Sudden Stops Under the Microscope

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Introduction

- Emerging markets experience recurrent episodes of "sudden stops"
  - Abrupt reversals of capital flows
- **Macro level**: contractions in economic activity, consumption, aggregate investment, currency depreciation (e.g., Calvo et al. 06)
- Goal of this paper: Study the **micro-level patterns** of adjustment
  - Inform theories explaining macro adjustments
- Approach: Exploit cross-sectional patterns in firms' borrowing (Khwaja Mian 08, Di Giovanni Kalemli-Ozcan Ulu Baskaya 22)
- Focus: Uruguay, EM featuring 2 sudden stops and rich loan-level data

Summary

1. **What are the channels of transmission of sudden stops?**
   - Lender channel (e.g., Calvo 04, Morelli Ottonello Perez 22)
   - Collateral channel (e.g., Korinek and Mendoza 14)
   - Risk channel (Neumeyer Perri 05, Uribe Yue 06, Hegarty et al. 24)

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2. **Are sudden stops different from regular business cycles?**
   - Lender channel more than doubles during episodes of sudden stops
     Consistent with intermediaries' acceleration mechanisms (e.g., Caballero Krishnamurthy 01, Gertler Kiyotaki 10; He Krishnamurthy 12, Brunnermeier Sannikov 14)
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   - We do not find a strengthening of the collateral and risk channels

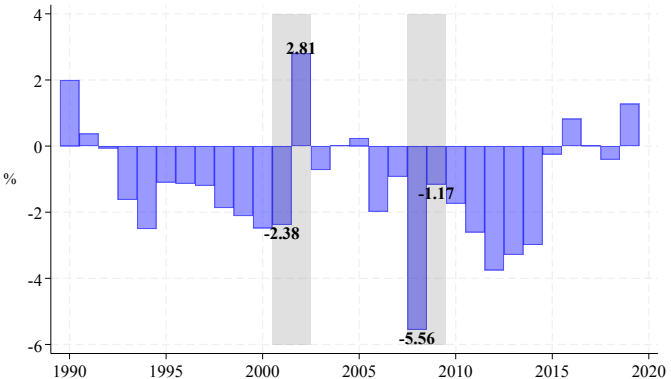
3. **Are the effects of sudden stops heterogeneous?**
   - Lender channel affects more firms with high risk and in nontradable sector
   - Less heterogeneity for risk and collateral channels

Outline

1. The macro dynamics during sudden stops
2. Micro-level data description
3. The micro dynamics during sudden stops
   - What are the channels of transmission of sudden stops?
   - Are sudden stops different?
   - Are the effects of sudden stops heterogeneous?
4. Conclusions

The Macro Dynamics During Sudden Stops

Sudden Stop Episodes: Uruguayan Current Account Dynamics

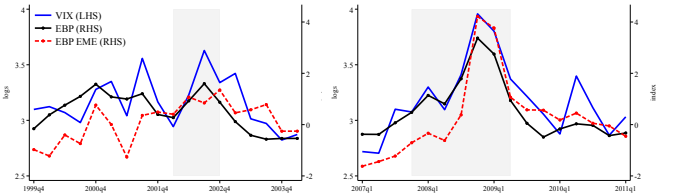


Current account as a percentage of GDP

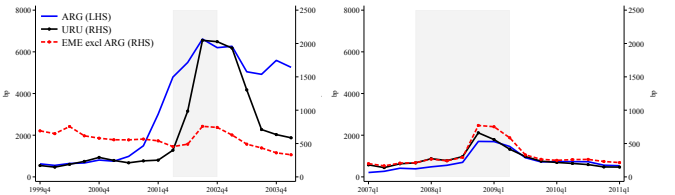
Global and Regional Context during Sudden Stops

