \log(M_i M_j) - \log(D_{ij})$$

When going to data in the context of international trade in physical goods,  $M$  is generally substituted by an appropriate measure of countries' economic masses such as the gross domestic product, and  $D_{ij}$  by the geographical distance between  $i$  and  $j$ . The model predicts that the outcome  $Y_{ij}$  is increasing with the countries' economic masses and decreasing with the geographical distance which proxies for the costs of trade.

The implementation of gravity models in financial economics is much more recent however. Indeed, the discovery that gravity equations fit well to data on international trade in financial securities constitutes the departure point of a growing literature parallel to the one on international portfolio selection and home bias. Portes *et al.* (2001) using data on equity flows between the US and a set of 40 advanced and emerging markets, and Portes and Rey (2005) using data on bilateral equity flows between 14 countries over a 8 years-long period, collectively show that a gravity model explains transactions in financial assets at least as well as goods trade transactions. Besides, Okawa and van Wincoop (2010) highlight the importance of the release of IMF's "Coordinated Portfolio Investment Survey" as a key driver for most of the recent contributions (see, among others, de Santis, 2010; Coeurdacier and Martin, 2009; de Santis and Gerard, 2009; Daude and Fratzscher, 2008; Ahearne *et al.*, 2004; Rose and Spiegel, 2002) directly using bilateral portfolio holdings data between more than 60 source and 200 destination countries.<sup>8</sup> Since the initiation of gravity models into the financial sphere is mostly empirical, academics have also come up with several attempts to provide theoretical justifications for the use of gravity equations in asset trade (see, for example, Okawa and van Wincoop, 2010; Martin and Rey, 2004) or to develop further econometric techniques used to estimate the model (Santos Silva and Tenreyro, 2006).

The rising popularity of the gravity model in international finance can be traced to the fact that it provides a relatively simple framework to gauge for a large variety of indirect barriers and frictions shaping the observed geographical patterns of cross-border portfolio holdings and flows. Indeed, this is precisely the point linking the two strands of literature on gravity models and home bias. The home bias phenomenon becomes more of a puzzle to the extent that one maintains the view that investors act according to the predictions of standard mean-variance portfolio diversification models. Or, these predictions fail to match with available data. In contrast, the gravity model constitutes a simple and testable framework that fits quite well with actual investment patterns qualified as "bias" by traditional portfolio selection models. In its basic estimating form, gravity equations adequately capture investors' preference towards

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<sup>8</sup> The CPIS files gather country-wide and bilateral portfolio investment statistics in three type of financial security; namely, equity, short-term debt and long-term debt. Briefly, the CPIS is an attempt undertaken by the IMF in the mid-1990s in response to the lack of a worldwide reliable and comparable data base concerning the international portfolio investment positions. When the first issue was published in 1997, only 29 countries had adequately responded to the survey, but the survey coverage improved since then.

closer geographies by means of the distance variable although distance itself should not be a significant covariate of portfolio holdings from a diversification perspective since distant markets typically share weaker correlations with one's home market and provide consequently better hedge opportunities for investors. Geography alone, however, should not be considered as the only or the direct factor that explains asset holdings. Indeed, as emphasized by Okawa and van Wincoop (2010), the gravity model can efficiently be used to control for other forms of international market frictions between countries by including a variety of additional gravity-type proxies into the regression framework such as dummies for common language, legal system origin or trade blocs (Portes and Rey, 2005; Lane and Milesi-Ferretti, 2008), telephone traffic, overlap in trading hours (Portes and Rey, 2005), country-specific political, economic or financial risk factors (Papaioannou, 2009) etc.

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PART C.  
ESSAYS

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Chapter 1.  
Domestic and Foreign Country Bias in International  
Equity Portfolios

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# 1 Introduction

Conventional wisdom suggests that investors should be better off diversifying an equity portfolio by purchasing stocks traded abroad as long as the target foreign exchanges are imperfectly correlated with the domestic exchange. However, despite the increasing access to financial markets worldwide and the general recognition in favor of the potential benefits of global diversification strategies, investors are still unwilling to take advantage of the alternatives located outside their domestic stock markets.<sup>9</sup> The so-called “home bias” in investment portfolios imply that investors irrationally neglect some more or less achievable gains from diversification, which is commonly referred to as one of the unresolved puzzles in international economics and finance literature.<sup>10, 11</sup>

Numerous studies have so far quantified the extent of the home bias for investors in various countries. French and Poterba (1991) document that investors in US, Japan and the UK hold respectively 94, 98 and 82% of their portfolio holdings in domestic stocks. By means of the traditional mean-variance analysis, however, Lewis (1999) finds that the optimal share an average US investor should hold in foreign equities varies between 43% and 76%. Examining the mutual funds’ domestic and foreign portfolio allocations, Chan *et al.* (2005) conclude that the funds based on US invest 85% of their portfolios to domestic securities whose share in the global market capitalization is up to 47%. Bellalah and Bellalah (2007) find that the home bias amounts to 56% for US and 99% for Israeli investors, reporting an average by 88% for their ten-country wide sample. According to Sorensen *et al.* (2007), the home bias in equity, debt and FDI’s seems to have declined over the period 1993-2003 for 24 OECD countries, while foreign holdings are still below the levels predicted by the theory. Likewise, Ahearne *et al.* (2004) report that foreign equities represent around 10% of US portfolio which is a significant increase from their 2% level in late 1980s, yet largely behind the share of non-American equities. Baele *et al.* (2007) note that the decrease of the home bias among European investors may be part of the recent European integration while those are still qualified as “underdiversified”. To summarize, despite the frequently claimed “integration of the financial globe”, the home bias persists and still remains a matter of fact across investors worldwide.

Another line of interest relates to whether such suboptimal allocations are limited to the

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<sup>9</sup> See Solnik (1974) or Adler and Dumas (1983) for pioneering models in the field of international asset pricing and portfolio diversification theory. Empirical evidence in favor of the gains from international portfolio diversification include, among others, Chiou (2009), Driessen and Laeven (2007), Das and Uppal (2004), and De Santis and Gérard (1997).

<sup>10</sup> In a comprehensive survey, Obstfeld and Rogoff (2000) distinguish six major puzzles in the international economic theory: 1) the home bias puzzle in trade, 2) the Feldstein-Horioka savings-investment puzzle, 3) the home bias puzzle in equity portfolios, 4) the international consumption correlations puzzle, 5) the purchasing power parity puzzle and 6) the exchange rate disconnect puzzle.

<sup>11</sup> There exist a vast literature on home bias. Strong and Xu (2003), Karolyi and Stulz (2003), and Lewis (1999) provide substantial reviews of both the theory and the empirics surrounding the subject. For another recent and brief review of the home bias explanations set forth in the literature see Hau and Rey (2008).

domestic components within the aggregate portfolios: While investors are clearly home-biased, do they properly diversify the foreign part of their investments? Interestingly, some recent inquiries such as Lane and Milesi-Ferretti (2008) or Hau and Rey (2008) point out that the existing and trivial amounts held abroad are not in line neither with the traditional view of investor behavior, nor the elementary logic of the diversification practice itself. Along the key results of the portfolio analysis, a simple reasoning would suggest that one should diversify in markets weakly correlated with one's home market as long as geographically proximate countries share stronger political, legal, or even cultural linkages leading to highly synchronized business cycles each other. In this paper, I basically show that the geographical structure of countries' cross-border holdings rejects these perspectives: While the domestic investment proportions are remarkably inefficient from a portfolio diversification standpoint, investors also diversify inadequately abroad in that they tend to prefer a limited number of proximate and strongly synchronized foreign markets when constructing the foreign component of their portfolios. Hence, such poorly diversified foreign portfolios tilted toward geographical proximate markets constitute the fundamental motivation of the paper, which is an issue overlooked by the ongoing debate on international portfolio selection and home bias.

Previous studies typically address the home bias on an aggregate level without explicitly considering the geography of existing cross-border assets (Hau and Rey, 2008).<sup>12</sup> Hence, it is well established that, say, French investors allocate smaller shares of their portfolio to non-French equities compared to predicted ones. Nonetheless, we do not know equally well neither on how these local investors' foreign assets are allocated across various destinations nor on the geographical patterns describing the collection of the destinations considered by local investors. Yet, recent research has set up a convincing case regarding the effect of the geography on domestic portfolio choice. For example, at a regional level, Coval and Moskowitz (2001, 1999) and Huberman (2001) document significant evidence in favor of the local equity preference that US investors exhibit. At an international level, other papers have studied the geography of foreign investing while their scope remains generally restricted. Kang and Stulz (1997) examine the preferences of non-Japanese investors' holdings within shares traded in Japan. Grinblatt and Keloharju (2001) investigate the determinants of Finnish investors' stock holdings in Finnish and Swedish firms. Ahearne *et al.* (2004) provide a breakdown by destination country of US investors' foreign holdings in 48 countries using survey data. Mishra and Daly (2006) provide a geographically disaggregated analysis of Australian investors' foreign assets.

On a broader scope, Chan *et al.* (2005) examine the portfolio allocations of mutual funds based in 26 countries and their holdings across 48 destinations. Beside documenting that

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<sup>12</sup> See, for instance, Baele *et al.* (2007), Sercu and Vanpée (2007), or Sorensen *et al.* (2007).

home bias (i.e. domestic investors overweighting their home market) exists for all countries in their sample, the authors also find that some countries' tend to overinvest into particular destinations leading to positive "foreign bias" ratios (i.e. foreign investors overweighting the destination). For example, they report that the share of US securities represents 61.9% of Canadian mutual funds' portfolios, in contrast to a US share by 46.9% in the world market capitalization. Likewise, Thailand-based mutual funds invest 22.3% of their portfolios to securities traded in Japanese market whereas the latter constitutes 11.3% of the total market capitalization.<sup>13</sup> Examining the cross-border investment patterns using a "gravity model", Lane and Milesi-Ferretti (2008) report the bilateral investment shares across main advanced economies, i.e. the Euro area, the UK, Japan and the US. For instance, UK and Japanese investors allocate 43.7 and 16.8% of their equity assets within the Euro area in contrast to a predicted share of 17.5% that local investors in these economies should have held based on a simple predictive benchmark portfolio allocation.<sup>14</sup> Hence, the authors' calculations point out to positive and negative biases regarding the equity holdings in the Euro area of UK and Japanese investors respectively.

Thus, this paper is mainly in line with Lane and Milesi-Ferretti (2008) and Chan *et al.* (2005) since I also provide evidence on the extent of home bias and the heterogeneities on bilateral portfolio holdings. Unlike these studies, however, I propose a more explicit and descriptive analysis of cross-border investment patterns by directly showing the geographical distribution of bilateral equity assets held by a comprehensive set of investor countries. Doing so, I distinguish two measures decomposing the domestic and foreign components of the home bias puzzle, i.e. the "domestic bias" and the "country bias". A country's domestic bias measures the extent to which local investors' holdings in their domestic market deviates from a predefined benchmark share. On the other hand, the country bias measures the deviation of local investors' bilateral holdings within a particular destination from the benchmark portfolio share. For ease of computation and comparison across countries, I assume that the benchmark allocations follows those implied by the international CAPM, i.e. the portfolio weight of each country is proportional to its relative weight in the world portfolio. While the domestic bias is an aggregate measure of the deviation from equilibrium, the country bias is unique for every possible pair of "source & destination country" in the sample; thus, it would describe in more detail the underlying geography of local investors' cross-border assets. Thus, the main objective is to extend the traditional single as well as the intra-country analysis of home bias that has so far been undertaken by previous studies.<sup>15</sup>

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<sup>13</sup> A similar disaggregated analysis of the foreign portfolio holdings is provided by Hau and Rey (2008) who use data on the mutual funds' equity holdings like Chan *et al.* (2005).

<sup>14</sup> The authors hold the international version of the CAPM to compute the benchmark portfolio shares.

<sup>15</sup> See, among others, Karlsson and Norden (2007), Sercu and Vanpée (2007).

I employ a data set that shows the geographical distribution of a country's aggregate cross-border equity assets. Namely, the IMF's "Coordinated Portfolio Investment Survey" (CPIS) files allow to distinguish between the domestic and foreign components of home bias via a destination-level breakdown of the source country's foreign holdings. The CPIS data consists essentially of a matrix where a particular column shows the amounts of portfolio assets held by a reporting (i.e. source) country in various destination countries listed in the survey. Hence, for each source country included in this study, I first compute its domestic bias ratio to control for the magnitude of local investors' portfolio assets within their own domestic market. Second, I report the distribution of the source country's cross-border assets across different destinations in which local investors hold a positive foreign investment. Describing the bilateral investment positions via pairwise "country bias ratios", I provide evidence on whether biased portfolio allocations are also present within the foreign component of local investors total portfolio holdings. I expect such a visualization of international equity holdings to prove also useful to expand our understanding on the geographical patterns as well as the possible determinants of bilateral portfolio investments.

The analysis point out to a number of findings concerning the home bias puzzle and the geographical structure of bilateral equity holdings. First, as revealed out by foreign diversification and domestic bias ratios, home bias exists across 36 countries for which I report foreign equity ownership data. Meanwhile, the domestic bias shows significant cross-sectional variation across developed-market and emerging-market source countries so that local investors in developed countries exhibit substantially lower domestic bias than do their counterparts in emerging countries. The domestic bias across developed and emerging markets subsamples are, on average, 65% and 93% respectively and the difference between group means is statistically significant. In particular, for some countries like Turkey or India, I find that local investors allocate almost all of their equity stock within their local market. Typically, the tendency to include foreign stocks in the aggregate equity portfolio increases with the economic development and the economic mass of local investors' country of residence. Hence, the rank correlation between the sample countries' GDP per capita and their domestic bias ratio is strongly negative by  $-85.5\%$  significant at 1% level. This result stands also at odds with a number of recent studies arguing that international portfolio diversification should be more advantageous to local investors in emerging markets whose equity comprise relatively little shares within the global marketplace.<sup>16</sup>

Second, I find widespread heterogeneities concerning the distribution of bilateral portfolio holdings. Restricting the focus on a narrower sample of 24 developed and emerging countries, I

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<sup>16</sup> For instance, according to Campbell and Kraussl (2007) *small countries, whose equity comprises a small fraction of the global mean-variance portfolio, would presumably have the most to gain from international diversification* (p. 1242). Likewise, Driessen and Laeven (2007) note that *for investors in small, developing countries, global diversification may be much more important than for US investors* (p. 1694).

compute 623 pairwise country bias ratios that each source country exhibits vis-à-vis various destinations listed in the foreign portfolio of local investors. For most of the bilateral investment positions, I obtain negative country bias measures suggesting that local investors' share in the destination country of interest is below the benchmark level. The result is not surprising since I would expect foreign investors to underweight a particular host as far as local investors overweight it. However, for 109 bilateral investment positions, I observe that investors overweight the destination market yielding to positive country bias ratios between the source and the host. While such overinvestment cases involve generally an offshore financial center (OFC) as the host market, I identify 37 source & host country pairs involving a non-OFC host market like Netherlands & UK, Finland & Sweden, Hungary & Austria etc. Geographical proximity plays an important role to describe these country pairs. Indeed, excluding the OFCs, the average distance between the source and host countries for which I observe positive and negative country bias ratios is 867 km and 6625 km respectively.

Third, I infer from the analysis that the collection of foreign destinations per source is commonly limited in a handful of destinations. In some emerging-market countries like Mexico and Indonesia, investors diversify their foreign equities in less than 15 destinations. For the rest of the sample, the fact that local investors consider more host countries in turn do not translate into a better diversification scheme neither. Indeed, to further mix up the domestic bias puzzle, investors concentrate most of their existing cross-border equity investments within a limited number of destinations: Half of the foreign equity wealth originates from holdings in only 8 and 23 host countries respectively for emerging and develop countries, and in general, the cumulated share of foreign holdings held within the first 10 destinations amount to 80% of the source countries' total foreign portfolio across the sample. Moreover, I observe that this geographic concentration is even more pronounced for the group of emerging countries, which is an observation in line with the stronger imperfect diversification of emerging market investors.

The remainder of the paper is organized as follows. The next section set up the definitions of the domestic and country bias ratios, and describes the data. The third section analyzes the international investment patterns and I document several stylized facts describing the geography of cross-border equity holdings stemming from the estimated domestic and country bias ratios. To better account for these stylized facts existing in bilateral investment positions, the fourth section presents a logit model whereby I relate the foreign diversification and country bias ratios to a series of predictor variables motivated from the previous section. The last section concludes.

## 2 Definitions and Data

### 2.1 Home Country Bias vs. Foreign Country Bias

The bilateral investment stocks between a set of investor (source) countries indexed by  $j = 1, \dots, p$  and destination (host) countries,  $i = 1, \dots, N$ , can be represented as follows,

$$(1) \quad I = \begin{bmatrix} I_{11} & I_{12} & \cdots & I_{1p} \\ I_{21} & I_{22} & \cdots & I_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ I_{N1} & I_{N2} & \cdots & I_{Np} \end{bmatrix}$$

with  $N \geq p$ . A particular element  $I_{ij}$  shows the amount invested by the source country in the host. Conversely, it also corresponds to the liabilities of the host with respect to the source. Using this matrix, one can express the total foreign assets and foreign liabilities of the source country  $j$  as follows

$$(2) \quad \text{Foreign assets, } FA_{jj} = \sum_i I_{ij} - I_{jj}, \quad \text{Foreign liabilities, } FL_{jj} = \sum_j I_{ij} - I_{jj} .$$

Let us assume that the elements in the  $j$ th column of the matrix  $I$  are normalized by country  $j$ 's market capitalization,  $MCAP_j$ , minus the country's total liabilities. Explicitly, the net position or equivalently, the "foreign diversification" of the residents of country  $j$  with respect to the destination country  $i$  is given by

$$(3) \quad FD_{ij} = \frac{FA_{ij}}{(FA_{jj} + MCAP_j - FL_{jj})} ,$$

where  $FA_j$  and  $FL_j$  are defined as above. By subtracting the foreign liabilities, I aim to approximate numerically the source country's net portfolio assets which is equal to equity held in the local market plus equity held in foreign markets. Following this representation, the diagonal of the sub-matrix represents the percentage of investment stock in the domestic market for all countries. Therefore, for every column we obtain  $\sum_{i=1}^N FD_{ij} = 1$  and the term  $1 - FD_{jj}$  would give the percentage share of equity held in foreign stock markets. Using the international CAPM (I-CAPM) as the benchmark portfolio selection model, the optimal fraction that country  $j$ 's investors should hold in their local market,  $W_j^*$ , is proportional to the country's world-market weight in the global portfolio, thus,

$$(4) \quad W_j^* = \frac{MCAP_j}{\sum_{i=1}^N MCAP_i} .$$

In passing, note that the proportions computed via the I-CAPM are not the only possible



benchmark weights. For instance, Baele *et al.* (2007) use different models, namely, i) the classical mean-variance approach, ii) the Bayesian approach introduced by Pastor (2000), and iii) the model-based approach, i.e. the I-CAPM framework, to derive optimal portfolio weights from the viewpoint of US, UK and Japanese investors. The authors perform also a relatively up-to-date estimation to test the validity of the I-CAPM. Out of their 25 country wide sample, they cannot reject the null hypothesis on the alpha coefficient for 21 case. Compared to alternative approaches, the advantage of adopting the model-based approach stems from the fact that the benchmark weights are easy to derive and independent of the local investor country of residence.

The domestic and country bias ratios can be computed using this notation. In order to provide estimates of the home bias for a particular country portfolio, the literature has so far distinguished a number of alternatives. For example, Chan *et al.* (2005) define the home bias as being the log ratio of the share of a particular host country's holdings in the local market to its corresponding world market capitalization weight. Sercu and Vanpée (2007) compute the home bias by subtracting the country's market capitalization weight from the proportion of domestic equities in a country's portfolio. In this study, following Kho *et al.* (2009), and Solnik (2008), I compute the home bias ratio as one minus the ratio of the weights of foreign equities in country  $j$ 's portfolio to shares of foreign equities in the world market portfolio, i.e.

$$(5) \quad \text{Home bias} = 1 - \frac{\text{Share of foreign equities in country } j \text{'s portfolio}}{\text{Share of foreign equities in world portfolio}} .$$

In line with Chan *et al.* (2005), I distinguish two measures to assess biased preferences in international equity portfolios. The first one, "the domestic bias", gives a broad measure of the extent to which the aggregate equity portfolio of the residents of a given country deviates from its world market equilibrium level. The second one, "the country bias", allows the breakdown of the aggregate deviation measured by the domestic bias. In particular, the country bias exists for all possible pairs in our sample and identifies the extent to which the holdings of an investor country within a destination deviates from its presumed equilibrium level. Following this setup, country  $j$ 's domestic bias of is given by

$$(6) \quad DB_j = 1 - \frac{1 - FD_{jj}}{1 - W_j^*} ,$$

where the term in the numerator corresponds to the share of equity investment in foreign stock markets and the term in the denominator is the relative market capitalization weight of all other  $N - 1$  countries from the viewpoint of country  $j$ . According to this representation, a positive  $DB_j$  translates into an overinvestment to the domestic market whereas negative values mean that residents of the source country underestimate their local market. When the

two terms are equal, the domestic bias is zero, whereby one obtains the equilibrium investment share. On the contrary, if local investors allocate all of their equity in their own market, i.e. if  $FD_{jj} = 1$ , then the domestic bias is equal to one.

As stated above, the domestic bias defines an aggregate measure of the deviation from optimality and is unique for a given country. While the resulting ratio is unique and it may eventually reflect a case of optimal investment level into the domestic stock market (i.e.  $DB_j = 0$ ), it does not exclude the possibility that some foreign countries may either be over- or under-weighted by investors in the source country. Therefore, I distinguish a secondary measure in order to account for the sub-optimality likely to prevail in the bilateral investment positions. Namely, the “country bias”,  $CB_{ij}$ , that a source country  $j$  exhibits with respect to its equity holdings in a particular destination is defined as

$$(7) \quad CB_{ij} = 1 - \frac{1 - FD_{ij}}{1 - W_i^*} ,$$

with  $FD_{ij}$  and  $W_i^*$  as defined previously. The country bias ratio allows one to break down the geographical distribution of a given source country’s cross-border portfolio allocations. A positive country bias means that source country  $j$ ’s investors overweight their allocations in the host country  $i$ , while a negative score points out to an underinvestment case. Yet, if the  $CB_{ij}$  is zero, then one obtains the equilibrium investment level.

To illustrate these issues, let us consider a hypothetical capital market in which the countries A, B, and C’s relative market capitalizations are 25%, 15% and 10% respectively. By construction, the sum of their stock market capitalizations correspond to half of the world portfolio capitalization. Further, assume that the bilateral equity shares (in percentages) held between these three countries are given by the following matrix.

$FD_{ij}$	A	B	C
A	25	15	0
B	15	15	0
C	10	20	100

Recall that the element  $FD_{ij}$  should be read as the percentage share of aggregate equity holdings invested by residents of country  $j$  in the destination  $i$ . Under this setup, one can compute the two measures set forth above, e.g. the domestic and country bias ratios. The table below summarizes the results.

$CB_{ij}$	A	B	C
A	0.0	-13.3	-33.3
B	0.0	0.0	-17.6
C	0.0	11.1	100.0

Country A's stock holdings are proportionally distributed with respect to the respective shares of other countries in the world-market portfolio. Therefore, there are neither domestic nor country bias concerning A's portfolio. For the case of country B, the share of equity held in the domestic market is optimal. However, two different cases arise in foreign assets held in A and C. In this setup, one observes that country B's residents underinvest country A's stock market while they clearly overinvest country C's stock market. Finally, investors located in country C completely neglect the international diversification opportunities which leads to an absolute domestic bias concerning country C's local investors.

## 2.2 Equity Holdings Data

I base my estimations of cross-border equity ownerships upon data from the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS) for the year-end 2006. The CPIS files gather country-wide and bilateral portfolio investment statistics in three type of financial security; namely, equity, short-term debt and long-term debt. This study reports data on investment positions in equity securities. Briefly, the CPIS is an attempt undertaken by the IMF in the mid-1990s in response to the lack of a worldwide reliable and comparable data base concerning the international portfolio investment positions. When the first issue was published in 1997, only 29 countries had adequately responded to the survey, but the survey coverage improved since then. For instance, the 2006 issue which is also the one I employ here, contains the bilateral investment positions for 74 respondent (i.e. source) countries' holdings in up to more than 200 destinations. The availability of such a large data base allows one to undertake a detailed (and also comparative) analysis of the geographical structure shaping countries' cross-border equity holdings. It also leaves out some important data-related problems from which the finance literature has suffered until recently in examining the home bias puzzle.<sup>17</sup> Despite its potential shortcomings (see Lane and Milesi-Ferretti, 2008), the CPIS provides a unique perspective on cross-country equity positions.

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<sup>17</sup> The common source of data for estimating cross-border portfolio investments is the IMF's International Investment Position data, included in the Balance of Payments Statistics. It has the main advantage that the database provides data across a comprehensive set of countries as well as it allows a time-series type analysis of the home bias. However, as it has been warned by, for instance, Warnock (2002) or Lane (2000), using flow data for estimating stock positions has several drawbacks. For a recent discussion, see Baele *et al.* (2007, p. 613-614).

## 3 Stylized Facts of International Investment Positions

### 3.1 Results from Domestic Bias Ratios

Table 1 provides summary statistics of the international investment positions in equities among 36 countries which participated to the 2006 survey. The sample is representative enough such that the foreign equity assets held by these countries (i.e. US\$ 11 094 192 millions) represents 80% of the total reported equity holdings in the CPIS, and the sum of their respective world-market capitalization weights corresponds to 85% of the total.<sup>18</sup> For each source country, I report i) the total foreign equity stock; ii) the share of the foreign equity assets allocated across three broad geographical regions (Europe, America, and Asia-Pacific) and the share of equity assets held in “offshore financial centers” (OFCs); iii) the country’s relative world market capitalization; and iv) the corresponding foreign diversification and the domestic bias ratios. For example, we observe that, out of the US\$ 88 145 millions of foreign equity holdings, Austrian investors allocate a share of 77.9%, 15.9% and 5.9% respectively into countries located in Europe, America and Asia-Pacific, and the proportion of foreign equity held in OFCs is up to 35.11%.<sup>19</sup>

[Insert Table 1 here]

Looking at the last two columns, the numbers clearly point out to significant deviations from the benchmark allocations regardless the source country considered. While home bias is generally high, we observe a large cross-sectional variation for the estimated domestic bias ratios: It ranges between some relatively lower values of 36.09% or 49.75% respectively for Netherlands and Belgium, to an absolute home bias with almost 100% of the equity held in the domestic market for India or Philippines. For countries like Greece, Poland and Turkey, the scores are close to the results obtained by Sorensen *et al.* (2007), or Baele *et al.* (2007). The extent of the domestic bias is less pronounced for countries with smaller economies in the sense that developed countries exhibit substantially lower domestic bias ratios. The average domestic bias ratio computed for developed countries is about 65.4%, while the same score jumps to 93.5% for the emerging countries with a statistically significant group difference. For some countries like Turkey, Brazil, India or Indonesia, the foreign diversification ratios are even below 1%, suggesting that investors in these markets completely disregard the

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<sup>18</sup> In this paper, I consider the world market capitalization as the sum of 112 countries’ individual market capitalizations, i.e. US\$ 54 791 846 millions. We collected statistics for market capitalizations from the World Federation of Exchanges as long as a particular country appears on their list, if not from CIA’s World Factbook. For countries member of the Euronext and the OMX Nordic Exchange, we directly downloaded data provided by the respective web sites of these exchanges.

<sup>19</sup> In dividing a particular source country’s foreign assets, I also identified two other groups, namely, destinations located in “Africa” and three other unspecified destinations labeled as “other countries (confidential data)”, “other countries (unallocated)” and “International Organizations”. However, the sum of the proportions reported for Europe, America and Asia-Pacific markets is generally close to unity, yielding an average value of 95.9% across the sample. Therefore, omitting foreign assets held in these destinations when reporting the patterns of foreign equity investment, has trivial impact.

international portfolio diversification opportunities. As a statistical check of the negative link between the country's economic development and the home bias, I compute the rank correlation between the domestic bias ratios and the countries' respective stock market capitalizations. I obtain a negative coefficient of -0.407 significant at the 5% level, suggesting that home bias tend to decline with the market size of the local investors. I also perform the same test using countries' GDPs and GDP per capita. Concerning the GDP, I obtain a slightly weaker correlation by -0.283 that is significant at the 10% level. However, the use of the GDP per capita yields to a much stronger negative relationship, the Spearman's rho is -0.855 significant at 1%. The results tend to support empirically the conclusions put forward in recent papers like Barron and Ni (2008), Ni (2009), or Graham *et al.* (2009), in which authors argue that the likelihood of investors to overweight their local market is inversely proportional to the size of the portfolio they manage.<sup>20, 21</sup>

A secondary intriguing feature of the difference between the propensity to invest overseas across developed and emerging countries is that investors in the former category might also be those who would expect to gain more from international diversification as this fact has been emphasized in studies like Driessen and Laeven (2007), or De Roon *et al.* (2001). Indeed, due to some well-known stylized facts like higher market synchronicity, lower liquidity, poorer investor protection standards etc. the opportunity cost of not diversifying internationally should be higher for investors in emerging markets.<sup>22</sup> Moreover, as stated by Olusi and Abdul-Majid (2008), and Lane and Milesi-Ferretti (2008) investors in smaller countries could benefit more from global diversification since their local markets are commonly less dependent on the global business cycle and provide weaker scope for domestic diversification. However, the question of whether investors in emerging markets could substantially benefit more from international diversification compared to investors in mature and developed capital markets is beyond the scope of this study and is left for further research.

Second, I investigate the geographic concentration of the countries' foreign holdings. Specifically, I report the percentage of cross-border equity stocks held in three broad geographic regions. Beside the lack of global portfolio diversification as documented by the domestic bias ratios, the observed geographic repartition of the foreign holdings across

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<sup>20</sup> A country's economic mass, however, should not be viewed as the only factor behind the difference in the extent of home bias across developed and emerging market investors. For instance, Aviat (2006) claims that "countries that are more open to trade also have more internationally diversified portfolios". Using the "gravity model" framework in examining the determinants of international investments in securities, Portes and Rey (2005) and Lane and Milesi-Ferretti (2008) show that larger economies tend to have larger international equity assets.

<sup>21</sup> That is said, Hau and Rey (2008) present evidence running counter the results put forward in these papers. Using portfolio holdings data at fund level, the authors show that funds with larger market capitalization tend to be more home biased. For another study dealing with the influence of the portfolio size on mutual fund investment behavior and the diversification strategies, see Pollet and Wilson (2008).

<sup>22</sup> For an introduction to and a literature review of key features which characterize the investment context in emerging markets see Schill (2006).

markets in Europe, America and Asia-Pacific points out to a regional preference concerning the existing cross-border assets. The claim of such a geographical bias is even more noticeable when one considers the portfolio allocations of European and non-European countries into Europe. While source countries (both developed and emerging) in Europe invest in average 71.14% of their portfolio into other European markets, the same ratio quickly falls to 31.51% when one considers the portfolio share held by non-European countries within Europe. Likewise, we observe that the sample mean of the percentage held by 6 investor countries in America within the same region is 55.97% while the average share held within America across the rest of the sample (i.e. non-American source countries) is only 24.04%. Yet, it can be easily checked that for both cases, the differences between the means are highly statistically significant, suggesting that countries exhibit a tendency to invest more in proximate markets when forming the foreign part of their portfolios.<sup>23</sup>

Another striking feature stemming from the table is the substantial volumes of foreign equity invested in markets qualified as “Offshore Financial Centers” (OFCs). Indeed, the average share of foreign equity held in OFCs amounts to 31.01% across the whole sample, ranging from 1.75% for Philippines to an upper limit of 70.89% for the case of Italy. Although there is not a complete agreement among scholars with respect to a specific definition of the OFCs, Zoromé (2007, p. 4) mentions three recurrent characteristics describing the investment environment within the OFCs. First, OFCs are mostly oriented financial services toward nonresidents. Second, they offer favorable regulatory environment such as low supervisory requirements. Third, OFCs are typically considered as “Tax Havens” in that investors enjoy very low taxation schemes on their holdings. In this study, I qualify those countries and jurisdictions as OFC according to the definitions provided by the IMF and the International Financial Stability Forum (FSF).<sup>24</sup> Throughout the next section, we will observe that OFCs such as Luxembourg, Ireland or Cayman Islands are frequently displayed in the destination list of the source countries.

### **3.2 Results from Country Bias Ratios**

Having documented the extent of the domestic bias, I now turn into a more detailed analysis and I seek answer(s) to the following question: Given the local investors’ apparent focus toward their domestic markets, is the foreign part of their equity portfolios properly diversified either? To answer the question, I examine the bilateral investment stocks among a set of 12 developed and 12 emerging countries by providing a geographical breakdown of their cross-

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<sup>23</sup> In both cases, to check the null hypothesis of equal sample means, I performed a heteroskedastic t-test due to unequal sample sizes. The critical p-values, either for one-tailed or two-tailed cases, are largely below the 1% level, suggesting that the null hypothesis can easily be rejected.

<sup>24</sup> The list of the OFCs as defined by the IMF and the FSF can be found in Zoromé (2007), p. 23.

border equity holdings across the destination countries considered by local investors.<sup>25</sup> Specifically, I compute the “country bias” ratios existing between each source country and the thirty most important destinations included in this source country’s aggregate foreign equity portfolio. As defined previously, the country bias ratio  $CB_{ij}$  between the host and the source countries, measures the deviation of  $j$ ’s holdings in the host from a predefined benchmark level. For each source country, the table shows 1) the destinations’ market weights in the world portfolio, 2) the pairwise foreign diversification ratios, and 3) the corresponding country bias ratios computed using the information given in the first and second columns. For a given pair of “source vs. destination”, recall that a positive (negative) country bias translates into the case where local investors in the source country overweight (underweight) their holdings in the destination with respect to the latter’s benchmark world market share.

[Insert Table 2 here]

The table resumes the bilateral investment positions by providing 659 foreign diversification and 623 country bias ratios. However, we cannot compute the country bias for 36 observations due to lack of market capitalization data for the host country, particularly when it involves cross-border assets held in OFCs. Nonetheless, we still report bilateral investment data for the OFCs since they frequently show up as destinations, attracting substantial portions of the source countries’ foreign equity wealth.

For most of the bilateral investment positions reported in Table 2, I observe that the foreign country shares of the local investors do not match with the destination countries’ relative market capitalizations weights in the world portfolio. 514 observations out of the 623 country bias ratios, are negative suggesting that the sample countries’ bilateral investment shares in various hosts typically falls behind the benchmark equilibrium level. This is not surprising since overweighting the domestic market would automatically imply the underweighting of the rest of the world. Concerning the constituents of local investors’ foreign holdings, it is quite apparent that developed countries with larger stock markets and sizeable economies are the principal destinations for investors either in developed and emerging countries: The sum of the investment shares held in developed countries and the G7 countries corresponds to 90% of the developed countries’ foreign assets and 45% of that of the emerging markets. Put another way, the seven biggest economies in the world soak up almost half of the foreign equity capital reported by these 24-country sample. However, even though these economies attract substantial volumes of foreign equity investment inward, they are still significantly underweighted by local investors’ portfolio whatever be the source.<sup>26</sup> Over the entire sample,

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<sup>25</sup> Compared to the previous subsection, I focus on a narrower but still representative sample: The sum of the foreign assets of these 24 countries corresponds to 72% of the total foreign equity assets reported by the CPIS files.

<sup>26</sup> The only exception is the position of Dutch investors whose bilateral holdings in the UK market exceed the world market weight of UK.

the average country bias regarding the holdings in the group of G7 is  $-10.4\%$ , which sharply drops with the market size of the destination. For example, while the average deviation of investors' foreign assets vis-à-vis their holdings in the US market is  $-48.5\%$ , the same statistic is about  $-8.4\%$  for the bilateral positions in Japan,  $-5.6\%$  in UK.<sup>27</sup> The next figure and the associated table provide an overview of these bilateral investment patterns.

[Insert Figure 1 here]

The figure shows the percentage shares of negative and positive country bias ratios and some preliminary statistics concerning the bilateral deviations measures deployed in Table 2, for all countries, and for developed and emerging countries subsamples. Excluding the destinations for which we can't estimate the extent of the bilateral deviation, the share of the negative country bias ratios is about 83% of the total (i.e. 623 observations), and the picture does not vary considerably across developed and emerging countries subsamples: In addition to the widespread domestic bias toward home market, investors generally underweight foreign markets when forming the cross-border part of their portfolios, mixing up the already incomplete international diversification scheme. I control the results by eliminating observations involving the OFC destinations, after which I am left out with 485 country bias scores, 271 observations for developed and 214 for emerging countries. Unsurprisingly, we notice that the respective shares of the negative and positive country bias ratios move in opposite directions: The proportion of the negative country bias ratios increase to 93% of the total whereas there is only 7% positive country bias left.<sup>28</sup> This is mainly due to numerous positive country bias ratios observed when the assets are held in an OFC.

Although a significant portion of the bilateral positions point out to negative deviations from the host countries' world market weights, we also notice a non-negligible number of cases in which local investors overinvest into a particular foreign country. In Table 2, 109 such bilateral holdings are highlighted using boldfaced characters. As emphasized previously, most of these positive deviations occur when the destination market involved is an OFC. Among the remaining 37 observations with non-OFC destinations, I observe such deviations across country pairs like "Finland & Sweden, Norway and Estonia", "France & Germany, Netherlands and Belgium", "Germany & Netherlands and Austria", "Netherlands & UK and Belgium", "Spain & Portugal", "Sweden & Finland, Norway and Denmark" within the developed countries. Looking at panel B, similar relationships exist between "Czech Republic & Belgium, Austria, Hungary, Slovakia, Poland and Slovenia", "Hungary & Austria, Poland

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<sup>27</sup> The situation is quite similar for the remaining members of the G7 group. Investors' foreign holdings within France, Canada, Germany and Italy deviate from their respective world market weights by  $-3.5\%$ ,  $-3\%$ ,  $-2.1\%$  and  $-1.5\%$  in average respectively.

<sup>28</sup> In this category, I also consider a small number of observations for which we have a zero foreign country bias, i.e. the bilateral investment share of local investors is exactly the same as the market capitalization weight of the host country. These country pairs are "Poland & Estonia", "India & Nepal", "India & Ghana", "Brazil & Panama", "Brazil & Paraguay", and "Brazil & Costa Rica", and four other cases which involve assets held in OFCs.



and Czech Republic”, “Poland & Austria, Hungary, Slovakia and Estonia”, “Argentina & Brazil”, etc. In a related fashion, five African countries are included nowhere but the list of South Africa; while Papua New Guinea does exclusively appear in Australian investors’ foreign portfolio.<sup>29</sup>

The most striking feature across these “source & host” country pairs is the geographical proximity between them. As mentioned earlier, investors’ preference toward less distant alternatives is by far an empirical regularity stemming from data either on a micro- or a macro-level. Yet, the bilateral investment positions reported here, show the significant influence of the distance on local investors’ decisions to invest abroad. For example, excluding holdings in OFCs, the average distance between the source and host countries with positive and negative country bias ratios is 867 km. and 6625 km. respectively. The difference between group means is statistically highly significant.<sup>30</sup> Over a set of 520 available observations, I also compute the rank correlation of the bilateral foreign diversification ratios with the corresponding distances between countries, and I find a negative correlation by  $-0.317$ , significant at the 1% level. Thus, the more a particular destination is geographically close to the source, the higher are local investors likely to allocate or even overweight their portfolio shares within this destination.

From a portfolio diversification perspective, however, distance should be a positive correlate of the of investors’ foreign holdings in a particular destination since geographical proximity would translate into more synchronized business cycles. Although the effect of the distance seems to be puzzling at first sight, the literature has provided evidence that the geography plays indeed a key role in portfolio selection either on a domestic (Malloy, 2005; Coval and Moskowitz, 1999) or an international level (Aviat and Coeurdacier, 2007; Hau, 2001). In fact, geographical proximity commonly translates into amplified relations across countries via extended economic, institutional, or cultural exchange mechanisms. For instance, the existence of a voluminous bilateral trade between two countries A and B compared to a third one C, would force A’s investors to hedge against the purchasing power parity risk and output fluctuations in country B rather those in C, leading to a country bias in favor of the destination B (see also Aviat and Coeurdacier, 2007 or Cooper and Kaplanis, 1994). Moreover, such trade linkages between A and B would also contribute to increase the quantity as well as to improve the quality of bilateral information flows across these two countries, creating a tendency among local investors to hold significant portions of the other country’s stocks.

Yet, geographical proximity could also proxy for some institutional and cultural affinities. First, recent papers like Papaioannou (2009), Alfaro *et al.* (2008) or Gelos and Wei (2005)

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<sup>29</sup> These countries are Ghana, Namibia, Botswana, Zimbabwe and Nigeria.

<sup>30</sup> Distance data for all source & destination country pairs is obtained from [www.indo.com/distance](http://www.indo.com/distance).

revealed significant linkages between institutional characteristics and cross-border investment patterns. According to these papers, to the extent that regional integrations generate similar taxation environments or common regulatory and legal institutions, one would expect that the heterogeneities across bilateral portfolio investments be less pronounced within such neighborhood clusters. In these terms, bilateral investment patterns observed among countries member of the OMX Nordic and Baltic Exchanges is particularly interesting: I observe that the holdings of Finnish and Swedish investors in other Scandinavian and Baltic stock markets (e.g. Denmark, Estonia, Finland, Norway and Sweden) are all positively biased with respect to the benchmark shares of these destinations. Second, concerning the impact of the culture, the literature has so far distinguished numerous factors ranging from language (Grinblatt and Keloharju (2001)) to religion (Stulz and Williamson (2003)), and commonly referred to as the “familiarity bias” in portfolio selection (Hiraki *et al.* (2003), Huberman (2001)). Although the very source of the familiarity bias is an ongoing debate, geography can help us to understand the information-based dimension of familiarity since geographical proximity translates into less significant information asymmetries and more frequent exchanges across countries, firms, and individuals.<sup>31</sup>

From the table, I distinguish another interesting but not directly observable feature which would equally help to describe the geography of international investments and the imperfect diversification of foreign portfolios. In fact, although many investor countries’ cross-border portfolio list include more than 30 destinations in the original data files, I note that the data loss due to considering a limited number of host countries remains trivial. More precisely, I observe that investors concentrate a big part of their cross-border assets in only a handful of countries: On average, the foreign equity stock held in the first 10 and 30 destinations constitutes respectively 80 and 97% of countries’ total foreign equity stock. I refer to this observation as the “geographic shrinkage” of the investment portfolios, which suggests that “home bias coexists with a substantial imperfect diversification in the sense that local investors do only consider a limited number of alternatives when forming the existing part of their foreign holdings”.

[Insert Figure 2 here]

To illustrate this point, Figure 2 provides a graphical sketch of the observed geographic concentration in cross-border portfolios. Specifically, I illustrate how much of the foreign

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<sup>31</sup> See Lütje and Menkhoff (2007) and Dvorak (2005) who examine local and foreign investors’ informational advantages within a particular domestic market. Essentially, the literature contrasts a purely behavioral source of the familiarity bias to the asymmetric information issue. According to the proponents of behavioral theories, familiarity is an “inclination that alters perception” and makes people to be “more comfortable and tolerant of risk when they are personally familiar with a specific circumstance” (Ricciardi (2008, p. 101)). On the other hand, the information-based familiarity bias, as the theoretical background is developed by Merton (1987), originates from a better (perceived) knowledge about a particular investment alternative so that “investors are not aware of all the stocks or do not know them well enough to be willing to invest in them” (Massa and Simonov, 2006, p. 640)).

equity stock is obtained by gradually enlarging the set of destinations for developed and emerging countries. In other words, the graphics show the marginal contribution of adding one more destination to the cumulative value of the source countries' cross-border holdings. To plot the curves, first, I sort out the available foreign diversification ratios displayed in Table 2 in a decreasing order. Second, I compute the percentage share of each observation in the total. Third, I calculate the cumulative sum of the percentage contribution of each subsequent observation till one obtains at least 90% of the total foreign diversification scheme which is given by the sum of all foreign diversification ratios. To avoid confusion, I omit holdings in the OFCs once again. From the figure, it is highly apparent that investors tend to shrink their cross-border equity assets in a limited number of destinations since the marginal contribution rapidly declines with the number of destinations: Half of the foreign equity is due to the investment stock in the first 8 and 23 observations respectively for emerging and developed countries. Almost 90% of the foreign assets is distributed within the first 52 destinations for the group of emerging countries while the same proportion of the developed countries' foreign holdings is spread into 138 destinations. Hence, the geographic concentration is substantially more pronounced for the group of emerging countries. Such an obvious gap suggests not only that investors in less developed countries are more home-biased as portrayed above, but also their foreign portfolios are geographically more shrunk than those of the developed countries.

To combine the geographic shrinkage with a likely impact of the host country's economic size, I perform the same procedure by considering the source countries' foreign assets in the group of G7 countries. The resulting graph is provided in the lower panel of Figure 2. Again, the geographic shrinkage among countries' foreign holdings is highly apparent. When I consider the group of emerging countries as the source, I observe that only the first 13 observations involving holdings in the G7 destinations suffice to constitute half of the total foreign equity stock held by investors in emerging markets. Looking at the group of developed countries, I observe that the sum of the first 24 bilateral foreign diversification ratios involving a G7 country as destination amount to 50% of these countries' total foreign assets. In fact, these 13 and 24 observations constitute only 4.3% and 6.7% of the total number of foreign diversification ratios reported respectively in Panel A and B of Table 2.

## 4 A Qualitative Analysis of Bilateral Portfolio Allocations

To investigate the cross-country differences in bilateral investment positions documented above, I relate the countries' foreign diversification and country bias ratios to a set of predictors. I distinguish two independent variables. First, the "foreign diversification",  $FD_{ij}$ , is defined as being equal to 1 if the source country  $j$  has a positive foreign investment stock in the host country  $i$ , and 0 otherwise. Second, the "country bias",  $CB_{ij}$ , is equal to 2 if the source

country  $j$  overinvests in the host country  $i$  with respect to the international market equilibrium share, 1 if the source country  $j$  underinvests in the host  $i$ , and 0 if there is any bilateral investment stock running from  $j$  into  $i$ . Thus, in both cases, a zero score corresponds to a lack of foreign equity holdings in the host country. Using the source and destination countries listed in Table 2, I obtain a dataset consisting of 24 source countries' bilateral investment stocks in 83 destinations. Obviously, I eliminate all observations involving the same country as the source and destination at the same time.

I employ an array of predictor variables which are essentially motivated by the discussion of the previous section. Namely, I employ 1) "DEV", a dummy variable equal to 1 if the destination country is a developed market, 2) "G20", a dummy variable equal to 1 if the destination belongs to the group of G20 countries, 3) "REG", a dummy variable equal to 1 if the source and destination countries fall within the same geographical group as classified by the World Bank, 4) "LANG", a dummy variable equal to 1 if the source and destination countries share a common language, 5) "OFC", a dummy variable equal to 1 if the destination country is referred to as an "offshore financial center",<sup>32</sup> 6) "FINCENTER", a dummy variable equal to 1 if at least one city located in the destination is listed in the "Global Financial Centres Index",<sup>33</sup> 7) "TRADE", a dummy variable equal to 1 if the source and destination countries share a common international trade agreement (ASEAN, European Union, MERCOSUR, NAFTA), 8) "DIST", a dummy variable equal to 1 if the geographical distance between the source and destination countries is less than 3,000 km, and 9) "EURO", a dummy variable equal to 1 if the destination country is in the Euro zone.

Tables 3 and 4 present the results of binary and ordinal logistic regressions where the dependent variables are "foreign diversification" and "country bias" respectively. The first column shows the results obtained using the full sample of source and destinations. I also run the regressions using different subsamples in columns 2 to 5. In column 2, I exclude all observations involving an "offshore financial market" as the destination. Therefore, the variable "OFC" is also excluded from the regressors. In columns 3 and 4, regressions are run using only the developed-market and emerging-market source countries. Finally, the column labeled "Euro-zone source countries" includes only the source countries making part of the Euro zone and I add the "EURO" variable in the set of explanatory variables to account for the impact of sharing a common currency on the decision to invest abroad. For each subsample, I also report the number of source countries and the number of observations used to estimate the equations. Standard errors are provided below the parameter estimates. The  $\chi^2$  statistic derived from a Wald test, evaluates the overall significance of the model against the null

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<sup>32</sup> The list of OFCs employed in the dataset is provided by Zoromé (2007, p. 23).

<sup>33</sup> Provided by The City of London Corporation, the "Global Financial Centres Index" evaluates the competitiveness of 46 financial centers worldwide. For more information [www.cityoflondon.gov.uk/GFCI](http://www.cityoflondon.gov.uk/GFCI)

hypothesis that all coefficients are zero. I denote the level of statistical significance at 10% (respectively at 5 and 1% levels) for of the estimated coefficients by \* (respectively by \*\* and \*\*\*). Due to the nature of the model, the percent of the explained variance is given by the pseudo R-squared measure.

[Insert Table 3 here]

[Insert Table 4 here]

As indicated by the Wald test results, the global null hypothesis is rejected for all specifications at 1% level. Regressions explain a good deal of the variance observed in the data as shown by the pseudo R-squared ranging from a lower value of 18% in Table 3 to a higher value of 34% in Table 4. The variables perform generally well with coefficient estimates being significant and entering the regressions with expected signs. At first sight, a country's level of economic development and the degree of market sophistication seem to be the foremost determinants of the bilateral investment patterns. Specifically, the variables "G20" and "FINCENTER" through which I capture these effects, enter the regressions with statistically significant coefficients across all specifications. In terms of the probability odds, the impact of a one unit increase in a destination's economic development (i.e. "G20") on the outcome of interest range between a lower value of 2.99 to a higher value of 3.9 in Table 3 and from 1.55 to 2.49 in Table 4. Likewise, the variable "DEV" indicating whether the destination is a developed-market country performs also well with the exception that it is not significant under the Euro zone subsample in Table 3 and under the third and fourth columns in Table 4. Beside the effect of the economic development, a destination's presence in the list the "Global Financial Centers Index" is more pronounced due to the higher coefficient estimates, in particular when one takes the country bias as the dependent variable. Hence, everything else being equal, the level of financial market competitiveness and sophistication reveals out to be another important driving factor behind the decision to invest cross-border.

The variables "REG" and "DIST" aim to capture the effect of geographical proximity on the likelihood to invest abroad. The region dummy does not adequately enter the regressions except the emerging-market source countries subsample in Table 3. Instead, DIST is likely to capture better the effect of the geographical proximity on bilateral equity holdings. It is not surprising that DIST performs much better for Euro zone countries subsample since a distance by 3,000 kilometers is enough to encompass most of the foreign destinations a source country in Europe would consider. The coefficients can be partially misleading when one considers some remote countries like South Africa or Australia, for which excluding all countries far from 3,000 kilometers would be equal to put zeros to almost all pairwise observations.

In line with the hypothesis of preference toward geographically close alternatives, it has also been emphasized that bilateral trade would serve as an appropriate proxy which captures

the informational frictions between countries (Lane and Milesi-Ferretti, 2008). In Tables 3 and 4, we observe that the TRADE variable performs also quite well under conventional levels of statistical significance. Moreover, it yields to the highest coefficients under the specification for which the dependent variable is set to be the country bias in column 1 of the Table 4. Hence, if a pair of source and destination countries share a common international trade agreement such as the NAFTA or the ASEAN group, it is more likely that one observes a positive cross-border portfolio investment running from in both ways among them.

Throughout the previous section, we have observed how frequently the offshore and small financial centers appear in the destination lists of source countries. These countries (or jurisdictions) which offer competitive investment features such as low or zero-taxation schemes are likely to attract substantial foreign capital inward to the extent that financial activity in OFCs is dominated by the provision of intermediation services for larger countries (Rose and Spiegel (2007)). Therefore, whether a destination country is an OFC or not should also affect the geography of a source country's foreign portfolio allocations. In Tables 3 and 4, I try to capture this effect by the variable "OFC". The estimated coefficients point out that the effect of OFCs on the geography of bilateral portfolio holdings is substantial when one considers the foreign diversification as the dependent variable. Surprisingly, the offshore dummy is not significant in none of the subsamples in Table 4, where the OFC effect seems to have been soaked up by the FINCENTER dummy.

## 5 Concluding Remarks

This study presents an analysis of the geographical patterns underlying the cross-border equity positions and the home bias in portfolio holdings across a large set of developed and emerging source countries as of the end-2006. I distinguish two components of the home bias phenomenon, namely the domestic bias and the country bias, each one capturing different aspects of local investors' portfolio allocations at home and abroad. The "domestic bias" refers to the deviation of local investors share in the domestic market while the "country bias" evaluates local investors' equity holdings in a particular foreign market, both using a predefined benchmark investment level. For comparison purposes, I employ the international CAPM to derive the optimal portfolio allocations. While earlier studies have well documented the first issue, i.e. the "domestic bias", I argue that relatively little is known concerning the bilateral investment patterns and the deviations from the international capital market equilibrium. Using data from the IMF's "Coordinated Portfolio Investment Survey", I provide an in-depth analysis of the international investments patterns and the geography of portfolio holdings. From a larger perspective not restricted either to US or to developed countries, I identify a number of stylized facts stemming both from the analysis of country-level and

bilateral equity portfolios which can be summarized as follows.

