The Puzzling Evolution of the Home Bias, Information Processing and Financial Openness

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Abstract

This paper explains the home equity bias and its puzzling evolution in a model where investors face an information constraint and have an initial local informational advantage. After financial liberalization, local investors have a magnified informational advantage since information processed under autarky remains useful after liberalization. A gradual shift towards foreign assets occurs as the relevance of autarkic information declines over time. In the long run, home bias remains large due to the interaction between information and portfolio choices. Empirical evidence supports the main predictions of our model, namely that bias increases with information capacity and decreases with financial openness.

Keywords: Home Bias, Rational Inattention, Asymmetric Information, Portfolio Choice.

JEL Codes: F30, G15, D82, G11.

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1 Introduction

Although the international finance literature has proposed several explanations for the home bias puzzle documented by French and Poterba (1991) and Tesar and Werner (1995), none of these explanations are able to account for the gradual decrease in bias over the past two decades.

Since investors facing capital controls, transactions costs, or legal restrictions hold most of their assets domestically, one of the first explanations of home bias was the presence of institutional barriers to financial trade.[1] The financial liberalization that characterized the 1980s, however, was not followed by a significant decline in home bias, suggesting that institutional barriers alone provide only a partial explanation. In response, recent work has turned to behavioral-based models, arguing that investor-specific psychological attributes such as familiarity, regret, overconfidence, patriotism, and "narrow framing" behavior drive agents to hold a substantial portion of their equity portfolios domestically.[2] Extensive research has also been done on informational-based models of home bias but, in order to match empirical estimates of this bias, these models have to assume implausibly large information asymmetries.[3] Van Nieuwerburgh and Veldkamp (2009) solved this problem by allowing investors to learn about domestic or foreign information before deciding which assets to hold. Assuming investors have an informational advantage that makes local investment slightly less risky, the authors show that domestic investors only acquire information about domestic assets and, compared to the world portfolio, hold a greater proportion of these assets. Both behavioral- and informational-based models can thus explain the presence of home bias but they have yet to address its recent evolution. To this end, we extend the Van Nieuwerburgh and Veldkamp (2009) model in several directions. We first allow investors to choose among a more general class of private signals as in Mondria (2009) and then introduce dynamics to explain the time series behavior

[1] Black (1974), Stulz (1981), Tesar and Werner (1995), Ahearne, Griever and Warnock (2001), Cooper and Kaplanis (1994, Kraay et al (2005) and Adler and Dumas (1983) among others.

[2] Familiarity in Huberman (2001), regret in Solnik (2008), overconfidence in Barber and Odean (2001, 2002) and Karlsson and Norden (2007), patriotism in Morse and Shive (2009) and "narrow framing" behavior in Magi (2009).

[3] Coval and Moskowitz (1999), Portes and Rey (2005), Kang and Stulz (1997), Gordon and Bovenberg (1996), Brennan and Cao (1997), Zhou (1998) and Hatchondo (2008) among others.

of home bias. We also provide empirical evidence in support of a positive relationship between information processing capacity and home equity bias.

We present a noisy rational expectations model with rationally inattentive agents. The basic framework, which builds on Van Nieuwerburgh and Veldkamp (2009) and Mondria (2009), consists of two independent risky assets and a continuum of investors who face information processing constraints as in Sims (2003, 2006). Investors choose their attention allocation, which is formalized by choosing noisy signals about linear combinations of asset payoffs, and their asset holdings. The interaction between information and portfolio choices drives investors with a small local informational advantage to hold a portfolio dominated by domestic assets. As the fraction of their wealth invested in the local market increases, these investors then have an incentive to acquire even more information about domestic assets, compounding the initial advantage and magnifying home bias. The introduction of dynamics in asset payoffs and financial openness to the basic framework allows us to explain the gradual decrease of home bias over time. In the model, when a country is in financial autarky investors only process information about domestic assets. After financial markets are liberalized, investors are able to hold foreign assets and benefit from international diversification. However, since the information processed under autarky is still useful for predicting the payoffs of domestic assets shortly after financial liberalization, investors have an advantage in holding domestic assets. The diversification benefits of foreign assets are thus outweighed by the informational advantage in domestic assets and investors continue to hold most of their portfolios locally. As the relevance of the information processed under autarky declines over time, a gradual shift towards foreign assets occurs but a slight asymmetry in investors' prior beliefs renders this shift incomplete.

Using data for a panel of 19 developed countries over the period 1988-2004, we find that the key features of our model – informational advantage, information processing capacity, and financial openness – are able to explain at least 47% of the variation in home bias. We consider four different measures of information capacity: the average circulation of newspapers, the number of telephone mainlines, the number of mobile telephone subscribers and the number of people with internet access. Financial openness is captured using both *de facto* and *de jure* measures while the familiarity of domestic agents with foreign markets is proxied by the number of international departures from the home country for any purpose other than a remunerated activity in the country visited. Our estimates confirm that home bias decreases with financial openness, and increases with information capacity and with informational advantage, as predicted by our model.

The remainder of the paper is organized as follows: Section 2 presents a portfolio choice model with rationally inattentive investors to explain both the home equity bias and its puzzling evolution, Section 3 details our empirical analysis, and Section 4 concludes. All proofs and technical derivations are contained in the appendix.

2 The Model

Although the main purpose of this paper is to discuss the puzzling time path of home bias, we will first examine the static version of the model as an intermediary step.

2.1 Basic Setup

This model builds on Van Nieuwerburgh and Veldkamp (2009) and Mondria (2009). The economy consists of two countries populated by a continuum of investors with measure one. There are two types of investors: a fraction λ of home investors and a fraction $1-\lambda$ of foreign investors. Investors can hold three types of assets: a riskless asset that pays R units of the consumption good, a risky domestic asset and a risky foreign asset. The two risky assets are independent and normally distributed.

As in Van Nieuwerburgh and Veldkamp (2009), home and foreign investors have different priors about the asset payoff vector $\tilde{R}$. In particular, investors are assumed to have an initial advantage in processing information about their home country's assets. This advantage is modeled as a lower variance in prior beliefs. Letting $\tilde{r}_{i,j} \sim N\left(\bar{r}_j, \sigma^2_{r,ij}\right)$ denote investor i's prior about the payoff of asset j, the priors of a home investor are $\tilde{R}_h = (\tilde{r}_{h,h}, \tilde{r}_{h,f})'$ where $\tilde{r}_{h,h} \sim N\left(\bar{r}_h, \sigma^2_{r,h}\right)$ and $\tilde{r}_{h,f} \sim N\left(\bar{r}_f, \phi\sigma^2_{r,f}\right)$. Similarly, the priors of a foreign investor are

$\tilde{R}_f = (\tilde{r}_{f,h}, \tilde{r}_{f,f})'$ where $\tilde{r}_{f,h} \sim N\left(\bar{r}_h, \phi\sigma^2_{r,h}\right)$ and $\tilde{r}_{f,f} \sim N\left(\bar{r}_f, \sigma^2_{r,f}\right)$. In both cases, $\phi \geq 1$. The mean vector and the diagonal variance-covariance matrix of $\tilde{R}_h$ are denoted by $\bar{R}$ and $\Sigma_{R,h}$ respectively. The mean vector and the diagonal variance-covariance matrix of $\tilde{R}_f$ are denoted by $\bar{R}$ and $\Sigma_{R,f}$ respectively. The numeraire in the market is the price of the bond and $\tilde{P} = (\tilde{p}_1, \tilde{p}_2)'$ is the price vector of the risky assets. The net supply of risky asset j is given by the realization of the random variable $\tilde{z}_j \sim N\left(\bar{z}_j, \sigma^2_{z,j}\right)$. Let $\bar{Z}$ and Σ_Z denote the mean vector and the diagonal variance-covariance matrix of the vector of net supply $\tilde{Z} = (\tilde{z}_1, \tilde{z}_2)'$. Asset supply randomness can be viewed as the result of liquidity traders and is necessary in order to avoid the perfect revelation of private information through prices.

In our static model, investors live for four periods. In the first period, they receive an initial wealth endowment, W_{i0}, and an information processing capacity, κ. In the second period, investors decide on an optimal attention allocation between the two countries. In the third period, after observing prices and receiving a private signal that depends on the attention allocation, investors choose their optimal asset demands. In the last period, investors consume their portfolios.

2.1.1 Information Processing

As in Mondria (2009), the attention allocation decision consists of two separate choices . First, investors decide on a form for their private signal (i.e., whether they want to receive information about the payoffs of individual assets or the payoffs of linear combinations of assets). Second, given the form of the private signal, investors decide how much information to process about each risky asset. Investors would like to choose a private signal that eliminates uncertainty about asset payoffs, but they are limited by an information processing constraint.

Investors are constrained to choose a signal of the following form

$$\tilde{Y}_i = C_i\tilde{R} + \tilde{\varepsilon}_i \text{ where } \tilde{\varepsilon}_i \sim N(0, \Sigma_i)$$

where C_i is any 2×2 matrix, $\tilde{\varepsilon}_i$ is independent of $\tilde{R}$, $\tilde{\varepsilon}_i$ is independent of $\tilde{\varepsilon}_k$ for $i \neq k$ and Σ_i is the variance-covariance matrix of $\tilde{\varepsilon}_i$. Private signals provide information about linear combinations of asset payoffs and the precision of a particular signal is higher when more attention is allocated to it. Investors find the optimal form of the posterior variance-covariance of asset payoffs, which is not initially constrained to be diagonal, by choosing the matrix of weights, C_i, and the variance-covariance matrix of the error term, Σ_i, in the private signal, subject to their information processing constraint. The information extracted from the optimal private signal is then incorporated into the investor's beliefs through rational Bayesian updating.

Following Sims (2003, 2006), we use concepts of information theory to quantify the information content of a private signal. Information is defined as a reduction in uncertainty where the uncertainty about a random variable X is measured by its entropy, $H(X)$. Since investors observe prices, $\tilde{P}$, and private signals, $\tilde{Y}_i$, in order to reduce uncertainty about their asset payoffs, $\tilde{R}$, the information processing constraint can be formalized as a restriction on the entropy reduction generated by these observations

$$H(\tilde{R}) - H\left(\tilde{R} \mid \tilde{Y}_i, \tilde{P}\right) \leq \kappa$$

Although prices are observable, they enter the constraint because investors use capacity when extracting information from them.[4] Assuming Gaussian distributions for both asset payoffs and private signals, the information processing constraint can be rewritten as

$$\ln\left|Var_i(\tilde{R})\right| - \ln\left|Var_i\left(\tilde{R} \mid \tilde{Y}_i, \tilde{P}\right)\right| \leq 2\kappa \tag{1}$$

where $\left|Var_i(\tilde{R})\right|$ is the determinant of the matrix $Var_i(\tilde{R})$.[5]

Given absolute risk tolerance parameter ρ, investors maximize their mean-variance objective function

$$EU_i = E\left(E\left[W_i' \mid \tilde{Y}_i, \tilde{P}\right] - \frac{1}{2\rho} Var\left[W_i' \mid \tilde{Y}_i, \tilde{P}\right]\right) \tag{2}$$

[4] The results of the paper are robust to other information processing constraints (i.e., Mondria (2009)'s constraint). See the additional appendix for more details.

[5] The entropy of a multinormal random variable $X \sim N(\bar{X}, \Sigma)$ is given by $H(X) = \frac{1}{2}\log\left((2\pi e)^n |\Sigma|\right)$, where $|\Sigma|$ is the determinant of Σ.

subject to the budget constraint

$$W_i' = W_{i0}R + X_i'(\tilde{R} - R\tilde{P})$$

where W_{i0} is the initial wealth of agent i, $X_i = (x_{i,1}, x_{i,2})'$ is the asset holdings vector of agent i, $\tilde{R}$ is the vector of risky asset payoffs and $\tilde{P}$ is the price vector of the risky assets. The market clearing condition is given by $\int_0^1 X_i di = \tilde{Z}$.

