From Carry Trade to Trade Credit: Financial Intermediation by Non-Financial Firms

Bryan Hardy [1] Felipe Saffie [2]

[1]Bank for International Settlements

[2]University of Virginia (Darden)

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International Fragmentation, Supply Chains, and Financial Frictions

The views expressed are those of the authors and not necessarily those of the Bank for International Settlements

Currency Risk and Account Receivables

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FX Credit

- FX funding typically cheaper than local currency
- Unequal access to FX funds: possibility for inter-mediation
- Trade credit often in local currency $\Rightarrow$ currency mismatch
- Policy: Regulation typically target banks

Questions

- Is trade credit lending backed by FX borrowing?
- Do firms adjust their FX borrowing and trade credit lending in response to carry trade opportunities (Dollar-Peso differentials)?
- Do firms generate FX mismatch through their financial intermediation?
- Do trade credit (supply chain) networks transmit FX risk?

This paper

We use unique firm level data of listed firms in Mexico to document:

1. **Currency mismatch:** firms borrow in FX and accumulate peso ST assets
   - We directly show!
2. **Financial intermediation:** positive co-movement between external funding (peso or FX) and accounts receivables
   - The main destination for FX debt funding ST assets is accounts receivables
3. **Carry trades:** high FX-peso interest rate differential drives FX borrowing, accumulation of ST peso assets, and expansion of trade credit and sales
4. **Real effects:** In a depreciation, exposed firms cut investment instead of trade credit

We confirm results 2 and 3 with cross-country data

Mexican Firm-Level Data

Unique Regulatory Firm-Level Data for Mexico

Several key advantages of our dataset:

1. **Quarterly data**: 2005q1-2015q2, 150+ non-financial firms listed on the Mexican Stock Exchange (BMV)
2. **Direct currency composition of balance sheet:** both assets and liabilities
3. **Liabilities by instrument (and currency)**: bonds, loans, trade credit, etc.
4. **Short term assets by instrument**: cash, accounts receivables, inventories, etc.
5. **Firm interest rates** for FX and peso loans
6. **Real variables**: sales, investment, employment, exports, etc.

Balance Sheet Positions

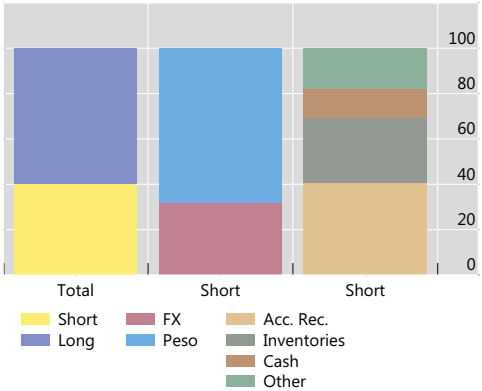

Figure: Assets

- Accounts receivable is the largest component (40%) of short-term assets

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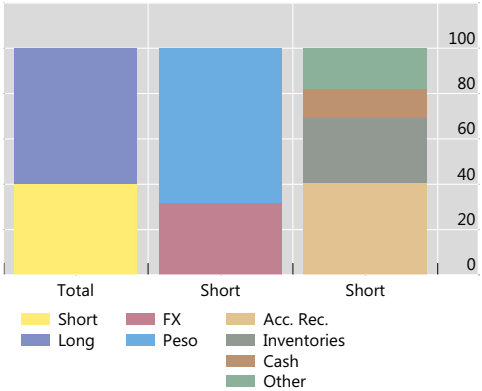

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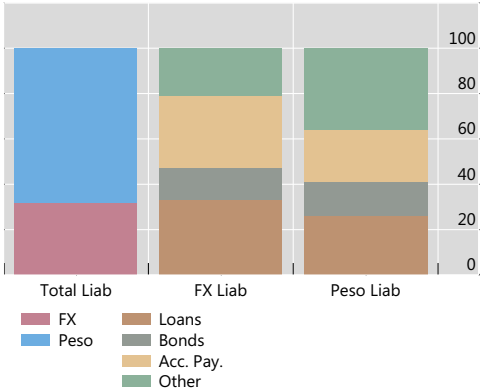

