Industrial Specialization Matters: A New Angle on Equity Home Bias

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Motivation

Equity Home Bias Puzzle
Domestic equity accounts for a predominant share of portfolios

⇒ One answer: risk-hedging motives
Motivation

Equity Home Bias Puzzle
Domestic equity accounts for a predominant share of portfolios

⇒ One answer: risk-hedging motives

My Contribution
Adds the sectoral dimension
Examines how industrial structure affects home bias
Preview of Results

Empirical Findings

- Compute home bias (HB) with proprietary financial datasets
- Find HB decreases in countries’ degree of industrial specialization
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Theoretical Contribution

Build a $2 \times 2$ DSGE model with Eaton-Kortum’s framework

- Identify interplay between sector choice and country choice
- Explain why sectoral productivity differences matter for home bias
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- Find HB decreases in countries’ degree of industrial specialization

Theoretical Contribution

Build a $2 \times 2$ DSGE model with Eaton-Kortum’s framework

- Identify interplay between sector choice and country choice
- Explain why sectoral productivity differences matter for home bias

Quantitative Assessment

- Estimate and solve the model covering 58 countries and 15 industries
- Confirm the empirical connection between portfolio diversification and industrial specialization
Related Literature

- Home Bias surveyed by Coeurdacier and Rey (2013):
  - Risk-hedging motives
    - Labor income risk
      Baxter and Jermann (1997) and Heathcote and Perri (2013)
    - Real exchange rate risk
      Cole and Obstfeld (1991) and Coeurdacier (2009)
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  - Market frictions
    - Informational frictions
      Brennan and Cao (1997), Razin et al. (1999)
    - Institutional frictions
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      Brennan and Cao (1997), Razin et al. (1999)
    - Institutional frictions
- Industrial specialization and risk-sharing
  Helpman and Razin (1978), Kalemli-Ozcan et al. (2003)
Intuition — Existing Papers

Home Sector a

Foreign Sector b

Labor Income Risk
Buy Foreign

Real Exchange Rate Risk
Ambiguous
Intuition — This Paper

- Home Sector a
- Foreign Sector a
- Home Sector b
- Foreign Sector b
Intuition — This Paper

- Home Sector a
- Foreign Sector a
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- Foreign Sector b

International Risk Hedging

Intra-national Risk Hedging
# Outline

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<th>Conclusion</th>
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Measure of Home Bias

\[ HB_{i,t} = 1 - \frac{\text{Share of Foreign Equities in Country } i\text{'s Equity Holding at } t}{\text{Share of Foreign Equities in World Market Portfolio at } t} \]

Example: US Market Values 40%
US investors split holdings 50-50

\[ HB_{US} = 1 - \frac{50\%}{60\%} = \frac{1}{6} \]

\[ HB = 1 \text{ full home bias; } HB = 0 \text{ full diversification} \]
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Data

- Numerator: Factset/Lionshare
- Denominator: Datastream
Factset/Lionshare Data

- When: 1998 - 2014
- Where: 100 countries or regions
- Who: institutional investors: banks, insurance companies, retirement or pension funds, hedge funds, sovereign wealth funds and mutual funds (Comparison)
- How: public filings (e.g. 13-Filings with SEC in the U.S.)
Ranking of Home Bias

\[ HB_i = 1 - \frac{\text{Share of Foreign Equities in Country } i \text{ Equity Holding}}{\text{Share of Foreign Equities in World Market Portfolio}} \]
Independent Variables

- Hirschman-Herfindahl index: \( HHI_{i,t} = \sum_{s=1}^{S} b_{i,s,t}^2 \) 
  
  \((b: \text{share of sectoral output in national output})\)

- Chinn-Ito index: a de jure measure of financial openness

- Real GDP: economic size

- IV: factor endowment including land, population, natural resource rents
## Home Bias and Country Specialization

