Corporate Debt Structure with Home and International Currency Bias

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Global Bond Issuance with Segmented Capital Markets

- Key feature of global bond portfolios: Home Currency Bias (Maggiori, Neiman and Schreger (2020))
- When investors don't lend in their home currency, they tend to do it in the dollar: International Currency Bias

This paper: implications of investor currency bias for currency composition of corporate debt

- Stylized facts of corporate bond issuance and holdings
- Simple model with investor segmentation by currency
- Quantity dimension of the Exorbitant Privilege

Related Literature

- **International role of currencies:** Ilzetzki, Reinhart and Rogoff (2019) and Ilzetzki, Reinhart and Rogoff (2022), Gourinchas et al. (2011), Eichengreen (2011), Gourinchas and Rey (2007), Coppola et al. (2023), Jiang et al. (2021), Farhi and Maggiori (2018), He et al. (2019), Gopinath and Stein (2018), and Hassan (2013)
- **International finance and macroeconomics with segmented financial markets:** Gabaix and Maggiori (2015), Greenwood et al. (2023), Gourinchas et al. (2022), and Maggiori (2022)
- **Currency composition of corporate borrowing:** Bruno and Shin (2017), Salomao and Varela (2022), Kalemli-Ozcan et al. (2016), Du et al. (2020), Eren et al. (2022), Tietz (2020), Calomiris et al. (2019), and Hale and Obstfeld (2016)
- **Hedging of currency risk:** Liao (2020), Sialm and Zhu (2021), Alfaro et al. (2021)
- **Global capital allocation:** Florez-Orrego et al. (2023)
- **Heterogeneous firms in trade:** Melitz (2003)

Data

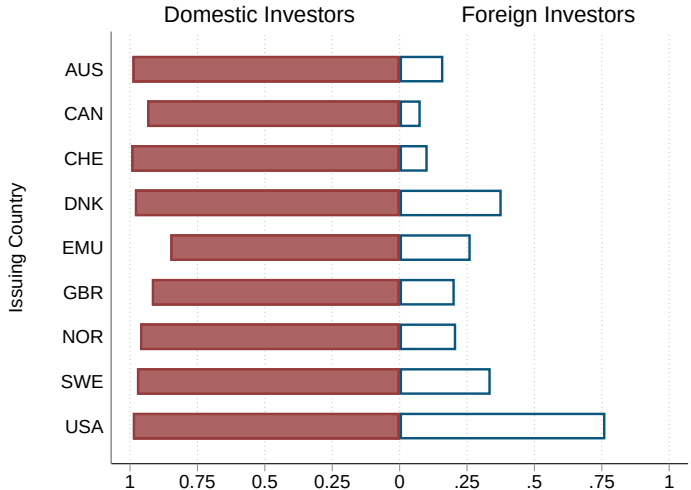
Use a portion data assembled by the Global Capital Allocation Project (GCAP)

1. Universe of security-level portfolio holdings of mutual funds and exchange-traded funds (ETFs) from Morningstar, US insurance holdings , sovereign wealth funds

2. Global bond issuance data from Coppola et al. (2021)

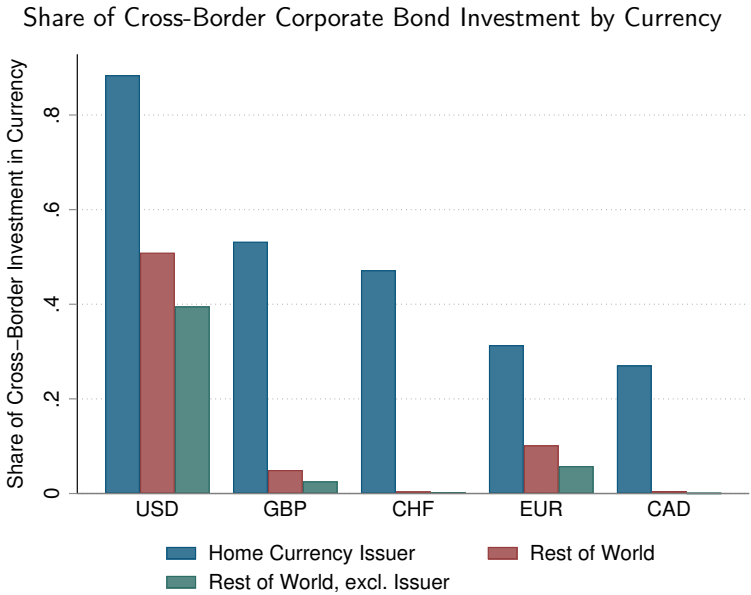
3. GCAP aggregation algorithm introduced in Coppola et al. (2021) to map the universe of debt securities issued worldwide to the identity and geography of their ultimate parent issuer

