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TASTE SHOCKS, ENDOGENOUS LABOR SUPPLY, AND EQUITY HOME BIAS

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The puzzling bias of equity portfolios toward domestic assets (equity home bias) remains substantial. This paper proposes a dynamic stochastic general equilibrium model and demonstrates that shocks to consumption tastes (taste shocks) are an effective explanation for the equity home bias puzzle. In the model, home assets provide insurance for home agents to hedge against domestic taste fluctuations, whereas such insurance cannot be offered by foreign assets. The empirical evidence shows that, in explaining equity home bias, hedging against consumption taste risks is more relevant than hedging against labor income risks or real exchange rate risks.

Keywords: Equity Home Bias, Taste Shocks, Endogenous Labor Supply

1. INTRODUCTION

Although the bias of equity holdings toward domestic assets (equity home bias) has declined over time, such bias remains substantial. In 2008, domestic equities constituted around 77.2% of equity portfolios of investors in the United States. This value is significantly larger than the 32.6% share of the United States in world equity market capitalization [Coeurdacier and Rey (in press)]. This equity home bias continues to be a puzzle despite progress in the general equilibrium theory of portfolio choice.[1]

This paper proposes a dynamic stochastic general equilibrium (DSGE) model and demonstrates that home assets provide effective insurance for home agents to hedge against domestic taste risks—a benefit not offered by foreign assets, leading to equity home bias. This model can match the level of equity home bias observed in the data, and it finds that taste shocks are crucial in producing the observed level of equity home bias. Specifically, equity home bias monotonically increases with the persistence and volatility of taste shocks, a property that is not examined in the literature.

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The intuition for the insurance property of home assets is as follows. Suppose that there are two states of the world. In the state with a positive realization of home taste shock, home marginal utility becomes higher. With an endogenous labor supply, agents will consume more and accept a lower wage level, thus leading to a drop in the marginal cost of home production. The home firm thus increases production and earns a larger profit, which in turn boosts home equity return. Because home equities pay off well when home consumers want to consume more, home equities are attractive to home agents. The intuition also applies to the state with a negative realization of home taste shocks, where home assets pay off less when home consumers want to consume less; home assets are again attractive to home agents.

In explaining equity home bias, we find empirical evidence that hedging against consumption taste risks is more relevant than hedging against labor income risks and against real exchange rate risks. To illustrate this finding, the equilibrium portfolio structure is decomposed into three hedging components: (1) against labor income fluctuations, (2) against consumer taste fluctuations, and (3) against real exchange rate fluctuations. Using data from the first quarter of 1980 to the fourth quarter of 2006 for the United States and the rest of the G7 countries, we demonstrate that hedging against taste risks contributes positively to equity home bias, whereas hedging against labor risks does the opposite. Hedging against real exchange rate risks makes either a positive or a negative contribution to equity home bias, depending on whether bonds are included as a type of assets. Furthermore, if the contribution of hedging against real exchange rate risks is positive, then it will be much smaller than that of hedging against consumption taste risks.

The studies that are closest to our theory are those of Coeurdacier et al. (2007), Pavlova and Rigobon (2007), and Heathcote and Perri (2009), which show that taste shocks are important in producing equity home bias. Unlike these papers, we endogenize labor supply in our model, thus leading to the non-necessity for home asset returns to move in the same direction as domestic real exchange rates. Therefore, our model is not subject to the critique by Van Wincoop and Warnock (2010).

The paper that is closest to our empirical work is that of Benigno and Nistico (2012). They focused on the role of heterogeneous beliefs and argued that standard open-economy macro models under rational expectations are not successful in explaining the home bias puzzle. In our paper, we show that an otherwise standard model with taste shocks does provide an explanation for the equity home bias.

The remainder of this paper is organized as follows. Section 2 derives the model. Section 3 presents calibration results, showing that taste shocks help produce the observed level of equity home bias. Section 4 decomposes the steady state portfolio structure into different hedging components and compares the contributions of components to the equity home bias. Section 5 concludes.

2. THE MODEL

The world consists of two ex ante symmetric countries, home and foreign, that trade goods with each other. Foreign variables are denoted by an asterisk and, where necessary, by an F ($_f$) subscript. Upper bars are used to represent steady state values of variables. Prices are flexible. Each country is populated by a unit mass of atomistic households.

The uncertainty in the economy comes from three potential sources: (1) country-specific technology shocks, (2) taste shocks, and (3) money supply shocks. Two asset structures are considered: (1) an economy with equities plus nominal bonds (simplified as an equity–bond economy) or (2) an economy with equity trading only (simplified as an equity-only economy). In the latter, we suppress money supply shocks, because the price level is relevant only when nominal bonds are introduced into the model.

2.1. Goods Market Structure

The representative home household consumes the basket of goods (C_t), which is a constant-elasticity-of-substitution (CES) aggregate of home-produced goods ($C_{\mathrm{h},t}$) and foreign exports ($C_{\mathrm{f},t}$), $C_t = [C_{\mathrm{h},t}^{\frac{\vartheta-1}{\vartheta}} + C_{\mathrm{f},t}^{\frac{\vartheta-1}{\vartheta}}]^{\frac{\vartheta}{\vartheta-1}}$, where ϑ represents substitution elasticity between home and foreign goods. The corresponding consumer price index (CPI) is then defined as

$$P_t = \left[P_{\mathrm{h},t}^{1-\vartheta} + P_{\mathrm{f},t}^{1-\vartheta}\right]^{\frac{1}{1-\vartheta}}, \tag{1}$$

where P_t, $P_{\mathrm{h},t}$, and $P_{\mathrm{f},t}$ denote home CPI, the price of home-produced goods, and the price of foreign exports, respectively. The demand for individual varieties is given by

$$C_{\mathrm{h},t} = C_t\left(\frac{P_{\mathrm{h},t}}{P_t}\right)^{-\vartheta}, \qquad C_{\mathrm{f},t} = C_t\left(\frac{P_{\mathrm{f},t}}{P_t}\right)^{-\vartheta}. \tag{2}$$

2.2. Household Preferences and Optimization

The representative household derives utility from consumption (C_t) and disutility from labor supply (L_t) and maximizes expected lifetime utility:

$$\max E_0 \sum_{t=0}^{\infty} \beta^t U(C_t, L_t), \quad \text{where} \quad U(C_t, L_t) \equiv \frac{\tau_t C_t^{1-\rho}}{1-\rho} - \frac{L_t^{1+\kappa}}{1+\kappa}. \tag{3}$$

The parameter $\rho > 0$ is the degree of risk aversion, $\beta \in (0, 1)$ is the subjective discount factor, and $\psi > 0$ is the Frisch labor supply elasticity. Following Stockman and Tesar (1995), preferences for consumption are subject to country-specific taste shocks (τ_t).

The household derives income from two potential sources: (1) nontradable wage income and (2) tradable financial income. In the equity–bond economy, the financial income comes from trading four types of assets in the international asset markets: two default-free nominal bonds ($B_{\mathrm{hb},t}$ and $B_{\mathrm{fb},t}$) in units of national currency, which pay nominal gross returns $R_{\mathrm{hb},t}$ and $R_{\mathrm{fb},t}$, respectively; and two equity shares ($x_{\mathrm{he},t}$ and $x_{\mathrm{fe},t}$), representing contingent claims on domestic and foreign firm profits D_t and D_t^*, respectively, with prices $Q_{\mathrm{he},t}$ and $Q_{\mathrm{fe},t}^*$ in national currencies. In the equity-only economy, financial income comes only from equity trading. The period budget constraint in the equity–bond economy is

$$\begin{aligned} & B_{\mathrm{hb},t} + S_t B_{\mathrm{fb},t} + x_{\mathrm{he},t} Q_{\mathrm{he},t} + S_t x_{\mathrm{fe},t} Q_{\mathrm{fe},t}^* + P_t C_t \\ & \quad = R_{\mathrm{hb},t} B_{\mathrm{hb},t-1} + S_t R_{\mathrm{fb},t}^* B_{\mathrm{fb},t-1} + x_{\mathrm{he},t-1} \left(Q_{\mathrm{he},t} + D_t \right) \\ & \quad + x_{\mathrm{fe},t-1} \left(Q_{\mathrm{fe},t}^* + D_t^* \right) + W_t L_t, \end{aligned} \quad (4)$$

and in the equity-only economy, it is

$$\begin{aligned} & x_{\mathrm{he},t} Q_{\mathrm{he},t} + S_t x_{\mathrm{fe},t} Q_{\mathrm{fe},t}^* + P_t C_t \\ & \quad = x_{\mathrm{he},t-1} \left(Q_{\mathrm{he},t} + D_t \right) + x_{\mathrm{fe},t-1} \left(Q_{\mathrm{fe},t}^* + D_t^* \right) + W_t L_t, \end{aligned}$$

where W_t is the nominal wage rate, and S_t is the nominal exchange rate expressed as the home currency price of one unit of foreign currency.

