Shocks Abroad, Pain at Home?
Bank-Firm Level Evidence on *Financial Contagion* during the Recent Financial Crisis

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Disclaimer

Motivation

- Globalization of the financial system
  - International wholesale bank liquidity
  - Foreign bank ownership
- Financial crisis originated in USA but spread (quickly) to Western Europe and Emerging Markets
  - Did the crisis spread through international bank linkages → International contagion?
  - Did this contagion cause real effects?
  - Were there heterogenous effects across firms?

Is a globalized banking sector a shock propagator or absorber?

This paper

- Experiment:
  - 14 Eastern European Countries
    - Not directly affected by banking crisis in the West
    - Credit boom fuelled by international capital and liquidity
    - Large presence of foreign banks
  - Compare before and after the start of the financial crisis:
    - Credit growth *banks*:
      - That *borrowed internationally* and those that did *not*
      - With *domestic* and with *foreign* ownership
    - Operational and asset growth *firms*:
      - Having a relationship with different types of banks
      - With different characteristics

Analyze matched *bank*- and *firm*-level data

Why is it important to analyze both ***bank***- and ***firm***-level data?

- Contagion link:
  - Contagion implies pass-through of credit contraction banks to firms
  - To test one needs bank-firm connections
- Bank-level data can be misleading:
  - Cannot fully control for demand
  - Driven by loans to large corporates
- Real effects: firm operational revenue, assets, etc.
- Firm heterogeneity: differential impact across firms

Only the combination of *bank- and firm*-level data (linked!) can assess the *real effects* of a credit contraction

Preview of main results

- Bank level:

  - Evidence on two transmission channels:

    - The *drying-up of international liquidity* for domestic banks results in a reduction in credit (growth) for these banks
      - Especially banks that were funded relative less with retail deposits

    - When *parent banks* become severely *affected by the crisis*, their subsidiaries start to reduce credit (growth)
      - Especially banks that were funded relative less with retail deposits

Preview of main results

- Firm level:
  - Evidence on two transmission channels for average firm:
    - No average real effects through *international liquidity*
    - Evidence of real effects through *foreign bank ownership*
  - Evidence allowing for firm heterogeneity
    - Less capitalized firms are affected by collapse in *international liquidity*
      - Suggests: flight to quality
    - Smaller firms borrowing from *foreign banks* relative less affected
      - Firms with more growth opportunities or higher margins

Main literature

- International contagion through *cross-border lending*

  Cetorelli & Goldberg (IER 2011); Kalemli-Ozcam, Papaioannou & Perri (2011); De Haas & Van Horen (AER 2012), De Haas & Van Horen (RFS forth)

  - We examine whether this channel of international contagion has any real effects

- International transmission of *liquidity shocks* (loan-level data)

  Schnabl (JF 2012)

  - As opposed to this paper, we analyze (i) real effects, (ii) heterogeneity across firms, (iii) the current crisis and (iv) more than one country

- Transmission of shocks through *foreign bank ownership*

  Popov & Udell (JIE forth); De Haas & Lelyveld (2011); Claessens & Van Horen (2011)

  - We do not only compare domestic and foreign banks but differentiate between internationally and locally funded domestic banks

Data

Bank ownership database

+

dealogic

+

BANKSCOPE

BUREAU VAN DIJK

KOMPASS

Bank-Firm connections

AMADEUS

analyse major databases from European sources

A pan-European database of 5 million public and private companies

BUREAU VAN DIJK

Bank-level data

1. All banks active in 14 ECA countries over period 2005-2009 from *Bank ownership database* (Claessens and Van Horen 2012)
   – No entry and exit
   – Match foreign banks with their parents
2. Identify international borrowers (domestic banks only)
   – Banks borrowed at least once between 2004 and 2007 from bond or syndicated loan market (*Dealogic*)
3. Balance sheet information from *Bankscope*

Only banks with information on loan growth at least 3 years

Sample of *238 banks*

40 International domestic, 76 Local domestic, 116 Foreign

Bank-firm connections

- *Kompass*: directories of over two million firms in 70 countries
- Data collected from chambers of commerce, firm registries, phone interviews and voluntary registering
- Use the directory from 2010
- Includes information on firm address, management, industry, date of incorporation and *firm-bank relationships* but *no balance sheet information*

Firm-level data

- *Amadeus*: extensive database with balance sheet information on limited liability firms in Europe
  - Unlisted and listed companies;
  - Very small (sole-owner) to large firms
  - But often balance sheet information lacking (mere legal entities – not economically active)

