

# Rethinking Exchange Rate Exposure in Equity Markets Through International Trade Networks

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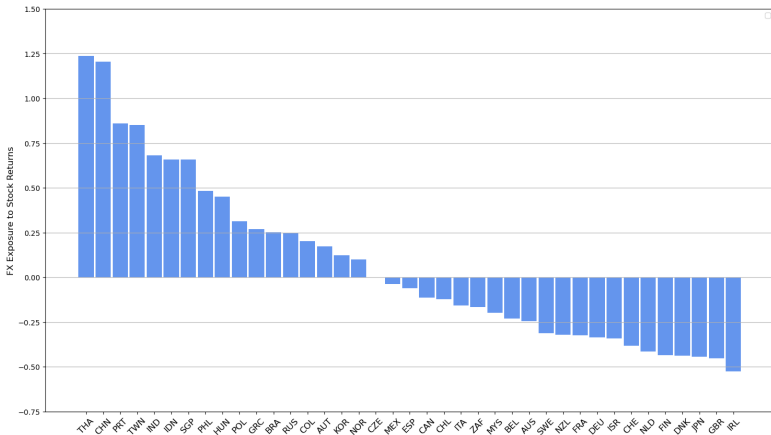
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# Research Question

$$R_{i,t} - R_{i,US} = \alpha_i + \beta_i FX_{i,t}^{USD} + \epsilon_{i,t}$$



What determines currency beta ( $\beta_i$ )?

# Prior Literature

- Classical theories predict that currency beta depends on firm's trade and production structure.<sup>3</sup>
  - For a net exporting firm, beta should be negative.
- Empirical studies **do not find clear evidence** on this relationship.
  - \* Some find negative correlation<sup>4</sup>, others find positive correlation<sup>5</sup>.
  - \* Some find no relationship at all<sup>6</sup>.
- Hau and Rey (2006)

*"the empirical literature has unambiguously shown that goods market variables do not explain exchange rate movements,"*

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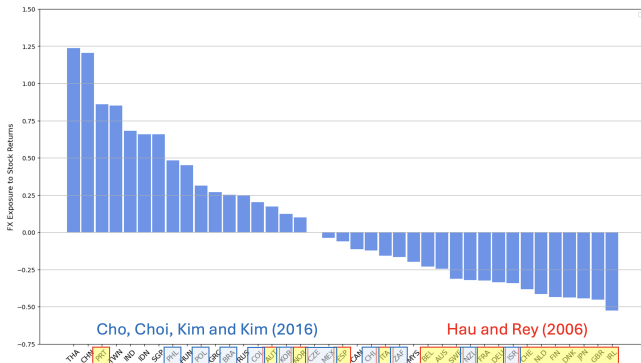
<sup>3</sup>Shapiro (1974), Dumas (1978)

<sup>4</sup>Hau and Rey (2006), Camanho, Hau, and Rey (2022)

<sup>5</sup>Cho, Choi, Kim, and Kim (2016)

<sup>6</sup>Bodnar, Dumas, and Martson (2002), Bartram, Brown, and Minton (2010), Amiti, Itskhoki, and Konings (2014)

# Prior Literature



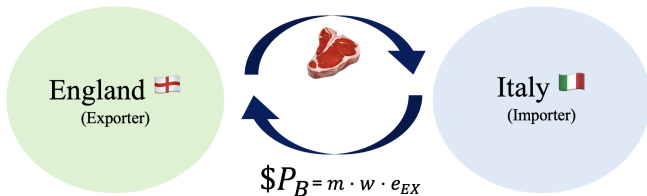
- Prior studies focus on the **capital flow** channel.
  - \* Hau and Rey (2006): Negative beta among 17 OECD countries.
  - \* Cho, Choi, Kim and Kim (2016): Positive beta among emerging countries.

