

Corporate Investment and the Real Exchange Rate

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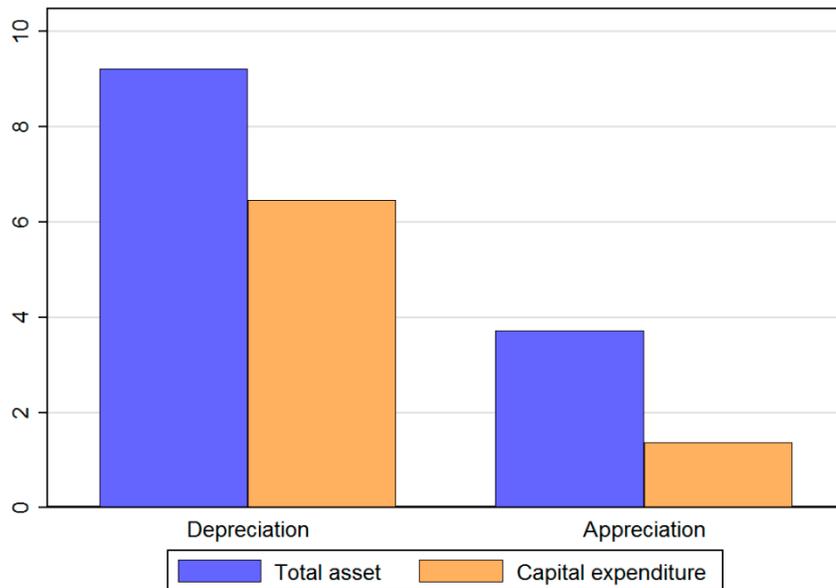
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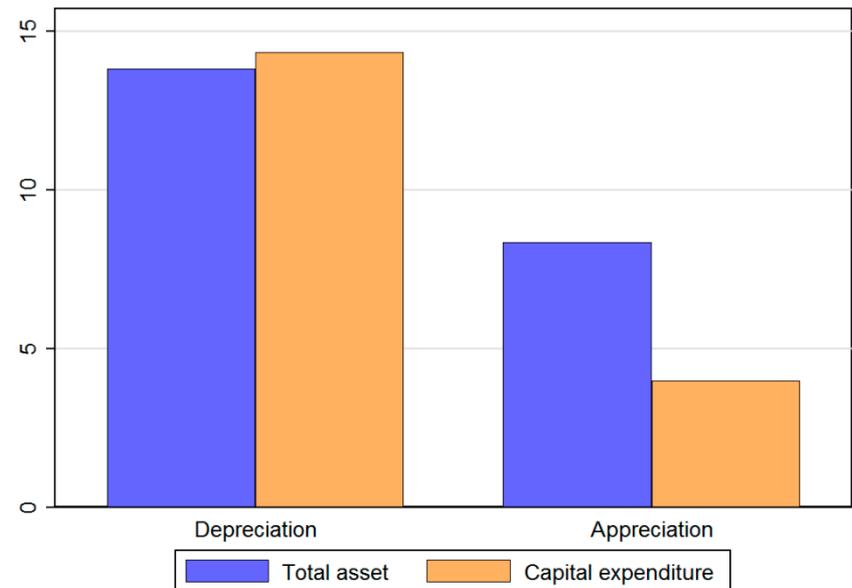
*The views expressed herein are those of the authors and should not be attributed to the IMF, its Executive Board, or its management.

Stylized Fact: Positive Correlation between RER and Firm Growth

Firms in advanced economies



Firms in emerging markets



Based on sample of ~25,000 tradable sector firms from 66 countries during 2000-2011.

Source: Worldscope.

Question

- How do exchange rate variations affect medium-term firm outcomes through investment?
- Literature identifies 3 main channels :
 - **Competitiveness channel (+)**
 - Higher current and/or future profitability raises return to capital. Strength depends on many firm/product/market characteristics.
 - **Balance sheet (BS) channel (-)**
 - Depreciation weakens net worth due to BS mismatch, reducing credit worthiness of firms.
 - **Aggregate lending channel (-).**
 - Depreciation is often associated with aggregate downturn or currency/banking crises, with lower overall credit supply.