To solve for the steady state portfolio holdings, the methodology derived in Devereux and Sutherland (2011) is applied. Following their solution procedure, we first rewrite the budget constraint in the form of the evolution of a country's net foreign asset position (NFA_t),

$$\mathrm{NFA}_t = r_{\mathrm{he},t} \mathrm{NFA}_{t-1} + r_{ex,t}' \alpha_{t-1} + w_t L_t + d_t - C_t, \quad (5)$$

where real asset returns ($r_{i,t}$) are defined over home consumption, with $i = hb, fb, he, fe$ in the equity–bond economy and $i = he, fe$ in the equity-only economy.

To save space, we provide an analysis for the equity–bond economy in the following. The analysis for the equity-only economy is similar but simpler. The NFA_t, the portfolio holdings (α_{t-1}), the real excess asset returns ($r_{ex,t}$), and the home equity return ($r_{\mathrm{he},t}$, as the reference asset) are defined as

$$\begin{aligned} \mathrm{NFA}_t &= \frac{1}{P_t} B_{\mathrm{hb},t} + \mathrm{RER}_t \frac{B_{\mathrm{fb},t}}{P_t^*} + q_{\mathrm{he},t} (x_{\mathrm{he},t} - 1) + q_{\mathrm{fe},t} x_{\mathrm{fe},t}, \\ \alpha_t &= \left[\frac{1}{P_t} B_{\mathrm{hb},t} \quad \mathrm{RER}_t \frac{B_{\mathrm{fb},t}}{P_t^*} \quad x_{\mathrm{fe},t} q_{\mathrm{fe},t} \right]', \\ r_{ex,t} &= [r_{\mathrm{hb},t} - r_{\mathrm{he},t} \quad r_{\mathrm{fb},t} - r_{\mathrm{he},t} \quad r_{\mathrm{fe}t} - r_{\mathrm{he},t}]', \end{aligned} \quad (6)$$

where $\mathrm{RER}_t = S_t P_t^* / P_t$ is the real exchange rate. The lower case letters in (5) and (6) are the corresponding real terms, in units of home consumption, of the upper case letters in (4).

The household's maximization of expected lifetime utility (3), subject to the budget constraint (5), yields the first-order conditions:

$$\tau_t w_t C_t^{-\rho} = L_t^{\kappa}, \quad (7)$$

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$$\tau_t C_t^{-\rho} = \beta E_t \left(\tau_{t+1} C_{t+1}^{-\rho} r_{i,t+1} \right), \tag{8}$$

where (7) is the Euler equation for labor supply and (8) is the Euler equation for individual asset returns.

The proportions of country wealth invested in each asset $\gamma_{i,t}$ (subject to $\sum_i \gamma_{i,t} = 1$) are defined as

$$\begin{aligned} \gamma_t &= \left[\gamma_{\text{hb},t} \quad \gamma_{\text{fb},t} \quad \gamma_{\text{fe},t} \quad \gamma_{\text{he},t} \right]' \\ &= \frac{1}{rw_t} \left[\frac{B_{\text{hb},t}}{P_t} \quad \text{RER}_t \frac{B_{\text{fb},t}}{P_t^*} \quad q_{\text{fe},t} x_{\text{fe},t} \quad q_{\text{he},t} x_{\text{he},t} \right]', \end{aligned} \tag{9}$$

where the country's real wealth (rw_t) is given by

$$\text{rw}_t = \frac{1}{P_t} B_{\text{hb},t} + \text{RER}_t \frac{B_{\text{fb},t}}{P_t^*} + q_{\text{he},t} x_{\text{he},t} + q_{\text{fe},t} x_{\text{fe},t}. \tag{10}$$

Equity home bias arises in the model if the steady state share in home equity satisfies $\bar{\gamma}_{\text{he}} > \frac{1}{2}$.

2.3. Firm Pricing

Each country has a representative firm, producing a distinct good with constant-returns-to-scale (CRS) technology: $y_t = A_t L_t$, where A_t represents country-specific technology shocks, and y_t is firm production satisfying the resource constraint

$$y_t = C_{h,t} + \frac{C_{h,t}^*}{1-\eta} = C_t \left(\frac{P_{h,t}}{P_t} \right)^{-\vartheta} + \frac{1}{1-\eta} C_t^* \left(\frac{P_{h,t}^*}{P_t^*} \right)^{-\vartheta}. \tag{11}$$

According to Obstfeld and Rogoff (2000), importing goods from another country incurs an iceberg trade cost $\eta \in (0, 1)$; that is, consuming one unit of imported goods requires $1/(1-\eta)$ units of that good to be shipped out.

Profit from domestic production d_t is thus

$$d_t = \frac{P_{\text{h},t}}{P_t} C_{\text{h},t} + \frac{S_t P_{\text{h},t}^*}{P_t} C_{\text{h},t}^* - w_t L_t. \tag{12}$$

In a flexible price setting without any friction, the maximization by the representative home firm of its period profit (12), subject to the resource constraint (11), gives the following conditions:

$$\frac{P_{\text{h},t}}{P_t} = \frac{\upsilon}{\upsilon - 1} \frac{w_t}{A_t}, \quad P_{\text{h},t}^* = \frac{1}{1-\eta} \frac{P_{\text{h},t}}{S_t}. \tag{13}$$

Wage payments and firm profits are thus

$$w_t L_t = \frac{\upsilon - 1}{\upsilon} \frac{P_{\text{h},t} y_t}{P_t}, \quad d_t = \frac{1}{\upsilon} \frac{P_{\text{h},t} y_t}{P_t}. \tag{14}$$

2.4. Market Equilibrium and Solution Procedure

We consider two economy structures: the bond–equity economy and the equity-only economy. In each economy, the total equity share supply is normalized at unity: $x_{ht} + x^*_{ht} = 1,\ x_{ft} + x^*_{ft} = 1$. Moreover, in the equity–bond economy, bond markets clear with zero net supply: $B_{ht} + B^*_{ht} = 0,\ B_{ft} + B^*_{ft} = 0$. To compute the real returns of nominal bonds in the bond–equity economy, we pin down the price levels based on the study of Devereux and Sutherland (2009) by assuming that the quantity theory of money holds:

$$M_t = P_{\mathrm{h},t}\, y_t. \tag{15}$$

We assume that home money supply (M_t), technology (A_t), and taste shocks (τ_t) are lognormally distributed, as shown in

$$\log X_t = \rho_X \log X_{t-1} + \varepsilon_{X,t}, \quad X_t = M_t, A_t, \tau_t, \tag{16}$$

where $\varepsilon_{X,t} = \{\varepsilon_{M,t}, \varepsilon_{A,t}, \varepsilon_{\tau,t}\}$ are money supply, technology, and taste innovations, respectively. These innovations are independent and identically distributed random variables with homoskedastic variances.