# Motivation

- We consider a **real economic channel**—in particular, how exchange rates affect
  - \* **export demand** (revenue channel)
  - \* **import costs** (cost channel)which move in opposite directions.
- Existing currency return measures often rely on a single USD benchmark or a single trade-weighted index, potentially blending these two forces.
- We ask whether a currency measure that **separates demand and cost components** can better explain why currency betas differ across countries and better capture the link between currency returns and stock returns.

# Simple Model

One monopolistic firm in each country that only export to/import from one another.

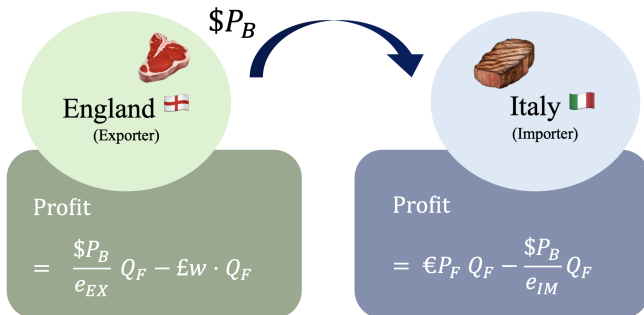


\* Producer Currency Pricing

- Price of beef is determined as  $m \cdot w$  in British pound.

# Simple Model

① *How does currency value affect profitability?*



$$\Pi_{EX}^* = \frac{(m-1)w}{2b} \left( a - \frac{m \cdot w \cdot e_{EX}}{e_{IM}} \right), \quad \Pi_{IM}^* = \frac{1}{4b} \left( a - \frac{m \cdot w \cdot e_{EX}}{e_{IM}} \right)^2$$

## Simple Model

② *How is currency beta determined?*

$$\begin{aligned}\beta_{c,q} &\equiv \frac{1}{P_c} \frac{\partial \Pi_c}{\partial q_c} = \frac{1}{P_c} \frac{\partial (S_c - C_c)}{\partial q_c} \\ &= \underbrace{\frac{S_c}{P_c}}_{\text{Sales-to-Price ratio}} \left( \underbrace{\left( \frac{1}{S_c} \frac{\partial S_c}{\partial q_c} \right)}_{\text{Revenue Channel}} - \underbrace{\left( \frac{C_c}{S_c} \right)}_{\text{Profit Margin}^{-1}} \underbrace{\left( \frac{1}{C_c} \frac{\partial C_c}{\partial q_c} \right)}_{\text{Cost Channel}} \right)\end{aligned}$$

The sign of  $\beta_{c,q}$  hinges on **Revenue channel vs. Cost channel**



# Data & Sample

## Trade Flows

- OECD Input-Output Tables

## Returns/ Financials

- Stock Returns: Datastream
- Currency Returns: Datastream, Compustat Global
- Country Returns: MSCI index (Bloomberg)
- World Returns: MSCI World Developed Market Index
- Sales, COGS: Worldscope

## Final Sample

- Sample Period: 1996-2021
- 40 countries with MSCI world index
- 474,475 unique country x industry x month

# Construction of Returns

- Export/Import based Currency Returns of (c,i)

Currency returns of c relative to (c,i)'s export/import partners

$$FX_{c,i,t}^{EX} = FX_{c,t}^{USD} - \sum_{d \in \Omega_{c,i}^{EX}} \nu_{c,i,d} FX_{d,t}^{USD}$$

$$FX_{c,i,t}^{IM} = FX_{c,t}^{USD} - \sum_{d \in \Omega_{c,i}^{IM}} \omega_{c,i,d} FX_{d,t}^{USD}$$

- Export to Import Currency Returns of (c,i)

Currency returns of (c,i)'s export partners relative to import partners

$$FX_{c,i,t}^{XM} = FX_{c,i,t}^{IM} - FX_{c,i,t}^{EX} = \Delta q_{c,i,t}^{EX} - \Delta q_{c,i,t}^{IM}$$

# Predictions

$$R_{c,i,t} = \alpha_{c,i} + \beta_{EX,c,i}FX_{c,i,t}^{EX} + \beta_{IM,c,i}FX_{c,i,t}^{IM} + \mathbf{Controls}_{c,i,t}$$

