



# Home bias and high turnover: Dynamic portfolio choice with incomplete markets<sup>☆</sup>

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## ABSTRACT

Why do investors trade a lot in foreign assets and hold so little of them in their portfolios? This paper shows that both observations can arise naturally in the presence of nondiversifiable nontraded consumption risk when each country specializes in production, preferences exhibit consumption home bias, and asset markets are incomplete. Using a general equilibrium two-country, two-sector (tradable and nontradable) model of the world economy with production I show that low diversification occurs because variations in relative prices (i) increase the riskiness of foreign assets and (ii) facilitate risk-sharing across countries. Large and volatile capital flows are necessary to take advantage of international risk premia differentials that occur in response to productivity changes in the nontradable sector. I characterize the optimal portfolio holdings, the evolution of the investment opportunity set, the risk premium, and the dynamics of capital flows using a new methodology for solving dynamic general equilibrium models with incomplete markets and portfolio choice.

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## 1. Introduction

Investors around the world allocate most of their portfolios to domestic assets despite the apparent diversification gains to be had from holding foreign assets. The potential welfare gains from international diversification and investors' unwillingness to diversify is a long-standing puzzle in international finance – termed home bias. Another aspect of the home bias puzzle concerns portfolio flows. A number of studies document that cross-border equity flows by domestic residents are large in magnitude and volatile, suggesting that investors do try to take advantage of diversification opportunities

abroad.<sup>1</sup> In fact, size and volatility of U.S. portfolio flows (equity and debt inflows and outflows) exceed the volatility of U.S. current account to GDP ratio. Furthermore, the size and volatility of portfolio flows across borders exceed the size and volatility of portfolio flows in and out of domestic assets.<sup>2</sup> Overall, it seems as though investors trade too much and hold too little of their portfolios in foreign assets. This paper develops a model that can reconcile these two seemingly

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<sup>1</sup> For example, based on U.S. international investment position data from the U.S. Bureau of Economic Analysis (BEA), U.S. holdings of foreign equities amounted to 37% of U.S. GDP and to 26% of U.S. stock market capitalization in 2007. At the same time, according to the International Financial Statistics (IFS) from the International Monetary Fund (IMF), U.S. annual gross portfolio flows amounted to almost 11% of GDP and 7.4% of capitalization in 2006. In terms of volatility, the standard deviation of U.S. net equity assets (or equity outflows) and liabilities (or equity inflows) to GDP during 1990:1–2007:1 was in the order of 0.17%, for U.S. net debt assets (or debt outflows) to GDP the number was 0.18%, while for U.S. net debt liabilities (or debt inflows) to GDP the number was 0.54%. To put these numbers in perspective, during the same period, the standard deviation of the ratio of the U.S. current account to GDP (Hodrick–Prescott filtered) was only 0.12%. Similar pattern also holds in annual data on capital flows and current account. Lewis (1999) provides a survey of the literature on home bias in equities and consumption, capital flows, as well as on welfare gains from diversification.

<sup>2</sup> Tesar and Werner (1994, 1995) provide detailed evidence on high volume and high turnover rate of foreign equity investments in a sample of OECD countries. They show that the turnover rate on foreign equity is significantly larger than the turnover rate on domestic equity. Warnock (2002) updates these statistics using the results of comprehensive benchmark surveys of foreign equity holdings for U.S. and Canada, but still finds that foreign equity turnover is above domestic equity turnover.

contradictory observations. It generates a bias in country portfolios towards domestic assets together with large and variable international asset flows.<sup>3</sup>

The key feature that distinguishes this paper from earlier research on home bias is its analysis of a model with incomplete asset markets. Specifically, my analysis is based on a set of primitive assumptions regarding investors' access to equity markets rather than on an assumption about the degree of risk-sharing achieved in equilibrium. The novelty of my approach is that the degree of risk-sharing is determined endogenously as part of the competitive equilibrium of the model I study. Consequently, I can address the fundamental question of why investors hold most of their portfolios in domestic assets when it appears, a priori, that international diversification could bring welfare gains by facilitating greater risk-sharing.<sup>4</sup> Addressing this question is the central task of this paper.

My analysis uses a two-country general equilibrium model with two sectors: a tradable sector and a nontradable sector. Both sectors are subject to stochastic productivity shocks. Each country specializes in the production of its tradable good. Household preferences are defined over the consumption of three goods: a domestic nontradable and a basket of domestic and foreign tradable goods. Households finance these consumption expenditures by trading in equities issued by tradable firms in both countries, equities indexed to domestic nontradable production, and bonds. In this setting, the home bias (in tradable portfolios) arises as households try to hedge the fluctuations in their nontradable consumption even though productivity changes are independent across sectors and countries. Variations in nontradable consumption also lead to changes in risk premia, which in turn drive portfolio flows across borders.