A log-linearized DSGE model is not suitable for the investigation of endogenous portfolio structure because a first-order approximation satisfies certainty equivalence; thus all assets are perfect substitutes. For this reason, the methodology developed in Devereux and Sutherland (2011) is adopted. The solution procedure combines a second-order approximation of Euler equations to individual assets with a first-order approximation to the remaining parts of the optimal conditions. The steady state portfolio holdings $\bar{\alpha}$ can be represented as a function of fundamental parameters. The steady state fractions of country wealth invested in each asset $\bar{\gamma}$ can then be obtained using (9).[2]

3. CALIBRATION

The model is essentially a consumption-based international asset-pricing model with endogenous labor supply. We first calibrate the model to the moments of international asset returns and test if the overidentification restrictions are valid. We then solve for the country portfolio allocations using the methodology derived in Devereux and Sutherland (2011).

3.1. Generalized Method of Moments Estimation and Overidentification Restriction Test

Equation (8) shows that taste shock is critical for asset pricing because it enters the pricing kernel of Euler equations for asset returns. With an endogenous labor supply, taste shock drives a wedge between the substitution of consumption and leisure and real wage compensation, as shown in (7). By direct substitution, from

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(7) and (8), we have

$$1 = \beta E_t \left[\frac{L_{t+1}^{\kappa}}{L_t^{\kappa}} \left(\frac{w_{t+1}}{w_t} \right)^{-1} r_{i,t+1} \right]. \tag{17}$$

Equation (17) provides a set of moment conditions that can be used to estimate the labor supply elasticity κ and the time discount factor β.

To estimate the β and κ parameters, equation (17) is applied to the generalized method of moments (GMM) estimator proposed by Hansen and Singleton (1982). The instrument z_{t+1} is formed as a product of labor growth rate, nominal wage growth rate, inflation rate, and asset returns, as indicated in Hansen and Singleton (1982):

$$z_{i,t+1} = \frac{L_{t+1}}{L_t} \frac{W_{t+1}}{W_t} \left(\frac{P_{t+1}}{P_t} \right)^{-1} r_{i,t+1}. \tag{18}$$

The vector of instruments includes constant and lagged values of z_{t+1}. The number of lags (NLAG) included is chosen to be 1, 2, 3, or 4.[3] Asset returns used in estimating (17) are from U.S. data from the first quarter of 1980 to the fourth quarter of 2006 and from the aggregate of the rest of the G7 countries (excluding the United States), depending on estimation specification.[4]

GMM estimation results for one moment condition, with home stock as the single asset, are first presented in the first four rows of Table 1. We report GMM estimates of $\hat{\kappa}$ and $\hat{\beta}$, their standard errors, the numbers of overidentification restrictions, and p-values of the overidentification restriction tests. In these four rows, different numbers of lags are included as instruments. For instance, the instrumental variable is $z_t = \{z_{\text{he},t}\}$ when NLAG $= 1$, whereas it is $z_t = \{z_{\text{he},t}, z_{\text{he},t-1}, z_{\text{he},t-2}, z_{\text{he},t-3}\}$ when NLAG $= 4$.

Estimates of κ are insignificantly different from zero, implying that labor enters the utility function linearly in (3). This type of utility function is frequently used in the real business cycle literature [Cogley and Nason (1995)]. The estimate is consistent with the empirical literature on labor supply elasticity. For example, Chetty et al. (2011a) found that estimates of κ around 0.25 are consistent with micro and macro data. Chetty et al. (2011b) mentioned that κ must be less than 0.47 in a model with balanced growth and an intertemporal elasticity of substitution of consumption below unity, which is also the case in our model. Estimates of β range from 0.983 to 0.988 and are highly significant, which is expected for the quarterly U.S. data series. Overidentification restriction tests indicate that the overidentification restrictions are valid in these specifications.

Euler equation (17) holds for different assets. Therefore, it must hold simultaneously for domestic and foreign asset returns. The second set of results [rows (5) to (8) of Table 1] presents the results when home stock and foreign stock returns are included in moment conditions. Vectors of instruments are formed using only lagged values of home stock returns, as in the first set of results, to avoid the small sample bias. In this set of results, estimates of κ and β are consistent with

TABLE 1. GMM estimates with instrumental variables for the period 1980:q1–2006:q4

Return	# Lags	β	$se(\beta)$	κ	$se(\kappa)$	# restrictions	OIR p-value
H_s	1	0.983***	(0.038)	−1.053	(9.309)	0	—
H_s	2	0.988***	(0.024)	−2.177	(5.632)	1	0.885
H_s	3	0.984***	(0.022)	−1.471	(5.255)	2	0.923
H_s	4	0.983***	(0.020)	−1.472	(4.758)	3	0.985
H_sF_s	1	0.981***	(0.027)	−1.744	(7.082)	2	0.846
H_sF_s	2	0.985***	(0.020)	−3.091	(4.744)	4	0.791
H_sF_s	3	0.986***	(0.018)	−3.877	(4.307)	6	0.669
H_sF_s	4	0.981***	(0.017)	−2.810	(3.999)	8	0.804
$H_sF_sH_3F_3$	1	0.998***	(0.003)	−1.301	(0.918)	6	0.261
$H_sF_sH_3F_3$	2	0.998***	(0.002)	−1.217**	(0.591)	10	0.313
$H_sF_sH_3F_3$	3	0.998***	(0.002)	−1.388**	(0.564)	14	0.273
$H_sF_sH_3F_3$	4	0.996***	(0.002)	−0.961**	(0.405)	18	0.400

Notes: (1) $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. (2) H_s, F_s, H_3, F_3 are, respectively returns of home equity, foreign equity, home 3-month bond, and foreign 3-month bond. (3) The vector of instruments includes constant and lagged values of z_{t+1} as defined in (18) in the text. To avoid small sample bias, lags used in the estimates are based on lags of home equity returns alone. (4) # restrictions are the total number of moment conditions minus the number of parameters, and OIR p-value is the p value reported for the overidentification test.

those reported in the first set of results. Here, overidentification restriction tests have p-values greater than 5%, providing further evidence that supports the model specification in Section 2.

These patterns of results are preserved in the third set of estimates [rows (9) to (12) of Table 1], where home and foreign stock returns and bond returns are all included. Point estimates for β are a little bigger than corresponding estimates obtained earlier. Estimates of κ become significantly negative as the number of lags increases. This may be a result of the small sample bias, as stated in Hansen and Singleton (1982).

To summarize, the overidentification restrictions are valid in the specifications listed in Table 1, indicating that the inclusion of taste shocks in the pricing kernel is useful in matching aggregate asset returns.

3.2. Parameterization

To solve for steady state portfolio holdings, values must be assigned to fundamental parameters. The labor supply elasticity κ and the time discount factor β are set at their GMM estimates, $\kappa = 0$ and $\beta = 0.987$. All parameter values in the benchmark model are listed in Table 2. Because of the introduction of taste shocks in the pricing kernel, we cannot estimate the coefficient of the relative risk aversion ρ as we did for κ and β. Thus, we choose the widely used value of $\rho = 2$ [Wang et al. (2012)] in the benchmark analysis, but consider other values of $\rho \in [1, 10]$, as suggested by Mehra and Prescott (1985), to check the robustness of our results.

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TABLE 2. Parameters in the model

Parameter	Values
β	0.987
κ	0
ρ	(1,10)
ν	1.1
η	0.4
σ_τ	0.022
σ_A	0.026
s_c	0.987
s_l	0.974
ρ_τ	0.85
ρ_A	0.96
ρ_M	0.1
σ_M	0.05

The substitution elasticity across country varieties is set at $\upsilon = 1.1$ [Feenstra et al. (2012)]. We define the steady state consumption–financial wealth ratio as $s_c = \bar{C}/r\bar{w}$, and the steady state labor income–financial wealth ratio as $s_l = \bar{w}\bar{L}/r\bar{w}$. The choice of $\upsilon = 1.1$ and $\beta = 0.987$ implies $s_c = 0.015$, which matches the ratio documented in Benigno and Nistico (2012) for the U.S. quarterly data. The steady state relation reveals that $s_l = s_c + (\beta - 1)/\beta$.