2.1.2 Solution

The model is solved using backward induction. First, given an arbitrary attention allocation, investors choose their optimal asset holdings. Second, given the optimal holdings for each attention allocation, investors choose the optimal attention allocation.

Optimal Asset Holdings In the third period, after observing private signals and asset prices, investors form posterior beliefs about asset payoffs in order to choose an optimal portfolio. The resulting asset holdings are given by

$$X_i\left(\tilde{Y}_i, \tilde{P}\right) = \rho Var_i\left[\tilde{R} \mid \tilde{Y}_i, \tilde{P}\right]^{-1} E\left[\tilde{R} - R\tilde{P} \mid \tilde{Y}_i, \tilde{P}\right] \quad (3)$$

Aggregating these asset demands and imposing market clearing conditions as in Admati (1985) then yields the rational expectations equilibrium price.

Proposition 1 *There exists a unique linear rational expectations equilibrium price that depends on both market aggregates*

$$\tilde{P} = A_0 + A_1\tilde{R} - A_2\tilde{Z}, \text{ with } A_2 \text{ nonsingular}$$

The conditional distribution of $\tilde{R}$ given private signal $\tilde{Y}_i$ and equilibrium price vector $\tilde{P}$ is multivariate normal with variance-covariance matrix

$$V_i = Var_i\left[\tilde{R} \mid \tilde{Y}_i, \tilde{P}\right] = \left(\Sigma_{Ri}^{-1} + \Pi\Sigma_Z^{-1}\Pi + C_i'\Sigma_i^{-1}C_i\right)^{-1} \quad (4)$$

where $\Pi = \left[\int_0^1 \rho C_i' \Sigma_i^{-1} C_i di\right]$. *Moreover, the optimal asset holdings of investor i are given by*

$$X_i\left(\tilde{Y}_i, \tilde{P}\right) = G_{0i} + G_{1i}\tilde{Y}_i - G_{2i}\tilde{P}$$

Expressions for A_0, A_1, A_2, G_0, G_1 *and* G_2 *are in the appendix.*

Optimal Attention Allocation In the second period, investors choose the form of their private signal along with the amount of information they want to process about each market.

The objective function for the second period is obtained by substituting the optimal asset holdings given by (3) into the objective function given by (2). The objective function can then be written as[6]

$$EU_i = RW_{i0} + \frac{\rho}{2}\left\{Tr\left(V_i^{-1}Q_i - I\right) + ER'V_i^{-1}ER\right\} \tag{5}$$

where $Tr(X)$ is the trace of matrix X, V_i is given by (4), $ER = (er_h, er_f)'$ are the expected excess returns given by

$$\begin{aligned} ER = E & \left[E\left(\tilde{R} \mid \tilde{Y}_i, \tilde{P}\right) - R\tilde{P}\right] \\ = & (I - RA_1)\bar{R} - RA_0 + RA_2\bar{Z} \end{aligned} \tag{6}$$

and Q_i is the unconditional variance of the excess returns

$$\begin{aligned} Q_i &= Var_i\left(\tilde{R} - R\tilde{P}\right) \\ &= \Sigma_{Ri} + R^2 A_1 \Sigma_{Ri} A_1' + R^2 A_2 \Sigma_Z A_2' - RA_1\Sigma_{Ri} - R\Sigma_{Ri}A_1' \end{aligned} \tag{7}$$

In the second period, investors maximize the objective function given by (5) subject to the information constraint given by (1). The following lemma shows that investors choose to observe one linear combination of both risky assets as a private signal.

[6] The derivation of the objective function can be found under the proof of Lemma 1 in the additional appendix.

Lemma 1 *Each investor allocates all the limited capacity, κ, to learn about one linear combination of asset payoffs given by $\tilde{Y}_i = c_{ih}\tilde{r}_h + c_{if}\tilde{r}_f + \tilde{\varepsilon}_i$.*

Because the matrix of weights in the private signal, $C_i = (c_{ih}, c_{if})$, is a 1×2 matrix, the variance-covariance matrix of the error term in the signal, Σ_i, is a scalar. The higher the variance of $c_{ih}\tilde{r}_h$, the more information the signal contains about the domestic asset. Similarly, the higher the variance of $c_{if}\tilde{r}_f$, the more information the signal contains about the foreign asset. Because investors are only concerned about the relative weight that each risky asset has in the private signal, we normalize the matrix of weights so that $c_{ih} = 1$ and, therefore, $C_i = (1, c_{if})$. The next proposition shows that, if there is no informational advantage and a particular parameter restriction is satisfied, then there exists a unique, linear, symmetric rational expectations equilibrium in which all investors choose the same linear combination for the private signal.

Proposition 2 *If there is no informational advantage (i.e., $\phi = 1$) and the parameters are such that $Q^*_{hf} > -\bar{Q}^*$ (expressions for Q_{hf} and $\bar{Q}^*$ are located in the appendix), then there exists a unique, linear, symmetric rational expectations equilibrium private signal. In this equilibrium, all investors allocate their attention to learn about the same linear combination of asset payoffs, namely $C = (1, c^*_f)$, and choose the same variance for the error term, Σ^*, in the private signal.*

The parameter condition prevents the equilibrium covariance of excess returns, Q^*_{hf}, from being too negative. Because investors are interested in holding a diversified portfolio, they choose a linear combination of payoffs to serve as their private signal. If there is no informational advantage, then there is no home bias as both domestic and foreign investors choose the same attention allocation.

The following proposition shows that if home investors have an informational advantage in domestic assets, then different types of investors choose different private signals.

Proposition 3 *A home investor with a local informational advantage (i.e., $\phi > 1$) optimally processes more information about domestic assets than does a foreign investor.*

If there is local informational advantage, home investors optimally choose to observe a private signal that puts more weight on the domestic asset. Thus, domestic investors tilt their portfolios towards domestic assets. As a consequence, the initial informational advantage is magnified and there is a home bias as shown in the following sections.

2.1.3 Numerical Example: Investment Specialization

The interaction between investment and attention decisions drives investors to specialize in processing information about the asset in which they have an initial advantage. Intuitively, the more information investors have about an asset, the higher their holdings of that asset will be. Furthermore, as the amount invested in a particular asset increases, so too will investors' incentives to acquire and process information about it.

We run a numerical example to show the optimal investment specialization.[7] In our simulations, home and foreign assets have an expected payoff of 3 and a standard deviation of 20%. Domestic investors have an initial advantage of 10% in domestic assets so that $\phi = 1.1$. Following Ahearne, Griever and Warnock (2004), home bias is defined as

$$Home\ Bias = 1 - \frac{Share\ of\ foreign\ equities\ in\ U.S.\ Portfolio}{Share\ of\ foreign\ equities\ in\ World\ Portfolio}$$

As we can see in Figure 1, as long as the information processing capacity, κ, is positive, domestic investors tilt their portfolios towards the domestic asset and the initial informational advantage is magnified. In particular, Figure 1 shows that, although the home bias generated by the initial advantage is small, the optimal level of specialization leads to a substantial amount of bias. Indeed, the bias that prevails under optimal specialization is only slightly smaller than that which prevails under full specialization. If, as in Proposition 2, there is no informational advantage, then all investors hold the same portfolio and there is no home bias.

[Insert Figure 1 about here]

A testable implication of the model is that home bias increases with information processing

[7] The parameter values are as follows: $\lambda = 0.5, \sigma_{rh} = \sigma_{rf} = 0.2$, $\bar{r}_h = \bar{r}_f = 3$, $\sigma_{zh} = \sigma_{zf} = 20$, $\bar{z}_h = \bar{z}_f = 16$, $\rho = 0.5$. The results are robust to changes in all the parameters.

capacity. Intuitively, the amount of home equity bias depends on the amount of information the domestic investor has relative to the average investor. With more information processing resources, the knowledge wedge between the domestic investor and the average investor increases, amplifying home bias. Figure 2 illustrates the positive relationship between attention allocated to domestic assets and information processing capacity. Investor i's attention allocation to home assets is defined as the home asset's weight in the private signal relative to the foreign asset's weight and is given by $\frac{\sigma^2_{r,ih}}{c^2_{if}\sigma^2_{r,if}}$. Attention allocation to home assets is of this form as the private signal contains more information about the home asset when the variance of $\tilde{r}_h$ is high and/or when the variance of $c^*_{if}\tilde{r}_f$ is low.

[Insert Figure 2 about here]

2.2 Introducing Dynamics

In this section, we add dynamics to the static model in order to explain the evolution of home bias over time. We introduce persistence by assuming that asset payoffs follow an autoregressive process. As shown in the previous section, investors specialize in processing information about assets in which they have an initial advantage. When asset payoffs exhibit some degree of persistence, information processed about payoffs in the current period is also useful for processing information about payoffs in the following period. Consequently, investors find it optimal to process more information about domestic assets in every period and the initial advantage is magnified.

2.2.1 Persistent Asset Payoffs

Assume that asset payoffs can be characterized by an $AR(1)$ process. In particular,

$$\tilde{R}_{t+1} = F\tilde{R}_t + \tilde{v}_{t+1} \text{ where } \tilde{v}_{t+1} \sim N(\bar{\nu}, \Sigma_v)$$

$$\Sigma_v = \begin{pmatrix} \sigma^2_{v,h} & 0 \\ 0 & \sigma^2_{v,f} \end{pmatrix} \text{ and } F = \begin{pmatrix} f & 0 \\ 0 & f \end{pmatrix} \text{ where } 0 < f < 1$$

Investor i's beliefs about asset j are now given by $\tilde{v}_{i,j} \sim N\left(\bar{\nu}_j, \sigma^2_{v,ij}\right)$. As in the basic setup, the home investor has an initial advantage in processing information about home assets $\tilde{v}_{h,h} \sim N\left(\bar{\nu}_h, \sigma^2_{v,h}\right)$ and $\tilde{v}_{h,f} \sim N\left(\bar{\nu}_f, \phi\sigma^2_{v,f}\right)$ where $\phi \geq 1$, while the foreign investor has an initial advantage in processing information about foreign assets $\tilde{v}_{f,h} \sim N\left(\bar{\nu}_h, \phi\sigma^2_{v,h}\right)$ and $\tilde{v}_{f,f} \sim N\left(\bar{\nu}_f, \sigma^2_{v,f}\right)$ where $\phi \geq 1$. The unconditional variance of asset payoffs is given by $Var_i(\tilde{r}_{jt}) = \frac{\sigma^2_{v,ij}}{(1-f^2)}$, while the variance conditional on the information set in period t, $I_{i,t} = \left\{\tilde{Y}_{i,h}, \tilde{P}_h\right\}_{h=0}^{h=t}$, is given by

$$U_{i,t,t+1} = Var_i(\tilde{R}_{t+1} \mid I_{i,t}) = FV_{i,t,t}F + \Sigma_v \text{ where } V_{i,t,t} = Var_{i,t,t}(\tilde{R}_t \mid I_{i,t}) \tag{8}$$

Each period, new assets that pay off at the end of the period are issued. There are no multi-period lived assets. For tractability, we assume that in each period t a continuum of two-period lived investors is born with an initial wealth endowment. Before dying, each investor i gives her information to the investor i born next period.[8] Each period, investors are constrained to choose a signal of the following form $\tilde{Y}_{i,t+1} = C_{i,t+1}\tilde{R}_{t+1} + \tilde{\varepsilon}_{i,t+1}$ where $\tilde{\varepsilon}_{i,t+1} \sim N(0, \Sigma_{i,t+1})$ and face an information constraint that restricts the amount of information they can process. Investors choose a private signal that reduces their uncertainty by

$$\ln\left|Var_i(\tilde{R}_{t+1} \mid I_{i,t})\right| - \ln\left|Var_i\left(\tilde{R}_{t+1} \mid I_{i,t}, \tilde{Y}_{i,t+1}, \tilde{P}_{t+1}\right)\right| \leq 2\kappa \tag{9}$$

The information constraint limits the reduction in the posterior variance-covariance matrix of asset payoffs. The conditional variance of R_{t+1} after prices and the private signal have been observed is given by

$$Var_i\left(\tilde{R}_{t+1} \mid I_{i,t}, \tilde{Y}_{i,t+1}, \tilde{P}_{t+1}\right) = \left(U^{-1}_{i,t,t+1} + \Pi_{t+1}\Sigma_Z^{-1}\Pi_{t+1} + C'_{i,t+1}\Sigma^{-1}_{i,t+1}C_{i,t+1}\right)^{-1} \tag{10}$$

where $\Pi_{t+1} = \left[\int_0^1 \rho C'_{i,t+1}\Sigma^{-1}_{i,t+1}C_{i,t+1}di\right]$ and $U_{i,t,t+1}$ is given by equation (8).