First, the domestic bias is unsurprisingly omnipresent across the 36 countries for which I report data on foreign asset holdings. However, there exists a large cross-sectional variation concerning the domestic bias ratios. These range from a lower value of 36% to a higher value of almost 100%. While two Benelux countries, namely Belgium and the Netherlands are relatively more outward looking compared to the rest of the sample, in some countries like Turkey or India, I observe a quasi-absolute domestic bias with almost 100% of the equity wealth held within the domestic market. Overall, developed countries exhibit weaker domestic bias than does emerging countries as captured by the negative rank correlation by  $-0.855$  between countries' GDP per capita and their respective domestic bias ratios.

Second, as conjectured by Chan *et al.* (2005) who note that *when domestic investors overinvest in their local market, foreign investors must on average underinvest in this local market* (p. 1510), I find that the deviations from the world-market equilibrium are not solely limited to the domestic component of countries' equity holdings. To account for this observation, I break down the sample countries' aggregate cross-border equity stock by destination market and I present estimates of 623 different bilateral country bias ratios that these source countries exhibit vis-à-vis various destinations. Such a disaggregation of the cross-border holdings is an important feature of this paper with respect to previous studies such as Lane and Milesi-Ferretti (2008) or Chan *et al.* (2005), in that it provides direct evidence on both the bilateral investment patterns and the geography of local investors' foreign equity holdings. For most of the bilateral investment positions examined, I still find negative deviations from the benchmark portfolio shares suggesting that suboptimal allocations exist equally on disaggregated foreign equity stocks. However, even after excluding OFC countries, there exists a non-negligible number of observations where the resulting country bias point out to positive deviations from the benchmark shares, so that local investors allocate more than the relative world-market weight into the host. I observe that distance is a key factor to describe this set of positively deviated bilateral holdings; and more generally, local investors are broadly unwilling to incorporate geographically remote markets in the list of foreign destinations when they consider to invest abroad. Consistent with previous studies like Portes and Rey (2005) or Portes *et al.* (2001), distance seems to capture much of the international market frictions preventing investors from considering overseas markets.

I identify a third and related issue which further mix up the inadequate diversification and the geography of cross-border portfolio allocations. Countries' foreign holdings are mostly concentrated in a handful of destinations and this observation is more pronounced concerning the cross-border equity allocations of emerging market investors. The target destinations generally tend to be countries with developed and large equity markets; namely the group of G7 and/or the markets located in the European Union, particularly when the source country is

also located in Europe. Aggregating the source countries' foreign holdings, I find that summing up the investment shares in only 8 host market out of the 299 available observations, is enough to explain half of the emerging markets' existing foreign equity stocks. While relatively much smoother, the geographic shrinkage of the cross-border holdings is equally present within developed-market source countries: The first 23 foreign diversification ratios out of the 360 available observations reported in Table 2 explain half of the foreign equity stock of local investors in developed countries.

An important direction for future investigation concerns the role of offshore financial centers. In Table 1 and Table 2, I presented the source countries' aggregate and bilateral shares of foreign assets held in OFCs. Quantitatively, foreign equity investment inward OFCs represents in average 26% of the total foreign equity held by 36 countries included in Table 1, and for countries like Italy, Turkey and Belgium, one observes that the investment shares held within OFCs exceed half of the local investors' aggregate cross-border holdings. Geographically, one can also note that offshore markets appear frequently among the list of destination markets regardless the home country of domestic investors: More than one fifth of the 623 bilateral country bias ratios reported in Table 2 belongs to observations involving an OFC as the host market. As pointed out by Lane and Milesi-Ferretti (2008), OFCs act as pure intermediaries in international asset allocation process to the extent that every dollar invested in an OFC is reinvested abroad by the corresponding market. Hence, determining the reallocation of these funds to their ultimate destination would be an additional but difficult exercise due to limited information on the patterns of investment toward OFCs. As an issue so far overlooked by the literature and in connection with Lane and Milesi-Ferretti's claim, investigating whether investors show a geographical preference vis-à-vis their allocations within OFCs would also constitute a challenge for future research in order to enlarge our understanding on the patterns of cross-border investments in these small but regularly frequented markets.

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Table 1. Domestic bias ratios and the geographic concentration in international equity holdings

Panel A Developed countries	Region	Foreign equity	% of foreign equity held in			World market weight	Foreign diversification	Domestic bias ratio
			Europe	America	Asia-Pacific			
Austria	Europe	88 145	77.90	15.94	5.98	0.36	39.36	60.49
Belgium	Europe	267 105	87.77	9.92	2.28	0.72	49.89	49.75
Denmark	Europe	130 724	55.04	28.64	15.03	0.44	41.74	58.08
Finland	Europe	96 259	73.91	17.66	7.43	0.56	36.09	63.71
France	Europe	706 969	70.02	20.59	8.99	4.40	30.82	67.76
Germany	Europe	611 558	81.62	12.97	5.29	2.99	39.17	59.63
Greece	Europe	13 355	66.60	27.25	0.97	0.38	7.49	92.48
Italy	Europe	534 875	84.51	11.46	3.72	1.87	43.62	55.55
Netherlands	Europe	558 128	44.16	42.16	12.87	1.41	63.00	36.09
Norway	Europe	176 025	51.71	32.75	12.90	0.51	47.41	52.35
Spain	Europe	175 415	85.01	10.03	4.46	2.41	14.01	85.64
Sweden	Europe	260 392	61.92	28.20	9.57	1.13	37.28	62.29
Switzerland	Europe	421 722	60.15	18.10	5.90	2.21	38.47	60.66
United Kingdom	Europe	1 362 010	40.89	29.62	25.15	6.92	37.42	59.80
Canada	America	480 281	29.75	55.14	14.66	3.10	26.45	72.71
United States	America	4 328 962	50.59	21.33	26.93	35.72	19.86	69.11
Australia	Asia-Pacific	164 856	18.70	51.51	14.50	2.00	15.77	83.90
Japan	Asia-Pacific	510 418	34.37	54.90	10.56	8.96	11.79	87.05

Panel B Emerging countries	Geographical region	Foreign equity	% of foreign equity held in			World market weight	Foreign diversification	Domestic bias ratio	
			Europe	America	Asia-Pacific				Offshore markets
Bulgaria	Europe	148	98.98	0.75	0.27	42.41	0.02	1.51	98.48
Czech Republic	Europe	9 683	89.72	9.11	1.01	22.74	0.09	19.59	80.39
Hungary	Europe	4 740	83.73	11.83	4.06	44.92	0.08	18.31	81.68
Poland	Europe	5 224	73.38	9.63	0.13	27.91	0.28	3.82	96.17
Turkey	Europe	165	64.64	25.69	0.45	54.18	0.30	0.13	99.87
Argentina	America	11 525	22.01	74.56	3.25	14.18	0.09	19.50	80.48
Brazil	America	3 735	31.09	68.22	0.50	52.53	1.30	0.67	99.32
Chile	America	43 969	54.46	45.19	0.34	52.51	0.32	21.05	78.89
Mexico	America	5 303	28.62	71.37	0.01	18.36	0.64	2.20	97.79
India	Asia-Pacific	241	44.74	23.77	27.05	44.58	1.49	0.04	99.96
Indonesia	Asia-Pacific	359	0.06	2.46	97.48	3.47	0.25	0.32	99.68
Malaysia	Asia-Pacific	3 753	16.02	10.54	72.84	66.15	0.43	1.82	98.17
Philippines	Asia-Pacific	117	15.89	81.10	2.91	1.75	0.12	0.20	99.80
South Korea	Asia-Pacific	36 819	52.32	18.34	28.43	61.18	1.52	5.59	94.33
Thailand	Asia-Pacific	1 694	28.30	10.85	14.95	31.52	0.26	1.54	98.45
Egypt	Mid.East-Africa	886	15.78	2.65	66.50	12.34	0.17	1.02	98.97
Israel	Mid.East-Africa	12 550	21.49	70.85	3.26	6.07	0.30	9.00	90.97
South Africa	Mid.East-Africa	66 082	71.45	26.80	0.78	25.95	1.30	9.30	90.58

Notes: All numbers expressed as percentage values except "Foreign equity" column which is in terms of US\$ millions. For each source country, the table reports i) the amount of total foreign equity assets reported by the investor country, ii) the geographic distribution of these funds across destinations located in Europe, America and Asia-Pacific regions, iii) the share of foreign equity held in OFCs (regardless the geographical group of the destination market), iv) the source country's relative share in the world-market capitalization (we assume a total value of US\$ 54 791 846 millions corresponding to the sum of 112 countries' market capitalizations for which we have access to data), v) the source country's foreign diversification ratio which indicates the ratio of the local investors' foreign equity holdings to their aggregate equity holdings (domestic plus foreign), vi) the domestic bias ratio which is defined as one minus the ratio of the country's foreign diversification score to one minus the country's world-market capitalization weight.

Table 2. Country bias ratios and the geographic breakdown of international equity holdings

Panel A. Developed-market countries

j		Finland					France					Germany					Italy				
i	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	
1	Sweden	1.13	5.28	4.20	Luxembourg	0.15	4.24	4.10	Luxembourg	0.15	16.78	16.66	Luxembourg	0.15	24.66	24.55		0.15	24.66	24.55	
2	Luxembourg	0.15	5.18	5.04	USA	35.72	4.02	-49.3	USA	35.72	4.56	-48.5	Ireland	0.30	3.23	2.94		0.30	3.23	2.94	
3	USA	35.72	4.28	-48.9	UK	6.92	3.65	-3.52	France	4.40	3.62	-0.82	France	4.40	2.95	-1.52		4.40	2.95	-1.52	
4	UK	6.92	3.86	-3.29	Germany	2.99	3.44	0.47	UK	6.92	2.43	-4.83	USA	35.72	2.59	-51.5		35.72	2.59	-51.5	
5	Ireland	0.30	2.67	2.38	Netherlands	1.41	2.25	0.84	Netherlands	1.41	1.70	0.29	Germany	2.99	1.54	-1.49		2.99	1.54	-1.49	
6	France	4.40	2.27	-2.23	Japan	8.96	1.97	-7.68	Ireland	8.96	1.40	1.10	Cayman Islands	0.00	1.48	1.48		0.00	1.48	1.48	
7	Cayman Islands	0.00	1.67	1.67	Italy	1.87	1.87	-0.01	Italy	1.87	1.33	-0.55	UK	6.92	1.26	-6.08		6.92	1.26	-6.08	
8	Japan	8.96	1.42	-8.28	Switzerland	2.21	1.58	-0.65	Switzerland	2.21	1.31	-0.92	Netherlands	1.41	1.02	-0.40		1.41	1.02	-0.40	
9	Germany	2.99	1.41	-1.63	Cayman Islands	0.00	1.23	1.23	Japan	8.96	1.26	-8.46	Japan	8.96	0.94	-8.81		8.96	0.94	-8.81	
10	Netherlands	1.41	1.06	-0.36	Ireland	0.30	1.10	0.81	Spain	2.41	1.01	-1.44	Switzerland	2.21	0.58	-1.67		2.21	0.58	-1.67	
11	Switzerland	2.21	0.94	-1.30	Spain	2.41	1.07	-1.38	Finland	0.56	0.47	-0.09	Bermuda	0.00	0.44	0.43		0.00	0.44	0.43	
12	Russia	2.41	0.84	-1.61	Belgium	0.72	0.76	0.04	Belgium	0.72	0.42	-0.30	Spain	2.41	0.39	-2.07		2.41	0.39	-2.07	
13	Norway	0.51	0.64	0.13	Finland	0.56	0.42	-0.15	Austria	0.36	0.40	0.04	Austria	0.36	0.26	-0.10		0.36	0.26	-0.10	
14	Spain	2.41	0.47	-1.99	Bermuda	0.00	0.36	0.35	Sweden	1.13	0.32	-0.81	Virgin Isl. (UK)	N/A	0.19	N/A		N/A	0.19	N/A	
15	Italy	1.87	0.43	-1.47	Sweden	1.13	0.25	-0.89	Cayman Islands	0.00	0.21	0.21	Finland	0.56	0.18	-0.38		0.56	0.18	-0.38	
16	Denmark	0.44	0.36	-0.08	Virgin Isl. (UK)	N/A	0.25	N/A	Norway	0.51	0.16	-0.35	Australia	2.00	0.15	-1.89		2.00	0.15	-1.89	
17	South Korea	1.52	0.24	-1.30	South Korea	1.52	0.19	-1.35	Bermuda	0.00	0.16	0.15	Belgium	0.72	0.15	-0.57		0.72	0.15	-0.57	
18	Belgium	0.72	0.22	-0.51	China	4.43	0.16	-4.46	Australia	2.00	0.15	-1.88	Sweden	1.13	0.15	-0.99		1.13	0.15	-0.99	
19	Hong Kong	3.13	0.21	-3.01	Austria	0.36	0.15	-0.21	South Korea	1.52	0.13	-1.42	South Korea	1.52	0.11	-1.44		1.52	0.11	-1.44	
20	Estonia	0.01	0.17	0.16	Greece	0.38	0.14	-0.24	China	4.43	0.13	-4.50	Hong Kong	3.13	0.10	-3.13		3.13	0.10	-3.13	
21	Austria	0.36	0.17	-0.20	Canada	3.10	0.13	-3.07	Russia	2.41	0.12	-2.35	Canada	3.10	0.10	-3.10		3.10	0.10	-3.10	
22	Taiwan	1.09	0.16	-0.93	Antilles (Neth.)	N/A	0.13	N/A	Hong Kong	3.13	0.12	-3.11	China	4.43	0.09	-4.54		4.43	0.09	-4.54	
23	Singapore	0.70	0.16	-0.55	Hong Kong	3.13	0.12	-3.11	Greece	0.38	0.11	-0.27	Russia	2.41	0.08	-2.39		2.41	0.08	-2.39	
24	Guernsey	N/A	0.15	N/A	Portugal	0.19	0.12	-0.07	Turkey	0.30	0.10	-0.20	Greece	0.38	0.08	-0.31		0.38	0.08	-0.31	
25	India	1.49	0.15	-1.37	Jersey	N/A	0.11	N/A	Brazil	1.30	0.09	-1.22	Brazil	1.30	0.07	-1.24		1.30	0.07	-1.24	
26	Bermuda	0.00	0.15	0.14	Brazil	1.30	0.11	-1.20	Jersey	N/A	0.09	N/A	Taiwan	1.09	0.07	-1.03		1.09	0.07	-1.03	
27	Australia	2.00	0.14	-1.90	Norway	0.51	0.11	-0.40	Singapore	0.70	0.07	-0.63	Jersey	N/A	0.06	N/A		N/A	0.06	N/A	
28	Poland	0.28	0.13	-0.15	Russia	2.41	0.08	-2.39	Denmark	0.44	0.06	-0.37	Portugal	0.19	0.06	-0.13		0.19	0.06	-0.13	
29	Brazil	1.30	0.12	-1.19	Guernsey	N/A	0.07	N/A	Taiwan	1.09	0.06	-1.04	Norway	0.51	0.05	-0.46		0.51	0.05	-0.46	
30	Greece	0.38	0.10	-0.28	India	1.49	0.07	-1.44	South Africa	1.30	0.04	-1.27	Antilles (Neth.)	N/A	0.04	N/A		N/A	0.04	N/A	

Table 2. (continued)

Panel A. (continued)

j	Netherlands				Spain				Sweden				UK			
	<i>i</i>	<i>Destination</i>	$W_t^*$	$FD_{jt}$	$CB_{jt}$	<i>Destination</i>	$W_t^*$	$FD_{jt}$	$CB_{jt}$	<i>Destination</i>	$W_t^*$	$FD_{jt}$	$CB_{jt}$	<i>Destination</i>	$W_t^*$	$FD_{jt}$
1	USA	35.72	23.64	-18.8	Luxembourg	0.15	4.67	4.53	USA	35.72	9.31	-41.1	USA	35.72	9.35	-41.0
2	UK	6.92	7.58	<b>0.71</b>	France	4.40	2.54	-1.94	Luxembourg	0.15	6.24	<b>6.10</b>	Japan	8.96	4.76	-4.61
3	Luxembourg	0.15	5.95	<b>5.81</b>	Germany	2.99	1.03	-2.02	UK	6.92	4.16	-2.97	France	4.40	2.23	-2.28
4	Japan	8.96	3.60	-5.89	USA	35.72	0.98	-54.0	Japan	8.96	2.06	-7.58	Germany	2.99	2.03	-0.99
5	Germany	2.99	2.90	-0.09	UK	6.92	0.73	-6.66	Finland	6.92	1.82	<b>1.26</b>	Ireland	0.30	1.89	<b>1.60</b>
6	Ireland	0.30	1.96	<b>1.67</b>	Ireland	0.30	0.69	<b>0.39</b>	France	4.40	1.73	-2.80	Switzerland	2.21	1.61	-0.62
7	Switzerland	2.21	1.81	-0.41	Netherlands	1.41	0.64	-0.78	Germany	2.99	1.56	-1.47	Netherlands	1.41	1.48	<b>0.06</b>
8	Australia	2.00	1.36	-0.65	Italy	1.87	0.62	-1.28	Switzerland	2.21	1.55	-0.67	Italy	1.87	0.98	-0.92
9	France	4.40	1.30	-3.25	India	1.49	0.44	-1.07	Russia	2.41	0.99	-1.45	Australia	2.00	0.97	-1.05
10	Italy	1.87	1.29	-0.59	Portugal	0.19	0.29	<b>0.10</b>	Ireland	0.30	0.96	<b>0.67</b>	Spain	2.41	0.86	-1.59
11	Sweden	1.13	0.86	-0.28	Switzerland	2.21	0.24	-2.01	Norway	0.51	0.95	<b>0.44</b>	Hong Kong	3.13	0.80	-2.40
12	Canada	3.10	0.84	-2.33	Brazil	1.30	0.18	-1.13	Denmark	0.44	0.61	<b>0.18</b>	South Korea	1.52	0.77	-0.76
13	Belgium	0.72	0.79	<b>0.07</b>	Japan	8.96	0.17	-9.65	Netherlands	1.41	0.60	-0.82	Luxembourg	0.15	0.75	<b>0.61</b>
14	South Korea	1.52	0.71	-0.83	Belgium	0.72	0.11	-0.62	Italy	1.87	0.54	-1.36	Taiwan	1.09	0.58	-0.51
15	Spain	2.41	0.61	-1.85	Finland	0.56	0.09	-0.47	Canada	3.10	0.41	-2.78	Cayman Islands	0.00	0.58	<b>0.58</b>
16	Cayman Islands	0.00	0.59	<b>0.59</b>	Cayman Islands	0.00	0.09	<b>0.09</b>	Australia	2.00	0.37	-1.67	Sweden	1.13	0.53	-0.60
17	Hong Kong	3.13	0.57	-2.64	Sweden	1.13	0.08	-1.06	Spain	2.41	0.36	-2.11	China	4.43	0.41	-4.20
18	Finland	0.56	0.52	-0.04	Morocco	0.09	0.07	-0.02	Bermuda	0.00	0.30	<b>0.30</b>	Jersey	N/A	0.40	N/A
19	Taiwan	1.09	0.52	-0.58	Austria	0.36	0.05	-0.31	Hong Kong	3.13	0.29	-2.93	Brazil	1.30	0.40	-0.91
20	Bermuda	0.00	0.48	<b>0.47</b>	Virgin Isl. (UK)	N/A	0.04	N/A	South Korea	1.52	0.26	-1.28	Finland	0.56	0.39	-0.18
21	Brazil	1.30	0.48	-0.83	Greece	0.38	0.04	-0.34	Cayman Islands	0.00	0.24	<b>0.24</b>	Russia	2.41	0.37	-2.10
22	Singapore	0.70	0.41	-0.29	Mexico	0.64	0.03	-0.61	Singapore	0.70	0.19	-0.52	Singapore	0.70	0.34	-0.37
23	Russia	2.41	0.33	-2.14	Canada	3.10	0.02	-3.18	Greece	0.38	0.17	-0.21	Norway	0.51	0.31	-0.20
24	Norway	0.51	0.32	-0.19	Norway	0.51	0.02	-0.49	Taiwan	1.09	0.15	-0.95	Belgium	0.72	0.29	-0.43
25	Austria	0.36	0.32	-0.04	Bermuda	0.00	0.02	<b>0.01</b>	Austria	0.36	0.11	-0.25	Bermuda	0.00	0.22	<b>0.21</b>
26	Greece	0.38	0.31	-0.07	Chile	0.32	0.02	-0.30	Belgium	0.72	0.10	-0.62	Mexico	0.64	0.21	-0.43
27	China	4.43	0.30	-4.32	Guernsey	N/A	0.01	N/A	Poland	0.28	0.10	-0.18	Denmark	0.44	0.21	-0.23
28	South Africa	1.30	0.29	-1.02	Russia	2.41	0.01	-2.46	Turkey	0.30	0.10	-0.20	India	1.49	0.20	-1.31
29	Mexico	0.64	0.24	-0.40	Argentina	0.09	0.01	-0.08	Brazil	1.30	0.10	-1.21	Greece	0.38	0.20	-0.18
30	Denmark	0.44	0.23	-0.21	Antilles (Neth.)	N/A	0.01	N/A	China	4.43	0.10	-4.53	South Africa	1.30	0.19	-1.12

Table 2. (continued)

Panel A. (end)

j		Australia					Canada					Japan					USA				
i	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	Destination	$W_i^*$	$FD_{ij}$	$CB_{ij}$	
1	USA	35.72	7.76	-43.5	USA	35.72	13.04	-35.3	USA	35.72	5.17	-47.5	UK	6.92	3.09	-4.12	UK	6.92	3.09	-4.12	
2	Japan	8.96	1.34	-8.37	UK	6.92	2.91	-4.31	USA	6.92	1.20	-6.15	Japan	8.96	2.49	-7.11	Japan	8.96	2.49	-7.11	
3	UK	6.92	1.21	-6.14	Japan	8.96	2.32	-7.29	UK	0.00	0.74	<b>0.74</b>	France	4.40	1.41	-3.13	France	4.40	1.41	-3.13	
4	Netherlands	1.41	0.95	-0.47	France	4.40	1.10	-3.46	Cayman Islands	4.40	0.56	-4.02	Canada	3.10	1.37	-1.79	Canada	3.10	1.37	-1.79	
5	Germany	2.99	0.45	-2.62	Switzerland	2.21	0.75	-1.49	France	2.00	0.39	-1.65	Switzerland	2.21	1.20	-1.03	Switzerland	2.21	1.20	-1.03	
6	Hong Kong	3.13	0.40	-2.81	Germany	2.99	0.72	-2.34	Australia	2.99	0.37	-2.70	Germany	2.99	1.01	-2.04	Germany	2.99	1.01	-2.04	
7	Canada	3.10	0.28	-2.91	Cayman Islands	0.00	0.63	<b>0.63</b>	Switzerland	2.21	0.34	-1.91	Bermuda	0.00	0.88	<b>0.87</b>	Bermuda	0.00	0.88	<b>0.87</b>	
8	Italy	1.87	0.16	-1.74	Netherlands	1.41	0.62	-0.80	Canada	3.10	0.30	-2.89	Netherlands	1.41	0.74	-0.68	Netherlands	1.41	0.74	-0.68	
9	Singapore	0.70	0.14	-0.57	Australia	2.00	0.40	-1.63	Luxembourg	0.15	0.27	<b>0.12</b>	Cayman Islands	0.00	0.74	<b>0.74</b>	Cayman Islands	0.00	0.74	<b>0.74</b>	
10	India	1.49	0.14	-1.38	Bermuda	0.00	0.39	<b>0.39</b>	Hong Kong	3.13	0.25	-2.97	South Korea	1.52	0.52	-1.02	South Korea	1.52	0.52	-1.02	
11	New Zealand	0.08	0.10	<b>0.02</b>	South Korea	1.52	0.38	-1.16	Netherlands	1.41	0.24	-1.19	Australia	2.00	0.47	-1.56	Australia	2.00	0.47	-1.56	
12	China	4.43	0.06	-4.57	Italy	1.87	0.35	-1.55	China	4.43	0.23	-4.39	Italy	1.87	0.43	-1.48	Italy	1.87	0.43	-1.48	
13	Norway	0.51	0.06	-0.45	Spain	2.41	0.32	-2.15	Italy	1.87	0.19	-1.72	Brazil	1.30	0.42	-0.89	Brazil	1.30	0.42	-0.89	
14	Belgium	0.72	0.06	-0.66	Hong Kong	3.13	0.26	-2.97	Spain	2.41	0.17	-2.30	Hong Kong	3.13	0.39	-2.82	Hong Kong	3.13	0.39	-2.82	
15	Brazil	1.30	0.06	-1.26	Ireland	0.30	0.23	-0.07	Ireland	0.30	0.16	-0.13	Spain	2.41	0.39	-2.07	Spain	2.41	0.39	-2.07	
16	Finland	0.56	0.04	-0.53	Mexico	0.64	0.21	-0.43	Bermuda	0.00	0.15	<b>0.15</b>	Mexico	0.64	0.39	-0.25	Mexico	0.64	0.39	-0.25	
17	Thailand	0.26	0.04	-0.22	Sweden	1.13	0.20	-0.94	Sweden	1.13	0.12	-1.02	Taiwan	1.09	0.34	-0.75	Taiwan	1.09	0.34	-0.75	
18	Malaysia	0.43	0.02	-0.41	Brazil	1.30	0.15	-1.16	India	1.49	0.09	-1.43	China	4.43	0.34	-4.28	China	4.43	0.34	-4.28	
19	Bermuda	0.00	0.02	<b>0.02</b>	Finland	0.56	0.13	-0.43	Singapore	0.70	0.09	-0.62	Sweden	1.13	0.27	-0.87	Sweden	1.13	0.27	-0.87	
20	Indonesia	0.25	0.02	-0.23	Taiwan	1.09	0.12	-0.98	South Korea	1.52	0.08	-1.47	Antilles (Neth.)	N/A	0.26	N/A	Antilles (Neth.)	N/A	0.26	N/A	
21	Pap. New Guinea	0.01	0.02	<b>0.01</b>	Singapore	0.70	0.11	-0.59	Taiwan	1.09	0.06	-1.04	Finland	0.56	0.26	-0.31	Finland	0.56	0.26	-0.31	
22	Philippines	0.12	0.01	-0.12	Denmark	0.44	0.10	-0.33	Finland	0.56	0.06	-0.50	Ireland	0.30	0.22	-0.08	Ireland	0.30	0.22	-0.08	
23	Portugal	0.19	0.01	-0.18	Belgium	0.72	0.09	-0.64	Belgium	0.72	0.06	-0.66	India	1.49	0.22	-1.29	India	1.49	0.22	-1.29	
24	Turkey	0.30	0.01	-0.29	Norway	0.51	0.08	-0.43	Guernsey	N/A	0.05	N/A	Singapore	0.70	0.20	-0.50	Singapore	0.70	0.20	-0.50	
25	Luxembourg	0.15	0.00	-0.14	South Africa	1.30	0.07	-1.24	Russia	2.41	0.05	-2.42	Russia	2.41	0.18	-2.28	Russia	2.41	0.18	-2.28	
26	Argentina	0.09	0.00	-0.09	India	1.49	0.07	-1.45	Brazil	1.30	0.05	-1.26	South Africa	1.30	0.18	-1.13	South Africa	1.30	0.18	-1.13	
27	Egypt	0.17	0.00	-0.17	China	4.43	0.06	-4.57	Norway	0.51	0.04	-0.47	Norway	0.51	0.15	-0.37	Norway	0.51	0.15	-0.37	
28	Chile	0.32	0.00	-0.32	Antilles (Neth.)	N/A	0.06	N/A	Denmark	0.44	0.03	-0.40	Belgium	0.72	0.13	-0.59	Belgium	0.72	0.13	-0.59	
29	Czech Republic	0.09	0.00	-0.09	Luxembourg	0.15	0.06	-0.09	Austria	0.36	0.03	-0.33	Israel	0.30	0.12	-0.18	Israel	0.30	0.12	-0.18	
30	Peru	0.07	0.00	-0.11	Austria	0.36	0.05	-0.31	Greece	0.38	0.03	-0.35	Panama	0.01	0.10	<b>0.09</b>	Panama	0.01	0.10	<b>0.09</b>	



Table 2. (continued)

Panel B. Emerging-market countries

j	Czech Rep.				Hungary				Poland				Turkey			
	<i>i</i>	<i>Destination</i>	$W_t^*$	$FD_{jt}$	$CB_{jt}$	<i>Destination</i>	$W_t^*$	$FD_{jt}$	$CB_{jt}$	<i>Destination</i>	$W_t^*$	$FD_{jt}$	$CB_{jt}$	<i>Destination</i>	$W_t^*$	$FD_{jt}$
1	Belgium	0.72	5.23	4.54	Luxembourg	0.15	6.64	6.51	Luxembourg	0.15	1.03	0.89	Luxembourg	0.15	0.07	-0.08
2	Austria	0.36	3.21	2.86	Austria	0.36	2.05	1.69	Austria	0.36	0.56	0.20	USA	35.72	0.03	-55.5
3	Luxembourg	0.15	2.97	2.83	USA	35.72	1.62	-53.0	Hungary	0.08	0.44	0.36	Belgium	0.72	0.01	-0.72
4	USA	35.72	1.25	-53.6	Germany	2.99	1.46	-1.58	USA	35.72	0.36	-55.0	UK	6.92	0.00	-7.44
5	Netherlands	1.41	1.10	-0.31	Netherlands	1.41	0.80	-0.62	Turkey	0.30	0.21	-0.09	Germany	2.99	0.00	-3.08
6	Germany	2.99	0.88	-2.17	Poland	0.28	0.75	0.48	Netherlands	1.41	0.21	-1.23	Switzerland	2.21	0.00	-2.26
7	France	4.40	0.82	-3.75	Ireland	0.30	0.74	0.44	UK	6.92	0.09	-7.34	Bahrain	0.04	0.00	-0.04
8	Russia	2.41	0.61	-1.85	France	4.40	0.72	-3.85	France	4.40	0.08	-4.52	Netherlands	1.41	0.00	-1.43
9	Ireland	0.30	0.42	0.12	Belgium	0.72	0.61	-0.11	Germany	2.99	0.06	-3.01	Canada	3.10	0.00	-3.20
10	Hungary	0.08	0.41	0.33	Cayman Islands	0.00	0.39	0.39	Ireland	0.30	0.03	-0.27	France	4.40	0.00	-4.61
11	UK	6.92	0.38	-7.03	Czech Republic	0.09	0.34	0.25	Slovakia	0.01	0.02	0.01	Norway	0.51	0.00	-0.51
12	Slovakia	0.01	0.35	0.34	Switzerland	2.21	0.29	-1.97	Sweden	1.13	0.02	-1.12	South Africa	1.30	0.00	-1.32
13	Poland	0.28	0.33	0.05	Sweden	1.13	0.20	-0.94	Italy	1.87	0.02	-1.89	Spain	2.41	0.00	-2.47
14	Cyprus	0.03	0.33	0.30	UK	6.92	0.19	-7.24	Estonia	0.01	0.01	0.00	Sweden	1.13	0.00	-1.14
15	Cayman Islands	0.00	0.29	0.29	Norway	0.51	0.18	-0.33	Denmark	0.44	0.01	-0.43	Finland	0.56	0.00	-0.57
16	Turkey	0.30	0.16	-0.14	Indonesia	0.25	0.17	-0.09	Canada	3.10	0.01	-3.20	Denmark	0.44	0.00	-0.44
17	Switzerland	2.21	0.12	-2.14	China	4.43	0.17	-4.46	Kazakhstan	0.02	0.00	-0.02	Italy	1.87	0.00	-1.91
18	Bermuda	0.00	0.10	0.09	Russia	2.41	0.16	-2.31	Australia	2.00	0.00	-2.04	China	4.43	0.00	-4.63
19	China	4.43	0.08	-4.55	Thailand	0.26	0.14	-0.12	Cayman Islands	0.00	0.00	0.00				
20	Slovenia	0.03	0.08	0.05	Canada	3.10	0.09	-3.11								
21	Virgin Isl. (UK)	N/A	0.08	N/A	Hong Kong	3.13	0.08	-3.14								
22	Japan	8.96	0.06	-9.78	Italy	1.87	0.07	-1.84								
23	Antilles (Neth.)	N/A	0.05	N/A	Australia	2.00	0.07	-1.97								
24	Hong Kong	3.13	0.04	-3.19	Spain	2.41	0.06	-2.41								
25	Spain	2.41	0.04	-2.43	Japan	8.96	0.06	-9.78								
26	Jersey	N/A	0.04	N/A	South Africa	1.30	0.06	-1.26								
27	Italy	1.87	0.04	-1.87	Bermuda	0.00	0.04	0.04	0.04	0.00	0.04	0.04	0.04			
28	Mauritius	0.01	0.02	0.01	Israel	0.30	0.03	-0.27								
29	Sweden	1.13	0.02	-1.12	Brazil	1.30	0.02	-1.29								
30	Finland	0.56	0.02	-0.55	Croatia	0.05	0.02	-0.04								

Table 2. (continued)

Panel B. (continued)

j	India						Indonesia						Malaysia						South Korea					
	<i>i</i>	<i>Destination</i>	$W_t^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_t^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_t^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_t^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_t^*$	$FD_{ij}$	$CB_{ij}$			
1	Ireland		0.30	0.01	-0.28	India	1.49	0.29	-1.22	Singapore	0.70	0.76	0.06	Luxembourg	0.15	2.40	2.26							
2	USA		35.72	0.00	-55.6	Thailand	0.26	0.01	-0.25	Hong Kong	3.13	0.21	-3.01	USA	35.72	0.79	-54.3							
3	South Korea		1.52	0.00	-1.54	Singapore	0.70	0.01	-0.70	USA	35.72	0.11	-55.4	Hong Kong	3.13	0.63	-2.58							
4	Taiwan		1.09	0.00	-1.09	Cayman Islands	0.00	0.00	0.00	Japan	8.96	0.11	-9.73	Japan	8.96	0.27	-9.54							
5	Mexico		0.64	0.00	-0.64	USA	35.72	0.00	-55.6	UK	6.92	0.09	-7.34	China	4.43	0.26	-4.37							
6	Turkey		0.30	0.00	-0.30	Virgin Isl. (UK)	N/A	0.00	N/A	Luxembourg	0.15	0.09	-0.05	UK	6.92	0.21	-7.22							
7	Brazil		1.30	0.00	-1.31	Malaysia	0.43	0.00	-0.43	Australia	2.00	0.07	-1.97	India	1.49	0.17	-1.35							
8	South Africa		1.30	0.00	-1.31	China	4.43	0.00	-4.63	Ireland	0.30	0.07	-0.23	Cayman Islands	0.00	0.16	0.16							
9	Hong Kong		3.13	0.00	-3.23	UK	6.92	0.00	-7.44	South Korea	1.52	0.05	-1.49	Australia	2.00	0.15	-1.89							
10	Singapore		0.70	0.00	-0.71					Taiwan	1.09	0.04	-1.05	Ireland	0.30	0.10	-0.20							
11	Thailand		0.26	0.00	-0.26	Bermuda	0.00	0.04	0.04	Bermuda	0.00	0.04	0.04	France	4.40	0.09	-4.52							
12	Chile		0.32	0.00	-0.32	Thailand	0.26	0.00	0.00	Thailand	0.26	0.03	-0.23	Singapore	0.70	0.07	-0.63							
13	Indonesia		0.25	0.00	-0.25	Indonesia	0.25	0.02	-0.24	Indonesia	0.25	0.02	-0.24	Russia	2.41	0.05	-2.42							
14	Australia		2.00	0.00	-2.04	Cayman Islands	0.00	0.00	-2.04	Cayman Islands	0.00	0.02	0.02	Brazil	1.30	0.03	-1.28							
15	Malaysia		0.43	0.00	-0.43	Germany	2.99	0.02	-3.06	Germany	2.99	0.02	-3.06	Virgin Isl. (UK)	N/A	0.02	N/A							
16	Kenya		0.02	0.00	-0.02	Saudi Arabia	0.60	0.01	-0.59	Saudi Arabia	0.60	0.01	-0.59	Vietnam	N/A	0.02	N/A							
17	Zimbabwe		0.05	0.00	-0.05	Canada	3.10	0.01	-3.19	Canada	3.10	0.01	-3.19	Germany	2.99	0.02	-3.07							
18	Jordan		0.05	0.00	-0.05	France	4.40	0.01	-4.60	France	4.40	0.01	-4.60	Canada	3.10	0.01	-3.19							
19	UK		6.92	0.00	-7.44	India	1.49	0.01	-1.51	India	1.49	0.01	-1.51	Switzerland	2.21	0.01	-2.25							
20	Sri Lanka		0.01	0.00	-0.01	Bahamas	N/A	0.01	N/A	Bahamas	N/A	0.01	N/A	Bermuda	0.00	0.01	0.01							
21	France		4.40	0.00	-4.61	China	4.43	0.01	-4.63	China	4.43	0.01	-4.63	Netherlands	1.41	0.01	-1.42							
22	Panama		0.01	0.00	-0.01	Philippines	0.12	0.01	-0.12	Philippines	0.12	0.01	-0.12	Sweden	1.13	0.01	-1.13							
23	Nepal		0.00	0.00	0.00	Denmark	0.44	0.00	-0.43	Denmark	0.44	0.00	-0.43	Taiwan	1.09	0.01	-1.09							
24	Canada		3.10	0.00	-3.20	Netherlands	1.41	0.00	-1.43	Netherlands	1.41	0.00	-1.43	Italy	1.87	0.01	-1.90							
25	Belgium		0.72	0.00	-0.72	South Africa	1.30	0.00	-0.72	South Africa	1.30	0.00	-0.72	Malaysia	0.43	0.01	-0.42							
26	Netherlands		1.41	0.00	-1.43	Switzerland	2.21	0.00	-2.26	Switzerland	2.21	0.00	-2.26	Spain	2.41	0.00	-2.47							
27	Ile Maurice		0.01	0.00	-0.01	Unt. Arab Emir.	0.25	0.00	-0.25	Unt. Arab Emir.	0.25	0.00	-0.25	Guernsey	N/A	0.00	N/A							
28	Philippines		0.12	0.00	-0.12	Egypt	0.17	0.00	-0.17	Egypt	0.17	0.00	-0.17	Norway	0.51	0.00	-0.51							
29	Ghana		0.00	0.00	0.00	Spain	2.41	0.00	-2.47	Spain	2.41	0.00	-2.47	Finland	0.56	0.00	-0.56							
30	Saudi Arabia		0.60	0.00	-0.60	Italy	1.87	0.00	-1.91	Italy	1.87	0.00	-1.91	Austria	0.36	0.00	-0.36							

Table 2. (end)

Panel B. (end)

j	Argentina				Brazil				Mexico				South Africa				
	<i>i</i>	<i>Destination</i>	$W_i^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_i^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_i^*$	$FD_{ij}$	$CB_{ij}$	<i>Destination</i>	$W_i^*$	$FD_{ij}$	$CB_{ij}$
1	USA		35.72	11.84	-37.1	Bermuda	0.00	0.16	<b>0.15</b>	USA	35.72	1.57	-53.1	UK	6.92	4.84	-2.24
2	Luxembourg		0.15	2.75	<b>2.61</b>	USA	35.72	0.13	-55.4	Luxembourg	0.15	0.36	<b>0.21</b>	USA	35.72	1.79	-52.8
3	Brazil		1.30	2.18	<b>0.90</b>	Virgin Isl. (UK)	N/A	0.07	N/A	Netherlands	1.41	0.19	-1.24	Ireland	0.30	0.80	<b>0.51</b>
4	Spain		2.41	1.18	-1.27	France	4.40	0.05	-4.56	Ireland	0.30	0.04	-0.26	Bermuda	0.00	0.62	<b>0.62</b>
5	Japan		8.96	0.46	-9.34	Bahamas	N/A	0.04	N/A	UK	6.92	0.02	-7.42	Luxembourg	0.15	0.50	<b>0.35</b>
6	Mexico		0.64	0.33	-0.31	Switzerland	2.21	0.03	-2.23	Switzerland	2.21	0.01	-2.26	Jersey	N/A	0.17	N/A
7	UK		6.92	0.12	-7.31	Portugal	0.19	0.03	-0.16	France	4.40	0.00	-4.60	Guernsey	N/A	0.17	N/A
8	Australia		2.00	0.09	-1.95	Belgium	0.72	0.03	-0.70	Spain	2.41	0.00	-2.47	France	4.40	0.08	-4.53
9	France		4.40	0.08	-4.53	Cayman Islands	0.00	0.02	<b>0.02</b>	Germany	2.99	0.00	-3.08	Cayman Islands	0.00	0.06	<b>0.06</b>
10	Chile		0.32	0.07	-0.25	Luxembourg	0.15	0.02	-0.12	Sweden	1.13	0.00	-1.14	Ghana	N/A	0.05	N/A
11	Netherlands		1.41	0.07	-1.37	Spain	2.41	0.02	-2.45	Italy	1.87	0.00	-1.91	Japan	8.96	0.05	-9.79
12	Panama		0.01	0.06	<b>0.05</b>	Panama	0.01	0.01	0.00	Finland	0.56	0.00	-0.57	Switzerland	2.21	0.04	-2.22
13	China		4.43	0.05	-4.58	Uruguay	0.00	0.01	0.01	Australia	2.00	0.00	-2.04	Isle of Man	N/A	0.03	N/A
14	Finland		0.56	0.04	-0.52	Argentina	0.09	0.01	-0.08	Belgium	0.72	0.00	-0.72	Virgin Isl. (UK)	N/A	0.01	N/A
15	Taiwan		1.09	0.03	-1.07	Germany	2.99	0.01	-3.07					Australia	2.00	0.01	-2.03
16	Peru		0.07	0.03	-0.08	Netherlands	1.41	0.01	-1.43					Netherlands	1.41	0.01	-1.43
17	Canada		3.10	0.03	-3.18	Canada	3.10	0.01	-3.20					Taiwan	1.09	0.01	-1.09
18	Germany		2.99	0.02	-3.06	UK	6.92	0.01	-7.43					Germany	2.99	0.01	-3.07
19	Switzerland		2.21	0.01	-2.25	Italy	1.87	0.00	-1.90					Ile Maurice	0.01	0.01	0.00
20	Sweden		1.13	0.01	-1.13	Ireland	0.30	0.00	-0.29					Namibia	N/A	0.01	N/A
21	Austria		0.36	0.01	-0.36	Paraguay	0.00	0.00	0.00					Botswana	N/A	0.01	N/A
22	Uruguay		0.00	0.01	<b>0.01</b>	Puerto Rico	N/A	0.00	N/A					Zimbabwe	0.05	0.00	-0.04
23	Russia		2.41	0.00	-2.47	Lebanon	0.02	0.00	-0.01					Nigeria	0.06	0.00	-0.06
24	Italy		1.87	0.00	-1.91	Costa Rica	0.00	0.00	0.00					Canada	3.10	0.00	-3.20
25	Costa Rica		0.00	0.00	0.00	Venezuela	0.02	0.00	-0.01					Egypt	0.17	0.00	-0.17
26	India		1.49	0.00	-1.52	Australia	2.00	0.00	-2.04					Hong Kong	3.13	0.00	-3.23
27	Venezuela		0.02	0.00	-0.01	Jersey	N/A	0.00	N/A					Italy	1.87	0.00	-1.90
28	Greece		0.38	0.00	-0.38	Colombia	0.10	0.00	-0.10					Spain	2.41	0.00	-2.47
29	Belgium		0.72	0.00	-0.72	Japan	8.96	0.00	-9.84					Argentina	0.09	0.00	-0.09
30						Hungary	0.08	0.00	-0.08					North Korea	N/A	0.00	N/A

Notes : All numbers are expressed as percentage values. The table reports 1) the weight of country *i*'s market capitalization in the world-portfolio ( $W_i$ ), 2) the actual share a destination country *i* represents in the total equity holdings of the source country *j* ( $FD_{ij}$ ), and 3) the country bias which measures the resulting deviation from the benchmark investment share ( $CB_{ij}$ ).

Table 3. Statistical analysis of foreign diversification ratios

Dependent variable: Foreign diversification	All countries	All countries ex OFCs	Developed-market source countries	Emerging-market source countries	Euro-zone source countries
DEV	0.6319*** (0.1897)	0.9735*** (0.2177)	0.9233** (0.4344)	0.8424*** (0.2371)	1.0745 (0.8012)
G20	1.1092*** (0.1432)	1.1707*** (0.1445)	1.3454*** (0.2668)	1.1645*** (0.1936)	1.3618*** (0.3885)
REG	0.1323 (0.1609)	0.2043 (0.1891)	-0.0404 (0.2887)	0.6221*** (0.2146)	-0.5958 (1.0088)
LANG	0.4560*** (0.1050)	0.3378*** (0.1235)	0.2157 (0.1695)	0.2843* (0.1545)	0.7743*** (0.2544)
OFFSHORE	0.5254*** (0.1246)	-	0.7830*** (0.2075)	0.5051*** (0.1853)	1.0365*** (0.3238)
FINCENTER	0.8974*** (0.1508)	0.5232*** (0.1853)	1.2697*** (0.2967)	1.0431*** (0.2028)	1.7788*** (0.5060)
TRADE	0.6639** (0.2650)	0.4102 (0.3272)	-0.4415 (0.4849)	0.8687** (0.3772)	-0.1376 (0.9317)
DIST	0.7017** (0.2105)	0.9078*** (0.2696)	1.3974*** (0.4241)	0.3647 (0.2893)	1.6104** (0.6429)
EURO	-	-	-	-	-0.5538 (0.6620)
Number of source countries	24	24	12	12	6
Number of observations	1968	1488	984	984	492
$\chi^2$ statistic	314.85***	259.38***	127.35***	196.03***	75.50***
Pseudo R-squared	0.1956	0.2150	0.1804	0.2392	0.2280

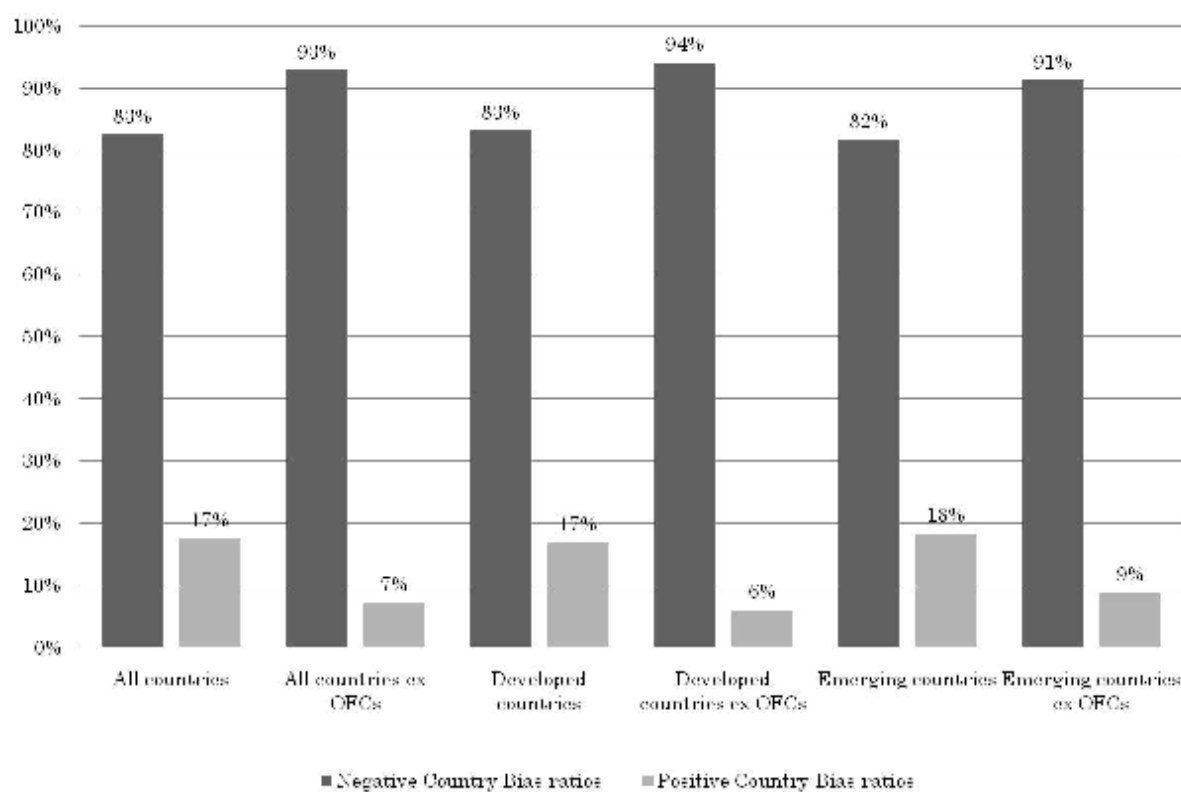
Notes: The table reports the results of logistic regressions. The dependent is  $FD_{ij}$ , equal to 1 if the source country  $j$  invests in the destination  $i$ , 0 otherwise. The predictors are 1) DEV, a dummy equal to 1 if the destination is a developed country, 2) G20, a dummy equal to 1 if the destination belongs to G20 countries, 3) REG, a dummy equal to 1 if the source and destination are in the same geographical group, 4) LANG, a dummy equal to 1 if the source and destination share a common language, 5) OFC, a dummy equal to 1 if the destination country is an offshore market, 6) FINCENTER, a dummy equal to 1 if the destination is listed in the "Global Financial Centres Index", 7) TRADE, a dummy equal to 1 if the source and destination countries share a common international trade agreement, 8) DIST, a dummy equal to 1 if the geographical distance between the source and destination countries is less than 3,000 km, 9) EURO, a dummy equal to 1 if the destination is in the Euro zone. The column "All countries ex OFCs" excludes from the destination set those qualified as an OFC so that the model omits "OFFSHORE" from the list of regressors. In columns 3 and 4, regressions are run using only the developed-market and emerging-market source countries respectively. Finally, the column labeled "Euro-zone source countries" includes only the source countries making part of the Euro zone.  $\chi^2$  statistics derived from a Wald test checks the overall significance of the model against the null that all coefficients are zero. Statistical significance at 10% (respectively 5 and 1%) is denoted by \* (respectively \*\* and \*\*\*).

Table 4. Statistical analysis of country bias ratios

Dependent variable: Country bias	All countries	All countries ex OFCs	Developed-market source countries	Emerging-market source countries	Euro-zone source countries
DEV	-0.4848*** (0.1612)	0.7631*** (0.2032)	-1.0462 (0.2656)	-0.0188 (0.2136)	-1.4449*** (0.4029)
G20	0.5903*** (0.1239)	0.9237*** (0.1325)	0.4439** (0.1876)	0.7275*** (0.1780)	0.5144* (0.2696)
REG	-0.0434 (0.1578)	0.2213 (0.1831)	-0.4060 (0.2572)	0.4848** (0.2118)	-3.2774*** (0.7490)
LANG	0.2848*** (0.0984)	0.3528*** (0.1182)	0.0648 (0.1443)	0.2301 (0.1488)	0.4901** (0.2119)
OFC	0.0185 (0.1217)	-	-0.0017 (0.1751)	0.0721 (0.1874)	0.3993 (0.2642)
FINCENTER	1.9200*** (0.1473)	0.5889*** (0.1903)	2.9653*** (0.2724)	1.7514*** (0.1991)	3.9597*** (0.4557)
TRADE	1.3940*** (0.2175)	0.6571** (0.3010)	1.2778*** (0.3159)	1.4219*** (0.3266)	2.0014*** (0.5651)
DIST	0.2194 (0.1976)	0.9612*** (0.2573)	0.1363 (0.3072)	0.2374 (0.2812)	1.5576*** (0.6007)
EURO	-	-	-	-	0.8749** (0.4394)
Number of source countries	24	24	12	12	6
Number of observations	1968	1488	984	984	492
$\chi^2$ statistic	442.32***	288.60***	195.83***	242.93***	111.47
Pseudo R-squared	0.2418	0.2244	0.2602	0.2637	0.3483

Notes: The table reports the results of ordinal logistic regressions. The dependent is  $CB_{ij}$ , which is equal to 2 if the source country  $j$  overinvests in the destination  $i$ , 1 if the source country  $j$  underinvests in the destination  $i$ , and 0 if there is no investment. The predictors are 1) DEV, a dummy equal to 1 if the destination is a developed country, 2) G20, a dummy equal to 1 if the destination belongs to G20 countries, 3) REG, a dummy equal to 1 if the source and destination are in the same geographical group, 4) LANG, a dummy equal to 1 if the source and destination share a common language, 5) OFC, a dummy equal to 1 if the destination country is an offshore market, 6) FINCENTER, a dummy equal to 1 if the destination is in the "Global Financial Centres Index", 7) TRADE, a dummy equal to 1 if the source and destination share a common international trade agreement, 8) DIST, a dummy equal to 1 if the geographical distance between the source and destination is less than 3,000 km, 9) EURO, a dummy equal to 1 if the destination is in the Euro zone. The column "All countries ex OFCs" excludes destinations qualified as an OFC from the list of regressors. In columns 3 and 4, regressions are run using only the developed-market and emerging-market source countries respectively. Finally, the column labeled "Euro-zone source countries" includes only the source countries part of the Euro zone.  $\chi^2$  statistics derived from a Wald test checks the overall significance of the model against the null that all coefficients are zero. Statistical significance at 10% (respectively 5 and 1%) is denoted by \* (respectively \*\* and \*\*\*).

