Exchange Rate Risk in Public Firms

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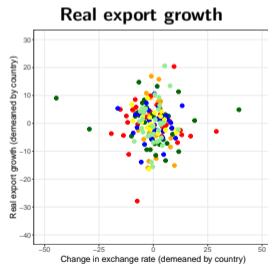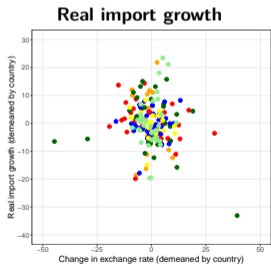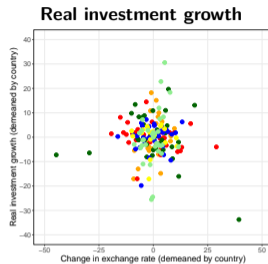
MIT Sloan

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Motivation

▶ According to models and intuition, exchange rates may affect firms

    ▶ through international trade (exports vs imports),

    ▶ through international financing and investing (assets vs liabilities).

▶ But firms may hedge

    ▶ financially: e.g., forwards & futures, options, swaps, foreign-currency debt

    ▶ operationally: production & sales across countries

▶ After hedging, is there any remaining impact of exchange rates on firms?

    ▶ At the aggregate level? Exchange rate disconnect puzzle (Meese and Rogoff, 1983)

    ▶ At the micro level?

# Exchange Rates and Real Macroeconomic Variables

Our Approach

- We study the impact of exchange rates **at the firm level** in six major currency areas (US, euro area, Japan, Taiwan, South Korea, and India)

- Using publicly available financial statements, focusing on **FX transaction income**

  - Intuition: e.g., think of a Japanese firm that exports in U.S. dollars but receives those dollars three months later

    - If the local currency (yen) appreciates and the U.S. dollar depreciates, the Japanese firm collects less yen: that's a FX transaction income loss

  - Measured net of financial hedging (e.g. through derivatives), includes the impact on exports and imports, assets and liabilities (e.g., foreign currency debt)

  - **Signals firms' exposure to exchange rate risk**

Aggregate FX Transaction Income: India and Taiwan
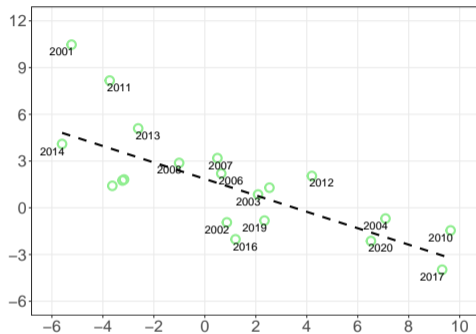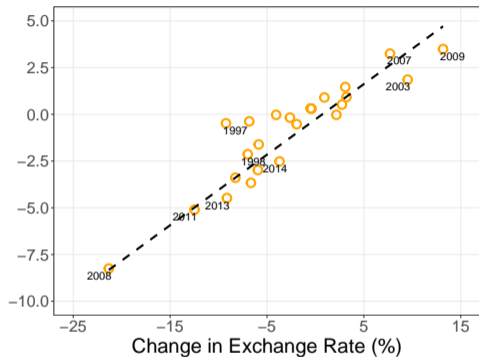
Total FX transaction income of all Indian (left) and Taiwanese (right) firms in each year, scaled by total operating income. A positive change in exchange rate indicates a local currency appreciation against the U.S. dollar.

Summary of Results

1. Limited financial hedging: FX transaction income comove with exchange rate changes

   ▶ Across countries: a local currency appreciation leads to aggregate income gains (South Korea, India, euro area) or losses (Japan, Taiwan)

   ▶ Across industries: when the local currency appreciates, FX transaction income losses increase with net exports

   ▶ Across firms: when the local currency appreciates, FX transaction income gains increase with foreign currency debt issuance

2. Limited to no operational hedging: FX transaction income passes through to profits

   ▶ Exchange rates affect some firms' profits: Firms with large FX transaction exposure react more; a 10% exchange rate movement leads to income differences as large as **0.7% of total assets** (compared to median income/assets of 4%) between the top and bottom quartiles of exposed firms in each country

3. FX transaction income passes through to taxes, net equity payouts, and investment

Literature

- **Exchange rate disconnect:** Laursen and Metzler (1950), . . . , Meese and Rogoff (1983), . . . Kalemli-Ozcan and Varela, (2020), Itskhoki and Mukhin (2021), Camanho, Hau, and Rey (2021), Lilley, Maggiori, Neiman and Schreger (2022), Chahrour, Cormun, De Leo, Guerron, and Valchev (2022)
  - **Impact of large depreciations on firms/EM:** Aguiar (2005), Ranciere, Tornell, and Vamvakidis (2010), Kim, Tesar, and Zhang (2015), Du and Schreger (2016), Alfaro, Asis, Chari, and Panizza (2017), Ahnert, Forbes, Friedrich, and Reinhardt (2018), Niepmann and Schmidt-Eisenlohr (2019), Kohn, Leibovici, and Szkup (2020), Verner and Gyongyosi (2020), Kalemli-Ozcan, Liu, and Shim (2021), Salomao and Varela (2021), Keller (2021), Agarwal (2021), Bengura, Matsumoto, and Safie (2022), Blanco, Drenik and Zaratiegui (2022), Gyongyosi, Rariga and Verner (2022)
  - **Impact of FX changes on firms' management:** Campa and Goldberg (1995), Nucci and Pozzolo (2001), Ekholm, Moxnes, and Ulltveit-Moe (2012), Barbiero (2020), Welch and Zhou (2024)
- **Currency invoicing and international trade:** Goldberg and Tille (2009), Gopinath (2016), Boz, Gopinath and Plagborg-Moller (2017, 2019), Gopinath and Stein (2018), Boz et al. (2020) + large literature on exchange rate pass-through on prices (survey in Burnstein and Gopinath, 2014, cross-country comparisons in Gopinath, Itskhoki, and Rigobon, 2010, Devereux, Tomlin and Dong, 2015, and Forbes, Hjortsoe, and Nenova, 2017)
- **Foreign currency debt:** Aguiar (2005), Bleakley and Cowan (2008), Kim, Tesar, and Zhang (2015), Bruno and Shin (2017), Acharya and Vij (2020), Salomao and Varela (2021), Liao (2020), Caramichael, Gopinath, and Liao (2021), Ivashina, Gutierrez, and Salomao (2021), Colacito, Qian, and Stathopoulos (2022)
- **FX hedging:** Stulz (1984), Smith and Stulz (1985), Breeden and Viswanathan (1990), Froot, Scharfstein, and Stein (1993), Guay and Kothari (2003), Rampini and Viswanathan (2010)
  - Guay and Kothari (2003), Kim, Mathur and Nam (2006), Allayannis and Ofek (2001), Allayannis and Weston (2015), Lyonnet, Martin and Mejean (2016), Hoberg and Moon (2017), Alfaro, Calani, and Varela (2022, 2023)
- **FX accounting exposure:** Bartov and Bodnar (1994), Soo and Soo (1994), White, Sondi, and Fried (2001), Louis (2003)
- **FX risk and equity returns**