2002 episode 2009 episode

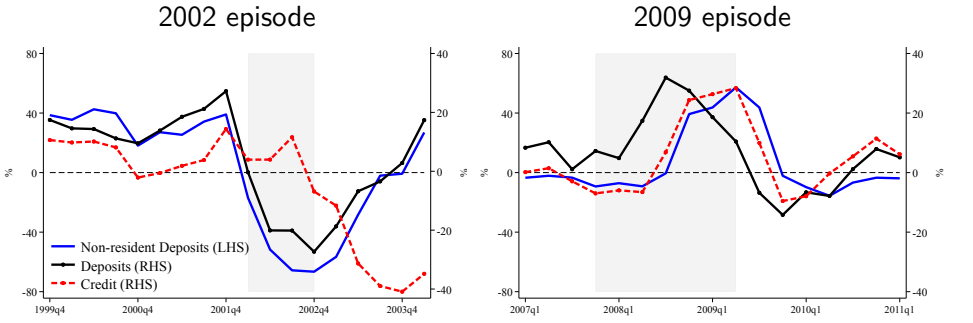
Excess bond premium and VIX



Emerging-market sovereign spreads



Banking Sector Dynamics during Sudden Stops

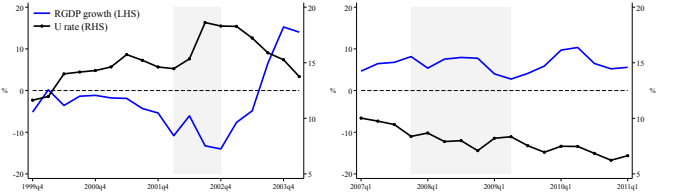


Growth in Real Credit, Deposits, and Non-resident Deposits

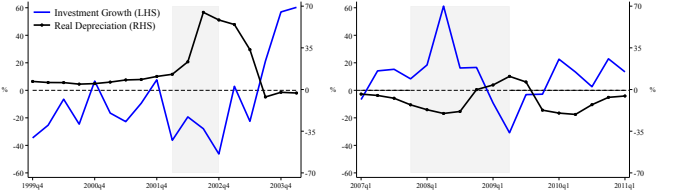
Macro Dynamics during Sudden Stops

2002 episode 2009 episode

Real GDP growth and unemployment rate



Investment and real exchange rate depreciation



Consumption and NER

Data Description

Data Description

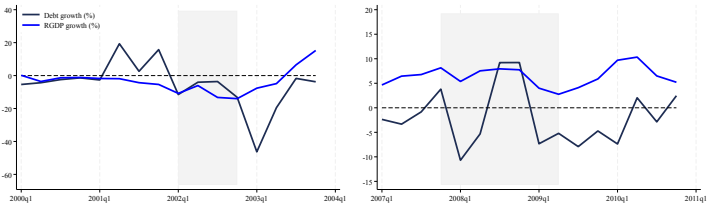
- **Credit Register**: comprehensive data on loans across the financial system
  - Detailed information on borrowers and loans:
    - Loan amount, currency, maturity, and collateral
    - Borrower's country of residency, sector, and credit risk category
- Balance sheet and income statement data for all financial institutions
- **Coverage of combined firm-bank dataset**:
  - 109,419 firms, 23 banks, and 170,924 bank-firm pairs from 1999 to 2019

Firms' Borrowing Dynamics

2002 episode

2009 episode

Firms' average borrowing



Descriptive statistics

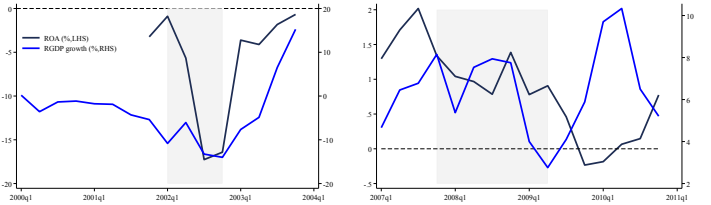
	All firms	Firms w multiple banks		Firms w multiple collateral		Firms w multiple credit risk	
	$\Delta \log b_{jt}$	$\Delta \log b_{jt}$	# banks relationships	$\Delta \log b_{jt}$	# collateral types	$\Delta \log b_{jt}$	Unsecured loans (%)
Mean	-3.5	7.0	2.4	-3.6	2.0	-1.9	26.8
Median	-5.4	-1.7	2.0	-4.5	2.0	-3.6	1.6
SD	99.2	80.8	0.8	80.2	0.2	60.5	38.1
Bottom 5%	-152.9	-96.5	2.0	-124.8	2.0	-97.8	0.0
Top 95%	161.7	139.7	4.0	122.2	2.0	99.1	100.0
Number of units	109,409	2,123	2,123	7,765	7,765	24,144	24,144
Observations	1,919,998	345,327	345,327	51,474	51,474	345,327	345,327

