

# What Hinders Investment in the Aftermath of Financial Crises: Insolvent Firms or Illiquid Banks?

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# Research Question

- ① How do financial crises turn into real ones?
  - Financial crises exacerbate firms' financial constraints → ↓ Investment and Growth
- ② What are the mechanisms?
  - An Old Debate: Whether financial frictions operate via demand for credit or supply for credit
  - Finance Literature—Bank lending channel: Financial sector **illiquidity**.
  - Macro Literature—Firm balance sheet channel: Firms have weak balance-sheets and face **insolvency**

## Contribution of the paper

- Provide evidence on which financial constraint is more relevant for the real economy.
- Provide evidence on substantial real effects of bank credit supply shocks.
- Bridge finance and macro literatures.
- Quantify real effects of both lending channel and balance sheet channel.

**First time evidence on the effect of financial frictions on real variables (investment) identifying the channel**

# Bank Lending Channel

- **Financial Sector Illiquidity:** Troubled banking sector cuts lending in the face of a negative liquidity shock.
  - Holmstrom and Tirole (1997), Kiyotaki and Moore (1997): Financial crisis turn into recession.
  - Chang and Velasco (2001): Model on emerging market crisis:
    - Deteriorating access to liquidity hinders investment and growth.
    - The decline in liquidity is the result of:
      - Failing domestic banks
      - AND decline in foreign credit (“sudden stops”)

# Firm Balance Sheet (Collateral) Channel

- **Insolvency:** Firms' weak balance sheets and lower net worth.
  - Bernanke and Gertler (1989): Business downturns  $\rightarrow$   $\downarrow$  firm net worth  $\rightarrow$   $\uparrow$  cost of borrowing  $\rightarrow$  further  $\downarrow$  investment (Accelerator effect).
  - The  $\downarrow$  firm net worth can be the result of:
    - Maturity Mismatch: Financing of illiquid long term assets with short term debt.
      - Bernanke, Gertler and Gilchrist (1996): Firms with higher short-term debt receive lower credit contributing more to Y decline.
    - Currency Mismatch: Different currency denomination of assets and liabilities.
      - Cespedes, Chang and Velasco (2004): Depreciation  $\rightarrow$  inflates foreign currency debt  $\rightarrow$  insolvent firm cannot borrow  $\rightarrow$  Y decline

# Illiquidity: Finance Lit: Banks Credit Supply

- The aim is to establish a causal relationship between a negative bank supply shock and credit provision
- Ample evidence: Kashyap and Stein (2000); Khwaja and Mian (2008); Paravisini (2008); Schnabl (2010); Ivashina and Scharfsten (2010); Jimenez, Ongena, Peydro-Alcalde, and Saurina (2012).
- Data and/or estimation strategy limitations prevented to study whether financial shocks to banks have real effects:
  - Peek and Rosengren (1997); Kashyap, Stein, and Wilcox (1993); Kashyap, Lemont, and Stein (1994); Becker and Ivashina (2011); Adrian, Colla, and Shin (2012)
- Recent exceptions on exports:
  - Paravisini, Rappoport, Schnabl and Wolfenzon (2010); Amiti and Weinstein (2011)

# Illiquidity: International Macro/Trade Lit: Access to Finance

- “Normal” times: Antras, Desai and Foley (2009) weak financial institutions increase reliance on financing through internal capital markets by foreign affiliates.
- “Crises” times: Foreigners perform better during financial crises because they have access to credit
  - Desai, Foley and Forbes (2008): Currency crises from 25 emerging markets. US multinational affiliates increase sales, assets and capital expenditure compared to domestic firms.
  - Blalock, Gertler and Levine (2007): Indonesia, foreign owned exporters increase investment relative to domestic exporters.
  - Alfaro and Chen (2010): world-wide dataset on multinational subsidiaries show that establishments with stronger vertical production and financial linkages with the parent company increased sales during “Global Financial Crisis”.

## Solvency: Balance sheet channel

- Do firms holding high short-term dollar denominated debt decrease investment during depreciations?
- Aguiar (2005): Mexico 1995 crisis, large depreciation → exporters with high short term dollar debt decreased investment.
- Bleakley and Cowan (2008): 5 Latin American countries, average exchange rate depreciations do not lead to a decrease in investment.



# Our Methodology

- Main identification challenge: separate demand for credit by firms from the supply of credit by banks, holding firm creditworthiness constant
  - Make use of a positive demand shock and a negative supply shock at the country level
- Empirical analysis based on the experience of 6 Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico and Peru).
- Experience of two types of crises during the 1990s and mid-2000s: currency and twin.

