

Off the Cliff and Back? Credit Conditions and International Trade during the Global Financial Crisis

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Off the cliff. . .

A sharp and sudden drop in trade flows witnessed in the final quarter of 2008:

- ▶ World trade fell by 12% in 2009 (WTO)
- ▶ Greatly exceeds the projected 6% fall in industrial output and 2.5% fall in income per capita (IMF projections)
- ▶ Especially acute for small open economies
- ▶ Contagion: Exports fell even for countries with relatively sound banking sectors
- ▶ Impact on trade is drawing a lot of attention:

Freund (2009), Bricogne, Fontagné, Gaulier, Taglioni and Vicard (2009), Levchenko, Logan and Tesar (2009), Eaton, Kortum, Neiman and Romalis (2009), Bems, Johnson and Yi (2010), Alessandria, Kaboski and Midrigan (2010)

Effect of the global financial crisis on international trade

Why have trade flows contracted?

1. Producer side: Collapse in financial intermediation (financing constraints)
2. Consumer side: Collapse of aggregate demand

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What we do:

- ▶ Establish and quantify the effects that the severe tightening of credit conditions had on trade flows
- ▶ Use monthly US import data from Nov 06 to Oct 09
- ▶ Exploit the variation in financial dependence across sectors and the variation in the cost of credit (proxied by the interbank lending rate) across countries and over time

What we find: Summary

- ▶ **Cross-country:** Higher interbank rates associated with lower trade volumes

Thus, lower export volumes for countries where credit conditions were tighter

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- ▶ **Cross-country:** Higher interbank rates associated with lower trade volumes

Thus, lower export volumes for countries where credit conditions were tighter

- ▶ **Cross-country and Cross-industry:** Effects are more severe in industries that
 - ▶ require more external financing (Rajan and Zingales 1998);
 - ▶ have fewer collateralizable assets (Braun 2003, Claessens and Laeven 2003); and
 - ▶ have poorer access to trade credit (Fisman and Love 2003)
- ▶ For such financially dependent sectors, this sensitivity to credit conditions intensified during the peak of the financial crisis (post Sep 08)

What we find: Summary

- ▶ Examine robustness to:
 - ▶ An extensive set of fixed effects
 - ▶ Country factor endowments
 - ▶ Initial GDP and GDP per capita
 - ▶ Domestic production (industrial production index)
- ▶ Additional corroborating evidence using private credit over GDP or accounting standards:

Countries with stronger initial financial development were better able to withstand the contraction in trade in more financially dependent industries

What we find: Summary

Interpreting the magnitudes:

Consider two scenarios to provide bounds on how much credit conditions mattered for trade volumes:

- (i) Suppose that interbank rates remained at their Sep 08 highs
- (ii) Suppose that interbank rates fell immediately to their Aug 09 lows

Find:

- ▶ Large level effects of credit conditions on trade volumes, both in the cross-country and within-country experiences
- ▶ Large and systematic differences in the trade response of sectors depending on their level of financial vulnerability (external finance dependence, asset tangibility, access to trade credit)

What we find: Discussion

Important implications:

- ▶ New evidence of the effect of credit constraints and short-term fluctuations in the cost of capital on international trade
- ▶ Large real effects from financial crises
- ▶ Potentially significant scope for welfare gains from policy interventions to mitigate trade collapse

What we find: Discussion

Important implications:

- ▶ New evidence of the effect of credit constraints and short-term fluctuations in the cost of capital on international trade
- ▶ Large real effects from financial crises
- ▶ Potentially significant scope for welfare gains from policy interventions to mitigate trade collapse

Two potential explanations for the heightened sensitivity of exports to credit conditions during the crisis:

- ▶ Reduced consumer demand and lower expected export revenues in the US
- ▶ Decline in the availability of trade credit and trade financing in the US
- ▶ Both interact with and magnify the effect of tight credit conditions in exporting countries, with particularly detrimental consequences for financially dependent sectors

Related literature

1. Importance of external financing for export activities:

Beck (2002, 2003), Becker and Greenberg (2007), Svaleryd and Vlachos (2005), Hur et al. (2006), and Manova (2008a,b)