The iceberg trade cost is set at $\eta = 0.4$ [Anderson and van Wincoop (2004)].[5] Following Stockman and Tesar (1995), the volatility of taste shocks is allowed to be around 85% of the volatility of productivity shocks (σ_A). Therefore, we set $\sigma_\tau = 0.022$ and $\sigma_A = 0.026$. The autocorrelation of productivity shocks is commonly estimated at 0.96 [Bergin (2006)], and the autocorrelation of taste shocks is set at 0.85 in the baseline case [Stockman and Tesar (1995)]. We also consider other values of taste shock persistence and volatility to check the robustness of our findings. Moreover, in the equity–bond economy, the standard deviation of money supply shocks is set at $\sigma_m = 0.05$ as in Devereux and Sutherland (2009).

3.3. Optimal Portfolio Holdings and the Role of Taste Shocks

The model finds evident equity home bias in the benchmark setting. The steady state share of country wealth invested in domestic equity ($\bar{\gamma}_{\text{he}}$) is around 71.66% in the equity–bond economy, and 61.36% in the equity-only economy. The numbers are close to those documented in the literature for U.S. holdings of domestic equity; for instance, 77.2% in Coeurdacier and Rey (in press), 88% in Ahearne et al. (2004), and the numbers shown in Figure 1.

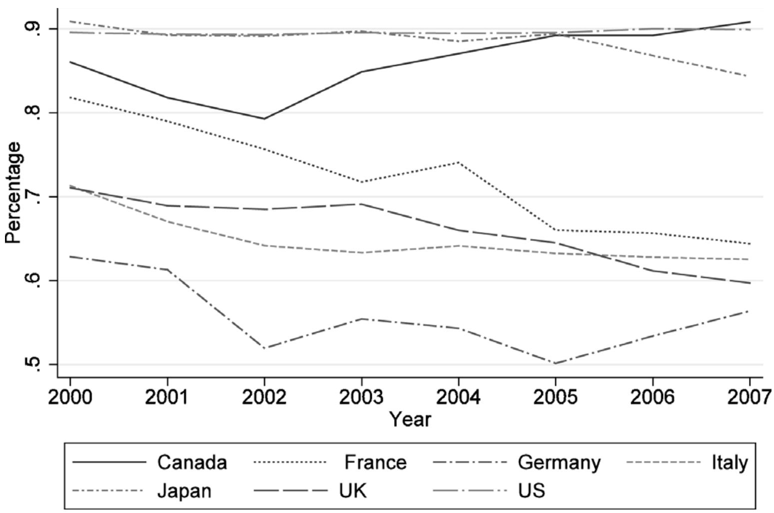

FIGURE 1. The foreign diversification in G-7 countries (2001–2007). Following Amadi and Bergin (2008), the foreign diversification (FD) is defined as the share of a country portfolio invested in foreign equity assets. The value of a country portfolio is given by the sum of its stock market capitalization (MKTCAP) and the foreign equity assets (FA) adjusted for the foreign equity liabilities (FL). The foreign diversification is thus given by FD = FA/(MKTCAP + FA - FL).

Incorporating taste shocks is the key to producing equity home bias. When taste shock is shut off from the economy, the model finds that home investors will purchase only 36.74% of the domestic equity share. This finding is consistent with that of Coeurdacier (2009), which reveals that investors show a bias toward foreign equities when technology shock is the single source of uncertainty.

The intuition that taste shocks play a crucial role in producing equity home bias is that home assets provide effective insurance for home agents against domestic taste shocks, thus making home assets attractive to home agents. Specifically, a positive realization of home taste shocks will drive up home marginal utility from consumption when marginal utility is positively related to domestic taste shocks. The agent will thus consume more and accept lower wages. With a substitution elasticity of varieties larger than one, the drop in the marginal cost of production allows home firm to increase production more than the drop in its goods price, thus leading to a rise in home profit and, hence, a rise in home equity returns. However, foreign terms of trade appreciate as the price of home goods drops, deterring home demand for foreign goods. Consequently, home equity returns will be higher than foreign returns, making home equity holdings attractive to home agents. This reasoning applies to a state with a negative realization of home taste shocks, where home assets pay off less when home consumers want to consume less, and are thus attractive to home agents once more.

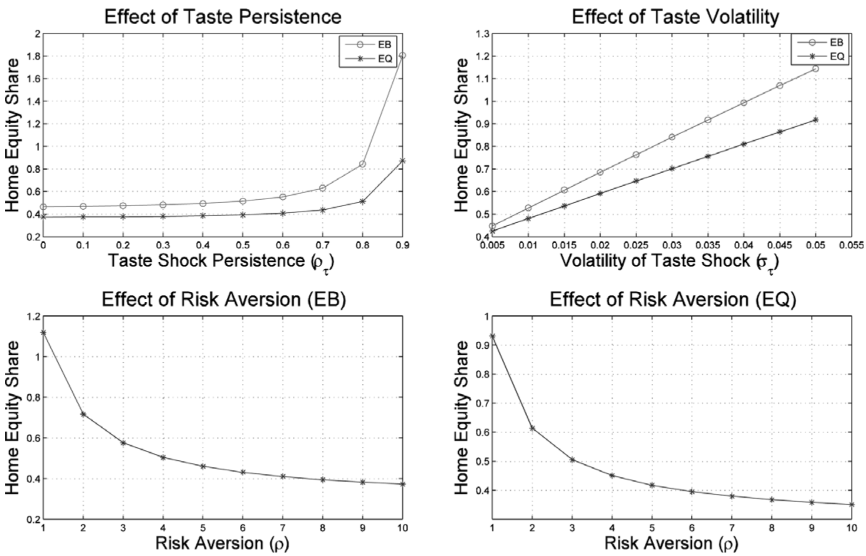

FIGURE 2. Effect of taste persistence, volatility and risk aversion. EQ is the equity-only economy and EB is the equity–bond economy.

Figure 2 illustrates that home agents are willing to hold a rising share of country wealth in domestic equity when taste shocks become more persistent or volatile. Intuitively, as taste shocks become more persistent, the rise in home aggregate consumption becomes more substantial, thus leading to an increase in home equity return and making home assets even better insurance for the agents. More volatile taste shocks result in greater volatility of the marginal utility. Given that taste shocks are positively correlated with home equity returns, home agents will then invest more in home equities to obtain insurance against domestic taste shocks.[6]

Figure 2 also reports optimal portfolio holdings under different degrees of risk aversion. Keeping all other parameter values fixed, the two lower panels show that as consumers become more averse to risk, the effect of taste shocks on equity home bias becomes smaller. The intuition is that when agents become more risk-averse, they are more willing to smooth consumption. Thus, the effect of taste shocks on home aggregate consumption is muted. This weakens the role of home equity holdings in hedging against taste risks, leading to lower conditional covariance–variance ratios between taste risks and excess foreign equity returns, and hence lower holdings of domestic equity. This intuition becomes evident in Section 4.

4. EMPIRICAL ANALYSIS

Our calibration demonstrates that taste shocks are crucial in producing equity home bias. In this section, we empirically examine the contribution of taste risks to equity home bias compared with the contribution of labor income risks and real

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exchange rate risks. Our DSGE model shows that previous information and the spaces of the rest asset returns matter for portfolio choices in a dynamic setting.