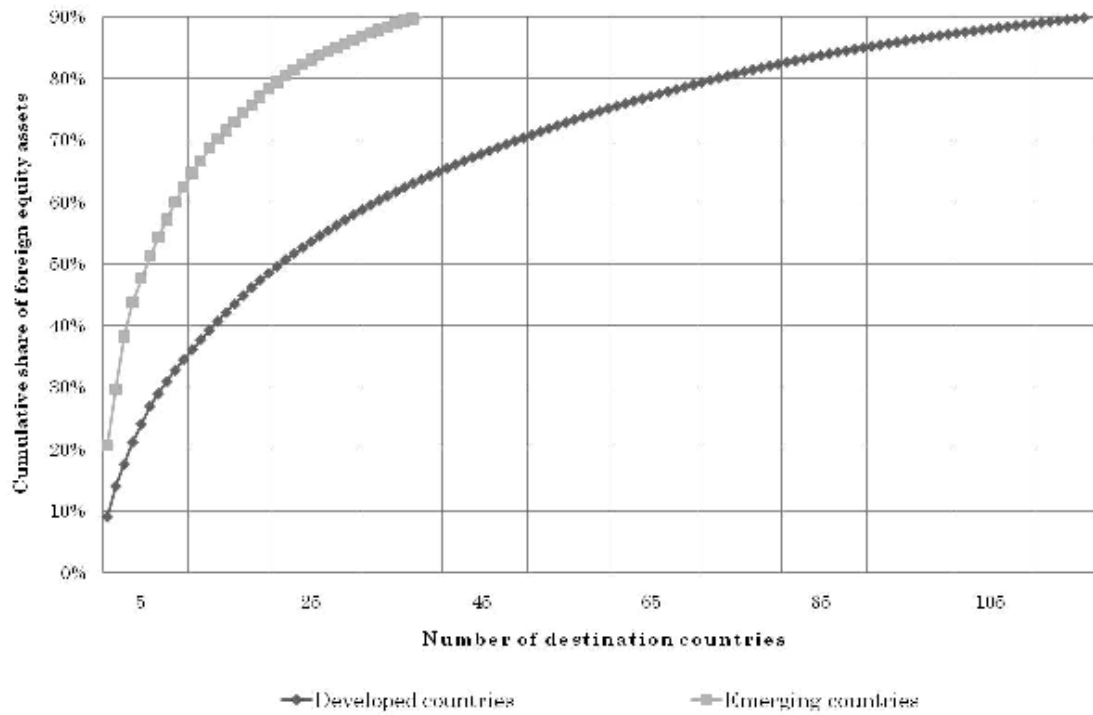
Figure 1. Distribution of positive and negative country bias ratios



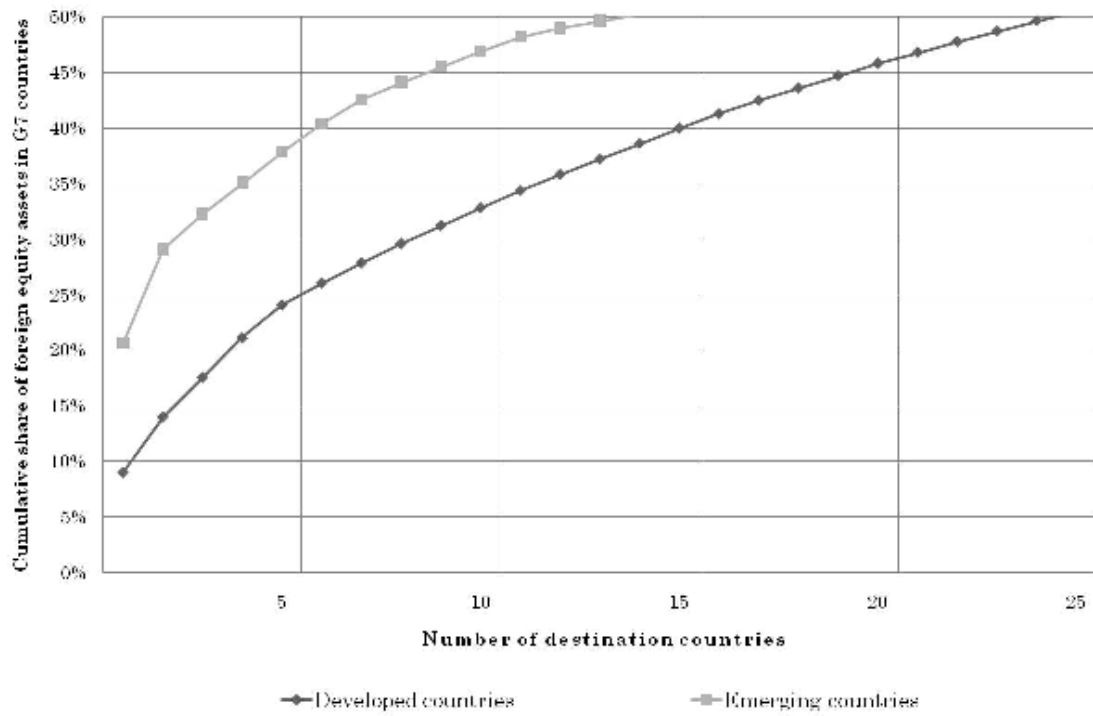
	All countries	Developed countries	Emerging countries
# of Country Bias ratios (CB)	623	344	279
of which			
CB < 0	514	286	228
CB ≥ 0	109	58	51
Mean CB	-3,03%	-4,40%	-0,78%
Median CB	-0,92%	-0,81%	-1,13%
Range	[-55,6%, 24,55%]	[-54%, 24,55%]	[-55,6%, 6,51%]
Min. CB	India, Indonesia & USA	Spain & USA	India, Indonesia & USA
Max. CB	Italy & Luxembourg	Italy & Luxembourg	Hungary & Luxembourg
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# of OFC destinations	138	73	65
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# of CB ratios (ex OFCs)	485	271	214
of which			
CB < 0 (ex OFCs)	448	254	194
CB ≥ 0 (ex OFCs)	37	17	20
Mean CB (ex OFCs)	-3,77%	-5,30%	-1,06%
Median CB (ex OFCs)	-1,20%	-1,02%	-1,43%
Range (ex OFCs)	[-55,6%, 4,54%]	[-54%, -0,18%]	[-55,6%, 4,54%]
Min. CB (ex OFCs)	India, Indonesia & USA	Spain & USA	India, Indonesia & USA
Max. CB (ex OFCs)	Czech Rep. & Belgium	Finland & Sweden	Czech Rep. & Belgium

Figure 2. Geographic shrinkage of international equity investments

Panel A: All destinations (ex OFCs)



Panel B : G7 destinations



## NOTES

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Chapter 2.  
A Cross-Sectional Analysis of Potential Gains from  
International Portfolio Diversification

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# 1 Introduction

International trade in financial assets can be considered as a recent phenomenon to either institutions or investors in developing countries. Along numerous structural factors like the progress in information processing technologies, the emergence of new financial instruments or the collapse of fixed exchange rate regimes etc., the policy choice of developing countries favoring capital market deregulation and liberalization has also greatly promoted the globalization of the financial sector. Starting by the industrialized world, developing countries had been subsequently drawn into the process partly due to advice given by international institutions and the mainstream view that there were great benefits from opening up to international capital movements (Khor, 2001). Despite the lifting of restrictions on cross-border investing and the striking increase of capital flows worldwide, investors still remain reluctant to hold significant portions of their wealth in foreign assets. Put another way, from the huge amounts of capital flows under circulation do not emerge equally large stocks of foreign portfolio assets as shown by, for example, Tesar and Werner (1995) who document the “higher turnover rates of foreign holdings compared to domestic holdings”. In turn, the apparent domestic concentration in international investments, coined by the term *home bias*<sup>34</sup>, means that investors fail to exploit the potential welfare gains that could be achieved via cross-border diversification of portfolios.

There exists actually a huge body of empirical literature documenting the potential gains from international portfolio diversification. Moreover, recent studies show that the geographical diversification dominates over the industry or regional diversification despite the frequently-claimed integration of financial markets worldwide (Baele and Inghelbrecht, 2009; Chiou, 2009; De Santis and Sarno, 2008; Driessen and Laeven, 2007), suggesting that the international market frictions are still large enough to defend the absence of perfect synchronization across national exchanges. Within the related literature mainly starting from the contribution of Grubel (1968) who carried out Markowitz (1952) and Tobin’s (1958) pioneering work to the international scale, we observe that many studies typically focus on the issue by taking the viewpoint of investors in the U.S. or, more generally, those in developed-market countries. For instance, Chiou (2009), Li *et al.* (2003), De Santis and Gerard (1997) document substantial benefits of global diversification for U.S. investors. Gupta and Donleavy (2009) and Allen and Macdonald (1995) consider the viewpoint of Australian investors, while Heimonen (2002), Booth and Martikainen (1999) and Liljeblom *et al.* (1997) consider that of the Scandinavian investors. They all find out significant gains from international portfolio diversification.

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<sup>34</sup> Strong and Xu (2003), Karolyi and Stulz (2003) and Lewis (1999) provide comprehensive reviews on the home bias literature.

Controlling for various investment constraints and market frictions such as transactions costs or restrictions on short-sales, some studies also suggest that these benefits exhibit non-negligible cross-sectional variation. For example, De Roon *et al.* (2001) find that the diversification benefits mostly disappear for U.S. investors once they control for market frictions. According to Rowland and Tesar (2004), U.S. investors can even achieve the benefits of global diversification by investing in stocks of multinational firms domestically traded. Over a sample of 52 countries, Driessen and Laeven (2007) note that while constraints on short-sales mostly leads to a decrease in the global diversification benefits, the gains remain larger for developing countries, in particular for countries with high country risk. In the same spirit, Campbell and Kraussl (2007) underline that “small countries, whose equity comprises a small fraction of the global-mean-variance efficient portfolio, would presumably have the most to gain from international diversification”. Although the existing literature typically lacks of a comprehensive study on the cross-country differences in the gains from international diversification from the viewpoint of local investors in various countries, a number of reasons would intuitively justify such a perspective.

First, as underlined by Rowland and Tesar (2004), domestic diversification opportunities should obviously be larger for local investors in mature capital markets than for their counterparts in smaller and less liquid capital markets. Indeed, the authors show that a typical U.S. investor can achieve an appropriate international diversification scheme without having to trade abroad. Errunza *et al.* (1999) examine whether U.S. investors could mimic foreign market returns with domestically traded securities. They conclude that the gains beyond those achievable through home-made diversification are insignificant for 11 out of the 16 foreign markets they include into the analysis. In contrast, this would not be easily the case for a local investor in an emerging market having access to a limited number of internationally open firms whose cash flows typically depend on internal dynamics. Moreover, Lesmond (2005) notes that, although some smaller markets such as Taiwan exhibit high levels of liquidity comparable to those observed in developed markets, most emerging markets have substantially lower liquidity levels. Olusi and Abdul-Majid (2008), and Lane and Milesi-Ferretti (2008) also state that investors in smaller countries could benefit more from diversification since their local markets are commonly less dependent on the global business cycle and provide weaker scope for diversification at home.

Second, investors in developed markets naturally enjoy from some well-established institutional standards and market infrastructure such as more transparent information disclosure, better accounting practices, investor protection rules etc. Consequently, limiting the scope of their investments exclusively to domestic securities would alter the portfolio performance of investors in emerging markets. Third, the market synchronicity, i.e. the tendency of stocks to move in the same direction over a particular period is substantially

higher in emerging markets than in developed markets. For example, comparing the market synchronicity over a sample of 21 countries, Schill (2006) notes that while about 58% of the US stocks move in the same direction during one week – which is a relatively weak level of synchronicity, the same ratio is up to 75% for Malaysian stocks, and 80% and 83% for Polish and Chinese stocks respectively.<sup>35</sup>

Fourth and perhaps more perplexing than the aforementioned statements, is the fact that local investors in emerging markets are also those who concentrate their portfolios towards domestic securities more than do investors in developed markets. For example, Baele *et al.* (2007) assess the magnitude of the home bias across 25 countries and find that most countries exhibit an average home bias around 0.7 – 0.8. That is said, the average home bias among four emerging market making part of the Baele *et al.*'s sample rises up to 0.96. In an earlier chapter of this dissertation, I provide similar evidence over a larger sample of 18 emerging and 18 developed market countries using equity holdings data from the IMF's "Coordinated Portfolio Investment Survey". While home bias is omnipresent across the whole sample for the year-end 2006, there exists a large cross-sectional variation among the estimates: The extent of the domestic bias generally declines with the investor country's economic mass and/or the degree of its market sophistication. It ranges from a lower value of 36% concerning the foreign holdings of Dutch investors to an absolute domestic bias with almost 100% of the equity wealth held in the home market for investors in India or Philippines. Overall, the average home bias across developed and emerging countries, are about 65.1% and 93.5% respectively, and the difference between the two means is statistically highly significant. In summary, the fact that local investors in emerging markets exhibit substantially higher degrees of domestic portfolio bias stands also at odds with the view that they should presumably benefit more from international diversification.

This paper's objective is to contribute to the empirical literature by providing an up-to-date analysis of the gains from international portfolio diversification as well as an examination of the cross-sectional variation of the economic gains from diversification between countries. I employ a dataset consisting of 36 country and 4 regional indices provided by the Morgan Stanley Capital International (MSCI) in monthly frequencies for the period January 1988 to December 2007. The set of countries included into the study comprises 22 developed and 14 emerging markets.<sup>36</sup> Using the sample estimates of return expectations and covariances, I solve for different international tangency portfolios and I identify the potential gains from

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<sup>35</sup> Schill (2006) discusses the institutional features altering the traditional investment paradigms in emerging markets. See also Bekaert and Harvey (2003) for an extensive overview of the particularities of emerging market finance.

<sup>36</sup> The countries included in the analysis are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, United States for developed countries, and Argentina, Brazil, Chile, China, Greece, Indonesia, Jordan, Korea (South), Malaysia, Mexico, Philippines, Taiwan, Thailand, Turkey for emerging countries.

diversification on the basis of changes in portfolio expected returns, volatilities and Sharpe ratios compared to a purely domestic strategy. The main emphasis is put on the cross-sectional variation of these changes within the sample. I also analyze the impact of different portfolio constraints and that of the “home bias” on international diversification potential. The results can be summarized as follows.

First, the mean-variance optimization framework confirms the existence of substantial benefits from international diversification regardless the investors’ country of origin: Assuming that local investors hold an unconstrained tangency portfolio, the average increase in the reward-to-risk ratio is 30% and the average decrease in the portfolio volatility is minus 4.5% over the full sample. Imposing short-sales constraints reduce some part of the diversification benefits, which remain nonetheless large enough to justify the advantage of the global portfolio diversification over domestic investment strategies: Holding a long-only tangency portfolio, local investors can expect, on average, an increase in the Sharpe ratios by about 19%. Computing the return correlations between the country indices and a number of regional indices (i.e. the MSCI all country Americas, Asia-Pacific and Europe indices), I find that correlation coefficients are particularly high when the geographical location of the country matches with the geographical coverage of the regional investable index of interest. This suggests that regional diversification is likely to erode some part of the international diversification potential as suggested by, for example, Driessen and Laeven (2007).

Second, there exists a considerable cross-sectional variation in the potential gains from international diversification: Concerning an international tangency portfolio with no short-sales, the increase in the Sharpe ratio compared to a domestic portfolio, ranges from a lower value by 8.4% for Danish investors to higher value by 31.8% for Japanese investors, with a sample standard deviation by 6%. That is said, the gains from international diversification presents are particularly important for local investors in smaller capital markets. On average, local investors in emerging and developed countries can decrease the portfolio volatility by about 7.2% and 2.4% respectively. Likewise, the average increase in the Sharpe ratio is also higher for the group of emerging countries. This finding is also consistent with the view that emerging countries are less dependent on the global business cycle and, therefore, more segmented from the world capital markets than are developed countries. The results of the regression analysis suggest that the country risk and the level of the economic development (measured by the GDP per capita) are the major correlates of the observed variability in the gains from international diversification for local investors in different countries.

In line with the impact of short-sales constraints, I also document the effect of the home bias on the benefits from international diversification by imposing threshold portfolio weight constraints to the international tangency portfolio. Doing so, I assume that local investors allocate at least 10%, 20% and 50% of their wealth in their domestic market and compare the

changes in the resulting portfolio parameters with those that can be obtained by investing domestically. Unsurprisingly, the overweighting of the domestic market significantly alters the portfolio parameters, concerning both the Sharpe ratio and the portfolio volatility. For some countries like the U.S., the Netherlands or Chile, local investors are substantially worse off by holding half of their portfolios in the local market given the negative changes in the Sharpe ratios. Moreover and paradoxically, the magnitude of local investors' home bias is inversely related to the potential benefits likely to be achievable through international portfolio diversification.

The paper is organized as follows: The next section introduces the data set and a number of preliminary statistics useful to understand the underlying international portfolio diversification potential for local investors. Section three presents the method employed to solve for the international efficient portfolios and the resulting international diversification gains from the viewpoint of local investors. This section also analyzes the effect of overweighting the local market to control for the extent to which home bias erodes the gains from international diversification. Section four uses a simple regression framework to examine the determinants of the observed cross-sectional variation in the gains from international diversification. Section five concludes.

## **2 Data and Preliminary Statistics**

In this study, I employ country and regional indices provided by the Morgan Stanley Capital International (MSCI) that are frequently used in empirical research.<sup>37</sup> MSCI gross indices are adjusted for dividend streams and allow comparability across countries given the standardization of the methodology. Specifically, I employ a time-series dataset that comprises equity indices in monthly frequencies for 36 countries for the period January 1988 to December 2007. Since the index data are available in US dollars or the respective country's local currency terms, I employ index values in US dollar terms to ensure consistency and avoid currency fluctuations over time. The set of countries included in the analysis comprise 23 developed and 13 emerging countries since index data for most emerging countries is available for a shorter period of time compared to developed countries. As noted by Gupta and Donleavy (2009), the distinction "developed vs. emerging markets" should be based on theoretical constructs, although most studies – including the present one – follow the distinction proposed by the World Bank. Beside the country indices, I also make use of four additional global indices, i.e. the MSCI All Country (AC) World index, Americas index, Asia-Pacific index and the Europe index, that help to gauge for the overall market movements in the corresponding geographical region. The list of the countries making up these global indices is provided in the

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<sup>37</sup> See Harvey (1991) for a comprehensive discussion on the MSCI indices.

appendix. The next table lists summary statistics of the monthly returns for the thirty-six countries and these four global indices.

[Insert table 1 here]

To highlight the differences between developed and emerging countries, the table distinguishes the statistics across these two groups. The high return vs. high risk pattern of the emerging markets is evident from the data. Over a twenty-year long period, returns on emerging market indices were on average higher than those of the developed markets with a substantially higher variability around the mean. It turns out that the ex-post risk-to-reward ratio for developed countries is considerably higher than that of the emerging markets. Indeed, a simple *t*-test suggests that the difference is also statistically significant at the 1% level. This observation also underlines the importance of the portfolio diversification into the developed countries for local investors in emerging countries although the literature generally highlights the diversification potential of emerging countries for investors in mature capital markets. Another striking point is the relatively poor performance of the AC Asia-Pacific index, which yields to a Sharpe ratio by only 5.3%, while the performance of the AC World index is about 19% over the period of interest.

Correlations are central to the portfolio analysis such that the benefits from international portfolio diversification are typically attributed to the imperfect synchronicity between country indices. Table 2 shows the correlation coefficients of the market returns on each country with the returns in other countries as well as the returns on the respective global indices included in the study. Given the large number of countries, I provide the average scores of the correlation of a country with other countries in the sample instead of providing the coefficients matrix. Although not reported, these empirical coefficients are all significantly different from zero at the 1% level.

[Insert table 2 here]

A number of observations can be drawn from the table. First, the coefficients are mostly lower than unity regardless of the column observed. The average correlation between a country's market returns and the remaining countries in the sample is about 36%, which is a quite weaker score. In fact, the potential benefits of the international portfolio diversification can be basically advocated on the basis of this imperfect correlation structure across markets. Second, we observe that the correlations are substantially weaker concerning emerging markets countries regardless of the column considered. For example, while the average correlation coefficient between developed countries' returns and the returns on the MSCI AC World index is 0.66, the same statistic drops to 0.38 when calculated over the emerging countries group. This point also supports the view that emerging capital markets are less integrated with the global business cycle than developed ones. Third, the calculated



coefficients exhibit substantial variability across different geographical clusters as revealed by systematically higher correlations when a particular country and the regional index belongs to the same geography. For example, using countries' membership data on different global indices, we find that the average correlation that European and non-European countries exhibit with the MSCI AC Europe index is respectively 70% and 40%. Similarly, countries in the Asia-Pacific region are substantially more correlated with the AC Asia-Pacific index than are countries from other regions of the World. It follows that investing in closer geographies is likely to erode the underlying diversification potential of an international portfolio, although a fair amount of the diversification gains can still be obtained by investing regionally as shown by, for example, Driessen and Laeven (2007).

### 3 International Diversification Benefits

In this section, I analyze the potential benefits of international portfolio diversification from the viewpoint of local investors in various countries. The diversification potential is described with respect to a classic portfolio optimization framework. More specifically, diversification benefits for local investors in each country are analyzed in terms of the resulting increase in the expected return, decrease in the volatility or increase in the risk-return tradeoff of the international portfolio.

#### 3.1 Efficient Portfolios

Introduced by Markowitz' (1952) pioneering work, the efficient frontier is defined as the locus of all feasible portfolios that maximizes the expected return given a target level of risk or minimizes the portfolio risk given a target level of expected return. Tobin (1958) showed that, if a risk-free asset exists, the problem can be reduced to choosing a single super-efficient portfolio among the infinite set of efficient portfolios.<sup>38</sup> This section provides a short introduction to this methodology employed to identify the gains from diversification.

Suppose a mean-variance rational investor facing a set of  $N$  risky assets. The mean return on each asset is denoted by  $R_i$ ,  $i = 1, \dots, N$ , and the covariances of returns between each asset are denoted by  $\sigma_{ij}$ ,  $i, j = 1, \dots, N$ . Denoting by  $x_i$  the fraction of investor's wealth allocated in asset  $i$  and assuming that the investor distributes all his wealth across the set of investable assets, i.e.  $\sum_{i=1}^N x_i = 1$ , then the resulting portfolio parameters are expressed as follows,

$$(1) \quad R_p = \sum_{i=1}^N x_i R_i$$

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<sup>38</sup> For a short and step-by-step introduction to the mathematics of mean-variance analysis, see among others, Constantinides and Malliaris (1995).

$$(2) \quad \sigma_p = \left[ \sum_{i=1}^N \sum_{j=1}^N x_i x_j \sigma_{ij} \right]^{1/2}$$

Suppose that a risk-free asset with the rate of return  $R_f$  exists. Then, it can be shown that there exists a unique optimal portfolio  $x^* = [x_1^*, \dots, x_N^*]'$  from the full set of efficient portfolios lying on the efficient frontier. Formally, the investor seeks to identify the composition of the tangency portfolio  $x^*$ , solution to the following problem,

$$(3) \quad \max_{\{x_i\}_{i=1}^N} \theta = \frac{R_p - R_f}{\sigma_p}$$

subject to the constraints  $\sum_{i=1}^N x_i = 1$ , and  $x_i \geq 0$ ,  $i \in N$ , if short-sales are not allowed. In equation (3), the parameter  $\theta$  refers to the Sharpe ratio, which is the portfolio's excess return over a risk-free rate,  $(R_p - R_f)$  per unit of risk exposed,  $\sigma_p$ . The composition of the tangency portfolio is then determined by plugging the expressions for the portfolio return (1) and the standard deviation (2) into the equation (3) and solving for the vector  $x^*$ . Once this unique risky portfolio is determined, investors can allocate the wealth between the risk-free asset and the tangency portfolio according to their risk aversion, while the composition of the tangency portfolio itself is independent of investor's risk aversion (Eun and Resnick, 1994).

Beside computing the optimal international portfolio solution to (3), I also compute three other portfolios by imposing additional constraints to the problem along the classic constraint that the portfolio weights sum up to unity. In fact, the possibility to sell short among the full set of countries yields to an unconstrained international tangency portfolio. I relax this assumption by imposing constraints on short-selling within developed markets, emerging markets and the full set of countries, a procedure that provides three additional tangency portfolios upon which the gains from international diversification can be evaluated. Formally, beside solving for (3), I also solve for the following portfolios,

$$(4) \quad \max_{\{x_i\}_{i=1}^N} \theta \quad \text{s.t.} \quad \sum_{i=1}^N x_i = 1 \quad \text{and} \quad x_i \geq 0 \quad \forall i = 1, \dots, N$$

$$(5) \quad \max_{\{x_i\}_{i=1}^N} \theta \quad \text{s.t.} \quad \sum_{i=1}^N x_i = 1 \quad \text{and} \quad x_i \geq 0 \quad \text{if } i \in \{Developed\ markets\}$$

$$(6) \quad \max_{\{x_i\}_{i=1}^N} \theta \quad \text{s.t.} \quad \sum_{i=1}^N x_i = 1 \quad \text{and} \quad x_i \geq 0 \quad \text{if } i \in \{Emerging\ markets\}$$

For each country in the sample, I estimate the first two moments – the means and the covariances – using historical return data and then use these estimates to solve for the international tangency portfolios in equations (3) to (6). Then, the benefits from international

portfolio diversification for local investors in each country are determined by comparing the resulting international portfolio's risk-return characteristics with those of a purely domestic portfolio which corresponds to investing into the domestic market index. In particular, I define the potential gains from international diversification on the basis of three arguments: the differences between international portfolio's expected return, risk, and Sharpe measure with those of the domestic market index:  $\Delta R = R_p - R_i$ ,  $\Delta\sigma = \sigma_p - \sigma_i$ , and  $\Delta\theta = \theta_p - \theta_i$  where the subscripts  $P$  and  $i$  denote the parameters of the international portfolio and the country portfolio respectively. Therefore, holding the international tangency portfolio is said to be advantageous for local investors in different countries if the parameters of the resulting portfolio improves at least one of these characteristics. Obviously, the key improvement of interest for local investors concerns whether the Sharpe measure of the international portfolio is higher or not than that of the domestic market portfolio.

### 3.2 Results

Figure 1 visualizes the respective compositions and the parameters of international tangency portfolios solution to problems given in equations (3) to (6). Panel A shows the weights of the unconstrained portfolio where short-selling is allowed for all countries in the sample while panel B shows the constrained international portfolio for which short-selling is prohibited. Panel C and D show the compositions of the international portfolios corresponding to equations (5) and (6) where short-selling is not possible respectively in developed markets and emerging markets. For each portfolio, the figure also shows the corresponding portfolio's expected return, volatility and the Sharpe ratio. Not surprisingly, the unconstrained international portfolio in panel A yields the best risk-reward tradeoff compared to other portfolios in panel B to D. When short-selling is not possible for the full sample, only 10 markets out of the 36 enter the portfolio. Looking at panel D, we note that the constrained international portfolio with long-only positions in emerging markets performs considerably better than the constrained portfolio where the same constraint is imposed to developed markets. In fact, the result can be explained by the superior risk-return characteristics of most of the developed markets over the period of interest.

[Insert figure 1 here]

Table 3 summarizes the international diversification benefits from the viewpoint of local investors and highlights the impacts of various short-selling constraints on the diversification potential related to different scenarios. Panel A shows the results for the unconstrained tangency portfolio, while panel B and C show the results when short-sales are constrained for the group of developed and emerging countries respectively. Finally, panel D shows the results for the constrained strategy where short-selling is prohibited over the full sample. In each panel, the first column displays the countries' respective weights in the international portfolio.

The columns “Delta [Expected Return]”, “Delta [Volatility]”, and “Delta [Sharpe ratio]” display the variations (with respect to a purely domestic strategy) in the parameter scores that would be obtained if local investors of the country of interest held the international portfolio whose parameters are shown below each panel. For example, looking at the scores in panel A concerning France, the numbers 0.65, -1.54 and 24.68 mean that French investors would have increased the expected return, decreased the volatility, and increased the Sharpe measure on their investments by these respective percentages compared to the case in which they would solely held the domestic portfolio of equities. Finally, to facilitate comparison across developed and emerging countries, I also report the respective group averages of the parameter changes.

[Insert table 3 here]

Unsurprisingly, the changes in expected returns are more important for local investors in developed countries than those in emerging countries. Across the four scenarios examined in panels A to D, the average increase in portfolio returns that could be obtained via international diversification is about 0.53% for developed countries while the same average is 0.39% for emerging countries. In contrast, international diversification has a more favorable impact concerning the reduction in the portfolio volatility for emerging market investors in all cases. On average, local investors in emerging markets can reduce their portfolio volatility by about 7.05% while the reduction in the volatility due to diversification is 2.27% for local investors in developed markets. Interestingly, the long-only tangency portfolio reported in panel D provides the highest improvement in portfolio volatility for local investors.

Obviously, the main parameter of interest concerns the improvement of the risk-return tradeoff from holding the international portfolio, which is measured by the Sharpe ratio. Regardless of the international portfolio considered, Japanese investors obtain the highest improvement given the poor risk-return performance of the Japanese domestic market over the sample period. In line with previous studies, the results point out to substantial diversification benefits for local investors in all countries. For example, by holding the long-only tangency portfolio reported in panel D, local investors in developed and emerging countries can increase the reward-to-risk ratio of their portfolios by about 20 and 26% respectively, compared to a domestic strategy. Again, the potential benefits of international diversification are more important for investors in smaller capital markets. Across the four possible scenarios, on average, the increase in the Sharpe ratio is about 23% for developed countries while the same statistic is 29% once we consider the group of emerging countries. Thus, evidence provided here is consistent with previous studies (e.g. Bekaert and Harvey, 1995; Harvey, 1995) suggesting that many developing countries are less integrated with world capital markets, which in turn, could be at the root of most of the potential gains from international portfolio diversification for local investors in these countries.

The results also show that the benefits from international diversification remain still large enough once we take into account various constraints on short-selling in either developed or emerging markets. Prior studies showed that investment constraints may not completely erode the benefits from international diversification (Chiou *et al.*, 2008; Li *et al.*, 2003; De Roon *et al.*, 2001; Bekaert and Urias, 1996). In this paper too, imposing constraints on short sales eliminate some part of the diversification gains as suggested by the relatively weaker increases in Sharpe ratios. Also, we observe that the negative impact due to restricting the short-sales is larger when these restrictions apply to the group of developed markets compared to emerging markets. Yet, substantial reward-to-risk improvements that could be achievable via cross-border diversification of portfolios still remain.

### 3.3 Home Bias and the Costs of Under-diversification

The “home bias” in portfolios is one of the major puzzles in international economics (Obstfeld and Rogoff, 2000). Beside the fact that the home bias constitutes an important challenge for the mainstream asset pricing models (e.g. Adler and Dumas, 1983) it also runs counter to the empirical literature on the benefits of international diversification. Why investors hold poorly diversified portfolios largely concentrated within domestic securities while international diversification is potentially more beneficial? If international diversification is more advantageous than domestic diversification, then what are the opportunity costs induced by overweighting the domestic assets? Attempts trying to answer the first question have so far generated a huge volume of the literature whereby researchers seek to rationalize the home bias phenomenon. This literature is well exposed in, for example, Karolyi and Stulz (2003) or Lewis (1999). Rather, this section discusses the second one.

To examine the impact of portfolio allocation within the domestic market, I employ the same framework introduced above by adding further constraints on the optimization process;

$$(7) \quad \max_{\{x_i\}_{i=1}^N} \theta \quad \text{s.t.} \quad \sum_{i=1}^N x_i = 1 \quad \text{and} \quad (a) \quad x_i \geq 0, \quad \forall i$$

$$\text{and} \quad (b) \quad x_i \geq c_i, \quad i = 1, \dots, N, \quad c_i = 0.1, 0.2, 0.5$$

Equation (7) has the same setup as the problem given in equation (4) with the important exception that there exists an additional constraint to capture the home bias effect by restricting local investors in each country  $i$  to hold  $c_i$  percent of their wealth in domestic stocks. Put another way, local investors in country  $i$  are assumed to allocate at least, say, 20% of their portfolios in domestic assets and will distribute the remaining 80% across the rest of the investment set. Solving the problem above yields to 108 (36 countries  $\times$  3 constraints) different cases upon which the effect of the home bias on the diversification potential of an

international portfolio can be evaluated. The results are summarized in the following table.

[Insert table 4 here]

Table 4 reports the percentage changes in Sharpe ratios for local investors across different international investment scenarios. It can be noticed that the first column reproduces the increases in Sharpe ratios provided in panel D of table 3, the case for which local investors are assumed to hold the long-only international tangency portfolio. Columns 2 to 4 show the percentage changes in the Sharpe ratios resulting from investing into an international tangency portfolio without short-sales and where the weight of the domestic market is not less than the respective values provided in each column, i.e., 10%, 20% and 50%. The results are easy to interpret: Overweighting the domestic market has a significant impact on the ex-post reward-to-risk performance of local investors' portfolios. In particular, home bias is particularly influential on the diversification potential of optimized portfolios when the domestic country share exceeds 20%. Over the full sample, while the average gains from international diversification is 18.7% when investors are allowed to hold the long-only tangency portfolio, the same statistic drops to 3.7% for the case where local investors are restricted to hold at least half of their wealth in domestic stocks. Further, for some countries like Denmark or Mexico, a home bias by 50% seriously alters the performance of the investment portfolios as suggested by the negative changes in the Sharpe ratios.

To further highlight the relationship between local investors' bias toward domestic securities and the implicit opportunity costs related to holding poorly diversified portfolios, figure 2 visualizes the scatter plots of local investors' potential gains from international diversification against the home bias ratio of the country of interest. A given country's home bias ratio is plotted on the horizontal axis. The graphs in the upper and lower panel show respectively the decrease in the portfolio volatility and the increase in the Sharpe ratio on the vertical axis. The estimations of cross-border equity ownership are based upon data from the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS) for the year-end 2006. In brief, the CPIS is an attempt undertaken by the IMF in the mid-1990s in response to the lack of a worldwide reliable and comparable data base concerning the international portfolio investment positions. When the first issue was published in 1997, only 29 countries had adequately responded to the survey, but the survey coverage improved since then. Using data on countries' aggregate foreign equity assets from the CPIS and data on domestic market capitalization, I compute the home bias of local investors in country  $j$  as follows (Kho *et al.*, 2009),<sup>39</sup>

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<sup>39</sup> The formula to calculate the home bias implicitly assumes that the benchmark portfolio weights for local investors in a particular are given by the international CAPM, such that the optimal fraction that country  $j$ 's investors should hold in the domestic market corresponds to country  $j$ 's relative world-market capitalization weight. Obviously, comparing the diversification gains obtained through a mean-variance analysis to home bias ratios derived from the international CAPM framework is questionable. Yet, using a single and unique benchmark for local investors in all

$$(8) \quad \text{Home bias}_j = 1 - \frac{\text{Share of foreign equities in country } j \text{'s portfolio}}{\text{Share of foreign equities in world portfolio}}$$

[Insert figure 2 here]

The linear fits inside the scatters suggest that the extent of the home bias over the sample is inversely related to the degree with which local investors could have benefited from international diversification. In the upper panel, the rank correlation between the decrease in portfolio volatilities and the home bias ratios is minus 0.71, significant at the 1% level. In the lower panel, the rank correlation between the increase in Sharpe ratios and the home bias ratios is also high by about 0.59, significant at the 1% level as well. The numbers point out a counter-intuitive scheme since local investors who stick more to their domestic market are also those who are likely to benefit more from global portfolio diversification. As a result, the opportunity costs in terms of the reduction of portfolio risk or the improvement of reward-to-risk ratios are also greater for local investors in emerging markets.

## 4 The Cross-Section of the Gains from Diversification

Evidence provided in the previous section confirmed the existence of significant benefits from global diversification for local investors in different countries. The gains are identified on the basis of the differences between the *ex-post* Sharpe ratio of the local portfolio (i.e. the domestic market index) and an international tangency portfolio whose weights are obtained by solving a simple mean-variance problem over a predetermined set of investment universe. Yet, the results suggest that the gains from diversification exhibit considerable cross-sectional variation within the sample. Concerning the tangency portfolio with constraints on short-sales for example, the increase in Sharpe ratio ranges from a lower value by 8.4% for Danish investors to a higher value by 31.8% for Japanese investors, with a standard deviation by 6%. In this section, I employ regression analysis to examine what country-specific factors can explain the observed cross-sectional variation in diversification benefits. Specifically, the objective is to find out whether the benefits from global diversification are more important for emerging countries with smaller economies and less mature capital markets.

Given this objective and the discussion provided in the introduction, I collect the following country-level data. The core variable of interest is the *International Country Risk Guide* (ICRG) country risk rating scores provided by the *Political Risk Services* (PRS) group, a commercial business information provider. In fact, the benefits from international diversification for local investors depend closely on the extent to which the domestic market is

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countries greatly facilitates the task. Further, the results obtained are quite consistent with the view that local investors in emerging countries who stick more to their home market than investors in developed countries, are also those who should benefit more from international diversification.

integrated with world capital markets (Harvey, 1995). Thus, country-specific characteristics like foreign ownership restrictions for both local and foreign investors, market sophistication, political stability, the strength and impartiality of the legal system etc. contribute all together to the degree of a country's stock market integration with the rest of the world (Driessen and Laeven, 2007). Initially, this rating measure consists of various dimensions of the political and business environment faced by firms operating in a given country, and it has been widely used to proxy for a country's riskiness in applied work (Driessen and Laeven, 2007; Bekaert and Harvey, 1997). In this study, I use the arithmetic average score of six broad sub-indicators reported by the ICRG. In brief, weaker country risk is associated to higher numerical scores in the ICRG. The appendix provides detailed explanations about the dimensions measured for each country and a summary of the raw data employed.

Beside the ICRG risk rating scores, I include a number of other controls into the regressions to explain the cross-sectional variation in diversification gains. First, I collect data on sample countries' market capitalization since the benefits from international diversification are likely to be larger for emerging countries with smaller economies. Thus, the variable "market capitalization" is a proxy for "size". Second, as another useful substitute likely to gauge for the difference between developed and emerging countries is the GDP per capita. Indeed, the country classification "developed vs. emerging" adopted by the World Bank is also based on GDP per capita, which is a good measure of the country's "economic development", rather than the economic mass. Third, I use a country's "freedom to trade internationally" score to control for the impact of the openness on the diversification potential for local investors. This is an index variable provided by the Economic Freedom Network that takes into account several dimensions related to the facility with which a country's citizens trade in international capital markets (see appendix for more details). In fact, as argued by Stulz and Williamson (2003), finance could be more valuable to countries that can benefit more from being open to international trade, which in turn can boost local investors' tendency to include more of foreign assets in their investment portfolios. Finally, I control for a cultural dimension, namely local investors' "uncertainty avoidance" as a plausible factor influencing the international diversification potential.<sup>40</sup> This is also an index variable issued from Geert Hofstede's research on cultural affinities. The "uncertainty avoidance index" of a country deals with a society's tolerance for uncertainty and ambiguity. It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured (novel, unknown, or surprising) situations. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules; safety and security measures. As noted

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<sup>40</sup> Regarding the hypothesized effect of the culture, Stulz and Williamson (2003) note the following: *If, as argued by the practitioners of behavioral finance, individuals have psychological biases that matter for finance, it would be surprising that individuals' view of the world as determined by their culture does not matter for how they view and act in financial markets* (p. 347).



by Chiou (2009), compared with the other three dimensions (i.e. individualism, masculinity and power distance), uncertainty avoidance is probably the most relevant dimension to equity investment. It is expected that the international diversification should be more valuable for countries with higher uncertainty avoidance index scores.<sup>41</sup>

I hold the country-level differences in portfolio Sharpe ratios and volatilities as the dependent variables since the increase in the expected return could be influenced by the level of the variance in the local market (Driessen and Laeven, 2007).<sup>42</sup> Numerical scores for individual countries' volatilities and Sharpe ratios come from the international tangency portfolio with short-sales restricted across the full sample. In all regressions, the estimation procedure provides *t*-statistics obtained using robust standard errors based on the Huber-White sandwich estimator of variance to control for heteroskedasticity. The results are provided in the next table.

[Insert table 5 here]

In table 5, panel A shows the OLS regression results with the increase in Sharpe ratios as the dependent variable whereas in panel B the dependent variable is the differences in volatilities. I start by estimating the model by including the ICRG as the only predictor as shown in columns (1). Then, I add the remaining controls to the model one-by-one through columns (2) to (5). This choice is motivated to highlight the effect of the country risk in explaining the variation in the data since other combinations of the regressors generally yield to similar results. The numbers in parenthesis below the coefficient estimates are the *t*-statistics. Looking at the adjusted *R*-squared values, we note that the estimated models capture a big part of the variation in the data. The average *R*-squared is 0.88 in panel A and 0.70 in panel B. Although not reported here, across all specifications the null hypothesis that the regression coefficients are jointly equal to zero is rejected at the 1% level.

Concerning the significance of the parameter estimates, the results are mostly in line with the previous discussions as well as earlier results provided in the literature. For example, of all the country-specific variables they investigate, Driessen and Laeven (2007) note that only the ICRG country risk rating is the statistically significant one responsible from the increase in Sharpe ratios. The results are quite consistent in that the ICRG appears to be the main determinant of the improvement in portfolio parameters for local investors. In panel A, the

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<sup>41</sup> The list of the candidate predictors can be extended. However, since different measures of economic and financial development are likely to be highly correlated (Beck *et al.*, 2000), it would be convenient to restrict the exercise across a small number of variables. Yet, I repeated additional exercises (not reported in the paper) with other variables. For example, Driessen and Laeven (2007) use the trade volume to GDP ratio to control for the effect of a country's openness on the increase in Sharpe ratios. I also controlled for the same variable in this study, however, the statistical significance of the trade to GDP ratio is generally weak.

<sup>42</sup> I have also run the regressions using the percentage difference in expected returns between the tangency portfolio and the domestic index. However, the results generally lack of both statistical and economic significance even concerning the ICRG variable.

country risk rating is highly significant in all cases except column (1) where the sign of the parameter is opposite to what is expected. Looking at panel B, the parameter estimates are also statistically and economically highly significant in columns (2) to (5). The changes in portfolio volatilities tend to be larger for countries with weaker ICRG scores to which more country risk is associated. Therefore, local investors resident in countries with more country risk are also those who would potentially benefit more international diversification.

The GDP per capita variable also performs generally well since it enters the regressions with significant and expected parameters. This variable which is a good proxy for a country's economic development, tells us that the level of the economic development is inversely related to the benefits that international portfolio diversification potentially presents for local investors. This point also supports Campbell and Kraussl's (2007) view that *investors in small countries, whose equity comprises a small fraction of the global mean-variance efficient portfolio, would presumably have the most to gain from international diversification* (p. 1242). The market capitalization performs poorly with insignificant parameter estimates. In fact, most of the effect of a country's economic mass can be soaked up by inclusion of the GDP per capita given the high-to-moderate correlation by 0.43 between these variables. Consistent Stulz and Williamson's (2003) proposition, the degree with which local investors are free to trade in international markets, that is, a country's openness to foreign markets also affects positively the magnitude of the gains from international portfolio diversification. Finally, despite the slightly significant coefficients, we note that a country's uncertainty avoidance is positively related to the magnitude of the benefits from global diversification since uncertainty avoidance is typically high across developing countries.

## 5 Conclusion

In this paper, I investigate the benefits of international portfolio diversification from the viewpoint of local investors in 36 countries using monthly country index data over the period January 1988 – December 2007. Using a simple mean-variance framework, I identify the benefits of diversification by distinguishing three arguments, namely, the resulting change in portfolio expected return, volatility and the Sharpe ratio with respect to a purely domestic investment strategy that consists on exclusively investing into the domestic market index. Beside estimating the international diversification potential, I also examine the cross-sectional variation of the diversification gains by means of regression analysis of the increase in the ex-post Sharpe ratios and the decrease in volatilities on an array of country-specific predictor variables. A number of results can be drawn from the study.

First, the mean-variance analysis suggests that there are substantial benefits from international diversification whatever be country of origin of the investors: If they invest into

an international tangency portfolio instead of the domestic market, on average, local investors can increase the reward-to-risk ratio of their portfolios by 30% or decrease the portfolio volatility by 4.5%. Although short-sales constraints erode some part of the diversification gains, the latter remain large enough to justify the advantage of the global portfolio diversification over domestic investment strategies. Second, there exists an important cross-sectional variation in the potential gains from international diversification in that the benefits are significantly larger for local investors in emerging markets. This finding is mostly in line with the view that emerging countries are less dependent on the global business cycle and, therefore, more segmented from the world capital markets. Third, regression analysis show that the country risk, the degree of the economic development and foreign openness are the major factors that explain the observed variability in the diversification gains across countries.

Evidence presented here is suggestive but not without drawbacks. One can consider two main avenues for further analysis. First, the economic gains from international diversification from the viewpoint of local investors are identified on the basis of *ex-post* optimal tangency portfolio parameters and country weights. The latter in turn, largely depend on good prediction of the expected values and covariances of returns. The procedure followed here implicitly assumes that the traditional maximum likelihood sample estimates of the first two moments using historical data yields the best estimates of the true parameters of interest. However, as documented by a large body of literature<sup>43</sup>, it is well known that sampling errors and parameter instability over time involve a number of problems regarding the accuracy of mean-variance optimal portfolios.<sup>44</sup> Therefore, it would be useful to further check in a parallel study whether and to which extent the international diversification gains differ across local investors in different countries by taking into account the parameter uncertainty in optimizing the international portfolios.

A second and related point worth to emphasize concerns the static framework adopted for the analysis. Indeed, the potential benefits of international diversification can be time-varying to the extent that either the return expectations or the market comovements change over time. Undertaking a similar cross-country study with such an over-time perspective can also be useful to understand what international and/or domestic market conditions affect the potential benefits from international diversification from the viewpoint of local investors in various countries. In fact, since developed countries are already integrated with world capital markets

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<sup>43</sup> See, among others, Kan and Zhou (2007), Garlappi *et al.* (2007), Stevens (1998), Jorion (1986, 1985).

<sup>44</sup> A first problem concerns the large variability of the future returns' estimates so that in-sample efficient portfolios often leads to extreme and practically irrelevant asset weights as shown by Britten-Jones (1999) or Best and Grauer (1991) among others. Another issue is related to the robustness properties of the estimated parameters due to the assumption that the observed returns are realizations from a multivariate normal density. Jobson and Korkie (1980) show that conventional classical maximum likelihood procedure does not allow making reliable inferences for small samples under the assumption of multivariate normality. Best and Grauer (1991) find that the out-of-sample accuracy of in-sample mean-variance efficient portfolios are extremely sensitive to changes in asset means.

in a greater extent, examining the factors that explain the time-variation of the diversification gains for local investors in emerging markets would be particularly useful to further understand the sources of the segmentation that prevails between this group of countries and the global marketplace.

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## APPENDIX A. Sample countries' membership to MSCI regional and global indices

The table below shows the sample countries' membership to MSCI all country World, Americas, Asia-Pacific and Europe indices. Hence, for example, while the USA is part of the MSCI all country World and Americas indices, only Argentina and Jordan are not included in none of these global indices calculated by the MSCI.

Table A1. Country membership information for MSCI All Country World and Regional indices

Country	World	Americas	Asia-Pacific	Europe
<i>Developed markets</i>	✓		✓	
Australia	✓		✓	
Austria	✓			✓
Belgium	✓			✓
Canada	✓	✓		
Denmark	✓			✓
Finland	✓			✓
France	✓			✓
Germany	✓			✓
Hong Kong	✓		✓	
Ireland	✓			✓
Italy	✓			✓
Japan	✓		✓	
Netherlands	✓			✓
New Zealand	✓		✓	
Norway	✓			✓
Portugal	✓			✓
Singapore	✓		✓	
Spain	✓			✓
Sweden	✓			✓
Switzerland	✓			✓
U.K.	✓			✓
U.S.A.	✓	✓		
<i>Emerging markets</i>				
Argentina				
Brazil	✓	✓		
Chile	✓	✓		
China	✓		✓	
Greece	✓			✓
Indonesia	✓		✓	
Jordan				
Korea	✓		✓	
Malaysia	✓		✓	
Mexico	✓	✓		
Philippines	✓		✓	
Taiwan	✓		✓	
Thailand	✓		✓	
Turkey	✓			✓



## APPENDIX B. Data sources

- International Country Risk Guide (ICRG): The ICRG data is provided by the *Political Risk Services*, a commercial business information provider ([www.prsgroup.com](http://www.prsgroup.com)). Producing country-level political, economic and financial risk ratings on a monthly basis since 1980, the ICRG monitors actually 140 countries and is widely used to proxy for country risk in applied work. Numerical scores used in this study show a particular country's political risk and are the weighted averages of the following sub-indicators and dimensions (source: Political Risk Services International Country Risk Guide):

### 1. Voice and accountability including;

1.1 Military in politics: The military are not elected by anyone, so their participation in government, either direct or indirect, reduces accountability and therefore represents a risk. The threat of military intervention might lead as well to an anticipated potentially inefficient change in policy or even in government. It also works as an indication that the government is unable to function effectively and that the country has an uneasy environment for foreign business.

1.2 Democratic accountability: Quantifies how responsive government is to its people, on the basis that the less response there is the more likely is that the government will fall, peacefully or violently. It includes not only if free and fair elections are in place, but also how likely is the government to remain in power or remain popular.

### 2. Political stability and absence of violence including;

2.1 Government stability: Measures the government's ability to carry out its declared programs, and its ability to stay in office. This will depend on issues as: the type of governance, the cohesion of the government and governing party or parties, the closeness of the next election, the government command of the legislature, and approval of government policies.

2.2 Internal conflict: Assess political violence and its influence on governance. Highest scores go to countries with no armed opposition, and where the government does not indulge in arbitrary violence, direct or indirect. Lowest ratings go to civil war torn countries. Intermediate ratings are awarded on the basis of the threats to the government and business.

2.3 External conflict: The external conflict measure is an assessment both of the risk to the incumbent government and to inward investment. It ranges from trade restrictions and embargoes, whether imposed by a single country, a group of countries, or the international community as a whole, through geopolitical disputes, armed threats, exchanges of fire on borders, border incursions, foreign-supported insurgency, and full-scale warfare.

2.4 Ethnic tensions: This component measures the degree of tension within a country

attributable to racial, nationality, or language divisions. Lower ratings are given to countries where racial and nationality tensions are high because opposing groups are intolerant and unwilling to compromise. Higher ratings are given to countries where tensions are minimal, even though such differences may still exist.

3. Government effectiveness including;

Bureaucratic quality: This component measures institutional strength and quality of the civil service; assesses how much strength and expertise bureaucrats have and how able they are to manage political alternations without drastic interruptions in government services, or policy changes. Good performers have somewhat autonomous bureaucracies, free from political pressures, and an established mechanism for recruitment and training.

4. Regulatory quality including;

Investment profile: Assessment of factors that affect the risk to operations: contract viability/expropriation, repatriation and payment delays.

5. Rule of law including;

Law and order: The law sub-component is an assessment of the strength and impartiality of the legal system, while the Order sub-component is an assessment of popular observance of the law.

6. Control of corruption including;

Corruption: Measures corruption within the political system, which distorts the economic and financial environment, reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability, and introduces an inherently instability in the political system.

- Freedom to Trade Internationally: This is a composite index variable consisting of the following sub-components: 1) Taxes on international trade including i) revenues from trade taxes (% of trade sector), ii) mean tariff rate, iii) standard deviation of tariff rates; 2) Regulatory trade barriers including i) non-tariff trade barriers, ii) compliance cost of importing and exporting; 3) Size of the trade sector relative to expected; 4) Black-market exchange rates and 5) International capital market controls including i) foreign ownership & investment restrictions, ii) capital controls. Details regarding each component can be found in Economic Freedom of the World annual reports. Source: Economic Freedom Network 2007 annual report, [www.freetheworld.com](http://www.freetheworld.com).