Share of Corporate Bond Investment by Investor and Currency Type



Maggiori et al. (2020) and Florez-Orrego et al. (2023)

Home and International Currency Bias



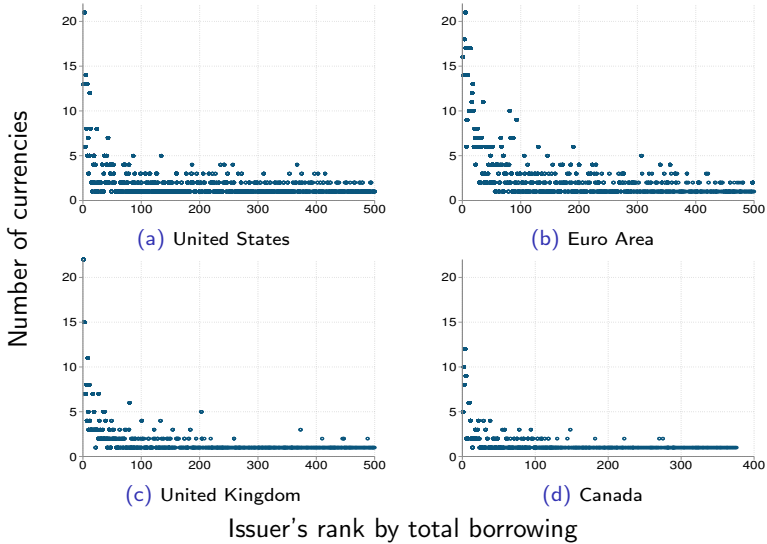
Home Currency Bias Regressions

$$s_{j,p,c} = \alpha_{j,p} + \beta_j 1_{Currency_i = Country_j} + Controls + \epsilon_{j,p,c}$$

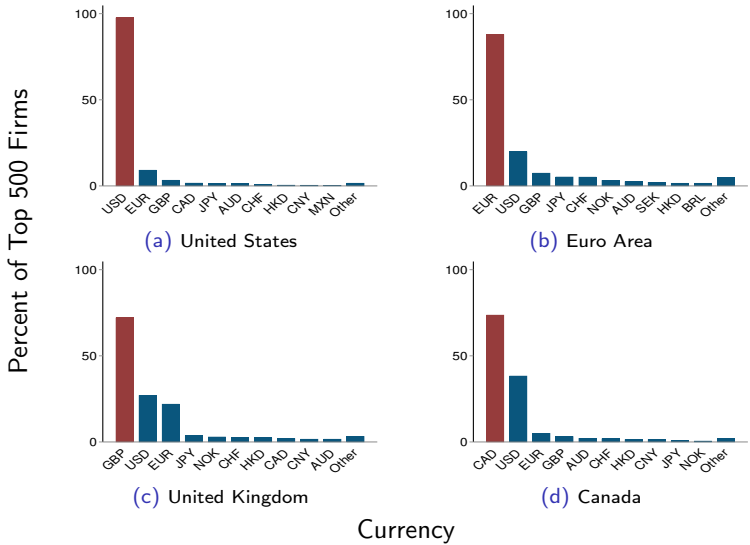
	CAN	EMU	GBR	SWE	USA
Currency	0.849***	0.622***	0.479***	0.609***	0.690***
	(0.008)	(0.009)	(0.017)	(0.076)	(0.014)
Obs.	31,266	31,266	31,266	31,266	31,266
# of Firms	3,201	3,201	3,201	3,201	3,201
R^2	0.947	0.870	0.822	0.876	0.894
Firm FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Maggiori et al. (2020) and Florez-Orrego et al. (2023)