- Currency Crises: RER increases more than 25%.
  - We study four episodes of currency crises (Mexico 1995, Argentina 2002, Brazil 1999 and 2002)
- Twin Crises: Reinhart and Rogoff (2008) classification of banking crises:
  - Bank runs that lead to closure, merging or takeover by the public sector of one or more financial institutions.
  - In the absence of bank runs: closure, merging, takeover or government assistance of an important financial institution (or group of institutions) that mark the start of similar outcomes for other financial institutions.
  - Mexico (1994) and Argentina (2001).

## Balance-sheet channel

- Currency crises are expected to have two countervailing effects:
  - 1 Generate investment opportunities in tradable sector  $\rightarrow \uparrow$  demand for credit.
  - 2 Impact firms' creditworthiness by inflating the value of dollar denominated debt.
    - Exporting firms with no dollar-debt do not experience a change in networth.
    - The change in networth will depend on firms' ability to match dollar denominated income and dollar debt.
- Focus on the sample of exporting firms that are the ones with the investment opportunity and the possibility of avoiding a mismatch on their balance sheet.
- An insolvent firm: high leverage and holdings of short-term foreign currency denominated debt NOT matched by a dollar denominated stream of income like dollar assets and/or export revenue.

# Liquidity Channel

- We exploit two layers of country and firm heterogeneity:
  - 1 Country Heterogeneity
    - ★ **All** currency crises share the depreciation of the currency → potential weak balance sheets.
    - ★ **Some** depreciation episodes, in addition, witnessed an economy-wide illiquidity problem. (Twin Crises)
  - 2 Firm Heterogeneity
    - ★ We measure differential access to finance by firm **ownership structure**.
      - Access to international capital markets: Issue bond abroad, syndicated loan abroad, stock abroad.
      - Foreign ownership: more reliable source of credit during financial crises.

# Differences-in-Differences

- Investigate the differential response of foreign-owned and domestic exporters with and without short-term dollar debt at the onset of twin and currency crises.
- Main hypothesis: If illiquidity is the main channel, foreign-owned exporters should perform better than domestic exporters **ONLY** during twin crises, holding dollar debt and leverage constant (balance sheet channel is accounted for).

## Exporter Sample

$$\begin{aligned}
 y_{i,c,j,t} = & \beta_1 Foreign_{i,c,j,t-1} \times SDDebt_{i,c,j,t-1} \times Post_{c,t} \quad (1) \\
 & + \beta_2 Foreign_{i,c,j,t-1} \times SDDebt_{i,c,j,t-1} \\
 & + \beta_3 Foreign_{i,c,j,t-1} \times Post_{c,t} \\
 & + \beta_4 SDDebt_{i,c,j,t-1} \times Post_{c,t} \\
 & + \beta_5 Foreign_{i,c,j,t-1} \\
 & + \beta_6 SDDebt_{i,c,j,t-1} \\
 & + \phi_{j,t} + \varphi_{c,t} + \alpha_i + \xi_{i,c,j,t}
 \end{aligned}$$

$\beta_4$  Effect of holding dollar debt after crisis **only** for domestic exporter sample.

$\beta_3$  Performance of foreign exporters with no dollar debt after the crisis.

$\beta_1$  Performance of foreign exporters with dollar debt after the crisis.

$$\begin{aligned}
 y_{i,c,j,t} = & \beta_1 \text{Foreign}_{i,c,j,t-1} \times \text{SDDebt}_{i,c,j,t-1} \times \text{Post}_{c,t} \\
 & + \beta_2 \text{Foreign}_{i,c,j,t-1} \times \text{SDDebt}_{i,c,j,t-1} \\
 & + \beta_3 \text{Foreign}_{i,c,j,t-1} \times \text{Post}_{c,t} \\
 & + \beta_4 \text{SDDebt}_{i,c,j,t-1} \times \text{Post}_{c,t} \\
 & + \dots
 \end{aligned} \tag{2}$$

- $\beta_4$  insignificant: exporting firms match dollar debt and export revenue and there is no significant difference between foreign and domestic exporters.
- $\beta_1 > \beta_4$ : Foreign-owned exporters holding dollar debt outperform domestic exporters holding dollar debt. Access to finance or liquidity channel.
- $\beta_1 < \beta_3$ : Foreign-owned exporters holding dollar debt underperform relative to foreign-owned exporters without dollar debt. Solvency channel.

$$\begin{aligned}
 y_{i,c,j,t} = & \beta_3 Foreign_{i,c,j,t-1} \times Post_{c,t} \\
 & + \beta_4 SDDebt_{i,c,j,t-1} \times Post_{c,t} \\
 & + \dots
 \end{aligned} \tag{3}$$

- $\beta_4$ : confounding effect of foreign and domestic exporters.
- $\beta_3$ : confounding effect of holding dollar debt or not.