<table>
<thead>
<tr>
<th>Dep. Var: Home Bias</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHI</td>
<td>-2.072 ***</td>
<td>-2.380 ***</td>
<td>-2.407 ***</td>
<td>-2.866 ***</td>
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<tr>
<td></td>
<td>(0.373)</td>
<td>(0.276)</td>
<td>(0.308)</td>
<td>(0.472)</td>
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<tr>
<td></td>
<td>[ -0.234 ]</td>
<td>[ -0.268 ]</td>
<td>[ -0.271 ]</td>
<td></td>
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<tr>
<td>Chinn-Ito</td>
<td>-0.781 ***</td>
<td>-0.778 ***</td>
<td>-0.779 ***</td>
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<tr>
<td></td>
<td>(0.052)</td>
<td>(0.052)</td>
<td>(0.054)</td>
<td></td>
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<tr>
<td></td>
<td>[ -0.607 ]</td>
<td>[ -0.605 ]</td>
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<tr>
<td>log(GDP)</td>
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<td>-0.004</td>
<td>-0.007</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(0.013)</td>
<td>(0.012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[ -0.015 ]</td>
<td></td>
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<tr>
<td>IV</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>332</td>
<td>332</td>
<td>332</td>
<td>330</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.080</td>
<td>0.438</td>
<td>0.438</td>
<td>0.434</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses, standardized coefficients in brackets. ***significant at 1%, **significant at 5%.
Outline

Introduction

Empirical

Model

Quantitative Assessment

Conclusion
Setup

- Two symmetric countries ($i = \{H, F\}$) both produce and consume two goods ($s = \{a, b\}$)
- Eaton-Kortum trade framework with productivity differences $\bar{T}_{H,b} = \bar{T}_{F,a} = 1$, $\bar{T}_{H,a} = \bar{T}_{F,b} = T > 1$
- $1 - \alpha$ of firms’ revenue is used to cover labor costs, and $\alpha$ is paid as dividends to stock owners
- Households have CRRA utility and CES consumption bundles; they supply labor inelastically
- Budget constraint $P_{i,t}C_{i,t} + \sum_{s=\{a,b\}}[q_{H,s,t}(\nu_{H,s,t}^{i} - \nu_{H,s,t-1}^{i}) + q_{F,s,t}f_{i}(\nu_{F,s,t}^{i} - \nu_{F,s,t-1}^{i})]$ 
  $= w_{i,t}L_{i,t} + \sum_{s=\{a,b\}}(d_{H,s,t}\nu_{H,s,t}^{i} + d_{F,s,t}f_{i}\nu_{F,s,t}^{i})$
  (q asset prices; d dividends; $\nu^{i}$ asset holdings $i$; $f_{i}$ financial frictions)
Proposition 1

The share of total domestic assets in the portfolio is

\[
D = \frac{1}{2} + \left[ \frac{\sigma - 1}{2\sigma\alpha} \sum \chi(\hat{e}) \right.
- \frac{1 - \alpha}{2\alpha} \sum \chi(\hat{wL})
- \frac{2\mu - 1}{2} \sum \chi(\hat{d_H}) \left. \right] \times A
\]

where \( \Sigma \chi(\hat{x}) \): covariance between \( \hat{x} \) and the two domestic dividends; \( A > 0 \)
Proposition 1

The share of total domestic assets in the portfolio is

$$D = \frac{1}{2} + \left[ \frac{\sigma - 1}{2\sigma\alpha} \sum \chi(\hat{e}) - \frac{1 - \alpha}{2\alpha} \sum \chi(\hat{wL}) - \frac{2\mu - 1}{2} \sum \chi(\hat{d}_H) \right] \times A$$

where $\Sigma \chi(\hat{x})$: covariance between $\hat{x}$ and the two domestic dividends; $A > 0$

Proposition 2

Sectoral share $\mu$ and domestic share $D$ are substitutes as long as $\sum \chi(\hat{d}_H) > 0$.