[8] This assumption is taken from Bacchetta and Van Wincoop (2006) in order to avoid a solution with infinitely higher-order expectations. Indeed, this technical difficulty is the reason why most noisy rational expectations models are static. For an overview, see Brunnermeier (2001).

2.2.2 Numerical Example: Home Bias Magnified

This section illustrates the implications of the model when payoffs are persistent.[9] In Figure 3, we observe the magnification of home bias when asset payoffs are persistent, $f = 0.9$.[10] In the static model, investors capitalize on their initial informational advantage and allocate more attention to domestic assets. The reduction in the posterior variance of domestic asset payoffs is thus greater than the reduction for foreign asset payoffs. When asset payoffs are persistent, information processed in the current period can be used to process information about future asset payoffs, yielding a greater informational advantage in the following period and giving domestic agents an incentive to hold more and more domestic assets.

[Insert Figure 3 about here]

As investors tilt their portfolios towards domestic assets, more information is required about these assets and the attention allocated to them increases. Figure 4 illustrates the increasing time path of the attention allocation to domestic markets.

[Insert Figure 4 about here]

The introduction of persistent asset payoffs increases home bias by fifteen percentage points relative to the static model and generates a home bias of almost 60% when $\kappa = 0.6$. In terms of dynamics, it generates an increase in home bias over time.

2.2.3 The Puzzling Evolution of Home Bias

Figure 5, reproduced from Ahearne, Griever and Warnock (2004),[11] shows the evolution of the share of domestic equities and the evolution of home bias in the US portfolio from the first quarter of 1980 to the last quarter of 2000. Between 1980 and 1985, US investors had

[9] The parameterization is as in the previous section.

[10] Note that asset payoffs are not the same as equity returns, which have almost zero autocorrelation. Persisent asset payoffs are approximated by estimating the first-order autocorrelation of the annual price levels for the Dow Jones Industrial Average, the NYSE Composite and the S&P 500 indices between 1980 and 2004. See Appendix B for details. The autocorrelations range from 0.88 to 0.91, which is similar to that of Veldkamp (2006).

[11] We would like to thank Frank Warnock for kindly providing us with the data for this graph.

on average 98.5% of their portfolios in domestic equities and, as a result, home bias averaged a high of 96.8% during that period. Up until the mid 1980's, there were many barriers to the international trade of assets and, as a consequence, the volume of financial trades was meager. Based on both de jure and de facto measures, there was very little financial openness and developed economies were essentially in financial autarky. In the late 1980's, institutional restrictions to international financial investment were removed in most developed economies. This deregulation led to a gradual decrease in home bias, which reached a level of 78% in 2000.

[**Insert Figure 5 about here**]

With only persistence in asset payoffs, the preliminary results obtained in the previous sections suggest that home bias should have increased significantly over the past few decades since past information is useful for processing information about the current state of the economy. Nonetheless, it is only when we combine financial openness with persistent payoffs that we are able to explain the time series behavior of home bias. In the following numerical example, we use our model to simulate the portfolio choices of a country that is forced to live in financial autarky for five periods before opening up to financial transactions. As we will see, the simulated path mimics the path described by actual data.

2.2.4 Numerical Example: Adding Financial Openness

When there are many restrictions on the international trade of assets, as was the case in the 1970's, countries effectively behave as financial autarkies. If investors are only allowed to hold domestic assets, they will only process information about domestic assets. If, in contrast, markets are opened to the rest of the world, investors have an incentive to hold foreign assets in order to obtain gains from diversification. This then requires that they begin processing information about foreign markets. The shift to processing foreign information, however, will be slow since investors emerging from financial autarky will have accumulated a large local informational advantage. Because past information is useful in processing information about future asset payoffs, investors will smooth their transition towards holding foreign assets and home bias will only decrease gradually through time.

In Figure 6, asset payoffs are persistent and investors are banned from investing in foreign assets for 5 periods (years). During those 5 periods then, they only hold and process information about domestic assets. After 5 periods, foreign markets are opened and investors have a diversification incentive to hold foreign assets. Initially, there is a substantial jump in home bias as foreign markets are opened swiftly and in an unanticipated manner. There are no sovereign risk problems, there is no transition into the open economy and all information is immediately available to foreign investors. However, domestic investors continue to hold mostly domestic assets as they are able to benefit from the fact that they have already processed large amounts of information regarding those assets. Over time though, the information processed under autarky becomes less relevant and the diversification benefits of foreign assets increase relative to the informational advantage in domestic assets, generating a gradual decline in home bias. Nevertheless, the interaction between optimal attention allocation and optimal portfolio choice implies that, even in the new steady state, there is a substantial home bias. The better the information about domestic assets, the higher the domestic asset holdings. Furthermore, the higher the demand for domestic assets, the greater the incentive to process information about them. Therefore, because a small asymmetry in investors' prior beliefs still exists in the new steady state, domestic investors optimally choose a portfolio with mostly domestic assets.

[Insert Figure 6 about here]

Figure 6 shows the gradual transition from the pre-liberalization equilibrium to the post-liberalization equilibrium. In Figure 7, we observe how the attention allocated to domestic assets behaves after markets open to financial trade. If the economy is in autarky, the amount of attention allocated at home is infinite. When the economy opens, attention allocated to domestic assets decreases over time because investors start holding and allocating attention to foreign assets.

[Insert Figure 7 about here]

The introduction of financial autarky into the model generates a smooth decline in home bias followed by stabilization in the new post-liberalization steady state.[12]

The transition to the post-liberalization steady state is illustrated in Figure 8 for different levels of initial local informational advantage, ϕ, when investors have information capacity $\kappa = 0.6$. The model predicts that countries with a larger initial informational advantage have a more substantial home equity bias.

[Insert Figure 8 about here]

2.3 Discussion

The main difference relative to Van Nieuwerburgh and Veldkamp (2009) is that we do not constrain the matrix of weights in the private signal to be the identity matrix - that is, we do not impose $C_i = I$. Therefore, even if the risky assets are *ex ante* independent, we do not assume independence from uncertainty across assets *ex post*.

As shown in Lemma 1, for any matrix of weights in the private signal, investors decide to allocate all their attention to one private signal. If $C_i = I$, then investors fully specialize in learning about one asset by choosing either a signal about the domestic asset or a signal about the foreign one.

Since home bias with optimal specialization in our model is slightly lower than that in the full specialization environment of Van Nieuwerburgh and Veldkamp (2009), Figure 1 essentially shows that the results on home bias generated by these authors are robust to removing the restriction on the posterior variance-covariance matrix.

However, the dynamic version of Van Nieuwerburgh and Veldkamp (2009) is not able to explain the evolution of home bias. Figure 9 illustrates the dynamics of home bias after financial liberalization under the assumption that $C_i = I$. When explaining the evolution of home bias, we assume that investors are allowed to hold only domestic assets for the first 5 periods. This assumption is intended to approximate the financially autarkic nature of the 1970's. For the first 5 periods then, investors face a univariate problem and the information

[12] This finding is consistent with Karolyi and Stulz (2003) and Kho, Stulz, and Warnock (2009). They argue there is an apparent plateau in the time path of US home bias after 1994.

constraint for home investors can be written as

$$\ln |Var_i(\tilde{r}_{h,t+1} \mid I_{i,t})| - \ln |Var_i(\tilde{r}_{h,t+1} \mid I_{i,t+1})| \leq 2\kappa$$

where $Var_i(\tilde{r}_{h,t+1} \mid I_{i,t}) = f^2 Var_i(\tilde{r}_{h,t} \mid I_{i,t}) + \sigma^2_{v,h}$. In the univariate case, the information flow constraint has the following steady state: $Var_i(\tilde{r}_{h,t} \mid I_{i,t}) = Var_i(\tilde{r}_{h,t+1} \mid I_{i,t+1}) = \frac{\sigma^2_{v,h}}{\exp(2\kappa) - f^2}$. Before financial liberalization (period $t \leq 5$), the dynamics generated by our model are the same as the dynamics under Van Nieuwerburgh and Veldkamp (2009) because our investors still only process information about one asset and the information flow constraint is moving towards its steady state. Once the markets are opened, however, the dynamics of the two models differ. In Van Nieuwerburgh and Veldkamp (2009), following liberalization, there is an immediate drop in equity home bias because investors purchase foreign assets. There is no gradual decrease in home bias because investors keep processing only information about domestic assets and thus keep moving towards the univariate steady state. In our paper, because investors have a diversification incentive to hold foreign assets, they choose to process information about both assets. This then tilts the portfolio of domestic investors away from autarky, prompting domestic investors to gradually process more and more information about foreign assets and moving them towards a new steady state.

[Insert Figure 9 about here]

3 Empirical Evidence

Numerical simulations of the model presented in this paper yield three basic predictions: (1) home bias increases with (domestic) informational advantage; (2) home bias decreases with financial openness; and (3) home bias increases with information capacity. In this section, we test these predictions.

3.1 Data

The data set includes measures of home bias, information capacity and financial openness for the following 19 industrialized countries over the period 1988-2004: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Italy, Japan, Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States.[13] Table 1 to Table 3 present summary statistics.

[Insert Table 1, 2 and 3 about here]

3.1.1 Home Bias

For each country i in each year t, we use market capitalization data from the World Bank's *World Development Indicators* database to calculate the share of foreign equities in the world portfolio, sfe_{it}^{world}.[14] We combine this data with data on international investment positions in equity securities (both in assets and liabilities) from the IMF's *International Financial Statistics* database to calculate the share of foreign equities in country i's portfolio, $sfe_{it}^{country}$. Based on these two shares, we can then calculate the degree of home bias, hb_{it}, using the following definition from Ahearne, Griever and Warnock (2004):

$$hb_{it} = 1 - \frac{sfe_{it}^{country}}{sfe_{it}^{world}}$$

3.1.2 Information Capacity

Sims (2006) emphasizes the distinction between limitations in "wiring" capacity and limitations in internal human capacity. Wiring capacity refers to periodical subscriptions, telephone lines, internet connections and other communication technologies that allow agents to access information that is freely available in the outside world. Internal human capacity, on the other hand, refers to human decision making limitations or, more precisely, how efficiently the information accessed through the "wires" is used when real actions are taken. In this paper,

[13] We started with the 22 industrialized countries, but we eliminated three countries that only had observations for less than half of the time span.

[14] The term "foreign" is from point of view of country i.

we focus on wiring capacity since its measurement is less subjective.

The World Bank's *World Development Indicators* database includes four different measures of "wiring" capacity: the average circulation (or copies printed) of *newspapers* that publish at least four times a week, the number of *telephone* mainlines, the number of *mobile* telephone subscribers and the number of people with *internet* access.