- Matching procedure
  - Matching by firm name, city, email, internet and/or telephone number
  - Match if:
    - Exact name and city (account for multiple branches)
    - Exact email or internet address and city
    - Last eight numbers of telephone number contain equal string of 6 consecutive numbers

Firm-level data

- Were able to match *43,847 firms* that fit our criteria:
  - Bank-firm connection provided in Kompass and bank in our sample of banks
  - Firm active for the whole sample period (2005-2009)
    - Exclude firms that entered the market
    - Do not study exits
  - Balance sheet information available in Amadeus (2005-2009)
    - Not all balance sheet information equally well reported. Especially financial information (loans, etc.) often lacking

6,891 firms with *international banks*

30,473 firms with *foreign banks*

6,483 firms with *local domestic banks*

Number of banks by bank type in sample countries

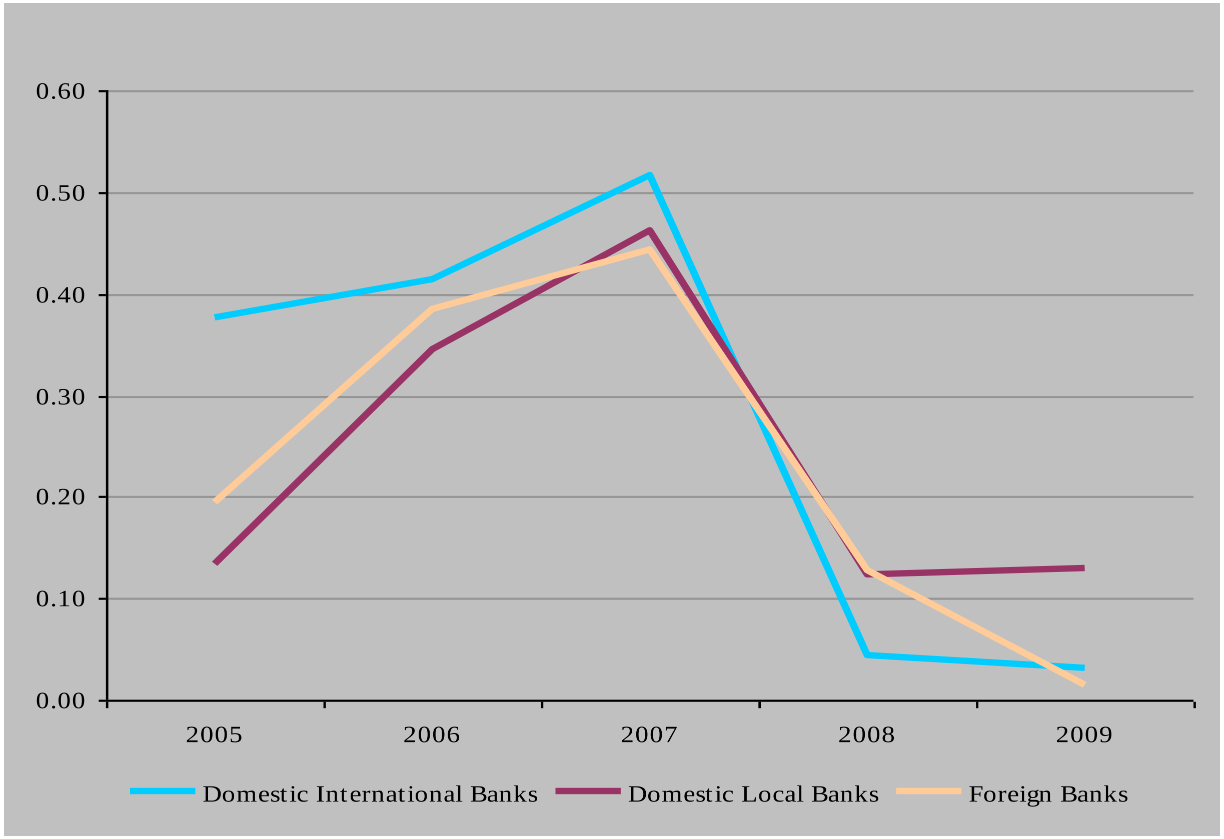
Country	Domestic International Banks	Foreign Banks	Domestic Local Banks	Total Number of Banks	*Share in Percent*
Bosnia-Herzegovina	0	7	5	12	*5.0%*
Bulgaria	4	7	4	15	*6.3%*
Croatia	0	10	16	26	*10.9%*
Czech Republic	0	9	8	17	*7.1%*
Estonia	0	2	2	4	*1.7%*
Hungary	1	14	1	16	*6.7%*
Lithuania	2	5	1	8	*3.4%*
Poland	2	15	8	25	*10.5%*
Romania	1	12	3	16	*6.7%*
Serbia and Montenegro	0	8	12	20	*8.4%*
Slovakia	0	12	0	12	*5.0%*
Slovenia	5	6	5	16	*6.7%*
Turkey	9	6	6	21	*8.8%*
Ukraine	16	9	5	30	*12.6%*
Total Number of Banks	40	122	76	238	*100%*
Share, in Percent	*16.8%*	*51.3%*	*31.9%*	*100%*	