1. *If currency appreciates relative to exporting partners, stock returns would decrease. ( $\beta_{EX} < 0$ )*
  2. *If currency appreciates relative to importing partners, stock returns would increase. ( $\beta_{IM} > 0$ )*
- ⇒ *If a firm is a **net exporter**, the first relationship dominates and would have a **negative** currency beta. ( $\beta_{USD} < 0$ )*

# Main Results

**Table 2. Stock returns and currency returns against import-export benchmarks**

$$R_{c,i,t} = \alpha_{c,i} + \beta_{EX,c,i} FX_{c,i,t}^{EX} + \beta_{IM,c,i} FX_{c,i,t}^{IM} + \text{Controls}_{c,i,t}$$

$$R_{c,i,t} = \alpha_{c,i} + \beta_{XM,c,i} FX_{c,i,t}^{XM} + \gamma_{USD,c,i} FX_{c,i,t}^{USD} + \text{Controls}_{c,i,t}$$

Panel A. Value-weighted country-industry returns

Dependent Variable: $R_{c,i,t}$									
$FX_{c,i,t}^{EX}$	-0.096 (-6.01)	-0.034 (-2.78)	-0.072 (-5.14)	-0.074 (-5.26)	-0.076 (-5.39)				
$FX_{c,i,t}^{IM}$	0.350 (21.73)	0.059 (4.75)	0.065 (4.57)	0.078 (5.49)	0.079 (5.57)				
$FX_{c,t}^{USD}$						0.395 (104.80)	-0.116 (-31.94)	-0.111 (-30.39)	-0.111 (-30.52)
$FX_{c,i,t}^{XM}$						0.164 (10.45)	0.075 (5.41)	0.081 (5.82)	0.083 (5.93)
$R_{c,t}$		0.787 (581.98)							
$R_{WLD,t}$			0.842 (372.36)	0.842 (372.65)	0.842 (372.57)		0.872 (359.12)	0.871 (359.03)	0.871 (358.98)
Country FE	N	N	N	Y	N	N	N	Y	N
Industry FE	N	N	N	Y	N	N	N	Y	N
Country × Industry FE	N	N	N	N	Y	N	N	N	Y
Adj-R <sup>2</sup>	0.005	0.420	0.230	0.232	0.228	0.023	0.232	0.233	0.230
N	474,475	474,475	474,475	474,475	474,475	474,475	474,475	474,475	474,475

# Main Results

*What determines the sign of currency beta ( $\beta_i$ )?*

**Table 4. Currency Exposure and Net Export**

Panel A. Value-weighted country-industry returns								
	Dependent Variable: Value-weighted country-industry returns							
$FX_{c,t}^{USD}$	0.396 (97.87)	-0.116 (-29.14)	0.404 (74.55)	0.351 (46.47)	0.353 (46.81)	0.399 (98.24)	-0.113 (-28.40)	-0.109 (-27.40)
$FX_{c,t}^{USD} \times \text{FracExp}_{c,i,t}^-$			-0.046 (-2.13)		-0.166 (-6.44)			
$FX_{c,t}^{USD} \times \text{FracImp}_{c,i,t}^-$				0.236 (7.09)	0.372 (9.26)			
$FX_{c,t}^{USD} \times \text{NetExp}_{c,i,t}^-$						-0.068 (-8.80)	-0.055 (-7.77)	-0.055 (-7.87)
$\text{NetExp}_{c,i,t}^-$						0.001 (3.37)	0.001 (4.74)	0.005 (6.70)
$\text{FracExp}_{c,i,t}^-$			0.001 (1.06)		0.002 (3.61)			
$\text{FracImp}_{c,i,t}^-$				-0.004 (-4.21)	-0.006 (-5.38)			
$R_{WLD,t}$		0.872 (360.41)					0.872 (360.42)	0.871 (361.24)
Country FE	N	N	N	N	N	N	Y	N
Industry FE	N	N	N	N	N	N	Y	N
Country $\times$ Industry FE	N	N	N	N	N	N	N	Y
Adj-R <sup>2</sup>	0.023	0.232	0.023	0.023	0.023	0.023	0.232	0.230
N	474,475	474,475	474,475	474,475	474,475	474,475	474,475	474,475