Contribution

- Previous work focuses on the impact of the RER on **externally-financed** investment
- Large share of investment financed with **internal funds**, even in large public firms (60-70% for Compustat firms)
- Our ***internal financing channel***:
 - Exchange rate variations affect cash flows and *internal financing* capacity
 - Effect goes in the opposite direction of external finance for tradable-sector firms
 - Operates both in normal and crises times and can counteract the BS and lending channel

Related Strands of Literature

1. RER and firm performance

- Effect on sales, employment, profits
- Effects depend on export/import exposure, intermediate input structure, competitive environment, value chain in production, etc.
- Williamson, 2001; Campa and Goldberg, 2001; Amiti et al. 2014

2. RER and firm investment

- Focused on crisis episodes (cheaper labor, more expensive capital)
- Balance sheet channel: Aguiar, 2005, Chang and Velasco, 2000, Duchin et al., 2010, Bleakley and Cowan, 2008
- Bank lending channel: Desai et al., 2008, Amiti and Weinstein, 2013, Kalemli-Ozcan et al., 2015

3. Cash flow and investment

- Links to firms' financial constraints
- Fazzari et al. 2000, Kaplan and Zingales, 1997; Chen and Chen, 2012; Agca and Mozumdar, 2015

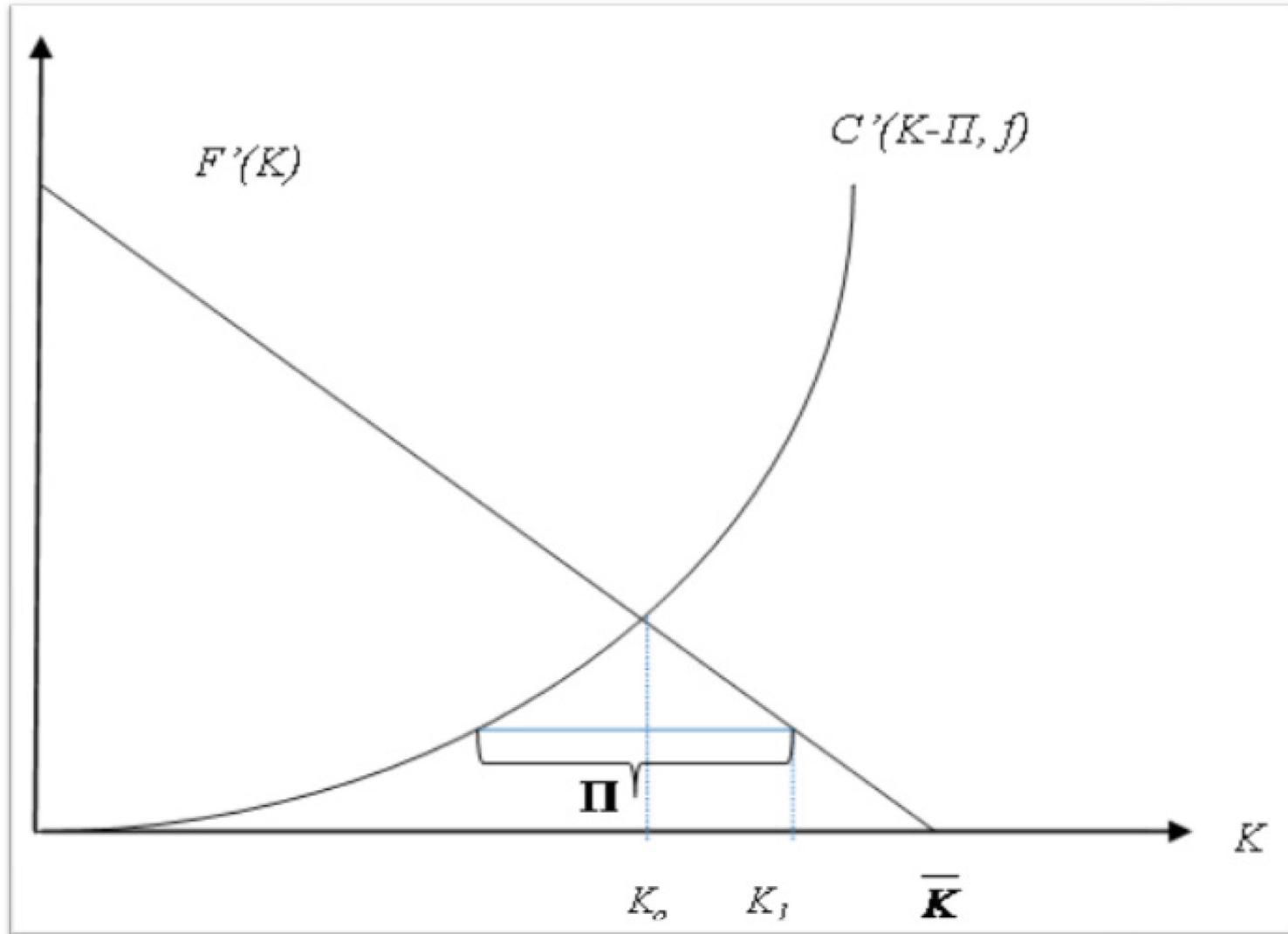
4. Macro literature on growth determinants