Game Plan. . .
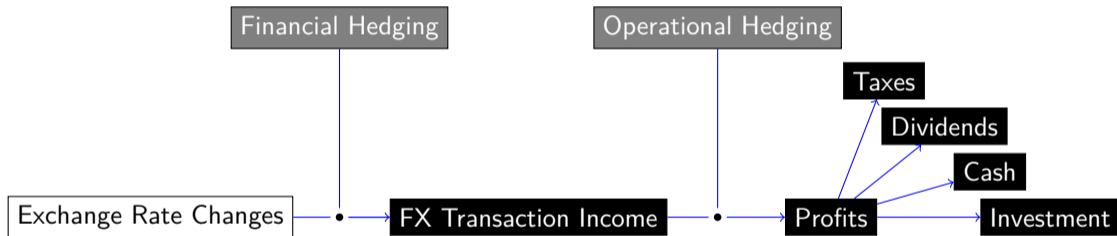
Road Map

Review of FX Accounting

Example: FX Transaction Income in Nintendo's Income Statement

Income Statement	April 2015 – March 2016
Net sales	4,464
Cost of sales	2,508
Selling, general and administrative expenses	1,664
Operating Income	290
Non-operating net income	
Interest net income	41
Foreign exchange gains/losses	(162)
. . .	. . .
Total non-operating net income	(36)
Ordinary income	254
Extraordinary income	(10)
Profit before income taxes	245
Profit	146

Nintendo's consolidated statements of income, in millions of U.S. dollars. Fiscal year from April 1, 2015 to March 31, 2016.

- ▶ FX transaction income (foreign exchange loss) / Sales $= -162/4,464 = -3.6\%$
- ▶ FX transaction income / Operating income $= -162/290 = -55.9\%$

Review of FX Accounting

- Firms report financial statements in a single "functional" currency (e.g. Japanese yen)

- ... but may have assets and liabilities denominated in other currencies (e.g. U.S. dollar)
  - Accounts receivable (sales invoiced in foreign currency, with payment delay)
  - Accounts payable
  - Foreign currency debt
  - Foreign currency cash or securities holdings

- In the income statement, **FX transaction income** summarizes the overall effect of exchange rate changes on the value of monetary items (e.g., debt, accounts receivables/payables, cash)
  - *Net of gains/losses on financial hedging positions* (e.g. FX forward contracts)

Example: Japanese Firm Sells in US$, No Hedging

December 31, 20X0:

- ▶ A Japanese firm invoices a sale for $1M
    - ▶ Will receive payment three months later on March 31, 20X1
- ▶ Spot exchange rate: ¥**100 = $1**

March 31, 20X1:

- ▶ Japanese firm collects $1M from customer
- ▶ Yen has appreciated against the dollar: new spot exchange rate is ¥**90 = $1**
- ▶ Firm reports annual financial statement for fiscal year 20X0 (ending March 31, 20X1)

Income Statement

	FY 20X0
Sales	¥100M
Non-Operating Income	
FX Transaction Income	−¥10M
Income Before Taxes	¥90M

FX transaction loss reconciles the difference between initial value of the $1M sale (in JP¥) and value on the payment date, based on spot exchange rates at each date

Example: Japanese Firm Sells in US$, With Hedging

December 31, 20X0:

- ▶ A Japanese firm invoices a sale for 1M$
- ▶ The firm also enters a forward contract to exchange 1M$ for ¥99M on March 31, 20X1
- ▶ Spot exchange rate: **¥100 = $1**

March 31, 20X1:

- ▶ Japanese firm collects 1M$ from customer
- ▶ Settles forward contract to receive ¥99M
- ▶ Reported FX transaction income determined by difference between forward and spot rates at invoice date

Income Statement	
	FY 20X0
Sales	¥100M
Non-Operating Income	
FX Transaction Income	−¥1M
Income Before Taxes	¥99M

When the firm financially hedges, FX transaction income *is unaffected by changes in spot exchange rates*

Example: Japanese Firm Borrows in US$

March 31, 20X1:

- A Japanese firm has a 2-year zero coupon bond outstanding, with face value $1M$
- Spot exchange rate: ¥**90** = **$1**

March 31, 20X2:

- Yen appreciates against the dollar: new spot exchange rate is ¥**80** = **$1**
- Firm reports annual financial statement for fiscal year 20X1 (ending March 31, 20X2)

Balance Sheet		
	FY 20X0	FY 20X1
Assets	. . .	. . .
	. . .	. . .
Liabilities	. . .	. . .
Debt	¥90M	¥80M

