Sticky Leverage and Debt Overhang: Evidence from Foreign-Denominated Debt in Latin America

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TRANSMISSION CHANNELS OF MONETARY SHOCKS

How does montary policy (MP) impact firm's stock performance and real decisions?

- Mainstream: sticky price
    - Price adjustment is costly.
    - Monetary expansion $\Rightarrow$ higher output.

- Alternative channel: sticky leverage (Gomes, Jermann, and Schmid, 2016)
    - Debt payments are nominal.
    - Expansionary MP $\Rightarrow$ real value of debt $\downarrow$ $\Rightarrow$ boosts firm performance

EMPIRICAL EVIDENCE

- Lack of empirical evidence on sticky leverage

- Intertwined effect of LEVERAGE on the transmission of MP

  ▶ Augmentation mechanism: through sticky price or wage

  ▶ Standalone channel: leverage is nominally sticky

  ▶ Empirical challenge: disentangle the two

- A new empirical design: how will U.S. monetary shocks affect foreign firms with dollar-denominated debt?

  ▶ Sticky price: no direct impacts except through import/export.

  ▶ Sticky leverage: with FDD, more responsive in equity values, investment and sales growth

OUR CONTRIBUTION

- New empirical evidence to support sticky leverage channel and debt overhang

- Investigate the effects of U.S. MP shocks on Latin American companies borrow in both foreign denominated debt (FDD) and locally denominated debt (LDD)

    ▶ firms with more FDD experience higher abnormal stock returns after expansionary U.S. MP shocks
    ▶ investment growth and sales growth of these firms also increase.
    ▶ the sticky leverage channel is more prominent for firms with longer term debt.

LITERATURE REVIEW

- Sticky price and sticky leverage literature
    - Sticky price: monetary shocks only account for 2- 23% of the fluctuations of U.S. real output.
    - Sticky leverage: monetary shocks can account for 10-40% in theory.
    - This paper provides new empirical evidence on the sticky leverage channel.
- Debt overhang literature
    - Existing debt discourages corporate investment (Myers 1977)
    - Empirical evidence is scarce: rarely examined in clean empirical setting due to endogeneity.
    - This paper empirically test and support the prediction in Diamond and He (2014).
- Foreign currency exposure on firm-level policies
    - Firms with different currency composition of liabilities are affected by EX volatility.
    - This paper employs a novel experiment and a new perspective.

A SIMPLE THEORY

- We extend Diamond and He (2014) by adding FDD.

- Suppose a firm has both locally denominated debt (LDD) and foreign-denominated debt (FDD).

  ▶ Their nominal values in local currency are denoted by L and F, respectively

- Suppose all FDD are fixed in U.S. dollars.

  ▶ If U.S. has monetary expansion, L is unchanged and F is lower.

  ▶ Equity values, investment, and output increase.

  ▶ More long-term FDD may lead to higher increase

figure

DATA

- Two major Latin American countries: Brazil (2002-2018) and Mexico (1996-2018).

- Company data: Economatica,
  - Daily returns, quarterly financial, and FDD

- U.S. MP shocks
  - high-frequency identification following Nakamura and Steinsson (2018).
  - changes in federal funds futures and Eurodollar futures in a 30-minute window surrounding scheduled FOMC announcements.

- Commodity-level annual trade data from UN Comtrade

KEY SPECIFICATION

$$R_{jt} = \beta_1 FDD_{jt} + \beta_2 Lev_{jt} + \gamma_1 \left(FDD_{jt} \times \mathsf{Shock}_t \right) + \gamma_2 \left(Lev_{jt} \times \mathsf{Shock}_t \right)$$
$$+ Control_{jt} + \delta_j + \alpha_t + \varepsilon_{jt}$$

- R_{jt}: stock price response at FOMC
- γ_1: role of FDD
- γ_2: the conventional investment channel of MP transmission.
- δ_j, α_t: fixed effects.
- Controls: market cap, BM, firm size, Tobin's Q, cash/asset, ROE, sales/asset, ROE

EVIDENCE ON STOCK RETURNS

	Raw Return	Abnormal Return
Shock*L.FDD	-8.414**	-9.914**
	(4.071)	(3.850)
Shock*L.Leverage	11.541***	12.390***
	(3.173)	(2.987)
L.FDD	0.243	0.264
	(0.221)	(0.226)
L.Leverage	0.004	-0.101
	(0.220)	(0.244)
Controls	Y	Y
Fixed effects	F,S	F,S
Observations	27,841	27,250
Adj. R^2	0.117	0.125

- Abnormal return: raw - [-23,3] average
- 1 p.p. ↑ i & 1 sd ↑ FDD (0.131) = -1.3 p.p.