4.1. Decomposition of Optimal Portfolio Holdings into Hedging Components

The methodology developed in Benigno and Nistico (2012) is adopted to derive the steady state fractions of country wealth invested in each asset under three asset market structures. We study different cases where bonds may or may not enter the economy. We will show whether including bond returns matters for the estimated contribution of taste risks to home equity bias.[7]

We will demonstrate that the steady state portfolio holdings have three components: those from (1) hedging against the risks in cross-country nontradable labor income differentials ε_{lt+1}, (2) hedging against the risks in consumption taste fluctuations $\varepsilon_{\tau t+1}$, and (3) hedging against the risks in real exchange rate fluctuations $\varepsilon_{rer,t+1}$. These components are conditional on the spaces of the rest asset returns and on the up-to-date t information.[8]

A few notations are first defined to simplify the exposition. Excess asset returns in the asymmetric equity–bond economy are given by

$$\hat{\text{exr}}_t \equiv \begin{bmatrix} \hat{\text{exr}}_t^{fb} \\ \hat{\text{exr}}_t^{he} \\ \hat{\text{exr}}_t^{fe} \end{bmatrix} = \begin{bmatrix} \hat{r}^*_{\text{fb},t+1} + \Delta\,\hat{\text{RER}}_{t+1} - \hat{r}_{\text{hb},t+1} \\ \hat{r}_{\text{he},t+1} - \hat{r}_{\text{hb},t+1} \\ \hat{r}^*_{\text{fe},t+1} + \Delta\,\hat{\text{RER}}_{t+1} - \hat{r}_{\text{he},t+1} \end{bmatrix}. \tag{19}$$

In the equity-only economy, it is

$$\hat{\text{exr}}_t = \begin{bmatrix} \hat{r}^*_{\text{fe},t+1} + \Delta\,\hat{\text{RER}}_{t+1} - \hat{r}_{\text{he},t+1} \end{bmatrix},$$

and in the symmetric equity–bond economy, it is

$$\hat{\text{exr}}_t = \begin{bmatrix} \hat{r}^*_{\text{fb},t+1} + \Delta\,\hat{\text{RER}}_{t+1} - \hat{r}_{\text{hb},t+1} & \hat{r}^*_{\text{fe},t+1} + \Delta\,\hat{\text{RER}}_{t+1} - \hat{r}_{\text{he},t+1} \end{bmatrix}',$$

where $\Delta\,\hat{\text{RER}}_{t+1} = \hat{\text{RER}}_{t+1} - \hat{\text{RER}}_t$. Long-run risks in labor income differentials across countries ε_{lt+1}, long-run risks in cross-country taste differentials $\varepsilon_{\tau t+1}$, and long-run risks in real exchange rate fluctuations $\varepsilon_{\tau,t+1}$ are defined as forecast

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differences over time,

$$\varepsilon_{l,t+1} = \sum_{i=0}^{\infty} \beta^i \left[E_{t+1} \left(\Delta \hat{\psi}^x_{t+1+i} - \Delta \hat{\text{RER}}_{t+1+i} \right) - E_t \left(\Delta \hat{\psi}^x_{t+1+i} - \Delta \hat{\text{RER}}_{t+1+i} \right) \right],$$

$$\varepsilon_{\tau,t+1} = \sum_{i=0}^{\infty} \beta^i \left[E_{t+1} \left(\Delta \hat{\tau}^x_{t+1+i} \right) - E_t \left(\Delta \hat{\tau}^x_{t+1+i} \right) \right], \quad \textbf{(20)}$$

$$\varepsilon_{\tau,t+1} = \sum_{i=0}^{\infty} \beta^i \left[E_{t+1} \left(\Delta \hat{\text{RER}}_{t+1+i} \right) - E_t \left(\Delta \hat{\text{RER}}_{t+1+i} \right) \right],$$

where

$$\psi_t \equiv w_t L_t = \frac{W_t L_t}{P_t}, \quad \Delta \hat{\psi}^x_t = \left(\hat{\psi}_t - \hat{\psi}^*_t \right) - \left(\hat{\psi}_{t-1} - \hat{\psi}^*_{t-1} \right), \quad \text{and}$$

$$\Delta \hat{\tau}^x_t = \left(\hat{\tau}_t - \hat{\tau}^*_t \right) - \left(\hat{\tau}_{t-1} - \hat{\tau}^*_{t-1} \right).$$

(1) Equity-Only Economy

In an economy with equities as the only trading assets, the steady state portfolio is a linear combination of covariance–variance ratios conditioned on previous information but not on other asset returns, and satisfying $\bar{\gamma}_{\text{fe}} + \bar{\gamma}_{\text{he}} = 1$. The steady state fraction of country wealth invested in home asset is given by

$$\bar{\gamma}_{\text{he}} = \frac{1}{2} + \frac{1}{2} \times \frac{\frac{\beta s_l}{(1-\beta)} \text{cov}_t \left(\varepsilon_{l,t+1}, \hat{\text{exr}}^{fe}_{t+1} \right) - \frac{\beta s_c}{(1-\beta)\rho} \text{cov}_t \left(\varepsilon_{\tau,t+1}, \hat{\text{exr}}^{fe}_{t+1} \right) + \frac{\beta(\rho-1)s_c}{(1-\beta)\rho} \text{cov}_t \left(\varepsilon_{rer,t+1}, \hat{\text{exr}}^{fe}_{t+1} \right)}{\text{var}_t \left(\hat{\text{exr}}^{fe}_{t+1} \right)}. \quad \textbf{(21)}$$

Equity home bias arises if $\bar{\gamma}_{\text{he}} > \frac{1}{2}$. We define hedging components as follows:

$$\lambda_l \equiv \frac{\beta s_l}{1-\beta} \frac{\text{cov}_t \left(\varepsilon_{l,t+1}, \hat{\text{exr}}^{fe}_{t+1} \right)}{\text{var}_t \left(\hat{\text{exr}}^{fe}_{t+1} \right)}, \quad \lambda_\tau \equiv - \frac{\beta s_c}{(1-\beta)\rho} \frac{\text{cov}_t \left(\varepsilon_{\tau,t+1}, \hat{\text{exr}}^{fe}_{t+1} \right)}{\text{var}_t \left(\hat{\text{exr}}^{fe}_{t+1} \right)},$$

$$\lambda_{rer} \equiv \frac{\rho-1}{\rho} \frac{\beta s_c}{1-\beta} \frac{\text{cov}_t \left(\varepsilon_{rer,t+1}, \hat{\text{exr}}^{fe}_{t+1} \right)}{\text{var}_t \left(\hat{\text{exr}}^{fe}_{t+1} \right)}.$$

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Equation (21) implies that $\lambda_i > 0,\ i = l, \tau, rer$ if factor i (labor risks, taste risks, or real exchange rate risks) contributes positively to equity home bias. These sign restrictions provide us with a way to empirically examine contributions of different types of risks to equity home bias by computing these hedging components directly from data.

(2) Symmetric Equity–Bond Economy

In a symmetric equity–bond economy, the two countries are ex ante symmetric and hold assets symmetrically, thus satisfying $\bar{\gamma}_{\text{he}} + \bar{\gamma}_{\text{fe}} = 1,\ \bar{\gamma}_{\text{hb}} + \bar{\gamma}_{\text{fb}} = 0$. Investors do not need to make decisions first on overall equity and bond positions. Furthermore, once the home equity position is determined, the foreign equity position is determined as well. The following equation presents the steady state home equity position:

$$\bar{\gamma}_{\text{he}} = \frac{1}{2} + \frac{1}{2} \times \frac{\frac{\beta s_l}{(1-\beta)} \operatorname{cov}_t\left(\varepsilon_{l,t+1}, \widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{fb}_{t+1}\right) - \frac{\beta s_c}{(1-\beta)\rho} \operatorname{cov}_t\left(\varepsilon_{\tau,t+1}, \widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{fb}_{t+1}\right) + \frac{\beta(\rho-1)s_c}{(1-\beta)\rho} \operatorname{cov}_t\left(\varepsilon_{rer,t+1}, \widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{fb}_{t+1}\right)}{\operatorname{var}_t\left(\widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{fb}_{t+1}\right)}. \tag{22}$$