Income Statement	
	FY 20X1
Non-Operating Income	
FX Transaction Income	+¥10M

FX transaction gain measures the fall in JP¥ value of the firm's US$ debt

Example: FX Transaction Income for Nintendo

Legend: FX Transaction Income/Assets — – Yearly Changes in the Yen–USD Rate
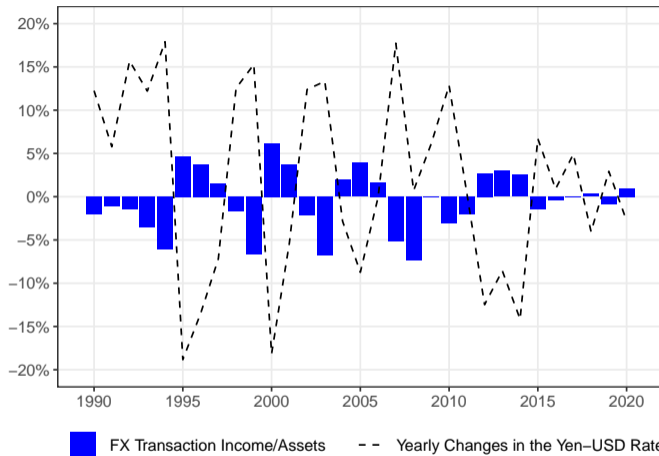
- ▶ An increase of the exchange rate corresponds to an appreciation of the yen (the domestic currency for a Japanese firm).
- ▶ When the yen appreciates, Nintendo records FX transaction losses.

Pros and Cons of FX Transaction Income

Pros

1. Publicly available, large sample
2. Net of financial hedging
3. Income statement: aggregate (exports & imports, assets & liabilities), realized and unrealized gains and losses, aggregated across subsidiaries

Cons

1. Misses some FX exposure: notably, competitivity issues without payment delays (e.g. wages), effect on *future* revenues/costs (e.g. "cash flow" hedges), subsidiaries' valuation effects, second-round exposure
2. Net of financial hedging: no details on actual financial hedging contracts
3. Aggregates international trade & financial exposure

Determinants of Firms' FX Transaction Risk Exposure

Data

- ▶ Sources:
    - ▶ Annual accounting data: Compustat Fundamentals files, North America and Global
    - ▶ Stock prices: Compustat Security files
    - ▶ Foreign currency debt: Capital IQ Capital Structure Debt file
    - ▶ Country-by-industry international trade flows: World Input-Output Database
    - ▶ Foreign sales: Worldscope
    - ▶ Exchange rates:
        - ▶ U.S. dollar bilateral exchange rates for non-U.S. countries
        - ▶ BIS effective exchange rate index for U.S.

- ▶ Sample:
    - ▶ Six countries/currency areas: United States, euro area, Japan, Taiwan, South Korea, India
        - ▶ Keep firms headquartered in country/area that report financial statements in domestic currency
    - ▶ Non-financial firms (drop finance, real estate, and utilities); apply standard filters
    - ▶ Sample period: 1987-2020
    - ▶ All variables winsorized at (1%, 99%) percentiles

Missing Data

- Firm-level imports (available for example in the Census' Longitudinal Firm Trade Transactions Database)

- Currency of denomination for trade credit

- Foreign currency cash/security holdings

- FX derivatives (sometimes in footnotes of annual reports)

- Details of operational hedging, foreign currency transactions without payment delay, etc.
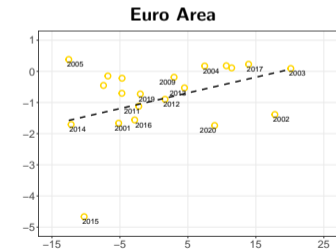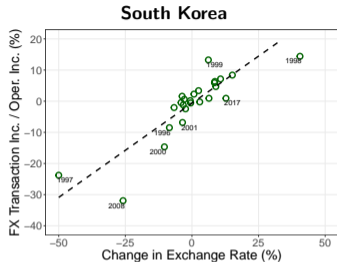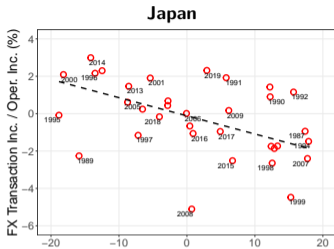
Export Currency Invoicing Shares by Currency Area
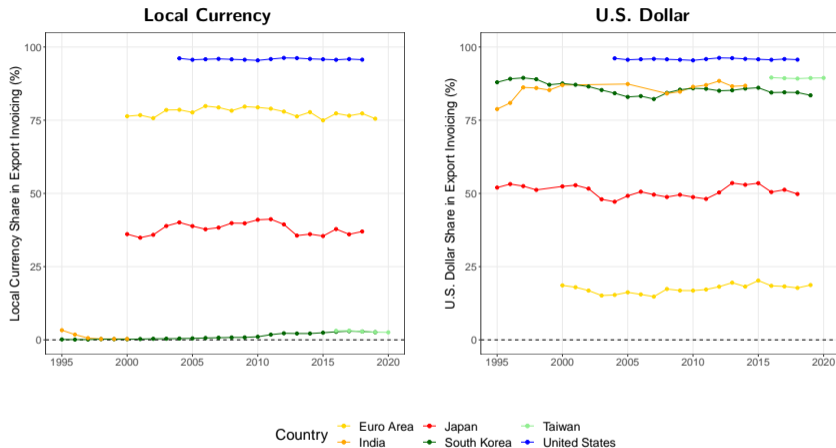
Source: Boz, Casas, Georgiadis, Gopinath, Le Mezo, Mehl, and Nguyen (2022)

- ▶ Many firms' international sales are invoiced in a currency other than their local currency.
- ▶ Exceptions: U.S. and euro area.