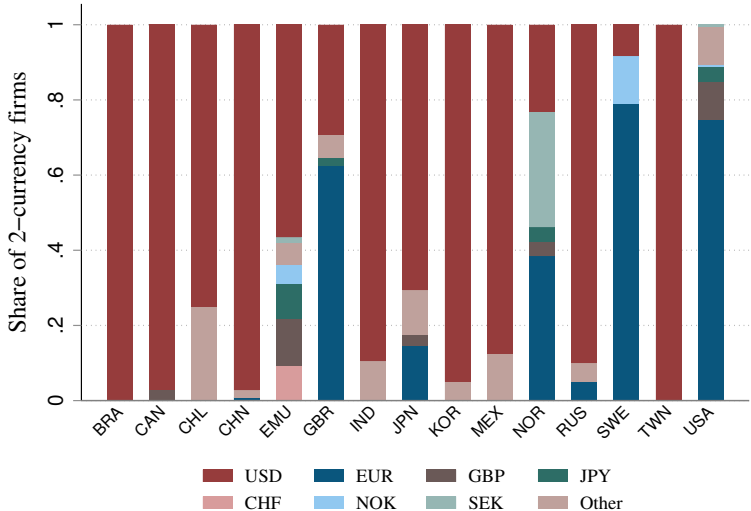
Size-Dependent Selection into Foreign Currency Issuance



Currency Denomination of Bonds by Large Firms



Currency Pecking Order: Second Currency of Two-Currency Issuers



A Simple Model of Corporate Bond Issuance

- Firms issue bonds to purchase capital and produce
- Investors segmented by currency, downward sloping demand in each currency
- Currencies differ by slope of interest rate schedule
- Firms pay a fixed cost to borrow in foreign currency

Firm Issuance Decision

- Firms choose debt issuance to maximize profits net of borrowing costs and fixed cost of foreign currency (FC) issuance

$$\max_{\{Q_{k,p}\}_{k=1}^{N}} \quad Y_p - \sum_{k=1}^{N} R_{k,p} Q_{k,p} - c_{k_p}\ 1_{\{FC_p\}}$$

$$s.t. \quad Y_p = A_p K_p; \quad K_p = \sum_{k=1}^{N} Q_{k,p},$$

$$R_{k,p} = \bar{R}_p + \Gamma_k Q_{k,p}.$$

where

- $Q_{k,p}$ bonds issued by firm p in currency k and $R_{k,p}$ corresponding interest rate
- Γ_k is the slope of interest rate schedule in currency k
- c_{k_p} is fixed cost of FC borrowing

Firm Issuance Decision: Local Currency (LC) Only Borrowers

- Firms choose debt issuance in their own currency $Q_{k,p}$ to maximize profits net of borrowing costs

$$\begin{aligned} \max_{Q_{k,p}} \quad & Y_p - R_{k,p} Q_{k,p} \\ s.t. \quad & Y_p = A_p K_p; \quad K_p = Q_{k,p}, \\ & R_{k,p} = \bar{R}_p + \Gamma_k Q_{k,p}. \end{aligned}$$

- Optimal Issuance in LC

$$Q_{k,p_{LC}} = \frac{A - \bar{R}_p}{2\Gamma_k}$$

where here k denotes the local currency of firm p

Firm Issuance Decision: Multi-Currency (MC) Borrowers

- Two Stage problem. **(1) Optimal composition** (2) Total borrowing in MC

$$\begin{aligned} \min_{\{\omega_{k,p}\}_{k=1}^{N}} \quad & \sum_{k=1}^{N} R_{k,p}\, \omega_{k,p} \\ s.t. \quad & \sum_{k=1}^{N} \omega_{k,p} = 1, \\ & R_{k,p} = \bar{R}_p + \Gamma_k \omega_{k,p} Q_p. \end{aligned}$$

- Optimal Composition

$$\omega_{k,p} = \frac{\Gamma_k^{-1}}{\sum_{i=1}^{N} \Gamma_i^{-1}}$$

Firm Issuance Decision: Multi-Currency (MC) Borrowers

- Two Stage problem. (1) Optimal composition **(2) Total borrowing in MC**

$$\max_{Q_{PMC}} Y_{p_{MC}} - R_{w,p} Q_{p_{MC}}$$

$$R_{w,p} = \bar{R}_p + \Gamma_w Q_p,$$

$$\Gamma_w = \omega_{k,p} \Gamma_k = \frac{1}{\sum_{i=1}^{N} \Gamma_i^{-1}}.$$

- Optimal Borrowing

$$Q_{p_{MC}} = \frac{A - \bar{R}_p}{2\,\Gamma_w}$$

Most Productive Firms Borrow in Multiple Currencies

- Threshold for borrowing in foreign currency when

$$\pi_{p_{LC}} = \pi_{p_{MC}}$$

- Delivers productivity threshold

$$\hat{A}_p^* = \left(4c_{k_p}\frac{\Gamma_w \Gamma_{k_p}}{\Gamma_{k_p} - \Gamma_w}\right)^{\frac{1}{2}} = 2\left(c_{k_p}\,\Gamma_{w-k_p}\right)^{\frac{1}{2}},$$

where $\hat{A}_p = A_p - \bar{R}_p$, and denote by $\hat{A}_p^*$ the net productivity $\hat{A}_p$ that makes a firm indifferent between issuance in local and multiple currencies