## A new hand-collected database

- Universe of non-financial listed firms with annual accounting information from Argentina, Brazil, Chile, Colombia, Mexico and Peru; 1990 to 2005.
  - ★ Sales, Investment: change in stock of physical capital (property, plant, and equipment)
  - ★ Currency and maturity composition of assets and liabilities: from firms' balance sheets in stock market statements
  - ★ Exports: Income statements and custom office records
  - ★ Foreign Ownership: Time varying ownership stakes based on M&A transactions 1981–2005, other ownership changes via ORBIS database and company web sites.

## Foreign Ownership

- SDC Platinum from Thompson, 1981 to 2005: to ensure that we capture changes that predates the firm's first appearance in our sample.
- Zephyr from Bureau Van Dijk, 1997 to 2005: provides info on initial stake and acquisitions of minority stakes.
- Companies web pages (Funding Universe website).
- A total of 4406 deals where 28% of our firms are involved.
- Use Corporations Affiliations database to identify firms in our sample that are affiliates of global firms.

TABLE 4 —DOLLAR DEBT BY FIRM TYPE: SUMMARY STATISTICS

	Exporter			Non-Exporter		
	Mean	Median	Observations	Mean	Median	Observations
Argentina	0.52	0.58	106	0.44	0.41	58
Brazil	0.28	0.24	331	0.13	0.02	458
Chile	0.28	0.21	936	0.07	0.00	608
Colombia	0.10	0.04	328	0.07	0.00	293
Mexico	0.44	0.43	974	0.24	0.15	644
Peru	0.53	0.54	313	0.52	0.55	14
Total	0.35	0.31	2988	0.15	0.02	2075

  

	Foreign Exporter			Domestic Exporter		
	Mean	Median	Observations	Mean	Median	Observations
Argentina	0.58	0.61	47	0.47	0.52	59
Brazil	0.30	0.34	42	0.28	0.23	289
Chile	0.21	0.11	224	0.30	0.23	712
Colombia	0.09	0.08	37	0.10	0.03	291
Mexico	0.33	0.33	119	0.45	0.45	855
Peru	0.47	0.44	105	0.56	0.57	208
Total	0.31	0.27	574	0.35	0.31	2414

# Exports

- Export to Sales ratio
- Exporter dummy: 1 if the firm reported export revenue and 0 otherwise.
- High Exporter dummy: 1 if the firm reported an export to sales ratio greater than 10%.
- Predetermined dummy: 1 if the firm was considered an exporter in any of the three years prior to the first currency crisis.
  - Argentina 1999, 2000 and 2001; Brazil 1996, 1997 and 1998; Mexico 1992, 1993 and 1994. Colombia (1995, 1996 or 1997)

# Controls

- Short-term bank debt to total liabilities: Leverage and firm dependence on banking credit.
- International Borrowing: Bond abroad, international loan and equity abroad

$$\begin{aligned}
 y_{i,c,j,t} = & \beta_1 \text{Exporter}_{i,c,j,t-1} \times \text{Post}_{c,t} \\
 & + \beta_2 \text{Exporter}_{i,c,j,t-1} \\
 & + \phi_{j,t} + \varphi_{c,t} + \alpha_i + \xi_{i,c,j,t}
 \end{aligned} \tag{4}$$

DEPENDENT VARIABLE: INVESTMENT

<u>Crisis</u>	All Types of Crises			
	Continuous	Continuous	Predetermined <i>Dummy</i>	Continuous
<u>Exporter Definition</u>				
<u>Dollar Debt Definition</u>		Continuous	Continuous	Predetermined <i>Dummy</i>
	(1)	(2)	(3)	(4)
<i>Exports</i> × <i>Post</i>	-0.004 (0.03)	0.029 (0.02)	0.003 (0.01)	0.002 (0.03)
<i>ShortDollarDebt</i> × <i>Post</i>		-0.066* (0.03)	-0.060 (0.04)	-0.012 (0.01)
Observations	5,265	5,265	5,265	5,265

- Are all types of crises the same?
- What about exporters holding dollar debt?