Aggregate FX Transaction Income Across Countries (as a % of operating income)
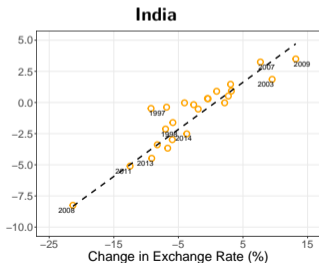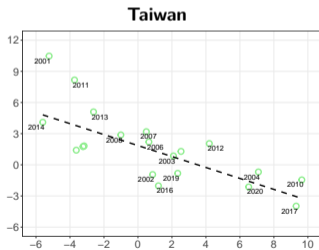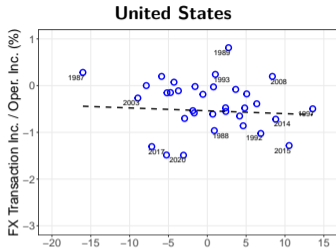
Total FX transaction income of all firms, scaled by aggregate operating income, all country-years with at least 200 firm observations.

Aggregate Response to a 10 % Local Currency Appreciation

▶ **Up to +/- 5% of aggregate operating income**

Taiwan	Japan	United States	Euro area	India	South Korea
FX Transaction Income scaled by operating income					
−5.77%	−0.77%	−0.14%	+0.47%	+3.22%	+5.12%
(1.31)	(0.27)	(0.16)	(0.29)	(0.32)	(1.39)

Notes: Operating income is total revenue minus COGS minus operating expenses; FX transaction income is not part of operating income. Standard errors by bootstrapping.

▶ In Japan and Taiwan, a 10% appreciation of the local currency means aggregate FX transaction losses equal to 0.8% and 5.8% of operating income.

▶ In India and South Korea, a 10% appreciation of the local currency means aggregate FX transaction gains equal to 3.2% and 5.1% of operating income.

▶ But aggregate FX transaction income is a small percentage of GDP!

Determinants of Firms' FX Transaction Risk Exposure

Estimate, for each country, the sensitivity of FX transaction income to exchange rate change Δs_t, conditional on vector of firm characteristics $X_{i,t}$:

$$\frac{\text{FX Transaction Income}_{i,t}}{\text{Assets}_{i,t}} = \alpha_i + \beta \Delta s_t + \Gamma' \left(\Delta s_t \times X_{i,t} \right) + \varepsilon_{i,t}$$

- $\Delta s_t > 0$ indicates an appreciation of the local currency
- $X_{i,t}$:
    - Industry-level net exports / output
    - Firm-level foreign currency debt / assets
    - Controlling for firm-level cash / assets, and net trade credit / assets

Determinants of Firms' FX Transaction Risk Exposure

|	USA	EUR	JPN	TWN	KOR	IND	Pooled
	FX Transaction Income$_t$ /Assets$_{t-1}$ (basis points)						
Exchange rate change Δs_t (%)	-1.05^{***}	-0.57^{***}	-0.71^{***}	-4.20^{***}	-0.52	2.07^{***}	-0.22
	(0.22)	(0.12)	(0.10)	(0.33)	(0.67)	(0.62)	(0.18)
$\Delta s_t \times$ Industry Net Exports / Output	0.50	-0.57	-6.93^{***}	-14.04^{***}	-13.74^{***}	-2.56	-10.80^{***}
	(1.90)	(0.76)	(0.69)	(1.12)	(1.80)	(1.82)	(1.32)
$\Delta s_t \times$ Foreign Currency Debt$_{t-1}$/Assets$_{t-1}$	-0.20	4.93^{**}	0.96	52.63^{***}	61.86^{***}	18.89^{***}	39.03^{***}
	(6.70)	(2.26)	(7.43)	(6.81)	(6.44)	(3.96)	(8.78)
$\Delta s_t \times$ Cash$_{t-1}$/Assets$_{t-1}$ (std.)	-0.33^{*}	-0.35^{***}	-0.23^{***}	-2.68^{***}	-1.29^{***}	-0.38^{***}	-0.63^{***}
	(0.19)	(0.08)	(0.06)	(0.45)	(0.16)	(0.13)	(0.12)
$\Delta s_t \times$ Net Trade Credit$_{t-1}$/Assets$_{t-1}$ (std.)	-0.03	-0.20^{**}	-0.005	-1.89^{***}	-1.17^{***}	-0.61^{*}	-0.35^{***}
	(0.19)	(0.08)	(0.04)	(0.20)	(0.18)	(0.31)	(0.11)
Fixed Effects				Firm			
Observations	8,075	17,117	33,043	19,112	17,153	18,403	112,903
R^2	0.23	0.17	0.23	0.39	0.24	0.26	0.21

Note: *p<0.1; **p<0.05; ***p<0.01

▶ Example: A 10% appreciation of the New Taiwanese dollar against the U.S. dollar leads a typical firm in a high-export industry (net exports equal to 50% of their gross output) to report a FX transaction loss equal to $10 \times (-4.20 - 14.04 \times 0.5)$ basis points $\approx 1.1\%$ of total firm assets, twice as large as the 0.42% FX transaction loss that would be reported by a typical firm in an industry with no foreign currency debt and no net exports.

▶ Following a local currency appreciation, FX transaction losses increase with the amount of cash and trade credit: is some of it kept in foreign currency?

▶ For a Korean firm with foreign currency debt equal to 10% of assets (roughly the 90th percentile), a 10% appreciation of the Korean won against the U.S. dollar leads to an additional FX transaction gain of 0.60% of total assets. (Median Income/Assets =3%)
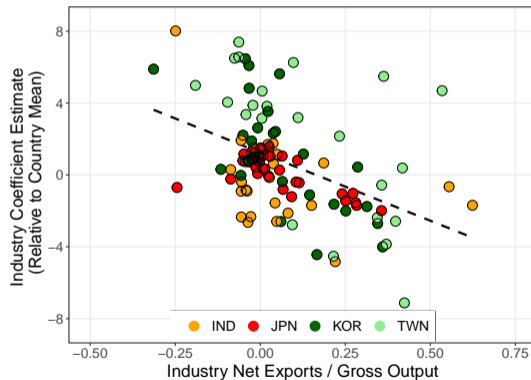
Local Currency Appreciation $\Rightarrow$ Losses for Exporters, Gains for Importers