Banks' Returns and Collateral during Sudden Stops

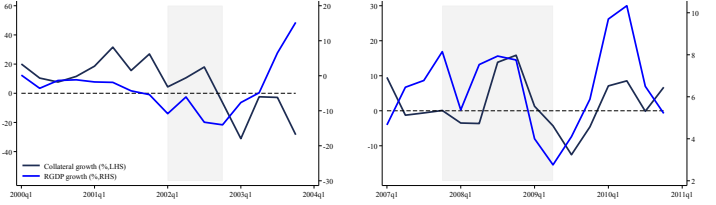
2002 episode

2009 episode

Banks' return on assets



Collateral values



Transmission Channels

The Lender Channel

Theories linking sudden stops to the balance sheet of financial intermediaries

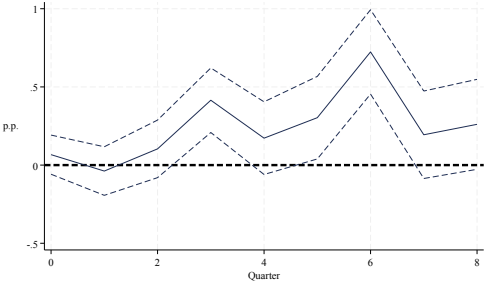
- shocks affecting intermediaries' net worth reduce the supply of credit for domestic agents (e.g., Calvo 04, Morelli Ottonello Perez 22)

Firm-level empirical model:

$$\log b_{jt+h} - \log b_{jt-1} = \alpha_{jh} + \alpha_{th} + \beta_h Z_{jt} + \mathbf{\Gamma}'_h \boldsymbol{X}_{jt-1} + \varepsilon_{jt+h}$$

- b_{jt}: Debt of firm j in period t
- Z_{jt}: Firm-level exposure to lender channel: Average return on assets of banks linked to firm j
- $\boldsymbol{X}_{jt-1}$: Firm-level controls (NPL ratio, liquid collateral ratio, credit risk, age,..)

The Lender Channel: Firm-level Estimates



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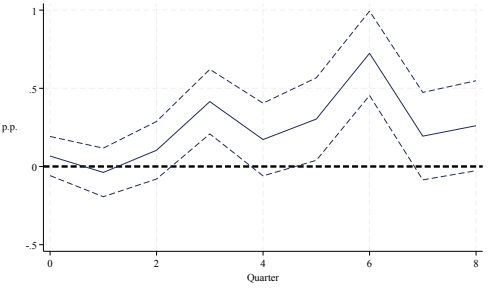


	2002 episode			2009 episode		
	ΔZ (pp)	Effect (pp)	Share (%)	ΔZ (pp)	Effect (pp)	Share (%)
Lender channel	-17.2	-10.1	29	-1.57	-1.13	7.8
Obs. debt growth		-34.7			-14.5	

The Lender Channel: Loan-level Estimates

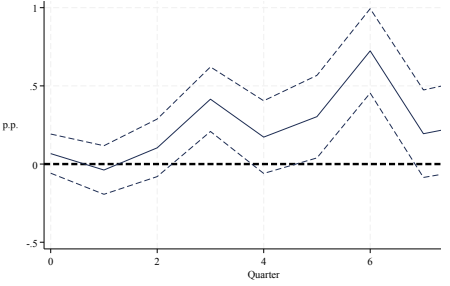
Empirical model:

$$\log b_{ijt+h} - \log b_{ijt-1} = \alpha_{ih} + \alpha_{jth} + \beta_h R_{it} + \mathbf{\Gamma}'_h \boldsymbol{X}_{ijt-1} + \varepsilon_{ijt+h},$$

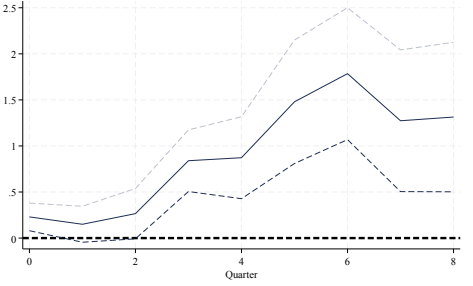
- b_{ijt}: Debt of firm j from bank i in period t
- R_{it}: Return on assets of banks i in period t
- α_{jth}: absorbs firm-specific credit demand shocks (e.g., Khwaja and Mian, 2008)