(Notation: $\mu = \nu_{H,a} + \nu_{F,a}$, $D = \nu_{H,a} + \nu_{H,b}$)

$\Sigma \chi(\hat{d}_H)$: the covariance between domestic dividends relative to foreign ones and sector $a$ dividends relative to sector $b$ ones
Proposition 4

Home bias decreases in $T$ the sectoral productivity disparity.

$$ HB = \frac{f - 1}{f + 1} + \frac{2}{f + 1} \left[ -\frac{1 - \alpha}{\alpha} + \frac{1}{\alpha} \frac{T - 1}{T + 1} \left( 1 - \frac{1}{\sigma} \right) \right] $$

where $\lambda \equiv \frac{1 - \tau}{1 + \tau} \left[ 1 - \phi + (\phi - \frac{1}{\sigma})(\frac{1 - \tau}{1 + \tau})^2 \right]^{-1} < 0$
Proposition 4

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where $\lambda \equiv \frac{1 - \tau}{1 + \tau} \frac{1 - \phi}{1 - \phi} \left[ 1 - \phi + (\phi - \frac{1}{\sigma}) \left( \frac{1 - \tau}{1 + \tau} \frac{1 - \phi}{1 - \phi} \right)^2 \right]^{-1} < 0$

$f = \infty$

Infinite financial friction $f$, full home bias
Proposition 4

Home bias decreases in $T$ the sectoral productivity disparity.

$$
HB = \frac{f - 1}{f + 1} + \frac{2}{f + 1} \left[ -\frac{1}{\alpha} + \frac{1}{\alpha} \frac{T - 1}{T + 1} \frac{1 - \frac{1}{\sigma}}{\lambda} \right]
$$

where $\lambda \equiv \frac{1 - \tau^{1-\phi}}{1 + \tau^{1-\phi}} [1 - \phi + (\phi - \frac{1}{\sigma})(\frac{1 - \tau^{1-\phi}}{1 + \tau^{1-\phi}})^2]^{-1} < 0$

$f = \infty$

Infinite financial friction $f$, full home bias

$f = 0, T = 1$

A single good world, as in Baxter and Jermann (1997)

$f = 0, T = \infty$

Fully specialized countries, as in Coeurdacier and Rey (2013)
Outline

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Extended Model

- Covers 58 countries and 15 manufacturing sectors
- Includes nontradable sectors

\[
Ci = C_{i,T}^\mu_i C_{i,N}^{1-\mu_i} = \left( \sum_{s=1}^{S} \frac{1}{\phi_s} C_{i,s}^{\phi-1} \right)^{\phi-1} \mu_i C_{i,N}^{1-\mu_i}.
\]

- Embeds trade costs

\[
p_{i,s}(Z) = \frac{\tau_i r_{i,s}^{\alpha} w_{i,s}^{1-\alpha}}{A_{i,s}(Z)}.
\]

- Incorporates capital restriction

\[
P_{i,t} C_{i,t} + \sum_{k \in \{1,2,\ldots,S,N\}} [q_{i,k,t}(\nu_{i,k,t} - \nu_{i,k,t-1}) + q_{j,k,t}f_i(\nu_{j,k,t} - \nu_{j,k,t-1})]
\]

\[
= w_{i,t} L_{i,t} + \sum_{k \in \{1,2,\ldots,S,N\}} (d_{i,k,t}\nu_{i,k,t} + d_{j,k,t}f_i\nu_{j,k,t}).
\]

(1)
Parametrization(1)

Common variables from previous literature

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>$\beta$</td>
<td>Discount factor</td>
<td>0.95</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Coefficient of relative risk aversion</td>
<td>2</td>
</tr>
<tr>
<td>$\phi$</td>
<td>Elasticity of substitution between sectors</td>
<td>2</td>
</tr>
<tr>
<td>$\theta$</td>
<td>Dispersion of productivity draws</td>
<td>8.28</td>
</tr>
</tbody>
</table>

Country-specific factors

- Examples: labor and capital endowments, expenditure on nontradables
- Sources: Penn World, OECD
Parametrization(2)