- Rajan and Zingales, 1998; Rodrik, 2008.

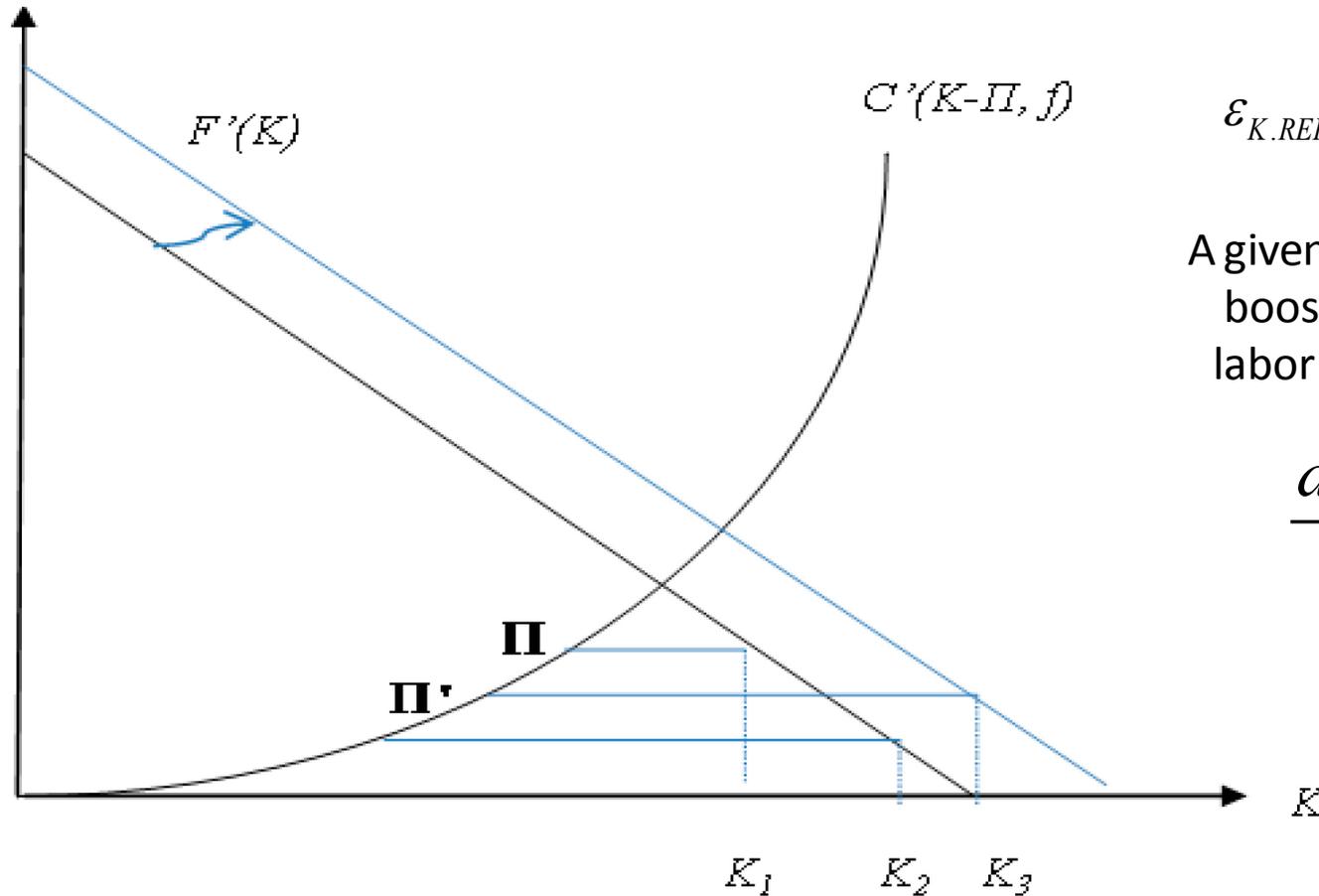
Intuition -- The **Internal Financing Channel**