The intuition for these results is the following. When preferences are complementary in the consumption of a nontradable and a basket of tradable goods, any increase in nontradable consumption must be accompanied by an increase in tradable consumption, both local and imported. Thus, households allocate a larger share of their portfolios to tradable assets whose payoffs are high when their nontraded consumption is high. When, in addition, local and imported tradable goods are imperfect substitutes, variations in the relative price of the imported good perform two roles: First they correlate negatively with the relative supply of foreign tradable dividends; second, they increase the variability of foreign tradable returns in the eyes of domestic households. The first effect decreases the relative value of foreign equity payouts to domestic households. The second effect makes the return on foreign assets riskier. The combination of these two effects inclines households to increase their holdings of domestic equity and skew their portfolios against foreign assets. Variations in the terms of trade are also associated with significant changes in the risk premia on tradable assets. In equilibrium, the shifts in expected excess returns are accompanied by the changes in desired households' portfolios, which in turn trigger large and volatile international capital flows.

This paper builds on a large literature that studies the role of real exchange rate fluctuations for international risk-sharing. Cole and Obstfeld (1991) studied a two-country economy with complete markets and showed that when preferences are symmetric Cobb–Douglas or separable, any variation in relative endowments induces an exactly off-setting change in relative price. As a result, any portfolio

<sup>3</sup> Throughout the paper I use the definition of capital flows that is conventionally employed by the national statistical agencies and by the IMF's IFS database to record the transactions in the financial account of country's balance of payments. It records capital flows as changes in the holdings of assets measured at market prices. Any changes in the market value while securities are still in the holders' possession (valuation changes) are omitted under this definition. An alternative definition of capital flows will also include valuation effects that may arise from asset price and exchange rate variations. My focus in this paper is on the former definition.

<sup>4</sup> Of course, the presence of home bias does not in itself imply that risk-sharing is incomplete. For example, Heathcote and Perri (2004) present a model in which world equilibrium is Pareto efficient and portfolios exhibit home bias.

ensures perfect risk-sharing across countries. Kollmann (2005) uses constant elasticity of substitution (CES) preferences with home bias in consumption to generate portfolio home bias in an endowment economy. Uppal (1993) reaches an opposite conclusion in a complete market general equilibrium setting with shipping costs.<sup>5</sup> Heathcote and Perri (2004) extend this analysis by introducing production. As in Cole and Obstfeld (1991), changes in relative prices facilitate pooling of risks across countries.<sup>6</sup>

A big strand of literature extends this analysis to introduce non-traded goods, so that the relative prices of non-traded goods contribute to the variation in real exchange rate.<sup>7</sup> Stockman and Dellas (1989) started this literature by studying an endowment economy in which investor preferences are separable in tradable and nontradable consumption. They find that asset holdings are constant and the equilibrium portfolio shares are equally split between home and foreign tradable equity, while domestic nontradable equity is completely held by domestic investors. The implications of a richer preference specification are examined in Tesar (1993), Pesenti and van Wincoop (2002), Baxter et al. (1998), Serrat (2001), Matsumoto (2007), and Collard et al. (2007).

Tesar (1993) shows that when tradable and nontradable goods are complementary in consumption, the deviations from an equally-weighted tradable portfolio towards a home biased tradable portfolio will be welfare-improving if domestic nontradable productivity is more strongly correlated with domestic than foreign tradable productivity. Pesenti and van Wincoop (2002) derive an analogous result in a partial equilibrium framework and confirm it empirically using a sample of 14 OECD countries. Serrat (2001) solves for the optimal portfolios in an endowment general equilibrium model in which preferences are defined over a nontradable good and a basket of home and foreign tradable goods. In his framework domestic investors are the sole owners of local nontraded assets, while the home bias in traded portfolios arises under conditions analogous to those in Tesar (1993) and Pesenti and van Wincoop (2002). Kollmann (2006) revisits Serrat's model and shows that when the consumption aggregator is Cobb–Douglas and asset markets are complete, the optimal tradable portfolio remains equally-weighted, while the nontradable portfolio split becomes indeterminate. This result is reminiscent of Baxter et al. (1998). They argued that home bias in tradable equity cannot arise in a static economy with complete markets and international trade in claims to tradable and nontradable goods. Matsumoto (2007) studies asset allocations in the model with both nontraded goods and nontraded factors and finds that the optimal traded portfolios are sensitive to parameter values, especially the elasticity of substitution between different consumption goods and nontraded factors. Collard et al. (2007) and Coeurdacier (2009) confirm this result and emphasize the role of consumption home bias for optimal equity portfolios.

The key conclusion that emerges from this literature is that the degree of equity home bias that can be attributed to the presence of nontraded goods or factors is sensitive to the preference and technology parameters. In this paper I continue to focus on non-traded risk arising from the presence of nontraded good in households' consumption basket. However, relative to the existing literature, I add two new features to the model – capital accumulation and incomplete asset markets. The first feature allows me to eliminate portfolio sensitivity to

<sup>5</sup> Uppal (1993) shows that observed portfolios can not be justified by the consumption bias towards domestic goods. On the contrary, investors that are more risk-averse than a log investor will prefer foreign stocks. The reason for his result is that the real exchange rate is negatively correlated with foreign returns, making returns on foreign assets less risky than domestic returns in the eyes of home investors.

<sup>6</sup> Recent work has extended the analysis by introducing additional shocks, assets, etc. (Coeurdacier et al. (2007, 2008), Coeurdacier and Gourinchas (2008), Engel and Matsumoto (2008)).

<sup>7</sup> Another source of non-traded risk is labor income risk. Its role for equity home bias was studied in Baxter and Jermann (1997), Engel and Matsumoto (2006), Matsumoto (2007).

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