Table 1. Summary statistics

	Mean	Standard deviation	Sharpe ratio	Minimum	Maximum
Country indices					
Australia	1.07	5.27	20.36	-16.14	16.08
Austria	0.93	6.35	14.70	-26.51	22.65
Belgium	1.03	5.02	20.59	-20.81	22.46
Canada	0.98	5.04	19.47	-24.55	13.62
Denmark	1.26	5.14	24.55	-14.37	13.87
Finland	1.13	9.12	12.44	-38.21	28.72
France	1.02	5.39	18.88	-16.65	19.09
Germany	0.98	6.19	15.81	-27.91	21.26
Hong Kong	1.19	7.44	16.05	-34.06	28.69
Ireland	0.81	5.61	14.48	-19.44	16.90
Italy	0.73	6.36	11.44	-20.64	19.61
Japan	0.07	6.36	1.14	-21.55	21.72
Netherlands	1.07	4.81	22.32	-19.60	12.34
New Zealand	0.61	6.48	9.45	-22.36	24.42
Norway	1.15	6.66	17.24	-32.49	15.58
Portugal	0.59	6.24	9.46	-21.51	25.00
Singapore	0.90	6.88	13.01	-22.86	22.99
Spain	1.05	6.03	17.36	-24.34	19.69
Sweden	1.18	7.12	16.53	-25.15	20.55
Switzerland	1.06	4.76	22.32	-17.00	15.43
UK	0.84	4.36	19.34	-10.93	14.07
USA	0.94	3.93	23.93	-14.97	10.82
<i>Average</i>	<i>0.94</i>	<i>5.93</i>	<i>16.40</i>	<i>-22.37</i>	<i>19.34</i>
Argentina	1.59	14.70	10.78	-48.39	67.05
Brazil	1.85	16.12	11.47	-109.52	59.13
Chile	1.56	6.98	22.37	-34.39	20.03
China	0.85	7.05	12.04	-21.78	19.99
Greece	1.24	9.40	13.22	-25.59	44.03
Indonesia	1.03	13.96	7.38	-51.99	66.48
Jordan	0.62	5.13	12.08	-19.99	19.14
Korea	0.75	10.70	7.00	-37.48	53.41
Malaysia	0.77	8.70	8.85	-35.95	40.58
Mexico	1.87	9.38	19.88	-41.93	25.41
Philippines	0.67	9.29	7.17	-34.56	36.04
Taiwan	0.58	10.79	5.36	-41.04	38.14
Thailand	0.65	11.41	5.71	-41.57	35.98
Turkey	1.17	16.69	7.03	-53.18	54.96
<i>Average</i>	<i>1.09</i>	<i>10.74</i>	<i>10.74</i>	<i>-42.67</i>	<i>41.46</i>
<i>Average (all)</i>	<i>0.99</i>	<i>7.80</i>	<i>14.20</i>	<i>-30.26</i>	<i>27.94</i>
Global indices					
AC World	0.76	3.98	18.95	-15.09	10.71
AC Americas	0.95	3.94	24.20	-16.24	10.25
AC Asia-Pacific	0.31	5.78	5.31	-19.54	19.28
AC Europe	0.97	4.38	22.05	-13.98	12.86

Notes: The table reports summary statistics for monthly returns in USD terms of 36 country and 4 regional indices over the period 1988:01 – 2007:12. The numbers are given in percentage values. The risk-free rate is assumed to be zero when calculating the Sharpe ratio.

Table2. Correlations

Country	Average correlation with other countries	Correlation with the MSCI AC			
		World	Americas	Asia-Pacific	Europe
Australia	0.415	0.622	0.539	0.531	0.585
Austria	0.354	0.430	0.277	0.321	0.594
Belgium	0.387	0.645	0.524	0.391	0.746
Canada	0.450	0.742	0.771	0.516	0.640
Denmark	0.399	0.641	0.509	0.441	0.723
Finland	0.339	0.589	0.533	0.392	0.579
France	0.452	0.751	0.626	0.470	0.879
Germany	0.462	0.731	0.615	0.421	0.881
Hong Kong	0.402	0.589	0.537	0.511	0.506
Ireland	0.410	0.686	0.562	0.504	0.704
Italy	0.364	0.577	0.424	0.403	0.666
Japan	0.314	0.705	0.363	0.964	0.484
Netherlands	0.485	0.792	0.672	0.509	0.893
New Zealand	0.363	0.500	0.391	0.453	0.487
Norway	0.438	0.643	0.550	0.452	0.705
Portugal	0.352	0.525	0.373	0.358	0.620
Singapore	0.441	0.633	0.575	0.552	0.530
Spain	0.466	0.748	0.601	0.540	0.785
Sweden	0.467	0.764	0.642	0.538	0.787
Switzerland	0.405	0.692	0.540	0.492	0.786
UK	0.450	0.801	0.655	0.553	0.889
USA	0.449	0.843	0.995	0.451	0.709
<i>Average</i>	<i>0.412</i>	<i>0.666</i>			
Argentina	0.191	0.222	0.305	0.108	0.196
Brazil	0.273	0.432	0.390	0.349	0.341
Chile	0.323	0.417	0.473	0.270	0.358
China	0.461	0.624	0.565	0.583	0.512
Greece	0.283	0.352	0.267	0.210	0.449
Indonesia	0.267	0.278	0.290	0.254	0.249
Jordan	0.064	0.098	0.081	0.103	0.062
Korea	0.292	0.464	0.373	0.534	0.327
Malaysia	0.337	0.427	0.359	0.397	0.375
Mexico	0.328	0.501	0.550	0.347	0.396
Philippines	0.329	0.410	0.399	0.361	0.321
Taiwan	0.263	0.351	0.319	0.332	0.267
Thailand	0.360	0.472	0.451	0.464	0.358
Turkey	0.245	0.332	0.305	0.208	0.341
<i>Average</i>	<i>0.287</i>	<i>0.384</i>			
<i>Average (all)</i>	<i>0.363</i>	<i>0.556</i>			

Notes: The table reports the correlation coefficients between MSCI country and regional index returns over the period 1988:01 – 2007:12. For each country, the first column shows the average coefficient between the country's index return and the remaining countries in the sample. Columns two to five show the correlation of the country's index with one of the four global and regional indices. All coefficients are statistically significant at the 1% level.

Table3. Disaggregation of the potential gains from international diversification

## Panel A. Tangency portfolio with no restrictions on short-sales

Countries	Portfolio composition	Delta [Expected return]	Delta [Volatility]	Delta [Sharpe ratio]
Developed markets				
Australia	45.39	0.60	-1.42	23.19
Austria	18.18	0.74	-2.50	28.87
Belgium	11.40	0.64	-1.18	22.97
Canada	-11.41	0.69	-1.20	24.09
Denmark	37.52	0.41	-1.29	18.99
Finland	0.65	0.54	-5.26	31.14
France	1.84	0.65	-1.54	24.68
Germany	-43.24	0.69	-2.34	27.75
Hong Kong	9.73	0.48	-3.59	27.51
Ireland	-9.82	0.86	-1.76	29.09
Italy	-2.03	0.94	-2.51	32.13
Japan	-22.49	1.60	-2.52	42.46
Netherlands	21.48	0.60	-0.96	21.23
New Zealand	-15.07	1.06	-2.63	34.13
Norway	-12.91	0.52	-2.81	26.32
Portugal	-8.40	1.08	-2.40	34.12
Singapore	-3.19	0.78	-3.03	30.56
Spain	1.16	0.62	-2.19	26.20
Sweden	2.63	0.50	-3.27	27.04
Switzerland	31.08	0.61	-0.91	21.23
UK	-20.85	0.83	-0.52	24.22
USA	41.81	0.73	-0.08	19.62
<i>Average</i>		<i>0.74</i>	<i>-2.09</i>	<i>27.16</i>
Emerging markets				
Argentina	-1.53	0.09	-10.84	32.79
Brazil	-0.59	-0.18	-12.25	32.10
Chile	16.18	0.11	-3.13	21.18
China	-11.52	0.82	-3.20	31.54
Greece	5.51	0.43	-5.54	30.35
Indonesia	-0.20	0.64	-10.10	36.21
Jordan	15.21	1.05	-1.29	31.50
Korea	2.55	0.92	-6.84	36.58
Malaysia	7.62	0.90	-4.85	34.73
Mexico	9.48	-0.19	-5.53	23.67
Philippines	-7.74	1.01	-5.43	36.41
Taiwan	0.52	1.09	-6.93	38.23
Thailand	-8.61	1.02	-7.55	37.87
Turkey	-0.34	0.50	-12.82	36.55
<i>Average</i>		<i>0.59</i>	<i>-6.88</i>	<i>32.84</i>
<i>Mean</i>	<i>1.67</i>			
<i>Volatility</i>	<i>3.84</i>			
<i>Sharpe ratio</i>	<i>43.60</i>			

Table3 (continued).

## Panel B. Tangency portfolio with restrictions on short-sales in developed markets

Countries	Portfolio composition	Delta [Expected return]	Delta [Volatility]	Delta [Sharpe ratio]
Developed markets				
Australia	18.06	0.18	-1.83	16.06
Austria	2.37	0.32	-2.91	21.73
Belgium	0.00	0.21	-1.59	15.83
Canada	0.00	0.27	-1.61	16.95
Denmark	18.06	-0.01	-1.70	11.86
Finland	0.00	0.11	-5.67	24.00
France	0.00	0.23	-1.95	17.55
Germany	0.00	0.27	-2.75	20.62
Hong Kong	4.68	0.05	-4.00	20.38
Ireland	0.00	0.44	-2.17	21.95
Italy	0.00	0.52	-2.92	25.00
Japan	0.00	1.18	-2.93	35.32
Netherlands	0.00	0.17	-1.38	14.09
New Zealand	0.00	0.64	-3.04	26.99
Norway	0.00	0.10	-3.22	19.19
Portugal	0.00	0.66	-2.81	26.98
Singapore	0.00	0.35	-3.44	23.42
Spain	0.00	0.20	-2.60	19.06
Sweden	0.00	0.07	-3.68	19.90
Switzerland	16.14	0.19	-1.32	14.10
UK	0.00	0.41	-0.93	17.09
USA	18.48	0.31	-0.49	12.48
<i>Average</i>		<i>0.31</i>	<i>-2.50</i>	<i>20.03</i>
Emerging markets				
Argentina	0.84	-0.34	-11.25	25.66
Brazil	-2.26	-0.60	-12.66	24.97
Chile	20.17	-0.31	-3.54	14.05
China	-12.21	0.40	-3.61	24.40
Greece	2.46	0.01	-5.95	23.21
Indonesia	1.13	0.22	-10.51	29.07
Jordan	18.36	0.63	-1.70	24.36
Korea	-1.79	0.50	-7.25	29.45
Malaysia	3.54	0.48	-5.26	27.59
Mexico	9.47	-0.62	-5.94	16.54
Philippines	-5.38	0.58	-5.84	29.28
Taiwan	-1.50	0.67	-7.34	31.09
Thailand	-8.37	0.60	-7.96	30.74
Turkey	-2.24	0.08	-13.23	29.42
<i>Average</i>		<i>0.16</i>	<i>-7.29</i>	<i>25.70</i>
<i>Mean</i>	<i>1.25</i>			
<i>Volatility</i>	<i>3.42</i>			
<i>Sharpe ratio</i>	<i>36.46</i>			

Table3 (continued).

## Panel C. Tangency portfolio with restrictions on short-sales in emerging markets

Countries	Portfolio composition	Delta [Expected return]	Delta [Volatility]	Delta [Sharpe ratio]
Developed markets				
Australia	38.14	0.64	-1.17	21.43
Austria	15.63	0.78	-2.24	27.10
Belgium	11.97	0.68	-0.92	21.20
Canada	-11.17	0.73	-0.94	22.32
Denmark	43.06	0.45	-1.04	17.22
Finland	2.71	0.58	-5.01	29.37
France	3.61	0.69	-1.29	22.91
Germany	-50.50	0.73	-2.09	25.99
Hong Kong	5.95	0.52	-3.34	25.74
Ireland	-9.29	0.90	-1.50	27.32
Italy	-3.08	0.98	-2.26	30.36
Japan	-26.57	1.64	-2.26	40.69
Netherlands	28.18	0.64	-0.71	19.46
New Zealand	-16.12	1.10	-2.37	32.36
Norway	-12.64	0.56	-2.56	24.55
Portugal	-12.83	1.12	-2.14	32.35
Singapore	-14.24	0.82	-2.78	28.79
Spain	1.95	0.66	-1.93	24.43
Sweden	4.99	0.53	-3.01	25.27
Switzerland	30.97	0.65	-0.66	19.46
UK	-8.41	0.87	-0.26	22.45
USA	32.22	0.77	0.17	17.85
<i>Average</i>		<i>0.77</i>	<i>-1.83</i>	<i>25.39</i>
Emerging markets				
Argentina	0.00	0.13	-10.58	31.03
Brazil	0.00	-0.14	-12.00	30.33
Chile	15.29	0.15	-2.88	19.42
China	0.00	0.86	-2.95	29.77
Greece	5.29	0.47	-5.29	28.58
Indonesia	0.00	0.68	-9.85	34.44
Jordan	15.39	1.09	-1.03	29.73
Korea	0.00	0.96	-6.59	34.81
Malaysia	0.00	0.94	-4.59	32.96
Mexico	9.50	-0.15	-5.27	21.90
Philippines	0.00	1.04	-5.18	34.65
Taiwan	0.00	1.13	-6.68	36.46
Thailand	0.00	1.06	-7.29	36.10
Turkey	0.00	0.54	-12.56	34.78
<i>Average</i>		<i>0.63</i>	<i>-6.62</i>	<i>31.07</i>
<i>Mean</i>	<i>1.71</i>			
<i>Volatility</i>	<i>4.09</i>			
<i>Sharpe ratio</i>	<i>41.83</i>			

Table3 (end).

## Panel D. Tangency portfolio with restrictions on short-sales

Countries	Portfolio composition	Delta [Expected return]	Delta [Volatility]	Delta [Sharpe ratio]
Developed markets				
Australia	8.33	0.08	-1.75	12.58
Austria	0.00	0.22	-2.83	18.26
Belgium	2.46	0.12	-1.50	12.36
Canada	0.00	0.17	-1.53	13.48
Denmark	22.58	-0.10	-1.62	8.38
Finland	0.00	0.02	-5.59	20.53
France	0.00	0.14	-1.87	14.07
Germany	0.00	0.18	-2.67	17.14
Hong Kong	0.00	-0.04	-3.92	16.90
Ireland	0.00	0.34	-2.09	18.48
Italy	0.00	0.43	-2.84	21.52
Japan	0.00	1.08	-2.84	31.85
Netherlands	0.00	0.08	-1.29	10.62
New Zealand	0.00	0.54	-2.96	23.52
Norway	0.00	0.01	-3.14	15.71
Portugal	0.00	0.57	-2.73	23.51
Singapore	0.00	0.26	-3.36	19.95
Spain	0.00	0.11	-2.52	15.59
Sweden	0.00	-0.02	-3.60	16.43
Switzerland	15.76	0.09	-1.24	10.62
UK	0.00	0.31	-0.85	13.61
USA	9.33	0.22	-0.41	9.01
<i>Average</i>		<i>0.22</i>	<i>-2.42</i>	<i>16.55</i>
Emerging markets				
Argentina	0.78	-0.43	-11.17	22.18
Brazil	0.00	-0.69	-12.58	21.49
Chile	15.10	-0.41	-3.46	10.57
China	0.00	0.31	-3.53	20.92
Greece	0.60	-0.08	-5.89	19.77
Indonesia	0.00	0.13	-10.43	25.60
Jordan	17.74	0.54	-1.62	20.89
Korea	0.00	0.41	-7.17	25.97
Malaysia	0.00	0.39	-5.17	24.12
Mexico	7.32	-0.71	-5.85	13.06
Philippines	0.00	0.49	-5.76	25.80
Taiwan	0.00	0.58	-7.26	27.62
Thailand	0.00	0.50	-7.88	27.26
Turkey	0.00	-0.02	-13.14	25.94
<i>Average</i>		<i>0.07</i>	<i>-7.21</i>	<i>22.23</i>
<i>Mean</i>	<i>1.16</i>			
<i>Volatility</i>	<i>3.51</i>			
<i>Sharpe ratio</i>	<i>32.99</i>			

Notes: The table summarizes the international diversification benefits for local investors in four panels corresponding to different international portfolios. The first column shows the portfolio composition and the resulting portfolio parameters are reported below the first column. In columns (2) to (4), the benefits from diversification are reported as the ex-post percentage changes in three portfolio parameters, namely, the portfolio expected return, volatility, and Sharpe ratio that would be obtained by holding the corresponding international portfolio.



Table 4. Home bias and the costs of the under-diversification

Tangency portfolio	Unconstrained weights	Minimum domestic investment share, $c_i$		
		10%	20%	50%
Country				
Australia	12.58	10.91	7.06	-2.44
Austria	18.26	16.57	12.72	3.22
Belgium	12.36	10.68	6.83	-2.67
Canada	13.48	11.80	7.95	-1.55
Denmark	8.38	6.72	2.86	-6.63
Finland	20.53	18.84	14.98	5.49
France	14.07	12.40	8.54	-0.96
Germany	17.14	15.46	11.61	2.11
Hong Kong	16.90	15.22	11.36	1.87
Ireland	18.48	16.79	12.94	3.44
Italy	21.52	19.83	15.97	6.48
Japan	31.85	30.13	26.28	16.78
Netherlands	10.62	8.95	5.09	-4.40
New Zealand	23.52	21.82	17.97	8.47
Norway	15.71	14.03	10.18	0.68
Portugal	23.51	21.81	17.96	8.46
Singapore	19.95	18.26	14.40	4.91
Spain	15.59	13.91	10.05	0.56
Sweden	16.43	14.75	10.89	1.40
Switzerland	10.62	8.95	5.10	-4.40
UK	13.61	11.94	8.08	-1.41
USA	9.01	7.34	3.49	-6.01
<i>Average</i>	<i>16.55</i>	<i>14.87</i>	<i>11.01</i>	<i>1.52</i>
Argentina	22.18	20.49	16.64	7.14
Brazil	21.49	19.80	15.95	6.45
Chile	10.57	8.91	5.05	-4.44
China	20.92	19.23	15.38	5.88
Greece	19.74	18.05	14.19	4.70
Indonesia	25.60	23.90	20.04	10.55
Jordan	20.89	19.20	15.34	5.85
Korea	25.97	24.27	20.41	10.92
Malaysia	24.12	22.42	18.56	9.07
Mexico	13.06	11.39	7.53	-1.96
Philippines	25.80	24.10	20.25	10.75
Taiwan	27.62	25.91	22.06	12.56
Thailand	27.26	25.56	21.70	12.21
Turkey	25.94	24.24	20.39	10.89
<i>Average</i>	<i>22.23</i>	<i>20.53</i>	<i>16.68</i>	<i>7.18</i>

Notes: The table reports the percentage increases in Sharpe ratios for different international investment strategies. The first column reproduces the increases in Sharpe ratios when local investors are assumed to hold the international tangency portfolio with short-sales prohibited in all countries given in panel D of the table 3. Columns two to four show the percentage changes in the Sharpe ratios resulting from investing into an international tangency portfolio without short-sales and where the weight of the domestic market is not less than the respective values provided in each column, i.e., 10%, 20% and 50%.

Table 5. Explaining the cross-section of diversification benefits

## Panel A. Dependent variable: Differences in Sharpe ratios

Variable	(1)	(2)	(3)	(4)	(5)
ICRG	***0.224 (14.26)	***-0.457 (-4.26)	***-0.410 (-3.54)	***-0.435 (-0.41)	** -0.306 (-2.07)
<i>log</i> GDP per capita		***5.484 (6.46)	**4.463 (2.62)	**3.725 (2.59)	1.841 (0.90)
<i>log</i> Market capitalization			0.496 (0.56)	-0.051 (-0.05)	0.034 (0.04)
Freedom to trade				2.2203 (1.47)	*2.565 (1.77)
Uncertainty avoidance					*0.079 (1.73)
Observations	36	36	36	36	36
Adjusted R <sup>2</sup>	0.826	0.889	0.887	0.897	0.903

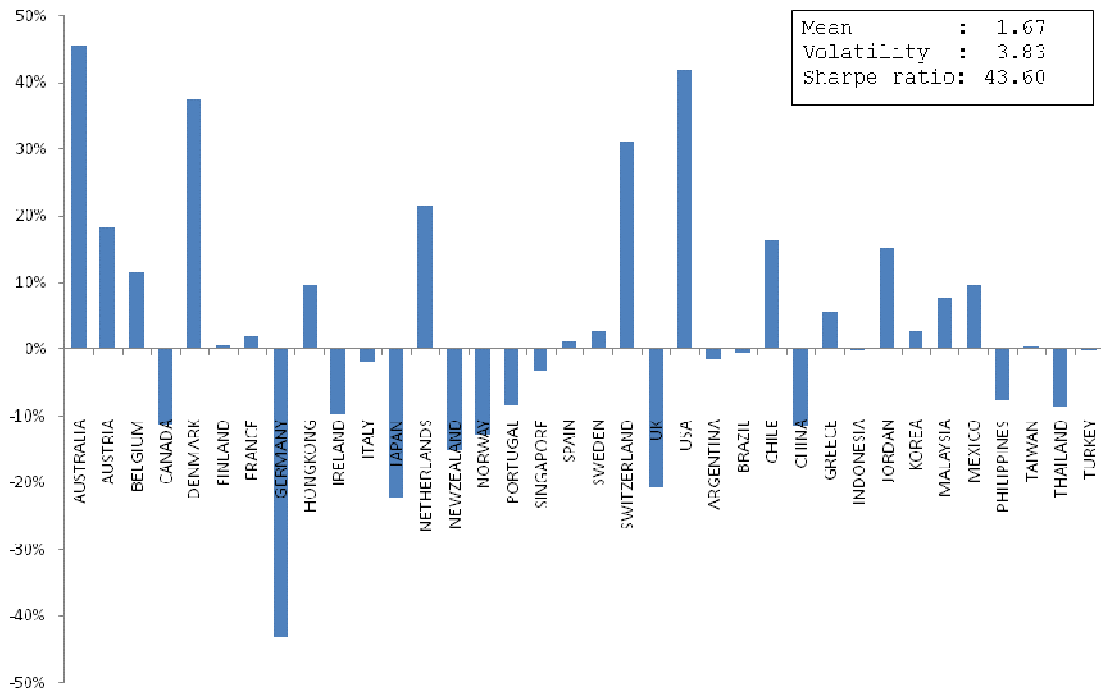
## Panel B. Dependent variable: Differences in volatilities

Variable	(1)	(2)	(3)	(4)	(5)
ICRG	***-0.048 (-7.25)	***0.317 (4.17)	***0.329 (3.72)	***0.340 (3.77)	***0.293 (3.19)
<i>log</i> GDP per capita		***-2.939 (-4.74)	***-3.215 (-3.07)	***-2.907 (-2.82)	** -2.217 (-2.11)
<i>log</i> Market capitalization			0.134 (0.36)	0.362 (1.11)	0.331 (1.14)
Freedom to trade				** -0.926 (-2.32)	** -1.053 (-2.63)
Uncertainty avoidance					* -0.029 (-2.00)
Observations	36	36	36	36	36
Adjusted R <sup>2</sup>	0.488	0.735	0.728	0.750	0.759

Notes: The table reports the results from OLS regression of the diversification gains in terms of the differences in Sharpe ratios and the portfolio volatilities. Panel A shows the results with the increase in Sharpe ratios as the dependent variable whereas in panel B the dependent is set to be the differences in volatilities. The numbers in parenthesis below the coefficient estimates are the *t*-statistics obtained using robust standard errors based on the Huber-White sandwich estimator of variance to control for heteroskedasticity. Statistical significance at the 1%, 5% and 10% is denoted respectively by \*, \*\*, and \*\*\*.

Figure1. Composition of the tangency portfolios

Panel A. Unconstrained portfolio



Panel B. Constrained portfolio (long-only)

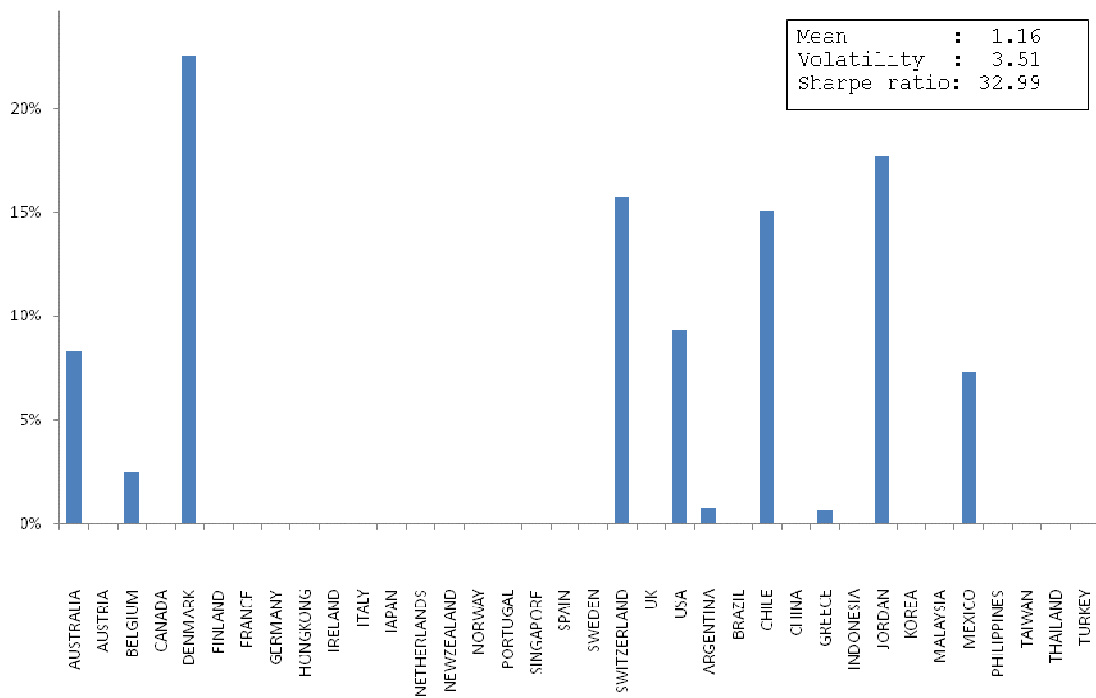
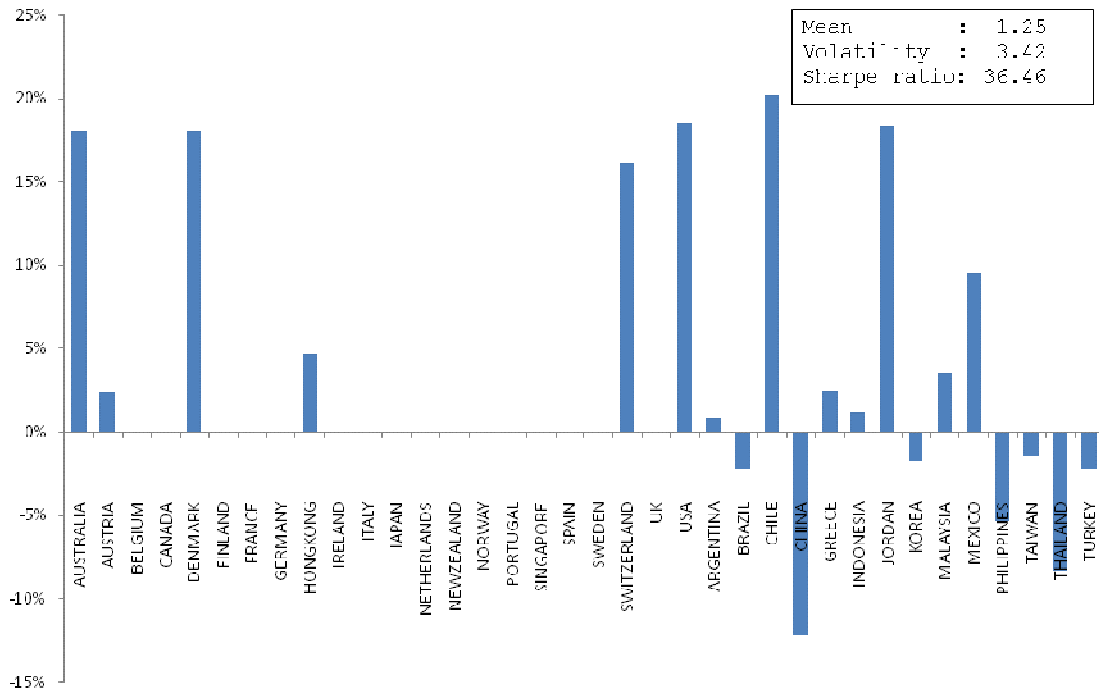
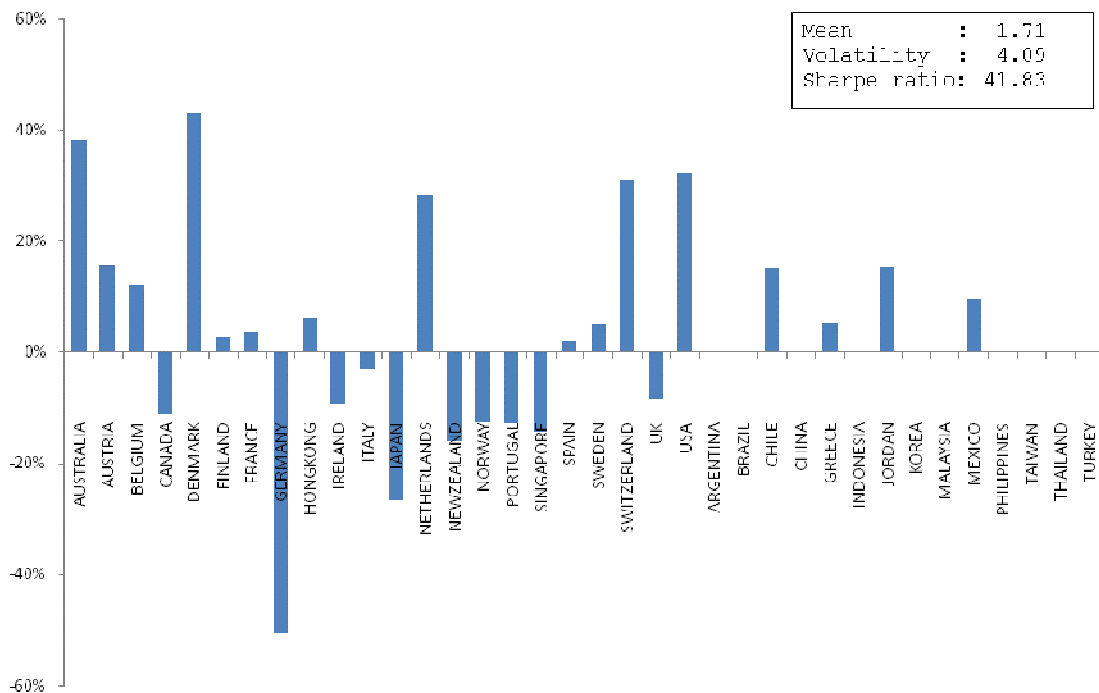


Figure1 (continued). Composition of the tangency portfolios

Panel C. Constrained portfolio (long-only in developed markets)

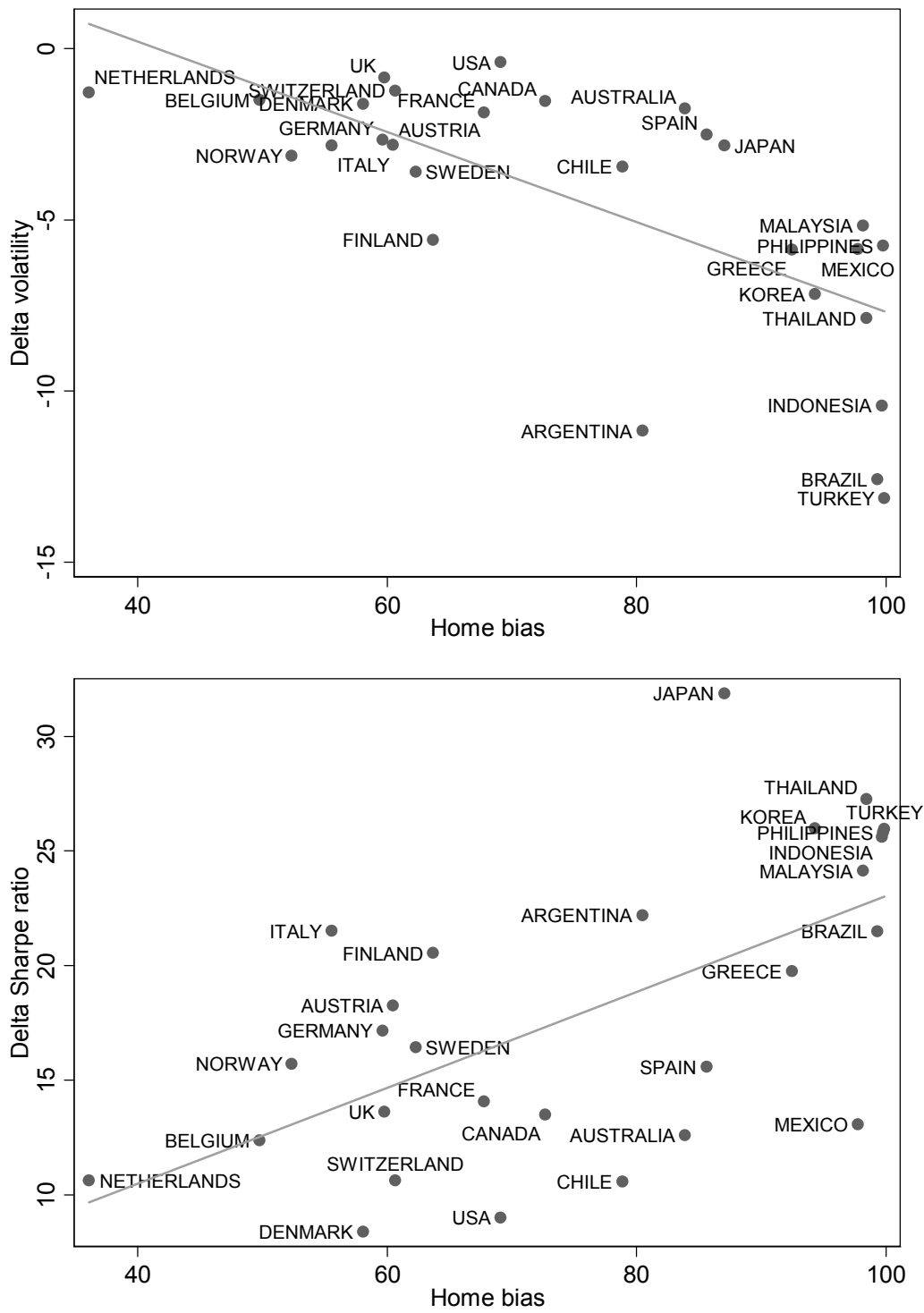


Panel D. Constrained portfolio (long-only in emerging markets)



Notes: The figure visualizes the composition of the optimal international portfolios using data over the period 1988:01 – 2007:12 distinguishing four cases, namely, 1) short-selling is possible for the full sample (panel A), 2) short-selling is not possible for the full sample (panel B), 3) short-selling is constrained within developed markets only (panel C), and 4) short-selling is constrained within emerging markets only (panel D).

Figure 2. Home bias and diversification benefits



Notes: The figure shows the scatter plots of countries' home bias measures against the percentage changes in portfolio volatilities (upper panel) and the Sharpe ratios (lower panel) as a result of holding the international tangency portfolio.





Chapter 3.  
The Determinants of International Equity Holdings



# 1 Introduction

Recent results from the home bias and international portfolio diversification literature set up the following picture regarding the geography of aggregate and bilateral portfolio holdings:

- 1) Despite the frequently-claimed gains from global portfolio diversification and the easier access to financial markets worldwide (Baele and Inghelbrecht, 2009; Chiou, 2009), home bias in equities remains still high (Sorensen *et al.*, 2007; Baele *et al.*, 2007).
- 2) The propensity to invest abroad declines with the home country's economic mass, implying that the domestic bias is particularly stronger among emerging-market countries although they are likely to benefit more from global portfolio diversification (Campbell and Kraussl, 2007; Driessen and Laeven, 2007).
- 3) Investors concentrate their already trivial cross-border assets in a handful of destinations (Hau and Rey, 2008) which tend to be mature and developed countries, and the huge volumes of cross-border capital flows mainly turn around the industrialized world in contrast to the predictions of the benchmark neoclassical model with frictionless markets (Papaioannou, 2009; Prasad *et al.*, 2007, Lucas, 1990).
- 4) The geography of bilateral portfolio holdings shows evidence of a preference toward physically proximate alternatives, so that distance and stock market correlations appear to be significantly positive covariates of bilateral asset holdings (Lane and Milesi-Ferretti, 2008; Aviat and Coeurdacier, 2007; Portes and Rey, 2005).

These observations make it hard to justify an investor portrait whose objective is simply to maximize the expected risk-adjusted-return on his investments. Pioneering studies in the field such as Adler and Dumas (1983) and Solnik (1974), propose that agents should be better off investing into an identical risky portfolio partly hedged against the exchange rate risk (under the assumption of deviations from the purchasing power parity), in which every asset is represented in proportion to its relative weight in the world-market portfolio. However, these models embedded within the individual rationality and the market efficiency paradigms commonly fail to replicate the size and the asymmetries of the domestic portfolio bias as well as the geographical underpinnings of bilateral holdings in financial assets. Over a sample of 25 countries, Baele *et al.* (2007) report that “most countries exhibit an average home bias around 0.7 – 0.8”. Other estimates by Sorensen *et al.* (2007) show that the average home bias across OECD countries is about 67% as of the end-2003. Moreover, these estimates exhibit significant in sample heterogeneity such that emerging countries exhibit substantially higher home bias than developed countries.<sup>45</sup>

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<sup>45</sup> The average home bias across four emerging markets studied by Baele *et al.* (2007) is 0.96. In another section of this dissertation where I examined the equity home bias as of the end-2006 using IMF data, I provided complementary results over a larger sample. I found the average home bias ratios of 0.65 and 0.93 for 18 developed and 18 emerging countries respectively, with the difference between the group means being statistically highly significant.

Studies dealing with reasons as to why investors overweight the home country in their portfolio allocations mainly fall into two broad categories (French and Poterba, 1991). Among the so-called “institutional” explanations, a number of attempts tackled the issue in terms of direct barriers to international investments such as capital controls (Errunza and Losq, 1985; Stulz, 1981; Black, 1974) or other forms of market imperfections such as transaction costs (Rowland, 1999). However, both the gradual liberalization of capital markets starting from the mid-1980’s and the relatively higher volumes of cross-border trading as revealed by high turnover rates in international transactions rule out these explanations (Warnock, 2002; Tesar and Werner, 1995). A second group of studies put forward investors’ hedging purposes against domestic price uncertainty due to i) deviations from purchasing power parity, e.g. inflation risk (Adler and Dumas, 1983), ii) non-traded consumption goods (Stockman and Dellas, 1989; Cooper and Kaplanis, 1994), or iii) non-tradable factors such as human capital (Baxter and Jermann, 1997).<sup>46</sup> Finally, home bias may also be due to informational asymmetries between local and foreign investors. Brennan and Cao (1997) and Gehrig (1993) provide theoretical models where home bias arises from an informational advantage possessed by local investors on their home market over foreign investors. Recently, Barron and Ni (2008) and Ni (2009) add up to this literature by showing that, beside the information asymmetries, portfolio size can also explain the home bias whereby managers having larger portfolios under control are less inclined to exhibit home bias. Empirical evidence with respect to the impact of the asymmetric information on home bias is, however, somewhat mixed.<sup>47</sup>

Other studies account for the effect of investor psychology within the portfolio selection problem. Commonly referred to as the “behavioral finance” school, the central premise is that individuals are only quasi-rational in their decision-making process (Ricciardi, 2008a) and act mainly according to the principles of Kahneman and Tversky’s (1979) *prospect theory*. The main insight is to reject the fully rational model of individual decision-making by introducing a series of cognitive and affective aspects likely to influence an investors’ risk perception in uncertain or risky decision-making contexts.<sup>48</sup> In applied work related to the domestic and/or

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<sup>46</sup> Cooper and Kaplanis (1994) note that, for reasonable degrees of risk aversion, inflation hedging is unlikely to be a plausible reason of the home bias phenomenon. Baxter and Jermann (1997) show that investors should even sell short their own market in order to hedge human capital risk because of the strong correlation prevailing between returns on physical capital and human capital. More recently, using household portfolio data in Sweden, Massa and Simonov (2006) show that investors do not engage in hedging nonfinancial and financial income, but instead they tilt their portfolio toward stocks geographically and professionally close to them.

<sup>47</sup> Dvorak (2005) finds that foreign institutions in Indonesian stock market enjoy better information due to their experience and expertise. Lütje and Menkhoff (2007) report survey results that local investors fail to materialize the informational advantage they pretend to possess. On the opposite, Malloy (2005) and Hau (2001) argue that local analysts and investors outperform foreigners, a finding which supports the link between proximity and the quality of information.

<sup>48</sup> Ricciardi (2008a, 2008b) provides two extensive and up-to-date surveys of the behavioral finance theory in comparison to the traditional finance theories based upon the concepts of rationality and market efficiency. The author presents a formal introduction to theories mainly related to risk perception and other concepts that influence the individual’s decision-making process under conditions of risk and uncertainty. For other theoretical discussions, see also Barberis and Thaler (2003) or Shleifer (2000).

international asset allocation context, the literature has addressed a number of concepts like the “familiarity bias” (Chan *et al.*, 2005; Huberman, 2001; Grinblatt and Keloharju, 2001), “narrow framing” (Magi, 2009; Nocetti, 2006), or investors’ relative optimism and perceived competence about domestic stocks (Suh, 2005; Strong and Xu, 2003). In short, although it is acknowledged that direct barriers to international investments are nowadays an unlikely reason to explain the home bias, the literature still lacks a fully convincing case, whereby the ongoing debate mainly contrasts the informational vs. behavioral explanations of the home bias puzzle, none of them excluding each other.

A common feature among these attempts is that they all investigate the extent of the aggregate or the “country level” home bias (Hau and Rey, 2008; Karlsson and Norden, 2007), i.e. items number 1 and 2 stated above. In this study, following Lane and Milesi-Ferretti (2008) and, Portes and Rey (2005), I consider the aggregate home bias as given and focus on the determinants of bilateral holdings instead. Specifically, I examine the geography of cross-border equity investments in order to shed light on the “distance” (Portes and Rey, 2005; Aviat and Coeurdacier, 2007) puzzle mentioned in items 3 and 4. The underlying theoretical assumption is that, in a fully integrated global economy with frictionless goods and asset markets, 1) investors should hold identical portfolios (Lane and Milesi-Ferretti, 2008) and 2) capital flows from rich to poor countries where marginal returns are higher (Papaionnaou, 2009; Lucas, 1990). Yet, to the extent that investors concentrate their foreign portfolio holdings within a handful of proximate and highly correlated destinations, it is unlikely to justify any risk-sharing motive within the existing bilateral portfolio holdings worldwide.

I argue that the preference revealed by investors toward geographically proximate alternatives would undergo two different but somewhat complementary viewpoints. On the empirical side, geography is documented as a key determinant of investment decisions either on a domestic (Huberman, 2001; Coval and Moskowitz, 1999) or international level (Lane and Milesi-Ferretti, 2008; Chan *et al.*, 2005; Sarkissian and Schill, 2004). Intuitively, however, distance should not capture the costs of trading in securities since, unlike physical goods, assets are “weightless”. Distant stocks (or countries) could even be thought of as being better hedge instruments against local or regional risks prevailing among countries geographically close to each other due to stronger political, economic, and trade linkages they typically share among each other. So, why this is not the case and where does this obvious effect of the distance comes from? According to Portes and Rey (2005), *the most natural explanation is that informational frictions are positively correlated with distance which is a barrier to interaction among economic agents and [...] to cultural exchange* (p. 270). From this perspective, distance is mostly related to an asymmetric information story, implying that investors buy securities about which they have enough information as argued by Merton (1987), and this is why they prefer closer geographies when choosing their portfolios.

Besides, the distance puzzle could also be related to some kind of *familiarity bias* underlying the investor behavior. Ricciardi (2008a) defines the familiarity bias simply as *an inclination that alters individuals' risk perception* (p. 101). The concept conjectures that individuals feel more comfortable with risks they feel familiar with, so that they use “heuristic simplifications in their decision-making process” (Massa and Simonov, 2006). Hence, geography would help to capture such mental shortcuts in the context of portfolio selection where investors typically prefer to allocate across nearby stocks or markets. Although it is by now a well-known fact that investors prefer familiar stocks (Huberman, 2001) or markets located nearby (Aviat and Coeurdacier, 2007; Grinblatt and Keloharju, 2001), whether the puzzling effect of the geography goes through the asymmetric information or the familiarity-bias framework, remains unclear. Massa and Simonov (2006) note that *familiarity-driven investment is a rational response to information constraints as opposed to a behavioral heuristic* (p. 634). Contrasting the information-driven with the behavioral hypotheses, the authors conclude that 1) familiarity mostly affects less informed investors and 2) the more sophisticated the investor is, the weaker is the effect of behavioral familiarity on decision-making. A similar result has also been provided by Grinblatt and Keloharju (2001) who note that *the influence of distance and culture on stockholdings and trades is smaller [...] for more sophisticated household investors* (p. 1054). To summarize, prior studies show that geographical distance is frequently used in empirical work on home bias and the patterns of international investments, and evidence suggest that “distance comes up remarkably strongly with the predicted (negative) sign” (Portes *et al.*, 2001). However, it is so far unclear whether the intriguing effect of the distance on the individual's decision making and portfolio selection goes through an asymmetric information or a behavioral channel. As noted by Portes and Rey (2005), distinguishing purely behavioral familiarity effects from those originated by informational asymmetries remains a challenge to the existing literature.

I propose to contribute to this body of research by analyzing the determinants of bilateral equity holdings within a micro-founded model of international capital market equilibrium. Setting the amount of bilateral equity holdings as the dependent variable, I estimate a simple gravity model of international portfolio holdings using not only the physical distance but also the “informational” and “cultural” distances between countries. Specifically, I construct two artificial variables likely to proxy for informational and cultural frictions across borders, and also likely to underlie the puzzling effect of the geographical distance. Namely, I calculate the “information distance” between two distinct countries A and B by plugging data on bilateral phone call traffic into a simple formula developed by Cilibrasi and Vitanyi (2007). In turn, I define the “cultural distance” between A and B using a formula originally proposed by Kogut and Singh (1988) and numerical scores on four country-specific cultural dimensions identified

by Geert Hofstede's work on cultural affinities.<sup>49</sup> The basic motivation to include these two measures essentially follows Massa and Simonov's (2006), and Portes and Rey's (2005) inquiries on the competing hypothesis of behavioral-based vs. information-based familiarity channel of the geography. As far as I know, such an attempt that aims to isolate the informational vs. cultural effects of the geography has not been modeled in the literature and therefore, can be considered as the main contribution of the paper. While investigating the relative effects of geographical, information and cultural distance on bilateral equity investments, I also control for a number of other gravity-type variables mainly motivated from the previous literature as well. Namely, I expand the scope of the analysis by including an array of additional variables classified into the following categories: 1) Economic development, 2) Openness, 3) Familiarity, 4) Transparency, and 5) Portfolio Diversification.

Within the related literature, data limitations have usually meant important concerns with respect to the estimation of bilateral or aggregate investment stocks<sup>50</sup>, restricting the scope of the analysis into a single country (for instance, Sweden in Karlsson and Norden, 2007; Japan in Kang and Stulz, 1997; Australia in Mishra and Daly, 2006; or the United States in Ahearne *et al.*, 2004; and Dahlquist *et al.*, 2003). Other studies have directly focused on the patterns of foreign direct investment (Stein and Daude, 2007; Wei, 2000) or those of the international banking assets (Aviat and Coeurdacier, 2007), for which comparable data on investment positions is readily available.<sup>51</sup> In this study, I use survey data from the International Monetary Fund to analyze the determinants of 24 countries' foreign equity portfolio allocations for the year-end 2006. Since the first time it had been published in 1997, the "Coordinated Portfolio Investment Survey" (CPIS) is being released on an annual basis by the IMF from 2001 onwards. It has the main advantage of directly providing holdings data on equities, as well as short and long-term bonds. Though more than 70 reporting countries had participated to the 2006 survey, the sum of the foreign equity assets held by our sample is quite representative and covers about 72% of the total assets reported.<sup>52</sup>

In line with previous work such as Lane and Milesi-Ferretti (2008) or Aviat and

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<sup>49</sup> Details regarding the computations of these two distance measures are provided below.

<sup>50</sup> Among studies taking into account a broader perspective, cross-border holdings were commonly estimated using flow data from balance of payments statistics. See, for instance, Baele *et al.* (2007), Portes and Rey (2005), Bekaert and Harvey (2000). However, as warned by Cleaver and Warnock (2003), the use of flows would be misleading when one looks for obtaining stock positions due to high turnover rates observed in international capital flows and the very nature of the balance of payments methodology. For example, Warnock (2002, p. 797) points out that flow data does not allow to conclude on the true origin of foreign investment since the host country and the intermediary country from which the operation is held are not necessarily the same.

<sup>51</sup> See also Chan *et al.* (2005) and Gelos and Wei (2005) who employ data on mutual fund's cross-border equity allocations. For example, Gelos and Wei (2005) the country allocation of 137 equity funds managing US\$ 44 billion of assets in emerging markets, while Chan *et al.* (2005) make use of mutual fund equity holdings from 26 developed and developing countries with a breakdown across 48 destinations.

<sup>52</sup> For others papers making use of the CPIS data, see, for example, Lane and Milesi-Ferretti (2008), Mishra and Daly (2006) or Faruquee *et al.* (2004).

Coeurdacier (2007), I use a gravity model framework as the basis for the empirical investigations. In its well-known original setup in physics, the model postulates an equilibrium relationship between two distinct objects' masses and the physical distance between them. Since it had been first implemented in economic theory by Tinbergen (1962), the gravity model constitutes an important toolbox to trade economists, while its employment within the financial globe is relatively recent. Using capital flow data, studies such as Papaioannou (2009) or Portes and Rey (2005) have shown that the gravity model can also explain the patterns of international trade in securities as good as it does in physical goods. Being well supported on the empirical ground, a theoretical support is provided by Martin and Rey (2004) who developed a two-country equilibrium model from which a gravity-style relationship emerges naturally. In short, the gravity model postulates that the volume of bilateral transactions (or holdings) between two countries is an increasing function of their respective economic masses and a decreasing function of the trading cost among them. In applied work, the economic size and the trading cost are generally substituted by countries' respective GDPs and the physical distance respectively.

The paper is organized as follows. The next section reviews the theoretical framework set up by Martin and Rey (2004) which serves as the basis to the empirical analysis. The third section introduces the methodology and the data set that will be employed throughout the rest of the paper. I provide the results of the empirical analysis in the fourth section. The last section concludes.

## 2 A Model of International Asset Holdings

In this section, I provide a brief overview of the theoretical setting that I will make use of throughout the empirical analysis. The framework follows a general equilibrium model under incomplete markets introduced in a two-country setting by Martin and Rey (2004), and further studied by Aviat and Coeurdacier (2007) and Faruqee *et al.* (2004).<sup>53</sup> The objective is to lay out a review of the benchmark theory upon which I base the econometric specification of the gravity equation used throughout the empirical analysis.<sup>54</sup>

Let us assume an international capital market where countries are indexed by  $i$  or  $j$ . Each country is populated by  $n_i$  agents with intertemporal neoclassic (e.g. concave and strictly

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<sup>53</sup> In an earlier version of their 2008 paper, Lane and Milesi-Ferretti (2004, p. 3-4) distinguish three alternatives to modeling the behavior of cross-border portfolio holdings. The first approach, due to Obstfeld and Rogoff (2000), is a static model of bilateral holdings in which frictions in good markets lead to domestically biased portfolios even though financial markets are complete. The N-country generalization of the Obstfeld-Rogoff study is provided by Lane and Milesi-Ferretti (2004). The second approach is that of Davis *et al.* (2000) whereby the authors introduce a dynamic model of portfolio allocation and consumption under incomplete markets. The third approach (which is also the one we adopt here), comes from Martin and Rey (2004) who develop a model of bilateral asset holdings from which a gravity-type model emerges naturally.

<sup>54</sup> Readers interested with the empirical results can skip this section without loss of generality.

decreasing) utility functions.<sup>55</sup> At time  $t$  each agent (i.e. investor)  $h_i \in \{1, \dots, n_i\}$  is endowed  $y$  units of tradable good (i.e. the numéraire) which he can either consume or invest in a set of risky projects.<sup>56</sup> The total number of the risky projects developed by an agent is  $z_{hi}$  and the cost of developing a new project is a differentiable function  $f(z_{hi})$  with  $f'(z_{hi}) > 0$  and  $f''(z_{hi}) > 0$ . Thus, not only the cost of developing a new project is an increasing function of  $z_{hi}$  but the associated marginal cost is also increasing with the number of projects already developed.

The next period  $t + 1$  comprises  $S$  different states of the world, each with equal probability  $Pr(i = S) = 1/S$ . Following this setup, each risky project can be considered as an Arrow-Debreu style security because its payoff next period is either equal to  $d$  if state  $i \in \{1, \dots, S\}$  occurs, and 0 otherwise. There are no intermediary streams such as labor income, therefore the dividends  $d$ , are the unique source of consumption next period. Different securities serve as hedge instruments against different sources of risk; consequently, each security is an imperfect substitute of another one. This feature of the model simply implies that diversification across securities is beneficial. Nevertheless, the number of the states of the world is bigger than the total number of Arrow-Debreu securities, implying that 1) the market is incomplete, and 2) at the limit, diversification cannot eliminate all the risk an agent bears.