- Derived using model of firm investment in SOE with financial frictions – cost of external finance is higher than internal finance (Fazzari et al. 2000) & increasing with each unit borrowed.
- Firm produces tradable good, is price-taker in world markets. Wages indexed to domestic consumption price. Real depreciation reduces the product wage, increases profits. More if higher labor share.
- When firms are financially constrained (i.e., under-investing relative to perfect financial markets), they always exhaust internal funds for investment before borrowing externally. Increase in profits increases investment for given return to capital.

Internal Financing and Investment



Higher Profits Increase Firm Scale through Capital Investment

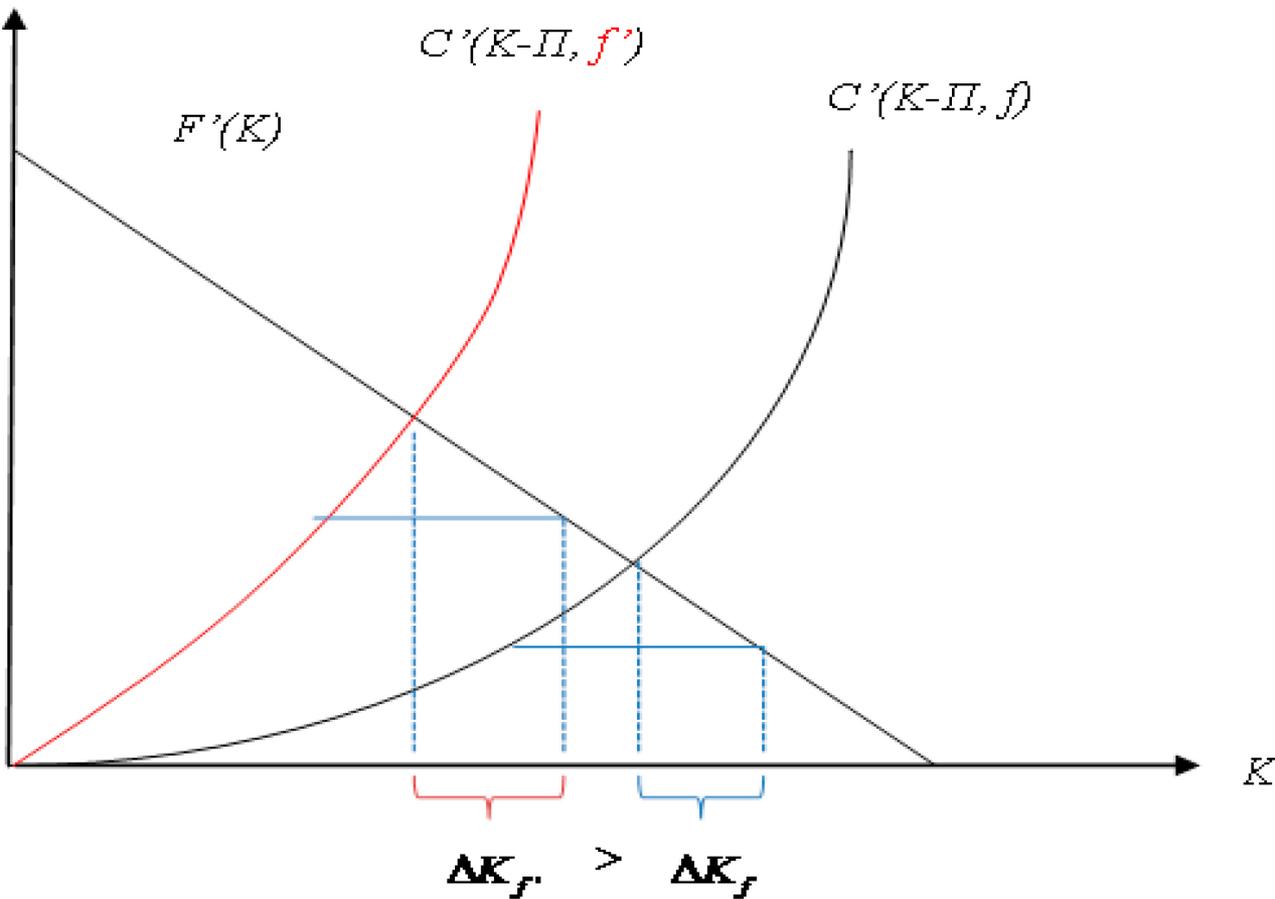


$$\varepsilon_{K.RER} = \frac{d \ln K}{d \ln RER} > 0$$

A given real depreciation boosts profits more if labor share (α) higher:

$$\frac{d \varepsilon_{K.RER}}{d \alpha} > 0$$

Given Increase in Profits Boosts Investment More when Financial Frictions Are Larger



f = wedge between internal and external financing cost = degree of financial frictions.

For a given labor share, depreciation boosts investment more if financial frictions larger:

$$\frac{d\varepsilon_{K.RER}}{df} > 0$$

Empirical Strategy

Use triple difference-in-differences approach for firm outcomes:
cash flow, investment, asset growth, and market value