$$\frac{\text{FX Transaction Income}_{i,t}}{\text{Assets}_{i,t}} = \alpha_i + \Delta s_t \times \sum_j \beta_j 1_{Industry(i)=j} + \Gamma' \left(\Delta s_t \times \widetilde{X_{i,t}}\right) + \varepsilon_{i,t}$$
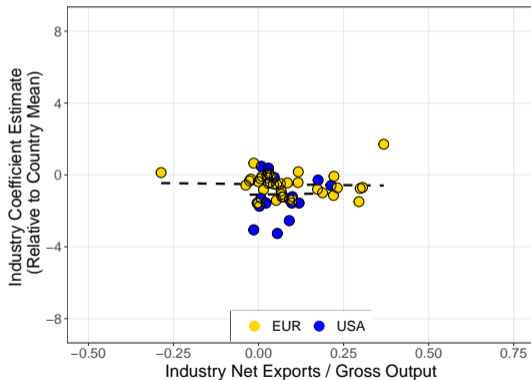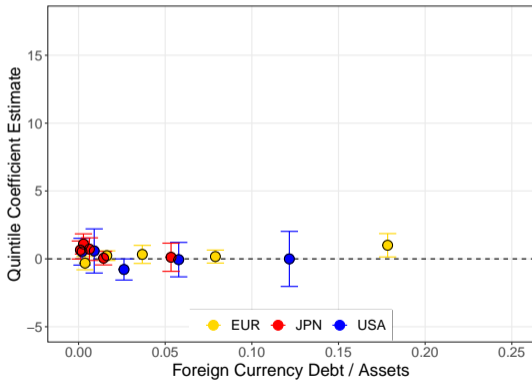

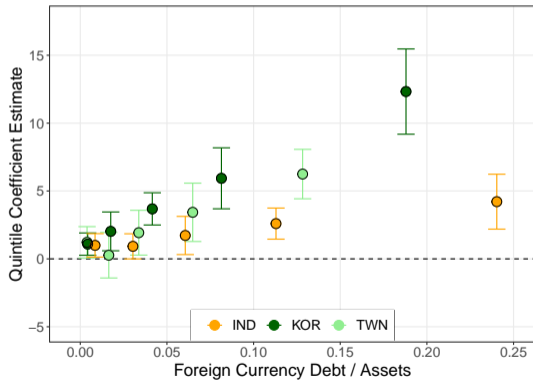Coefficient units: FX transaction income / assets (basis points) per 1% change in exchange rate

Local Currency Appreciation ⇒ Gains for Foreign Currency Borrowers

$$\frac{\text{FX Transaction Income}_{i,t}}{\text{Assets}_{i,t}} = \alpha_i + \Delta s_t \times \sum_k \eta_k 1_{FCLeverageQuintile=k} + \Gamma' \left(\Delta s_t \times \widetilde{X_{i,t}} \right) + \varepsilon_{i,t}$$

Notes: FX transaction income / assets (basis points) per 1% change in exchange rate. Bands: +/- 2 clustered std. errors. A 10% appreciation of the local currency against the U.S. dollar leads firms in the top foreign currency leverage quintile to report an FX transaction gain of 0.40% of total assets in India, 0.50% of assets in Taiwan, and 1.25% of assets in South Korea.

From Micro to Macro

1. For each country c, a panel regression:

$$\frac{\text{FX Transaction Income}_{i,t}}{\text{Assets}_{i,t}} = \alpha_i + \beta \times \Delta s_{c,t} + \sum_{k=1}^{K} \gamma_k \times X_{i,k,t} \times \Delta s_{c,t} + \varepsilon_{i,t}$$

   ▶ the "baseline" component: $\widehat{\delta}_{i,0,t} \equiv \widehat{\beta}$
   ▶ the component attributable to firm characteristic k: $\widehat{\delta}_{i,k,t} \equiv \widehat{\gamma}_k X_{i,k,t}$

2. The weighted-average component-specific loading for firms in country c is

$$\overline{\overline{\delta}}_{c,k} \equiv \sum_{i,t} \frac{\text{Assets}_{i,t}}{\sum_{i',t'} \text{Assets}_{i',t'}} \times \widehat{\delta}_{i,k,t}$$

▶ Three groups of firm characteristics:
   ▶ Industry-level net exports / output and firm-level net trade credit / assets,
   ▶ Firm-level foreign currency debt / assets,
   ▶ Others: baseline component and cash / assets.

Determinants of FX Transaction Income Across Countries
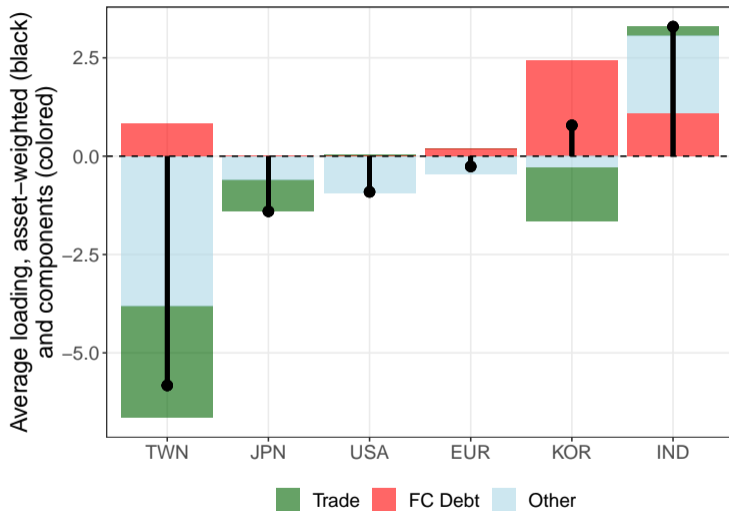
Average regression-implied exchange rate loading for firm-year observations in each country, where the average is weighted by total firm assets. "Trade" includes industry net exports and firm-level net trade credit. "Other" includes baseline and cash.