The Lender Channel: Loan-level Estimates

Firm-level estimates



Loan-level estimates



Robustness

The Collateral Channel

Theories linking sudden stops to changes in collateral values

- Negative shocks lead to contractions in collateral values, which induce deleveraging
- Deleveraging induces further contractions in collateral values, leading to a downward spiral
  (e.g., Mendoza 02, 10; Bianchi 11)

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Empirical models

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$Z_{jt} = \sum_k \omega_{jkt} \Delta q_{kt}$: average change in the value of collateral associated with loans to firm j

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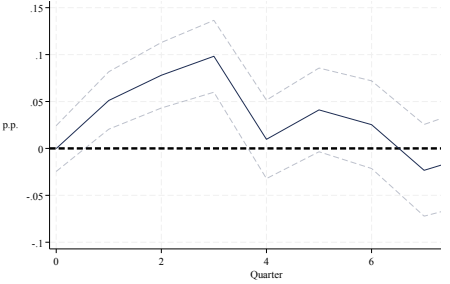
- Loan level:

$$\log b_{kjt+h} - \log b_{kjt-1} = \alpha_{kh} + \alpha_{jth} + \beta_h \Delta q_{kt} + \mathbf{\Gamma}'_h \boldsymbol{X}_{kjt-1} + \varepsilon_{kjt+h}$$

  - α_{jth} firm-time fixed effects, α_{kh} collateral-type fixed effects

The Collateral Channel

Firm-level estimates



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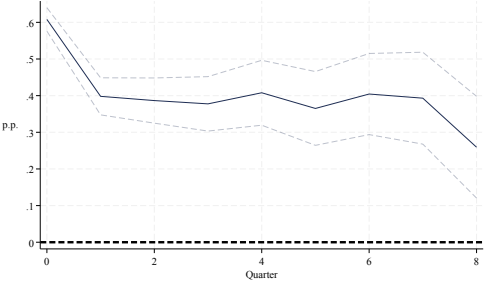

Robustness

Transmission Channels: Quantifying Aggregate Effects

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Collateral channel	**-58**	**-5.7**	**16.3**	**-12.6**	**-1.24**	**8.5**
Obs. debt growth		-34.7			-14.5	

The Risk Channel

Theories linking sudden stops to changes in external risky borrowing costs

(e.g., Neumeyer Perri 05, Uribe Yue 06, Hegarty et al., 22)

- Increases in the global price of risk raise borrowing costs for risky agents, reducing their borrowing

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$Z_{jt} = \text{Risk}_{jt-1}\text{EBP}_t$, Risk_{jt-1} : firm j's share of unsecured debt

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- Loan level:

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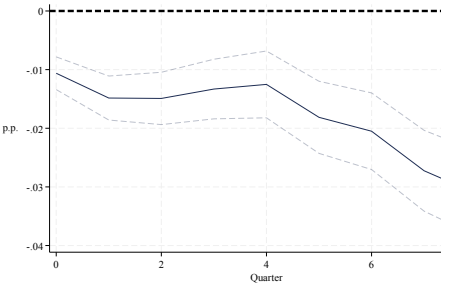
$Z_{ijt} = \text{Risk}_{ijt-1}\text{EBP}_t$, Risk_{ijt-1} : dummy $= 1$ if debt unsecured

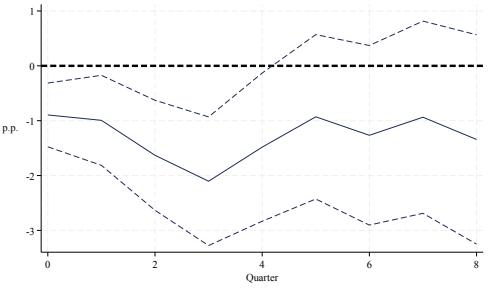
α_{jth} firm-time fixed effects, α_{ih} secured/unsecured fixed effects

The Risk Channel

(e) Firm-level estimates



(f) Loan-level estimates



Similar results using the VIX, as in Di Giovanni, Kalemli-Ozcan, Ulu, and Baskaya (2022) Details

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Collateral channel	-58 p.p.	-5.7	16.3	-12.6 p.p.	-1.2	8.5
Risk channel	**0.9 s.d.**	**-.64**	**1.9**	**4.9 s.d.**	**-5.8**	**40**
Obs. debt growth		-34.7			-14.5	

Are sudden stops different?