Risky securities developed by agents in different countries are traded on a frictional international capital market. The residents of the country  $i$  pay a transaction cost  $\tau_i^j > 0$  when they trade overseas or earn a dividend gain in a foreign country  $j \neq i$ . Letting  $p_{hj}$  be the price of a share of the project developed by agent  $h_j$  and  $s_{hi}^j$  be the demand of  $h_i \neq h_j$  for an asset traded in country  $j$ , the amount paid by  $h_i$  to purchase one share of such an asset is given by  $p_{hj}s_{hi}^j(1 + \tau_i^j)$  if the asset pays a dividend next period, and the agent  $h_i$  i.e. the holder of the asset, receives  $d(1 - \tau_i^j)$  per share of project he purchased. Assuming that the transaction costs apply to the buyer of the asset, the budget constraint of the representative agent in country  $i$  can be expressed as follows,

$$(1) \quad y_i + \sum_{i \in \{1, \dots, z_{hi}\}} \alpha_{hi}^i p_{hi}^i = c_{1,hi} + f(z_{hi}) + \sum_{\substack{i \in \{1, \dots, n_i\} \\ i \neq h_i}} p_i s_{hi}^i + \sum_{j \in \{1, \dots, n_j\}} p_j s_{hi}^j (1 + \tau_i^j)$$

On the left-hand side of the equation, beside the initial endowment  $y_i$ , the investor sells a portion  $\alpha_{hi}^i$  of the securities he developed himself. Put another way, the coefficient alpha represents the investor's diversification level, and by construction, the term  $(1 - \alpha_{hi}^i)$  corresponds to the share of projects developed by  $h_i$  but which does not float on the market. On

<sup>55</sup> The concavity assumption implies also that agents are risk-averse.

<sup>56</sup> Intuitively, the term "agents" substitutes investors and "risky projects" substitutes a risky financial instrument, such as equities for example.

the right-hand side, we observe the agent's consumption in the first period,  $c_{1,hi}$ , the cost he bears to develop new projects,  $f(z_{hi})$ , and his demand for assets developed by agents other than himself in country  $i$  and in country  $j$  on which a transaction cost  $(1 + \tau_i^j)$  already applies.

Following the standard rational expectations model of portfolio choice<sup>57</sup>, each agent maximizes a time-additive utility of the form,

$$(2) \quad E[U_{hi}] = c_{1,hi} + \delta \cdot E \left[ \frac{(c_{2,hi})^{(1-1/\sigma)}}{1 - 1/\sigma} \right]$$

where  $\delta$  is the subjective discount rate of the next period utility from consumption and corresponds to the inverse of investor's coefficient of risk aversion. Obviously, the latter one is different from zero, which also captures the feature that all agents are risk-averse. According to the payoff structure imposed to Arrow-Debreu securities and the hypothesis that all states of the world next period have equal probability, we can explicitly write the expected utility as,

$$(3) \quad E[U_{hi}] = c_{1,hi} + \delta \cdot E \left[ \frac{1}{S} \frac{1}{1 - \frac{1}{\sigma}} \left( \sum_{i \in Z_{hi}} ((1 - \alpha_{hi}^i)d)^{(1-\frac{1}{\sigma})} + \sum_{\substack{i \in n_i \\ i \neq h_i}} (ds_{hi}^i)^{(1-\frac{1}{\sigma})} + \sum_{j \in n_j} ((1 - \tau_i^j)s_{hi}^j)^{(1-\frac{1}{\sigma})} \right) \right]$$

Taking the expectation on the right-hand side and rearranging, we obtain,

$$(4) \quad E[U_{hi}] = c_{1,hi} + \frac{\delta}{S} \frac{d^{(1-\frac{1}{\sigma})}}{1 - \frac{1}{\sigma}} \left( \sum_{i \in Z_{hi}} (1 - \alpha_{hi}^i)^{(1-\frac{1}{\sigma})} + \sum_{\substack{i \in n_i \\ i \neq h_i}} (s_{hi}^i)^{(1-\frac{1}{\sigma})} + (1 - \tau_i^j) \sum_{j \in n_j} (s_{hi}^j)^{(1-\frac{1}{\sigma})} \right)$$

under the budget constraint given above. We observe that there are three elements making up the expected consumption in the second period. The first term in the parenthesis on the right-hand side of the equation is the expected utility from consumption due to payoffs of the projects developed by the agent himself and which does not float on the market. The second term corresponds to the utility from consumption the representative agent would obtain by dividend-paying projects developed by other agents in the local market. Finally, the third element corresponds to the expected utility from consumption backed by the dividend yields of the projects purchased abroad. Choosing the consumption in the first period, the number of risky projects to develop, the demand for domestic and foreign assets developed by other agents and the number of projects to keep in the second period, the representative maximizes the utility (4) subject to the budget constraint (1). From the first-order conditions, we obtain the following individual asset demands for projects traded in home and foreign countries

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<sup>57</sup> See Uppal and Wang (2003), p. 2467.



respectively,

$$(5) \quad s_{hi}^i = \left(\frac{\delta}{S}\right)^\sigma d^{\sigma-1} p_i^{-\sigma} \quad \text{and} \quad s_{hi}^j = \left(\frac{\delta}{S}\right)^\sigma d^{\sigma-1} p_j^{-\sigma} \frac{(1 - \tau_i^j)^{\sigma-1}}{(1 + \tau_i^j)^\sigma}$$

The market clears if the demand from both domestic and foreign agents for a project developed and traded in country  $j$  is equal to the supply, or more formally if  $\sum_i n_i s_{hi}^j = 1, \forall j$ , assuming that the number of shares for each project is normalized to one. Then, from the individual asset demand, we deduce the aggregate cross-border holdings of country  $i$  in country  $j$  as follows,

$$(6) \quad Y_i^j = n_i \left( \left(\frac{\delta}{S}\right)^\sigma d^{\sigma-1} p_j^{-\sigma} \frac{(1 - \tau_i^j)^{\sigma-1}}{(1 + \tau_i^j)^\sigma} \right) n_j p_j$$

Rearranging, the expression above yields to the following log-linear relationship:

$$(7) \quad \log(Y_i^j) = \sigma \log\left(\frac{\delta}{S}\right) + \log(n_i n_j) + (\sigma - 1) \log(r_j) - \log(\theta_i^j)$$

Equation (7) shows a theoretical gravity-style relationship on bilateral portfolio holdings held by the source country  $i$  in the host country  $j$ . The first term is a constant. The second term corresponds to the investor and host countries' market sizes. The third term reflects a return-chasing component with  $r_j = d/p_j$ . Finally, the last term stands for the international transaction costs where  $\theta_i^j$  substitutes  $(1 - \tau_i^j)^{\sigma-1} / (1 + \tau_i^j)^\sigma$ . As noted by Aviat and Coeurdacier (2007), the key point is to determine the transaction costs which characterize the international capital market with frictions. Empirical studies typically employ the bilateral distance between the source and the destination countries as an accurate proxy of the transaction costs. However, as discussed in the introduction, whether the impact of the geography undergoes an informational or a behavioral channel remains an unanswered yet relevant question for existing studies.

## 3 Methodology and Data

### 3.1 Econometric Specification

In light of the theoretical detour above, I propose as the basis of the econometric analysis the following log-linear model for portfolio assets held by investors in country  $i$  in the destination country  $j$ ,

$$(8) \quad \log(Y_{ij}) = c + \alpha \log(M_i M_j) + \beta \log(\theta_{ij}) + \gamma \log(r_j)$$

with  $\alpha > 0$  and  $\beta < 0$ . The product  $M_i M_j$  stands for the size effect where  $M_i$  and  $M_j$  denote the respective economic masses of the source and destination countries. The parameter  $\theta_{ij}$  stands for the cost of trading in international capital market and  $r_j$  is the return on the destination country's stock market. In this basic form, the equation represents a log-linearized structure of the original gravity model which had been frequently used to explain patterns of international trade in goods. As emphasized previously, recent studies such as Portes and Rey (2005) or Portes *et al.* (2001) have shown that the model performs equally well when we consider trade in financial securities too. The log-log specification implies that parameter estimates are in terms of elasticities, i.e. the ratios of percentage changes in the corresponding variables. Due to the signs imposed to coefficients, the model considers the bilateral trade in securities between a pair of source and destination countries as an increasing function of their respective economic masses and a decreasing function of the trading cost between them.

When going to data, I substitute  $Y_{ij}$  by  $ASSETS_{ij}$ , i.e. the stock of equity assets held by country  $i$  (i.e. the source) in country  $j$  (i.e. destination), and the terms  $M_i$  and  $M_j$  by the countries respective GDPs. The parameter  $\gamma$  captures the return-chasing component as shown in the theoretical relation (7). I substitute it by the average return on the country  $j$ 's broad stock market index over the period 2002:01-2006:12 (see below for further details). In equation (8), the key parameter of interest is  $\beta$  through which I capture the effect of international market frictions,  $\theta_{ij}$ . The first proxy is the geographical distance between the source and host countries. I also control for two alternative "distance" concepts as mentioned in the introduction. Namely, I add the "information" and "cultural" distance measures subsequently into the regressions so as to disentangle the impact of the geographical distance on international asset holdings across an information-based and a cultural component.

While the destination list is initially the same for all reporting countries, not every investor country holds a positive amount of foreign equity in a given host. In other terms, while a source country A might have invested in destinations C and D, it might also be the case that another source country B holds foreign portfolio assets only in country C and completely neglect country D. To deal with such missing observations across different subjects one possible way is to specify the dependent variable as  $\log(1 + ASSETS_{ij})$ . Doing so, whenever there is a missing observation between a given pair of source & host, one obtains zeros which would then be included into regressions. However, there is a large gap between the number of available observations for the dependent variable and the number of observations for different variables and filling up with zeros the cases for which there are no bilateral assets holdings, would significantly alter the distributional properties of the underlying model. To avoid such

biases, I drop missing observations from the raw data set for the corresponding set of exogenous and endogenous variables.<sup>58</sup> Therefore, regressions are run over an unbalanced panel. I also exclude all bilateral equity holdings involving a destination classified as an “offshore financial center”. Although the amounts invested in OFCs represent non-negligible portions of reporting countries’ total foreign equity assets, the underlying motivation follows Lane and Milesi-Ferretti’s statement (2008) who note that these destinations act *as pure intermediaries, and are neither true sources nor final destinations of investment* (p. 543-544).<sup>59</sup>

The empirical analysis consists of estimating the empirical counterpart of the theoretical relationship given in equation (3.1) and a number of its variants such as

$$(9) \quad \log(ASSETS_{ij}) = c + \alpha \log(SIZE_{ij}) + \beta \log(DISTANCE_{ij}) + \gamma \log(RET_j) + \delta' \mathbf{Z}_{ij} + \varepsilon_{ij}$$

where  $DISTANCE_{ij}$  is the distance between the source and destination countries,  $RET_j$  is the host destination country’s market return,  $SIZE_{ij}$  is the product of source and host countries’ GDPs, and  $\mathbf{Z}_{ij}$  a set of additional control variables that will be introduced later. To gauge for the impact of countries’ economic masses, I use nominal GDP data from the World Economic Outlook database. Given the panel feature of the data set, the model specification depends on the structure imposed to the residuals. As a first alternative, I start by estimating the model with random effects on both sides as specified in (3.4). Second, to control for unobservable source country-specific factors, I add fixed-effects and estimate the following equation

$$(10) \quad \log(ASSETS_{ij}) = c_i + \alpha \log(SIZE_{ij}) + \beta \log(DISTANCE_{ij}) + \gamma \log(RET_j) + \delta' \mathbf{Z}_{ij} + \varepsilon_{ij}$$

Data for bilateral equity holdings comes from the International Monetary Fund’s “Coordinated Portfolio Investment Survey” database available at the IMF’s web site. Originally, the CPIS data is a multidimensional array representing the reporting countries’ bilateral foreign holdings (organized in columns) across the same set of 237 destinations (organized in rows).<sup>60</sup> From the original data matrix, I consider a subset consisting of the bilateral equity investments reported by 24 developed and emerging-market source countries

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<sup>58</sup> On the other hand, non-linear Tobit regressions allow one to include zero observations for the dependent variable by censoring data on the left.

<sup>59</sup> I exclude from the original data set the following fifty OFC destinations: Andorra, Anguilla, Antigua and Barbuda, Aruba, the Bahamas, Bahrain, Barbados, Belize, Bermuda, British Indian Ocean Territory, Cayman Islands, Cook Islands, Costa Rica, Cyprus, Dominica, Dominican Republic, Falkland Islands, Faroe Islands, Gibraltar, Grenada, Guernsey, Haiti, Hong Kong SAR of China, Ireland, Isle of Man, Jersey, Lebanon, Liechtenstein, Luxembourg, Macao SAR of China, Malta, Marshall Islands, Mauritius, Monaco, Netherlands Antilles, Niue, Panama, Puerto Rico, Reunion, Samoa, Seychelles, Singapore, St. Kitts and Nevis, St. Vincent and Grenadines, Switzerland, Turks and Caicos Islands, United States minor outlying islands, Vanuatu, Virgin Islands (UK) and Virgin Islands (US).

<sup>60</sup> I also exclude three destinations labeled as “international organizations”, “other countries (confidential data)”, and “other countries (unallocated)”. The data loss due to this elimination, is trivial: The sum of the foreign assets held in these destinations does not exceed 15% of the total assets reported for a particular country in the group of developed countries (the maximum observed for Australia), and 17% in the group of emerging countries (the maximum observed for Poland).

in various destinations.<sup>61</sup> Nevertheless, the sample is representative enough so that the sum of the foreign assets held by this subset of countries corresponds to 72% of the 74 reporting countries' total foreign assets as provided in the CPIS 2006 data files.

To proxy for the international market frictions, I first employ *Geographical Distance<sub>ij</sub>*, defined as the flight distance in kilometers between the source and host countries' capital or main cities. It is known from previous literature on international goods and asset trade that the geographical distance stands as a good proxy for the bilateral frictions across national markets. Concerning physical goods, the impact of the geographical distance is easy to understand: Distance can proxy for, say, transportation costs across boundaries. However, assets are weightless and trading in assets should not be affected by the physical proximity. Yet, evidence show that this is not the case. In many empirical studies, the coefficient estimates on the geographical distance is shown to be statistically significant, suggesting that distance plays a key role to explain the international capital flows or assets. That is said, the literature lacks of a rigorous treatment on whether the effect of the distance on asset holdings or trades, is essentially related to some informational or a behavioral aspect of the investor's portfolio selection and decision-making processes. I argue that the effect of the physical distance on the geographical patterns of cross-border asset holdings can be decomposed into two components, i.e. "information distance" and "cultural distance", which account respectively for information- or familiarity-based aspects of investors' preference towards geographically proximate markets. The following sections briefly discuss these two alternative measures of distance and describe the methodologies employed.

## 3.2 Cultural Distance & Information Distance

### A. Cultural Distance

The first measure proposed to substitute the geographical distance is the cultural distance. Earlier studies have provided valuable insights into the economic outcomes of individuals' or societies' cultural characteristics using various dimensions to control for such effects. For example, religion is an important aspect likely to shape out societies' and corporations' culture. Guiso *et al.* (2003) use the World Values Survey to identify the relationship between intensity of religious beliefs and economic attitudes. They find that religious beliefs are associated to good economic attitudes that are more favorable to higher per capita income and growth. Using data on Finnish investors' shareownership and equity trades, Grinblatt and Keloharju (2001) point out to the importance of language stating that *investors whose native tongue is Finnish prefer to hold and trade in Finnish companies that publish their annual reports in*

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<sup>61</sup> In the group of developed-market source countries we include Australia, Canada, Finland, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, the UK and the USA; while the group of emerging-market source countries consists of Argentina, Brazil, Czech Republic, Hungary, India, Indonesia, Malaysia, Mexico, Poland, South Africa, South Korea and Turkey.

*Finnish to Finnish companies that publish their reports in Swedish and vice versa* (p. 1054). Stulz and Williamson (2003) note that *if, as argued by the practitioners of behavioral finance, individuals have psychological biases that matter for finance, it would be surprising that individuals' view of the world as determined by their culture does not matter for how they view and act in financial markets* (p. 347). Thus, culture provides a suitable framework to control for various behavioral biases advocated by the practitioners of behavioral finance and which would ultimately shape out the observed geography of international portfolio holdings.

To develop a quantitative measure of market imperfections due to culture, I make use of Geert Hofstede's seminal work on cultural affinities. Originally, the study consists of an analysis of a large data base of employee values scores collected by IBM between 1697 and 1973 in more than 70 countries. Since 2001, Hofstede's work lists cultural dimensions scores across 74 countries and regions partly based on replications and extensions of the initial IBM study. Based upon a model that identifies the primary dimensions to describe a country's cultural patterns, Hofstede distinguishes five different indicators. I include four indicators however, due to limited data availability for the fifth one, which is the "long-term orientation". Specifically, I employ: 1) the Power Distance Index (PDI) which represents the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally. This index suggests that a society's level of inequality is endorsed by the followers as much as by the leaders. 2) Individualism (IDV) represents the degree to which individuals are integrated into groups. On the individualist side, we find societies in which the ties between individuals are loose. On the collectivist side, we find societies in which people from birth onwards are integrated into strong, cohesive in-groups. 3) Masculinity (MAS), the opposite being femininity, refers to the distribution of roles between genders. In countries where masculinity is strong, people are keener to seek competitive outcomes; managers tend to make decisions on their own (De Jong and Semenov, 2002). 4) Uncertainty Avoidance index (UAI) which deals with a society's tolerance for uncertainty and ambiguity. It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured (novel, unknown, or surprising) situations. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules; safety and security measures. The next table shows the original numerical scores associated to these dimensions.

[Insert table 1 here]

Initially, the raw data set comprises 60 countries plus 3 geographical regions in which several countries are reported as sharing the same estimated scores. In particular, 7 countries are included in the group "Arab World", 4 countries are included in the group "East Africa", and 3 countries are included in the group "West Africa". The column labeled "C." displays a particular country's cluster membership that I obtain as a result of a four-means cluster analysis over the scores associated to these four dimensions reported in the table. In these

terms, we observe that while France, Germany and Italy fall within the same cultural cluster, the US, UK and Australia share the common cultural cluster, which suggest the relative accuracy of Hofstede's cultural dimension scores to distinguish between different societies' cultural affinities. Based upon this multivariate data matrix consisting of 74 countries' individual scores on 4 different subjects, I define the *cultural distance* between two countries as follows,

$$(11) \quad \text{Cultural Distance}_{ij} = \sum_{c=1}^4 [(S_{ci} - S_{cj})^2 / V_c] / 4$$

where  $S_{ci}$  is the score for the  $c$ th cultural dimension of the country  $i$ . Data on individual countries' cultural dimensions comes from Hofstede's work on cultural affinities as emphasized above.  $V_c$  is the variance of the  $c$ th cultural dimension across all countries in the sample. The formulation above is due to Kogut and Singh (1988) and frequently employed in applied work (see, among others, Beugelsdijk and Frijns, 2010; Lucey and Zhang, 2010; Reus and Lamont, 2009; Lee *et al.*, 2008).

#### B. Information Distance

The second measure proposed to substitute the geographical distance is the information distance. In contrast to cultural distance however, existing studies have not come up with such a direct quantitative measure of information distance even if imperfections linked to informational asymmetries are widely recognized as a key determinant of the geographical patterns of cross-border portfolio holdings. In related empirical work, researchers have proposed, beside the physical distance, several other proxies to control for information-based frictions. Coval and Moskowitz (1999) suggest that air fares or phone rates can be good substitutes to gauge for the economic distance between countries. Ahearne *et al.* (2004) point out to the information content inherent in US investor protection regulations, i.e. accounting standards, disclosure requirements and regulatory environment, as an important factor to explain the home bias. Sarkissian and Schill (2004) note that economic distance can help to explain overseas listing decisions of firms, and that cross-listing is more frequent across markets that are geographically and industrially close to each other. According to Bekaert (1995), inefficient settlement systems and poor accounting standards can be at the root of informational barriers against equity flows into emerging markets. Portes and Rey (2005) capture the informational dimension inherent to cross-border portfolio flows by using bilateral telephone calls, the number of bank branch subsidiaries, and the degree of overlap in trading hours across countries.

To develop a quantitative measure capturing the information distance between two

countries, I employ an indirect theoretical framework developed by Cilibrasi and Vitanyi (2007). Omitting technical details which would overcome the scope of the present paper, the authors develop a theory of semantic distance between a pair of objects and propose the following formula of the *Normalized Information Distance* between two objects  $x$  and  $y$ ,

$$(12) \quad NID_{xy} = \frac{K(x, y) - \min(K(x), K(y))}{\max(K(x), K(y))}$$

where  $K(x)$  is the *Kolmogorov complexity* of the string  $x$  which refers to the *length* of the shortest computer program of the fixed reference computing system that produces  $x$  as the output. However, the expression above is uncomputable since Kolmogorov complexity  $K(x)$  is uncomputable. Cilibrasi and Vitanyi (2007) apply this theory to construct a formula that extracts a measure of distance between different objects within the World Wide Web, which is undoubtedly the largest database ever created.<sup>62</sup> Namely, they define the following *Normalized Google Distance* between two strings  $x$  and  $y$ ,

$$(13) \quad NGD_{xy} = \frac{\max\{\log f(x), \log f(y)\} - \log f(x, y)}{\log N - \min\{\log f(x), \log f(y)\}}$$

where  $f(x)$  denotes the number of web pages containing the string  $x$ , and  $f(x, y)$  denotes the number of web pages containing both  $x$  and  $y$  simultaneously, as reported from searches performed using Google. Finally,  $N$  corresponds to the cardinal of a universal set including all web pages listed within Google. Note further that the results are insensitive to  $N$  which can be arbitrarily chosen with the unique condition of being sufficiently larger than  $\max\{f(\cdot)\}$ .

In this paper, I employ the previous formulation of the *Normalized Google Distance* to derive a quantitative measure of the information flow between countries. To obtain the necessary inputs for calculations, I use data on bilateral telephone traffic as a proxy for the overall information flow between two countries. Portes and Rey (2005) also use telephone traffic data as a direct measure of information exchange between countries by normalizing the volume of telephone calls from country  $i$  to country  $j$  by the square root of the product of their respective GDPs. Unlike Portes and Rey (2005) however, I implement a different approach to control for the information distance that is analogous to those proposed by Cilibrasi and Vitanyi (2007). Namely, I define the information distance between two countries  $i$  and  $j$  as follows:

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<sup>62</sup> The authors' insight can be summarized as follows. Words acquire their meaning from the way they are used in the society and, for computers the equivalent of "society" is "database", and the equivalent of "use" is "way to search the database".

$$(14) \quad \text{Information Distance}_{ij} = \frac{\max\left\{\log\left(\frac{f(s)}{p_s}\right), \log\left(\frac{f(d)}{p_d}\right)\right\} - \log\left(\frac{f(s,d)}{p_s + p_d}\right)}{\log N - \min\left\{\log\left(\frac{f(s)}{p_s}\right), \log\left(\frac{f(d)}{p_d}\right)\right\}}$$

where  $f(s)$  and  $f(d)$  denotes country  $s$  and  $d$ 's total phone traffic (incoming and outgoing calls) over a given time period,  $f(s,d)$  denotes the bilateral phone traffic involving countries  $s$  and  $d$ , all these terms normalized by the countries' respective populations,  $p_s$  and  $p_d$ . Finally, I substitute  $N$  by the total telephone traffic over the full data set which yields to a number sufficiently larger than any conceivable  $f(\cdot)$ . Implementing the previous formulation instead of directly using the volume of the bilateral telephone traffic between two countries (either in levels or in logs) can be justified given the objective to obtain a *distance* measure. As underlined by Cilibrasi and Vitanyi (2007), equations (13) and (14) have several interesting numerical properties. For example, under this formulation, the information distance between two distinct objects is bounded on the continuous interval  $[0, \infty)$  and is always nonnegative. By definition, one obtains  $\text{Information Distance}_{ij} = 0$  if  $i = j$ , and  $\text{Information Distance}_{ij} = \text{Information Distance}_{ji}$ , i.e. the distance between two objects is symmetric. The measure is also scale invariant in the sense that the set of different outcomes does not depend on the number  $N$ . In fact, as  $N$  grows, the relative frequencies of different  $f(\cdot)$  tend toward a fixed fraction of  $N$ . For calculations, I obtain data on international telephone traffic in millions of minutes over the year 2006 and countries' populations in millions as of the end-2006 from Telegeography. The full data set comprises a total of 1545 observations regarding the bilateral telephone communications between a set of 102 source and 206 destination countries. The total international telephone traffic during 2006 is 378 474 millions of minutes of which about 66 568 millions of minutes originate from the bilateral traffic between Canada, Mexico and the United States. To avoid measurement biases, I normalize the volume of the international telephone traffic by the countries' population. In fact, examining 2006 data, we observe that the total telephone traffic between France and Italy and is about 1340 millions of minutes while the volume of the telephone traffic between France and Belgium is slightly lower, about 1 310 millions of minutes. However, one cannot deduce that the communication is more intense between Italy and France than it is between Belgium and France since Italy's population is about 6 times than that of Belgium's.

### C. Information and Cultural Distance vs. Geographical Distance

Given the respective definitions of information and cultural distance measures, how one can assess their relationship with the geographical distance? In order to justify the central hypothesis that the effect of the geography on bilateral portfolio holdings can undergo an informational and/or a cultural component, these two measures should not be strongly



correlated with the geographical distance. As a simple response to such concerns, the figure below provides the scatter plots of cultural and information distance measures against the geographical distance.

[Insert figure 1 here]

The graph in the upper panel shows the scatter plot between geographical distance (plotted on the horizontal axis) and information distance (plotted on the vertical axis). The graph in the lower panel shows the scatter plot between geographical distance (plotted on the horizontal axis) and cultural distance (plotted on the vertical axis). For purposes of comparability, I use standardized scores with zero mean and unit variance for each variable. Looking at figure 1, we observe that these two artificial distance variables can effectively capture distinct aspects of the international capital market frictions by disaggregating the unified effect of the physical distance. The rank correlation between cultural distance and geographical distance is about 8% while the rank correlation between information distance and geographical distance is a bit higher but still weak, by about 32%. Indeed, countries which are informationally or culturally close (resp. remote) to each other are not necessarily those that are geographically close (resp. remote). For instance, while United States and Canada rank 59<sup>th</sup> regarding the physical distance between their main cities, these two countries rank 33<sup>th</sup> and 27<sup>th</sup> respectively on the basis of information and cultural distance measures respectively. Another striking example with respect to the irregularity between geography and cultural affinities involves the US and Australia who rank 2<sup>nd</sup> according to cultural distance measure although these two countries take the 1902<sup>th</sup> place in the sample once we consider the flight distance about 16 000 kilometers between Sydney and New York.

### 3.3 Additional Controls

Beside the core variables identified above I also conjecture that the foreign equity holdings would depend on a number of additional gravity-type variables as proposed by previous studies. Specifically, I hypothesize that foreign openness, economic development, and market transparency can influence investors' decision to allocate their foreign assets into a particular host market. To control for these effects, I estimate augmented forms of the initial gravity model by adding an array of additional variables described below.

#### A. Economic Development

I test whether the level of the destination country's economic development is considered as an asset for investors. As noted by Chan *et al.* (2005), a country's degree of development and

market sophistication should presumably have a positive impact in attracting foreign capital.<sup>63</sup> At an individual investor scale, Grinblatt and Keloharju (2001), and Karlsson and Norden (2007) argue that home bias is inversely linked to investors' sophistication level. Additionally, as emphasized by La Porta *et al.* (1997, 2000), investors may also feel more comfortable when they purchase stocks from developed markets with healthier legal systems and better investor protection rights. In line with these studies, the hypothesis maintained is that the level of economic development and market sophistication could lower the costs due to market frictions via better structured and developed financial markets.

I dispose several proxies to capture the impact of the economic development on bilateral equity positions. First, I propose to introduce the destination country's GDP per capita,  $GDPPC_j$ . The second variable measures the degree of the recipient country's financial market sophistication. Namely, the variable  $FMSOP_j$  is an index variable with scores given out of an upper limit by 7. Higher index values are assigned to superior market sophistication for the country in question. The third variable, i.e. the investor protection index ( $INVPRO_j$ ) is an aggregate measure combining a country's 1) degree of transparency in transactions; 2) the liability of self-dealing, and 3) the shareholders' ability to sue officers and directors for misconduct.<sup>64</sup> For countries with better investor protection standards, the index assigns higher values. Given their definitions, all these controls are expected to be positively correlated with the size of bilateral portfolios.

## B. Foreign Openness

Examining the impact of countries' cultural backgrounds on cross-sectional differences in investor protection standards, Stulz and Williamson (2003) find that *finance is more valuable to countries that can benefit more from being open to international trade* (p. 338). According to Ahearne *et al.* (2004), although capital controls have been reduced, they can still affect cross-border investment and the authors give the example of US investors who underweight the Chinese market maintaining substantial barriers to foreign investment. As such, the openness of a country's international trade or capital flows may promote the foreign investment inward, whereby affecting the geographical spread of the source country's target foreign destinations. The degree of openness can also be considered as a proxy for the information cost that investors bear whenever they consider investing into a particular foreign market. To control for these effects, I employ two variables. The first one is an artificial variable assessing a

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<sup>63</sup> While Chan *et al.* (2005) consider the economic development, the stock market development and the investor protection standards as separate categories of explanations, I believe that they can all be embedded into a single group, capturing various aspects of a particular country's degree of economic development.

<sup>64</sup> In line with the "protecting investors" dimension of the World Bank's Doing Business Project, a recent study include Djankov *et al.* (2008) in which the authors propose a measure of legal protection of minority shareholders against self-dealing transactions benefiting controlling shareholders.

country's degree of openness to international trade. Namely,  $FTRADE_j$  corresponds to the volume of foreign trade in goods and services (i.e. the nominal sum of the imports and exports) scaled by the country's nominal GDP for the year-end 2006. The second variable to control for the effect of foreign openness is mergers & acquisitions,  $MA_j$ , is a measure of the foreign openness.<sup>65</sup> It is the monetary sum of a country's cross-border mergers & acquisitions (i.e. purchases plus sales) scaled by the GDP. Again, I expect both of these controls to enter the model with a positive sign.

### C. Familiarity

Ricciardi (2008a) defines "familiarity" as an *inclination that alters an individuals' perception of risks implying that investors tend to fear less from familiar risks than those that are unfamiliar* (p. 101). With respect to the international portfolio allocation and the home bias literature, the concept of familiarity implies that investors shrink their portfolios across investment alternatives they feel more familiar with. To gauge for this impact, previous studies employed so far different proxies such as geographical proximity, trade linkages or cultural affinities. For example, Massa and Simonov (2006) argue that *investors prefer to invest in countries geographically and professionally closer to their domestic country* (p. 634). Coval and Moskowitz (1999) note that US fund managers exhibit systematic biases toward nearby firms' stocks, and Huberman (2001) provide similar evidence on the effect of geographical proximity using a sample US households' stock holdings. By the same token, other studies proposed that cultural affinities such as the existence of a common language (Grinblatt and Keloharju, 2001)<sup>66</sup>, the origin of the legal system (La Porta *et al.*, 1997; La Porta *et al.*, 2000), the intensity of bilateral trade (Chan *et al.*, 2005), the religious connections (Stulz and Williamson, 2003)<sup>67</sup> etc. would also influence portfolio selection.

Following these studies, I use an array of explanatory variables to control for possible familiarity effects in bilateral equity holdings. The first measure,  $BTRADE_{ij}$ , is the relative amount of country  $i$ 's foreign trade due to transactions with country  $j$  as the partner. More explicitly, a percentage of, say, 10% between a source country A and a destination country B, means that the bilateral imports and exports transacted with country B corresponds to one tenth of the sum of all imports and exports of the country A. I also add a number of indicator variables relative to other aspects of familiarity. Namely,  $LANG_{ij}$ , is a dummy variable equal to

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<sup>65</sup> I believe I am the first to introduce this variable.

<sup>66</sup> Grinblatt and Keloharju (2001) argue that Finnish households are more likely to invest in the stocks of Swedish firms communicating in the investor's native tongue.

<sup>67</sup> Stulz and Williamson (2003, p. 316-317) identify three channels through which culture can affect finance: "First, the values that are predominant in a country depend on its culture. [...] Second, culture affects institutions. For instance, the legal system is influenced by cultural values. Third, culture affects how resources are allocated in an economy".

1 if the source and host countries share a common language family and 0 otherwise. The second variable,  $LEGAL_{ij}$ , is a dummy equal to 1 if the source and host countries' legal systems derive from a common origin.<sup>68</sup> The third variable  $REG_{ij}$ , is a dummy variable equals to 1 if the source and host countries fall into the same geographical region. I compute this binary variable by distinguishing between four broad geographical regions, i.e. Africa, America, Asia-Pacific and Europe following the classification proposed by the World Bank.

#### D. Transparency

This category of controls is motivated from recent evidence set forth by Gelos and Wei (2005) who investigate the effect of a country's transparency on the foreign investment patterns of emerging market funds. The authors find that "international funds prefer to hold more assets in more transparent markets" and "both government and corporate transparency have separate and distinct positive effects on investment flows from international funds into a particular country". Compiling various sources, they elaborate two groups of indicators, namely "government opacity" and "corporate opacity". In this study, however, I use other proxies directly observable and allowing for larger sample coverage.<sup>69</sup> Implementing Gelos and Wei's analysis to country-level equity positions, I conjecture that more transparency would imply less (perceived) risk and/or weaker information asymmetry and encourage investors to invest more in this market.

The first variable used to assess a country's transparency is the "Corruption Perceptions Index", abbreviated as  $CPI_j$ . Briefly, a country's CPI score relates to perceptions of the degree of corruption among public officials and politicians as seen by business people and country analysts. Original country scores range from 0 to 10, with higher values assigned to weaker perceived corruption. Second, I include the "Judiciary Independence Index", denoted  $JUDIN_j$ , which measures the degree of independence of a country's judiciary system. Raw scores are given in numerical values out of 7. Values closer to 7 are assigned to higher perceived dependence of the judiciary system to political influences of members of government, citizens and firms. The third variable, the "Capital Market Controls" index ( $CMC_j$ ) directly measures the intensity of capital market controls within a country. It indicates the percentage of capital controls not levied as a share of the 13 different types of international capital controls reported by the IMF. Originally, individual country ratings range from 0 to 10, with lower scores assigned to countries with higher restrictions on foreign capital flows. Therefore, while I expect a positive coefficient estimates on  $CPI_j$ , while the variables  $JUDIN_j$  and  $CMC_j$  should be

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<sup>68</sup> I distinguish between the legal systems from English, French, German and Scandinavian origins.

<sup>69</sup> The corporate opacity measure used by Gelos and Wei (2005) covers 53 countries. The scope of my analysis, however, requires a larger data collection in that we deal with up to 102 destination countries.

inversely related to the dependent.

#### E. Portfolio Diversification

After all, the basic premise behind diversification is that it ought to enhance either the expected return given the risk or to reduce the risk given the expected return of a portfolio. Thus, the last category of controls checks whether the existing geography of international equity holdings is guided or not by any diversification motive. Doing so, I employ three variables using data from Morgan Stanley Capital International. Using country gross index series (dividends included) in US\$ terms over the period 2002:01-2006:12, I construct 1)  $RET_j$ , the average 5-year return on the country  $j$ 's stock market; 2)  $SHRP_j$ , the risk-adjusted-return on country's broad market index computed as the ratio of mean excess return to the standard deviation; and 3)  $COR_{ij}$  is the correlation between the country  $i$  and  $j$ 's stock market returns.<sup>70</sup> In light of our theoretical detour above, I employ the average return directly in the gravity model, and I control for the results using the Sharpe ratio and the market correlations later.

### 3.4 Descriptive Statistics

Table 2 provides summary statistics regarding the variables described above.

[Insert table 2 here]

For each variable, the table shows the total number of observations, the mean, the standard deviation, the minimum and the maximum scores. The first column displays the expected signs of the regression coefficients. The large differences in the number of available observations across variables imply that regressions are run over an unbalanced panel. Following Papaioannou (2009), I transform raw scores of financial market sophistication, investor protection, foreign trade to GDP, corruption perceptions, judiciary independence and capital market controls so as to restrict scores between 0 and 100. The reason for which the maximum score associated to the financial market sophistication is that descriptive statistics are computed over a filtered data set excluding observations involving an OFC as the destination. The largest bilateral portfolio asset position concerns US investors' holdings in the UK. Germany and Switzerland are the countries closest to each other as shown by the cultural distance. The smallest informational distance is between Japan and South Korea. The smallest and the largest geographical distance are observed between Finland & Estonia and Spain & New Zealand. In addition, while the physical distance between the US and the UK is up to 5500 kilometers long, these two countries are found to be very close to each other according to both the informational and cultural distance measures. Looking at different

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<sup>70</sup> In case there is lack of a directly observed time series for a particular destination, I substitute it by an appropriate regional index.

variables groups, we observe a significant cross-sectional variation. For example, the GDP per capita ranges between a minimum of US\$ 122 for Zimbabwe to a maximum value of US\$ 72,768 for Norway. The UK ranks first in the market sophistication category while New Zealand gets the highest score on the investor protection index. Libya and Swaziland rank the last places with respect to the financial market sophistication and the investor protection indices respectively. An interesting observation is related to the bilateral trade between Canada and the US as shown by a maximum score of 69%. This suggests that 69% of Canada's foreign trade volume originates from transactions with the US as the partner. The second highest score concerning bilateral trade is observed between the US and Mexico with a bilateral foreign trade volume about 68%.

For modeling purposes, it is also useful to check for the pairwise correlations between these variables. Overall, correlations between different variables belonging to the same category are not strong enough to raise concerns about multicollinearity. For example, the average correlation between the economic development variables, i.e. GDP per capita, financial market sophistication and investor protection is about 44%; and the average correlation between the variables in the transparency category, i.e. corruption perceptions, judiciary independence and capital market controls is about 49%. Further, the pairwise correlations between the three distance measures are also sufficiently weak: The average is 22%. This suggests that each of these proxies may truly serve to account for diverse aspects of the international market frictions within a gravity model framework.

## 4 Empirical Analysis

### 4.1 The Gravity Model of Bilateral Equity Holdings

Tables 3 to 5 present the estimation results for the gravity model as described in equations (9) and (10). The dependent variable is  $\log(Assets_{ij})$ , i.e. logarithm of the bilateral equity assets held by a source country  $i$  in the host country  $j$  as of the end-2006. Results for the full sample includes 24 source countries and are reported in panels A of table 3 to 5. Besides, I also distinguish two subsamples which include 12 developed-market source countries and 12 emerging-market source countries separately, whose results are reported in panels B and C respectively.

[Insert tables 3 to 5 here]

In each table, columns (1) to (3) report regression results with geographical, cultural and information distance variables separately to highlight their respective effects on bilateral asset holdings. Alternatively in columns (4) to (6), I control for possible spillovers from information and cultural distances to geographical distance using two-stage regressions to check whether

geography affects bilateral asset holdings through information or culture. Concerning table 5 with non-linear regressions, I make the same comparisons by testing the joint effects of the information and cultural distance on the dependent along the geographical distance, since a two-stage procedure is not available for panel Tobit regressions. To guarantee comparability between the coefficients on different distance variables, I standardize raw scores to bring them to the same scale.<sup>71</sup> Due to the log-log specification imposed to both sides of the regressions, the estimated coefficients are all in terms of elasticities. Because of the large gap in the number of available observations across different variables in the dataset, in particular concerning information and cultural distance measures (475 against 1560), I eliminate the cases where there is no observation for information distance.<sup>72</sup>

I consider various estimation techniques. In table 3, regressions are estimated using generalized least squares (GLS) in columns (1) to (3), and generalized two-stage least-squares (G2SLS) in columns (4) to (6). GLS estimations assume a two-way random effect specification for residuals. I check for the adequacy of random effects for GLS estimations via Breusch-Pagan Lagrange multiplier test (see Breusch and Pagan, 1980) where the null hypothesis is that variances across entities are zero. Breusch-Pagan LM statistic is asymptotically distributed as a chi-squared distribution and the resulting  $\chi^2$  values are all significant at 1% level suggesting that a random effects specification for error terms could be appropriate. I also verified the results using emerging and developed countries subsamples. The results remain unchanged. Regarding the G2SLS procedures, first-stage regressions include the geographical distance as the dependent and information and cultural distances as predictors in columns (4) to (6) where I report the coefficient estimates of information and cultural distance variables obtained from the first-stage regressions. Table 4 assumes a one-way fixed-effect model to estimate the gravity model whereby I include dummies to control for unobservable source-country specific effects. As in the case for random effects under the GLS estimations, I also control for the adequacy of fixed-effects using a joint test to see if source country dummies are all equal to zero. As suggested by highly significant  $F$  statistics, I find that adding fixed-effects across different entities can also be appropriate to control for unobservable country-specific characteristics. In table 4, columns (1) to (3) display the results obtained from panel OLS procedures where geographical, information and cultural distance variables enter the regressions separately. As in table 3, columns (4) to (6) allows information and cultural distance measures to influence geographical distance indirectly through instrumental variables estimations.

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<sup>71</sup> Geographical distance is in kilometers whereas information and cultural distance variables are without unit.

<sup>72</sup> Interestingly, after performing this elimination, I am left with fewer observations for the cultural distance than for information distance. Overall, the data set still comprises a sufficient number of observations to perform necessary calculations.

In table 5, I opt for a non-linear procedure and estimate the gravity model using panel Tobit regressions. In fact, previous estimations set the dependent variable as log of the bilateral equity assets, thereby discarding several observations with zero cross-border assets between a given source and host country pair  $i, j$ . Alternatively in table 5, following Lane and Milesi-Ferretti (2008), I set the dependent as  $\log(\text{Assets}_{ij} + \varepsilon)$  with  $\varepsilon$  being a small number and use the resulting zero observations within a panel Tobit specification with left-censored data. For comparison, while regressions reported in columns (1) of table 3 and 4 comprise 383 observations, Tobit regression with the same set of predictor variables employ 421 observations. For each model specification the same set of destinations is used depending on data availability. In the end, even though the underlying econometric theory and model assumptions differ across estimations, both statistical and economic implications of the estimated coefficients point out to interesting results, regrouped in three categories.

First, consistent with previous studies such as Papaioannou (2009), Lane and Milesi-Ferretti (2008) or Portes *et al.* (2001), we observe that a gravity model of international trade in financial assets performs fairly well. Regressions capture a more or less important part of the variation in data as suggested by the goodness of fit measures: Concerning the panel OLS regressions with source-country fixed effects, the estimated model including return, size and geographical distance as predictors explains 64% of the cross-sectional variation in asset holdings over the full sample. A non-linear specification using left-censored data with the same set of predictors also captures almost half of the variation in the data (the pseudo  $R$ -squared close to 50%). In contrast to results presented in panels C where I include emerging countries into the estimations, the model fit is improved when I restrict the estimations within the developed countries subsample; the adjusted  $R$ -squared is above 70% through columns (1) to (3) in table 4.<sup>73</sup> Looking at regression coefficients, we observe that size and distance variables are appropriately signed through different samples and specifications. Bilateral asset holdings respond positively to source and host countries' economic mass as suggested by highly significant coefficients. Geography has a counter-intuitive impact on bilateral asset holdings, which tend to decrease systematically as the physical distance between the source and destination countries increases. Further, physical distance affects the behavior of investors in emerging countries more than it does for investors in developed countries as suggested by the large gap between the estimated coefficients on geographical distance reported in panels B and C of the tables: Under the panel OLS specification we observe that when geographical distance is cut by 50%, emerging countries' foreign equity assets is more than doubled. This observation also underlines the importance of the gravity model to understand the patterns of international portfolio investments. From a purely diversification

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<sup>73</sup> A similar result is found by Lane and Milesi-Ferretti (2008) who also distinguish between regression results using developed countries and emerging countries separately.



perspective, remote geographies should be particularly preferred by investors willing to diversify away the risk on their portfolios, implying that foreign holdings should increase with distance. However, investors do merely follow this rule and tend to concentrate their investments across a limited set of foreign countries closer to their own home country.

Second, beside the well-documented impact of physical distance on international equity investments, the information and cultural distance measures also perform quite well in a gravity equation. This suggests that these two alternative distance measures are also able to account for other aspects of international market frictions beside the geographical distance. Using the full sample and developed-market source countries subsample, both information and cultural distance enter the regressions with well-determined coefficients significant at the 1% level. Using the emerging-market source countries, however, both distance measures are no longer statistically significant and the cultural distance measure is positively signed implying that it is economically insignificant too. Looking at the estimated coefficients on distance proxies however, we can deduce that the effect of the geographical distance on bilateral assets is systematically higher than those of the information and cultural distance since regressions are run using standardized scores. For example, under the GLS specification, we observe that while the geographical distance has a coefficient by  $-0.88$  in panel A, the coefficients on information and cultural distance variables are  $-0.50$  and  $-0.32$  respectively. Given the log-log specification, this implies that a 10% decrease in information and cultural distance between two countries is expected to increase bilateral equity holdings by 5.4% and 3.5% respectively.

Third, empirical evidence suggest that the controversial effect of the geography on international portfolio investments is more likely to undergo an informational-based channel rather than reflecting investors' preference towards foreign markets they feel more familiar with and culturally closer to their own home market. In fact, inspection of the results obtained from two-stage procedures given in columns (4) to (6) allows one a direct assessment of the separate and joint impact of the cultural or information distance first on geographical distance and second on bilateral equity assets. Looking at panel A of table 3, we observe that while the first-stage coefficients associated to both information and cultural distance measures are separately significant in columns (4) and (5), we note that cultural distance is no more significant once it is used to predict the geographical distance jointly with the information distance. The same result also holds for the first stage estimation results under the fixed-effects specification in table 4: Information distance explains geography more than the cultural distance as suggested by the significant coefficient for the first variable and insignificant for the second. Further, comparing the respective coefficient estimates of the first-stage regressions reported in columns (4) and (5), we also note systematically higher coefficients associated to information distance than the one obtained for cultural distance, an observation that also holds for Tobit regressions displayed in table 5. Specifically, we note that the impact

of the geographical distance on the dependent variable is considerably reduced when information distance is included into the regressions. Thus, evidence presented so far tend to support Massa and Simonov's (2006) view that *familiarity-driven investment is a rational response to information constraints as opposed to a behavioral heuristic* (p. 634), and thereby the home bias puzzle and investors' preference towards physically markets are part of an information-based story as opposed to psychological biases argued by the practitioners of the behavioral finance.

## 4.2 Regressions with Other Variables

In this subsection, I augment the baseline specification by adding into the initial model a number of additional variables previously employed by the related literature. Namely, I introduce several proxies to control for the likely effects of economic development, familiarity, foreign openness and transparency on sample countries' foreign equity holdings. I also check for any diversification motive in the observed geography of cross-border equity holdings via two proxies, namely, the destination market's Sharpe ratio and the bilateral correlation coefficient between the source and host markets. For modeling purposes, omitting the return component and with a bit of rewriting, I consider the following specification for the baseline gravity model as proposed by Portes and Rey (2005, p. 275),

$$(15) \quad \log(Y_{ij}) = c + \alpha \log(M_i M_j) + \beta \log(\theta_{ij})$$

Decomposing the log-product yields to,

$$(16) \quad \log(Y_{ij}) = c + \alpha_1 \log(M_i) + \alpha_2 \log(M_j) + \beta \log(\theta_{ij})$$

As underlined by Portes and Rey (2005) theory suggests that  $\alpha_1 + \alpha_2 = 1$  (p. 276). Denoting by  $\mathbf{Z}_{ij}$  the set of other controls to be included, equation (15) can be rewritten as follows,

$$(17) \quad \log\left(\frac{Y_{ij}}{M_i M_j}\right) = c + \beta \log(\theta_{ij}) + \delta' \mathbf{Z}_{ij} + \varepsilon_{ij}$$

Substituting the terms  $Y_{ij}$ ,  $M_i M_j$ ,  $\theta_{ij}$  and  $\mathbf{Z}_{ij}$  by their data counterparts, the general estimating model is defined as follows,

$$(18) \quad \log\left(\frac{Assets_{ij}}{GDP_i \times GDP_j}\right) = c_i + \beta \log(Distance_{ij}) + \delta_1(Economic\ Development) + \delta_2(Familiarity) + \delta_3(Foreign\ Openness) + \delta_4(Transparency) + \delta_5(Portfolio\ Diversification) + \varepsilon_{ij}.$$

To estimate (18), I adopt one-way fixed-effects specification to control for unobservable source country-specific characteristics as is the case in table 4. As emphasized previously,

either Breusch-Pagan LM test for random effects or the joint  $F$ -test for source country fixed-effects support cannot reject the hypothesis that the model specifications proposed in table 3 and table 4 (columns 1 to 3) is appropriate. In fact, this choice is rather motivated by the fact that most of the available controls reflect destination country-specific characteristics such as the financial market sophistication or corruption perceptions, except the familiarity group including two-dimensional proxies such as the bilateral trade or common legal origin dummy. Tables 6 to 8 present the results of estimating the preceding equation by substituting the  $DISTANCE_{ij}$  by the geographical, information and cultural distance respectively. In column (1) through tables 6 to 8, I present the results using the full set of controls. In columns (2) to (6), I present the results obtained by regressing each group of controls separately on the dependent variable, which is specified from now on as log of the normalized bilateral equity assets, i.e.  $\log(Assets_{ij}/GDP_i \times GDP_j)$ .

[Insert tables 6 to 8 here]

In line with previous results provided by Chan *et al.* (2005) and Portes *et al.* (2001), the recipient country's economic development in attracting foreign capital investments inward is well captured, especially via destination countries' GDP per capita variable which is significant and correctly signed whether it is regressed jointly with geographical, information or cultural distance in columns (2). However, unlike Portes and Rey (2001) who report a significant positive impact of the market sophistication on cross-border equity flows, the two other proxies for countries' economic development, i.e. financial market sophistication index and investor protection index, perform rather poorly with statistically insignificant coefficients. As a further check, I also controlled for the effect of market sophistication and investor protection on bilateral equity holdings separately along with the geographical, information and cultural distance measures in other regressions. I find that both variables enter the models with expected signs and significant coefficients except for the case where I use investor protection index and cultural distance as predictor variables.

Consistent with previous research, familiarity also helps explaining bilateral investments. The respective effects of familiarity proxies used in tables 6 to 8 are mainly captured by the bilateral trade variable since dummies for common language, legal origin and geographical region are of no economic consequence as shown by statistically significant but negative coefficient estimates regarding legal origin and geographical region dummies. Indeed, there is no reason to expect bilateral equity assets to decrease when the source and destination countries share a common legal system origin. The statistical insignificance of these binary variables is also quite surprising since prior studies find strong links between these variables and the foreign investment patterns. For example, Aviat and Coeurdacier (2007) report significant positive effect of sharing a common legal origin system on bilateral banking claims.

Lane and Milesi-Ferretti (2008) note that speaking a common language is expected to raise bilateral equity holdings by about 50%. A possible interpretation for the failure of these dummies would be that their impact can be soaked up by bilateral trade covariate which enters the models with very well-determined coefficients through tables 6 to 8. To check for this effect, I have run the regressions in columns (3) without including the bilateral trade. For example, using geographical distance and dummy variables for common language, legal origin and geographical region within the same model, I find that only language (beside the geographical distance) is correctly signed with a coefficient significant at 5% level. The same observation also holds for the common language dummy when regressed together with the information distance.

Destination countries' degree of openness to international trade affects bilateral equity holdings mainly through the mergers & acquisitions variable  $MA_j$ , which measures the monetary sum of total mergers and acquisitions over the year 2006 scaled by the source country's GDP. Regardless of the distance measure employed in estimations, the coefficient on mergers & acquisitions is statistically significant at the 1% level and correctly signed. I have also used this variable without including foreign trade into different models with geographical, information and cultural distance and I still have found significant coefficients at the 1% level. On the other hand, the countries' foreign trade volume to GDP ratio also enters regressions with statistically significant coefficient estimates, but not with the expected sign: The magnitude of bilateral equity assets between a given pair of source and host countries is expected to respond positively to the host country's level of openness to international trade as proposed by previous studies like Aviat (2006) or Stulz and Williamson (2003). Indeed, the extent to which a given market or country ties economic relations abroad is likely to improve the amount and the quality of information exchange among the partners involved, and consequently, to boost bilateral portfolio investments.

The positive effect of a host country's transparency is on bilateral equity assets well captured in particular by the corruptions perceptions index since the remaining two proxies fail to adequately enter the regressions. Across tables 6 to 8, the coefficient on the  $CPI_j$  is around 0.30 suggesting that a 50% improvement in a given country's degree of corruption could boost bilateral foreign equity inflows by about 15%. Thus evidence broadly support Gelos and Wei's (2005) view that improving a country's transparency could lead to an increase in investment flows, implying a weaker home bias by foreign investors against the country of interest.<sup>74</sup> On the contrary, the two other variables, i.e. the judiciary independence and capital market controls indices, are of no consequence on the dependent variable as shown by insignificant coefficient estimates. As before, I checked for the separate effect of these proxies

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<sup>74</sup> Gelos and Wei (2005) suggest that *becoming more transparent can be an effective way for countries to benefit from international financial integration while avoiding excessive volatility during turbulent times* (p. 3012).

in other regressions, the results are unaffected either for judiciary independence or capital market controls.

Finally, in columns (6) I control for whether the observed bilateral equity holdings are driven by investors' diversification motive and add two variables into the baseline gravity model specification. In fact, from a portfolio diversification viewpoint, a destination market's Sharpe ratio should be positively correlated with foreign investors' portfolio assets within this market of interest; and negatively correlated with the pairwise correlation between the source and host countries' market returns since the greater the degree with which two markets are synchronized the lower the benefit from portfolio diversification. However, the results are exactly the opposite of what is expected and further complicate the puzzling picture of international portfolio investments: Not only investors hold fewer assets in destinations with higher risk-adjusted returns as suggested by significant coefficients on the Sharpe ratio; they are also likely to invest more in destinations whose stock markets are more correlated with their domestic stock market: The coefficient on the pairwise correlation between the source and host markets is around 0.63, significant at the 1% level. Previously, Aviat and Coeurdacier (2007) referred to this observation as the *correlation puzzle*. This suggests that risk diversification is an unlikely determinant of bilateral portfolio investments as emphasized by Portes and Rey (2005) who note that investors tend to prefer informationally close markets when they consider investing abroad.