In our baseline specification, we choose telephone lines as the primary indicator of a country's communication technology. This choice is based on several reasons. First, unlike the *newspapers* series, data on *telephone* mainlines is available for all countries in almost every year of our sample. Second, as opposed to *internet* or *mobile* phones which only became popular in the late 1990's, fixed *telephone* lines were a mature technology throughout our sample. Third, our choice is consistent with the cross-border equity flows analysis of Portes and Rey (2005) who show that *telephone* call traffic is a good proxy for the overall information flow between two countries. Fourth, Comin, Hobijn and Rovito (2006) report on page 4 that "the median correlation of country ranking across technologies within the OECD is 0.54", so a country with a high *telephone* mainline capacity is likely to have a high capacity in other telecommunication technologies.[15]

In what follows, our main measure of a country's information capacity is $telephone_{it}^{norm}$: the number of telephone mainlines per 1,000 people normalized by GDP per capita (in thousands of US dollars). The intuition behind this normalization is that we want to compare the channel capacity available to individuals when they are taking real actions with similar economic value. In practical terms, we are calculating the average number of phone lines available to 1,000 individuals when each individual is engaging in an economic activity that is worth $1,000 of his own annual income. The following example illustrates the effect of our normalization. Imagine that we would like to compare two individuals. In a given year, individual A has one phone line and produces $1,000 worth of economic activity. Individual B, on the other hand, has two phone lines and produces $4,000 worth of economic activity. Without normalization, we would say that individual B has a greater channel capacity. With normalization, however, we

[15] Their analysis, however, is not limited to telecommunication technologies. They also consider technologies in areas such as agriculture, finance, health, steel, textile, tourism and transportation.

take into account that individual B only has half a phone line available for every action worth \$1,000 and conclude that A has the greater capacity. We will also consider specifications where $telephone_{it}^{norm}$ is replaced by the total number of telephone lines within a country, $telephone_{it}^{total}$, or the number of telephone lines per 1,000 people, $telephone_{it}^{per1000}$.

The same normalizations will be applied to the three other measures of information capacity in our robustness checks. That is, we will also present results using $newspapers$, *internet* and *mobile* as explanatory variables and enter these variables either as total numbers, numbers per 1,000 people or numbers per 1,000 people normalized by GDP per capita.

3.1.3 Financial Openness

We also include two measures of financial openness: the Chinn-Ito Index of Financial Openness from Chinn and Ito (2006), $finopen_{it}^{CI}$, and the Lane-Milesi-Ferretti Measure of International Financial Integration from Lane and Milesi-Ferretti (2007), $finopen_{it}^{LMF}$. The Chinn-Ito Index is the standardized principal component of four binary dummy variables reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*. These variables are: (1) the presence of multiple exchange rates, (2) the existence of restrictions on current account transactions, (3) the existence of restrictions on capital account transactions, and (4) the requirement that export proceeds be surrendered. The Lane-Milesi-Ferretti volume-based measure of International Financial Integration is constructed as the sum of a country's stocks of external assets and liabilities divided by its GDP and has the same intuition as volume-based measures of trade openness which divide the sum of exports and imports by GDP.

Figures 10 and 11 show the evolution of the two different measures of financial openness from 1970 to 2004. The Chinn and Ito Capital Openness Index is a *de jure* measure of financial openness that focuses on regulatory restrictions on capital account transactions reported by the IMF. The Lane-Milesi-Ferretti measure of International Financial Integration is a *de facto* measure of financial openness based on the volume of a country's stocks of external assets and liabilities relative to its GDP. The US illustrates the difference between the two indices. Since the US has never officially imposed capital account restrictions as defined by the IMF, it has registered the maximum level of *de jure* financial openness throughout the period. On the other hand, actual US financial flows reveal that the US has been less financially open relative to both the average industrialized country and the average emerging market economy. Differences aside, however, both indices tell the same story when we look at the time path of average financial openness for developed and emerging economies. In the 1970's, the world was almost in financial autarky and there was very little *de jure* and *de facto* financial openness. The many barriers to international trade in assets led to a very small volume of financial trade until the 1980's when institutional restrictions on international financial investment were removed in most developed economies and the Chinn and Ito Capital Openness Index increased sharply to a level close to the maximum around 1993. Clearly, the actual volume of financial trade responded to a higher degree of liberalization. The average sum of financial assets and liabilities divided by GDP for the developed economies doubled from less than 1 in 1980 to almost 2 in 1995 before reaching 4.5 in 2004.

[**Insert Figure 10 and 11 about here**]

We consider both types of financial openness measures in our analysis since each has its own drawbacks. The main weakness of the *de jure* measures is that investors may find ways to circumvent capital account restrictions, nullifying the expected effect of the regulatory capital controls. The main weakness of the *de facto* measures, on the other hand, is that they may reflect changes in macroeconomic conditions even if there are no regulatory changes for capital account transactions. However, as we will see later on, our results are robust to the choice of financial openness indicator.

3.1.4 Familiarity

We use a measure of the home country's familiarity with foreign countries to proxy domestic informational advantage - or, more specifically, the inverse of domestic informational advantage. This variable, $int'l\ departure$, is the number of departures (per 1,000 people) made from the country of usual residence to any other country for any purpose other than a remunerated activity in the country visited. The higher this number, the more familiar domestic residents are expected to be with foreign cultures and, therefore, the smaller the informational differential between home and foreign markets. According to our model, the higher the familiarity effect, the smaller the informational advantage and, theoretically, the lower the home bias.

It is interesting to note that our measure of familiarity includes only non-business related international departures. The exclusion of business related international travel is particularly important for endogeneity reasons. It is not unusual for the number of international business trips to increase with the amount invested abroad, making reverse causality an issue. By excluding international business trips, we are more likely to capture the effect of generally-induced familiarity on portfolio investment decisions.

3.2 Estimation Output

3.2.1 Basic Specification

In our basic specification, home bias is the dependent variable while the number of telephone mainlines per 1,000 people normalized by GDP per capita and the Lane-Milesi-Ferretti volume-based measure of International Financial Integration (i.e., the *de facto* measure of financial openness) are the main explanatory variables.[16] Table 4 presents the estimation results.

The first equation does not control for time or country effects. We can see that financial openness and information capacity alone are able to explain 47% of the variation in home bias in our panel. Moreover, the coefficients on both variables are significant at the 1% significance level and have the expected sign. In particular, a 1% increase in our measure of financial openness decreases the level of home bias by approximately 0.24% while a 1% increase in our measure of information capacity increases home bias by about 0.22%.

In the second equation, we include time dummy variables to control for omitted variables that vary across time but not across countries. The values of the original coefficients are only marginally changed and the R^2 increases slightly from 47% to 50%. In the third equation, we include only country dummies (i.e., fixed effects) in order to control for omitted variables that vary across countries but not across time. We observe a significant increase in the R^2 to

[16] All variables are in logs so that the coefficients can be interpreted as elasticities.

69%. Both coefficients remain significant at the 1% significance level, but there is a significant increase in the magnitude of the coefficient associated with our measure of information capacity. The fourth equation includes both time and country dummies. The R^2 increases further to 75% and both coefficients retain the expected signs. Their significance, however, is reduced to the 5% level. The magnitude of the home bias elasticity with respect to financial openness is also reduced. In particular, an increase of 1% in the Lane-Milesi-Ferretti measure reduces home bias by 0.07%. In contrast, the home bias elasticity with respect to information capacity is still larger than the one obtained in the first equation: an increase of 1% in the normalized number of telephone mainlines increases the level of home bias by 0.28%.

[Insert Table 4 about here]

Finally, we confirm our results with two different types of panel estimations. The fifth equation presents the between effects estimates (regression on group means). The coefficient on financial openness retains a similar magnitude and is significant at the 5% significance level. The coefficient associated with information capacity increases to 0.59, although its significance is reduced to the 10% level. The last equation presents the results of the random effects estimates. Both coefficients have similar magnitudes, the expected signs and high significance (at the 1% level). Furthermore, this regression shows that, without using any time or country dummy variables, we are able to explain 50% of the cross sectional variance (the 'between' R^2) and 42% of the time series variance (the 'within' R^2).

3.2.2 Robustness Checks

Using the fourth equation in Table 4 - that is, the regression with both time and country fixed effects - we perform five different robustness checks. Table 5 presents the estimation outputs from each change. The first equation uses the Chinn-Ito Index of Financial Openness (the *de jure* measure).[17] In the second and third equations, we change the measure of information capacity; the second equation uses the total number of telephone mainlines while the third equation uses the number of telephone mainlines per 1,000 people. The next two equations

[17] This variable is not in logs since it can be negative by construction.

exclude the largest countries, in terms of market capitalization, from the sample. In 1996, the mid-year in our sample, US market capitalization represented 41.9% of the world's market capitalization. The second highest share was Japan's at 15.3% so that, together, the US and Japan were responsible for more than one half of the world's total market capitalization.[18] The fourth equation excludes the US and the fifth equation excludes both the US and Japan. Table 5 shows that our results are robust to all the changes we have considered. First, coefficients and their standard errors are fairly similar to those in the benchmark case (correct sign, similar magnitude and significance). Additionally, the R^2 for each equation remains high, ranging from 73% to 75%.

[Insert Table 5 about here]

Finally, we consider one last robustness check. One could argue that our information capacity variable is only statistically significant because it is working as a proxy for a country's level of development. Indeed, the correlation between the logs of the number of telephone lines per 1,000 people and per capita GDP is 0.71, suggesting that more developed economies have a larger overall channel capacity. Perhaps then, the positive and statically significant coefficient is capturing the fact that, for an unknown reason, more developed economies have a higher home bias while channel capacity, on its own, is unimportant. In order to control for this case, we include per capita GDP as a regressor. This variable turns out not to be significant while the other variables, particularly information capacity, retain the correct signs, similar magnitudes and high significance.

3.2.3 Familiarity Effects

Equations (1) to (4) in Table 6 use home bias as the dependent variable and the following variables as regressors: the number of international departures (per 1,000 inhabitants) made from the country of usual residence to any other country for any purpose other than a remunerated activity in the country visited, the number of telephone mainlines per 1,000 people

[18] In fact, this is true for every year in our sample.

normalized by GDP per capita and the Lane-Milesi-Ferretti volume-based measure of International Financial Integration (the *de facto* measure of financial openness). Equation (1) does not include any time or country fixed effects, equation (2) includes time effects, equation (3) includes country fixed effects and equation (4) includes both.

[Insert Table 6 about here]

Unfortunately, Table 6 is not directly comparable to the basic specification in Table 4. Missing observations for $int'l$ $departure$ reduce the sample by approximately 45%, from 293 to 160 observations. However, we can see that both $finopen$ and *telephone* have the correct signs and similar magnitudes compared to the coefficients reported in Table 4. Moreover, both variables are significant at the 1% level. Interestingly, the number of international departures is also significant at the 1% level and bears the expected negative sign: as predicted by our model, the higher the familiarity with foreign countries, the lower the degree of home bias.

Once again though, it could be argued that richer economies have a larger number of international tourist departures and that the significance of this coefficient in our regressions is actually capturing the effect of economic development on the home bias. Equation (5) includes GDP per capita as a control for development and the results suggest that this variable is not significant. In contrast, the number of international tourist departures is significant at the 5% level and has the expected sign.

3.2.4 Alternative Measures of Information Capacity

Equations (1) to (3) in Table 7 report the estimation results of the baseline regression for alternative measures of information capacity (all normalized by GDP). We note that only $newspapers$ is significant at the 5% level and has the predicted positive sign. Mobile phones and internet subscribers are not significant at the 10% level.

[Insert Table 7 about here]

In equations (4) to (6), we estimate the model using all four measures of information capacity (including telephone mainlines) as regressors. The difference between each equation is the normalization adopted: equation (4) uses capacity normalized by GDP, equation (5) uses capacity per 1,000 people and equation (6) uses total capacity. We observe that the average number of newspapers in circulation is the best measure of information capacity as it is the only variable that is significant at the 5% level and bears the expected sign. Once newspaper circulation is included, the number of telephone mainlines is not significant anymore. All three columns also show that the significance of the coefficient associated on newspaper circulation does not depend on the choice of normalization. These results suggest that newspapers are the best measure of information capacity. This is not surprising as daily newspaper headlines are still the major source of diffusion of public information. The problem of using *newspapers* as our baseline measure of information capacity, however, is that the number of missing observations reduces the sample from 293 to only 74.