Figure: Liabilities

- Accounts receivable is the largest component (40%) of short-term assets
- Bank and trade credit form the majority of FX liabilities (1/3 each)

Firms borrow in FX to finance Peso assets and lend to other firms

Empirical Specification

$$\frac{\Delta STAsset_{it}}{TotalAssets_{it-1}} = \gamma \frac{CashFlow_{it}}{TotalAssets_{it-1}} + \sum_{type} \beta^{type} \frac{\Delta Borrowing_{it}^{type}}{TotalAssets_{it-1}} + \alpha_i + \alpha_t + \epsilon_{it}$$

- *STAsset*: section of the firm's short term assets (FX assets, cash, etc.)
- *CashFlow*: net income of the firm over the quarter (non-debt funds)
- $Borrowing^{type}$: section of the firm's liability structure (FX liabilities, etc.)
- Firm and time fixed effects, standard errors are clustered at the firm level

Intuition: Decompose change in short term assets by sources that finance it: internal funds and external funds

Result 1: Direct Evidence on Currency Mismatch

	All Firms			Non-Exporters	
	(1) Total	(2) FX	(3) Peso	(4) FX	(5) Peso
Cash Flow$_{it}$	0.525***	0.176**	0.349***	0.0380	0.465**
	(0.127)	(0.070)	(0.157)	(0.0446)	(0.201)
Δ FX Liab$_{it}$	0.381***	0.215***	0.166***	0.230***	0.146*
	(0.0506)	(0.033)	(0.0521)	(0.0518)	(0.0863)
Δ Peso Liab$_{it}$	0.438***	0.0351	0.403***	0.032	0.389***
	(0.0521)	(0.0238)	(0.0486)	(0.0279)	(0.0622)
Observations	3889	3889	3889	2425	2425
R^2	0.233	0.066	0.130	0.0756	0.123
Firms	152	152	152	96	96
FirmFE	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes

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- Firms accumulate Peso assets out FX borrowing.

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- Firms accumulate Peso assets out FX borrowing.
- Valid for non-exporters. No mismatch for Peso borrowing.

Result 2: Firm Level Financial Intermediation

	(1) Cash and Financial	(2) Accounts Receivable	(3) Inventories	(4) Other Short Term
Cash Flow$_{it}$	0.138*	0.131***	0.261**	0.007
	(0.0708)	(0.0395)	(0.118)	(0.018)
Δ FX Liab$_{it}$	0.0878***	0.150***	0.120***	0.0206***
	(0.0198)	(0.0222)	(0.0286)	(0.00653)
Δ Peso Liab$_{it}$	0.106***	0.149***	0.148***	0.0308***
	(0.0216)	(0.0285)	(0.0340)	(0.01)
Observations	3868	3889	3889	3889
R^2	0.047	0.07	0.115	0.005
Firms	152	152	152	152
FirmFE	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes

- **Bruno and Shin (2017)**: firms accumulate cash out of FX borrowing.

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- 30-40% of funding to ST assets is for **accounts receivable**.

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- **Bruno and Shin (2017)**: firms accumulate cash out of FX borrowing.
- 30-40% of funding to ST assets is for **accounts receivable**.
- Pattern is independent of exporter status.

Interest Rate Differential, FX borrowing, and Trade Credit

Carry Trades and FX Exposure

- Do firms respond to interest rate deviations?

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$$\frac{\Delta Position_{it}}{TotalAssets_{it-1}} = \alpha_i + \lambda \frac{\Delta IRD_t}{Vol_t} + X_{it-1}\beta + Z_t\Gamma + \epsilon_{it}$$

- *Position*: short term positions by Asset (FX, Peso, Cash and Financial, Accounts Receivable, Inventories, etc.) and Liability (FX, Peso, FX Loans, etc.)
- *IRD*: **interest rate differential** between the average **Peso** loan rate and average **FX** loan rate for firms in sample
- *Vol*: standard deviation of the daily exchange rate over the quarter.
- X: vector of controls (log assets, sales, cash, liabilities, bond credit, exports)
- Z: vector of macro time series controls (VIX, oil prices, etc.)