INTERNATIONAL TRADE POSITIONS

- U.S. MP shocks may indirectly affect foreign firms through international trade positions
- Sticky price + sticky leverage

$R_{jkt} = \beta_1 FDD_{jkt} + \beta_2 Lev_{jkt} + \beta_3 NX_{kt}$

$+ \gamma_1 (FDD_{jkt} \times \text{Shock}_t) + \gamma_2 (Lev_{jkt} \times \text{Shock}_t) + \gamma_3 (NX_{kt} \times \text{Shock}_t)$

$+ \theta_1 (FDD_{jkt} \times NX_{kt} \times \text{Shock}_t) + \theta_2 (Lev_{jkt} \times NX_{kt} \times \text{Shock}_t)$

$+ \text{Control}_{jkt} + \delta_j + \alpha_t + \varepsilon_{jt}.$

Results with International Trade

	Raw Return	Abnormal Return
Shock*L.FDD*L.NX	-13.661***	-9.038***
	(4.004)	(2.136)
Shock*L.Leverage*L.NX	2.245	1.408
	(1.476)	(1.282)
Shock*L.FDD	-7.308	-7.163
	(6.333)	(5.979)
Shock*L.Lev	9.496*	7.235
	(5.219)	(5.184)
Shock*L.NX	-1.082***	-0.980***
	(0.299)	(0.208)
L.FDD*L.NX	0.067	0.094
	(0.116)	(0.135)
L.Lev*L.NX	-0.249*	-0.063
	(0.142)	(0.114)
L.FDD, L.Lev, L.NX, Controls	Y	Y
Fixed effects	F,S	F,S
Observations	12,837	12,559
Adj. R^2	0.092	0.099

DEBT OVERHANG

$$\Delta Y_{jt} = \beta_1 FDD_{jt} + \beta_2 Lev_{jt} + \gamma_1 \left(FDD_{jt} \times \text{Shock}_t^Q \right)$$
$$+ \gamma_2 \left(Lev_{jt} \times \text{Shock}_t^Q \right) + \text{Control}_{jt} + \delta_j + \alpha_t + \varepsilon_{jt},$$

- ΔY_{jt}: the change of investment over lag assets; the change of sales over lag assets; FDD or Leverage

- $shock_t^Q$: the cumulative MP shocks during the past quarter

RESULTS OF DEBT OVERHANG

	$\frac{\Delta Inv}{Assets_{t-1}}$	$\frac{\Delta Sales}{Assets_{t-1}}$	FDD	Lev
Qshock*L.FDD	-0.133**	-0.302	-1.023***	0.100
	(0.055)	(0.477)	(0.160)	(0.103)
Qshock*L.Lev	0.040	0.236	0.059	-0.089
	(0.033)	(0.283)	(0.060)	(0.067)
L.FDD	0.005	0.037	0.871***	-0.000
	(0.006)	(0.040)	(0.013)	(0.009)
L.Lev	0.009	0.044	-0.016**	0.861***
	(0.006)	(0.052)	(0.006)	(0.014)
Controls	Y	Y	Y	Y
Fixed effects	F,YQ	F,YQ	F,YQ	F,YQ
Observations	10,009	10,082	10,057	10,069
Adj. R^2	0.503	0.815	0.934	0.963

- investment growth: 1 p.p. $\uparrow$ i + 1 sd $\uparrow$ FDD = -1.7%
- sales growth: 1 p.p. $\uparrow$ i + 1 sd $\uparrow$ FDD = -3.93%
- FDD holding: 1 p.p. $\uparrow$ i + 1 sd $\uparrow$ FDD = -13.4%

LONG- VERSUS SHORT-TERM DEBT OVERHANG

$$R_{jt} = \beta_1 (STFDD_{jt}) + \beta_2 (LTFDD_{jt}) + \beta_3 Lev_{jt}$$

$$+ \gamma_1 [(STFDD_{jt}) \times Shock_t] + \gamma_2 [(LTFDD_{jt}) \times Shock_t]$$

$$+ \gamma_3 (Lev_{jt} \times Shock_t) + Control_{jt} + \delta_j + \alpha_t + \varepsilon_{jt}$$

- STFFD: short-term FDD/total asset

- LTFFD: long-term FDD/total asset

RESULTS: LONG- VERSUS SHORT-TERM FDD

	Raw Return	Abnormal Return
Shock*L.ST FDD	4.735	3.017
	(9.428)	(9.429)
Shock*L.LT FDD	-11.490**	-10.105**
	(5.740)	(5.034)
Shock*L.Leverage	5.182	4.171
	(4.932)	(4.495)
L.ST FDD	-0.267	-0.130
	(0.521)	(0.518)
L.LT FDD	-0.119	0.070
	(0.285)	(0.272)
L.Lev	-0.081	-0.283
	(0.371)	(0.412)
Controls	Y	Y
Fixed effects	F,S	F,S
Observations	27,841	27,250
Adj. R^2	0.117	0.125

ADDITIONAL TESTS

- We do NOT observe significant effects through the FDD channel following European Central Bank (ECB) MP shocks, because FDD of the Latin American Firms are mostly dollar denominated.
- The channel we identified is not contaminated by the liquidity channel of MP transmission.
  - ▶ Restrict sample to firms not-cross-listed at the U.S. market: we find similar results.
  - ▶ Firms hold higher FDD in the flexible FX regime do not have stronger connection with the U.S. during the fixed FX regime.
  - ▶ Firms with a stronger net export exposure have lower FDD holding in general. Thus, the NX position does not affect firms' access to FDD.