## DEPENDENT VARIABLE: INVESTMENT

<u>Crisis</u>	<u>Twin Crises</u>		<u>Currency Crises</u>	
	Continuous	Predetermined Dummy	Continuous	Predetermined Dummy
<u>Exporter Definition</u>	Continuous	Continuous	Continuous	Continuous
<u>Dollar Debt Definition</u>	(1)	(2)	(3)	(4)
<i>Exports</i> × <i>Post</i>	0.013 (0.03)	-0.034 (0.02)	0.049** (0.02)	0.038** (0.02)
<i>ShortDollarDebt</i> × <i>Post</i>	-0.090** (0.04)	-0.055* (0.03)	-0.025 (0.04)	-0.057 (0.05)
<i>Exports</i> × <i>ShortDollarDebt</i> × <i>Post</i>		-0.129 (0.09)		0.095 (0.09)
Observations	5,265	5,265	5,265	5,265
Firms	906	906	906	906
<u>F-test</u>				
<i>ShortDollarDebt</i>		0.0464		0.788
<i>ShortDollarDebt</i> × <i>Post</i>		0.145		0.497

## Exporter Sample

$$\begin{aligned}
 y_{i,c,j,t} = & \beta_1 \text{Foreign}_{i,c,j,t-1} \times \text{SDDebt}_{i,c,j,t-1} \times \text{Post}_{c,t} \quad (5) \\
 & + \beta_2 \text{Foreign}_{i,c,j,t-1} \times \text{SDDebt}_{i,c,j,t-1} \\
 & + \beta_3 \text{Foreign}_{i,c,j,t-1} \times \text{Post}_{c,t} \\
 & + \beta_4 \text{SDDebt}_{i,c,j,t-1} \times \text{Post}_{c,t} \\
 & + \beta_5 \text{Foreign}_{i,c,j,t-1} \\
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$\beta_1$  Performance of foreign exporters with dollar debt after the crisis.

## DEPENDENT VARIABLE: INVESTMENT

Crisis	Twin Crises		Currency Crises	
Exporter Definition	Predetermined		Predetermined	
<u>Dollar Debt Definition</u>	Continuous		Continuous	
Foreign Definition	Predetermined		Predetermined	
Fixed Effects:foreign*year	no	yes	no	yes
	(1)	(2)	(3)	(4)
$SDD \times Foreign \times Post$	0.249** (0.09)	0.269*** (0.07)	-0.082 (0.09)	-0.053 (0.09)
$SDD \times Foreign$	-0.012 (0.03)	-0.002 (0.04)	0.005 (0.03)	0.009 (0.03)
$SDD \times Post$	-0.198* (0.10)	-0.197* (0.10)	0.040 (0.08)	0.040 (0.08)
$SDD$	0.021 (0.03)	0.021 (0.03)	0.011 (0.02)	0.011 (0.03)
$Foreign \times Post$	0.171*** (0.05)	0.110** (0.04)	-0.029 (0.04)	-0.008 (0.04)

- Foreign-owned exporters do not suffer an illiquidity problem during twin crises and invest more relative to domestic exporters regardless of their solvency.
- A domestic exporter with 1 percent extra short-term dollar debt ratio, would experience a decline in investment of 13 percents.
- A foreign exporter with same balance sheet deterioration, would increase investment by 5 percentage points.
- F-test: Dollar debt and foreign ownership do not have any DIFFERENTIAL role under currency crisis

## Threats to Identification

- Any other difference between foreign-owned and domestic exporters—MOST captured by  $\text{foreign} \times \text{year}$ ;  $\text{foreign} \times \text{post}$ 
  - Different information/anticipation of crisis— $\text{Foreign} \times \text{year}$  trends
  - Different destination markets—NOT THE CASE (Mexico-76 vs 74 to US)
  - Different use of intermediate inputs—NOT THE CASE (Mexico-66 vs 29, foreigners use more)
- Significant differences in prior investment trends in debt holdings by foreign and domestic—NONE
- Systematic differences in dollar debt holdings and foreign ownership status in the eve of crisis—repeat with predetermined DD

# Robustness

- Additional Controls:
  - Matching via dollar assets
  - Cash Holdings
  - Alternative measure of leverage
  - Bank dependence control
  - Other forms of access to international markets
- Different currency crises, different treatment (Mexico, 95; Brazil, 99-financial excesses)
- Alternative estimation: sample of solvent firms (or mismatch variable) based on exports minus DD relative to assets/liabilities
- Alternative investment variable

# Conclusion

- Investment and growth are hindered during financial crises due to international and domestic illiquidity
- Foreign exporters with dollar debt perform better than domestic exporters with dollar debt ONLY during twin crises.
- The paper provides new evidence on the real effects of shocks to the banking sector using firm-level investment data from emerging markets.
- Important policy implications:
  - 1 The 13 percent decline in firm-level investment for highly dollarized domestic exporters (key for emerging markets central banks)
  - 2 Foreign currency borrowing might not be detrimental during periods of instability as long as access to finance is not limited.

- Thank you!