Result 3: Carry Trades and ST Currency Positions

	Short Term Liabilities				Short Term Assets			
	(1) FX	(2) FX	(3) Peso	(4) Peso	(5) FX	(6) FX	(7) Peso	(8) Peso
Δ IRD$_t$	0.453***	0.216*	0.144	0.0897	0.0378	-0.150	0.398**	0.448**
	(0.115)	(0.126)	(0.164)	(0.178)	(0.104)	(0.111)	(0.169)	(0.187)
Observations	2999	2999	2999	2999	3001	3001	3001	3001
R^2	0.0167	0.0310	0.0290	0.0292	0.00486	0.0182	0.0251	0.0274
Firms	133	133	133	133	134	134	134	134
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes	No	Yes

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- FX borrowing responds to interest rate deviations.

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- FX borrowing responds to interest rate deviations. Peso doesn't.

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FirmControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes	No	Yes

- FX borrowing responds to interest rate deviations. Peso doesn't.
- Accumulate ST Peso assets, not FX $\Rightarrow$ Increase mismatch

Deriv

Result 3: Which Assets are accumulated?

	Financial Assets		Cash		Accounts Receivables		Inventories	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ IRD$_t$	0.268***	0.227**	-0.405***	-0.518***	0.167**	0.181**	0.277***	0.304***
	(0.0724)	(0.0875)	(0.0709)	(0.0778)	(0.0787)	(0.0825)	(0.0561)	(0.0677)
Observations	3224	3224	3202	3202	3224	3224	3224	3224
R^2	0.0241	0.0296	0.0911	0.102	0.0164	0.0185	0.0353	0.0389
Firms	139	139	139	139	139	139	139	139
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes	No	Yes

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FirmFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes	No	Yes

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FirmControls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes	No	Yes

- Accounts receivables and inventories increase.
- Cash is put to work.

Result 3: Trade Credit and Sales

	Gross Trade Credit		Sales		AR/Sales	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ IRD$_t$	0.444***	0.471***	0.405***	0.436***	0.255	0.233
	(0.120)	(0.140)	(0.0796)	(0.100)	(0.187)	(0.219)
Observations	3224	3224	3224	3224	3122	3122
R^2	0.0251	0.0328	0.150	0.162	0.0147	0.0150
Firms	139	139	139	139	137	137
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes

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FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
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- Gross trade credit (Acc. Rec.+ Acc. Pay.) flows through the firm.

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- Gross trade credit (Acc. Rec.+ Acc. Pay.) flows through the firm.
- Sales expands proportionally.

Mexican Peso Depreciation

Real Effects of the Carry Trades

- We see that firms build up FX exposure by reacting to carry trade incentives
- How does this activity affect real outcomes when the risk is realized?

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- How does this activity affect real outcomes when the risk is realized?

$$Y_{it} = \alpha_i + \alpha_t + \underbrace{\beta_0 \Delta STFXP_i \times Shock_t}_{\text{Carry Trade Effect}} + \underbrace{X_i \times Shock_t \Gamma}_{\text{Other Channels}} + \epsilon$$

- $Y \in \{\Delta \log(PPE), \Delta \log(Employment), Profits/Assets\}$
- $\Delta STFXP_i$ is the change $\frac{STFXL - FXA}{Assets}$ between 2005q1 and 2008q4
- *Shock* takes a value of 0 during 2007-2008, 1 during 2009-2010, and 0 during 2011-2012.
- Controls include pre-shock averages of log assets, cash, leverage, bond credit, exports, sales and FX exposure