2. Firm level evidence on credit constraints and exporting:

Greenaway et al. (2007), Muûls (2008), Manova et al. (2009), Amiti and Weinstein (2009), Minetti and Zhu (2009)

3. Impact on output and trade during a crisis:

Kroszner, Laeven and Klingebiel (2007), Campello, Graham and Harvey (2009), Iacovone and Zavacka (2009), Amiti and Weinstein (2009)

4. Impact on trade during this crisis:

Freund (2009), Bricogne et al. (2009), Levchenko et al. (2009), Eaton et al. (2009), Bems et al. (2010), Alessandria et al. (2010)

Plan of Talk

1. Introduction and Motivation
2. **A glance at the data**
3. Empirical strategy
4. Findings and Results
 - 4.1 Level effects
 - 4.2 Cross-industry effects
 - 4.3 Interpreting the magnitudes
5. Conclusions (and caveats)

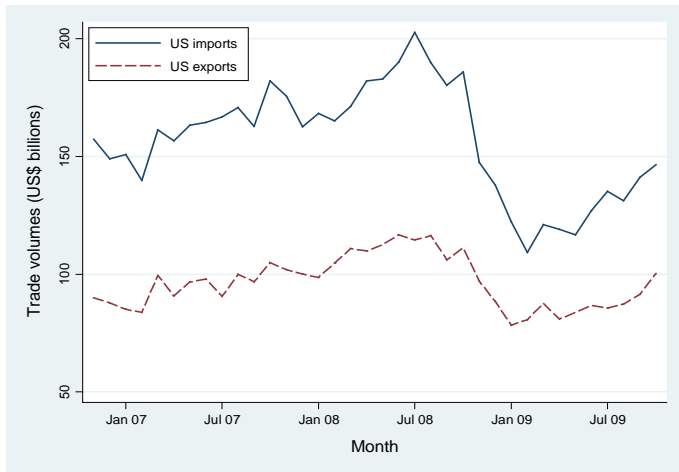
US Trade Flows during the Global Financial Crisis

Data from the US Census Bureau:

- ▶ Monthly exports and imports (for the US' top 100 trade partners)
- ▶ Nov 06 to Oct 09 (previous version up to Apr 09 only)
- ▶ Available at up to the NAICS 6-digit level, but we focus on the 3-digit level of aggregation

US Trade Flows during the Global Financial Crisis

Figure 1
The Decline in US Trade Volumes during the Global Financial Crisis



Source: US Census Bureau.

US Trade Flows during the Global Financial Crisis

Table 1
The Month-on-Month Fall in US Manufacturing Imports (Oct-Nov 2008)

A: Industries (NAICS 3-digit) with sharpest declines in imports (top 5)

324:	Petroleum and Coal Products Manufacturing	-54.0%
315:	Apparel Manufacturing	-33.3%
331:	Primary Metal Manufacturing	-23.7%
316:	Leather and Allied Product Manufacturing	-22.6%
335:	Electrical Equipment, Appliance, and Component Manufacturing	-22.3%

B: Industries (NAICS 3-digit) with smallest declines in imports (bottom 5)

321:	Wood Product Manufacturing	-12.3%
336:	Transportation Equipment Manufacturing	-11.8%
326:	Plastics and Rubber Products Manufacturing	-10.1%
311:	Food Manufacturing	-7.3%
337:	Furniture and Related Product Manufacturing	-5.5%

Notes: Calculated from US Census Bureau Data on US imports from the rest of the world.

US Trade Flows during the Global Financial Crisis

Observations:

1. Sudden and severe contraction between Oct and Nov 08

This comes shortly after two key events (collapse of Lehman Brothers and the bailout of AIG) that marked the peak of the crisis in Sep 08

2. Contraction in US imports (-19.3%) was more severe than that in US exports (-13.8%)
3. Focusing on manufacturing: Decline was very broad-based, although there is interesting variation in the severity across sectors (Table 1)

Why does credit matter for international trade?