$$\begin{aligned} \text{AssetGrowth}_{ijct} = & \beta_1 (\ln RER_{ct} \times \text{LaborShare}_j) + \beta_2 (\ln RER_{ct} \times \text{LaborShare}_j \times -\text{Credit} / \text{GDP}_{ct-1}) \\ & + \alpha_i + \delta_{ct} + \eta_{jt} + \gamma_1 Z_{ijct-1} + \varepsilon_{ijct} \end{aligned}$$

$$\begin{aligned} \text{Investment}_{ijct} = & \beta_3 (\ln RER_{ct} \times \text{LaborShare}_j) + \beta_4 (\ln RER_{ct} \times \text{LaborShare}_j \times -\text{Credit} / \text{GDP}_{ct-1}) \\ & + \alpha_i + \delta_{ct} + \eta_{jt} + \gamma_2 Z_{ijct} + \varepsilon_{ijct} \end{aligned}$$

$$\text{CashFlow}_{ijct} = \beta_5 (\ln RER_{ct} \times \text{LaborShare}_j) + \alpha_i + \delta_{ct} + \eta_{jt} + \gamma_3 Z_{ijct-1} + \varepsilon_{ijct}$$

Indices: i for firm, j for industry, c for country, t for year

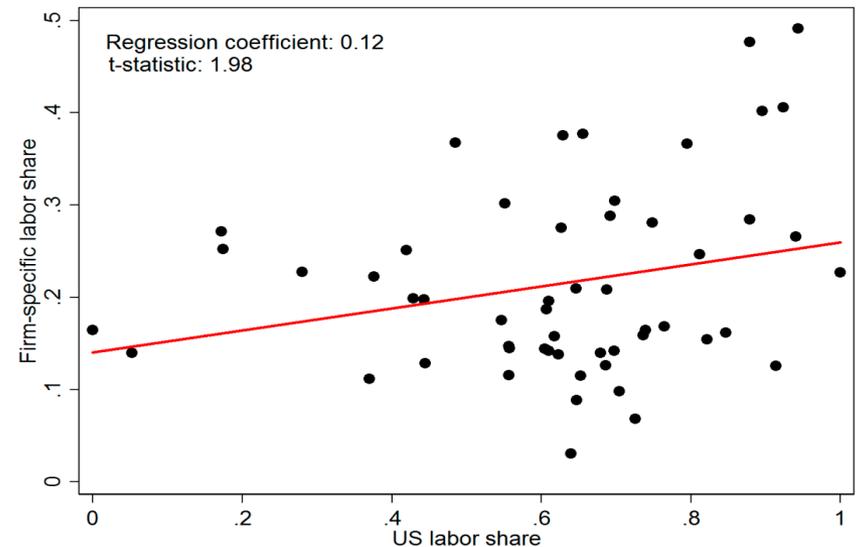
Other controls: other double interactions, firm size, Tobin's Q, sales growth, and capital stock

Hypotheses: $\hat{\beta}_1, \hat{\beta}_2, \hat{\beta}_3, \hat{\beta}_4, \hat{\beta}_5 > 0$

Data

- **Firm-level data:**
 - Worldscope: listed firms, global coverage
 - Coverage: 66 countries, 2000-2011
 - Some 30,000 firms (both tradable and non-tradable sectors)
- **Labor share:**
 - Average payroll share of US firms at the 3-digit NAICS industry level (Elsby, Hobijn and Sahin, 2013)
- **Real exchange rate:**
 - Penn World Tables 8.1
 - Market exchange rate / PPP
- **Other variables:**
 - WDI, IFS, WEO, Dealogic Loan Analytics and DCM Analytics

Correlation of median firm-level labor share and average US labor share at the industry level



Sources: Elsby, Hobijn, and Sahin (2013) and Worldscope.