(3) Asymmetric Equity–Bond Economy

In the asymmetric equity–bond economy, we could have that $\bar{\gamma}_{\text{he}} + \bar{\gamma}_{\text{fe}} \neq 1$, which implies that investors need to first separate their investment between equity and bond positions (note that $\sum_i \gamma_i = 1,\ i = hb, fb, he, fe$), as in

$$\bar{\gamma}_{\text{he}} + \bar{\gamma}_{\text{fe}} = \frac{1}{2} + \frac{\beta}{2(1-\beta)} \times \frac{\frac{s_C}{\rho} \operatorname{cov}_t\left(\varepsilon_{\tau,t+1}, \widehat{\text{exr}}^{de}_{t+1} \mid \widehat{\text{exr}}^{fe}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right) - s_l \operatorname{cov}_t\left(\varepsilon_{l,t+1}, \widehat{\text{exr}}^{de}_{t+1} \mid \widehat{\text{exr}}^{fe}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right) - \frac{(\rho-1)s_C}{\rho} \operatorname{cov}_t\left(\varepsilon_{rer,t+1}, \widehat{\text{exr}}^{de}_{t+1} \mid \widehat{\text{exr}}^{fe}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right)}{\operatorname{var}_t\left(\widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{de}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right)}, \tag{23}$$

and then make decisions within the group of equity investment, that is, decide their foreign and domestic equity positions as shown in

$$\bar{\gamma}_{\text{fe}} = \frac{1}{2} + \frac{\beta}{2(1-\beta)} \times \frac{\frac{s_C}{\rho} \operatorname{cov}_t\left(\varepsilon_{\tau,t+1}, \widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{de}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right) - s_l \operatorname{cov}_t\left(\varepsilon_{l,t+1}, \widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{de}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right) - \frac{(\rho-1)s_C}{\rho} \operatorname{cov}_t\left(\varepsilon_{rer,t+1}, \widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{de}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right)}{\operatorname{var}_t\left(\widehat{\text{exr}}^{fe}_{t+1} \mid \widehat{\text{exr}}^{de}_{t+1}, \widehat{\text{exr}}^{fb}_{t+1}\right)}. \tag{24}$$

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4.2. Data

We follow Bergin (2006), Coeurdacier and Gourinchas (2011), and Benigno and Nistico (2012) in choosing data sources and constructing variables.[9] Data for the United States are used for the home country, and an aggregate of the remaining G7 countries is used for the foreign country. Foreign aggregate variables are weighted averages of the remaining G7 countries excluding the United States, with the gross domestic product (GDP) share of each country as the weight. All data are quarterly series from the first quarter of 1980 to the last quarter of 2006.

All series are demeaned, logged differences over time, except equity returns and yields on long-term and short-term bonds, which are logged in levels. To match the model, data are transformed into country differences, home minus foreign counterparts, for all variables except for excess equity and bond returns across countries, which are foreign minus home counterparts. Following Stockman and Tesar (1995), taste shock is captured by the labor supply Euler equation (7) at the GMM estimate of $\kappa = 0$:

$$\hat{\tau}_t = \log\left(\frac{P_t C_t^{\rho}}{W_t}\right).$$

4.3. Econometric Methods

The econometric strategy follows Benigno and Nistico (2012). With the values from a VAR estimate, we compute the three long-run risks, ε_{lt+1}, $\varepsilon_{\tau t+1}$, and $\varepsilon_{rer,t+1}$, using (20); the corresponding covariance–variance ratios; and the implied steady state fractions of country wealth invested in each asset $\bar{\gamma}$, using (21) to (24). Equity home bias arises if the fraction of country wealth invested in home equity satisfies $\bar{\gamma}_{\text{he}} > \frac{1}{2}$ in the equity-only and symmetric equity–bond economies, or $\bar{\gamma}_{\text{he}} > \bar{\gamma}_{\text{fe}}$ in the asymmetric equity–bond economy.

To compute for the optimal portfolio holdings $\bar{\gamma}$, a few parameters must be set ahead, specifically, $\beta,\ s_l,\ s_c,\ \rho$. We set $\beta = 0.987$ at the GMM estimate in Section 3.1. Benigno and Nistico (2012) documented the U.S. real consumption–financial wealth ratio as 0.015; thus we set $s_c = 0.015$, and then calculate real labor income–financial wealth ratio using the steady state relation $s_l = s_C + (\beta - 1)/\beta$. We set $\rho = 2$ in the benchmark but vary risk aversion $\rho \in [1, 10]$ to check robustness.

The VAR (1) model is represented as

$$y_t = Ay_{t-1} + e_t, \qquad e_t \sim N(0, \Omega), \tag{25}$$

where y_t is the demeaned series of Y_t, which is defined as

$$Y_t \equiv \left[\Delta\hat{\psi}_t^x - \Delta\,\widehat{\text{RER}}_t \quad \Delta\hat{\tau}_t^x \quad \Delta\,\widehat{\text{RER}}_t \quad \widehat{\text{exr}}_t \quad X_t\right]'.$$

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TABLE 3. Summary statistics

	$\mu(\cdot)$	$\sigma(\cdot)$	$\rho(\cdot)$	$\rho(\cdot, \Delta\hat{\psi}_t^x - \Delta RE\hat{R}_t)$	$\rho(\cdot, \Delta\hat{\tau}_t^x)$	$\rho(\cdot, \Delta RE\hat{R}_t)$
$\Delta\hat{\psi}_t^x - \Delta RE\hat{R}_t$	0.829	14.196	0.063	1		
$\Delta\hat{\tau}_t^x$	2.199	17.614	0.172	0.816	1	
$\Delta RE\hat{R}_t$	-0.398	11.032	0.232	0.018	0.567	1
$\hat{r}^*_{\text{fb},t+1} + \Delta RE\hat{R}_{t+1} - \hat{r}_{\text{hb},t+1}$	0.132	10.251	0.111	−0.920	−0.571	0.331
$\hat{r}_{\text{he},t+1} - \hat{r}_{\text{hb},t+1}$	6.768	15.781	0.003	−0.043	−0.097	−0.125
$\hat{r}^*_{\text{fe},t+1} + \Delta RE\hat{R}_{t+1} - \hat{r}_{\text{he},t+1}$	-2.136	16.654	0.154	−0.553	−0.411	0.062

Note: The mean $\mu(\cdot)$ and the standard deviation $\sigma(\cdot)$ are annualized percentage points.

e_t has a multivariate normal distribution with zero mean and variance–covariance matrix Ω; X_t represents the additional control variables chosen from Benigno and Nistico (2012), with various specifications including different variables.[10] The vector of $\widehat{\text{exr}}_t$ has different components under different asset market structures, as described earlier. The optimal lag length of 1 is chosen by using the Schwarz information criterion.

Estimates of the coefficients and the covariance–variance matrix, $\hat{A}$and $\hat{\Omega}$, are critical for computing $\bar{\gamma}$ in (21) to (24). l_l', l_τ', l_{rer}', and l_{exr}' are defined to be the selection vector that extracts $\Delta\hat{\psi}_t^x - \Delta\,\widehat{\text{RER}}_t$, $\Delta\hat{\tau}_t^x$, $\Delta\,\widehat{\text{RER}}_t$ and $\widehat{\text{exr}}_{t+1}^{fb}$, $\widehat{\text{exr}}_{t+1}^{de}$, $\widehat{\text{exr}}_{t+1}^{fe}$ from vector y_t.[11] Thus, we have

$$\Delta\hat{\psi}_t^x - \Delta\,\widehat{\text{RER}}_t = l_l' y_t, \quad \Delta\hat{\tau}_t^x = l_\tau' y_t, \quad \Delta\,\widehat{\text{RER}}_t = l_{rer}' y_t, \quad \text{ex}\hat{\text{r}}_t = l_{\text{exr}}' y_t.$$

Based on (20), we have long-run risks ε_{lt+1}, $\varepsilon_{\tau t+1}$, and$\varepsilon_{\tau,t+1}$ given by $\varepsilon_{it+1} = l_i' H e_{t+1}$, $i = l, \tau, rer, \text{exr}$, where $H \equiv (I - \beta A)^{-1}$. The conditional covariance and variance are computed as $\text{cov}_t(\varepsilon_{it+1}, \widehat{\text{exr}}_{t+1}) = l_{\text{exr}}' \Omega H' l_i$.

4.4. Results

Summary statistics. Table 3 reports summary statistics of the six key variables of interest. The mean $\mu(\cdot)$ and the standard deviation $\sigma(\cdot)$ are annualized percentage points. Table 3 also reports the autocorrelation coefficients $\rho(\cdot)$ and the correlations with the growth rates in relative labor income differentials, in relative taste shock differentials across countries, and in real exchange rate fluctuations over time, $\rho(\cdot, \Delta\hat{\psi}_t^x - \Delta\,\widehat{\text{RER}}_t)$, $\rho(\cdot\Delta\hat{\tau}_t^x)$, and $\rho(\cdot, \Delta\,\widehat{\text{RER}}_t)$, respectively.