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Empirical models:

$$\log b_{ijt+h} - \log b_{ijt-1} = \alpha_{ih} + \alpha_{jth} + \beta_h Z_{ijt} + \boldsymbol{\gamma_h} Z_{ijt} \boldsymbol{S_t} + + \boldsymbol{\Gamma}'_h \boldsymbol{X}_{ijt-1} + \varepsilon_{ijt+h}$$

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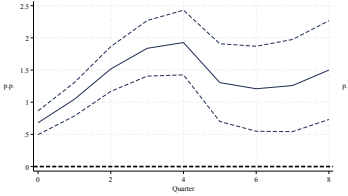
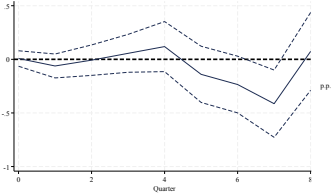
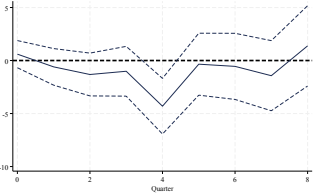
Lender channel



Collateral channel



Risk channel



Firm-level estimates Robustness

Are the effects of sudden stops heterogeneous?

Heterogeneous Effects: The Lender Channel

			Impact	Peak	Average	Obs
A	By type of collateral	Uncollateralized	.23	3.8	1.6	76,211
			(.423)	(1.61)		
		Collateralized	.25	1.9	.93	311,100
			(.135)	(.773)		
B	**By firm's risk**	Low risk	-.17	1.1	**.4**	218,505
			(.16)	(.957)		
		High risk	.9	2.6	**1.5**	169,909
			(.259)	(1.08)		
C	**By firm's sector**	Tradable	.11	.88	**.23**	123,235
			(.227)	(.964)		
		Non-tradable	.3	2.4	**1.2**	435,626
			(.137)	(.668)		
D	By currency denomination	Local currency	-.82	3.3	1.5	209,533
			(.33)	(1.23)		
		Foreign currency	.42	1.3	.61	382,719
			(.115)	(.638)		
E	By type of bank	Local banks	.47	6	2.7	63,041
			(.143)	(1.42)		
		Foreign banks	.12	2.2	1.5	245,086
			(.439)	(.944)		
		Private banks	-.063	1.4	.64	338,420
			(.133)	(.693)		
		Excluding failed banks	.56	1.8	1.2	539,072
			(.235)	(.559)		

Heterogeneous Effects: The Collateral Channel

			Impact	Peak	Average	Obs
A	By firm's risk	Low risk	.62	.62	.37	5,558
			(.043)	(.043)		
		High risk	.6	.6	.41	12,468
			(.031)	(.031)		
B	By firm's sector	Tradable	.66	.66	.34	3,552
			(.046)	(.046)		
		Non-tradable	.58	.58	.43	14,474
			(.031)	(.031)		
C	By currency denomination	Local currency	.61	.61	.4	4,638
			(.047)	(.047)		
		Foreign currency	.61	.61	.38	13,422
			(.028)	(.028)		
D	By type of bank	Local banks	.83	.96	.41	2,573
			(.079)	(.31)		
		Foreign banks	.68	.68	.47	6,076
			(.045)	(.045)		
		Private banks	.63	.63	.42	8,637
			(.033)	(.033)		
		Excluding failed banks	.61	.61	.39	16,860
			(.027)	(.027)		

Heterogeneous Effects: The Risk Channel

			Impact	Peak	Average	Obs
A	By firm's sector	Tradable	-.011	-.06	-.026	123,235
			(.01)	(.02)		
		Non-tradable	-.0086	-.0119	-.0091	435,626
			(.0051)	(.017)		
B	**By currency denomination**	Local currency	-.015	-.035	**-.013**	209,533
			(.012)	(.021)		
		Foreign currency	-.0009	-.0035	.0049	382,719
			(.005)	(.0088)		
C	By type of bank	Local banks	-.023	-.025	-.014	63,041
			(.012)	(.029)		
		Foreign banks	-.0079	-.0256	-.0142	245,086
			(.0083)	(.0163)		
		Private	-.009	-.0293	-.0132	338,420
			(.0063)	(.0127)		
		Excluding failed banks	-.01	-.025	-.016	539,072
			(.0046)	(.0093)		

Conclusions

Conclusions

- Evidence transmission channels of sudden stops at the micro level
- Findings highlight two central factors in these episodes:
  - Intermediaries' balance sheets: distinguishing feature setting sudden stops apart from regular business cycles
  - Firms' default risk, which amplifies these effects
- Policies targeting financial stability, firms' indebtedness, and bankruptcy resolution can be central to mitigating the effects of sudden stops
- Future research: Study these policies by combining empirical estimates with quantitative models of sudden stops

Thank you!