The Internal Financing Channel for Tradable Sector Firms

	Asset growth	Investment	Investment	Cash flow
Tobin's Q_t		0.068*** (0.004)		
Sales Growth $_{t-1}$		0.034** (0.015)	0.044*** (0.015)	
Log(RER)$_t$*Labor share	0.413*** (0.104)	0.880* (0.472)	0.896* (0.464)	0.082** (0.039)
Log(RER)$_t$*Labor share*(Credit/GDP)$_{t-1}$	0.293*** (0.081)	0.731** (0.342)	0.718** (0.334)	
Observations	132,200	93,271	95,988	137,484
R-squared	0.371	0.631	0.627	0.720

All regressions include: country-year, industry-year, firm fixed effects, lagged firm size, and the double interaction term “Labor share*Credit/GDP”. Standard errors clustered at the firm level.

Economic Magnitudes

- Key takeaway: for given real depreciation, there is an impact differential between high and low labor-share firms, but this differential is larger in less financially developed countries.
- In countries with low financial development, a real depreciation of 10% is associated with a growth rate that is ≈ 2 pp higher for high vs. low-labor share firms. The same differential is close to 0 in countries with high financial development

High vs. low labor share: wood products vs. mining

High vs. low financial development: the Netherlands vs. Turkey

Additional Evidence: Impact on Firm Performance and Market Value

	Sales Growth		Market Cap Growth		Stock Market Return	
	t	t+1	t	t+1	t	t+1
Tobin's Q_t				-0.054*** (0.003)		-0.046*** (0.003)
Sales Growth $_{t-1}$				-0.033* (0.016)		-0.031*** (0.010)
Log(RER)$_t$*Labor share	0.324*** (0.103)	0.228** (0.103)	0.181 (0.238)	0.908** (0.407)	0.069 (0.164)	0.823*** (0.245)
Log(RER)$_t$*Labor share*(Credit/GDP)$_t$	0.223*** (0.080)	0.129** (0.052)	0.236*** (0.079)	0.429* (0.208)	0.224* (0.132)	0.660*** (0.182)
Observations	126,279	105,727	123,893	75,256	123,632	80,707
R-squared	0.396	0.385	0.425	0.472	0.474	0.506

All regressions include: country-year, industry-year, firm fixed effects, lagged firm size, and the double interaction term "Labor share*Credit/GDP". Standard errors clustered at the firm level.

Placebo Test: No Evidence of Internal Financing Channel for Non-Tradable Sector Firms

	Investment	Investment	Cash flow
Tobin's Q_t	0.127*** (0.016)		
Sales Growth $_{t-1}$	0.022 (0.033)	0.035 (0.032)	
Log(RER)$_t$*Labor share	-1.833 (1.202)	-1.625 (1.155)	-0.087 (0.057)
Log(RER)$_t$*Labor share*(Credit/GDP)$_{t-1}$	-1.197 (0.898)	-1.113 (0.881)	
Observations	24,631	25,736	33,515
R-squared	0.653	0.648	0.782

All regressions include: country-year, industry-year, firm fixed effects, lagged firm size, and the double interaction term "Labor share*Credit/GDP". Standard errors clustered at the firm level.