When all predictors enter the regressions simultaneously, only a few of them preserves its explanatory power. First, none of the distance proxies is helpful to explain bilateral equity holdings and their coefficients are greatly reduced according to results displayed in columns (1) of tables 6 to 8. This suggests that their respective effects are absorbed by other predictors in the model. When I use geographical and cultural distance variables, I observe that bilateral trade, mergers & acquisitions, capital market controls and Sharpe ratio are both statistically and economically significant. The only exception concerns the capital market controls variable whose coefficient loses its explanatory power when regressed along with the information distance. Second, the negative coefficient on the Sharpe ratio generally confirms the estimation results presented in columns (6) where I control if bilateral equity holdings could be driven by a diversification motive. Besides, the coefficients on pairwise market correlation are also positive but not significant at conventional confidence levels. As a further check of the correlation puzzle, I have also run the same regressions with the complete set of predictors by excluding the Sharpe ratio variable. In this case, I have found that  $COR_{ij}$  still enters the models with positive estimates significant at the 10% level. Third, estimations provided in columns (1) further highlight the effect of destination countries' foreign openness on bilateral equity investments from the source markets in the sample as captured by the mergers & acquisitions to GDP ratio,  $MA_j$ , which enters the models in all cases whether one uses

geographical, information or cultural distance.

Fourth, we observe that bilateral trade is also a major determinant of bilateral equity holdings. Not only it has a systematic positive influence on the dependent variable when it is regressed jointly with other familiarity dummies, but it remains the major predictor in the regressions even though I employ other proxies to control for economic development, transparency, foreign openness etc. To check for the consistency of the effect of bilateral trade on bilateral equity assets, I have run additional estimations for the general model given in equation (18) using different combinations of control variables. Given the unmanageable amount of possible combinations across this set of available variables, I estimated stepwise regressions (both forward and backward) allowing variables to enter the regressions with a significance level equal or more than 10%. Regardless of the distance proxy used in regressions, I find that bilateral trade is systematically the first variable to be included in regressions with well-determined and correctly signed coefficients and that the distance proxies perform rather poorly once bilateral trade makes part of the predictors within the estimated model.<sup>75</sup> Given this systematic effect of bilateral trade on bilateral equity holdings, the relevant question is to ask whether bilateral trade can be considered as a substitute for information or cultural proximity between countries.

### **4.3 Disentangling the Effect of Bilateral Trade: Information or Culture?**

According to Lane and Milesi-Ferretti (2008), there exists a strong link between trade and equity holdings and they suggest that this observation is particularly consistent with the informational potential of the strength of bilateral trade relations across countries (p. 546). They report that a simple econometric specification using bilateral trade as predictor of bilateral equity assets is enough to explain as much as 86% of the variance observed in a data set that covers a subsample of OECD countries' foreign equity assets. The strong positive link between bilateral trade and equity holdings would reflect the preference that investors exhibit for "professionally closer countries" as conjectured by Massa and Simonov (2006). Examining the complementarity between bilateral trade and bilateral asset holdings within a simultaneous equation framework, Aviat and Coeurdacier (2007) argue that 1) distance which substitutes transport costs in goods market would induce home bias in asset portfolios and 2) part of the effect of geographical distance on bilateral asset holdings could be related to bilateral trade relations between countries. The authors report that a 10% increase in bilateral trade leads to a 3% increase in bilateral banking claims. Moreover, although the direction of causality between trade and assets runs significantly in both ways, they find that the impact

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<sup>75</sup> Concerning stepwise procedures, I have used a linear specification for the panel data with source country fixed-effects and the bilateral trade is the first control to enter the models after different dummies introduced for entities.

of trade on asset holdings is substantial. Portes and Rey (2005) suggest that information flows via trade in goods could enhance bilateral portfolio holdings to the extent that trading partners are more likely to share and exchange information, thereby eroding a good part of the informational asymmetries in the financial markets.

In light of these studies, I propose a simple way to control for whether the effect of bilateral trade on portfolio holdings goes through our information or cultural distance measures since these two alternative variables are found to be good proxies for geographical distance as shown by empirical results provided above. Indeed, the direction of causality between trade and asset holdings runs significantly in both ways and omitting bilateral trade in goods within a gravity model of bilateral equity holdings could lead to estimation bias problems as underlined by Aviat and Coeurdacier (2007). Then, it would be conceivable to introduce the variable  $Assets_{ij}$  into the basic gravity model provided in equation (15) as a plausible predictor of bilateral trade in goods,

$$(19) \quad \log(Bilateral\ trade_{ij}) = c + \beta \log(Distance_{ij}) + \gamma \log(Assets_{ij})$$

If bilateral trade in goods is endogenous to the baseline gravity model of asset holdings and if the effect of geographical distance on portfolio assets can effectively be decomposed into two components, i.e. information distance and cultural distance, one would expect the predicted values of bilateral trade in goods to be correlated with these two alternative distance measures. Then, by comparing the correlations coefficients between the predicted values of the dependent variable and different distance proxies, one would understand whether the effect of goods trade on the observed geography of portfolio holdings goes through an informational or cultural channel. I estimate the preceding equation using panel OLS with source country fixed-effects and substitute the terms  $Distance_{ij}$  by geographical distance between countries  $i$  and  $j$ , and  $Assets_{ij}$  by bilateral equity assets held by source country  $i$  in the host country  $j$  scaled by source and host countries' GDPs products. The estimation results are as follows:

$$(20) \quad \log(Bilateral\ trade_{ij}) = 1.87 - 0.32 \log(Geographical\ distance_{ij}) + 0.50 \log(Assets_{ij})$$

All coefficients are statistically significant at the 1% level (assuming heteroskedasticity-consistent estimator for the variance) with a satisfactory goodness-of-fit measure of the regression:  $R^2$  of within estimates is close to 0.31. Further, the  $F$  test to check if all fixed-effects are jointly equal to zero can be easily rejected as well. Given these results, the next figure provides the scatter plots of the predicted scores for the bilateral trade in goods against the information distance in panel A and the cultural distance in panel B.

[Insert figure 2 here]

As shown by the linear fits, the scatters broadly highlight the relative importance of information proximity against the cultural proximity to explain the effect of bilateral trade in goods on the geographical patterns of international portfolio investments. Computing the correlation between bilateral trade and information distance, I find a coefficient close to minus 0.38, which is significant at the 1% level. In contrast, the correlation between cultural distance and trade is fairly weak by minus 0.05 and statistically insignificant. In brief, evidence is mostly consistent and provides empirical support to previous studies such as Lane and Milesi-Ferretti (2008) or Portes and Rey (2005) who also underline the importance of goods trade in explaining the puzzling geography of international portfolio holdings via its potential value as an information variable.

## 5 Conclusion

I analyze a panel data set on countries' bilateral equity holdings as of the end-2006 to provide insights into the puzzling geographical patterns of international portfolio investments using a gravity framework. Following Portes and Rey's (2005) inquiry on distinguishing behavioral familiarity effects from those originated by informational asymmetries in international financial markets, I argue that the preference revealed by investors towards physically closer geographies would undergo two different channels and examine the link via two quantitative measures as alternatives to geographical distance, i.e. *information distance* and *cultural distance*, which account respectively for information- or familiarity-based aspects of investors' preference towards geographically proximate markets. While a generally recognized formula to provide a measure of the cultural distance between two countries is already available, I believe that, within the related literature, this paper is the first to propose and test a direct quantitative measure as a proxy of the *information distance* between two countries. The results can be summarized as follows.

First and consistent with previous studies such as Papaioannou (2009), Lane and Milesi-Ferretti (2008) or Portes *et al.* (2001), regressions show that a gravity model of international trade in financial assets performs fairly well to explain the observed geographical patterns of bilateral equity holdings. This finding is also robust to various estimations run either with the information and cultural distance, while variation in data is better captured when I use geographical distance to proxy for transaction costs in international financial markets. The baseline specification of the gravity model is particularly valid for the full sample and developed-market source countries subsample, while most of the coefficients on distance proxies lose their explanatory power for the emerging-market source countries subsample. I also check for the model accuracy using different estimation techniques including non-linear panel Tobit regressions, the results remain unchanged. Further, the impact of the physical



distance is further pronounced for emerging-market countries subsample: When geographical distance is cut by 50%, emerging countries' foreign equity assets is more than doubled.

Second, beside the systematic effect of geographical distance on bilateral equity holdings, information and cultural distance measures also perform quite well within the baseline gravity model. Given the lack of correlation between these two alternative distance measures and the standard geographical distance, one could deduce these proxies can also account for other aspects of international market frictions along with physical distance. In particular, when the information and cultural distance between two countries decrease by 10% bilateral equity assets held by source countries' investors in the corresponding host are expected to increase by about 5.4 and 3.5% respectively. Indeed, evidence suggests that the effect of the geography on international investment patterns is more likely to be a phenomenon linked to information asymmetries rather than reflecting the impact of cultural proximity between countries. The coefficient on information distance is systematically higher than that of the cultural distance regardless of the sample or the estimation technique used. When I employ these two distance measures jointly with geographical distance in 2SLS and IV estimations, the results from first-stage regressions show that information distance enters the models with expected sign and well-determined coefficients while the coefficient of the cultural distance lacks of statistical significance. This result is also valid concerning Tobit regressions. Moreover, the impact of geographical distance on the dependent variable is reduced in most cases once information distance is included into the model. In short, empirical evidence supports Massa and Simonov's (2006) view that familiarity-driven investment is a response to information constraints as opposed to a behavioral heuristic (p. 634).

As a further check, I control for these results using additional variables mainly drawn from previous studies. I augment the baseline specification by adding several proxies to control for the effects of countries' economic development, openness to foreign trade, transparency and the degree of familiarity with the host market on portfolio investments. I also check if bilateral equity assets are driven by any diversification motive. Destination countries' economic development explains part of the dependent variable as captured by the GDP per capita. Financial market sophistication and investor protection enter the regressions only when they are regressed separately from each other. Foreign openness is also helpful to explain bilateral equity holdings given the consistent estimates on the mergers & acquisitions variable. The positive effect of host countries' transparency mainly goes through the corruptions perceptions index variable. It suggests that improving a country's transparency could enhance foreign investment inward and, consequently, erode some part of the home bias that foreign investors exhibit vis-à-vis the country of interest. Finally, controlling for portfolio diversification, I find no evidence of any risk diversification motive in bilateral portfolios as in Portes and Rey (2005), since investors' tendency to hold stocks of a given country increases with the bilateral

correlation coefficient between the source and host markets' returns (see Aviat and Coeurdacier, 2007) and decrease with the host country's expected risk-adjusted return.

Beside the impact of information distance, the most striking result concerns the systematic effect of bilateral trade on bilateral equity holdings. Specifically, bilateral trade always enters the regressions with positive and very-well determined coefficient estimations regardless of the estimation technique or the sample employed. Previous studies such as Lane and Milesi-Ferretti (2008) or Aviat and Coeurdacier (2007) suggested that part of the effect of geographical distance on bilateral asset holdings could be related to bilateral trade relations between countries. In this paper, I check if the effect of trade on portfolio holdings undergoes the information or culture-based story since these two alternative variables appear also good proxies for the geographical distance. Regressions highlight the relative importance of information proximity against the cultural proximity to explain the effect of bilateral trade in goods on the geographical patterns of international portfolio investments via its potential values as an information variable.

I consider the empirical work presented here as robust evidence that information asymmetries are central to understand the nature of international market frictions and the existing patterns of cross-border portfolio investments. The analysis also sheds light into the home bias puzzle suggesting that investors prefer to hold stocks in markets that are informationally close to their own home market. Although the puzzling preference for proximate geographies appears to be better explained by information proximity than cultural proximity, further work is needed to effectively isolate the respective impacts of culture and information on the geographical spread of cross-border asset portfolios and to investigate the true direction of causality running from culture to information exchange and vice versa. In fact, even if the two quantitative measures I propose for cultural and information distance are weakly correlated each other (and with the geographical distance too), it would be also useful to check for the extent to which culture and information are separable by means of additional instruments likely to capture other facets of the information exchange across and the cultural affinities between countries.

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## APPENDIX A. Data: Sample, definitions and sources

Reporting (source) countries in the CPIS 2006 files:

Argentina, Australia, Brazil, Canada, Czech Republic, Finland, France, Germany, Hungary, India, Indonesia, Italy, Japan, Malaysia, Mexico, Netherlands, Poland, South Africa, South Korea, Spain, Sweden, Turkey, United Kingdom, United States.

Destination countries in the CPIS 2006 files:

Albania, Algeria, Argentina, Australia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Canada, Chile, China, Colombia, Congo Republic, Croatia, Czech Republic, Denmark, Ecuador, Egypt, Estonia, Finland, France, Gabon, Georgia, Germany, Ghana, Greece, Guatemala, Guyana, Hungary, Iceland, India, Indonesia, Iran, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Latvia, Liberia, Libya, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Mexico, Morocco, Namibia, Nepal, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia, Slovak Republic, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Swaziland, Sweden, Taiwan, Tanzania, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe.

Complement to variable definitions and data sources:

1) Economic development:

$GDPPC_j$ : Country  $j$ 's nominal GDP per capita. Source: IMF World Economic Outlook database.  $FMSOP_j$ : Country  $j$ 's financial market sophistication index. Source: World Economic Forum's Global Competitiveness Index, [www.weforum.org](http://www.weforum.org).  $INVPRO_j$ : Country  $j$ 's investor protection index. Source: The World Bank's "Doing Business Project" database.

2) Openness:

$FTRADE_j$ : The foreign trade volume of country  $j$ 's as a percentage of its GDP. Source: Author's own calculations based on trade statistics obtained from the web site [www.trademap.org](http://www.trademap.org), GDP data is from the IMF's World Economic Outlook database.  $MA_j$ : The monetary sum of the country  $j$ 's cross-border mergers and acquisitions scaled by its GDP. Source: Author's own calculations based on data covering the international mergers and acquisitions as reported by the World Investment Report (UNCTAD, 2007).

### 3) Familiarity:

$BTRADE_{ij}$ : The ratio of the country  $i$ 's bilateral trade volume with country  $j$  to the total foreign trade volume of country  $i$ . Source: Author's own calculations based on data from [www.trademap.org](http://www.trademap.org).  $LANG_{ij}$ : A dummy variable equal to 1 if countries  $i$  and  $j$  share a common language, 0 otherwise. Sources: CIA World Factbook.  $LEGAL_{ij}$ : A dummy variable equal to 1 if countries  $i$  and  $j$ 's legal systems come from the same origin, and 0 otherwise. Source: La Porta *et al.* (1997).  $REG_{ij}$ : A dummy variable equal to 1 if countries  $i$  and  $j$  are in the same geographical region, and 0 otherwise. Source: The World Bank.

### 4) Transparency:

$CPI_j$ : The corruption perceptions index. Source: Transparency International, [www.transparency.org](http://www.transparency.org).  $JUDIN_j$ : The judiciary system independence index. Source: The Economic Freedom Network, [www.freetheworld.com](http://www.freetheworld.com).  $CMC_j$ : The capital market controls index. Source: The Economic Freedom Network, [www.freetheworld.com](http://www.freetheworld.com).

### 5) Portfolio diversification:

$RET_j$ : The expected return on the country  $j$ 's market index.  $SHRP_j$ : The risk-adjusted return on country  $j$ 's market index defined as the ratio of mean excess return to the standard deviation (for purpose of computational facility, the international risk-free rate is assumed to be equal to zero).  $COR_{ij}$ : The correlation coefficient between the country  $i$  and  $j$ 's market returns. Source: All variables are computed using index data (dividends included) over the 5-year length period running from January 2002 to December 2006. Whenever there is lack of a directly observable MSCI index for a particular country, I substitute it by a regional MSCI index; that is I employ i) the MSCI Emerging Asia index for Bangladesh and China, ii) the MSCI Emerging Markets Latin America index for Ecuador, Jamaica, Uruguay and Venezuela, iii) the MSCI Emerging Markets Eastern Europe index for Czech Republic, Bulgaria, Estonia, Romania and Slovak Republic, iv) the MSCI Emerging Markets index for Kenya, Nigeria and Zambia, and v) the MSCI Europe & Middle East index for Kuwait.



Table 1. Hofstede's cultural dimensions and the countries' respective numerical scores

Country	C.	PDI	IDV	MAS	UAI	Country	C.	PDI	IDV	MAS	UAI
Argentina	1	49	46	56	86	Luxembourg <sup>a</sup>	1	40	60	50	70
Australia	2	36	90	61	51	Malaysia	4	104	26	50	36
Austria	1	11	55	79	70	Malta <sup>a</sup>	1	56	59	47	96
Bangladesh <sup>a</sup>	4	80	20	55	60	Mexico	3	81	30	69	82
Belgium	1	65	75	54	94	Morocco <sup>a</sup>	3	70	46	53	68
Brazil	3	69	38	49	76	Netherlands	2	38	80	14	53
Bulgaria <sup>a</sup>	3	70	30	40	85	New Zealand	2	22	79	58	49
Canada	2	39	80	52	48	Nigeria <sup>d</sup>	4	77	20	46	54
Chile	3	63	23	28	86	Norway	2	31	69	8	50
China <sup>a</sup>	4	80	20	66	30	Pakistan	3	55	14	50	70
Colombia	3	67	13	64	80	Panama	3	95	11	44	86
Costa Rica	3	35	15	21	86	Peru	3	64	16	42	87
Czech Rep. <sup>a</sup>	1	57	58	57	74	Philippines	4	94	32	64	44
Denmark	2	18	74	16	23	Poland <sup>a</sup>	1	68	60	64	93
Ecuador	3	78	8	63	67	Portugal	3	63	27	31	104
Egypt <sup>b</sup>	3	80	38	52	68	Romania <sup>a</sup>	3	90	30	42	90
El Salvador	4	66	19	40	94	Russia <sup>a</sup>	3	93	39	36	95
Estonia <sup>a</sup>	2	40	60	30	60	Saudi Arabia <sup>b</sup>	3	80	38	52	68
Ethiopia <sup>c</sup>	4	64	27	41	52	Sierra Leone <sup>d</sup>	4	77	20	46	54
Finland	2	33	63	26	59	Singapore	4	74	20	48	8
France	1	68	71	43	86	Slovakia <sup>a</sup>	4	104	52	110	51
Germany	1	35	67	66	65	South Africa	1	49	65	63	49
Ghana <sup>d</sup>	4	77	20	46	54	South Korea	3	60	18	39	85
Greece	3	60	35	57	112	Spain	1	57	51	42	86
Guatemala	3	95	6	37	101	Surinam <sup>a</sup>	3	85	47	37	92
Hong Kong	4	68	25	57	29	Sweden	2	31	71	5	29
Hungary <sup>a</sup>	1	46	80	88	82	Switzerland	1	34	68	70	58
India	4	77	48	56	40	Taiwan	3	58	17	45	69
Indonesia	4	78	14	46	48	Tanzania <sup>c</sup>	4	64	27	41	52
Iran	4	58	41	43	59	Thailand	3	64	20	34	64
Iraq <sup>b</sup>	3	80	38	52	68	Trinidad <sup>a</sup>	4	47	16	58	55
Ireland	2	28	70	68	35	Turkey	3	66	37	45	85
Israel	1	13	54	47	81	Unt. Arab Em. <sup>b</sup>	3	80	38	52	68
Italy	1	50	76	70	75	UK	2	35	89	66	35
Jamaica	4	45	39	68	13	USA	2	40	91	62	46
Japan	1	54	46	95	92	Uruguay	3	61	36	38	100
Kenya <sup>c</sup>	4	64	27	41	52	Vietnam <sup>a</sup>	4	70	20	40	30
Kuwait <sup>b</sup>	3	80	38	52	68	Venezuela	3	81	12	73	76
Lebanon <sup>b</sup>	3	80	38	52	68	Zambia <sup>c</sup>	4	64	27	41	52
Libya <sup>b</sup>	3	80	38	52	68						

Notes: a) estimated values, b) regional estimated values for "Arab World", c) regional estimated values for "East Africa", d) regional estimated values for "West Africa". The second column labeled "C." displays the country's membership score resulting from a four-means cluster analysis using raw data from [www.geert-hofstede.com](http://www.geert-hofstede.com).

Table 2. Descriptive statistics, raw data set

Variable		Obs.	Mean	St. dev.	Min.	Max.
<i>Dependent</i>						
Assets		1042	7000.63	37122.83	0.00	673978.00
<i>Size and distance</i>						
Size	(+)	2736	5.60e+11	2.76e+12	6.89e+07	5.78e+13
Distance, geographical	(-)	1626	7490.04	4674.48	84.00	19857.00
Distance, information	(-)	475	247.66	28.89	136.38	350.46
Distance, cultural	(-)	1560	268.42	104.26	28.05	692.68
<i>Economic Development</i>						
GDP per capita	(+)	2708	11331.09	15552.05	122.50	72768.10
Fin. market sophistication	(+)	2328	47.54	22.23	0.00	98.26
Investor protection	(+)	2664	48.90	16.46	0.00	100.00
<i>Openness</i>						
Foreign trade	(+)	2688	5.29	9.45	0.00	100.00
Mergers & Acquisitions	(+)	2160	2.85	3.24	0.00	14.04
<i>Familiarity</i>						
Bilateral trade	(+)	2700	0.81	2.85	0.00	68.93
Language	(+)	2856	0.47	0.49	0.00	1.00
Legal origin	(+)	945	0.32	0.46	0.00	1.00
Region	(+)	2856	0.26	0.44	0.00	1.00
<i>Transparency</i>						
Corruption perceptions	(+)	2664	31.04	27.91	2.56	100.00
Judiciary independence	(-)	2280	52.86	24.93	0.00	100.00
Capital market controls	(-)	2376	52.58	20.84	0.00	93.38
<i>Portfolio Diversification</i>						
Expected return	(+)	2040	2.02	1.09	-2.27	4.34
Sharpe ratio	(+)	2040	31.46	14.16	-23.58	64.29
Correlation	(-)	2040	50.21	22.72	-38.83	100.00

Notes: The table reports summary statistics computed from raw data. ASSETS are expressed in US\$ millions and, GDPPC in US\$ terms. Geographical distance is expressed in kilometers while the informational and cultural distances are without unit. The five sets of other explanatory variables are 1) Economic development variables, including the GDP per capita (GDPPC), financial market sophistication (FMSOP), and investor protection (INVPRO); 2) Openness variables, including foreign trade volume (FTRADE) and the mergers & acquisitions (MA) (both of them expressed as percentages of the country's GDP); 3) Familiarity variables, including the bilateral trade volume (BTRADE) as percentage of the source country's GDP, common language dummy (LANG), common legal origin dummy (LEG), common geographical region dummy (REG); 4) Transparency variables, including corruption perceptions index (CPI), judiciary system's independence index (JUDIN), and capital market controls index (CMC); and 5) Portfolio diversification variables, including the expected return (RET), Sharpe ratio (SHRP), and return correlations between the source and host countries (COR).

Table 3. The gravity model of bilateral equity holdings

Dependent: $\log(\text{Assets}_{ij})$	(1) GLS	(2) GLS	(3) GLS	(4) G2SLS	(5) G2SLS	(6) G2SLS
Panel A. All countries						
$\text{Return}_j$	-1.3818*** (-2.32)	-1.7605*** (-2.69)	-1.2727*** (-2.04)	-1.3637*** (-2.90)	-0.5209 (-0.86)	-0.9590** (-2.13)
$\text{Size}_{ij}$	1.2671*** (14.95)	1.1581*** (14.06)	1.1508*** (13.74)	1.3054*** (19.37)	1.4838*** (11.06)	1.3101*** (18.37)
$\text{Geographical distance}_{ij}$	-0.8865*** (-9.26)			-1.1632*** (-5.27)	-2.1981*** (-3.02)	-0.9959*** (-4.80)
$\text{Information distance}_{ij}$		-0.5017*** (-3.26)		<sup>a</sup> 0.4610*** (10.47)		<sup>a</sup> 0.4613*** (9.46)
$\text{Cultural distance}_{ij}$			-0.3280*** (-4.07)		<sup>a</sup> 0.1491*** (3.22)	<sup>a</sup> 0.0346 (0.81)
# of observations	383	383	358	383	358	358
$R^2$ (overall)	0.4812	0.3882	0.3911	0.4791	0.4198	0.4827
Wald $\chi^2$	560.24	423.42	408.74	610.19	330.03	531.90
Panel B. Developed-market source countries						
$\text{Return}_j$	-1.7540* (-2.34)	-2.1585*** (-2.67)	-1.7383** (-2.17)	-1.5894*** (-3.48)	-0.0471 (-0.0474)	-1.2728*** (-2.96)
$\text{Size}_{ij}$	1.3683*** (15.86)	1.2720*** (14.13)	1.2950*** (12.79)	1.4001*** (22.06)	1.5991*** (10.92)	1.4160*** (21.14)
$\text{Geographical distance}_{ij}$	-0.7039*** (-6.82)			-0.8394*** (-4.05)	-2.8667** (-2.18)	
$\text{Information distance}_{ij}$		-0.5118*** (-3.16)		<sup>a</sup> 0.6336*** (9.21)		<sup>a</sup> 0.6607*** (8.62)
$\text{Cultural distance}_{ij}$			-0.3376*** (-3.63)		<sup>a</sup> 0.1106* (2.00)	<sup>a</sup> -0.0203 (-0.39)
# of observations	284	284	261	284	261	261
$R^2$ (overall)	0.6616	0.6060	0.5861	0.6596	0.4152	0.6445
Wald $\chi^2$	589.21	515.03	439.06	730.79	222.04	643.52
Panel C. Emerging-market source countries						
$\text{Return}_j$	-2.8360* (-1.97)	-2.5713 (-1.59)	-1.2621 (-0.79)	-2.6418* (-1.69)	-0.9221 (-0.44)	-1.5147 (-0.96)
$\text{Size}_{ij}$	0.7927*** (3.90)	0.5305*** (2.93)	0.5831*** (3.32)	0.8087*** (3.21)	0.4929 (0.81)	0.7881*** (3.02)
$\text{Geographical distance}_{ij}$	-1.1792*** (-4.04)			-1.0300 (-1.25)	0.5688 (0.24)	-0.6220 (-0.80)
$\text{Information distance}_{ij}$		-0.2048 (-0.84)		<sup>a</sup> 0.2241*** (4.47)		<sup>a</sup> 0.2281*** (4.29)
$\text{Cultural distance}_{ij}$			0.0863 (0.31)		<sup>a</sup> 0.1282 (1.60)	<sup>a</sup> 0.0686 (0.92)
# of observations	99	99	97	99	97	97
$R^2$ (overall)	0.1456	0.0795	0.0649	0.1394	0.0176	0.1157
Wald $\chi^2$	49.28	27.11	29.20	40.91	27.80	35.51

Notes: The table reports GLS and G2SLS regression results for the gravity model of international equity holdings. The dependent variable is log of equity assets held by the source country  $i$  in the host country  $j$ .  $\text{Return}_j$  is lag-5 year average return on country  $j$ 's stock market.  $\text{Size}_{ij}$  is log of the source and host countries' GDP products.  $\text{Geographical distance}_{ij}$ ,  $\text{Information distance}_{ij}$ , and  $\text{Cultural distance}_{ij}$  are (log of the) the geographical, information and cultural distances between countries  $i$  and  $j$ . Concerning the G2SLS specification in columns (4) to (6), "a" denotes coefficient estimates from first-stage regressions. Heteroskedasticity consistent  $t$ -statistics obtained using the White (1980) method, are provided in parenthesis below the parameter estimates. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 4. The gravity model of bilateral equity holdings

Dependent: $\log(\text{Assets}_{ij})$	(1)	(2)	(3)	(4)	(5)	(6)
	Panel OLS	Panel OLS	Panel OLS	IV	IV	IV
Panel A. All countries						
$\text{Return}_j$	-1.4516** (-2.16)	-1.8509** (-2.49)	-1.3222* (-1.88)	-1.3746*** (-2.85)	-0.6258 (-1.05)	-0.9751** (-2.13)
$\text{Size}_{ij}$	1.2704*** (14.26)	1.1662*** (13.08)	1.1569*** (12.36)	1.3078*** (18.95)	1.4789*** (11.42)	1.3146*** (18.11)
$\text{Geographical distance}_{ij}$	-0.8641*** (-8.99)			-1.1735*** (-5.21)	-2.1643*** (-3.05)	-1.0137*** (-4.83)
$\text{Information distance}_{ij}$		-0.5438*** (-4.11)		<sup>a</sup> 0.4634*** (10.22)		<sup>a</sup> 0.4654*** (9.26)
$\text{Cultural distance}_{ij}$			-0.3278*** (-4.40)		<sup>a</sup> 0.1514*** (3.20)	<sup>a</sup> 0.0345 (0.78)
# of observations	383	383	358	383	358	358
$R^2$ (within)	0.6143	0.6025	0.5649	0.6328	0.4508	0.6314
$R^2$ (adjusted)	0.6385	0.5993	0.5612			
$F$ statistic	20.96	27.19	21.60	21.42	16.29	24.28
Panel B. Developed-market source countries						
$\text{Return}_j$	-1.5050** (-2.05)	-1.8366** (-2.38)	-1.4938* (-1.92)	-1.4146*** (-3.11)	-0.0442 (-0.04)	-1.1382*** (-2.65)
$\text{Size}_{ij}$	1.4284*** (15.89)	1.3488*** (15.01)	1.3707*** (13.55)	1.4389*** (22.57)	1.5996*** (10.74)	1.4547*** (21.55)
$\text{Geographical distance}_{ij}$	-0.6743*** (-6.71)			-0.8704*** (-4.16)	-2.8662** (-2.12)	-0.7604*** (-3.95)
$\text{Information distance}_{ij}$		-0.5533*** (-3.70)		<sup>a</sup> 0.6356*** (9.16)		<sup>a</sup> 0.6687*** (8.60)
$\text{Cultural distance}_{ij}$			-0.3158*** (-3.76)		<sup>a</sup> 0.1102* (1.95)	<sup>a</sup> 0.0301 (-0.58)
# of observations	284	284	261	284	261	261
$R^2$ (within)	0.7460	0.7206	0.6947	0.7424	0.1990	0.7404
$R^2$ (adjusted)	0.7432	0.7176	0.6911			
$F$ statistic	12.49	11.72	11.43	11.24	4.23	12.33
Panel C. Emerging-market source countries						
$\text{Return}_j$	-2.6541* (-1.68)	-2.3481 (-1.39)	-0.8541 (-0.54)	-2.5639 (-1.61)	-0.7269 (-0.36)	-1.2991 (-0.82)
$\text{Size}_{ij}$	0.9018*** (4.33)	0.6459*** (3.30)	0.7202*** (3.77)	0.8653*** (3.44)	0.6411 (1.28)	0.8863*** (3.57)
$\text{Geographical distance}_{ij}$	-1.2362*** (-3.78)			-1.0781 (-1.33)	0.3318 (0.17)	-0.6850 (-0.95)
$\text{Information distance}_{ij}$		-0.2535 (-1.14)		<sup>a</sup> 0.2351*** (4.64)		<sup>a</sup> 0.2413** (4.63)
$\text{Cultural distance}_{ij}$			0.0495 (0.21)		<sup>a</sup> 0.1493* (1.86)	<sup>a</sup> 0.0903* (1.24)
# of observations	99	97	97	99	97	97
$R^2$ (within)	0.3837	0.3122	0.3084	0.3823	0.2541	0.3767
$R^2$ (adjusted)	0.3642	0.2905	0.2860			
$F$ statistic	6.58	7.55	8.33	7.95	7.43	8.86

Notes: The table reports panel OLS and instrumental variables regression results for the gravity model of international equity holdings. The dependent variable is log of equity assets held by the source country  $i$  in the host country  $j$ .  $\text{Return}_j$  is lag-5 year average return on country  $j$ 's stock market.  $\text{Size}_{ij}$  is log of the source and host countries' GDP products.  $\text{Geographical distance}_{ij}$ ,  $\text{Information distance}_{ij}$ , and  $\text{Cultural distance}_{ij}$  are (log of the) the geographical, information and cultural distances between countries  $i$  and  $j$ . Concerning the IV specification in columns (4) to (6), "a" denotes coefficient estimates from first-stage regressions.  $F$ -stat is designed to jointly test that all individual effects are zero, for which the null hypothesis is rejected at all conventional levels throughout the table. Heteroskedasticity consistent  $t$ -statistics obtained using the White (1980) method, are provided in parenthesis below the parameter estimates. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 5. The gravity model of bilateral equity holdings

Dependent: log( $Assets_{ij} + \varepsilon$ )	(1) Panel Tobit	(2) Panel Tobit	(3) Panel Tobit	(4) Panel Tobit	(5) Panel Tobit	(6) Panel Tobit
Panel A. All countries						
$Return_j$	1.0881*** (3.17)	1.2914*** (3.35)	1.2243*** (3.30)	-0.4876* (-1.68)	1.2538*** (3.67)	-0.4881* (-1.68)
$Size_{ij}$	1.4654*** (21.31)	1.5599*** (21.61)	1.4393*** (18.26)	1.1250*** (17.51)	1.5273*** (20.51)	1.1248*** (17.43)
$Geographical\ distance_{ij}$	-0.9544*** (-7.59)			-0.5899*** (-5.61)	-0.9302*** (-7.44)	-0.5788*** (-5.61)
$Information\ distance_{ij}$		-0.5947*** (-4.44)		-0.6414*** (-6.25)		-0.6422*** (-5.91)
$Cultural\ distance_{ij}$			-0.4471*** (-3.85)		-0.2870*** (-2.67)	0.0021 (0.02)
# of observations	421	362	398	362	395	362
$R^2$ (pseudo)	0.4996	0.3854	0.4034	0.4662	0.4932	0.4664
$\chi^2$	483.80	594.91	361.41	676.91	460.64	676.91
Panel B. Developed-market source countries						
$Return_j$	1.2097*** (3.34)	1.4296*** (3.60)	1.2998*** (3.34)	-1.6479*** (-4.06)	1.3621*** (3.85)	-1.6355*** (-4.02)
$Size_{ij}$	1.5994*** (20.22)	1.7426*** (20.44)	1.6319*** (16.88)	1.1153*** (14.70)	1.6383*** (18.55)	1.1181*** (14.68)
$Geographical\ distance_{ij}$	-0.8563*** (-6.39)			-0.4981*** (-5.05)	-0.8589*** (-6.52)	-0.4998*** (-5.07)
$Information\ distance_{ij}$		-0.6867*** (-3.52)		-0.6840*** (-6.38)		-0.6678*** (-5.85)
$Cultural\ distance_{ij}$			-0.4693*** (-3.63)		-0.3436 (-2.91)	-0.0353 (-0.41)
# of observations	297	262	275	262	273	262
$R^2$ (pseudo)	0.4934	0.3840	0.4049	0.4297	0.4873	0.4097
$\chi^2$	448.03	676.99	328.33	767.86	415.81	768.52
Panel C. Emerging-market source countries						
$Return_j$	0.4427 (0.93)	0.4450 (0.9027)	0.5911 (1.12)	0.4895 (0.91)	0.5024 (1.00)	0.4751 (0.87)
$Size_{ij}$	1.0554*** (7.28)	0.9331*** (7.59)	0.9105*** (6.94)	0.9944*** (6.94)	1.1350 (7.51)	0.9753*** (6.80)
$Geographical\ distance_{ij}$	-0.9136*** (-2.83)			-0.9149*** (-2.72)	-0.9629*** (-2.99)	-0.9457** (-2.83)
$Information\ distance_{ij}$		-0.2435 (-1.37)		-0.0675 (-0.24)		-0.1247 (-0.45)
$Cultural\ distance_{ij}$			-0.2201 (-0.09)		0.0984 (0.42)	0.2782 (1.25)
# of observations	124	100	123	100	122	100
$R^2$ (pseudo)	0.4972	0.3972	0.4090	0.4951	0.4969	0.4841
$\chi^2$	57.02	44.40	52.82	54.37	62.91	56.71

Notes: The table reports panel Tobit regression results for the gravity model of international equity holdings. The dependent variable is log of equity assets held by the source country  $i$  in the host country  $j$ , normalized by the source and host countries' GDP products.  $Return_j$  is lag-5 year average return on country  $j$ 's stock market.  $Size_{ij}$  is log of the source and host countries' GDP products.  $Geographical\ distance_{ij}$ ,  $Information\ distance_{ij}$ , and  $Cultural\ distance_{ij}$  are (log of the) the geographical, information and cultural distances between countries  $i$  and  $j$ .  $t$ -statistics are provided in parenthesis below the parameter estimates through columns. Pseudo R-squared is defined as the squared correlation between the predicted and observed values of the dependent variable. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 6. Panel regressions with control variables: Estimations using geographical distance

Dependent: $\log\left(\frac{Assets_{ij}}{GDP_i \times GDP_j}\right)$	(1) All	(2) Economic development	(3) Familiarity	(4) Foreign openness	(5) Transparency	(6) Portfolio diversification
<i>DGEO<sub>ij</sub></i>	-0.0228 (-0.34)	-0.0498 (-1.45)	-0.0395 (-0.74)	-0.1235*** (-3.22)	-0.0483 (-1.37)	-0.0234 (-0.73)
<i>GDPPC<sub>j</sub></i>	0.1170 (1.52)	0.1980*** (4.91)				
<i>FMSOP<sub>j</sub></i>	-0.1390 (-0.92)	-0.1369 (-1.42)				
<i>INVPRO<sub>j</sub></i>	-0.0448 (-0.38)	0.1334 (1.10)				
<i>BTRADE<sub>ij</sub></i>	0.2506*** (4.45)		0.3369*** (7.29)			
<i>LANG<sub>ij</sub></i>	0.0388 (0.51)		0.0702 (1.13)			
<i>LEG<sub>ij</sub></i>	-0.0400 (-0.86)		-0.0992** (-2.17)			
<i>REG<sub>ij</sub></i>	-0.1828 (-1.44)		-0.2210 (-1.99)			
<i>FTRADE<sub>j</sub></i>	0.0010 (0.01)			-0.1864*** (-3.02)		
<i>MA<sub>j</sub></i>	0.1360** (2.23)			0.1747*** (3.43)		
<i>CPI<sub>j</sub></i>	-0.0655 (-0.38)				0.3141*** (4.09)	
<i>JUDIN<sub>j</sub></i>	0.1464* (1.61)				-0.0127 (-0.16)	
<i>CMC<sub>j</sub></i>	-0.4485*** (-2.64)				-0.1786 (-1.46)	
<i>SHRP<sub>j</sub></i>	-0.3270*** (-2.68)					-0.7081*** (-5.30)
<i>COR<sub>ij</sub></i>	0.3142 (1.51)					0.6390*** (5.11)
# of obs.	293	371	293	369	371	368
<i>R</i> <sup>2</sup> (adjusted)	0.2863	0.1493	0.2174	0.0655	0.1138	0.1371
<i>R</i> <sup>2</sup> (within)	0.3230	0.1585	0.2308	0.0731	0.1234	0.1441
<i>F</i> statistic	10.69	16.16	14.79	12.55	14.38	20.88

Notes: The table reports panel OLS regression results for the gravity model of international equity holdings using geographical distance, *DGEO<sub>ij</sub>*. The dependent variable is log of equity assets held by the source country *i* in the host country *j*. Predictor variables are 1) economic development variables including GDP per capita (*GDPPC<sub>j</sub>*), financial market sophistication (*FMSOP<sub>j</sub>*), investor protection (*INVPRO<sub>j</sub>*); 2) familiarity variables including bilateral trade (*BTRADE<sub>ij</sub>*), common language dummy (*LANG<sub>ij</sub>*), common legal origin dummy (*LEG<sub>ij</sub>*), common geographical region dummy (*REG<sub>ij</sub>*); 3) openness variables including foreign trade to GDP ratio (*FTRADE<sub>j</sub>*), mergers & acquisitions to GDP ratio (*MA<sub>j</sub>*); 4) transparency variables including corruption perceptions (*CPI<sub>j</sub>*), judiciary independence (*JUDIN<sub>j</sub>*), capital market controls (*CMC<sub>j</sub>*); and 5) portfolio diversification variables including Sharpe ratio (*SHRP<sub>j</sub>*), bilateral market correlations (*COR<sub>ij</sub>*). All regressors, except dummies, are specified in log levels. Regressions control for the source country fixed-effects. *F*-stat is designed to jointly test that all fixed-effects parameters are zero, for which the null hypothesis is rejected at all conventional levels throughout the table. Heteroskedasticity consistent *t*-statistics obtained using the White (1980) method, are provided in parenthesis below the parameter estimates. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 7. Panel regressions with control variables: Estimations using information distance

Dependent: $\log\left(\frac{Assets_{ij}}{GDP_i \times GDP_j}\right)$	(1) All	(2) Economic development	(3) Familiarity	(4) Foreign openness	(5) Transparency	(6) Portfolio diversification
<i>DINF<sub>ij</sub></i>	-0.0427 (-0.68)	-0.1581*** (-3.11)	0.0021 (0.03)	-0.1542*** (-3.07)	-0.1472*** (-2.86)	-0.1809*** (-5.20)
<i>GDPPC<sub>j</sub></i>	0.1234 (1.59)	0.2163*** (5.58)				
<i>FMSOP<sub>j</sub></i>	-0.1354 (-0.88)	-0.1152 (-1.13)				
<i>INVPRO<sub>j</sub></i>	-0.0459 (-0.40)	0.1543 (1.35)				
<i>BTRADE<sub>ij</sub></i>	0.2404*** (4.09)		0.3500*** (7.03)			
<i>LANG<sub>ij</sub></i>	0.0368 (0.47)		0.0766 (1.23)			
<i>LEG<sub>ij</sub></i>	-0.0442 (-0.93)		-0.0945** (-1.97)			
<i>REG<sub>ij</sub></i>	-0.1769* (-1.81)		-0.1718** (-2.01)			
<i>FTRADE<sub>j</sub></i>	0.0090 (0.15)			-0.1198** (-2.21)		
<i>MA<sub>j</sub></i>	0.1402** (2.32)			0.2238*** (5.06)		
<i>CPI<sub>j</sub></i>	-0.0623 (-0.36)				0.3357*** (4.75)	
<i>JUDIN<sub>j</sub></i>	0.1491* (1.67)				0.0013 (0.01)	
<i>CMC<sub>j</sub></i>	-0.4331 (-2.74)				-0.1475 (-1.22)	
<i>SHRP<sub>j</sub></i>	-0.3197*** (-2.66)					-0.6964*** (-5.34)
<i>COR<sub>ij</sub></i>	0.2954 (1.50)					0.6344*** (5.45)
# of obs.	293	372	293	370	373	368
<i>R</i> <sup>2</sup> (adjusted)	0.2887	0.1939	0.2162	0.0835	0.1508	0.1411
<i>R</i> <sup>2</sup> (within)	0.3253	0.2026	0.2296	0.0909	0.1599	0.1481
<i>F</i> statistic	10.74	22.95	14.90	17.04	22.04	21.45

Notes: The table reports panel OLS regression results for the gravity model of international equity holdings using information distance, *DINF<sub>ij</sub>*. The dependent variable is log of equity assets held by the source country *i* in the host country *j*. Predictor variables are 1) economic development variables including GDP per capita (*GDPPC<sub>j</sub>*), financial market sophistication (*FMSOP<sub>j</sub>*), investor protection (*INVPRO<sub>j</sub>*); 2) familiarity variables including bilateral trade (*BTRADE<sub>ij</sub>*), common language dummy (*LANG<sub>ij</sub>*), common legal origin dummy (*LEG<sub>ij</sub>*), common geographical region dummy (*REG<sub>ij</sub>*); 3) openness variables including foreign trade to GDP ratio (*FTRADE<sub>j</sub>*), mergers & acquisitions to GDP ratio (*MA<sub>j</sub>*); 4) transparency variables including corruption perceptions (*CPI<sub>j</sub>*), judiciary independence (*JUDIN<sub>j</sub>*), capital market controls (*CMC<sub>j</sub>*); and 5) portfolio diversification variables including Sharpe ratio (*SHRP<sub>j</sub>*), bilateral market correlations (*COR<sub>ij</sub>*). All regressors, except dummies, are specified in log levels. Regressions control for the source country fixed-effects. *F*-stat is designed to jointly test that all fixed-effects parameters are zero, for which the null hypothesis is rejected at all conventional levels throughout the table. Heteroskedasticity consistent *t*-statistics obtained using the White (1980) method, are provided in parenthesis below the parameter estimates. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 8. Panel regressions with control variables: Estimations using cultural distance

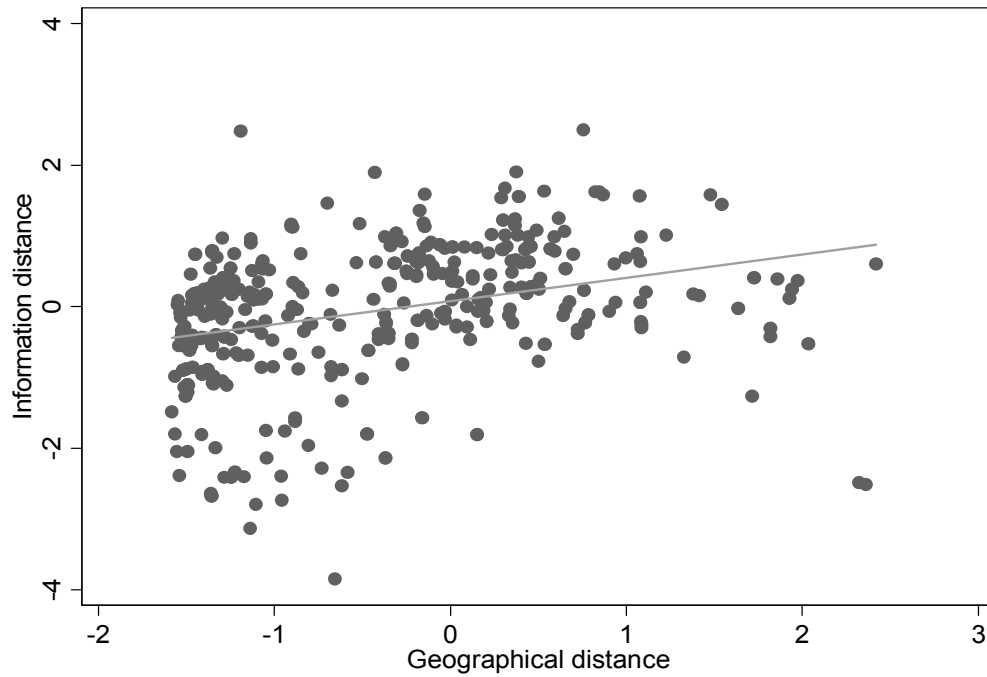
Dependent: $\log\left(\frac{Assets_{ij}}{GDP_i \times GDP_j}\right)$	(1) All	(2) Economic development	(3) Familiarity	(4) Foreign openness	(5) Transparency	(6) Portfolio diversification
<i>DCULT<sub>ij</sub></i>	0.0064 (0.24)	-0.0198 (-0.92)	-0.2250 (-0.82)	-0.0465** (-2.08)	-0.0191 (-0.84)	-0.0412** (-2.04)
<i>GDPPC<sub>j</sub></i>	0.1327 (1.48)	0.2056*** (5.03)				
<i>FMSOP<sub>j</sub></i>	-0.1215 (-0.81)	-0.1012 (-1.02)				
<i>INVPRO<sub>j</sub></i>	-0.0908 (-0.79)	-0.0588 (-0.55)				
<i>BTRADE<sub>ij</sub></i>	0.2594*** (4.75)		0.3447*** (7.49)			
<i>LANG<sub>ij</sub></i>	0.0444 (0.50)		0.0546 (0.76)			
<i>LEG<sub>ij</sub></i>	-0.0281 (-0.53)		-0.1126** (-2.10)			
<i>REG<sub>ij</sub></i>	-0.1629* (-1.65)		-0.1829** (-2.21)			
<i>FTRADE<sub>j</sub></i>	-0.0123 (-0.21)			-0.1044** (-2.04)		
<i>MA<sub>j</sub></i>	0.1296** (2.15)			0.1707*** (3.42)		
<i>CPI<sub>j</sub></i>	-0.10852 (-0.58)				0.3219*** (4.26)	
<i>JUDIN<sub>j</sub></i>	0.1896** (2.18)				0.0038 (0.06)	
<i>CMC<sub>j</sub></i>	-0.3409** (-2.06)				-0.2704** (-2.17)	
<i>SHRP<sub>j</sub></i>	-0.3021** (-2.45)					-0.5976*** (-4.63)
<i>COR<sub>ij</sub></i>	0.2466 (0.92)					0.6248*** (4.80)
# of obs.	289	345	289	346	345	345
<i>R</i> <sup>2</sup> (adjusted)	0.2855	0.1623	0.2198	0.0492	0.1309	0.1230
<i>R</i> <sup>2</sup> (within)	0.3227	0.1720	0.2334	0.0575	0.1410	0.1307
<i>F</i> statistic	10.29	15.23	14.15	9.71	13.01	16.65

Notes: The table reports panel OLS regression results for the gravity model of international equity holdings using cultural distance, *DCULT<sub>ij</sub>*. The dependent variable is log of equity assets held by the source country *i* in the host country *j*. Predictor variables are 1) economic development variables including GDP per capita (*GDPPC<sub>j</sub>*), financial market sophistication (*FMSOP<sub>j</sub>*), investor protection (*INVPRO<sub>j</sub>*); 2) familiarity variables including bilateral trade (*BTRADE<sub>ij</sub>*), common language dummy (*LANG<sub>ij</sub>*), common legal origin dummy (*LEG<sub>ij</sub>*), common geographical region dummy (*REG<sub>ij</sub>*); 3) openness variables including foreign trade to GDP ratio (*FTRADE<sub>j</sub>*), mergers & acquisitions to GDP ratio (*MA<sub>j</sub>*); 4) transparency variables including corruption perceptions (*CPI<sub>j</sub>*), judiciary independence (*JUDIN<sub>j</sub>*), capital market controls (*CMC<sub>j</sub>*); and 5) portfolio diversification variables including Sharpe ratio (*SHRP<sub>j</sub>*), bilateral market correlations (*COR<sub>ij</sub>*). All regressors, except dummies, are specified in log levels. Regressions control for the source country fixed-effects. *F*-stat is designed to jointly test that all fixed-effects parameters are zero, for which the null hypothesis is rejected at all conventional levels throughout the table. Heteroskedasticity consistent *t*-statistics obtained using the White (1980) method, are provided in parenthesis below the parameter estimates. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

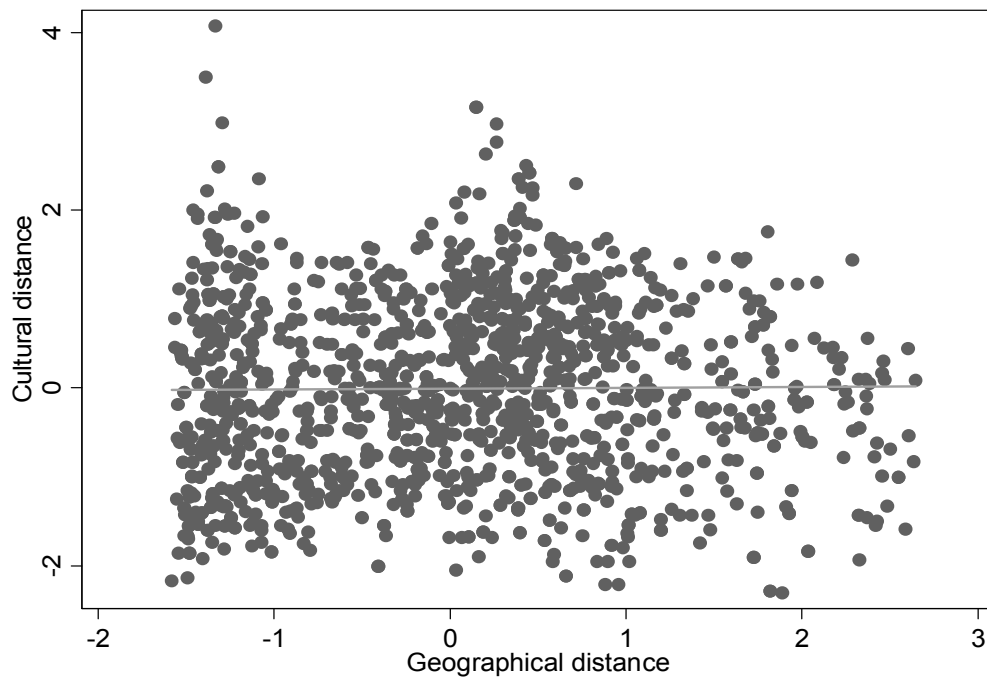


Figure 1. Information and cultural distance measures vs. geographical distance

Panel A. Information distance vs. Geographical distance



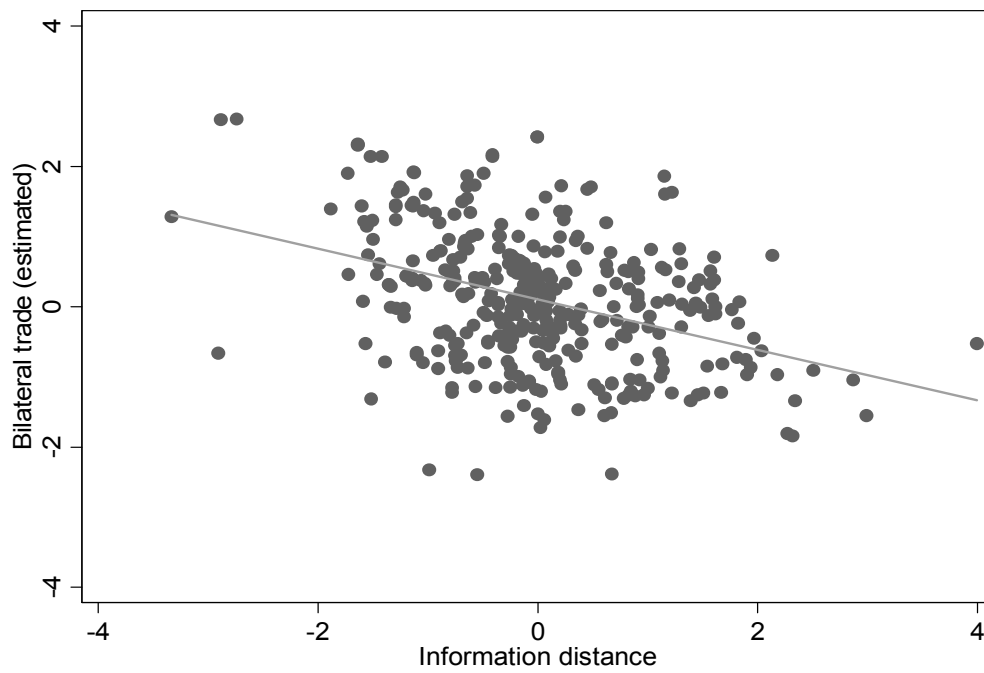
Panel B. Cultural distance vs. Geographical distance



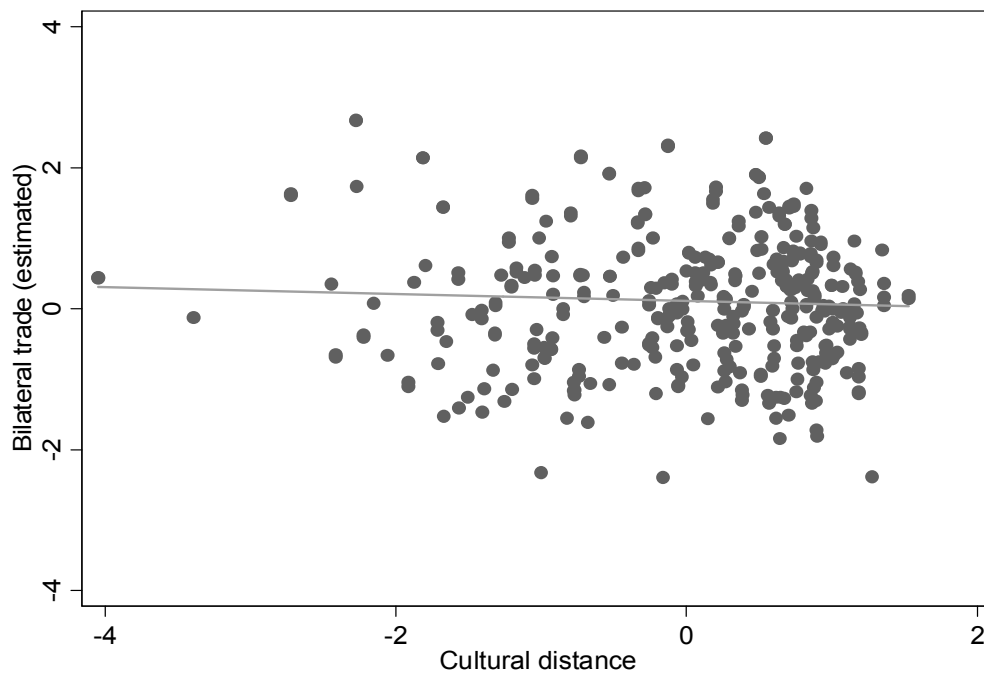
Notes: The figure shows the scatter plots of the informational distance and cultural distance measures against the geographical distance using standardized scores. Geographical distance is shown on the horizontal axis while the informational and cultural distance scores are shown on the vertical axis respectively in panels A and B.