Chronology

Table 1: 2002 Sudden Stop Chronology

8/1998	Russia's devaluation
1/1999	Brazil's devaluation
6/2001	Uruguay extends crawling exchange rate band
12/2001	Argentina establishes the "Corralito"
	Argentinean president quits
	IMF suspends loan disbursements to Argentina
	Argentina defaults
1/2002	Argentina's devaluation
	Uruguay re-extends crawling exchange rate band
2/2002	Argentina establishes the "Corralón"
	BCU intervenes to re-capitalize Banco Comercial, the main private bank
	BCU suspends Banco Galicia Uruguay and bank run starts
	Uruguay loses investment grade status
	Uruguay's Congress approves fiscal adjustment package
3/2002	Agreement between IMF and Uruguay was achieved for $743 million
4/2002	Foot-and-mouth disease ("Aftosa") breaks in Uruguay
5/2002	Uruguay's Congress approves 2nd fiscal adjustment package
6/2002	BCU intervenes in Banco Montevideo and La Caja Obrera
	Uruguay abandons crawling peg exchange rate regime
7/2002	Uruguay's Minister of Economy quits followed by the president of the BCU
	Uruguay declares bank holiday
8/2002	Bank holiday lifted after $3 billion bailout package provided by the US and mulilaterals

Fiscal and Reserves dynamics

Figure 1: Fiscal and Reserve Dynamics during Sudden Stop Episodes

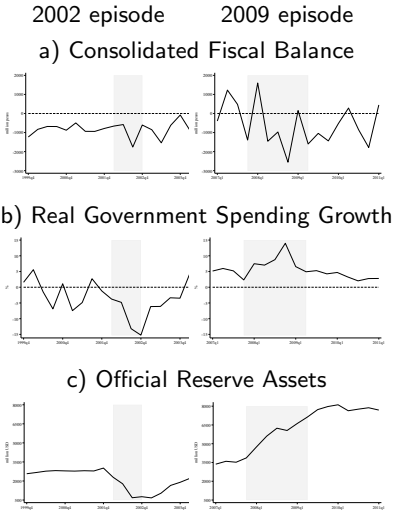
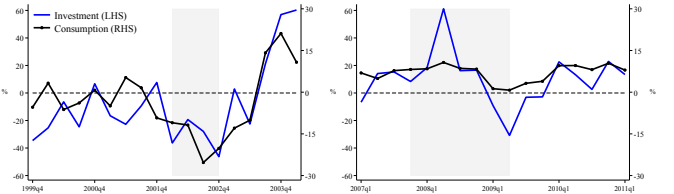


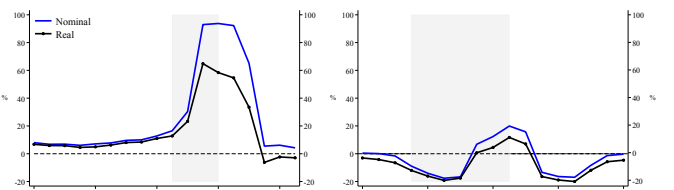
Figure 2: Economic Activity during Sudden Stop Episodes

2002 episode 2009 episode

b) Investment and Consumption Growth



c) Nominal and Real Depreciation



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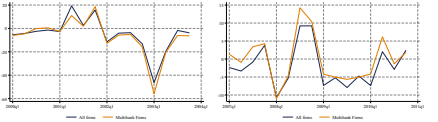
Firms' borrowing during Sudden Stops

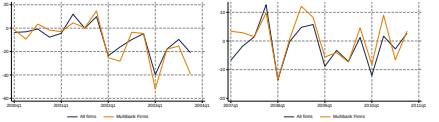
Figure 3: Firms' Borrowing during Sudden Stops