Threats to Identification (1)

Aggregate Lending and Savings Channels

- **Lending Channel:** Large depreciations coincide with financial crises and recessions, reducing the supply of bank credit
- **Savings Channel:** Increases in aggregate savings (policy driven, structural) are associated with weaker RER, increasing the supply of credit
- Net effect could go both ways. Differential effect may be correlated with ours.
- **Our Strategy:**
 - Test if firms in industries more *reliant on external finance* benefit more from real depreciation
 - Exclude country-years with banking crises

Control for Aggregate Lending and Savings Channels

	Asset Growth	Investment	Investment
Tobin's Q_t		0.069*** (0.005)	
Sales Growth $_{t-1}$		0.035** (0.015)	0.044*** (0.015)
Log(RER)$_t$*Labor share	0.388*** (0.109)	0.966* (0.494)	0.967** (0.485)
Log(RER)$_t$*Labor share*(Credit/GDP)$_{t-1}$	0.312*** (0.084)	0.855** (0.354)	0.844** (0.347)
Log(RER)$_t$*Ext. Finance Dependence*(Credit/GDP)$_{t-1}$	-0.083 (0.052)	-0.297 (0.195)	-0.389** (0.191)
Observations	121,375	86,681	89,152
R-squared	0.368	0.630	0.625

All regressions include: country-year, industry-year, firm fixed effects, lagged firm size, and the double interaction term “Labor share*Credit/GDP”. Standard errors clustered at the firm level.

Threats to Identification (2)

The Balance Sheet (BS) Channel

- RER movements lead to changes in firms' net worth and creditworthiness
- Most pronounced for firms with A-L currency mismatch
- Most pronounced during currency crises (EMs in 1990s)
- **Our strategy:**
 - Link firms with data on corporate debt (loan + bond) issuance at country level
 - Test if RER depreciation benefits investment less in countries with higher FX debt
 - Control for firms' net worth directly
 - Exclude country-years with currency crises

Control for Balance Sheet Channel

	Asset Growth	Investment	Investment
	Full	FX share>50%	Full
Tobin's Q_t		0.073*** (0.011)	0.072*** (0.004)
Sales Growth $_{t-1}$		0.090** (0.036)	0.054*** (0.015)
Net worth $_{t-1}$			0.008*** (0.000)
Log(RER)$_t$*Labor share	0.438*** (0.156)	6.079*** (2.234)	0.733 (0.474)
Log(RER)$_t$*Labor share*(Credit/GDP	0.302*** (0.092)	1.200** (0.592)	0.655* (0.343)
Log(RER)$_t$*Labor share*FX share	-0.041 (0.184)	-5.737** (2.599)	
Log(RER)$_t$*(Net worth)$_{t-1}$			0.004*** (0.001)
Observations	132,200	15,611	93,271
R-squared	0.371	0.672	0.637

All regressions include: country-year, industry-year, firm fixed effects, lagged firm size, and the double interaction term “Labor share*Credit/GDP”. Standard errors clustered at the firm level.

Drop Currency & Banking Crises

	Asset Growth	Investment	Asset Growth	Investment
	Drop currency crises		Drop banking crises	
Tobin's Q_t		0.068*** (0.004)		0.066*** (0.005)
Sales Growth $_{t-1}$		0.035** (0.015)		0.034** (0.016)
Log(RER)$_t$*Labor share	0.404*** (0.107)	0.793 (0.485)	0.386*** (0.113)	0.830 (0.509)
Log(RER)$_t$*Labor share*(Credit/GDP)$_t$	0.285*** (0.083)	0.669* (0.350)	0.234*** (0.088)	0.678* (0.373)
Observations	131,880	93,107	114,485	80,559
R-squared	0.371	0.631	0.410	0.646

All regressions include: country-year, industry-year, firm fixed effects, lagged firm size, and the double interaction term “Labor share*Credit/GDP”. Standard errors clustered at the firm level.

Other Tests and Robustness Checks

- Alternative proxies for financial constraints
 - $\text{Log}(\text{credit}/\text{GDP})$
 - Firm-level size (assets, employment)
- Alternative measures for Tobin's Q
 - Lagged, average, market/book value
- Saturated specifications
 - Added country-industry-year fixed effects
- Lower frequency data
 - Panel of 4-year averages

Implications for Policy

1. The link between real depreciation and economic growth remains contentious – while not resolving it, we improve on identification and causality using granular data.
2. While silent on the overall effects of real depreciation on productivity, we show that depreciations free up resources that can be used for investment and correct for the scarcity/misallocation of external finance. Benefits larger for countries with underdeveloped financial markets / misallocated capital and labor-intensive production structure.
3. In the long run, depreciation alone is not likely to be motor for growth. In the short-run, can “oil” the growth machine if productivity not compromised (i.e. macro balance maintained).

Thank you