# Country level Results

$$R_{c,t} = \alpha_c + \beta_{EX,c} FX_{c,t}^{EX} + \beta_{IM,c} FX_{c,t}^{IM} + \mathbf{Controls}_t$$

A Net Exporter has lower currency beta.

Table 6.

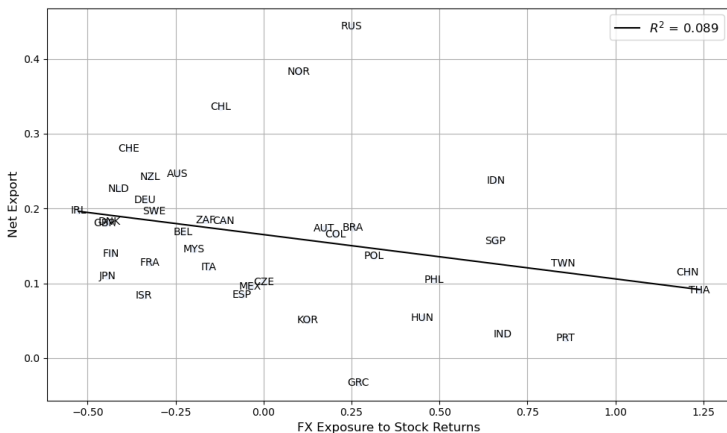
	Country index returns	
$FX_{c,t}^{EX}$	-0.507 (-2.38)	-0.513 (-2.41)
$FX_{c,t}^{IM}$	0.520 (2.40)	0.540 (2.50)
$FX_{c,t}^{EX} \times TrdShr_{c,t}^-$		
$FX_{c,t}^{IM} \times TrdShr_{c,t}^-$		
$TrdShr_{c,t}^-$		
$R_{WLD,t}$	0.911 (63.70)	0.911 (64.01)
Country FE	N	Y
Adj-R <sup>2</sup>	0.386	0.387
N	12,174	12,174

Table 7.

	Country index returns			
$FX_{c,t}^{USD}$	-0.097 (-1.49)	0.036 (0.79)	-0.083 (-1.29)	0.038 (0.84)
$FX_{c,t}^{USD} \times FracExp_{c,t}^-$	-1.978 (-3.25)		-2.001 (-3.28)	
$FX_{c,t}^{USD} \times FracImp_{c,t}^-$	1.702 (3.01)		1.677 (2.97)	
$FX_{c,t}^{USD} \times NetExp_{c,t}^-$		-0.689 (-3.28)		-0.661 (-3.19)
$FracExp_{c,t}^-$	0.014 (1.03)		0.093 (2.40)	
$FracImp_{c,t}^-$	-0.029 (-2.13)		-0.112 (-3.22)	
$NetExp_{c,t}^-$		0.008 (1.44)		0.017 (1.44)
$R_{WLD,t}$	0.930 (62.32)	0.929 (61.26)	0.930 (62.57)	0.928 (61.63)
Country FE	N	N	Y	Y
Adj-R <sup>2</sup>	0.388	0.388	0.389	0.389
N	12,174	12,174	12,174	12,174