- ▶ Exporting entails additional fixed costs: Learning about export market profitability, foreign distribution networks, regulatory compliance etc
- ▶ More risky than domestic transactions \Rightarrow need for trade insurance
- ▶ Involves longer lags (eg median shipment time of 2-3 months) \Rightarrow need credit lines to maintain a healthy cash flow

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Hence: A very active market for trade finance (insurance, letters of credit etc)

- ▶ Up to 90% of world trade relies on some form of trade finance, estimated at \$10-12 trillion per year (Auboin 2009)
- ▶ Shortfall in trade finance in second half of 2008 estimated at \$25-500 billion (Auboin 2009, Chauffour and Farole 2009)
- ▶ IMF-BAFT survey of 88 banks in 44 countries reported a rise of 31-64 basis points in the average spreads on various trade-related credit instruments in 2008Q4 relative to 2007Q4 (quoted in Amiti and Weinstein 2009)

Interbank rates

From Thomson Datastream: One-month / 30-day interbank rates

- ▶ Take monthly averages of daily quoted rates (sample of 31 countries)
- ▶ Caveats: What is the interbank rate?
 - ▶ Different quotes: Central bank, banker associations, large banks
 - ▶ More relevant as a measure of the cost of credit in countries with reasonably well-developed banking sectors

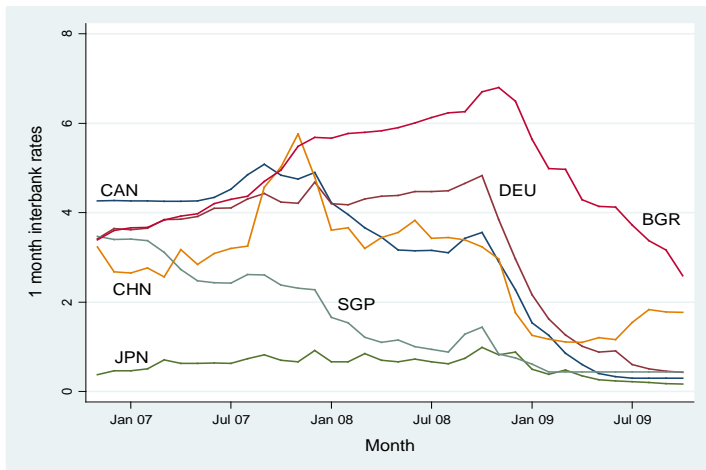
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 - ▶ Different quotes: Central bank, banker associations, large banks
 - ▶ More relevant as a measure of the cost of credit in countries with reasonably well-developed banking sectors
- ▶ Rise in interbank rates during the Global Financial Crisis reflects the severe tightening of credit conditions
- ▶ Started to decline after aggressive expansionary monetary policies to unfreeze credit markets
- ▶ Nevertheless, interesting variation across countries in the timing and extent of intervention

Interbank rates

Figure 2
Interbank Rates during the Global Financial Crisis



Source: Thomson Datastream.

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Level effects of *IBRATE* on trade volumes

$$\ln Y_{ikt} = \beta_1 \text{IBRATE}_{it} + \beta_2 D_{crisis} \times \text{IBRATE}_{it} + D_{kt} + \epsilon_{ikt}$$

- ▶ i : exporting country; k : industry; t : month
- ▶ D_{crisis} : equal to 1 if Sep 08 - Aug 09
- ▶ D_{kt} : industry-month fixed effects; control for
 - ▶ sector-specific aggregate demand shocks in the US
 - ▶ shocks related to credit conditions in the US
- ▶ Cluster by country (similar if by country-industry)

Cross-industry effects of *IBRATE* on trade volumes

Triple interactions:

$$\ln Y_{ikt} = \beta_1 IBRATE_{it} \times EXTFIN_k + \beta_2 D_{crisis} \times IBRATE_{it} \times EXTFIN_k + D_{it} + D_{kt} + D_{ik} + \epsilon_{ikt}$$

- ▶ D_{kt} : industry-month fixed effects; control for
 - ▶ sector-specific aggregate demand shocks in the US
- ▶ D_{it} : country-month fixed effects; control for
 - ▶ aggregate conditions (eg production shocks) in the exporting country
- ▶ D_{ik} : country-industry fixed effects; control for
 - ▶ other comparative advantage forces that are not time-varying
- ▶ Cluster by country (similar if by country-industry)

Industry measures of financial dependence

1. *EXTFIN*: Dependence on external credit

Fraction of total capital expenditures not financed by internal cash flow (Rajan and Zingales 1998)

2. *TANG*: Asset tangibility

Net plant, property and equipment divided by total assets (Braun 2003)

3. *TCRED*: Access to trade credit

Change in accounts payable divided by change in total assets (Fisman and Love 2003)

Constructed from Compustat for 1996-2005. Median value across firms in each NAICS 3-digit industry.