Finally, equation (7) includes financial openness, newspaper circulation and GDP per capita. The latter variable is intended to proxy for a country's level of development. We can see that newspaper circulation is still significant at the 5% level with the correct positive sign while GDP per capita is not. In conclusion, the significance of the information capacity variable is not a result of its correlation with a country's development level.

3.2.5 Initial Conditions

As our final robustness check, Table 8 analyzes how the current level of home bias is affected by initial conditions. Regressions (1) to (6) include the normalized number of telephone lines, the *de facto* measure of financial integration and one varying initial condition. We consider three different types of initial conditions, namely the 1988 levels of home bias, financial openness and information capacity. Since initial conditions are explanatory variables that only vary across countries but are constant over time, we cannot include country effects in our regressions. Hence, each equation is only estimated twice, with and without time effects.

[Insert Table 8 about here]

The estimation results suggest that, while the current level of home bias increases significantly with its initial level, it does not seem to be influenced by the initial level of information capacity. Financial openness in 1988 is only significant if we include time effects in the regression. The estimated coefficient in this particular case suggests that, the more open a country was in 1988, the lower its current home bias.

4 Conclusion

This paper presents a rational expectations model of asset prices with rationally inattentive investors that, unlike previous papers, explains both the substantial amount of equity wealth invested domestically and the puzzlingly gradual decrease of home bias over the past two decades. Using measures of information capacity and financial openness as explanatory variables, we are able to explain at least 46.8% of the variation in home bias in a panel of 19 developed countries over the period 1988-2004. Our estimates show that both explanatory variables are significant and, as predicted by our model, home bias decreases with financial openness and increases with information capacity.

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A Appendix

A.1 Proof of Proposition 1

The objective function in the third period is a standard mean-variance objective function. A closed form solution of a REE can be derived following Admati (1985). The equilibrium prices have the following form $\tilde{P} = A_0 + A_1\tilde{R} - A_2\tilde{Z}$, where

$$
\begin{aligned}
A_0 &= \frac{\rho}{R}\left(\rho\int_0^1 \Sigma_{Ri}^{-1}di + \rho\Pi\Sigma_Z^{-1}\Pi + \Pi\right)^{-1}\left(\int_0^1 \Sigma_{Ri}^{-1}di\bar{R} + \Pi\Sigma_Z^{-1}\bar{Z}\right) \\
A_1 &= \frac{1}{R}\left(\rho\int_0^1 \Sigma_{Ri}^{-1}di + \rho\Pi\Sigma_Z^{-1}\Pi + \Pi\right)^{-1}\left(\Pi + \rho\Pi\Sigma_Z^{-1}\Pi\right) \\
A_2 &= \frac{1}{R}\left(\rho\int_0^1 \Sigma_{Ri}^{-1}di + \rho\Pi\Sigma_Z^{-1}\Pi + \Pi\right)^{-1}\left(I + \rho\Pi\Sigma_Z^{-1}\right)
\end{aligned}
$$

and Π is given by

$$
\Pi = \left[\int_0^1 \rho C_i'\Sigma_i^{-1}C_i di\right] \tag{11}
$$

The conditional distribution of $\tilde{R}$ given a private signal $\tilde{Y}_i$ and the equilibrium price vector $\tilde{P}$ is a multivariate normal with variance-covariance matrix given by (4). The optimal asset holdings by an investor i, who observes the state of the world with a measurement error $\tilde{Y}_i$ and the equilibrium price vector $\tilde{P}$, are given by $X_i\left(\tilde{Y}_i, \tilde{P}\right) = G_{0i} + G_{1i}\tilde{Y}_i - G_{2i}\tilde{P}$ where

$$\begin{aligned} G_{1i} &= \rho C_i' \Sigma_i^{-1} \\ G_{2i} &= \rho R \left[\begin{array}{c} \left(\Sigma_{Ri}^{-1} + \Pi\Sigma_Z^{-1}\Pi + C_i'\Sigma_i^{-1}C_i\right) + \\ -\Pi\Sigma_Z^{-1}(I+\rho\Pi\Sigma_Z^{-1})^{-1}\left(\rho\int_0^1 \Sigma_{Ri}^{-1}di + \rho\Pi\Sigma_Z^{-1}\Pi + \Pi\right) \end{array} \right] \\ G_{0i} &= \rho\left[\left(\Sigma_{Ri}^{-1}\bar{R} + \Pi\Sigma_Z^{-1}\bar{Z}\right) - \rho\Pi\Sigma_Z^{-1}(I+\rho\Pi\Sigma_Z^{-1})^{-1}\left(\int_0^1 \Sigma_{Ri}^{-1}di\bar{R} + \Pi\Sigma_Z^{-1}\bar{Z}\right)\right] \end{aligned}$$

A.2 Proof of Lemma 1

This proof follows closely Mondria (2009), except that we use a different information processing constraint. As shown in Mondria (2009), without loss of generality, for any normalized matrix of weights, $C_i = \begin{pmatrix} 1 & c_{ihf} \\ 1 & c_{iff} \end{pmatrix}$, investors choose a normalized diagonal variance-covariance matrix of the error term in the private signal $\Sigma_i = \begin{pmatrix} \sigma_{ih}^2 & 0 \\ 0 & \sigma_{if}^2 \end{pmatrix}$ to maximize the objective function given by (5) subject to the information constraint given by (1). Due to the linearity of the objective function in the precision of each private signal and the form of the information constraint, the maximum is a corner solution. Therefore, investors want to allocate all their attention to learn about only one linear combination of asset payoffs. For additional details about this proof, see the additional appendix.

A.3 Proof of Proposition 2

This proof follows closely Mondria (2009), except that we use a different information processing constraint. The information capacity constraint given by (1) can be expressed by

$$\Sigma_i^{-1} = \frac{\frac{e^{2\kappa}}{\sigma_{r,ih}^2\sigma_{r,if}^2} - \left(\alpha_i\beta_i - \gamma^2\right)}{\alpha_i + \beta_i c_{if}^2 - 2\gamma c_{if}} \tag{12}$$

where α_i, β_i and γ are given by

$$\alpha_i = \frac{1}{\sigma_{r,if}^2} + \frac{\pi_{hf}^2}{\sigma_{zh}^2} + \frac{\pi_{ff}^2}{\sigma_{zf}^2} \quad \beta_i = \frac{1}{\sigma_{r,ih}^2} + \frac{\pi_{hh}^2}{\sigma_{zh}^2} + \frac{\pi_{hf}^2}{\sigma_{zf}^2} \quad \gamma = \frac{\pi_{hh}\pi_{hf}}{\sigma_{zh}^2} + \frac{\pi_{hf}\pi_{ff}}{\sigma_{zf}^2} \tag{13}$$

and π_{hh}, π_{hf} and π_{ff} are given by (11). Substituting the information constraint given by (12) into the objective function given by (5), the optimization problem becomes

$$\max_{c_{if}} \frac{\left[\left(er_h^2 + Q_{ihh}\right) + \left(er_f^2 + Q_{iff}\right)c_{if}^2 + 2\left(er_h er_f + Q_{ihf}\right)c_{if}\right]\left[\frac{e^{2\kappa}}{\sigma_{r,ih}^2\sigma_{r,if}^2} - \left(\alpha_i\beta_i - \gamma^2\right)\right]}{\alpha_i + \beta_i c_{if}^2 - 2\gamma c_{if}} + \Omega_i \tag{14}$$

where Ω_i is a constant, Q_{ihh}, Q_{ihf} and Q_{iff} are given by (7) and er_h and er_f are given in (6). Infinitesimal investors have no effect on prices and take as given $\Omega_i, er_h, er_f, Q_{ihh}, Q_{ihf}$ and Q_{iff}

when optimizing. The reaction function where investors take as given the aggregate variables of the economy is written as

$$c_{if}^{*}=\frac{\left[\alpha_i\left(er_f^2+Q_{iff}\right)-\beta_i\left(er_h^2+Q_{ihh}\right)\right]}{2\left[\beta_i\left(er_h er_f+Q_{ihf}\right)+\gamma\left(er_f^2+Q_{iff}\right)\right]}+$$
$$+\frac{\sqrt{\left[\alpha_i\left(er_f^2+Q_{iff}\right)-\beta_i\left(er_h^2+Q_{ihh}\right)\right]^2+4\left[\beta_i\left(er_h er_f+Q_{ihf}\right)+\gamma\left(er_f^2+Q_{iff}\right)\right]\left[\alpha_i\left(er_h er_f+Q_{ihf}\right)+\gamma\left(er_h^2+Q_{ihh}\right)\right]}}{2\left[\beta_i\left(er_h er_f+Q_{ihf}\right)+\gamma\left(er_f^2+Q_{iff}\right)\right]} \tag{15}$$

This c_{if}^{*} is a global maximum since the second order condition at this point is strictly negative and the objective function is not maximized by setting $c_{if}=\pm\infty$. A symmetric equilibrium is obtained by solving a fixed point problem that consists of finding the optimal c_{if}^{*} which is consistent with all investors choosing the same c_{if}^{*}. Following Mondria (2009), by imposing that all investors choose the same $c_{if}=c_f$, if the following two sufficient conditions are satisfied

$$\left(\beta^{*}\left(er_h^{*}er_f^{*}+Q_{hf}^{*}\right)+\gamma^{*}\left(er_f^{*2}+Q_{ff}^{*}\right)\right)>0 \quad \left(\alpha^{*}\left(er_h^{*}er_f^{*}+Q_{hf}^{*}\right)+\gamma^{*}\left(er_h^{*2}+Q_{hh}^{*}\right)\right)>0$$

then there is a unique fixed point given by

$$c_f^{*}=\frac{\left(\sigma_{rf}^2\sigma_{zf}^2+\sigma_{rf}^2\bar{z}_f^2-\sigma_{rh}^2\sigma_{zh}^2-\sigma_{rh}^2\bar{z}_h^2\right)+\sqrt{\left(\sigma_{rf}^2\sigma_{zf}^2+\sigma_{rf}^2\bar{z}_f^2-\sigma_{rh}^2\sigma_{zh}^2-\sigma_{rh}^2\bar{z}_h^2\right)^2+4\sigma_{rh}^2\sigma_{rf}^2\bar{z}_h^2\bar{z}_f^2}}{2\sigma_{rf}^2\bar{z}_h\bar{z}_f}$$

where er_h^{*} and er_f^{*} are the expressions of the expected excess returns given by (6) when all investors choose $c_{if}^{*}=c_f^{*}$, Q_{hh}^{*},Q_{hf}^{*} and Q_{ff}^{*} are the elements of the variance-covariance matrix of excess returns given by (7) when all investors choose $c_{if}^{*}=c_f^{*}$, and $\alpha^{*},\beta^{*},\gamma^{*}$ are the expressions given by (13) when all investors choose $c_{if}^{*}=c_f^{*}$. Note that the expressions for α^{*}, β^{*}, γ^{*}, er_h^{*}, er_f^{*}, Q_{hh}^{*}, Q_{hf}^{*} and Q_{ff}^{*} depend only on exogenous parameters since they are evaluated when all investors choose $c_{if}=c_f^{*}$. The two parameter restrictions can be written as the following parameter condition

$$Q_{hf}^{*}>-\bar{Q}^{*} \quad \text{where } \bar{Q}^{*}=\max\left\{er_h^{*}er_f^{*}+\tfrac{\gamma^{*}}{\beta^{*}}\left(er_f^{*2}+Q_{ff}^{*}\right),er_h^{*}er_f^{*}+\tfrac{\gamma^{*}}{\alpha^{*}}\left(er_h^{*2}+Q_{hh}^{*}\right)\right\}$$

Substituting $\alpha^{*},\beta^{*},\gamma^{*}$ and c_f^{*} consistent with the symmetric equilibrium when all investors choose $c_{if}^{*}=c_f^{*}$ into the information constraint given by (12), we obtain a second order equation for the variance of the error term in the private signal Σ_i which is given by

$$\left(e^{2\kappa}-1\right)(\Sigma)^2-\left(\sigma_{rh}^2+\left(c_f^{*}\right)^2\sigma_{rf}^2\right)\Sigma-\left(\sigma_{rh}^2+\left(c_f^{*}\right)^2\sigma_{rf}^2\right)\rho^2\left(\frac{1}{\sigma_{zh}^2}+\frac{\left(c_f^{*}\right)^2}{\sigma_{zf}^2}\right)=0$$

where only one of the solutions to the variance of the error term in the private signal is positive

$$\Sigma^{*}=\frac{\left(\sigma_{rh}^2+\left(c_f^{*}\right)^2\sigma_{rf}^2\right)+\sqrt{\left(\sigma_{rh}^2+\left(c_f^{*}\right)^2\sigma_{rf}^2\right)\left[\sigma_{rh}^2+\left(c_f^{*}\right)^2\sigma_{rf}^2+4\rho^2\left(e^{2\kappa}-1\right)\left(\frac{1}{\sigma_{zh}^2}+\frac{\left(c_f^{*}\right)^2}{\sigma_{zf}^2}\right)\right]}}{2\left(e^{2\kappa}-1\right)}$$

For additional details about this proof, see the additional appendix.