Carry Trade Consequences for Firm Outcomes

	Investment		Employment		Profits	
	(1)	(2)	(3)	(4)	(5)	(6)
Shock_t	-0.0143***		-0.00696**		-0.000312	
	(0.00323)		(0.00337)		(0.000974)	
$\text{STFXP Change}_i \times \text{Shock}_t$	-0.0448**	-0.0358**	0.0184	0.00893	-0.0114**	-0.0124*
	(0.0183)	(0.0142)	(0.0199)	(0.0201)	(0.00545)	(0.00641)
Observations	1995	1995	1980	1980	1903	1903
R^2	0.0201	0.00841	0.00191	0.00140	0.00326	0.00475
Firms	87	87	87	87	87	87
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	No	Yes	No	Yes	No	Yes
FirmControls	No	Yes	No	Yes	No	Yes

Carry Trade Consequences for Firm Outcomes

	Investment		Employment		Profits	
	(1)	(2)	(3)	(4)	(5)	(6)
Shock_t	-0.0143***		-0.00696**		-0.000312	
	(0.00323)		(0.00337)		(0.000974)	
$\text{STFXP Change}_i \times \text{Shock}_t$	-0.0448**	-0.0358**	0.0184	0.00893	-0.0114**	-0.0124*
	(0.0183)	(0.0142)	(0.0199)	(0.0201)	(0.00545)	(0.00641)
Observations	1995	1995	1980	1980	1903	1903
R^2	0.0201	0.00841	0.00191	0.00140	0.00326	0.00475
Firms	87	87	87	87	87	87
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	No	Yes	No	Yes	No	Yes
FirmControls	No	Yes	No	Yes	No	Yes

- Shock has a negative impact.

Carry Trade Consequences for Firm Outcomes

	Investment		Employment		Profits	
	(1)	(2)	(3)	(4)	(5)	(6)
Shock_t	-0.0143***		-0.00696**		-0.000312	
	(0.00323)		(0.00337)		(0.000974)	
$\text{STFXP Change}_i \times \text{Shock}_t$	-0.0448**	-0.0358**	0.0184	0.00893	-0.0114**	-0.0124*
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FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	No	Yes	No	Yes	No	Yes
FirmControls	No	Yes	No	Yes	No	Yes

- Shock has a negative impact.
- The build up of FX risk in drives the differential effect.

Carry Trade Consequences for Trade Credit

	Accounts Payable		Accounts Receivable		Sales	
	(1)	(2)	(3)	(4)	(5)	(6)
$Shock_t$	-0.00268***		-0.00390***		-0.00382***	
	(0.000844)		(0.00119)		(0.00140)	
$STFXP\ Change_i \times Shock_t$	0.00120	0.00166	0.00382	0.00172	-0.00163	-0.00439
	(0.00490)	(0.00418)	(0.00457)	(0.00545)	(0.00789)	(0.00752)
Observations	1976	1976	1976	1976	1975	1975
R^2	0.00291	0.00193	0.00322	0.00267	0.000737	0.00137
Firms	87	87	87	87	87	87
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	No	Yes	No	Yes	No	Yes
FirmControls	No	Yes	No	Yes	No	Yes

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Firms	87	87	87	87	87	87
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	No	Yes	No	Yes	No	Yes
FirmControls	No	Yes	No	Yes	No	Yes

- Direct negative effect of the shock.

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Firms	87	87	87	87	87	87
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
TimeFE	No	Yes	No	Yes	No	Yes
FirmControls	No	Yes	No	Yes	No	Yes

- Direct negative effect of the shock.
- Exposed firms absorb FX shock rather than passing it on.

External Validity

- Detailed Mexican data provides unique insight into these relationships
- But are these results specific to Mexico or more broadly applicable?