The negative correlation between labor income and excess equity returns, $\rho(\widehat{\text{exr}}_t^{fe}, \Delta\hat{\psi}_t^x - \Delta\,\widehat{\text{RER}}_t) < 0$, supports the findings in Baxter and Jermann

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TABLE 4. Portfolio holdings and hedging components (equity-only economy)

Risk aversion (ρ)	Hedging components			Portfolio holdings (%)	
	λ_l	λ_τ	λ_{rer}	γ_{he}	γ_{fe}
1	–0.065	0.511	0	72.28	27.72
2	–0.065	0.30	0.023	62.89	37.11
4	–0.065	0.195	0.035	58.19	41.81
6	–0.065	0.159	0.038	56.63	43.37
10	–0.065	0.131	0.041	55.38	44.62

Notes: (1) Hedging components are $\lambda_l = \frac{\beta s_l}{1-\beta} \frac{\text{cov}_t\left(\varepsilon_{l,t+1},\text{exr}_{t+1}^{fe}\right)}{\text{var}_t\left(\text{exr}_{t+1}^{fe}\right)}$, $\lambda_\tau = -\frac{\beta s_c}{(1-\beta)\rho} \frac{\text{cov}_t\left(\varepsilon_{\tau,t+1},\text{exr}_{t+1}^{fe}\right)}{\text{var}_t\left(\text{exr}_{t+1}^{fe}\right)}$, and $\lambda_{rer} = \frac{\rho-1}{\rho} \frac{\beta s_c}{1-\beta} \frac{\text{cov}_t\left(\varepsilon_{rer,t+1},\text{exr}_{t+1}^{fe}\right)}{\text{var}_t\left(\text{exr}_{t+1}^{fe}\right)}$. Reported λ_i in each column is computed from VAR estimation. (2) $\lambda_i > 0$ if the factor i, including labor risks, taste risks, and real exchange rate risks, contributes positively to the equity home bias. (3) Optimal portfolio holding, γ_{he}, is calculated based on equation (21).

(1997), who argue that equity home bias worsens once nontradable labor income is introduced. The negative correlation between taste shocks and excess equity returns, $\rho(\widehat{\text{exr}_t^{fe}}, \Delta\hat{\tau}_t^x) < 0$, provides desired support to our theory, suggesting that domestic equity may be more attractive in hedging against country-specific taste risks. The positive correlation between real exchange rate risks and excess foreign equity returns, $\rho(\widehat{\text{exr}_t^{fe}}, \Delta\,\widehat{\text{RER}}_t) > 0$, suggests that the real exchange rate risks can be a potential reason for equity home bias because home equity pays off well when the home household wants to consume more but home goods are expensive.

Optimal portfolio holdings. Although the unconditional correlations in Table 3 provide tentative insights, the conditional correlations described in (21) to (24) should be examined to study the steady state portfolio structure. We study portfolio holdings under different asset market structures, and then consider different specifications for each market structure by varying elements of the control variables: X_t. Only the most comprehensive specification is reported for each asset structure because results are robust to the variables included in X_t.

(1) Equity-Only Economy

When trading assets are equities only, the optimal asset holding is characterized by (21), with $l_{\text{exr}} = l_{\text{fe}}$. Table 4 reports the results for specifications with different levels of risk aversion. A few findings are worth noting. First, hedging components against taste and real exchange rate risks are positive ($\lambda_\tau > 0,\ \lambda_{rer} > 0$), implying that both risks can account for equity home bias. However, the hedging component against labor risks is negative ($\lambda_l < 0$), leading to equity foreign bias rather than home bias. This finding provides evidence for Baxter and Jermann (1997), but contradicts Coeurdacier and Gourinchas (2011) and Julliard (2002).

TABLE 5. Portfolio holdings and hedging components (symmetric equity–bond economy)

	Hedging components			Portfolio holdings (%)	
Risk aversion (ρ)	λ_l	λ_τ	λ_{rer}	γ_{he}	γ_{fe}
1	−0.0037	0.1449	0	57.06	42.94
2	−0.0037	0.0867	−0.0575	51.27	48.73
4	−0.0037	0.0576	−0.0863	48.38	51.62
6	−0.0037	0.0479	−0.0959	47.41	52.59
10	−0.0037	0.0401	−0.1036	46.64	53.36

Notes: (1) Hedging components are $\lambda_l = \frac{\beta s_l}{(1-\beta)} \frac{\mathrm{cov}_t\left(\varepsilon_{l,t+1}, \mathrm{exr}_{t+1}^{fe} \mid \mathrm{exr}_{t+1}^{fb}\right)}{\mathrm{var}_t\left(\mathrm{exr}_{t+1}^{fe} \mid \mathrm{exr}_{t+1}^{fb}\right)}$, $\lambda_\tau = \frac{-\beta s_c}{(1-\beta)\rho} \frac{\mathrm{cov}_t\left(\varepsilon_{\tau,t+1}, \mathrm{exr}_{t+1}^{fe} \mid \mathrm{exr}_{t+1}^{fb}\right)}{\mathrm{var}_t\left(\mathrm{exr}_{t+1}^{fe} \mid \mathrm{exr}_{t+1}^{fb}\right)}$, and $\lambda_{rer} = \frac{\beta}{(1-\beta)} \frac{(\rho-1)s_c}{\rho} \frac{\mathrm{cov}_t\left(\varepsilon_{rer,t+1}, \mathrm{exr}_{t+1}^{fe} \mid \mathrm{exr}_{t+1}^{fb}\right)}{\mathrm{var}_t\left(\mathrm{exr}_{t+1}^{fe} \mid \mathrm{exr}_{t+1}^{fb}\right)}$. (2) $\lambda_i > 0$ if the factor i, including labor risks, taste risks, and real exchange rate risks, contributes positively to the equity home bias. (3) Optimal portfolio holding, γ_{he}, is calculated based on equation (22).

Second, the degree of equity home bias decreases as investors become highly risk-averse. This finding is consistent with our calibration results. Again, the intuition is that as agents become more risk-averse, they become more willing to smooth consumption. Thus, the effect of taste shocks on home aggregate consumption is less significant. This weakens the role of home equity holdings in hedging against taste risks, leading to lower conditional covariance–variance ratios between taste risks and excess foreign equity returns, and hence, lower holdings of domestic equity.

(2) Symmetric Equity–Bond Economy

The symmetric equity–bond economy assumes two ex ante symmetric countries with $\bar{\gamma}_{\mathrm{he}} + \bar{\gamma}_{\mathrm{fe}} = 1$. The asset market structure is identical to that in Coeurdacier and Gourinchas (2011). The extraction vector is $l_{\mathrm{exr}} = [\, l_{\mathrm{fb}} \; l_{\mathrm{fe}} \,]$. Table 5 reports the results for specifications with different levels of risk aversion. The findings are similar to those for the equity-only economy. However, unlike that in the equity-only economy, the sign of λ_{rer} becomes negative because agents do not hold domestic equity to hedge against real exchange rate fluctuations with the introduction of bonds in the economy. In fact, agents hold domestic bonds to hedge against real exchange rate risks.[12]

(3) Asymmetric Equity–Bond Economy

In the asymmetric equity–bond economy, we do not impose restrictions of $\bar{\gamma}_{\mathrm{he}} + \bar{\gamma}_{\mathrm{fe}} = 1$. Equity home bias arises whenever $\bar{\gamma}_{\mathrm{he}} > \bar{\gamma}_{\mathrm{fe}}$. The dynamic setting implies that relevant moments in (23) and (24) are not only conditioned on the rest of asset returns, as in Coeurdacier and Gourinchas (2011), which assumes a static model, but also on the up-to-date t information. Table 6 reports hedging components and optimal equity holdings for specifications with different levels of risk aversion. The selection vector is $l_{\mathrm{exr}} = [\, l_{\mathrm{fb}} \; l_{de} \; l_{\mathrm{fe}} \,]$. The findings are similar to those in the symmetric equity–bond economy.