Taking Stock

- ▶ FX transaction income provides an **intuitive and aggregate measure of FX risk**:
    - ▶ The exposure varies with net trade and foreign currency debt
    - ▶ But FX transaction income also includes revaluation of other items that we don't directly observe (e.g. foreign currency cash holdings)!

- ▶ Firms report non-zero FX transaction income, correlated with exchange rate changes
  ⇒ Firms have **FX risk that is not financially hedged**

    - ▶ Why hedge? Managerial risk aversion, convex taxes, financial distress costs and debt overhang, asymmetric information, costly external financing

    - ▶ Why not fully? Left out to investors or government, hedging costs (e.g., collateral costs and manager attention costs), uncertain cash flows, expected currency carry trade returns, time-varying investment opportunities, behavioral biases.

    - ▶ Are the firms hedging operationally?

Passthrough of FX Transaction Income to Profits

FX Transaction Income and Firm Profits

How much of firms' reported FX transaction income passes through to their final profits?

$$\frac{\text{Pre-tax Income}_{i,t}}{\text{Assets}_{i,t-1}} = \alpha_i + \theta_{Ind(i),t} + \beta \frac{\text{FX Transaction Income}_{i,t}}{\text{Assets}_{i,t-1}} + \varepsilon_{i,t}$$

- ▶ α_i = firm fixed effects
- ▶ $\theta_{Ind(i),t}$ = industry-year fixed effects

$\beta < 1$ if FX transaction income is partially hedged by other components of income.

- ▶ e.g. currency risk arising from foreign currency sales (with payment delay) is partially offset by foreign currency costs (without payment delay)

Since FX transaction income is part of total pretax income: $\beta = 1$ in the absence of this operational hedging.
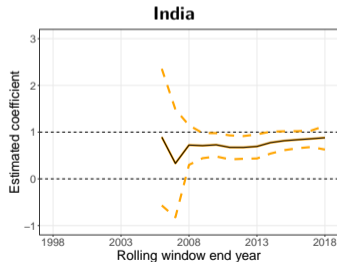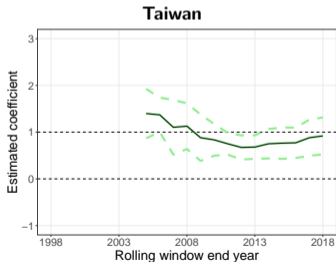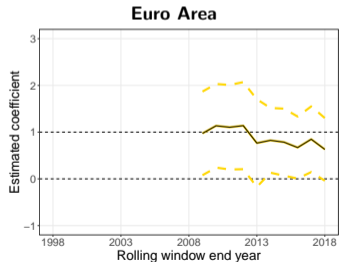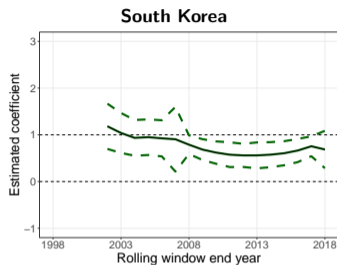
FX Transaction Income: Passthrough to Firm Profits

	USA	EUR	JPN	TWN	KOR	IND	Pooled
	Panel A: Pretax Income$_t$/Assets$_{t-1}$						
FX Trans. Income$_t$/Assets$_{t-1}$	0.93***	0.98***	0.55***	0.91***	0.71***	0.86***	0.77***
	(0.25)	(0.27)	(0.14)	(0.15)	(0.08)	(0.09)	(0.05)
R^2	0.74	0.66	0.53	0.63	0.53	0.68	0.63
	Panel B: Non-Operating Income$_t$/Assets$_{t-1}$						
FX Trans. Income$_t$/Assets$_{t-1}$	0.77***	1.11***	1.00***	0.99***	0.76***	1.05***	0.91***
	(0.06)	(0.11)	(0.05)	(0.04)	(0.09)	(0.04)	(0.06)
R^2	0.63	0.34	0.32	0.36	0.35	0.45	0.37
	Panel C: Operating Income$_t$/Assets$_{t-1}$						
FX Trans. Income$_t$/Assets$_{t-1}$	−0.15	−0.29	−0.42***	−0.09	−0.07	−0.23**	−0.17***
	(0.20)	(0.18)	(0.10)	(0.15)	(0.10)	(0.09)	(0.06)
Fixed Effects	Firm, Country-Industry-Year						
Observations	8,822	13,503	53,459	16,596	17,743	14,845	124,968
R^2	0.79	0.72	0.58	0.66	0.55	0.67	0.68

Note: *p<0.1; **p<0.05; ***p<0.01

FX Transaction Income: Passthrough to Firm Profits, Rolling Estimates
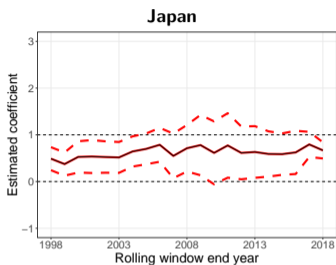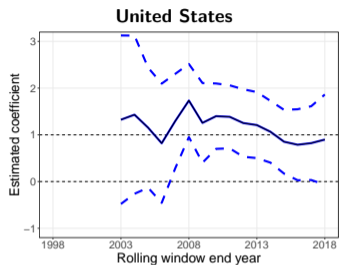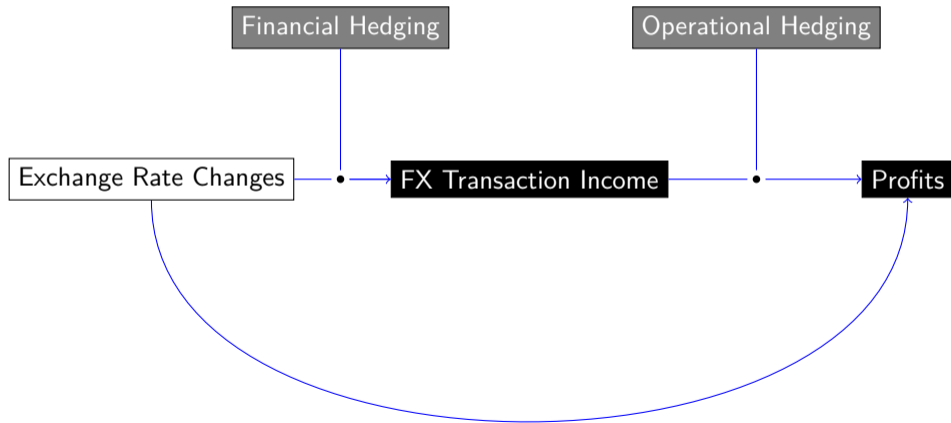