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Findings: Level effect of credit conditions on trade volumes

Focusing on cross-country variation, tighter credit conditions associated with...

- ▶ Reduced trade volumes

Table 2
Country Credit Conditions and Trade Volumes

	Dependent variable: Log (Industry exports to the US)					
	(1)	(2)	(3)	(4)	(5)	(6)
<u>Crisis = 1: Sep 08 to Aug 09</u>				Less TUR	Lag IBrate	US exports
IBrate	-0.162* [0.079]	-0.143* [0.082]	-0.037 [0.064]	-0.098 [0.092]	-0.032 [0.063]	-0.018 [0.067]
Crisis X IBrate		-0.036 [0.167]	-0.059** [0.026]	-0.036 [0.042]	-0.060** [0.028]	-0.126*** [0.038]
Factor endowments controls?	No	No	Yes	Yes	Yes	Yes
Initial income controls?	No	No	Yes	Yes	Yes	Yes
Ind-Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22145	22145	20208	19461	20208	20375
R-squared	0.283	0.284	0.577	0.589	0.577	0.728

Findings: Level effect of credit conditions on trade volumes

Focusing on cross-country variation, tighter credit conditions associated with...

- ▶ Reduced trade volumes (Table 2)
- ▶ Indicates that higher interbank rates indeed reflect a tightness of supply, rather than a high level of demand for credit
- ▶ Some signs of an intensifying effect after Sep 08

Findings: Cross-industry effects

Tighter credit conditions during the crisis period associated with...

- ▶ Lower export volumes in industries that are more dependent on external finance

Table 3
The Global Financial Crisis and Credit Channels of Comparative Advantage: EXTFIN

	Dependent variable: Log (Industry exports to the US)					
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis = 1: Sep 08 to Aug 09				Less TUR	Lag IBrate	US exports
IBrate X EXTFIN	-0.006 [0.005]	-0.001 [0.003]	0.000 [0.003]	0.004 [0.003]	-0.002 [0.004]	0.005 [0.003]
Crisis X IBrate X EXTFIN		-0.007* [0.004]	-0.009** [0.004]	-0.014* [0.007]	-0.009** [0.004]	-0.002 [0.003]
Factor endowments controls?	No	No	Yes	Yes	Yes	Yes
Initial income controls?	No	No	Yes	Yes	Yes	Yes
Cty-Ind, Cty-Mth, Ind-Mth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22901	22901	20208	19461	20208	20375
R-squared	0.964	0.964	0.965	0.966	0.965	0.967

Findings: Cross-industry effects

Tighter credit conditions during the crisis period associated with...

- ▶ Higher export volumes in industries with more collateralizable assets

Table 4
The Global Financial Crisis and Credit Channels of Comparative Advantage: TANG

	Dependent variable: Log (Industry Exports to the US)					
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis = 1: Sep 08 to Aug 09				Less TUR	Lag IBrate	US exports
IBrate X TANG	0.152* [0.081]	0.120 [0.092]	0.137 [0.109]	0.048 [0.148]	0.148 [0.104]	-0.068* [0.037]
Crisis X IBrate X TANG		0.057*** [0.017]	0.057 [0.041]	0.132** [0.050]	0.040 [0.039]	-0.011 [0.035]
Factor endowments controls?	No	No	Yes	Yes	Yes	Yes
Initial income controls?	No	No	Yes	Yes	Yes	Yes
Cty-Ind, Cty-Mth, Ind-Mth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22901	22901	20208	19461	20208	20375
R-squared	0.964	0.964	0.965	0.966	0.965	0.967

Findings: Cross-industry effects

Tighter credit conditions during the crisis period associated with...