Two Country Example

- Two currencies, USD and EUR. $\Gamma_{USD} < \Gamma_{EUR}$. Assume common fixed cost c

$$\Gamma_w = \frac{\Gamma_{USD}\Gamma_{EUR}}{\Gamma_{USD} + \Gamma_{EUR}}$$

- Multi-currency firms set their debt shares to:

$$\omega_{USD,p} = \frac{\Gamma_{EUR}}{\Gamma_{USD} + \Gamma_{EUR}}$$

$$\omega_{EUR,p} = \frac{\Gamma_{USD}}{\Gamma_{EUR} + \Gamma_{USD}}$$

Two Country Example

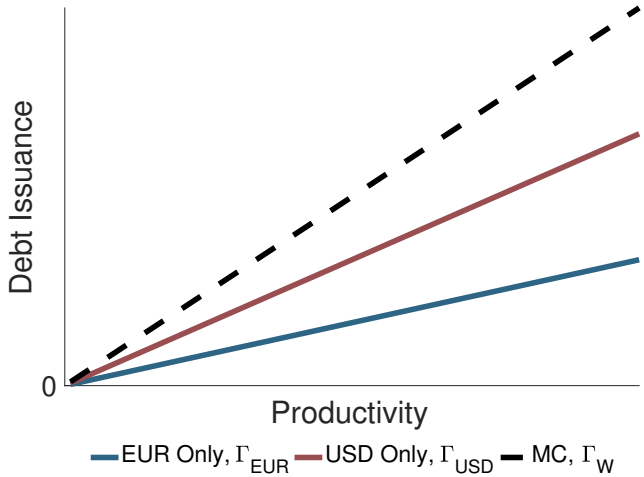
- Profits of LC and MC firms

$$\pi_{USD,p_{LC}} = \frac{\hat{A}_p^2}{4\Gamma_{USD}},$$
$$\pi_{EUR,p_{LC}} = \frac{\hat{A}_p^2}{4\Gamma_{EUR}},$$
$$\pi_{p_{MC}} = \frac{\hat{A}_p^2}{4\Gamma_w} - c = \frac{\hat{A}_p^2\left(\Gamma_{USD} + \Gamma_{EUR}\right)}{4\Gamma_{EUR}\Gamma_{USD}} - c.$$

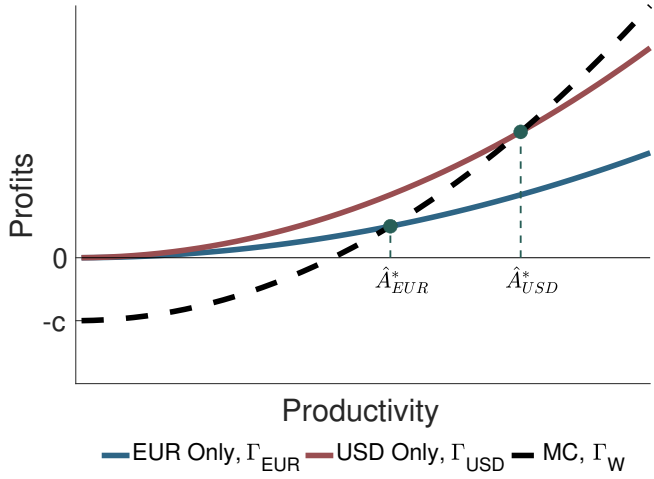
- Currency-Specific FC Borrowing Thresholds

$$\hat{A}^*_{USD} = 2\left(c\ \Gamma_{EUR}\right)^{1/2},$$
$$\hat{A}^*_{EUR} = 2\left(c\ \Gamma_{USD}\right)^{1/2}.$$

Model Mechanism: Debt Issuance



Model Mechanism: Profits



Towards Aggregation and Quantification

- While leaving model in partial equilibrium, provide a simple aggregation to recast measurable observables in terms of model parameters
- Assume net productivity distributed Pareto

$$g_i(\hat{A}_p) = 1 - \left(\frac{\hat{A}_p}{\hat{A}_i^{\text{Min}}} \right)^{-\alpha_i},$$

where $g_i(\hat{A}_p) = 0$ if $\hat{A}_p < \hat{A}_i^{\text{Min}}$ and where $\alpha_i > 2$