A.4 Proof of Proposition 3

The optimal matrix of weights in the private signal, C_i, by an investor who takes as given the actions from the other investors, i.e., the investor takes as given $er_h, er_f, Q_{ihh}, Q_{ihf}$ and Q_{iff}, is given by (15). The informational disadvantage in foreign assets is given by the parameter ϕ. If $\phi = 1$, then there is no informational advantage in domestic assets and all investors process the same information about both assets as shown in Proposition 2. However, when there is a local informational advantage, $\phi > 1$, a home investor optimally processes more information about home assets due to $\frac{\partial c^*_{hf}}{\partial \phi} < 0$. In words, the higher is the information disadvantage in foreign assets, the smaller is the weight of foreign assets in the private signal and the more information is processed about domestic assets.

B Autocorrelation of Asset Payoffs

We collected data between Jan 1st, 1980 and Dec 31, 2004 on three major stock price indexes in US: the Dow Jones Industrial Average Index, the NYSE Composite Index, and the S&P 500. The original data is at the daily frequency and for each stock price index we calculate two annual series. The end-of-period series contains the closing stock index price at the last trading day of the year; the average series contain the yearly average of the daily closing stock index prices. Table 9 presents the first-order autocorrelations of the end-of-period and average annual indexes. We can see that the autocorrelations range from 0.88 to 0.91, which is similar to that of Veldkamp (2006).

C Figures and Tables

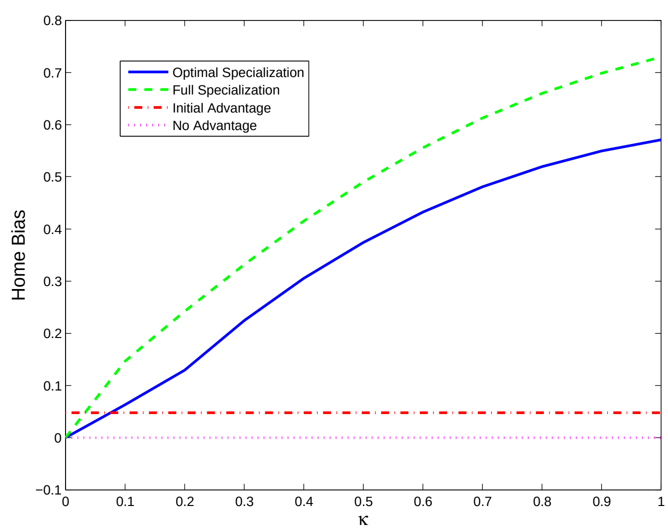

Figure 1: Home Bias Magnified. This figure shows that home bias increases with information capacity. The 'no advantage' line provides the amount of home bias in an economy with no initial informational advantage. The 'initial advantage' line refers to home bias in a world with a small initial information advantage and no information processing capacity. The 'full specialization' line shows home bias when investors only process local information. The 'optimal specialization' line plots home bias in our model.

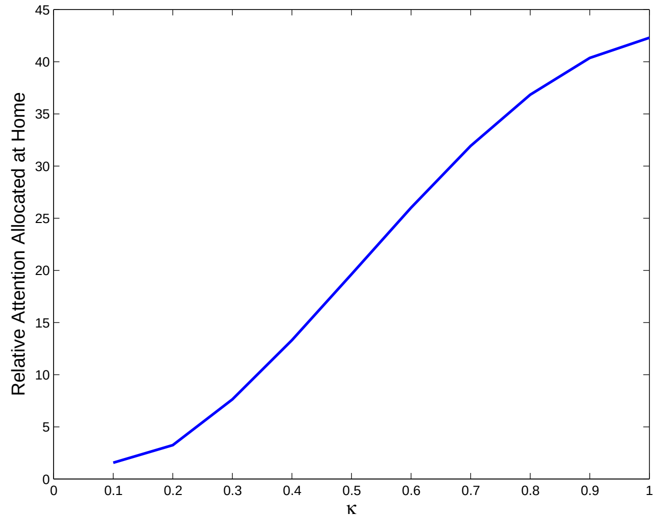

Figure 2: Optimal Attention Allocation. This figure shows that the attention allocated to domestic assets is increasing with information processing capacity.

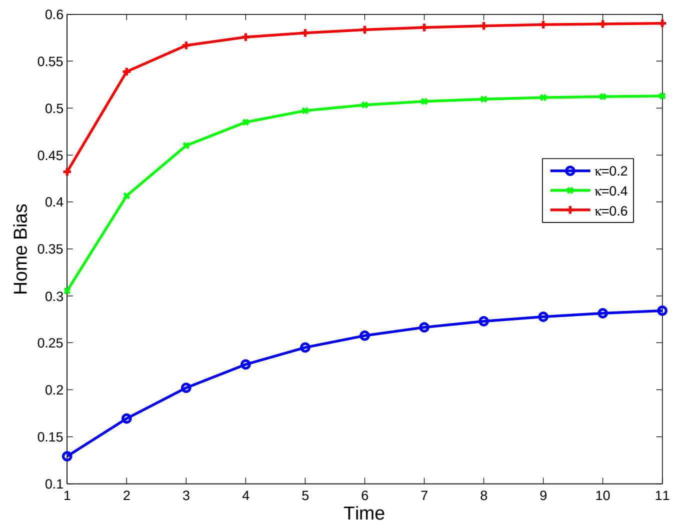

Figure 3: Home Bias Magnified. This figure shows that when asset payoffs are persistent home bias is magnified over time.

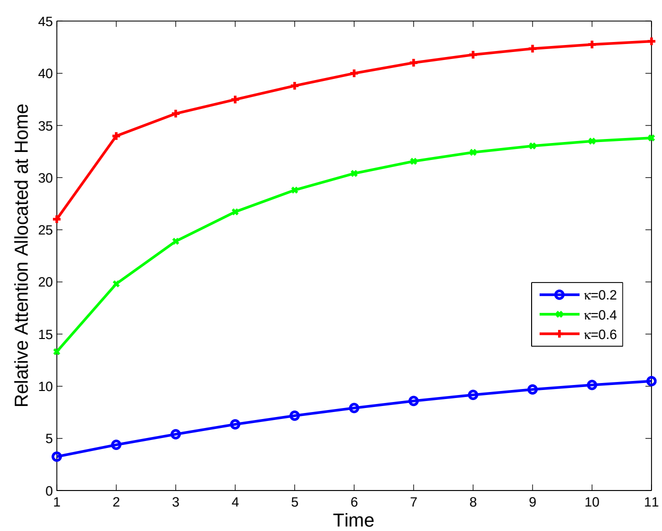

Figure 4: Optimal Attention Allocation. This figure shows that when asset payoffs are persistent the attention allocated to domestic assets increases over time.

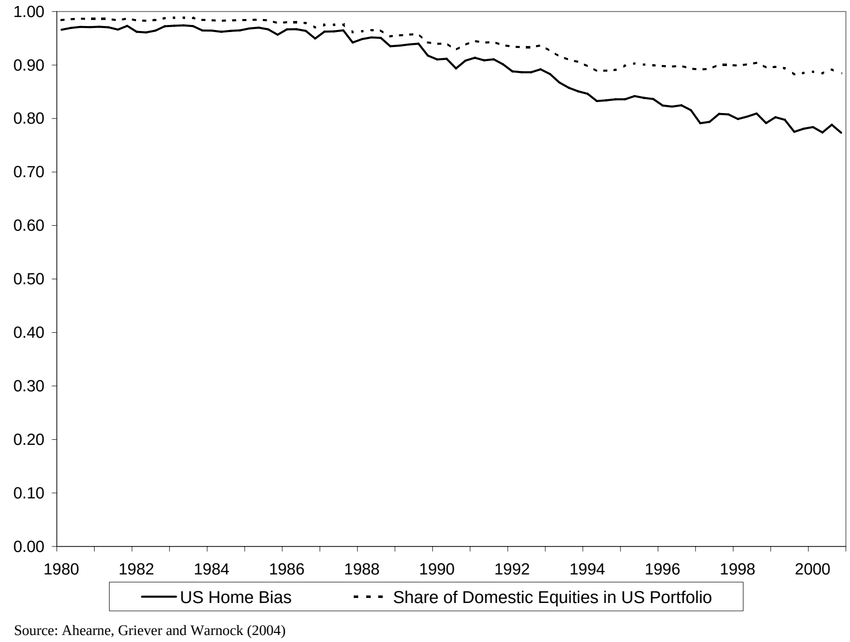

Figure 5: Home Bias and Share of Domestic Equities in US Portfolio

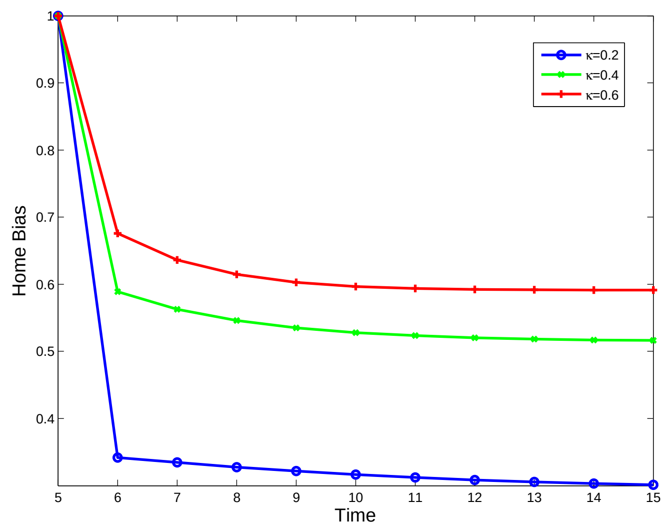

Figure 6: Home Bias Decline. This figure shows that when asset payoffs are persistent and investors are banned from investing in foreign assets for 5 periods, home bias gradually decreases over time.