- ▶ Higher export volumes in industries with more access to trade credit

Table 5
The Global Financial Crisis and Credit Channels of Comparative Advantage: TCRED

	Dependent variable: Log (Industry Exports to the US)					
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis = 1: Sep 08 to Aug 09				Less TUR	Lag IBrate	US exports
IBrate X TCRED	0.565* [0.293]	0.281 [0.275]	0.288 [0.311]	0.300 [0.527]	0.328 [0.331]	-0.133 [0.214]
Crisis X IBrate X TCRED		0.495*** [0.109]	0.587*** [0.174]	0.675** [0.260]	0.517*** [0.158]	-0.046 [0.243]
Factor endowments controls?	No	No	Yes	Yes	Yes	Yes
Initial income controls?	No	No	Yes	Yes	Yes	Yes
Cty-Ind, Cty-Mth, Ind-Mth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22901	22901	20208	19461	20208	20375
R-squared	0.964	0.964	0.965	0.966	0.965	0.967

Findings: Cross-industry effects

Robustness:

- ▶ Controls for (i) factor endowments interacted with factor intensities; (ii) GDP, GDP per capita interacted with industry fixed effects; (iii) the respective interactions with D_{crisis}
- ▶ Using the one-month lagged interbank rate
- ▶ Dating crisis to start at Mar 08 instead of Sep 08
- ▶ Treating Europe as a cluster when adjusting the standard errors

Findings: Cross-industry effects

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Remarks:

1. Credit conditions in source vs destination country: placebo results using log US exports
2. Effect of credit conditions above and beyond that on domestic production: controls for log industrial production index interacted with industry FEs
3. All three triple interactions simultaneously: strongest for *TCRED*

Cross-industry effects: An Illustration

Consider a flexible regression specification that allows a time-varying $IBRATE_{it} \times EXTFIN_k$ coefficient:

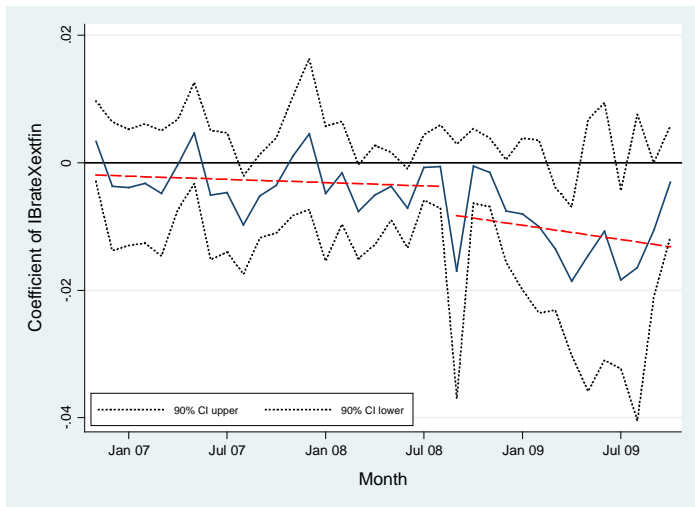
$$\ln Y_{ikt} = \sum_{m=1}^M \beta_m D_{t=m} \times IBRATE_{it} \times EXTFIN_k + D_{it} + D_{kt} + D_{ik} + \epsilon_{ikt}$$

Figure 3 plots the evolution of the β_m coefficients:

- ▶ No trend before Sep 08
- ▶ A distinct jump in Sep 08 in the importance of each credit channel
- ▶ This appears to taper off for *TANG* and *TCRED*