ECB MP Shocks

- Analyses with European Central Bank (ECB) MP shocks

- If FDD are U.S. dollar denominated, the same FDD would NOT transmit the ECB MP shocks to affect firm stock returns and real decisions.

- As expected, we don't observe the FDD channel of ECB MP shock transmission.

CROSS-LISTING

- 7.1% of the firms are cross-listed at the U.S.

- Potentially have greater liquidity exposure with the U.S. market.

- Non-cross-listed sample v.s. full sample: disentangle the liquidity channel from the FDD channel

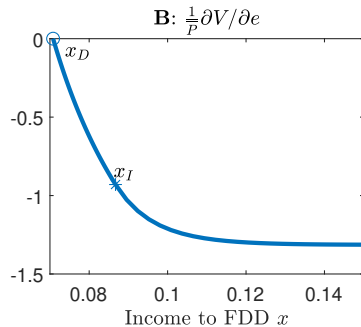- No weaker results in the non-cross-listed sample. Thus, FDD channel is identified.
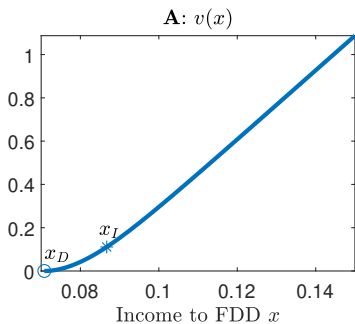
RESULTS: CROSS-LISTING

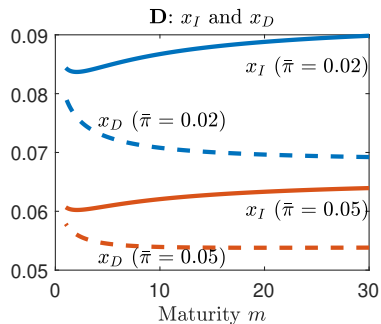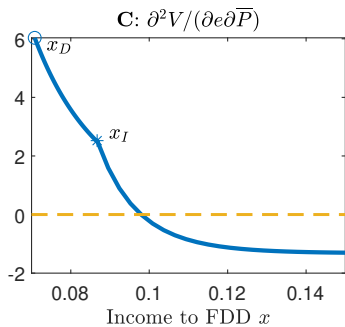|	Non-cross-listed sample				Full sample	
	(1) Ret	(2) Ret	(3) AbnRet	(4) AbnRet	(5) Ret	(6) AbnRet
MPShock * L.FDD	-9.121** (3.920)	-7.398* (4.262)	-9.950*** (3.802)	-9.361** (4.004)	-8.128* (4.253)	-10.183** (4.004)
MPShock * L.Lev	11.979*** (2.977)	11.118*** (3.352)	12.886*** (2.871)	12.277*** (3.128)	11.135*** (3.340)	12.350*** (3.111)
L.FDD	0.013 (0.208)	0.058 (0.225)	0.031 (0.218)	0.056 (0.240)	0.047 (0.216)	0.058 (0.228)
L.Lev	-0.180 (0.165)	0.071 (0.247)	-0.076 (0.168)	-0.044 (0.275)	0.129 (0.232)	0.016 (0.257)
MPShock * Cross * L.FDD					-2.058 (15.692)	3.685 (15.367)
MPShock * Cross * L.Lev					7.255 (12.209)	2.635 (12.469)
Fixed Effects	F,S	F,S	F,S	F,S	F,S	F,S
Controls	No	Yes	No	Yes	Yes	Yes
Observations	27,523	24,492	26,814	23,913	27,841	27,250
Adj.R^2	0.105	0.109	0.115	0.116	0.118	0.125

CONCLUSION

- Sticky leverage is present and works through debt overhang channel.

- Long-term debt may incur more debt overhang than short-term debt.

- Sticky leverage and sticky price effects can compound.

- U.S. MP shocks transmit to other countries through the dollar-denominated debt.

APPENDIX: MODEL

A: $v(x)$

B: $\frac{1}{P}\partial V/\partial e$

back

APPENDIX: MODEL

C: $\partial^2 V/(\partial e \partial \overline{P})$

x_D

x_I

Income to FDD x

D: x_I and x_D

x_I ($\bar{\pi} = 0.02$)

x_D ($\bar{\pi} = 0.02$)

x_I ($\bar{\pi} = 0.05$)

x_D ($\bar{\pi} = 0.05$)

Maturity m

back