Figure 2. The effect of bilateral trade on asset holdings: Information or Cultural distance?

Panel A. Bilateral trade vs. Information distance



Panel B. Bilateral trade vs. Cultural distance



Notes: The figure shows the scatter plots of bilateral trade (predicted values) against the information distance in panel A and cultural distance in panel B.







## Chapter 4.

# Foreign Equity Flows and the “Size Bias”: Evidence from an Emerging Stock Market

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# 1 Introduction

The “home bias” in portfolio investments remains an actual yet unresolved question in international economics and finance. The term basically refers to the fact that investors hold disproportionately larger shares of their wealth in domestic securities in contrast to what is expected based on both the empirical and theoretical research (van Wincoop and Warnock, 2009; Coeurdacier, 2009; Sorensen *et al.*, 2007; Baele *et al.*, 2007). Empirically, such a behavior is considered to be irrational since there is substantial evidence suggesting that the international diversification of portfolios is potentially more beneficial than domestic diversification (Baele and Inghelbrecht, 2009; Chiou, 2009; De Santis and Sarno, 2008; Driessen and Laeven, 2007). Although the magnitude of the home bias worldwide have slightly declined during the past decades (Fidora *et al.*, 2007), existing foreign holdings remain lower than those predicted by major international asset pricing models (e.g. Solnik, 1974; Adler and Dumas, 1983), such that investors are still qualified as “underdiversified” despite the lifting of many barriers to cross-border portfolio investments. So far, a large body of literature has tried to rationalize the home bias phenomenon. Typical explanations include explicit barriers to international capital movements (Rowland, 1999; Stulz, 1981), investors’ hedging motives against the price uncertainty due to deviations from the purchasing power parity (Cooper and Kaplanis, 1994) or the existence of non-traded goods and production factors (Baxter and Jermann, 1997), information asymmetries between foreign and domestic investors (Barron and Ni, 2008; Ni, 2009; Hatchondo, 2008; Brennan *et al.*, 2005) and, more recently, behavioral finance related explanations such as the familiarity bias (Grinblatt and Keloharju, 2001), cultural effects (Beugelsdijk and Frijns, 2010), overconfidence (Suh, 2005; Norman and Strong, 2003), narrow framing (Magi, 2009) etc.<sup>76</sup> Yet, among the existing body of explanations, none seems to have provided a satisfactory account of the problem.

This paper contributes to this growing literature on home bias by providing insights into the ongoing debate around the hypothesis of asymmetric information between foreign and domestic investors. More precisely, I analyze foreign investors’ portfolio investment patterns using firm-level data in an emerging stock market. Most of the available investigations focus on a country-level analysis of the home bias, documenting that investors allocate too much of domestic assets within their aggregate portfolios. That is said, investors’ portfolio holdings and trading patterns when they choose to diversify abroad are relatively less investigated. The benchmark theory predicts that, regardless of the nationality, every mean-variance rational investor should hold the value-weighted market portfolio of risky securities partly hedged against the exchange rate risk.<sup>77</sup> In practical work, this proposition implies that the optimal

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<sup>76</sup> Karolyi and Stulz (2003) and Lewis (1999) provide extensive surveys of the literature. See also Hau and Rey (2008) or Campbell and Kraussl (2007) for two more recent and concise reviews.

<sup>77</sup> See Solnik (1974) or Adler and Dumas (1983) for pioneering models. Cooper and Kaplanis (1994) provide a short

portfolio weight that an average investor should allocate into a particular country (including her own domestic country) when constructing her portfolio, corresponds to the world-market capitalization weight of the country of interest. Given this framework, one can formulate the research questions of the present paper as follows: Do foreign investors truly consider the market portfolio of the country in which they choose to invest? If not, do they exhibit a bias toward some stocks within the market they actually invest in?

To answer these questions, I employ a panel dataset on foreign investors' equity-level transactions (purchases and sales of stock) within an emerging stock market – namely, the Istanbul Stock Exchange (the “ISE” henceforth). The analysis consists on examining the determinants of non-residents (net) stock purchases and trades using an array of explanatory variables mainly drawn from the previous literature. With this respect, the paper is mostly in line with Kang and Stulz's (1997) study on non-Japanese investors' ownership in Japanese firms. It differs, however, on an important axis: Kang and Stulz (1997) employ directly data on ownership by foreign investors in local firms while I employ portfolio flow data for empirical analysis. I use a panel dataset that comprises equity transactions (purchases and sales) issued by non-resident investors (either institutional or individual) on 84 firms traded in the Turkish stock market over the period 1997-2008.<sup>78</sup> Although the full list of stocks includes on average more than 300 firms' shares over the analysis period, this subset of firms captures a significant portion of foreign investors' transactions in the ISE such that the year-end market capitalizations of this subset represents on average 86% of the total market capitalization throughout the sample period.

Preliminary inspections reject the hypothesis that foreign investors follow the standard international CAPM framework when investing into the Turkish stock market (see also Tesar and Werner, 1994). Foreign investors neglect the market portfolio of securities focusing mostly on a smaller subset of large capitalization stocks. The sectoral breakdown of the transactions issued by non-residents reveals out that foreigners prefer particularly financial firms (e.g. banks) such that the share of their transactions within this group of stocks generally exceed the share of financial firms in the value-weighted market capitalization of the ISE in general: On average, 61% of the transactions issued by foreign investors are concentrated within the financial stocks over a twelve-year long period from 1997 to 2008 while the average share of financial stocks in the ISE composition is about 52% over the same period.

Given the observation that foreign investors do not hold the market portfolio of domestic securities in the Turkish stock market, what are the firm-level determinants of their portfolio

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review of Adler and Dumas's model.

<sup>78</sup> In line with Dvorak's (2005) argument regarding his study on investors' performance in the Indonesian market, to my knowledge, this data has not been explored so far for such an empirical analysis of foreign investors' portfolio flow patterns in the Turkish stock market.



inflows? I answer this question by means of a simple empirical model relating foreign investors' trading patterns to an array of financial metrics which capture different characteristics of the stock or the firm of interest. Since the explanatory variables are on annual frequencies, I aggregate the monthly transactions data over years and I hold foreign investors' purchases, net purchases and traded value share on each stock as the dependent variables. The predictor variables include several proxies to gauge for the stocks' or the firm's size (market capitalization), market characteristics (expected return and beta), leverage (total debt / total capital ratio), valuation (price / book ratio), profitability (return on assets), and dividend yield (dividend payout ratio).

Regression results point out to two variables as significant predictors of foreign investors' equity trading patterns in the Turkish stock market. Namely, the firm's market capitalization and the expected return on the corresponding stock are the main determinants as suggested by the empirical analysis. For other firm-level variables such as the debt to capital, the price to book or the dividend payout ratio, the results remain mostly inconclusive given mostly insignificant coefficient estimates, both statistically and economically. The significance of the market capitalization and the expected return is also robust to a number of alternative model specifications, splitting the sample over different time-intervals, disaggregation across sectors (e.g. financial stocks vs. industrial stocks) or additional proxies to control for the "size" effect. In summary, foreign investors exhibit an apparent tendency to purchase or trade more on stocks with larger market capitalizations and higher expected returns.

The results of the empirical analysis provide useful insights into the ongoing debate on home bias. The joint effect of the firm's size and the stock's expected return on foreign investors' trades across domestic securities are mainly consistent with prior studies putting forward the role of the information asymmetries between domestic and foreign investors as the root cause of home bias. Indeed, the asymmetric information argument provides a simple and direct way to understand the reason as to why investors tilt their portfolios toward domestic securities: As long as investors are less well-informed about the payoffs on foreign securities, they would rationally overweight domestic securities, which would justify the persistence of the home bias worldwide in contrast to the predictions of the standard international portfolio diversification models with homogeneous investors. For example, using data on foreign ownership of Japanese firms by non-Japanese investors, Kang and Stulz (1997) find that the firm's market capitalization is the main determinant of foreign ownership of domestic securities. They argue that the significant positive impact of the firm's size on foreign investors' decision to invest more in stocks of this firm can be explained by Merton's (1987) hypothesis who note that investors are more likely to invest in firms they know more about and that the degree of the familiarity increases with the firm's size. Based upon the assumption that foreign investors are less well informed than local investors about the payoffs

on domestic securities, Brennan and Cao (1997) develop a noisy rational expectations model of international portfolio flows arguing that the differential information between foreigners and locals imply a higher expected return by foreign investors on their portfolio of domestic securities. Given the simultaneous and significant impact of the stock's return and the firm's size on foreign portfolio flows, the empirical analysis conducted in this paper replicate both of these theoretical and empirical predictions of the asymmetric information framework in the context of the Turkish stock market.

The paper proceeds as follows. Section 2 provides a brief presentation of the development of modern capital markets in Turkey with an emphasis on foreign investors' trading patterns within the Istanbul Stock Exchange over the sample period. Section 3 presents the transactions data and the results of the regressions of foreign investors' equity-level purchases and trades on an array of predictors capturing various firm characteristics. Section 4 examines in more details the observed "size bias" in foreign portfolio inflows into the Turkish market and provides a discussion that links the empirical results to the theory. Section 5 concludes.

## **2 Foreign Investors and the Istanbul Stock Exchange**

### **2.1 The Istanbul Stock Exchange at a Glance**

The establishment of an organized capital market in Turkey can be traced back to a series of reforms initiated in the second half of the 19<sup>th</sup> century. The first financial market in the Ottoman Empire started to operate under the name "Dersaadet Securities Exchange" in 1886. The main objective was the creation of a marketplace which would facilitate the exchange of the government bonds recently issued by the Ottoman Empire to finance the initial foreign loans accepted after the Crimean War. Quickly, the market witnessed highly speculative events, mainly due to European investors seeking higher returns in this newly established exchange. Following the foundation of the modern Turkish Republic, a law enacted in 1929 had reorganized the embryonic capital markets under the name "Istanbul Securities and Foreign Exchange". The quick emergence of the economic activity as well as the contribution of the exchange to the funding requirements of the business world had been harshly influenced by the subsequent Great Depression and the World War II. The problems grew worse upon the decision to move the exchange to the economically inactive capital city of Ankara.

The actual organization of the national financial markets, however, has its roots in a number of legislative and institutional developments undertaken in the early 1980s to set the stage for sound capital markets.<sup>79</sup> Founded by the end-1985, the Istanbul Stock Exchange

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<sup>79</sup> For example, in 1981, the "Capital Market Law" was enacted. In 1982, the "Capital Markets Board" (CMB) which is the regulatory and supervisory authority in charge of the securities market, was founded.

(ISE) is essentially the main capital market institution where the first stock trading started on January 3, 1986. As an autonomous professional public organization under its current form, the ISE benefits from a high degree of self-regulation and is essentially responsible for developing and maintaining the central securities market. Main types of securities traded in the ISE are corporate equities and bonds, State bonds, Treasury Bills and Revenue-Sharing Notes, while physical markets exist only for equity trading. There are no forward or options markets. The next table provides a short list of some milestones during the second phase of the Istanbul Stock Exchange history.

[Insert table 1 here]

Following the issuance of the “Decree no. 32” in August 11, 1989, foreign institutional and individual investors are allowed to purchase and sell all kinds of stocks listed in the ISE and repatriate the proceeds. The decree states that foreign investors may use the usual banking channels for the repatriation of the proceeds and the principal funds brought into the country. Further, any income from investments in stocks is not taxed, a rule which does not distinguish between resident and non-resident investors. Any restrictions had been exerted since the issuance of the Decree no. 32 so far, even during severe market downturns such as the Asian crisis or the February 2001 Turkish banking crisis. Hence, the data used in this paper on non-residents’ transactions, are clear from any binding constraints, and, therefore, should directly reflect their stock preferences (Kang and Stulz, 1997). The following table provides a number of summary statistics on the ISE over the period 1997-2008.

[Insert table 2 here]

Table 2 shows the number of firms traded on the exchange, their year-end market and total traded values, the price level of the “National-100” index (abbreviated “XU100”), the market-wide P/E ratio and the dividend yield between 1997 and 2008. As of the end-2008, the ISE’s market capitalization corresponds to 0.36% of the world stock market capitalization.<sup>80</sup> The numbers displayed below the market and traded values correspond to the percentages due to transactions on stocks listed within the XU100 index. Not surprisingly, the first 100 stocks generate almost the entire market capitalization or the transaction volume although there are on average 300 firms traded on the exchange throughout the period considered. It follows that the impact of the remaining firms to the broad market movements remains trivial. Looking at market capitalizations, traded value and the National 100 index scores together, we observe three periods of contraction in 1998, 2000-2002 and 2008. Indeed, the time-frame includes, along two global events (the Asian crisis and the 2007 subprime crisis), the most important crash of the national economy set off in February 2001. The subsequent contraction of the GDP

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<sup>80</sup> This ratio considers the world stock market capitalization as the sum of the domestic market capitalizations of 53 exchanges member of the World Federation of Exchanges (i.e. USD 32 551 432 millions). See <http://www.world-exchanges.org/statistics>.

by more than 10% explains the profound effect of the crisis on corporate earnings as suggested by the particularly high P/E scores in 2001 and 2002 despite the fact that the market-wide price level has also dropped by almost 100% over two years.

## 2.2 Foreign Investors in the ISE

Table 3 provides a first assessment of non-residents' equity trades activity over 1997-2008.

[Insert table 3 here]

The first two columns show respectively foreign investors' amount and rate of custody as reported by the Central Registry Agency Inc. of Turkey. Foreign investors' portfolio assets in the market follow a remarkable upward trend after the 2001-2002 downturns, reaching a peak at the end-2007. The third column shows the percentage of the total traded value due to transactions issued by foreign investors. Interestingly, examining foreigners' rate of custody and their traded value scores together, we observe that they provide on average only one fourth of the market liquidity while holding almost 75% of the market value of stocks. The fourth and fifth columns decompose non-residents' aggregate portfolio flows across purchases respectively in the primary and the secondary market. Purchases from the primary market correspond to foreigners' yearly cumulated equity investments through IPO's or capital increases. Purchases from the secondary market correspond to foreigners' yearly cumulated stock purchases net of sales over a given year. Thus, the column "net inflows" show non-residents' total purchases in the primary and the secondary markets. The largest outflow in the secondary market is recorded by the end of 2000, the year marked by the IMF-driven exchange rate based stability program to control the sticky inflation of the past two decades. The peg couldn't be sustained following an acute liquidity crisis that threatened the viability of the ongoing program: During two weeks-long period by the end-2000, USD 6.4 billion net foreign exchange outflow took place, with overnight inter-bank interest rates skyrocketed to 1700% on December 1<sup>st</sup>, 2000.<sup>81</sup> Finally, the last column shows the resulting change in foreign investors' portfolio value due to their purchases in the primary and the secondary market. It is calculated as follows: Since foreign investors' amount of custody shows their portfolio value by the end of year  $t$ , one would obtain the amount of custody of the year-end  $t + 1$  by adding the year  $t + 1$ 's net inflows to the previous year's score if there were no price movements. For example, given the end-2006 custody amount by USD 34 897 million and the net inflows by 8 501 million over 2007, foreign investors' custody amount as of the end-2007 should be USD 43 398 million. Thus, the difference between these two numbers reflects the yearly change in

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<sup>81</sup> See, among others, Alper (2001) for more details. As a result of this liquidity shock and partly due to risk accumulation within the banking system (currency and maturity mismatches, accumulation of non-performing loans), the unsustainable situation in Turkey ended on February 19<sup>th</sup>, 2001. The pegged exchange rate was abandoned three days later: The value of the national currency has plunged nearly 50% against the dollar, the high inflation pass through boosted the price level and the economy had contracted by about 12% throughout the 2001.

the value foreign investors' portfolio stock in the ISE. Following the downward sloping trend observed through years 2000 to 2002, we observe remarkable volumes of portfolio inflows during a five-year long period between 2003 and 2007. However, the huge drop of the portfolio value in 2008 seems to wipe away most of the previous years' positive changes. In fact, this decrease is mainly due to two factors. First, the broad market index (XU100) which had started the year 2008 on about 55 000 points, have plunged to 26 000 points mainly because of the global financial turmoil deepened throughout the same year. Second, the local currency have depreciated against the US dollar during the same period by about 30% (from 1.15 to 1.5 Turkish lira against one US dollar), which has also amplified the drop in non-residents' portfolio value. In fact, foreign investors' yearly sales of equity in the secondary market was only limited to USD 2 971 million during 2008.

While data presented in table 3 tell much about foreign investors' aggregate portfolio stocks and flows in the ISE, it provides no details on their transactions and preferences on an equity basis. Since January 1997, the ISE publishes disaggregated data on equity-level transactions realized on behalf and account of foreign banks, brokerage houses or individuals on a monthly basis over the secondary market. Therefore, to provide an in-depth account of foreign investors' portfolio patterns, this paper uses these transactions data over a 12-years long period from January 1997 to December 2008. An individual file shows the monthly cumulated amounts of foreign investors' purchases and sales on the secondary market, broken-down in each traded stock, either in local currency or USD terms. To keep the data clear from extreme currency fluctuations as well as for comparability purposes, I use values in USD terms. Compiling a set of 144 individual files over the sample period, I obtain a unique panel data set that comprises the nominal and traded values of the monthly transactions on each stock in the exchange. Hence, based on this data set, the next table provides a summary of foreign investors' purchases and sales on the secondary market as well as a disaggregation of their transactions across four major groups of stocks, i.e. financials, industrials, services and technology stocks.

[Insert table 4 here]

Table 4 shows the amounts of yearly purchases and sales of equity by non-resident investors, and the resulting net purchases and traded value. As of the end-2008, we observe that the value of foreign investors' equity trading has increased by about 16 times compared to its previous level in 1997.<sup>82</sup> Looking at the net purchases, we notice that foreigners have accumulated USD 6 855 millions of equity investment on the secondary market from 1997 to 2008. That is said, the table points out to a more remarkable fact as shown by the sectoral

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<sup>82</sup> To compare, the total value of equity trading among all stock exchanges member of the "World Federation of Exchanges" has increased by 5 times over the same period, from US\$ 22 179 712 millions in 1997 to US\$ 113 602 643 millions in 2008 (data obtained from the web site [www.world-exchanges.org](http://www.world-exchanges.org)).

breakdown of the transactions. The percentage numbers displayed below each year's scores show the relative shares of four broad industry groups within the corresponding transactions category. Namely, I distinguish among financial, industrial, services and technology stocks, for which the market provides the respective sectoral indices beside the aggregate market indices. For example, we observe that financial stocks represent 40 and 54% of foreign investors' purchases in 1997 and 1998 respectively. In order to highlight the relative importance of a particular sector from foreign investors' perspective, I also provide the year-end weights of each sector in the composition of the "ISE all shares index", which is the value-weighted index with the largest coverage of firms of the ISE.

Examination of the sectoral weights in the domestic market and the respective shares of these four sectors in foreign portfolio flows, suggests an important point. We observe that foreign investors focus more on financial stocks in their transactions whether one considers their purchases or traded value. For instance, the share of financial stocks in the total traded value is systematically higher than the traded value among industrials, services or technology stocks, except for the year 1997. On average, 61% and 68% of the transactions issued by non-residents are concentrated within the financial stocks over the full period and over the sub-period 2003-2008 respectively. Financial stocks also dominate when one considers the disaggregation of the yearly net purchases: Except two years (1997 and 2006), foreign investors' net purchases in industrial stocks are below their net purchases in financial stocks. Why could foreign investors focus more on financial stocks rather than the industrials or the services? The most natural explanation would rely on the weights of each sector in the market composition. Indeed, looking at the "sectoral weights" column, we note that the Turkish stock market consists mostly in financial firms which amount, on average, to more than half of the market value over the sample period, largely in front of the industrial, services and technology stocks. However, looking at the sectoral breakdown of the transactions and the sectoral weights simultaneously for each year, we observe that non-residents trade systematically more in financial stocks compared to the corresponding market weight of these stocks over time, suggesting the existence of a possible "size bias" in foreign portfolio flows.

### **3 Firm Characteristics and Foreign Portfolio Flows**

#### **3.1 Specification and Data**

In this section, I relate foreign investors' equity trading patterns in the Turkish stock market to an array of predictor variables that capture various firm-level characteristics. Specifically, the regression analysis conjectures that foreign investors' decision to trade in a particular stock can be explained by the corresponding firm's size (market capitalization), market characteristics (return and beta), leverage (total debt / total capital ratio), valuation (price /

book ratio), profitability (return on assets), and the dividend yield (dividend payout ratio). Thus, the estimating model takes following generic form,

$$(1) \quad Y_{i,t} = f(\text{Size, Market, Leverage, Valuation, Profitability, Dividends}) + \varepsilon_{i,t}$$

Following Kang and Stulz (1997), I adopt two approaches to estimate the preceding equation. In the first approach, regressions are estimated separately for each year and the results are aggregated over years. In the second approach, I use time-series cross-section specification to make better use of the time-series information of the data. Unlike Kang and Stulz (1997), however, panel regressions are run over an unbalanced panel such that there is no requirement to work within an identical sample of firms each year. While the first approach does not take into account the panel structure of the data and, therefore, the second approach is econometrically more appropriate, the results obtained using the year-by-year regressions are generally consistent with those obtained with the time-series cross-sectional regressions. To gauge for firms' size, market, leverage, valuation, profitability and dividend characteristics, I use the following firm-level variables obtained from the Worldscope:<sup>83</sup>

- *Market capitalization (Size)*: This is the market capitalization of stocks computed as the product of the year-end market price and the number of common shares outstanding. For companies with more than one type of common share, the market capitalization represents the total market value of the company. Original data expressed in local currency terms are converted into USD terms using the year-end USD/Turkish Lira exchange rate obtained from the Central Bank of the Republic of Turkey.

- *Return (Market)*: "Return" is the year-end average return on stock in excess of the average year-end return on the broad market index (i.e. the ISE National 100 index), both of them calculated using the last three years of historical data.

- *Beta (Market)*: "Beta" is the market model beta of the stock estimated using the last three years of historical data.

- *Price / Book (Valuation)*: The "price to book ratio" is measured as the ratio of the current market price to the current book-value per share. A lower PB ratio commonly means that the stock is undervalued.

- *Total Debt / Total Capital (Leverage)*: For all industries, the ratio "total debt to total capital" is defined as the (Long Term Debt + Short Term Debt & Current Portion of Long Term Debt) / (Total Capital + Short Term Debt & Current Portion of Long Term Debt).

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<sup>83</sup> The Worldscope database has the advantage to provide standardized report templates for each firm across four sectors of activity, i.e., "banking", "industrials", "insurance" and "other financials". Indeed, the standardization of various firms' financial reports is highly useful when it comes to compile individual firm data into a single file that can be used for empirical analysis.

- *Return on assets (Profitability)*: The “Return on assets” (ROA) is an indicator of a company’s profitability relative to its total assets. The common expression for ROA is the ratio of the firm’s net income to its total assets.<sup>84</sup>

- *Dividend payout ratio (Dividends)*: It is measured as the ratio of the dividends per share to earnings per share. Generally, the more mature a company is, the higher investors expect a dividend payout ratio.

While there are on average more than 300 firms whose stocks are exchanged by non-resident investors each year, I collect data for these explanatory variables for a smaller but still representative subset of 84 firms on annual frequencies from 1997 to 2008. I use two filters to obtain this subset of firms. First, I eliminate the firms not listed in the “National market” index, i.e. those listed in the “Regional”, “New Companies”, and “Watch List Companies” sub-markets. Second, I eliminate the firms for which historical price data are not available through the Worldscope database. Nevertheless, the data loss due to these filters remains trivial so that the resulting subset accounts for a major part of foreign investors’ aggregate transactions in the ISE: On average, the transactions volume due to this subset of firms represents 88% of foreign investors’ total transactions volume from 1997 to 2008, with a minimum share by 68% in 1997 and a maximum share by 97% in 2003. In addition, the sum of the year-end market capitalizations of this subset of firms represents on average 86% of the total market capitalization throughout the sample period.

A number of alternatives are available to define the dependent variable using foreign investors’ trade data. Using flows data from the U.S. Treasury Bulletin, Brennan and Cao (1997) examine purchases of foreign equities by U.S. residents in four developed countries, and the net purchases by U.S. residents in 16 emerging markets. Portes *et al.* (2001) use the gross transactions flows as the dependent variable (i.e. the sum of the purchases and sales) for a data set on bilateral cross-border transactions in portfolio equities for 14 countries over 8 years. In light of these studies, I employ three dependent variables, namely, i) foreign investors’ purchases, ii) net purchases and iii) traded value on each stock in the sample. Although raw data on foreign investors’ transactions are collected on a monthly frequency, the explanatory variables in turn are available only on annual frequencies; that’s why the dependents variables and the estimations are specified on annual frequencies through 1997-2008. The next table provides some descriptive statistics of the data. Panel A shows the

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<sup>84</sup> In fact, ROA is calculated using different formulas for firms having different report templates. Hence, in the Worldscope database, ROA is defined as 1) “(Net Income before Preferred Dividends + ((Interest Expense on Debt-Interest Capitalized) \* (1 – Tax Rate))) / Last Year’s Total Assets) \* 100” for industrial companies, 2) “(Net Income before Preferred Dividends + ((Interest Expense on Debt – Interest Capitalized) \* (1 – Tax Rate))) / (Last Year’s Total Assets – Last Year’s Customer Liabilities on Acceptances) \* 100” for banks, 3) “(Net Income before Preferred Dividends + ((Interest Expense on Debt-Interest Capitalized) \* (1 – Tax Rate))) + Policyholders’ Surplus) / Last Year’s Total Assets \* 100” for insurance companies, and 4) “(Net Income before Preferred Dividends + ((Interest Expense on Debt – Interest Capitalized) \* (1 – Tax Rate))) / (Last Year’s Total Assets – Last Year’s Custody Securities) \* 100” for companies reported under the “other financials” report template.



statistics for the pooled dataset combining the observations both on their time-series and the companies' sector of activity dimensions. Panel B shows the descriptive statistics by breaking down the data over the company's sector of activity and panel C by year of the observations.<sup>85</sup>

[Insert table 5 here]

Two features are worth being highlighted. First, outliers are very frequent across variables. One can easily notice that the variables exhibit significant cross-sectional variations in levels as suggested by the minimum and maximum scores or the standard deviations. The direct implication is that regressions are run using a dataset corrected from outliers.<sup>86</sup> The second feature of the data relates to equally frequent missing observations. In panels B and C, I report the number of missing observations by the companies' activity sector and the year of the observations respectively. For instance, while there are 853 available observations for the excess return and the beta, there are 695 observed values for the dividend payout ratio as shown in panel A. Looking at panel C, however, we observe that the frequency of the missing observations systematically declines over time. For example, while the percentage of the firms for which there exists an observed "Price / Book ratio" in 1997 is 54%, there is only one firm for which there is no observed "Price / Book ratio" in 2008.

### 3.2 Results from Year-by-year Regressions

Tables 6 to 8 present the first set of results obtained from year-by-year regressions.

[Insert tables 6 to 8 here]

Table 6 considers foreign investors' "purchases" as the dependent variable while tables 7 and 8 consider the "net purchases" and the "traded value" respectively. In each table, the dependent variable is simultaneously regressed on seven firm characteristics described above. Instead of providing the estimates separately each year, I aggregate the results over time as in Kang and Stulz (1997). Therefore, the reported coefficients are the time-series averages obtained from year-by-year regressions between 1997 and 2008. The first number in parenthesis below the parameters is the average *t*-statistic obtained by robust standard errors and the second number is the *p*-value of a *t*-test to check the null hypothesis that the average *t*-statistic is zero. The two numbers in brackets show the number of coefficients that are significantly positive and negative at the 10% level respectively. Looking at the raw data structure, it seems to be hard to justify that all the assumptions of the ordinary least squares procedure are satisfied. Therefore, beside the OLS estimations reported in columns (1) of

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<sup>85</sup> In panel C, I only report the first and the last two years because the decreasing pattern observed for the missing variables through time is quite regular.

<sup>86</sup> Before running the regressions, I delete the first and the last 5% percentiles of the data according depending on the endogenous variable. Doing so, while the loss of the available observations is limited, the goodness of fit of any estimated model is greatly improved.

tables 6 to 8, I implement two additional specifications, namely, the robust regression and the quantile regression, whose results are reported respectively in columns (2) and (3). Briefly, the robust regression performs the estimations using iteratively reweighted least squares procedure. The basic idea is to make some adjustments that take into account possible flaws in the data. The procedure assigns a weight to each observation with higher weights linked to better behaved observations. In fact, extremely deviant cases can have their weights close to zero such that they are not included in the analysis at all. Quantile regression is an alternative to robust regression procedure. The procedure followed here yields to a “median” regression whereby the coefficients are estimated by minimizing the absolute deviations from the median. Obviously, as an estimate of the central tendency, the median is much more resistant to the effect of outliers in the data than is the mean.

The regressions capture a significant portion of the variation in the data as shown by the relatively high  $R^2$  and pseudo- $R^2$  values concerning the quantile regression procedure. Not surprisingly, the OLS procedure captures the highest variation in the data regardless of the dependent variable used: In table 8 with the traded value as the dependent, OLS regressions explain on average 72% of the total variation in the data. While the complete panel comprises 84 firms, the average sample size remains around 45 across different estimations due to missing observations which are particularly more frequent before 2003. Firm characteristics like the dividend payout ratio or the return on assets have little, if not negligible, explanatory power as shown by weak and mostly insignificant coefficients. For other firm characteristics like leverage, the results remain mostly inconclusive: While the coefficient on the debt to capital ratio is positive and significant four times in column (1) of tables 6 and 8, it is insignificant once we choose the net purchases as the dependent in table 7. Likewise, the effect of the price to book ratio which proxies the firm’s valuation, is controversial since the mean of the coefficient estimates change of sign depending on the procedure employed. Hence, evidence presented so far provides weak evidence regarding the impact of these firm-level characteristics (i.e. dividends, profitability, leverage and valuation) on foreign investors’ equity transactions across ISE stocks.

In contrast, variables taking into account the firm’s market characteristics, i.e. the beta coefficient and the expected excess return on the stock, perform relatively better. In table 6, the coefficient of the stock’s beta is found to be significantly positive 8 times under the OLS specification, and 6 times under the robust and quantile regression specifications. Similar results appear in table 8 where the dependent is the traded value suggesting that foreign investors concentrate their portfolio transactions across stocks whose returns are more correlated with the overall market movements. Part of the positive relationship between the stocks’ beta and foreign investors’ trades vanishes once we choose the “net purchases” as the dependent. On the other hand, we observe that the expected return on the stock has a more

important explanatory power than the beta as suggested by the average of the estimated coefficients in table 7, regardless of the regression specification. Across columns (1) to (3), foreign investors' tendency to purchase more of a particular stock increases with the stock's return expectations at least during four years out of the twelve years of data.<sup>87</sup>

Throughout tables 6 to 8, the most striking result concerns the market capitalization, used to proxy for the firm's size. Looking at the average parameter estimates, we observe that the market capitalization enters the regressions with economically and statistically significant coefficients every year, except one year in column (3) of the table 6. Unsurprisingly, the effect of the firm's size on foreign investors' tendency to trade on the corresponding firm's stocks is even more emphasized when one takes the "traded value" as the dependent variable: The average coefficient estimates of the firm's market capitalization range between 1.32 and 1.44, with systematically significant and positive parameter estimates. In table 7 where the dependent is the "net purchases" of stock by foreign investors, while the OLS procedure yields to relatively less pronounced results, the robust and median regression procedures point out to similar strong effect of the firm's size on foreign investors' decision to purchase more of this firm's stock in the ISE.

### **3.3 Results from Time-Series Cross-Section Regressions**

While the results obtained from year-by-year regressions provide suggestive evidence on the patterns of foreign portfolio flows towards the Turkish stock market, one should also take into account the panel feature of the data. Thus, the next tables present the estimation results obtained by the time-series cross-section regressions.

[Insert tables 9 to 11 here]

In light of the previous results, I split the data into two subperiods, i.e. 1997-2002 and 2003-2008. The first sub-period comprises important domestic and external shocks such as the Asian crisis or the Turkish banking crisis in February 2001. Missing observations are also more frequent during this time interval compared to the second one. Therefore, besides showing the results for the full period in the first three columns, the last three columns provide the results using the last six years of data from 2003 to 2008. It can be noticed that excluding half of the data does not imply an equally important drop in the number of observations used in the estimations: While there are on average 630 available observations when regressions are run over the full period, the average number of observations is 374 when the analysis period is limited to years 2003 to 2008. Given the significance of the parameter estimates obtained previously, I estimate the regressions using three complementary sets of

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<sup>87</sup> Although not shown in tables 6 to 8, most of the coefficients that are significant are due to regressions run after the year 2002 in that the estimations perform substantially better than those made for the beginning of the analysis period.

explanatory variables. In columns (1) of tables 9 to 11, regressions are run using only the market capitalization as the predictor variable. In columns (2), I add the beta and the excess return, and in columns (3), I add the remaining variables used to proxy for the firm's valuation, leverage, profitability and dividend characteristics.

All regressions include a constant term and time-dummies to control for unobservable aggregate shocks as in Portes and Rey (2005). Therefore the estimation procedure yields to a one-way fixed effects specification with years as the cross-sectional dimension and stocks as the time-series dimension. One might argue that the choice of "years" as entities in a panel structure may seem inadequate from a statistical viewpoint. That is said, I control for the accuracy of time-fixed vs. cross-sectional-fixed effects via the incremental  $F$ -test to check the null hypothesis that the coefficient estimates of the dummies in the least-squares dummy variables specification are all jointly equal to zero. As shown by the systematically significant  $F$  statistics in tables 9 to 11, any OLS estimate which would leave out these time dummies would be biased and inconsistent due to omitted variables problem (Baltagi, 2008).<sup>88</sup> To control for heteroskedasticity, the estimation procedure provides  $t$ -statistics obtained using robust standard errors based on the Huber-White sandwich estimator of variance.

A number of results can be drawn from the parameter estimates. First, both the model fit and the coefficients' precision are substantially improved once we consider the 2003-2008 subperiod. While the number of available observations is reduced by splitting the time frame, we observe that the regressions account for a greater part of the variance in the data across models with the same set of predictors. For example, in columns (3) where the complete set of predictors is used, the  $R^2$  jumps from 0.42 to 0.65 in table 9, and from 0.19 to 0.26 in table 10. Further, we also note that the coefficients on a particular variable increase systematically when the 2003-2008 sample is used. Nonetheless, the increase in the precision of the point estimates or the overall goodness of fit of the models, do not seriously affect the economic significance of the variables.

Again, the "market capitalization" enters the regressions with the expected signs and very well-determined coefficients regardless of the dependent variable employed. The positive and large explanatory power of the firm's size on foreign investors' equity purchases or trades is not affected when we control for other variables such as leverage or valuation. In tables 9 and 11 with purchases and the traded value as the dependent, the market capitalization alone captures more than half of the variation in the data under the subperiod 2003-2008.

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<sup>88</sup> While not reported here, I also performed the same estimations by specifying the stocks instead of years, as entities in the panel data. However, the incremental  $F$  tests all failed to reject the null that the coefficient estimates of the corresponding dummies are jointly equal to zero, which would further strengthened the justification of the time-fixed effects specification. This counter intuitive switch between years as entities and stocks as time-series within the panel structure further implies the fact that the random effects and the fixed effects specifications lead to similar results although the Hausman tests suggest that the random effects model should be preferred in most of the cases.

Dividends, profitability, leverage and valuation proxies are significant in some cases; however, the results regarding these variables are generally inconclusive. For example, although the dividend payout ratio is statistically significant at the 1% level in table 11, the related coefficient changes of sign between the full period and the subperiod estimates, rising doubts about the economic significance of the firm's dividend payout feature on the dependent. The variables "return on assets" and "price to book ratio" have very weak regression coefficients close to zero. Results associated with the stocks' beta and expected excess return, are relatively more influential though. The market-model beta has a positive and significant effect when the dependent is set to be the purchases while it has no explanatory power when one chooses the net purchases as the dependent in table 10. On the other hand, the effect of the expected return is exactly the opposite: Foreign investors are likely to be "net purchasers" in stocks with higher expected excess returns as suggested by the significant coefficient estimates. Finally, looking at table 11 where the traded value is the dependent, we observe that both variables are appropriately signed with significant estimates.

The most prominent result still concerns the "size" variable. Across tables 9 to 11, we observe that the firm's market capitalization enter the regressions with positively and well-determined coefficients in all cases, regardless the dependent or the time period considered. Foreign investors exhibit an apparent tendency to purchase or trade more in larger firms. The positive impact of the firm's size on cross-border equity flows still holds when one examines the net purchases as well. This effect is more pronounced when one considers data from the 2003-2008 period as shown by higher coefficient estimates: For example, when regressed on the traded value share, the market capitalization alone is sufficient to explain almost 60% of the variation in the data.

Finally, one might be concerned about the use of financial ratios such as the price to book or the debt to capital ratio across firms from different sectors in estimating a particular empirical model. To check for the accuracy of the estimations across firms from different sectors, I also run the regressions above using two subsets of the data by distinguishing "financial" and "industrial" stocks only. The results are presented in the next table.

[Insert table 12 here]

Panel A and B provide the estimation results over the financial and industrial stocks subset respectively. Yet, I distinguish three different dependents and two sample periods. Given the coefficient estimates, we conclude that the results are mostly in line with those previously obtained. The firms' dividend payout ratio, profitability, leverage and valuation characteristics have little and economically irrelevant effects on all of the dependent variables considered. Further, these variables lose almost all their explanatory power when regressed under the industrial stocks subsample. As before, while the stocks' beta is a positive correlate of foreign

investors' stock purchases and traded value, it does not enter the regressions with significant coefficients when regressed against the net purchases. Once more, the market capitalization is found to be the steadiest explanatory variable across all specifications in panels A and B, with highly positive and statistically significant parameter estimates.

## 4 Further Investigations

### 4.1 Preference for Large Firms: Regressions with Additional Variables

The results of the regressions above point out to two main covariates regarding foreign investors' equity purchases and trades in the Istanbul Stock Exchange: The firm's size and the corresponding stock's expected return. In this subsection, I provide further evidence to gauge for foreign investors' equity trading patterns in Turkish stocks. Specifically, I make use of three additional variables which could also proxy for a firm's size: Net sales, net assets, and the enterprise value. For industrial stocks, the corresponding company's net sales represent gross sales and other operating revenues minus discounts, returns and allowances. For financial stocks, net sales represent the total operating revenue of the company. Net assets are defined as the company's total assets minus its total liabilities. Finally, the enterprise value is defined as the company's market capitalization net of the cash, preferred stocks and debt. As before, I collect data on these financial metrics over a sample of 84 stocks on an annual basis using the Worldscope database.

Table 13 presents the results from regressions with these additional variables using data over the period 2003-2008. Although the full period comprises 12 years, neither statistical nor the economic significance of the coefficients are affected by limiting the estimations over this subsample. I have also repeated the same procedure by splitting the data into financial and industrial stocks. Again, the results remain unchanged. Not surprisingly, correlations are important across these three additional variables that are likely to capture the effect of a firm's size on foreign investors' trades: The correlations across the market capitalization and the remaining three proxies for size are on average above 50%. Therefore, I first run the regressions by including each of these proxies separately beside the expected return variable. The results are displayed in columns (1) to (3). Columns (4) to (7) present the results obtained by the 2SLS procedure where the list of the instrument(s) is provided in the corresponding column. As before, all regressions include a constant term and time-dummies to control for unobservable shocks to data. The accuracy of the time dummies are tested using the classic  $F$ -test which is not reported in the table, whereby the null hypothesis is rejected in all cases. For brevity purposes, the coefficient estimates on constant terms are not reported since they are insignificant in all cases at the 1% level. In line with the previous analysis, I distinguish the

results between three dependent variables in panels A, B and C, i.e. foreign investors' equity purchases, net equity purchases and traded value share per equity.

[Insert table 13 here]

Depending on the exogenous variable employed, regressions capture a more or less considerable part of the variation in the data as shown by the within  $R^2$  values. Overall, the results are consistent with those obtained previously. Under the OLS specifications given in columns (1) to (3), the return and the size variables, i.e. the firm's net sales, net assets and enterprise value, enter the regressions simultaneously with well determined coefficients and expected signs. This suggests that these proxies are also useful to capture foreign investors' preference for larger firms in the Turkish stock market. The results provided in columns (4) to (7) further emphasizes the size bias given the statistically highly significant parameter estimates of the market capitalization variable. Looking at the results of the 2SLS procedure, however, the coefficients on the expected stock return remain significant only in panel B where the dependent variable is set to be non-residents' net purchases, which suggests that the use of net foreign equity purchases instead of the gross purchases is more suitable for modeling purposes. Yet, regardless of the dependent or the instrument(s) employed in either the OLS or the 2SLS specifications, there is a clear positive relationship between the foreign portfolio flows and the corresponding firm's size.

## 4.2 Explaining the “Size Bias” in Foreign Portfolio Flows

The link between a firm's size and foreign investors' preference to purchase or trade more on common stocks of the corresponding firm received considerable credit by the empirical analysis. Along the estimations performed, a simple and direct way to understand the size bias is to compute the correlation between non-residents' purchases or trades and the market capitalization of the company of interest. The rank correlation between foreign investors' net purchases and the market capitalization of the corresponding firm's stocks is 0.34. The same statistic jumps to 0.71 and 0.73 when it is calculated against foreign investors' traded value share and purchases respectively. All these coefficients are statistically significant at the 1% level. Previously, Kang and Stulz (1997) also reported a highly significant rank correlation by 0.45 between foreign ownership on Japanese firms and the market value of the corresponding shares. What explanation(s) could account for this apparent size bias concerning non-residents' stock purchases or trades? Which factor(s) could “size” substitute in investors' mind and decision making? This section provides further discussion of these issues.

A direct way of explaining foreign investors' preference for larger firms is that investing in these firms' stocks could be less prone to some forms of barriers to cross-border investments, barriers in terms of explicit investment constraints for example. Such an argument, however,

would be an unlikely reason given the context of this paper since, as a matter of fact, the ISE regulations rule out any discrimination between foreigners and locals in terms of equity trading, holding, taxation practices etc. Further, it is explicitly recognized by law that non-residents are allowed to purchase and sale any kind of stocks traded in the ISE and repatriate the proceeds. Therefore, there should be no difference from the perspective of foreign investors between small and large firms within the Turkish market.

A relevant theoretical framework helpful to understand the size bias is provided by Merton (1987). Noting that *an investor uses security k in constructing his optimal portfolio only if the investor knows about security k*, he argues that investors are more likely to hold shares in firms about which they know more and they are more familiar, and that the degree of the familiarity increases with the firm's size. This behavioral assumption captures the "incomplete information" feature across some market participants and is motivated by the fact that investor portfolios contain *only a small fraction of the thousands of traded securities available* as underlined by Merton (1987). Consequently, the visible tendency for trading within a narrow subset of large firms in the Turkish stock market is likely to confirm Merton's hypothesis in that foreign investors in Turkey behave as if they know less about domestic securities than do local investors. In turn, such a "limited attention" (Nocetti, 2006) approach by foreign investors provides a direct understanding of the fact that foreigners in Turkey focus on a subset of high market capitalization stocks in the ISE, instead of the market portfolio of securities as predicted by traditional portfolio models: The less well-informed foreigners rationally neglect small capitalization firms in favor of larger stocks in the market, an observation empirically well captured by statistically significant size proxies.

Some indirect evidence linking the concepts of information and size is recently provided by Barron and Ni (2008) who investigate the impact of the asymmetric information on the investment decisions of portfolio managers with different initial portfolio size. Using survey data for year 2003 from *Pensions & Investment* (an international financial newspaper for institutional investing and financial management), they show that managers having larger portfolios under their management are more likely to gather information on foreign assets, which implies a negative relationship between the portfolio size and the home bias that portfolio managers exhibit. Then, they built on this suggestive evidence to develop a rational expectations model with heterogeneous domestic portfolio managers in terms of the size of the portfolio they manage. Barron and Ni's (2008) main insight is that managers with larger risky assets will also have higher fractions of such assets in foreign markets, leading to weaker home bias for this group of investors.

In another frequently cited paper, Brennan and Cao (1997) develop a model of international portfolio investment flows which also highlights the asymmetric information between foreign and domestic investors. Based upon the noisy rational expectations equilibrium framework



developed by, Admati (1985) and Gehrig (1993), the key assumption adopted by Brennan and Cao (1997) is that an average local investor is better informed regarding the payoff structure of the domestic assets than is an average foreign investor. Testing their model using portfolio flows data on US investors' purchases of foreign equities in four developed and sixteen emerging markets, they find 1) no evidence that foreign investors are less well informed about the US market, while US investors appear to be less well informed about the foreign markets (except the UK), and 2) that portfolio flows are positively associated with returns on national market indices, in particular concerning US purchases of equities in emerging markets. Hence, as noted by the authors, *the major empirical implications [...] are that purchases of foreign equities will be a linear function of returns on the domestic and foreign equity markets; and that the coefficient of the return on the foreign market index will be positive, provided that foreign investors are less well informed about the payoffs on stock than are local investors* (p. 1854).

Consequently, we can deduce that the significance of the coefficients on Turkish stocks' returns as shown throughout the preceding analysis is consistent with the view that foreign investors are on average less well informed about the payoffs of domestic securities than are domestic investors. A second major implication of differential information within this theoretical framework is that informationally disadvantageous foreign investors rationally buy when the market rise and sell when it falls, i.e., *they follow the trend* (Brennan *et al.*, 2005). To emphasize this point more precisely, I provide an additional analysis of foreign investors' trading patterns in the Turkish market by aggregating non-residents' transactions data across stocks. More precisely, I calculate the sum of the non-residents' purchases and sales of domestic stocks for each month and obtain a time-series of the aggregate transactions over the period January 1997 – December 2008. Using these monthly observations of purchases and sales aggregated over individual stocks, I compute foreign investors' monthly net stock purchases and the cumulated time-series of net purchases. The next figure highlights the contemporaneous correlation between foreign investors' market-wide equity trading patterns and the evolution of a representative index of the ISE market, i.e. the National 100 index.

[Insert figure 1 here]

Figure 1 depicts foreign investors' trend following behavior in the Turkish stock market via two panels. In panel A, I plot the time-series of foreign investors' monthly net equity purchases on all ISE stocks on the left axis, and the returns on the ISE broad market index (computed as the log relatives of the National 100 index) on the right axis. In panel B, I plot foreign investors' cumulative net purchases (left axis) against the time-path followed by the National 100 index (right axis). The graphs in both panels suggest a strong correlation between the ISE index, either in levels or returns, and foreign investors' net equity purchases. In panel A, computing the rank correlation between foreign investors' net purchases and the returns on

the National 100 index, yields a strong correlation by 0.52 significant at the 1% level. Looking at panel B, we also observe that the time-plot of foreign investors' cumulated net purchases over the secondary market roughly follows roughly the evolution of the market. The relationship between foreigners' trading patterns and the ISE market movements can also be assessed by simple time-series regressions giving the following estimates,

$$\begin{array}{rcl}
 \text{Foreign Investors' Net Purchases}_t & = & 8.10 \times \text{ISE 100 return}_t \\
 t\text{-stat} & & 4.38 \\
 \text{Adj. } R^2 & & 0.12
 \end{array}$$

using data in panel A, and

$$\begin{array}{rcl}
 \text{For. Inv. Cumulated Purchases}_t & = & 0.12 \times \text{ISE 100 index}_t \\
 t\text{-stat} & & 13.30 \\
 \text{Adj. } R^2 & & 0.55
 \end{array}$$

using data in panel B. In both equations, coefficients are significant at the 1% level given the heteroskedasticity and autocorrelation consistent *t*-statistics obtained using the Newey-West variance estimator (see Newey and West, 1987).

One might be concerned about the accuracy of portfolio flows data for modeling purposes. As a final check of the contemporaneous correlation between non-residents' investment behavior and the broad market movements, I employ an alternative data set which directly shows foreign investors' portfolio holdings. Specifically, this supplementary data show foreign investors' amount of custody and the rate of custody in the whole market for which the data is available from the Istanbul Stock Exchange web site. While being conceptually more suitable to examine the "foreign ownership" in domestic securities, the major drawbacks with this custody data is that it is not published on an equity-basis as this is the case for transactions data and that it covers a much shorter period of time starting from January 2006. Figure 2 shows the results obtained using this portfolio holdings data.

[Insert figure 2 here]

The graphs in panel A and panel B show respectively the time-path of foreign investors' amount and rate of custody in the Turkish stock market against that of the ISE National 100 index over a three-year long period from January 2006 to December 2008. The observations are mostly in line with those obtained using transactions data such that there is a strong positive correlation between foreigners' portfolio holdings and the market fluctuations. To assess the underlying relationship, I compute the rank correlations between the each pair of variables plotted in panels A and B. The rank correlation between foreign investors' amount of custody and the price-level of the ISE National 100 index is 0.78. The rank correlation between foreign investors' rate of custody and the ISE National 100 index is 0.65. Both of the coefficients are significant at the 1% level. In summary, evidence presented in this subsection further confirms the asymmetric information hypothesis across foreign and domestic investors

as suggested by the contemporaneous correlation between the broad market return and foreign portfolio flows or assets.