Passthrough regression for pre-tax income, estimated over 10-year rolling windows (with at least 2000 firm-year observations)

Impact on Profits

- ▶ Passthrough
  - ▶ A ¥100 FX transaction loss means a ¥55 net income reduction — lowest passthrough
  - ▶ A €100 FX transaction loss means a €98 net income reduction — highest passthrough in our sample

- ▶ Interpretation: no full hedging, considering both financial and operational hedging
  - ▶ Left out to investors or government, hedging costs (e.g., collateral costs and manager attention costs), uncertain cash flows, expected currency carry trade returns, time-varying investment opportunities, behavioral biases?

- ▶ Zooming in on Japan (and India)
  - ▶ When the yen appreciates (and the US dollar depreciates), the average Japanese firm in our sample records some FX transaction income losses.
  - ▶ Part of these losses are offset by larger sales (sticky prices in dollars, US dollar depreciates against many currencies, and thus "cheaper" products: competitivity channel)

- ▶ More limited "competitivity" channel in other countries?

Exchange Rate Changes and Profits

Impact of Exchange Rate Changes on Profits

Exchange Rates and Firm Profits

1. In each year t, sort firms into four **FX exposure groups** based on realized values of FX Transaction Income$_{i,t}$/Assets$_{i,t-1}$ (using only firms that report a nonzero value):
   - Sort firms in *increasing* order if local currency appreciates in year t ($\Delta s_t > 0$)
   - Sort firms in *decreasing* order if local currency depreciates in year t ($\Delta s_t < 0$)

   Intuition: the Japanese firm that exports in \$ reports some FX transaction losses when the local currency appreciates ($\Delta s_t > 0$) and FX transaction gains when the local currency depreciates ($\Delta s_t < 0$) $\rightarrow$ first quartile

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2. Regress profits on interactions between Δs_t and **lagged** indicators for FX exposure:

$$\frac{\text{Pre-tax Income}_{i,t}}{\text{Assets}_{i,t-1}} = \alpha_i + \theta_{Industry(i),t} + \Delta s_t \times \sum_{k=2}^{4} \lambda_k 1_{\text{FX exposure quartile } (i,t-1)=k} + \Gamma' X_{i,t-1} + \varepsilon_{i,t}.$$

Following a 1% appreciation of the local currency, λ_k measures the expected difference in income between firms in exposure group k and those in group 1 (in basis points, scaled by lagged firm assets)

Exchange Rates and Firm Profits: Estimates

	Pretax Income$_t$/Assets$_{t-1}$ (basis points)					
	USA	EUR	JPN	TWN	KOR	IND
Δ Exchange Rate (%) × 1(2nd FX exposure quartile)	4.75	4.53**	2.49**	7.65***	0.71	−0.11
	(4.67)	(1.89)	(1.05)	(2.12)	(1.68)	(1.97)
Δ Exchange Rate (%) × 1(3rd FX exposure quartile)	12.55**	4.37*	2.59**	7.40***	3.88*	3.63
	(4.68)	(2.31)	(0.99)	(1.93)	(2.09)	(2.51)
Δ Exchange Rate (%) × 1(4th FX exposure quartile)	6.59	2.17	2.72**	4.52*	7.46***	5.48***
	(6.09)	(3.25)	(1.10)	(2.54)	(1.75)	(1.65)
Fixed Effects	Firm, Industry-Year					
Lagged Controls	Log Assets, Cash / Assets, Leverage, Market-to-Book					
Observations	11,020	11,935	27,725	19,338	22,362	14,567
R^2	0.77	0.71	0.60	0.65	0.55	0.71

Note: *p<0.1; **p<0.05; ***p<0.01

▶ For firms in the top FX exposure quartile: 10% appreciation of the local currency ⇒ income gains ranging from **0.2% to 0.7% of assets** (relative to firms in the lowest FX exposure quartile — this is a local effect)

   ▶ For comparison: sample median income / assets = 4%

Identification: Potential issues

Example: When the yen appreciates, the Japanese firm records FX transaction losses, and its profit margin decreases.

- ▶ External validity? — All public firms, sample of developed and developing economies

- ▶ Reverse causality? — Exchange rates are exogenous to each firm

- ▶ Omitted variables?

    - ▶ Could something else be decreasing the profit margin at the same time?
        - ▶ Something that is not in our firm-level controls (log assets, cash / assets, leverage, market-to-book, all lagged) and not in the firm and time × industry fixed effects?