Sector-specific factors

<table>
<thead>
<tr>
<th>Sector Name</th>
<th>Expenditure Shares within Tradables ($\psi_s$)</th>
<th>Capital Intensity ($\alpha_s$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>0.165</td>
<td>0.329</td>
</tr>
<tr>
<td>Beverages</td>
<td>0.054</td>
<td>0.272</td>
</tr>
<tr>
<td>Tobacco</td>
<td>0.010</td>
<td>0.264</td>
</tr>
<tr>
<td>Clothing &amp; Accessories, Footwear</td>
<td>0.134</td>
<td>0.491</td>
</tr>
<tr>
<td>Forestry</td>
<td>0.009</td>
<td>0.452</td>
</tr>
<tr>
<td>Paper</td>
<td>0.013</td>
<td>0.366</td>
</tr>
<tr>
<td>Oil &amp; Gas Producers,Coal</td>
<td>0.096</td>
<td>0.244</td>
</tr>
<tr>
<td>Chemicals</td>
<td>0.008</td>
<td>0.308</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>0.036</td>
<td>0.319</td>
</tr>
<tr>
<td>Iron &amp; Steel</td>
<td>0.015</td>
<td>0.381</td>
</tr>
<tr>
<td>Nonferrous Metals</td>
<td>0.074</td>
<td>0.407</td>
</tr>
<tr>
<td>Electronics &amp; Electric Equipment</td>
<td>0.060</td>
<td>0.405</td>
</tr>
<tr>
<td>Machinery</td>
<td>0.073</td>
<td>0.473</td>
</tr>
<tr>
<td>Automobiles &amp; Parts</td>
<td>0.183</td>
<td>0.464</td>
</tr>
<tr>
<td>Furnishings</td>
<td>0.068</td>
<td>0.460</td>
</tr>
</tbody>
</table>

Sources: US consumption data and I-O table

Country-sector specific factors

- Productivity estimated with trade data (Algorithm)
Figure: Model-implied and Actual Wages and Sectoral Exports
**Numerical Results (1)**

**HB and HHI**

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<tr>
<th>Dep. Var: Home Bias</th>
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<tr>
<td>HHI</td>
<td>-2.849 ***</td>
<td>-2.134 **</td>
</tr>
<tr>
<td></td>
<td>( 1.028 )</td>
<td>( 0.867 )</td>
</tr>
<tr>
<td></td>
<td>[ -0.311 ]</td>
<td>[ -0.313 ]</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.452</td>
<td>0.650 ***</td>
</tr>
<tr>
<td></td>
<td>( 0.488 )</td>
<td>( 0.082 )</td>
</tr>
<tr>
<td>Observations</td>
<td>58</td>
<td>36</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.097</td>
<td>0.098</td>
</tr>
</tbody>
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Note: Robust standard errors in parentheses and standardized coefficients in brackets. **significant at 5%, and *** significant at 1%.

**Financial Frictions**

$$f_i = \alpha + \beta Chinn_i + \epsilon_i,$$

$$\hat{\beta} = -0.60^{**}$$
Figure: Home Bias and HHI absent Financial Frictions
Counterfactual Analysis

When there is no productivity difference across sectors within a country,

- HHI decreases by 0.24 (or 55.8 percent) on average
- Home bias increases by 2.04 (126 percent) on average
- HHI and home bias are no longer significantly correlated
- Baseline vs counterfactual

\[ \Delta HB_i = \alpha + \beta \Delta HHI_i + \epsilon_i. \]

\[ \hat{\beta} = -0.304^{**} \]
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Summary

• Add the sectoral dimension to the home bias literature
• Examine the influence of industrial structure on portfolio choice
Conclusion

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• Examine the influence of industrial structure on portfolio choice

Future Research

• Study bilateral financial investment
• Introduce debt and examine investors’ preferences between different types of assets
National HB based on Factset Data versus that based on IFS
Algorithm

- **Step 1.** Guess factor prices using national output and endowment data.
- **Step 2.** Estimate sectoral productivity and trade cost to fit a country’s trade pattern including
  - (1) its share of all the countries’ exports in a sector
  - (2) the country’s overall export-to-output ratio
- **Step 3.** Plug the estimated productivity and trade cost in the model equations to determine factor allocations.
- **Step 4.** Update factor prices, repeat Step 2 and 3, until they satisfy the market-clearing conditions.
- **Step 5.** Solve the portfolio choice problem using Devereux and Sutherland (2011)’s method.