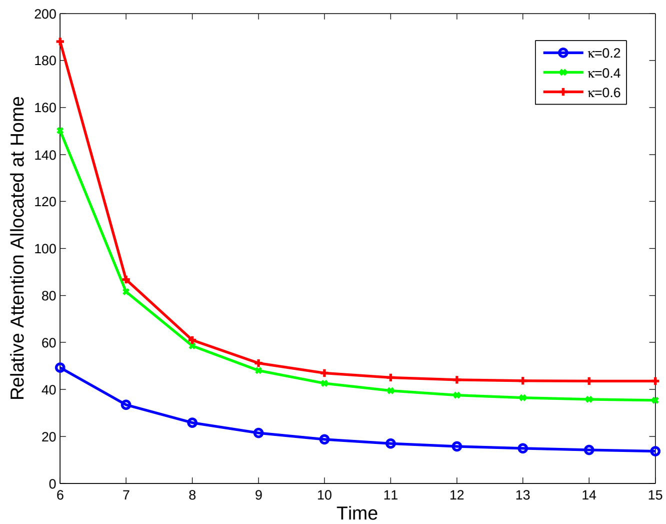

Figure 7: Optimal Attention Allocation. This figure shows that when asset payoffs are persistent and investors are banned from investing in foreign assets for 5 periods, the attention allocated to domestic assets gradually decreases over time.

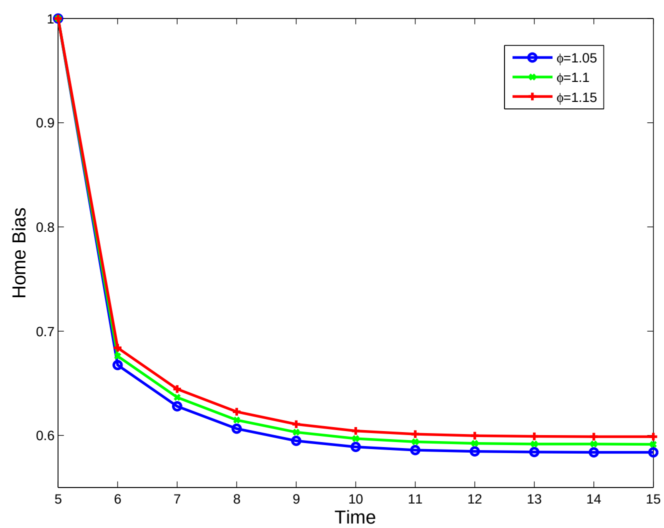

Figure 8: Home Bias Decline. This figure shows that when asset payoffs are persistent and investors are banned from investing in foreign assets for 5 periods, home bias gradually decreases to a new steady state that depends on the initial local information advantage.

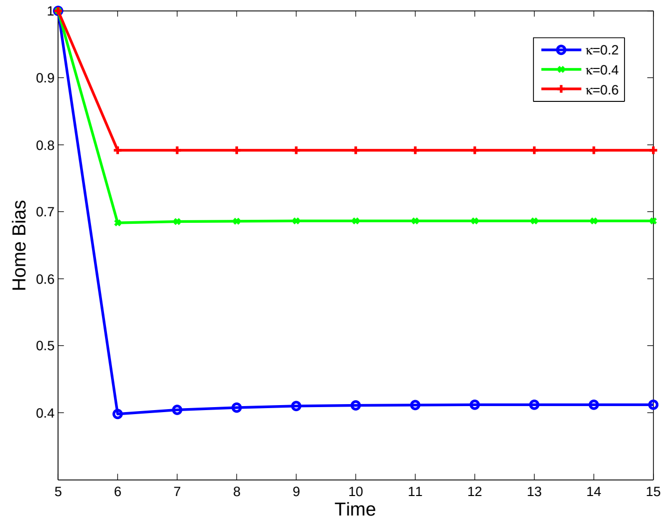

Figure 9: Home Bias Decline. This figure shows that when asset payoffs are persistent and investors are banned from investing in foreign assets for 5 periods, there is just an immediate drop in equity home bias after financial liberalization under the assumptions in Van Nieuwerburgh and Veldkamp (2009).

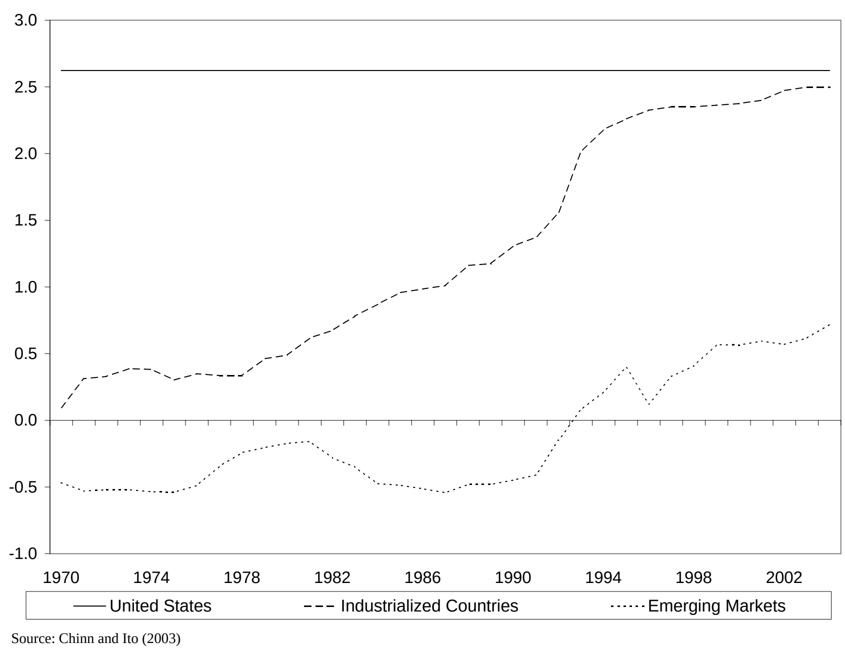

Figure 10: Chinn and Ito Capital Openness Index

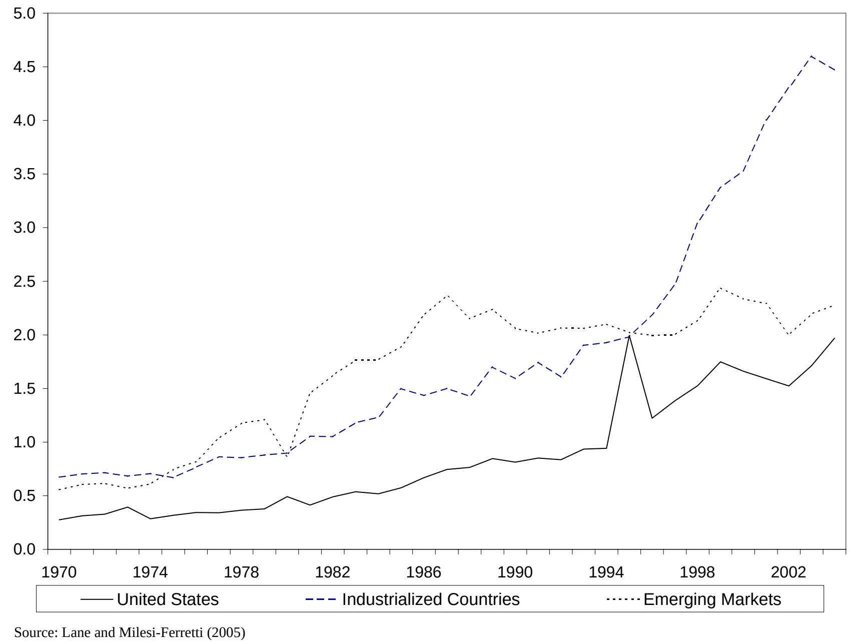

Figure 11: Lane and Milesi-Ferretti International Financial Integration Measure

Table 1: Summary Statistics

	Home Bias			Familiarity			Financial Openness					
	hb			*int' departures*			$finopen^{LMF}$			$finopen^{CI}$		
Country Name	N[a]	mean	s.d.[b]	N[a]	mean	s.d.[b]	N[a]	mean	s.d.[b]	N[a]	mean	s.d.[b]
Australia	17	0.87	0.03	9	169	16	17	1.52	0.41	17	2.05	0.63
Austria	17	0.61	0.24	8	584	152	16	2.01	0.87	17	2.22	0.57
Belgium	17	0.62	0.08	8	682	76	17	5.22	1.46	17	2.15	0.64
Canada	17	0.87	0.03	10	604	28	17	1.80	0.46	17	2.62	0.00
Denmark	14	0.72	0.11	9	923	51	14	2.63	0.92	14	2.60	0.07
Finland	17	0.89	0.14	10	1051	76	17	2.23	1.26	17	2.22	0.57
France	16	0.82	0.05	10	315	19	16	2.46	1.03	16	2.04	1.02
Germany	17	0.70	0.12	7	863	85	17	1.91	0.83	17	2.62	0.00
Iceland	11	0.78	0.08	6	805	144	11	1.74	1.00	11	1.24	0.00
Italy	17	0.83	0.12	9	377	52	17	1.52	0.67	17	1.92	1.11
Japan	10	0.91	0.03	10	128	10	10	1.25	0.23	10	2.49	0.14
Netherlands	17	0.58	0.12	9	891	83	17	4.34	2.11	17	2.62	0.00
New Zealand	15	0.84	0.14	10	322	45	15	1.99	0.49	15	2.62	0.00
Portugal	9	0.79	0.09	0	-	-	9	3.05	0.99	9	2.59	0.09
Spain	16	0.94	0.06	9	100	9	16	1.50	0.77	16	1.27	0.97
Sweden	17	0.77	0.13	10	1278	143	17	2.83	1.33	17	2.05	0.63
Switzerland	17	0.60	0.06	8	1656	69	17	5.51	2.69	0	-	-
United Kingdom	17	0.73	0.04	10	904	128	17	4.91	1.43	17	2.62	0.00
United States	17	0.82	0.06	10	202	8	17	1.31	0.44	17	2.62	0.00

[a] N: number of observations

[b] s.d.: standard deviation

Source: World Development Indicators and International Financial Statistics

Table 2: Summary Statistics (continued)

	Telephone Mainlines							Newspaper Circulation						
		$telephone^{norm}$		$telephone^{total}$		$telephone^{per1000}$			$newspapers^{norm}$		$newspapers^{norm}$		$newspapers^{norm}$	
Country Name	N[a]	mean	s.d.[b]	mean	s.d.[b]	mean	s.d.[b]	N[a]	mean	s.d.[b]	mean	s.d.[b]	mean	s.d.[b]
Australia	17	27.2	1.4	9,202,119	1,244,740	506	47	4	8.1	0.3	2,992,313	189,594	166	6
Austria	17	21.3	1.2	3,673,857	329,638	463	34	4	14.1	1.0	2,607,193	185,775	326	23
Belgium	17	22.2	1.4	4,582,560	516,760	451	46	4	7.3	0.4	1,580,673	18,548	155	2
Canada	16	29.1	1.5	17,813,420	2,216,539	603	47	4	7.7	0.4	5,081,278	98,363	167	2
Denmark	14	23.1	0.8	3,396,158	307,748	642	49	4	10.4	0.7	1,578,411	51,946	297	11
Finland	17	26.1	3.8	2,721,556	145,502	533	28	4	20.7	1.2	2,324,736	16,317	451	4
France	16	26.5	1.5	32,105,428	2,386,709	551	33	4	6.7	0.3	8,352,493	102,104	143	2
Germany	17	24.3	3.0	42,617,562	9,061,392	523	104	4	13.5	0.7	24,600,000	515,978	300	7
Iceland	11	22.6	0.9	177,375	19,023	636	52	4	12.1	1.3	93,902	3,892	340	19
Italy	17	24.9	0.9	24,805,128	2,132,160	433	34	4	5.8	0.1	6,008,018	188,746	104	3
Japan	10	13.2	0.7	61,959,271	1,937,808	489	18	4	15.4	0.2	72,200,000	363,936	571	4
Netherlands	17	24.9	2.3	8,017,882	979,636	515	55	4	13.0	1.0	4,546,571	132,989	289	11
New Zealand	15	35.6	3.0	1,708,593	127,804	455	18	4	16.2	1.2	805,808	28,760	211	9
Portugal	9	40.4	1.3	4,154,872	152,824	405	12	4	6.7	2.6	687,300	297,093	68	29
Spain	16	29.6	1.5	15,033,335	2,121,701	378	46	2	7.2	0.4	4,063,771	120,883	101	4
Sweden	17	28.9	1.7	6,199,992	384,187	706	33	4	16.8	1.4	3,769,111	104,725	426	12
Switzerland	17	20.0	1.4	4,612,804	591,878	655	63	4	11.2	0.3	2,646,053	32,790	371	4
United Kingdom	17	23.4	1.0	30,289,363	4,119,992	517	64	4	13.9	0.3	19,000,000	387,122	323	4
United States	17	19.3	0.9	163,200,000	22,500,000	604	51	4	6.1	0.4	55,600,000	311,406	200	4