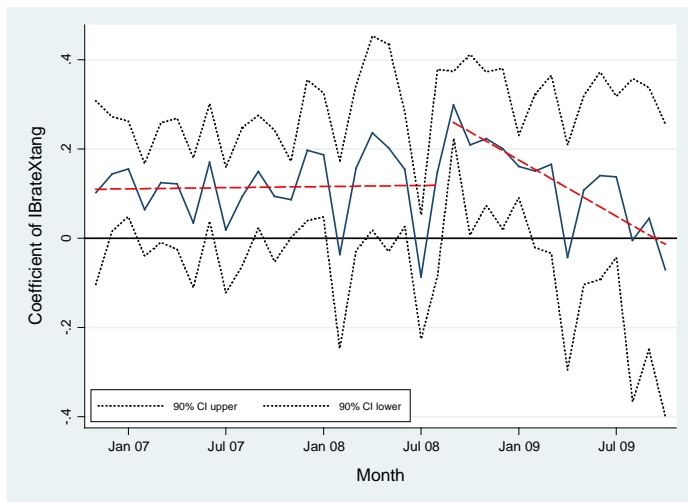
Cross-industry effects: *EXTFIN*

A: Interbank rate X *EXTFIN*



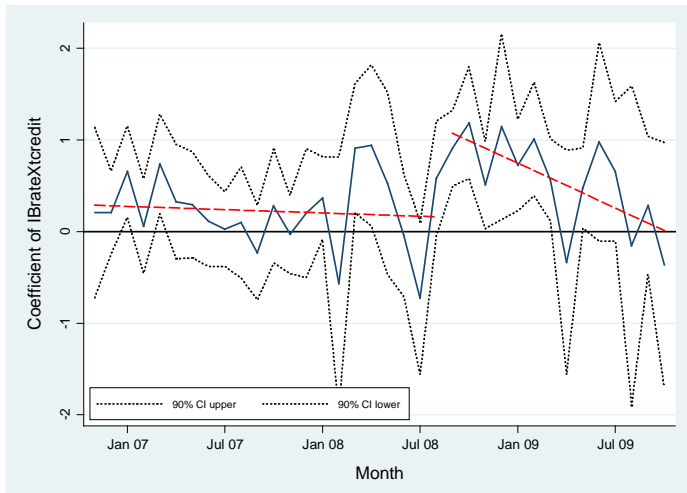
Cross-industry effects: *TANG*

B: Interbank rate X *TANG*



Cross-industry effects: *TCRED*

C: Interbank rate X *TCRED*



Additional findings using standard measures of financial development

- ▶ Private credit over GDP: Triple interaction signs are consistent with intuition

Table 6
Financial Development and Trade Flows during the Global Financial Crisis

<u>Crisis = 1: Sep 08 to Aug 09</u>	Dependent variable: Log (Industry Exports to the US) PC/GDP = Private Credit / GDP						
	Ind Char:	(1)	(2)	(3)	(4)	(5)	(6)
		EXTFIN	EXTFIN	TANG	TANG	TCRED	TCRED
Crisis X PC/GDP X Ind Char		0.059*** [0.019]	0.043 [0.028]	-0.358* [0.205]	-0.831*** [0.278]	-1.685 [1.217]	-4.185** [1.984]
Factor endowments controls?		No	Yes	No	Yes	No	Yes
Initial income controls?		No	Yes	No	Yes	No	Yes
Cty-Ind, Cty-Mth, Ind-Mth fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Observations		57144	44891	57144	44891	57144	44891
R-squared		0.953	0.958	0.953	0.958	0.953	0.958

Additional findings using standard measures of financial development

- ▶ Accounting standards: Similar results for *EXTFIN* and *TANG*, but statistical significance weaker

Table 7
Accounting Standards and Trade Flows during the Global Financial Crisis

		Dependent variable: Log (Industry Exports to the US)					
		ACCT = Accounting Standards					
<u>Crisis = 1: Sep 08 to Aug 09</u>		(1)	(2)	(3)	(4)	(5)	(6)
	Ind Char:	EXTFIN	EXTFIN	TANG	TANG	TCRED	TCRED
Crisis X ACCT X Ind Char		0.001 [0.001]	0.002* [0.001]	-0.006 [0.005]	-0.012 [0.007]	0.043 [0.052]	0.008 [0.060]
Factor endowments controls?		No	Yes	No	Yes	No	Yes
Initial income controls?		No	Yes	No	Yes	No	Yes
Cty-Ind, Cty-Mth, Ind-Mth fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Observations		29489	28353	29489	28353	29489	28353
R-squared		0.963	0.964	0.963	0.964	0.963	0.964

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Interpreting the magnitudes

Using reduced-form point estimates, consider two scenarios:

- (i) Interbank rates remained at their Sep 08 levels throughout
- (ii) Interbank rates dropped immediately in Oct 08 to Aug 09 rates

Compare predicted trade flows under these scenarios against predicted trade flows under the actual observed path of interbank rates

Interpreting the magnitudes

Using reduced-form point estimates, consider two scenarios:

- (i) Interbank rates remained at their Sep 08 levels throughout
- (ii) Interbank rates dropped immediately in Oct 08 to Aug 09 rates

Compare predicted trade flows under these scenarios against predicted trade flows under the actual observed path of interbank rates

Level effects based on the cross-country variation: (Table 2)

- ▶ Under (i), exports to the US would have been 35.2% less for the average country and sector
- ▶ Under (ii), exports to the US would have been 30.5% higher

Interpreting the magnitudes (cont.)