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TABLE 6. Portfolio holdings and conditional covariance–variance ratios (asymmetric equity–bond economy)

	Conditional covariance–variance ratios			Portfolio holdings (%)	
Risk aversion (ρ)	λ_l	λ_τ	λ_{rer}	γ_{he}	γ_{fe}
1	−0.0279	0.2696	0.00	62.08	35.94
2	−0.0279	0.2677	−0.0211	60.89	47.6
4	−0.0279	0.2653	−0.0316	60.29	53.42
6	−0.0279	0.2648	−0.0351	60.09	55.37
10	−0.0279	0.2645	−0.0380	59.93	56.92

Notes: (1) Hedging components are

$$\lambda_l = -\frac{\beta}{(1-\beta)} s_l \left[\frac{\text{cov}_t\left(\varepsilon_{l,t+1}, \text{exr}^{de}_{t+1} \mid \text{exr}^{fb}_{t+1}, \text{exr}^{fe}_{t+1}\right)}{\text{var}_t\left(\text{exr}^{de}_{t+1} \mid \text{exr}^{fb}_{t+1}, \text{exr}^{fe}_{t+1}\right)} - \frac{\text{cov}_t\left(\varepsilon_{l,t+1}, \text{exr}^{fe}_{t+1} \mid \text{exr}^{de}_{t+1}, \text{exr}^{fb}_{t+1}\right)}{\text{var}_t\left(\text{exr}^{fe}_{t+1} \mid \text{exr}^{de}_{t+1}, \text{exr}^{fb}_{t+1}\right)} \right],$$

$$\lambda_\tau = \frac{\beta}{(1-\beta)} \frac{s_c}{\rho} \left[\frac{\text{cov}_t\left(\varepsilon_{\tau,t+1}, \text{exr}^{de}_{t+1} \mid \text{exr}^{fb}_{t+1}, \text{exr}^{fe}_{t+1}\right)}{\text{var}_t\left(\text{exr}^{de}_{t+1} \mid \text{exr}^{fb}_{t+1}, \text{exr}^{fe}_{t+1}\right)} - \frac{\text{cov}_t\left(\varepsilon_{\tau,t+1}, \text{exr}^{fe}_{t+1} \mid \text{exr}^{de}_{t+1}, \text{exr}^{fb}_{t+1}\right)}{\text{var}_t\left(\text{exr}^{fe}_{t+1} \mid \text{exr}^{de}_{t+1}, \text{exr}^{fb}_{t+1}\right)} \right], \text{ and}$$

$$\lambda_{rer} = -\frac{\beta}{(1-\beta)} \frac{(\rho-1)\, s_c}{\rho} \left[\frac{\text{cov}_t\left(\varepsilon_{rer,t+1}, \text{exr}^{de}_{t+1} \mid \text{exr}^{fb}_{t+1}, \text{exr}^{fe}_{t+1}\right)}{\text{var}_t\left(\text{exr}^{de}_{t+1} \mid \text{exr}^{fb}_{t+1}, \text{exr}^{fe}_{t+1}\right)} - \frac{\text{cov}_t\left(\varepsilon_{rer,t+1}, \text{exr}^{fe}_{t+1} \mid \text{exr}^{de}_{t+1}, \text{exr}^{fb}_{t+1}\right)}{\text{var}_t\left(\text{exr}^{fe}_{t+1} \mid \text{exr}^{de}_{t+1}, \text{exr}^{fb}_{t+1}\right)} \right].$$

(2) $\lambda_i > 0$ if the factor i, including labor risks, taste risks, and real exchange rate risks, contributes positively to the equity home bias. (3) Optimal portfolio holdings, γ_{he} and γ_{fe}, are calculated based on equations (23) and (24).

5. CONCLUSIONS

Equity home bias remains substantial despite an expansion in international capital flows during the past decades. This paper demonstrates that shocks to consumption tastes (taste shocks) are an effective explanation for equity home bias. Although we remain agnostic about the source of taste shocks, they can be interpreted as sudden changes in the opinions of agents or a form of consumer confidence [Pavlova and Rigobon (2007)].

This paper sheds lights on the importance of taste shocks on equity home bias. The model suggests that home assets provide effective insurance for home agents against domestic consumer taste fluctuations, which is not offered by foreign assets, thus leading to equity home bias. The calibration of the model shows that taste shocks are crucial in producing the observed level of equity home bias in a model with an endogenous labor supply.

Our empirical study provides evidence of the important role of taste shocks in equity home bias. We find that agents hold domestic equities primarily to hedge against domestic taste risks rather than against labor income risks. If bonds are available assets, agents hedge against real exchange rate fluctuations by holding domestic bonds, rather than by holding domestic equities. If bonds are not available, agents may hold home equities to hedge against real exchange rate risks.

However, the relative importance of hedging against taste risks is greater than that of hedging against real exchange rate risks.

NOTES

1. See Lewis (1999) for an early survey and Coeurdacier and Rey (in press) for a recent survey.
2. See the Online Appendix for variable definitions and techniques used in Section 2.
3. As the number of lags rises, more orthogonality conditions are employed in the estimation, which may lead to estimates with less desirable properties because of potential small sample bias. Our estimation results are consistent for lags 1 to 4 but vary substantially for more lags, which may suggest the presence of a small sample problem when more than five lags are included.
4. All data, which include those used in GMM estimations in Section 3.1 and in VAR estimations in Section 4.2, are quarterly series from the first quarter of 1980 to the last quarter of 2006. Sources of data are as follows. Aggregate nominal compensation of employees, nominal consumption spending, nominal GDP, and U.S. trade balance came from the Organization for Economic Co-operation and Development (OECD) Quarterly National Accounts; the CPI, real GDP indexes, and wage indexes were from the International Financial Statistics (IFS) database; the nominal exchange rates and civilian employment were from the OECD Main Economic Indicator; the total stock return indexes, the three-month government bond yields, and the 10-year government bond returns came from Global Financial Data.
5. Anderson and van Wincoop (2004) demonstrated that the tax equivalent of "representative" trade costs for industrialized countries is 170%, among which 74% is transportation and border-related costs. These numbers imply a range for the upper bound of iceberg trade cost $\eta \in (0.45, 0.63)$ in a model where marketing and distribution sectors are not allowed.
6. Note that in the equity–bond economy, the bond positions are close to zero because under flexible price setting, investors try to minimize inflation risk by holding the smallest possible amount of nominal bonds.
7. The reason for doing so is that Coeurdacier and Gourinchas (2011) stated that Baxter and Jermann (1997) cannot account for the role of labor income in explaining equity home bias because they ignore the role of bonds.
8. See the Online Appendix for technique details. To save space, we did not report bond positions in this section. However, they are available upon request.
9. See the Online Appendix for data construction.
10. Control variables X_t include (1) growth rates in relative real consumption, (2) growth rates in relative real GDP across countries, (3) slope of the U.S. term structure (the long- minus short-term government bond yields), and (4) growth rates in the U.S. trade balance. The U.S. trade balance enters to match one of the findings in Gourinchas and Rey (2007), which states that the U.S. net export growth rate helps predict portfolio returns at long horizons. All the other variables are commonly used for predicting asset returns and labor income, as discussed in Campbell (1996).
11. The selection vectors are

$$\begin{aligned} l_l' &\equiv \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & \dots & 0 \end{bmatrix} \\ l_\tau' &\equiv \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & \dots & 0 \end{bmatrix}, \\ l_{rer}' &\equiv \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 & 0 & \dots & 0 \end{bmatrix} \end{aligned}$$

and

$$\begin{bmatrix} l_{\text{fb}}' \\ l_{de}' \\ l_{\text{fe}}' \end{bmatrix} \equiv \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 & 0 & \dots & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & \dots & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & \dots & 0 \end{bmatrix}.$$

12. If we calculate the portfolio holding of bonds, we find that $\gamma_{\text{hb}} = 0.5383$ when $\rho = 2$ (not reported in the table), indicating that home agents now use bonds to hedge against real exchange rate risks.

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