[a] N: number of observations
[b] s.d.: standard deviation
Source: World Development Indicators and International Financial Statistics

Table 3: Summary Statistics (continued)

	Mobile Phone Subscribers							Internet Access						
		mobile ^{norm}		*mobile* ^{total}		*mobile* ^{per1000}			*internet* ^{norm}		*internet* ^{total}		*internet* ^{per1000}	
Country Name	N[a]	mean	s.d.[b]	mean	s.d.[b]	mean	s.d.[b]	N[a]	mean	s.d.[b]	mean	s.d.[b]	mean	s.d.[b]
Australia	17	13.1	12.7	5,183,371	5,496,179	271	276	15	10.4	10.7	5,183,371	5,496,179	271	276
Austria	17	13.4	15.4	2,594,825	3,068,351	322	379	15	7.4	7.6	2,594,825	3,068,351	322	379
Belgium	17	11.8	15.1	2,717,512	3,561,755	263	344	15	6.1	7.0	2,717,512	3,561,755	263	344
Canada	17	7.4	6.3	5,189,596	4,957,821	168	156	15	10.0	9.5	5,189,596	4,957,821	168	156
Denmark	14	14.2	10.9	2,223,211	1,815,524	416	336	14	8.1	7.9	2,223,211	1,815,524	416	336
Finland	17	17.9	14.2	2,084,427	1,823,263	403	349	15	10.6	8.3	2,084,427	1,823,263	403	349
France	16	11.0	12.6	14,700,000	17,500,000	248	292	15	5.2	6.3	14,700,000	17,500,000	248	292
Germany	17	11.2	13.8	21,200,000	26,800,000	258	325	15	6.6	7.4	21,200,000	26,800,000	258	325
Iceland	11	18.9	11.5	157,845	106,389	556	364	11	14.9	7.9	157,845	106,389	556	364
Italy	17	18.8	21.5	20,300,000	23,800,000	352	412	15	6.9	9.0	20,300,000	23,800,000	352	412
Japan	10	12.3	5.4	58,200,000	26,800,000	458	209	10	7.2	5.3	58,200,000	26,800,000	458	209
Netherlands	17	12.4	15.1	4,583,613	5,709,136	286	353	15	10.4	9.7	4,583,613	5,709,136	286	353
New Zealand	15	19.9	17.8	1,074,910	1,054,218	275	263	13	19.0	16.7	1,074,910	1,054,218	275	263
Portugal	9	55.8	32.6	5,935,354	3,612,961	574	344	9	15.5	8.2	5,935,354	3,612,961	574	344
Spain	16	16.4	22.0	9,715,433	13,600,000	237	328	14	4.4	5.6	9,715,433	13,600,000	237	328
Sweden	17	15.3	12.7	3,586,890	3,241,024	403	362	15	10.3	9.4	3,586,890	3,241,024	403	362
Switzerland	17	8.7	9.8	2,131,346	2,461,563	294	336	15	5.1	5.3	2,131,346	2,461,563	294	336
United Kingdom	17	13.3	14.4	19,400,000	22,100,000	326	370	15	7.3	8.4	19,400,000	22,100,000	326	370
United States	17	6.6	5.7	63,300,000	60,000,000	224	205	15	7.7	6.4	63,300,000	60,000,000	224	205

[a] N: number of observations

[b] s.d.: standard deviation

Source: World Development Indicators and International Financial Statistics

Table 4: Basic Specification Estimation Output

Dependent Variable: Home Bias
Frequency: annual
Sample Period: 1988 to 2004
Country Sample: 19 Industrialized Countries

Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
$finopen^{LMF}$	-0.237***	-0.208***	-0.244***	-0.070**	-0.207**	-0.114***
	(0.015)	(0.016)	(0.027)	(0.031)	(0.074)	(0.029)
$telephone^{norm}$	0.222***	0.208***	0.349***	0.281**	0.593*	0.197**
	(0.045)	(0.049)	(0.103)	(0.126)	(0.274)	(0.090)
Time effects?	no	yes	no	yes	yes	yes
Country effects?	no	no	fixed	fixed	between	random
F-statistics and p-values Testing Exclusion of Group of Variables						
Time effects = 0		1.32		4.55	0.77	47.89
		(0.1862)		(<0.0001)	(0.6283)	(<0.0001)
Country effects = 0			18.01	16.90		
			(<0.0001)	(<0.0001)		
Number of obs.	293	293	293	293	293	293
R^2	46.8%	50.0%	69.1%	74.6%	69.8%	45.7%

Dummy variables are not reported. White's robust standard errors are given in parentheses under the coefficients, and p-values are given in parentheses under the F-statistics. The symbols *, ** and *** denote that the individual coefficient is significant at the 10%, 5% and 1% significance level respectively.

Table 5: Robustness Check Estimation Output

Dependent Variable: Home Bias
Frequency: annual
Sample Period: 1988 to 2004
Country Sample: 19 Industrialized Countries

Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Financial Openness	-0.027** (0.013)	-0.064** (0.028)	-0.073** (0.029)	-0.063** (0.031)	-0.055** (0.030)	-0.071** (0.030)
Information Capacity	0.296** (0.145)	0.432*** (0.148)	0.301** (0.136)	0.286** (0.126)	0.296** (0.125)	0.316** (0.141)
GDP per capita	-	-	-	-	-	0.153 (0.186)
Robustness Checks						
Financial Openness	$finopen^{CI}$	$finopen^{LMF}$	$finopen^{LMF}$	$finopen^{LMF}$	$finopen^{LMF}$	$finopen^{LMF}$
Information Capacity	$telephone^{norm}$	$telephone^{total}$	$telephone^{per1000}$	$telephone^{norm}$	$telephone^{norm}$	$telephone^{norm}$
Sample	includes all countries	includes all countries	includes all countries	excludes US	excludes US and Japan	includes all countries
Number of obs.	277	293	293	276	266	293
R^2	73.4%	75.0%	74.6%	74.6%	74.4%	74.6%

All regressions include time and country dummy variables, which are not reported. White's robust standard errors are given in parentheses under the coefficients, and p-values are given in parentheses under the F-statistics. The symbols *, ** and *** denote that the individual coefficient is significant at the 10%, 5% and 1% significance level respectively.

Table 6: Familiarity Effects

Dependent Variable: Home Bias
Frequency: annual
Sample Period: 1988 to 2004
Country Sample: 19 Industrialized Countries

Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$finopen^{LMF}$	-0.210***	-0.142***	-0.203***	-0.128***	-0.132***
	(0.026)	(0.025)	(0.057)	(0.047)	(0.049)
$telephone^{norm}$	0.222***	0.178***	0.635***	0.560***	0.618***
	(0.062)	(0.064)	(0.138)	(0.174)	(0.118)
$int'l\ departure^{per1000}$	-0.060***	-0.083***	-0.279***	-0.233***	-0.250**
	(0.014)	(0.013)	(0.118)	(0.113)	(0.124)
GDP percapita	-	-	-	-	0.330
	-	-	-	-	(0.338)
Time effects?	no	yes	no	yes	yes
Country effects?	no	no	fixed	fixed	fixed
F-statistics and p-values Testing Exclusion of Group of Variables					
Time effects = 0		3.96		4.32	3.84
		(0.0002)		(0.0001)	(0.0003)
Country effects = 0			23.08	16.03	17.08
			(<0.0001)	(<0.0001)	(<0.0001)
Number of obs.	160	160	160	160	160
R^2	38.7%	45.2%	83.3%	85.6%	85.7%

Dummy variables are not reported. White's robust standard errors are given in parentheses under the coefficients, and p-values are given in parentheses under the F-statistics. The symbols *, ** and *** denote that the individual coefficient is significant at the 10%, 5% and 1% significance level respectively.

Table 7: Alternative Measures of Information Capacity

Dependent Variable: Home Bias
Frequency: annual
Sample Period: 1988 to 2004
Country Sample: 19 Industrialized Countries

Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
$finopen^{LMF}$	-0.084*	-0.084***	-0.096***	-0.080**	-0.097**	-0.092**	-0.080*
	(0.044)	(0.031)	(0.037)	(0.032)	(0.040)	(0.038)	(0.042)
$telephone^{i}$	-	-	-	0.840	0.441	0.791	-
	-	-	-	(1.060)	(0.702)	(0.924)	-
$newspaper^{i}$	0.177**	-	-	0.257**	0.234**	0.248**	0.174**
	(0.079)	-	-	(0.115)	(0.102)	(0.106)	(0.078)
$mobile^{i}$	-	-0.001	-	-0.153	-0.173	-0.157	-
	-	(0.014)	-	(0.118)	(0.149)	(0.121)	-
$internet^{i}$	-	-	0.004	-0.076	-0.047	-0.050	-
	-	-	(0.010)	(0.050)	(0.070)	(0.060)	-
gpd percapita	-	-	-	-	-	-	-0.210
	-	-	-	-	-	-	(0.366)
Robustness Checks							
Normalization i	*norm*	*norm*	*norm*	*norm*	*per1000*	*total*	*norm*
Number of obs.	74	294	265	74	74	74	74
R^2	81.5%	74.0%	74.6%	83.8%	83.5%	83.8%	81.6%

All regressions include time and country dummy variables, which are not reported. White's robust standard errors are given in parentheses under the coefficients, and p-values are given in parentheses under the F-statistics. The symbols *, ** and *** denote that the individual coefficient is significant at the 10%, 5% and 1% significance level respectively.

Table 8: Initial Conditions

Dependent Variable: Home Bias
Frequency: annual
Sample Period: 1988 to 2004
Country Sample: 19 Industrialized Countries

Regressor	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
$finopen^{LMF}$	-0.179***	-0.042*	-0.242***	-0.153***	-0.237***	-0.208***
	(0.021)	(0.024)	(0.025)	(0.035)	(0.014)	(0.016)
$telephone^{norm}$	0.336***	0.196**	0.225***	0.182***	0.257***	0.211*
	(0.087)	(0.085)	(0.047)	(0.051)	(0.096)	(0.110)
$home\ bias^{1988}$	0.364***	0.903***	-	-	-	-
	(0.108)	(0.107)	-	-	-	-
$finopen^{LMF,1988}$	-	-	0.008	-0.062**	-	-
	-	-	(0.025)	(0.030)	-	-
$telephone^{norm,1988}$	-	-	-	-	-0.046	-0.005
	-	-	-	-	(0.095)	(0.103)
Time effects?	no	yes	no	yes	no	yes
F-statistics and p-values Testing Exclusion of Group of Variables						
Time effects = 0		3.68		1.49		1.34
		(<0.0001)		(0.1009)		(0.1702)
Number of obs.	218	218	293	293	293	293
R^2	50.7%	61.3%	46.9%	50.8%	46.9%	50.0%

All regressions include time and country dummy variables, which are not reported. White's robust standard errors are given in parentheses under the coefficients, and p-values are given in parentheses under the F-statistics. The symbols *, ** and *** denote that the individual coefficient is significant at the 10%, 5% and 1% significance level respectively.

Table 9: First Order Autocorrelation of US Stock Market Indices

	Autocorrelations	
Stock Market Index	end-of-period	average
Dow Jones (U.S.)	0.90	0.91
NYSE (U.S.)	0.88	0.89
S&P (U.S.)	0.89	0.90