2002 episode 2009 episode

(a) Firms' borrowing



(b) Local currency debt



(c) Foreign currency debt

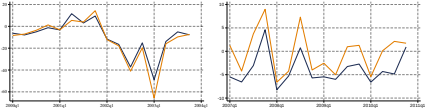


Figure 4: Average dynamics of firms' collateral (liquid assets)

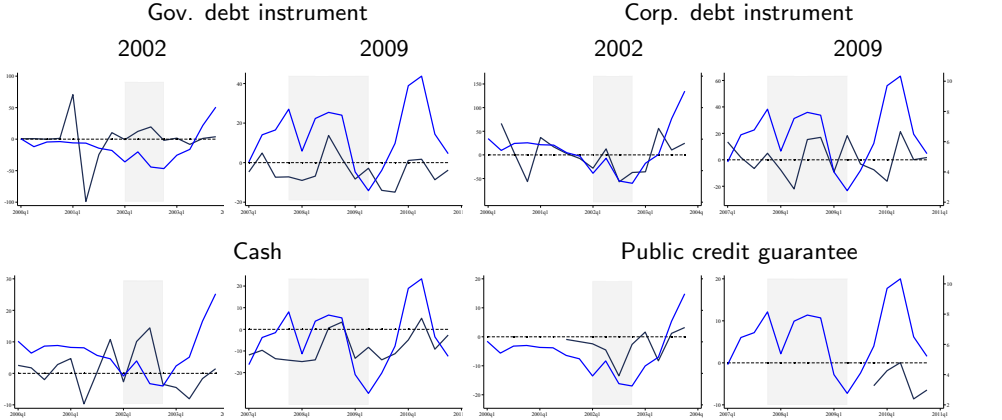


Figure 5: Average dynamics of firms' collateral (illiquid assets)

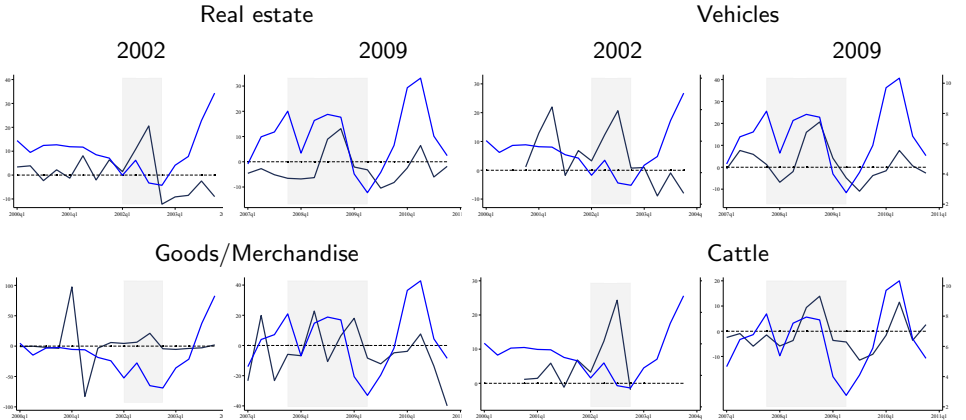
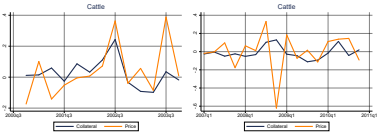


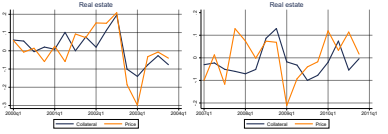
Figure 6: Change in asset prices and change in collateral value

2002 episode 2009 episode

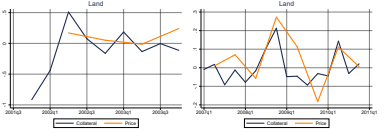
(a) Cattle



(b) Real Estate

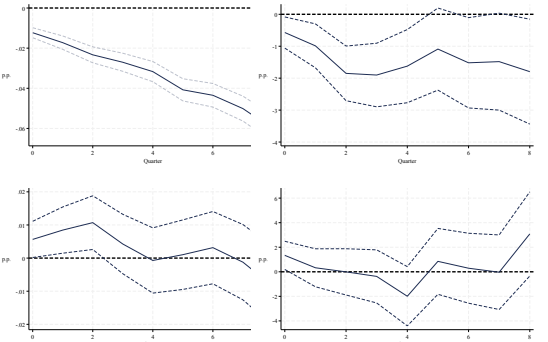


(c) Land



The risk channel-Robustness using VIX

(a) Firm-level estimates (b) Loan-level estimates



Agg effects of the risk channel-Robustness

	2002 episode			2009 episode		
	ΔZ (pp)	Effect (pp)	Share (%)	ΔZ (pp)	Effect (pp)	Share (%)
Lender channel	-17.2	-3.4	9.7	-1.57	-0.38	2.6
Collateral channel	-58	-1.7	5	-12.6	-0.38	2.6
Risk channel[a]	0.86	-0.38	1.12	4.9	-3.48	24
Observed credit growth (bp)		-3,470			-1,449	