    - ▶ Example: Time-varying manager's risk aversion + FX predictability
        - ▶ If the manager's risk aversion ↘ (and hedging decreases) just before a Yen appreciation (e.g., in a global crisis), then the firm experiences unusual FX transaction losses. At the same time, because of the global crisis, the firm reports low profits.
        - ▶ But 1) predicting exchange rates is hard, 2) this would imply a link between the exchange rate shocks and the operating profits (data: only in India for last quartile), and 3) it is not clear why this firm would be in the first quartile

- ▶ How could exchange rates not affect net income?
    - ▶ Only if the firm is not exposed or if it perfectly hedges (financially and/or operationally)
        - ▶ We're focusing on exposed firms, and we found that they don't hedge perfectly

From Profits to Investment

Game Plan...
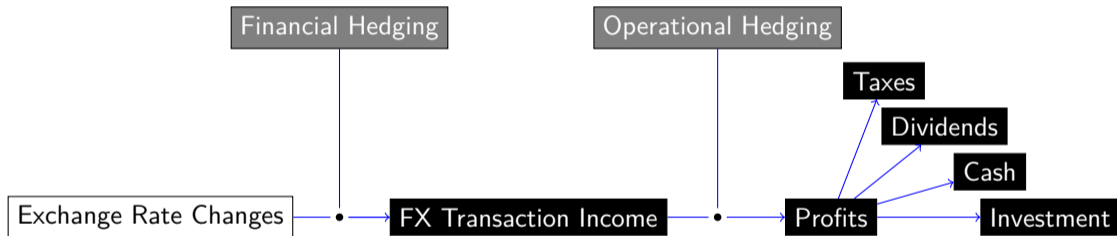
Following the Money

- Recall the monetary (trade payables and receivables, debt, cash) vs non-monetary items (e.g., property, plant and equipment, intangible assets, share capital, and other components of equity):

    - FX transaction income measures the impact of FX changes on monetary items

    - By definition, FX transaction income is thus contemporaneously correlated to the changes in values of the monetary items

- Firms may use the FX transaction windfall to increase taxes, dividends (or share repurchases), cash holdings, or investment.

    - Accounting standards ensure that

    $$\text{Assets} = \text{Current Assets (CA, including Cash)} + \text{Long-term Assets (PPE and Other Fixed Assets)}$$
    $$\text{Assets} = \text{Current Liabilities (CL)} + \text{Long-term Debt (LTB)} + \text{Equity}$$
    $$\Delta\text{Equity} = \text{Pre-tax Income} - \text{Taxes} - \text{Net Equity Payouts}$$

    - They imply that the pre-tax income is

    $$\text{Pre-tax Income} = \text{Taxes} + \text{Net Equity Payouts} + \underbrace{\Delta\text{(CA-CL)} - \Delta\text{LTB}}_{\Delta\text{Monetary Items}} + \Delta\text{Long-term Assets}$$

Investment

- ▶ Two potential effects on investment:
    - ▶ a cash flow effect: if firms are financially constrained, an FX windfall may spur investment
    - ▶ a competitivity effect: when the local currency appreciates, net exporters become less competitive, and may invest less

- ▶ When the local currency appreciates, net exporters report FX transaction losses and become less competitive: both cash flow and competitivity effects decrease investment

- ▶ When the local currency appreciates, firms with foreign currency debt report FX transaction gains, but they may become less competitive: cash flow and competitivity effects work in opposite directions

## Follow the Money

	Total	Taxes	Net Equity Payout	Δ Monetary Items	Δ Long-Term Assets
			Contemporaneous: $h = 0$		
Adj. FX Trans.$_t$	0.98***	0.14***	0.05**	0.65***	0.13*
	(0.05)	(0.01)	(0.02)	(0.08)	(0.07)
			One period ahead: $h = 1$		
Adj. FX Trans.$_t$	0.05	0.01	0.09***	−0.22***	0.16***
	(0.08)	(0.01)	(0.03)	(0.08)	(0.06)
			Two periods ahead: $h = 2$		
Adj. FX Trans.$_t$	−0.22*	−0.03	0.03	−0.21*	-0.01
	(0.11)	(0.02)	(0.03)	(0.11)	(0.08)
Firm FEs	Y	Y	Y	Y	Y
Country-Industry-Year FEs	Y	Y	Y	Y	Y
Observations	124,063	124,063	124,063	124,063	124,063

Real Effects

- For $1 that affects the pre-tax profits
    - immediately, 14 cents paid as taxes, 5 cents as dividends and share repurchases,
    - the next year, 9 more cents paid as dividends and share repurchases, 16 cents invested in long-term assets
    - two years later, no additional investment but cash still in the firm.

    - Comparable in magnitude to a cash flow effect.

Conclusion – in graphs
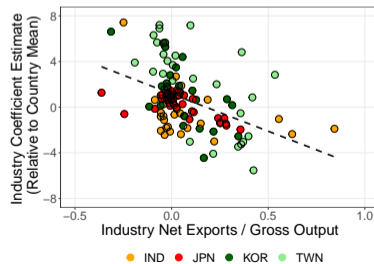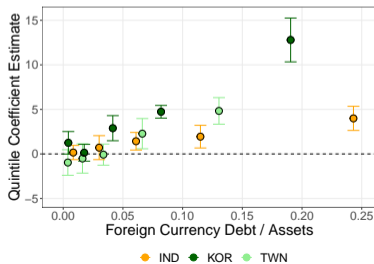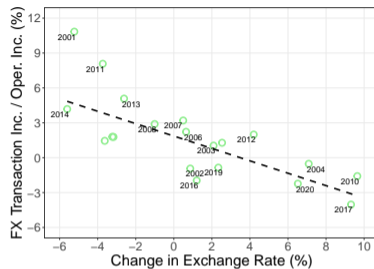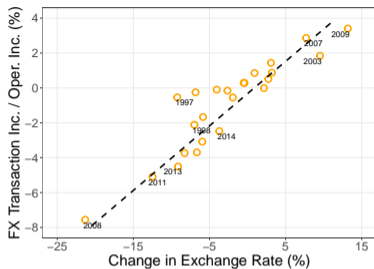
Conclusion

Using **publicly available data**, we characterize firms' exposure to exchange rate risk

▶ Limited financial hedging

  ▶ Many firms report large FX transaction gains and losses that strongly comove with changes in exchange rates

    ▶ International trade: local currency appreciation ⇒ income losses for exporters
    ▶ Foreign currency debt: local currency appreciation ⇒ income gains for borrowers

▶ Limited operational hedging

  ▶ FX transaction income passes through strongly to firms' final profits

▶ As a result, FX shocks impact firms' profits, net payouts, and investment

▶ **Conditional on this signal of exposure, exchange rates matter at the firm level**

THANK YOU!