Aggregate Borrowing

- Total borrowing B_i by country i as:

$$
\begin{aligned}
B_i &= \int_{\hat{A}_i^{\mathbf{Min}}}^{\infty} Q_i(a) f_i(a) da \\
&= \int_{\hat{A}_i^{\mathbf{Min}}}^{\hat{A}_i{}^*} Q_i(a) f_i(a) da + \int_{\hat{A}_i{}^*}^{\infty} Q_i(a) f_i(a) da \\
&= \underbrace{\int_{\hat{A}_i^{\mathbf{Min}}}^{\hat{A}_i{}^*} \frac{a}{2\Gamma_i} f_i(a) da}_{\text{Borrowing from LC firms}} + \underbrace{\int_{\hat{A}_i{}^*}^{\infty} \frac{a}{2\Gamma_w} f_i(a) da}_{\text{Borrowing from MC firms}} \\
&= B_i^{LC} + B_i^{MC}
\end{aligned}
$$

Aggregate Borrowing

- Integrating, we find that the borrowing of LC and MC firms can be written as:

$$B_i^{LC} = \frac{\alpha_i}{\alpha_i - 1} \frac{\left(\hat{A}_i^{\text{Min}}\right)^{\alpha_i}}{2\Gamma_i} \left(\left(\hat{A}_i^{\text{Min}}\right)^{1-\alpha_i} - \left(\hat{A}_i^{*}\right)^{1-\alpha_i} \right)$$

$$B_i^{MC} = \frac{\alpha_i}{\alpha_i - 1} \frac{\left(\hat{A}_i^{\text{Min}}\right)^{\alpha_i}}{2\Gamma_w} \left(\hat{A}_i^{*}\right)^{1-\alpha_i}$$

Output

- Firm profits gross of fixed costs

$$A_p Q(\hat{A}_p) - (\bar{R}_p + \Gamma Q(\hat{A}_p)) Q(\hat{A}_p) = \frac{Q(\hat{A}_p)\hat{A}_p}{2} = \frac{\hat{A}_p^2}{4\Gamma}$$

- We define GDP Y_i as value added net of borrowing costs and gross of fixed costs

$$\begin{aligned} Y_i &= \underbrace{\int_{\hat{A}_i^{\text{Min}}}^{\hat{A}^*} \frac{a^2}{4\Gamma_i} f_i(a) da}_{\text{Output from LC firms}} + \underbrace{\int_{\hat{A}^*}^{\infty} \frac{a^2}{4\Gamma_W} f_i(a) da}_{\text{Output from MC firms}} \\ &= Y_i^{LC} + Y_i^{MC}. \end{aligned}$$

- Integrating, we have output as

$$Y_i = \frac{\alpha_i}{\alpha_i - 2} \left(\hat{A}_i^{\text{Min}}\right)^{\alpha_i} \frac{1}{4} \left[\frac{1}{\Gamma_i} \left(\hat{A}_i^{\text{Min}}\right)^{2-\alpha_i} + (4c_i)^{\frac{2-\alpha_i}{2}} \left(\Gamma_{w-i}\right)^{-\frac{\alpha_i}{2}} \right]$$

Investor Demand

- For each firm p and currency k, specialist mass of investors Θ_k

$$\max_{q_{k,p}} \quad q^f R_f + q_{k,p}\, R_{k,p} - \frac{1}{2}\gamma \left(q_{k,p}\right)^2 - q_{k,p} x_p$$

$$s.t. \quad 1 = q^f + q_{k,p},$$

- Aggregating the individual investor demand curves to aggregate demand curve for k, p bonds:

$$R_{k,p} = \bar{R}_p + \frac{\gamma}{\Theta_k} Q_{k,p} = \bar{R}_p + \Gamma_k Q_{k,p},$$

where $\Gamma_k = \frac{\gamma}{\Theta_k}$.

Conclusion and Implications for Future Research

- Home and International Currency Bias with segmentation as incentive for FC borrowing
- Avenues for future research:
  - Heterogeneity in issuance threshold: Identify Γ_k by size of FC issuers by country
  - CIP deviations: differences in $\bar{R}$ affect optimal composition
  - Sequential entry into foreign currencies
  - Understanding the sources of the fixed costs
  - Partial hedging: UIP and CIP