Cross-country, cross-industry effects: (Tables 3-5)

- ▶ Under (i), US import performance would have been ...
 - ▶ 13.4% weaker in the most external finance-dependent sector (chemical manufacturing) relative to the least dependent sector (leather and allied manufactured products)
 - ▶ 17.0% weaker in the industry with the lowest share of tangible assets (leather and allied manufactured products) relative to the industry with the hardest assets (petroleum and coal products)
 - ▶ 16.9% weaker in the sector with least availability of trade credit (textiles) relative to the sector with the greatest access to buyer and supplier credit (petroleum and coal products)
- ▶ Corresponding figures under scenario (ii) are: 8.2%, 9.7%, 9.7%

Additional Findings

Level effect of *IBRATE* within countries:

- ▶ With country-month and industry-month fixed effects (fully saturated)
- ▶ For entire sample period

Table 9
Country Credit Conditions and Trade Volumes: The Within-Country Experience

Dependent variable:	Log (Industry exports to the US)		
	(1)	(2)	(3)
	Nov 06 to Oct 09		
IBrate	0.016** [0.008]	0.016* [0.008]	0.008 [0.006]
Observations	22901	22145	17695
R-squared	0.961	0.961	0.960
Log (Exchange Rate)?	No	Yes	Yes
Log (IPI)?	No	No	Yes
Cty-Mth, Ind-Mth fixed effects	Yes	Yes	Yes

Additional Findings (cont.)

Level effect of *IBRATE* within countries:

- ▶ Breaking up across different sub-periods

Table 9 (cont.)
Country Credit Conditions and Trade Volumes: The Within-Country Experience

	Dependent variable: Log (Industry exports to the US)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Nov 06 to Aug 08		Sep 08 to Dec 08		Jan 09 to Oct 09	
IBrate	0.028* [0.016]	0.003 [0.014]	-0.025** [0.010]	-0.033*** [0.009]	0.016 [0.021]	0.012 [0.025]
Observations	14121	10937	2566	1988	6214	4770
R-squared	0.966	0.964	0.981	0.980	0.968	0.969
Log (Exchange Rate)?	No	Yes	No	Yes	No	Yes
Log (IPI)?	No	Yes	No	Yes	No	Yes
Cty-Mth, Ind-Mth fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Additional Findings (cont.)

Level effect of *IBRATE* within countries:

- ▶ Repeat the same thought experiments for the Sep 08 - Dec 08 regression
- ▶ Under (i), trade flows in Dec 08 would have been 2.5% lower in the average country and sector
- ▶ Under (ii), trade flows in Dec 08 would have been 5.5% higher
- ▶ Relatively large in comparison to the overall 12% drop in world trade flows in 2008

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Concluding Remarks and Caveats

- ▶ Using interbank rates as a measure of the cost of credit, and monthly data on US imports:

Find evidence of a link between tight credit conditions and the collapse in international trade observed during the recent global financial crisis

- ▶ Level effect: Higher interbank rates associated with lower exports
- ▶ Cross-industry effect: Differential effects of higher interbank rates across sectors, depending on their external finance dependence, asset tangibility, and access to trade credit
- ▶ Cross-industry effects appear to intensify post Sep 08

Concluding Remarks and Caveats

Open questions:

1. Can more be done to distinguish between the credit constraints and the aggregate demand hypotheses? vs other alternative hypotheses?
2. Has access to credit become more important as a determinant of trade / comparative advantage?

Implications for trade shares: Will the crisis confer a permanent gain to exporting countries with better financial development?

3. Examining the pattern of the “recovery” of trade flows