Notes: This table reports back-of-envelope calculations for the different channels, using firm-level estimates. The first column shows the change in Z, while the second column shows the effect computed as $\hat{\beta}\Delta Z$, where $\hat{\beta}$ correspond to the average effect within 8 quarters. The third column correspond to column (2) as a % of the observed credit growth. a: ΔZ for the risk channel correspond to changes in EBP (std) times the share of unsecured debt.

Are Sudden Stops different?

Figure 7: Channels of Transmission: Differential Effects During Sudden Stops-Firm level estimates

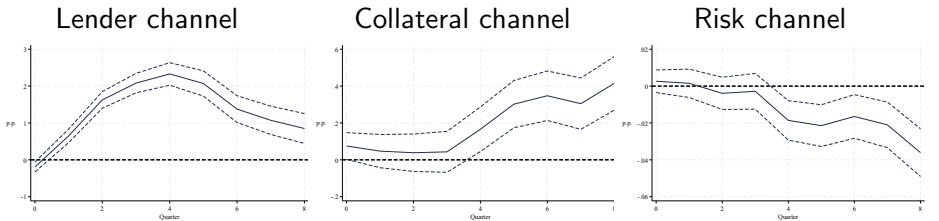


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Table 2: Channels of Transmission: Robustness Analysis

			Impact	Peak	Average	Obs
Panel A: Lender Channel						
A	Baseline		.23	1.8	.91	558,861
			(.117)	(.559)		
B	Robustness	No loan-level controls	.25	1.8	.96	558,861
			(.117)	(.561)		
		Separate firm and time FE	.32	1.5	.77	558,861
			(.098)	(.441)		
Panel B: Collateral Channel						
A	Baseline		.61	.61	.4	18,164
			(.025)	(.025)		
B	Robustness	No loan-level controls	.61	.61	.4	18,164
			(.025)	(.025)		
		Separate firm and time FE	.64	.64	.34	18,164
			(.02)	(.02)		
Panel C: Risk Channel						
A	Baseline		-.9	-2.1	-1.3	558,861
			(.454)	(.915)		
B	Robustness	No loan-level controls	-1	-2.3	-1.6	558,861
			(.454)	(.917)		
		Separate firm and time FE	-.4	-1.3	-.32	558,861
			(.348)	(1.09)		

Lender channel
Collateral channel
Risk channel

Table 3: Differential Effects of Channels of Transmission: Robustness Analysis

			Impact	Peak	Average	Obs
Panel A: Lender Channel						
A	Baseline		.68	1.9	1.4	558,861
			(.144)	(.392)		
B	Robustness	Shorter sudden stop window	.29	3.1	1.9	558,861
			(.148)	(.508)		
C	By Sudden stop episode	2002 episode	.38	.63	.27	558,861
			(.17)	(1.25)		
		2009 episode	.99	2.2	1.7	558,861
			(.175)	(.411)		
Panel B: Collateral Channel						
A	Baseline		.018	.14	-.048	18,164
			(.056)	(.183)		
B	Robustness	Shorter sudden stop window	.048	.16	.00097	18,164
			(.065)	(.249)		
C	By sudden stop episode	2002 episode	.009	.29	.0092	18,164
			(.065)	(.262)		
		2009 episode	.037	.097	-.105	18,164
			(.092)	(.342)		
Panel C: Risk Channel						
A	Baseline		.6	-4.3	-.84	558,861
			(.999)	(2.05)		
B	Robustness	Shorter sudden stop window	.29	-4.7	-.76	558,861
			(1)	(2.05)		
C	By sudden stop episode	2002 episode	4.3	-2.3	8.8	558,861
			(2.2)	(18)		
		2009 episode	-.047	-4.8	-1.4	558,861
			(1.1)	(2.1)		

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