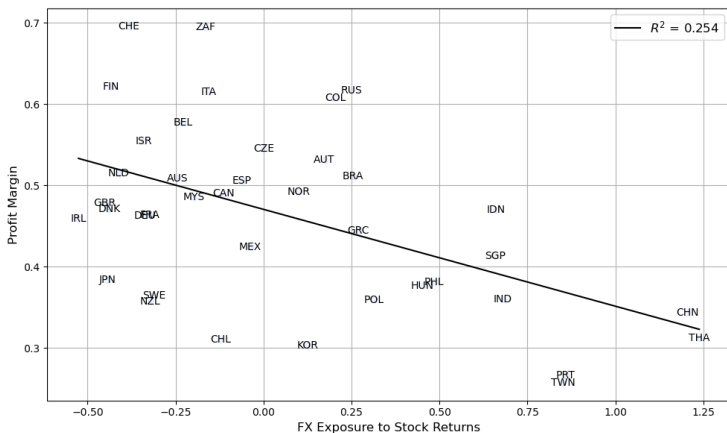
# Country level Results

$$\beta_{c,q} = \underbrace{\frac{S_c}{P_c}}_{\text{Sales-to-Price ratio}} \underbrace{\left( \frac{1}{S_c} \frac{\partial S_c}{\partial q_c} \right)}_{\text{Revenue Channel}} - \underbrace{\left( \frac{C_c}{S_c} \right)}_{\text{Profit Margin}^{-1}} \underbrace{\left( \frac{1}{C_c} \frac{\partial C_c}{\partial q_c} \right)}_{\text{Cost Channel}}$$



# Country level Results

$$\beta_{C,q} = \underbrace{\frac{S_C}{P_C}}_{\text{Sales-to-Price ratio}} \left( \underbrace{\left( \frac{1}{S_C} \frac{\partial S_C}{\partial q_C} \right)}_{\text{Revenue Channel}} - \underbrace{\left( \frac{C_C}{S_C} \right)}_{\text{Profit Margin}^{-1}} \underbrace{\left( \frac{1}{C_C} \frac{\partial C_C}{\partial q_C} \right)}_{\text{Cost Channel}} \right)$$





## Country level Results

$$\beta_{c,q} = \underbrace{\frac{S_c}{P_c}}_{\text{Sales-to-Price ratio}} \left( \underbrace{\left( \frac{1}{S_c} \frac{\partial S_c}{\partial q_c} \right)}_{\text{Revenue Channel}} - \underbrace{\left( \frac{C_c}{S_c} \right)}_{\text{Profit Margin}^{-1}} \underbrace{\left( \frac{1}{C_c} \frac{\partial C_c}{\partial q_c} \right)}_{\text{Cost Channel}} \right)$$

**Table 8. Currency risk exposure and profit margin**

	Dependent variable: Country index returns				
$FX_{c,t}^{USD} \times PM_{c,t}^-$	-0.261 (-2.88)	-0.246 (-2.73)	-0.271 (-3.09)	-0.223 (-2.40)	-0.249 (-2.77)
$FX_{c,t}^{USD} \times NetExp_{c,t}^-$				-0.631 (-3.01)	-0.604 (-2.93)
$FX_{c,t}^{USD}$	0.062 (1.10)	0.053 (0.95)	0.073 (1.36)	0.148 (2.48)	0.164 (2.77)
$PM_{c,t}^-$		0.008 (3.88)	0.012 (4.37)	0.008 (3.71)	0.012 (4.39)
$NetExp_{c,t}^-$				0.005 (1.00)	0.018 (1.51)
$R_{WLD,t}$	0.926 (61.18)	0.927 (61.27)	0.926 (61.85)	0.926 (61.10)	0.926 (61.68)
Country FE	N	N	Y	N	Y
Adj-R <sup>2</sup>	0.388	0.388	0.390	0.389	0.391
N	12,174	12,174	12,174	12,174	12,174

# Conclusion

- \* Currency returns and stock returns are related through the **real goods mechanism**, and disaggregating currency returns relative to export and import partners effectively captures this link.
- \* If currency value  $\uparrow$  relative to export partners, stock returns  $\downarrow$
- \* If currency value  $\uparrow$  relative to import partners, stock returns  $\uparrow$
- \* A **net exporter**, with the *first effect* dominating the *second effect*, has a negative currency beta.
- \* **High profit margin**, dampening the import cost channel, is related to negative currency beta.