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  - Standard balance sheet data
  - Capital Structure data (individual debts: detail on type, volume, currency, interest rate)
- Less detail, but we can check
  - Allocation of FX and Peso debt to short term assets
  - Change in FX borrowing and trade credit with the carry trade

External Validity: Corporate Saving by Instrument

	(1) Total	(2) Cash	(3) AR	(4) Inv	(5) Oth
Cash Flow$_{it}$	0.632***	0.152***	0.316***	0.0644***	0.0571***
	(0.0135)	(0.00761)	(0.00832)	(0.00579)	(0.00738)
Δ FX Debt$_{it}$	0.643***	0.150***	0.185***	0.157***	0.108***
	(0.0137)	(0.00670)	(0.00633)	(0.00529)	(0.00570)
Δ LC Debt$_{it}$	0.514***	0.0879***	0.179***	0.117***	0.0809***
	(0.0111)	(0.00360)	(0.00492)	(0.00360)	(0.00286)
Δ Other Liab$_{it}$	0.542***	0.0988***	0.192***	0.110***	0.0858***
	(0.0122)	(0.00396)	(0.00550)	(0.00375)	(0.00310)
Observations	159756	159756	159756	159756	159756
R^2	0.397	0.0405	0.173	0.112	0.0303
Firms	7607	7607	7607	7607	7607
FirmFE	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes

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Firms	7607	7607	7607	7607	7607
FirmFE	Yes	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes	Yes

- Accounts receivable remains the primary landing spot for funds allocated to ST assets.

External Validity: Carry Trades and Trade Credit

	(1) FX Loans	(2) LC Loans	(3) Acc. Rec.	(4) Acc. Rec. + Acc. Pay.	(5) Sales
Δ IRD$_{ct}$	0.0108**	-0.0128**	0.0145**	0.0369***	0.0175*
	(0.00461)	(0.00632)	(0.00694)	(0.0108)	(0.00987)
Observations	164829	164829	164829	164829	164829
R^2	0.0126	0.0697	0.0146	0.120	0.00377
Firms	7856	7856	7856	7856	7856
FirmFE	Yes	Yes	Yes	Yes	Yes
SectorTimeFE	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes

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Firms	7856	7856	7856	7856	7856
FirmFE	Yes	Yes	Yes	Yes	Yes
SectorTimeFE	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes

- Increase FX loans but not local currency loans

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FirmFE	Yes	Yes	Yes	Yes	Yes
SectorTimeFE	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes

- Increase FX loans but not local currency loans
- Expand trade credit and sales

Conclusion

- Our results suggest firms highly value their inter-firm relationships
  - Willing to absorb more of a shock rather than pass it on.
  - Contrast with literature on bank lending
  - But a large shock could cause trade credit networks to collapse

Conclusion

- Our results suggest firms highly value their inter-firm relationships
  - Willing to absorb more of a shock rather than pass it on.
  - Contrast with literature on bank lending
  - But a large shock could cause trade credit networks to collapse
- The role of trade credit in macroeconomic and financial stability deserves greater scrutiny (Hardy, Saffie, and Simonovska (2022, 2023))
- Our results shed light on the relationship between global financial conditions (especially dollar strength) and global value chains
  - Kalemli-Özcan et al (2014); Bruno, Kim, and Shin (2018); Gourinchas (2019); Erik et al (2020); Bruno and Shin (2023); Kim and Shin (2023)

Result 3: Change in Derivatives Positions

Back

	Short Term FX Position		Net Derivatives		Gross Derivatives	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ IRD$_t$	0.411***	0.344**	-0.00434	0.00589	0.0776***	0.0198
	(0.152)	(0.169)	(0.0173)	(0.0121)	(0.0166)	(0.0167)
Observations	2999	2999	3222	3222	3222	3222
R^2	0.0109	0.0140	0.0121	0.0146	0.0162	0.0446
Firms	133	133	139	139	139	139
FirmFE	Yes	Yes	Yes	Yes	Yes	Yes
FirmControls	Yes	Yes	Yes	Yes	Yes	Yes
MacroControls	No	Yes	No	Yes	No	Yes

- No change in net derivatives positions.
- Some evidence for expanded derivatives use, weaker with macro controls