### 4.3 The Performance of Foreign Investors

Models based on differential information between foreign and domestic investors (e.g. Brennan and Cao, 1997; Kang and Stulz, 1997) imply that foreign investors should expect a higher expected return on their portfolio domestic securities than do local investors. Moreover, empirical evidence provided throughout the previous sections is typically consistent with this theoretical prediction as shown by the significance of the “return” as an important covariate in explaining foreign investors trading patterns within the Turkish stock market. Finally, the corresponding firm’s size, as measured by the market capitalization of the common stocks, represents the main source of information retrieval for foreign investors on the domestic market of interest. On the empirical ground, the hypothesis of differential information between foreign and local investors should translate into the fact that foreigners should underperform locals to the extent the latter group is able to materialize this advantage. Do foreign investors really choose a portfolio with greater expected return than the market portfolio? Or, alternatively, are domestic investors able to materialize their informational advantage? To answer these questions, I employ data on investor performance provided by the Association of Capital Market Intermediary Institutions of Turkey (TSPAKB). The data come from the TSPAKB’s 2008 annual report and it allows a simple comparison between the respective performances of foreign and domestic investors in the ISE.

[Insert table 14 here]

Table 14 reports the yearly average returns realized by foreign and domestic investors on the ISE market and the yearly returns on the ISE National 100 index which is a weighted-average index made by the first most liquid and largest market capitalization stocks over the period 1999-2008. Looking at the table, we observe that domestic investors outperform the foreign investors in that, for every year up to 2007, domestic investors’ profits are above those realized by foreigners, or, equivalently, their losses are below those realized by foreigners. In passing note that the return on the ISE National 100 index is not located between the return of foreign and domestic investors on the market. This is simply due to the fact that investors hold portfolios other than that of the market portfolio or the distribution of investors’ trades over the considered transaction period. The group mean for foreign investors’ yearly returns is 28% while that of the domestic investors is 37% suggesting that foreign investors indeed underperform their domestic counterparts over the period of interest. The *t*-statistic reported below the table is to check whether the difference between the group means is statistically significant. The critical values of the *t*-statistic are 1.83 and 2.26 respectively for a one-tail ( $H_0: \mu_{Domestic} > \mu_{Foreign}$ ) and for a two-tail test ( $H_0: \mu_{Domestic} = \mu_{Foreign}$ ). Thus, we cannot reject

the hypothesis that domestic investors' performance is higher than that of the foreign investors. However, the non-rejection of a significant difference in the respective performance of foreign and domestic investors could simply be related to the insufficient number of available observations given the frequency and the starting point of the data employed.

## 5 Conclusion

This paper explores a panel dataset over January 1997 to December 2008 on foreign investors' firm-level transactions (e.g. purchases and sales of stock) in the Istanbul Stock Exchange (ISE). The analysis suggests a number of useful insights with respect to the determinants of cross-border portfolio flows and the equity home bias puzzle. First, preliminary inspections suggest that non-residents' transactions are concentrated across large capitalization stocks which tend to be financial firms (e.g. banks), discarding the hypothesis that foreign investors choose the market-portfolio of domestic securities as proposed by the traditional international CAPM framework. Second, I examine the determinants of foreign investors' equity transactions whereby I relate non-residents' yearly purchases, net purchases and trading volume on a subset of 84 firms to an array of predictor variables that proxy for the corresponding firms' size, leverage, valuation, profitability, dividend yield and market characteristics (e.g. the stock's return and its market-model beta). The results obtained by both cross-sectional and panel regressions point out to the stock's market capitalization and the expected return as the main determinants of foreign investors' trades. The statistical as well as the economic significance of the firm's size on foreign investors' tendency to purchase or trade more in the corresponding stocks, is also confirmed when regressions are run using other proxies for size or over alternative subsets (e.g. financial vs. industrial stocks).

From a theoretical viewpoint, the collection of the empirical results is typically linked to the information-based strand of the literature concerning the determinants of cross-border portfolio flows and the home bias. The simultaneous and significant effect of the market capitalization and the expected return on foreign investors' purchases of domestic stocks is consistent with the predictions of models assuming differential information between domestic and foreign investors (e.g. Brennan *et al.*, 2005; Brennan and Cao, 1997). First, the "size bias" captured by the systematically significant parameter estimates on the market capitalization variable confirms the Merton's hypothesis (Merton, 1987) according to which size substitutes the degree with which investors feel themselves familiar with the firm of interest, which, in turn, increase the likelihood of investors to invest into this firm's stocks. Second, the less well-informed foreign investors tend to expect higher returns on their portfolio of domestic securities than do local investors, which is also an empirical result in line with the hypothesis of differential information between foreigners and locals (see Brennan and Cao, 1997). In

summary, the results set forth using data on portfolio flows towards the Turkish market, can also be used to derive insights with respect to the origin of the equity home bias puzzle.

A major drawback of this study is that it employs portfolio equity flows data instead of foreign ownership data which would be conceptually more suitable in examining the determinants of asset holdings. The Istanbul Stock Exchange publishes data foreign investors' amount of custody in domestic stocks on an aggregate basis since January 2006 and do not provide a breakdown by country of origin of the holders. Although non-residents' market-wide equity holdings and their net purchases are not correlated over time, graphical examination as well as the regression analysis yield to similar results so that we observe a significant contemporaneous correlation between foreign asset holdings and the market return, an observation further highlighting the trend following behavior of foreign investors (see figure 3). Finally, another useful extension would be to distinguish among the country of origin of the portfolio flows which would allow a gravity-type analysis of cross-border flows into an emerging-market. However, such an analysis cannot be actually undertaken to date due to lack of appropriate data and is left for further research.

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Table 1. Some milestones in the Istanbul Stock Exchange history

Year	Month	Event
1985	December	Inauguration of the Istanbul Stock Exchange
1986	January	Commencement of stock trading on January, 3
1987	October	Commencement of daily calculation of ISE indices calculated so far on a weekly basis
1989	August	Issuance of "Decree 32" which allows foreign investors to purchase and sell all types of securities in Turkey and repatriate the proceeds
1991	January	Commencement of the calculation of Financials and Industrials Indices in addition to the ISE Composite Index
	June	Initiation of the Bonds and Bills Market and commencement of Outright Purchases and Sales Transactions
1992	October	Acceptance of the ISE as a full member to The World Federation of Exchanges (WFE, previously FIBV)
1993	January	Launch of the Rights Coupon Market and New Shares Market
	February	Initiation of the Repo/Reverse Repo Market
	October	Recognition of the ISE by the U.S. Securities and Exchange Commission (SEC) as a "Designated Offshore Securities Market"
	December	Initiation of computerized stock trading with 50 stocks
1994	September	Initiation of Small Orders Market in the Bonds and Bills Market
	November	Full automation of stock trading
1995	January	Launch of the Regional Markets and the Wholesale Market
	March	Designation of ISE Settlement and Custody Company as an "Eligible Foreign Custodian" by U.S. Securities and Exchange Commission (SEC)
	April	Disclosure of detailed balance sheet and income statements of companies including footnotes; Initiation of short selling transactions; Launch of the New Companies Market
	May	Recognition of the ISE as an "appropriate foreign investment market for the private and institutional Japanese investors" by the Japan Securities Dealers Association
1996	September	Foreign Currency Denominated Government Debt Securities started to traded at the Outright Purchases and Sales Market of the Bonds and Bills Market.
	December	Launch of the International Bonds and Bills Market within the ISE Int. Market
1997	February	ISE International Bonds and Bills Market started its operations upon the listing of 40 international bonds issued by the Undersecretariat of Treasury for trading abroad.
	August	Launch of the Repo and Reverse Repo Market on ISE International Market
1999	August	Starting from August 24, 1999, short-selling transactions and margin trading became available in all stocks traded on the ISE's markets. Previously, authorized ISE members had the opportunity to engage in short-selling transactions only in stocks constituting the ISE-National 100 Index.
2003	March	All orders submitted to the Stock Market for all stocks and during all sessions have been required to include customer account numbers. Regional Markets and New Companies Market were renamed as Second National Market and New Economy Market, respectively.
2005	February	ISE Executive Council has decided to launch a new index namely "ISE Corporate Governance Index".
2006	December	The ISE International Market and its submarkets (Depositary Receipts Market and International Market Bonds and Bills Market) were closed.
2007	April	International Bonds Market has started its operations within the ISE Foreign Securities Market on April 16, 2007. In the Market, listed Turkish Sovereign Eurobonds have been traded.
	August	ISE started to calculate the Corporate Governance Index.
2009	February	City Indices launched for 9 cities

Source: Prepared using information provided on [www.ise.org](http://www.ise.org)



Table 2. Main indicators of the Istanbul Stock Exchange, 1997-2008

Year	Number of firms traded	Market value (USD millions)	Traded value (USD millions)	National 100 index	Price / Earnings ratio	Dividend yield
1997 <i>% of XU100</i>	258	61 879 <i>99.14</i>	58 104 <i>98.40</i>	3 451	24.39	1.56
1998	277	33 975 <i>98.52</i>	70 396 <i>99.00</i>	2 597	8.84	3.37
1999	285	114 271 <i>98.25</i>	84 034 <i>98.68</i>	15 208	37.52	0.72
2000	315	69 507 <i>98.74</i>	181 934 <i>99.00</i>	9 437	16.82	1.29
2001	310	47 689 <i>98.95</i>	80 400 <i>99.43</i>	13 782	108.33	0.95
2002	288	34 402 <i>98.17</i>	70 756 <i>98.91</i>	10 369	195.92	1.20
2003	285	69 003 <i>99.45</i>	100 165 <i>99.24</i>	18 625	14.54	0.94
2004	297	98 073 <i>99.26</i>	147 755 <i>99.15</i>	24 971	17.18	1.37
2005	304	162 814 <i>99.27</i>	201 763 <i>97.67</i>	39 777	17.19	1.71
2006	316	163 775 <i>99.23</i>	229 642 <i>96.84</i>	39 117	22.02	2.10
2007	319	289 986 <i>99.41</i>	300 842 <i>96.86</i>	55 538	12.16	1.90
2008	317	119 698 <i>99.50</i>	261 274 <i>96.41</i>	26 864	5.55	4.93

Notes: The market and traded values are given in millions of USD terms and the numbers in italics provided below show the percentage due to the first 100 stocks listed in the XU100 index. Source: prepared using data from the Istanbul Stock Exchange and the Association of Capital Market Intermediary Institutions of Turkey.

Table 3. Foreign investors in the Istanbul Stock Exchange, 1997-2008

Year	Amount of custody	Rate of custody (%)	Traded value (%)	Purchases (primary market)	Purchases (secondary market)	Net inflow	Change in portfolio value
1997	N.A.	N.A.	15.33	N.A.	-304	N.A.	N.A.
1998	N.A.	N.A.	16.54	N.A.	-426	N.A.	N.A.
1999	N.A.	N.A.	21.22	10	1 031	1 164	10 501
2000	7 404	40.90	18.33	2 677	-3 133	-460	- 7 493
2001	5 635	49.20	15.09	10	509	519	- 2 287
2002	3 450	43.00	18.17	64	-14	50	-2 234
2003	8 690	51.50	17.30	87	1 010	1 097	4 406
2004	16 141	56.96	25.29	847	1 430	2 277	4 911
2005	33 782	66.34	40.14	2 641	4 083	6 724	10 944
2006	34 897	65.30	38.51	984	1 131	2 115	-858
2007	69 887	72.40	47.82	3 991	4 510	8 501	26 606
2008	27 297	67.46	54.35	1 195	-2 971	-1 776	-41 122

Notes: Numbers other than percentages are expressed in terms of USD millions. Source: prepared using data from the Istanbul Stock Exchange, the Association of Capital Market Intermediary Institutions of Turkey, and the Central Registry Agency.

Table 4. Summary and sectoral breakdown of foreign investors' transactions in ISE

Year	Sectoral weights	Purchases	Sales	Net purchases	Traded value
1997		4 302	4 607	-304	8 909
of which					
Financials	N.A.	40.19	37.59	0.86	38.84
Industrials	N.A.	44.88	46.80	73.93	45.87
Services	N.A.	11.06	10.62	4.49	10.83
Technology	N.A.	3.88	4.99	20.72	4.46
1998		5 610	6 035	-426	11 645
of which					
Financials	53.84	54.63	54.92	58.78	54.78
Industrials	33.01	33.53	35.48	61.15	34.54
Services	13.15	9.86	7.35	-25.71	8.56
Technology	N.A.	1.98	2.25	5.78	2.12
1999		9 434	8 403	1 031	17 837
of which					
Financials	60.97	63.30	62.58	69.13	62.96
Industrials	32.10	28.10	27.98	29.10	28.04
Services	6.93	5.45	6.32	-1.59	5.86
Technology	N.A.	3.15	3.13	3.36	3.14
2000		15 116	18 249	-3 133	33 365
of which					
Financials	50.35	58.98	59.32	60.93	59.17
Industrials	33.55	29.86	29.19	25.97	29.49
Services	13.85	7.16	7.80	10.93	7.51
Technology	2.25	4.00	3.69	2.17	3.83
2001		6 322	5 813	509	12 135
of which					
Financials	48.47	56.94	57.54	50.08	57.23
Industrials	37.00	28.55	27.09	45.26	27.05
Services	13.28	13.21	13.51	9.77	13.35
Technology	1.25	1.30	1.86	-5.10	1.57
2002		6 421	6 435	-14	12 856
of which					
Financials	42.02	53.83	54.17	215.05	54.00
Industrials	41.59	28.90	27.84	-475.25	28.37
Services	15.17	16.04	16.64	299.47	16.34
Technology	1.22	1.23	1.36	60.73	1.29

Table 4. (continued)

Year	Sectoral weights	Purchases	Sales	Net purchases	Traded value
2003		9 167	8 158	1 010	17 325
of which					
Financials	48.98	63.64	63.59	64.11	63.62
Industrials	37.91	21.83	21.72	22.64	21.78
Services	12.28	13.88	14.05	12.56	13.96
Technology	0.84	0.65	0.64	0.69	0.65
2004		19 395	17 965	1 430	37 361
of which					
Financials	52.55	68.05	67.42	75.99	67.75
Industrials	33.90	20.48	20.90	15.17	20.68
Services	11.00	10.98	11.02	10.42	11.00
Technology	0.55	0.49	0.66	-1.58	0.57
2005		42 540	38 457	4 083	80 998
of which					
Financials	58.45	67.37	68.03	61.14	67.68
Industrials	30.36	22.44	21.29	33.29	21.90
Services	10.65	9.58	10.00	5.64	9.78
Technology	0.54	0.61	0.68	-0.08	0.64
2006		44 779	43 647	1 131	88 426
of which					
Financials	54.38	69.08	71.04	-6.54	70.05
Industrials	31.06	21.47	19.82	85.19	20.65
Services	14.07	9.13	8.85	19.94	8.99
Technology	0.49	0.32	0.29	1.42	0.31
2007		74 184	69 675	4 510	143 859
of which					
Financials	56.07	69.84	69.88	69.22	69.86
Industrials	27.89	18.90	18.58	23.80	18.75
Services	15.71	10.98	11.27	6.61	11.12
Technology	0.33	0.28	0.27	0.38	0.28
2008		69 522	72 493	-2 971	142 015
of which					
Financials	51.48	68.89	67.96	46.07	68.41
Industrials	26.60	14.19	14.68	26.14	14.44
Services	21.62	16.80	17.23	27.08	17.02
Technology	0.29	0.12	0.14	0.72	0.13

Notes: Yearly purchases, sales, net purchases and traded values are expressed in terms of USD millions. "Sectoral weights" are the year-end weights of the corresponding sector in "ISE all shares" index composition. Source: prepared using data from the Istanbul Stock Exchange.

Table 5. Descriptive statistics

Panel A. Pooled data set

Variables	N	Mean	Std Dev	Min	Max
Purchases	827	3.37e+08	1.13e+09	0	1.87e+10
Net purchases	827	6.29e+06	7.43e+07	-8.70e+08	5.85e+08
Traded value	827	1.31	2.65	0	26.5
Price/Book	779	4.52	31.13	0.01	545.53
Total debt/Total capital	821	32.43	26.76	0.00	100.02
Return on assets	757	0.11	0.12	-0.32	0.76
Dividend payout	695	1.80	14.27	-1.59	274.94
Return	853	-0.03	0.16	-2.54	0.51
Beta	853	0.90	0.25	-0.47	1.54
Market capitalization	789	1352.80	2657.68	2.70	22409.20

Table 5. (continued)

## Panel B. Data sorted by the company's sector

Variables	Sector	N	Missing	Mean	Std Dev	Min	Max
Purchases	Financials	270	90	7.08e+08	1.81e+09	0	1.87e+10
Net purchases		270	90	1.28e+07	1.03e+08	-4.67e+08	5.85e+08
Traded value		270	90	2.58	3.90	0.00	26.5
Price/Book		266	94	2.29	4.96	0.01	37.98
Total debt/Total capital		286	74	47.08	29.10	0.00	96.32
Return on assets		251	109	0.05	0.08	-0.32	0.45
Dividend payout		231	129	1.70	18.15	0.00	274.94
Return		288	72	-0.01	0.12	-0.45	0.32
Beta		288	72	1.03	0.23	0.30	1.54
Market capitalization		267	93	2210.75	3671.09	15.18	22409.20
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Purchases	Industrials	416	40	1.36e+08	2.96e+08	481	2.75e+09
Net purchases		416	40	4.83e+06	4.43e+07	-2.53e+08	5.38e+08
Traded value		416	40	0.64	1.08	0.00	8.30
Price/Book		376	80	7.04	44.47	0.02	545.53
Total debt/Total capital		386	70	24.80	20.37	0.00	92.36
Return on assets		369	87	0.13	0.12	-0.23	0.71
Dividend payout		339	117	1.97	12.85	-1.59	169.75
Return		420	36	-0.02	0.13	-0.86	0.51
Beta		420	36	0.85	0.21	0.05	1.44
Market capitalization		382	74	848.53	1426.18	2.70	13528.32
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Purchases	Services	105	51	2.84e+08	8.84e+08	949	7.18e+09
Net purchases		105	51	-1.29e+06	9.13e+07	-8.70e+08	1.53e+08
Traded value		105	51	1.01	2.31	0.00	12.09
Price/Book		101	55	2.12	3.73	0.09	24.05
Total debt/Total capital		113	43	24.95	24.44	0.00	100.02
Return on assets		101	55	0.14	0.18	-0.25	0.76
Dividend payout		92	64	0.97	4.17	0.00	28.78
Return		109	47	-0.08	0.32	-2.54	0.34
Beta		109	47	0.72	0.28	-0.47	1.18
Market capitalization		104	52	1335.92	2912.66	22.84	20648.11
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Purchases	Technology	36	0	4.74e+07	6.87e+07	280 586	3.51e+08
Net purchases		36	0	-3.83e+06	1.29e+07	-5.13e+07	2.70e+07
Traded value		36	0	0.43	0.58	0.00	2.16
Price/Book		36	0	1.43	1.21	0.10	5.27
Total debt/Total capital		36	0	21.29	26.39	0.00	83.88
Return on assets		36	0	0.13	0.13	-0.04	0.58
Dividend payout		33	3	3.08	15.81	0.00	91.10
Return		36	0	-0.06	0.10	-0.20	0.15
Beta		36	0	0.99	0.14	0.69	1.23
Market capitalization		36	0	389.27	382.57	21.50	1705.78

Table 5. (end)

Panel C. Data sorted by year of the observations

Variables	Year	N	Missing	Mean	Std Dev	Min	Max
Purchases	1997	50	34	6.24E+07	8.98E+07	46 195	4.15E+08
Net purchases		50	34	-4.59E+06	2.43E+07	-6.44E+07	6.92E+07
Traded value		50	34	1.45	1.94	0.00	8.66
Price/Book		39	45	8.87	40.14	0.23	251.18
Total debt/Total capital		40	44	31.21	28.37	0.00	91.96
Return on assets		35	49	0.21	0.15	-0.12	0.62
Dividend payout		38	46	13.68	45.63	0.00	274.94
Return		55	29	-0.09	0.28	-1.79	0.29
Beta		55	29	0.94	0.29	-0.23	1.41
Market capitalization		40	44	1633.82	2825.44	30.87	15131.89
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Purchases	1998	53	31	8.80E+07	1.37E+08	18 844	5.28E+08
Net purchases		53	31	-3.68E+06	2.48E+07	-8.00E+07	9.59E+07
Traded value		53	31	1.54	2.37	0.00	9.33
Price/Book		39	45	3.90	15.08	0.15	89.43
Total debt/Total capital		40	44	28.19	26.91	0.00	89.77
Return on assets		38	46	0.17	0.12	-0.05	0.50
Dividend payout		36	48	9.59	27.38	0.00	133.85
Return		57	27	-0.06	0.20	-0.86	0.28
Beta		57	27	0.95	0.18	0.53	1.33
Market capitalization		39	45	774.31	1231.72	19.19	6164.87
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...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
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Purchases	2007	83	1	8.04E+08	1.95E+09	322 015	1.31E+10
Net purchases		83	1	3.34E+07	1.04E+08	-3.47E+08	5.85E+08
Traded value		83	1	1.09	2.68	0.00	18.07
Price/Book		81	3	5.50	34.06	0.05	307.27
Total debt/Total capital		84	0	31.05	25.73	0.00	84.53
Return on assets		83	1	0.09	0.09	-0.08	0.52
Dividend payout		52	32	0.18	0.37	-1.59	0.94
Return		84	0	-0.02	0.09	-0.27	0.23
Beta		84	0	0.84	0.28	-0.02	1.42
Market capitalization		84	0	2782.05	4804.52	68.71	22409.20
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Purchases	2008	83	1	7.65E+08	2.44E+09	65 126	1.87E+10
Net purchases		83	1	-3.09E+07	1.05E+08	-8.70E+08	1.27E+08
Traded value		83	1	1.10	3.45	0.00	26.50
Price/Book		83	1	0.90	2.50	0.02	22.41
Total debt/Total capital		84	0	36.90	27.53	0.00	100.02
Return on assets		84	0	0.06	0.10	-0.21	0.51
Dividend payout		74	10	0.39	1.20	0.00	9.52
Return		84	0	-0.04	0.10	-0.25	0.34
Beta		84	0	0.90	0.26	0.30	1.54
Market capitalization		84	0	1058.41	1964.87	21.50	9482.25

Table 6. Year-by-year regression estimates of foreign investors' portfolio flows

Dependent: Purchases	(1) OLS	(2) Robust	(3) Quantile
Intercept	0.0583 (0.58, 0.42) [1, 1]	0.0756 (1.99, 0.02) [3, 2]	0.0685 (0.90, 0.47) [3, 2]
Market capitalization	0.8988 (4.47, 0.00) [12, 0]	0.8805 (11.96, 0.00) [12, 0]	0.8611 (14.14, 0.00) [11, 0]
Beta	0.1403 (1.38, 0.01) [8, 1]	0.0858 (1.73, 0.01) [6, 0]	0.0896 (1.85, 0.01) [6, 0]
Return	0.0883 (0.54, 0.16) [2, 0]	0.0433 (0.45, 0.32) [3, 1]	0.0870 (0.67, 0.07) [3, 0]
Price / Book	0.0051 (0.43, 0.28) [2, 1]	-0.0965 (0.22, 0.51) [1, 0]	-0.0222 (0.26, 0.56) [2, 1]
Total debt / Total capital	0.1019 (1.19, 0.01) [4, 1]	0.0357 (0.61, 0.08) [1, 1]	0.0563 (0.83, 0.01) [3, 0]
Return on assets	0.0049 (0.76, 0.00) [0, 0]	0.0253 (0.27, 0.41) [2, 0]	-0.0002 (0.11, 0.73) [1, 1]
Dividend payout ratio	-0.5374 (0.10, 0.88) [1, 1]	0.6718 (1.04, 0.24) [2, 0]	0.5111 (1.81, 0.14) [3, 0]
Average sample size	46.67	45.92	46.67
Average $R^2$	0.6179	0.3640	
Average pseudo- $R^2$			0.4245

Notes: Regression coefficients are the time-series average from year-by-year regressions for the period 1997-2008. The first number in parenthesis below the estimates is the average  $t$ -statistic obtained using robust standard errors for the regressions. The second number in parenthesis is the  $p$ -value for a  $t$ -test to check the null hypothesis that the average  $t$ -statistic is zero. The numbers in brackets show the number of coefficients that are significantly positive and negative at the 10% level, respectively.



Table 7. Year-by-year regression estimates of foreign investors' portfolio flows

Dependent: Net purchases	(1) OLS	(2) Robust	(3) Quantile
Intercept	0.2351 (0.16, 0.78) [3, 2]	0.0065 (0.39, 0.53) [3, 3]	0.0519 (0.28, 0.62) [2, 3]
Market capitalization	0.3350 (1.84, 0.02) [6, 1]	0.3137 (4.35, 0.01) [9, 1]	0.3304 (6.38, 0.00) [9, 1]
Beta	0.0443 (0.21, 0.65) [2, 2]	0.0253 (0.17, 0.64) [2, 1]	0.0110 (0.42, 0.41) [2, 1]
Return	0.2121 (1.00, 0.02) [5, 0]	0.1439 (1.15, 0.02) [4, 0]	0.1986 (1.35, 0.01) [6, 0]
Price / Book	0.3646 (0.54, 0.13) [3, 0]	-1.6275 (1.13, 0.00) [1, 2]	0.0538 (0.31, 0.71) [1, 2]
Total debt / Total capital	0.0583 (0.36, 0.19) [0, 0]	0.0371 (0.57, 0.06) [2, 0]	0.0147 (0.40, 0.16) [0, 0]
Return on assets	-0.0802 (0.28, 0.38) [0, 1]	-0.0164 (0.02, 0.97) [1, 2]	-0.0289 (0.15, 0.84) [2, 1]
Dividend payout ratio	1.9309 (0.25, 0.43) [2, 0]	2.2701 (0.72, 0.27) [1, 2]	0.8261 (0.34, 0.41) [2, 1]
Average sample size	46.33	45.33	46.33
Average $R^2$	0.3662	0.2644	
Average pseudo- $R^2$			0.2239

Notes: Regression coefficients are the time-series average from year-by-year regressions for the period 1997-2008. The first number in parenthesis below the estimates is the average  $t$ -statistic obtained using robust standard errors for the regressions. The second number in parenthesis is the  $p$ -value for a  $t$ -test to check the null hypothesis that the average  $t$ -statistic is zero. The numbers in brackets show the number of coefficients that are significantly positive and negative at the 10% level, respectively.

Table 8. Year-by-year regression estimates of foreign investors' portfolio flows

Dependent: Traded value	(1) OLS	(2) Robust	(3) Quantile
Intercept	0.5356 (1.89, 0.01) [7, 1]	-0.0391 (1.06, 0.26) [4, 1]	0.4556 (1.77, 0.06) [5, 0]
Market capitalization	1.3293 (6.46, 0.00) [12, 0]	1.4351 (12.73, 0.00) [12, 0]	1.4487 (17.57, 0.00) [12, 0]
Beta	0.0573 (1.01, 0.01) [4, 0]	-0.0061 (1.35, 0.02) [6, 1]	0.0451 (1.79, 0.01) [5, 0]
Return	0.1075 (0.40, 0.20) [2, 0]	0.1283 (0.58, 0.18) [2, 1]	0.0849 (0.40, 0.36) [2, 2]
Price / Book	0.0265 (0.42, 0.18) [2, 0]	-2.6624 (0.02, 0.96) [1, 1]	-0.0043 (0.38, 0.31) [2, 1]
Total debt / Total capital	0.1690 (1.15, 0.01) [4, 0]	0.0619 (0.40, 0.09) [0, 0]	0.1411 (1.11, 0.00) [2, 0]
Return on assets	-0.0126 (0.15, 0.58) [1, 0]	-0.0313 (0.68, 0.00) [1, 0]	-0.0214 (0.00, 0.99) [1, 0]
Dividend payout ratio	0.5389 (0.42, 0.54) [2, 0]	0.8095 (0.64, 0.37) [2, 1]	1.3119 (1.31, 0.07) [4, 0]
Average sample size	43.00	42.08	43.00
Average $R^2$	0.7181	0.4058	
Average pseudo- $R^2$			0.4823

Notes: Regression coefficients are the time-series average from year-by-year regressions for the period 1997-2008. The first number in parenthesis below the estimates is the average  $t$ -statistic obtained using robust standard errors for the regressions. The second number in parenthesis is the  $p$ -value for a  $t$ -test to check the null hypothesis that the average  $t$ -statistic is zero. The numbers in brackets show the number of coefficients that are significantly positive and negative at the 10% level, respectively.

Table 9. Time-series cross-section regressions of foreign investors' portfolio flows

Dependent: Purchases	1997–2008 (1)	1997–2008 (2)	1997–2008 (3)	2003–2008 (1)	2003–2008 (2)	2003–2008 (3)
Intercept	0.0378 (1.21)	0.0347 (1.16)	0.0279 (0.84)	0.0009 (0.03)	0.0001 (0.00)	-0.0442 (-1.41)
Market capitalization	***0.6168 (6.81)	***0.5855 (6.61)	***0.6774 (6.38)	***0.7470 (7.43)	***0.7180 (7.46)	***0.6687 (6.53)
Beta		***0.2271 (6.71)	***0.1958 (5.23)		***0.2159 (5.05)	***0.1834 (5.20)
Return		0.0375 (0.79)	0.0107 (0.21)		0.0126 (0.52)	0.0209 (0.76)
Price / Book			0.0041 (0.26)			-0.0091 (-0.90)
Total debt / Total capital			***0.0995 (2.95)			0.0451 (1.28)
Return on assets			-0.0043 (-0.14)			-0.0106 (-0.48)
Dividend payout ratio			-0.0043 (-0.33)			**0.1109 (2.42)
Observations	689	689	560	416	416	316
min. per group	35	35	28	57	57	38
avg. per group	57.4	57.4	46.7	69.3	69.3	52.7
max. per group	73	73	66	74	74	67
$R^2$ (within)	0.3496	0.3946	0.4288	0.5544	0.5996	0.6573
$F$ statistic	***46.34	***36.44	***17.30	***55.18	***52.65	***22.92

Notes: The table reports the results of the time-series cross-section regressions of foreign investors' equity flows into Turkish stock market to an array of predictor variables. All regressions include year dummies throughout the time period considered (from 1997 to 2008). The  $F$  statistic tests the null hypothesis that the coefficient estimates of the dummies are jointly equal to zero. The numbers in parenthesis below the coefficients are the  $t$ -statistics obtained using robust standard errors based on the Huber & White sandwich estimate of variance. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 10. Time-series cross-section regressions of foreign investors' portfolio flows

Dependent: Net purchases	1997–2008 (1)	1997–2008 (2)	1997–2008 (3)	2003–2008 (1)	2003–2008 (2)	2003–2008 (3)
Intercept	0.0231 (0.66)	0.0136 (0.40)	0.0241 (0.63)	-0.0043 (-0.10)	-0.0039 (-0.09)	0.0147 (0.30)
Market capitalization	***0.3481 (4.90)	***0.3189 (4.59)	***0.4168 (4.80)	***0.3895 (4.14)	***0.3516 (3.83)	***0.4652 (3.76)
Beta		-0.0216 (-0.60)	0.0075 (0.19)		0.0079 (0.19)	0.0509 (1.04)
Return		***0.2229 (4.59)	***0.1957 (3.37)		***0.2119 (4.76)	***0.1760 (3.28)
Price / Book			0.0049 (0.21)			**0.0264 (2.10)
Total debt / Total capital			0.0103 (0.28)			0.0078 (0.15)
Return on assets			-0.0473 (-1.12)			-0.0074 (-0.19)
Dividend payout ratio			-0.0028 (-0.18)			0.0348 (0.80)
Observations	681	681	556	416	416	321
min. per group	33	33	28	66	66	38
avg. per group	56.8	56.8	46.3	69.3	69.3	53.5
max. per group	70	70	65	72	72	67
$R^2$ (within)	0.1241	0.1462	0.1897	0.1614	0.2082	0.2594
$F$ statistic	***24.01	***21.70	***8.11	***17.11	***18.64	***7.80

Notes: The table reports the results of the time-series cross-section regressions of foreign investors' equity flows into Turkish stock market to an array of predictor variables. All regressions include year dummies throughout the time period considered (from 1997 to 2008). The  $F$  statistic tests the null hypothesis that the coefficient estimates of the dummies are jointly equal to zero. The numbers in parenthesis below the coefficients are the  $t$ -statistics obtained using robust standard errors based on the Huber & White sandwich estimate of variance. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 11. Time-series cross-section regressions of foreign investors' portfolio flows

Dependent: Traded value	1997–2008 (1)	1997–2008 (2)	1997–2008 (3)	2003–2008 (1)	2003–2008 (2)	2003–2008 (3)
Intercept	0.0256 (0.86)	0.0201 (0.69)	*0.0681 (1.91)	0.0014 (0.05)	0.0008 (0.03)	0.0039 (0.11)
Market capitalization	***0.6865 (10.82)	***0.6473 (10.39)	***0.6870 (7.37)	***0.7979 (9.39)	***0.7708 (9.13)	***0.7662 (6.78)
Beta		***0.1705 (5.14)	***0.0948 (2.66)		***0.1571 (3.87)	***0.1202 (3.23)
Return		***0.1104 (2.89)	***0.1371 (2.80)		*0.0403 (1.76)	**0.0668 (2.33)
Price / Book			0.0038 (0.28)			-0.0081 (-1.01)
Total debt / Total capital			***0.1541 (4.04)			0.0412 (1.07)
Return on assets			** -0.0779 (-2.34)			-0.0121 (-0.57)
Dividend payout ratio			*** -0.0547 (-2.89)			***0.0871 (3.79)
Observations	650	650	516	390	390	289
min. per group	32	32	26	50	50	35
avg. per group	54.2	54.2	43.0	65.0	65.0	48.2
max. per group	75	75	59	75	75	59
$R^2$ (within)	0.4340	0.4646	0.4652	0.5993	0.6242	0.6330
$F$ statistic	***117.07	***65.45	***21.07	***88.18	***44.98	***18.13

Notes: The table reports the results of the time-series cross-section regressions of foreign investors' equity flows into Turkish stock market to an array of predictor variables. All regressions include year dummies throughout the time period considered (from 1997 to 2008). The  $F$  statistic tests the null hypothesis that the coefficient estimates of the dummies are jointly equal to zero. The numbers in parenthesis below the coefficients are the  $t$ -statistics obtained using robust standard errors based on the Huber & White sandwich estimate of variance. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 12. Regression estimates of foreign investors' portfolio flows by industry groups

## Panel A. Financial stocks

Dependent Time-period	Purchases		Net purchases		Traded value	
	1997-2008	2003-2008	1997-2008	2003-2008	1997-2008	2003-2008
Intercept	-0.0239 (-0.29)	-0.0621 (-0.75)	-0.0478 (-0.44)	-0.0866 (-0.69)	-0.0497 (-0.61)	-0.0241 (-0.31)
Market capitalization	***0.6336 (3.56)	***0.6685 (4.38)	**0.3162 (2.04)	*0.3330 (1.74)	***0.6155 (6.09)	***0.7342 (6.03)
Beta	***0.3177 (3.93)	***0.2733 (3.64)	0.0708 (0.95)	0.0812 (0.71)	**0.1545 (1.94)	*0.1585 (1.76)
Return	-0.0633 (-0.41)	-0.0209 (-0.24)	**0.3597 (2.07)	0.2294 (1.32)	**0.2468 (2.05)	*0.1410 (1.70)
Price / Book	-0.5263 (-1.57)	-0.1129 (-0.52)	0.0901 (0.15)	*0.9682 (1.80)	***-1.5561 (-3.39)	-0.2615 (-1.02)
Total debt / Total capital	0.0772 (1.33)	0.0386 (0.52)	-0.0325 (-0.46)	0.0938 (0.94)	***0.1742 (2.83)	0.0761 (1.13)
Return on assets	-0.2731 (-2.22)	-0.1033 (-1.00)	** -0.3941 (-2.27)	-0.2722 (-1.38)	***-0.3446 (-2.89)	-0.0401 (-0.42)
Dividend payout ratio	-0.0074 (-0.29)	0.1311 (1.30)	-0.0077 (-0.44)	0.0906 (0.83)	***-0.0939 (-4.67)	0.0478 (0.80)
Observations	162	101	154	94	152	94
min. per group	7	10	5	10	5	10
avg. per group	13.5	16.8	12.8	15.7	12.7	15.7
max. per group	22	22	19	20	24	24
$R^2$ (within)	0.4527	0.6473	0.2175	0.2199	0.6151	0.6829
$F$ statistic	***11.27	***13.52	***3.71	*2.03	***25.08	***9.44

Table 12. (continued)

## Panel B. Industrial stocks

Dependent Time-period	Purchases		Net purchases		Traded value	
	1997-2008	2003-2008	1997-2008	2003-2008	1997-2008	2003-2008
Intercept	-0.0621 (-1.42)	***-0.1201 (-2.89)	0.0129 (0.24)	-0.0084 (-0.12)	-0.0057 (-0.13)	-0.0367 (-0.70)
Market capitalization	***0.6115 (5.04)	***0.6398 (7.85)	***0.4765 (6.26)	***0.6789 (6.09)	***0.7766 (8.26)	***0.9141 (6.17)
Beta	***0.1109 (3.28)	***0.1019 (3.33)	-0.0479 (-0.80)	0.0026 (0.04)	***0.0943 (2.65)	***0.1105 (3.12)
Return	-0.0162 (-0.29)	0.0203 (0.60)	*0.1311 (1.89)	**0.1937 (2.12)	0.0118 (0.21)	0.0422 (1.09)
Price / Book	0.0087 (0.50)	-0.0152 (-1.52)	0.0042 (0.19)	0.0170 (1.63)	0.0147 (1.07)	*-0.0129 (-1.72)
Total debt / Total capital	*0.0590 (1.71)	-0.0142 (-0.35)	0.0401 (0.19)	-0.0662 (-0.84)	0.0662 (1.56)	*-0.0862 (-1.78)
Return on assets	-0.0084 (-0.27)	-0.0138 (-0.52)	0.0086 (0.20)	-0.0147 (-0.26)	-0.0395 (-1.14)	-0.0268 (-0.98)
Dividend payout ratio	-0.0162 (-0.56)	***-0.1025 (-1.97)	-0.0492 (0.24)	0.0035 (0.07)	-0.0186 (-0.53)	0.0170 (0.23)
Observations	297	160	297	165	280	152
min. per group	16	18	16	18	15	19
avg. per group	24.8	26.7	24.8	27.5	23.3	25.3
max. per group	35	33	35	35	30	30
$R^2$ (within)	0.3813	0.5132	0.1867	0.2484	0.4048	0.4981
$F$ statistic	***6.23	***12.46	***6.66	***9.34	***15.32	***8.54

Notes: The table reports the results of the time-series cross-section regressions of foreign investors' equity flows into Turkish stock market to an array of predictor variables. Regressions are run over the "financial" and "industrial" stocks subsample respectively in panels A and B. All regressions include year dummies throughout the time period considered (from 1997 to 2008). The  $F$  statistic tests the null hypothesis that the coefficient estimates of the dummies are jointly equal to zero. The numbers in parenthesis below the coefficients are the  $t$ -statistics obtained using robust standard errors based on the Huber & White sandwich estimate of variance. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).

Table 13. Additional investigations for the “Size” bias

Specification <i>Instrument(s)</i>	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS <i>Net Sales</i>	(5) 2SLS <i>Net Assets</i>	(6) 2SLS <i>Enterprise Value</i>	(7) 2SLS <i>All</i>
Panel A: Purchases							
Return	***0.1568 (4.79)	***0.0733 (2.69)	***0.0728 (2.50)	-0.0524 (-1.36)	-0.0314 (-0.88)	-0.0157 (-0.43)	-0.0159 (-0.43)
Market cap.				***1.0949 (16.86)	***0.9716 (17.79)	***0.8388 (18.43)	***0.8401 (18.52)
Net Sales	***0.6217 (5.16)			***0.5676 (14.47)			0.0679 (1.50)
Net Assets		***0.6174 (7.95)			***0.6351 (17.25)		-0.1136 (-1.78)
Enterprise value			***0.6452 (6.78)			***0.7691 (24.66)	***0.8202 (12.10)
Observations	418	418	394	416	416	394	394
<i>R</i> -squared <sup>a</sup>	0.4103	0.4021	0.4309	0.4369	0.5053	0.5271	0.5268
<i>F</i> statistic <sup>b</sup>	23.44	37.61	29.96	114.05	159.43	317.47	160.88
Panel B: Net purchases							
Return	***0.2866 (6.35)	***0.2562 (5.73)	***0.2636 (5.44)	***0.1881 (4.21)	***0.2273 (3.89)	***0.2395 (5.25)	***0.2316 (5.10)
Market cap.				***0.4891 (7.00)	***0.2620 (3.89)	***0.2325 (4.16)	***0.2766 (5.05)
Net Sales	***0.3014 (3.47)			***0.6152 (16.31)			***0.1768 (4.20)
Net Assets		***0.1665 (1.76)			***0.6374 (17.18)		*-0.1014 (-1.75)
Enterprise value			0.1829 (1.50)			***0.7866 (25.44)	***0.7485 (11.93)
Observations	418	418	393	416	416	394	394
<i>R</i> -squared <sup>a</sup>	0.1773	0.1095	0.1196	0.1889	0.1997	0.1914	0.1988
<i>F</i> statistic <sup>b</sup>	26.37	20.34	18.55	143.39	158.45	339.72	181.99
Panel C: Traded value							
Return	***0.1539 (5.05)	***0.0856 (3.32)	***0.0848 (3.05)	-0.0114 (-0.30)	0.0180 (0.54)	0.0201 (0.56)	0.0232 (0.65)
Market cap.				***1.1669 (15.57)	***0.9248 (18.35)	***0.8488 (19.22)	***0.8223 (18.74)
Net Sales	***0.5828 (4.66)			***0.4994 (11.77)			** -0.0915 (-2.06)
Net Assets		***0.6154 (7.67)			***0.6652 (18.12)		-0.0185 (-0.29)
Enterprise value			***0.6683 (5.56)			***0.7873 (24.57)	***0.8722 (11.98)
Observations	392	392	368	390	390	368	368
<i>R</i> -squared <sup>a</sup>	0.3527	0.3835	0.4360	0.4713	0.5845	0.5885	0.5909
<i>F</i> statistic <sup>b</sup>	21.42	37.71	24.50	127.41	176.21	190.72	181.71

Notes: a) *R*-squared for within estimates, b) For 2SLS specification, *F* statistic of the first-stage regressions is reported. The table reports the results of panel regressions of foreign investors' purchases, net purchases and traded value of stocks in the Istanbul Stock Exchange. All regressions include year dummies over the analysis period from 2003 to 2008. The numbers in parenthesis below the coefficients are the *t*-statistics obtained using robust standard errors based on the Huber & White sandwich estimate of variance. Statistical significance at 10% (resp. 5 and 1%) is denoted by \*\*\* (resp. \*\* and \*).



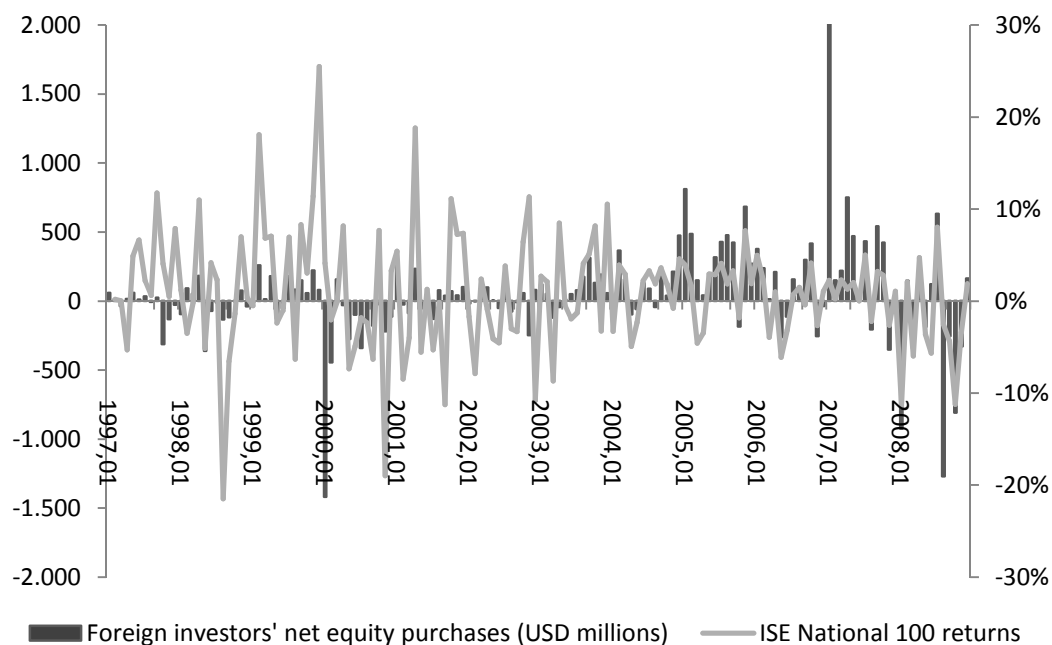
Table 14. The performance of foreign investors vs. domestic investors

Year	ISE National 100 index	Foreign investors	Domestic investors
1999	240	216	208
2000	-50	-49	-21
2001	-32	-29	-41
2002	-34	-39	-24
2003	111	97	101
2004	40	44	62
2005	59	48	72
2006	-6	-2	12
2007	72	61	61
2008	-63	-59	-58
Mean	34	29	37
<i>t</i> -statistic	1.97		

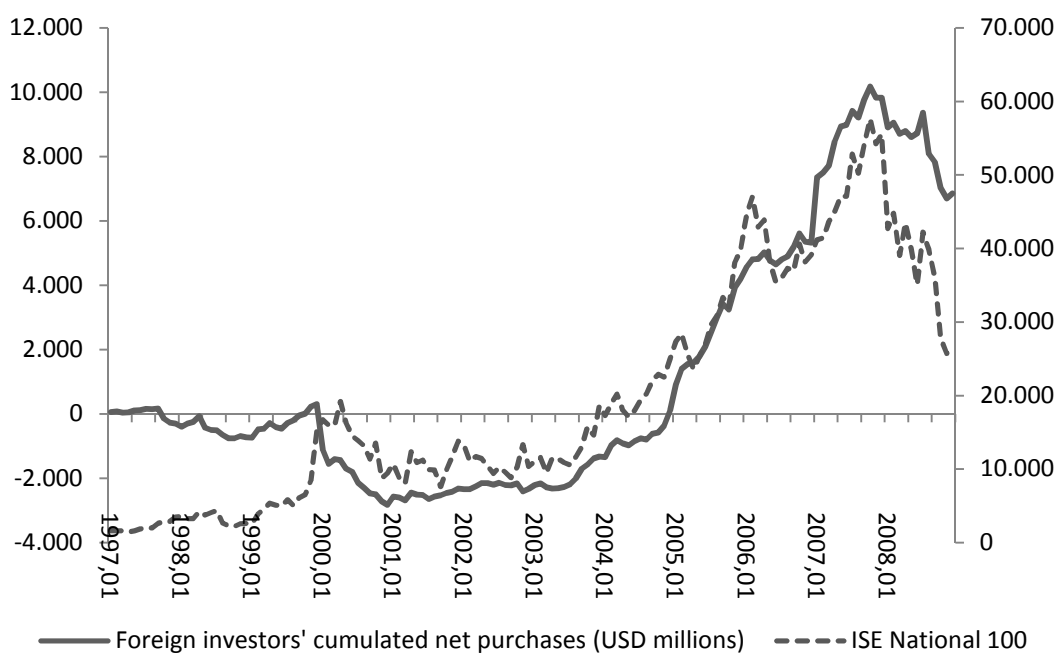
Notes: The table reports the yearly return (in percentages) on the ISE National 100 index, and the average returns (in percentages) obtained by foreign and domestic investors over the period 1999-2008. The *t*-statistic is reported to test whether the group means are statistically different. The critical values of the *t*-statistic are 1.83 and 2.26 respectively for a one-tail ( $H_0: \mu_d > \mu_f$ ) and for a two-tail test ( $H_0: \mu_d = \mu_f$ ). Source: Raw data retrieved from the TSPAKB's 2008 annual report.

Figure 1. Foreign investors' trend following behavior in the Turkish stock market

Panel A. Monthly net purchases & ISE National 100 index returns



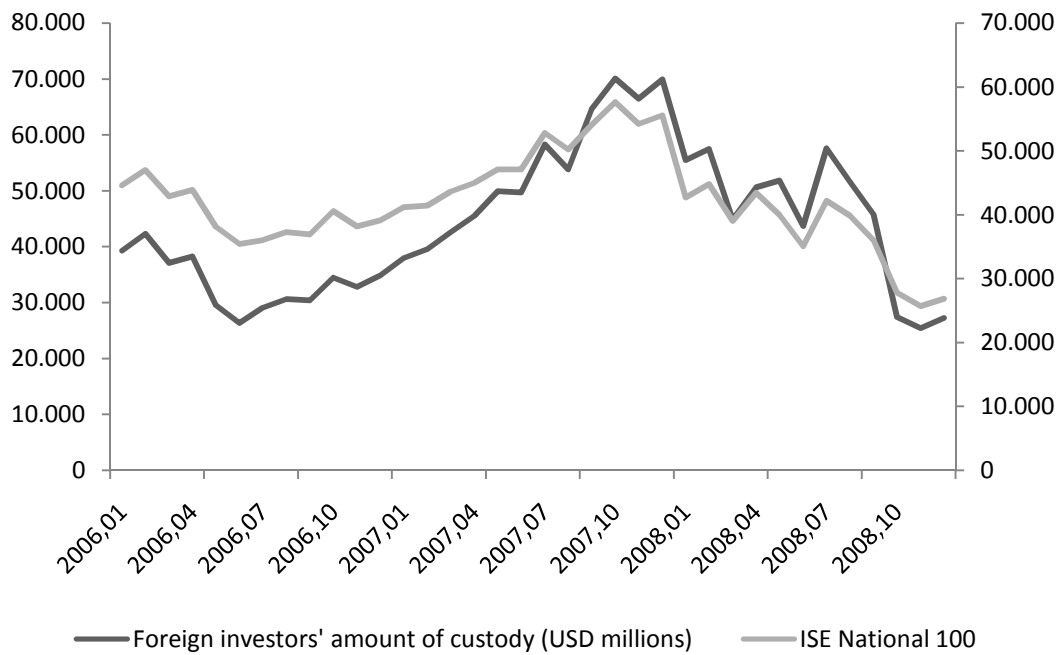
Panel B. Cumulated monthly net purchases & ISE National 100 index



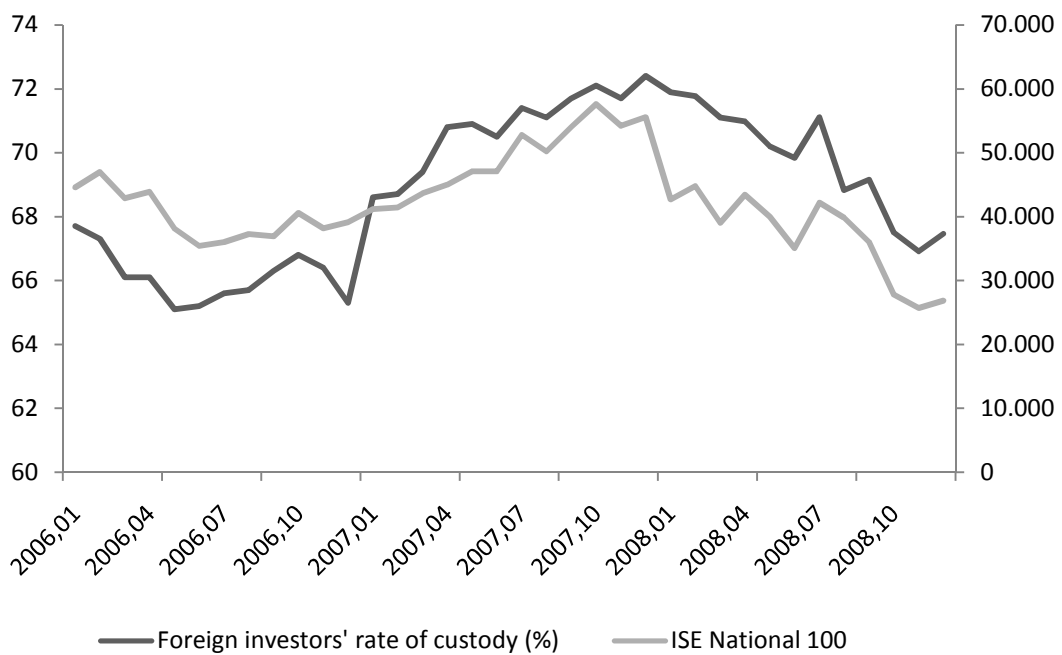
Notes: In panel A the bar graph plots foreign investors' monthly net equity purchases shown on the left axis and the returns on the broad market index (i.e. ISE National 100) are shown on the right axis. In panel B, the grey line shows the cumulated value of foreign investors' monthly net equity purchases (left axis) while the dashed line shows the time-evolution of the ISE National 100 index in levels (right axis).

Figure 2. Trend following behavior in foreign investors' portfolio holdings

Panel A. Foreign investors' amount of custody & ISE National 100 index



Panel B. Foreign investors' rate of custody & ISE National 100 index



Notes: The figure shows the time-path of foreign investors' amount (panel A) and rate (panel B) of custody against that of the ISE100 index from January 2006 to December 2008.





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