Number of firms by bank type in sample countries

Country	Firms with Domestic International Banks	Firms with Domestic Local Banks	Firms with Foreign Banks	Total Number of Firms	*Share in Percent*
Bosnia-Herzegovina	0	20	8	28	*0.1%*
Bulgaria	46	7	641	694	*1.6%*
Croatia	0	2,023	12,545	14,568	*33.2%*
Czech Republic	0	0	1,585	1,585	*3.6%*
Estonia	0	0	799	799	*1.8%*
Hungary	1,007	23	3,685	4,715	*10.8%*
Lithuania	4	2	66	72	*0.2%*
Poland	1,088	557	6,772	8,417	*19.2%*
Romania	385	1,570	1,726	3,681	*8.4%*
Serbia and Montenegro	0	1,210	166	1,376	*3.1%*
Slovakia	0	4	440	444	*1.0%*
Slovenia	2,543	879	1,391	4,813	*11.0%*
Turkey	191	4	5	200	*0.5%*
Ukraine	1,627	184	644	2,455	*5.6%*
Total Number of Firms	6,891	6,483	30,473	43,847	*100%*
Share, in Percent	*15.7%*	*14.8%*	*69.5%*	*100%*	

How did banks react?

Bank loan growth, by bank type, 2005-2009



- Compared to local domestic banks:
  - International banks stronger credit reduction
  - Also foreign banks lower credit growth, but only in second part of crisis

Bank loan growth

- Panel regression: loan growth 2005-2009
- Transmission variables:
  - International bank dummy: =1 if bank borrowed at least once through syndicated lending or issued bond between 2004 and 2007, =0 otherwise
  - Foreign bank dummy: =1 if bank owned by foreign bank in 2007, =0 otherwise
- Two crisis years: 2008 and 2009
  - International liquidity already dried up in 2007
  - Problems parent banks surfaced mostly in 2008
- Controls
  - Consecutively controlling for bank fixed effects, year fixed effects, country-year fixed effects
- OLS, cluster by bank and year

Sharp credit contraction during the crisis

Model Independent Variables	(1)	(2)	(3)	(4)
International	0.115**			
	(0.039)			
International * 2008	-0.193***	-0.180***	-0.180***	-0.093*
	(0.000)	(0.005)	(0.005)	(0.085)
International * 2009	-0.214***	-0.188***	-0.190***	-0.132**
	(0.001)	(0.005)	(0.007)	(0.037)
Foreign	0.026			
	(0.327)			
Foreign * 2008	-0.020	-0.026	-0.023	-0.020
	(0.320)	(0.469)	(0.534)	(0.650)
Foreign * 2009	-0.139***	-0.142***	-0.139***	-0.107**
	(0.000)	(0.001)	(0.001)	(0.022)
2008	-0.202**	-0.210**		
	(0.018)	(0.030)		
2009	-0.196**	-0.208**		
	(0.025)	(0.037)		
Constant	0.324***	0.977***	0.768***	0.109
	(0.000)	(0.000)	(0.000)	(0.202)
Bank Fixed Effects	no	yes	yes	yes
Year Fixed Effects	no	no	yes	no
Country * Year Fixed Effects	no	no	no	yes
Number of Observations	1,066	1,066	1,066	1,066
R2	0.265	0.487	0.568	0.682

International and foreign banks contract lending more

Independent Variables / Model	(1)	(2)	(3)	(4)
International	0.115**			
	(0.039)			
International * 2008	-0.193***	-0.180***	-0.180***	-0.093*
	(0.000)	(0.005)	(0.005)	(0.085)
International * 2009	-0.214***	-0.188***	-0.190***	-0.132**
	(0.001)	(0.005)	(0.007)	(0.037)
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Country * Year Fixed Effects	no	no	no	yes
Number of Observations	1,066	1,066	1,066	1,066
R2	0.265	0.487	0.568	0.682

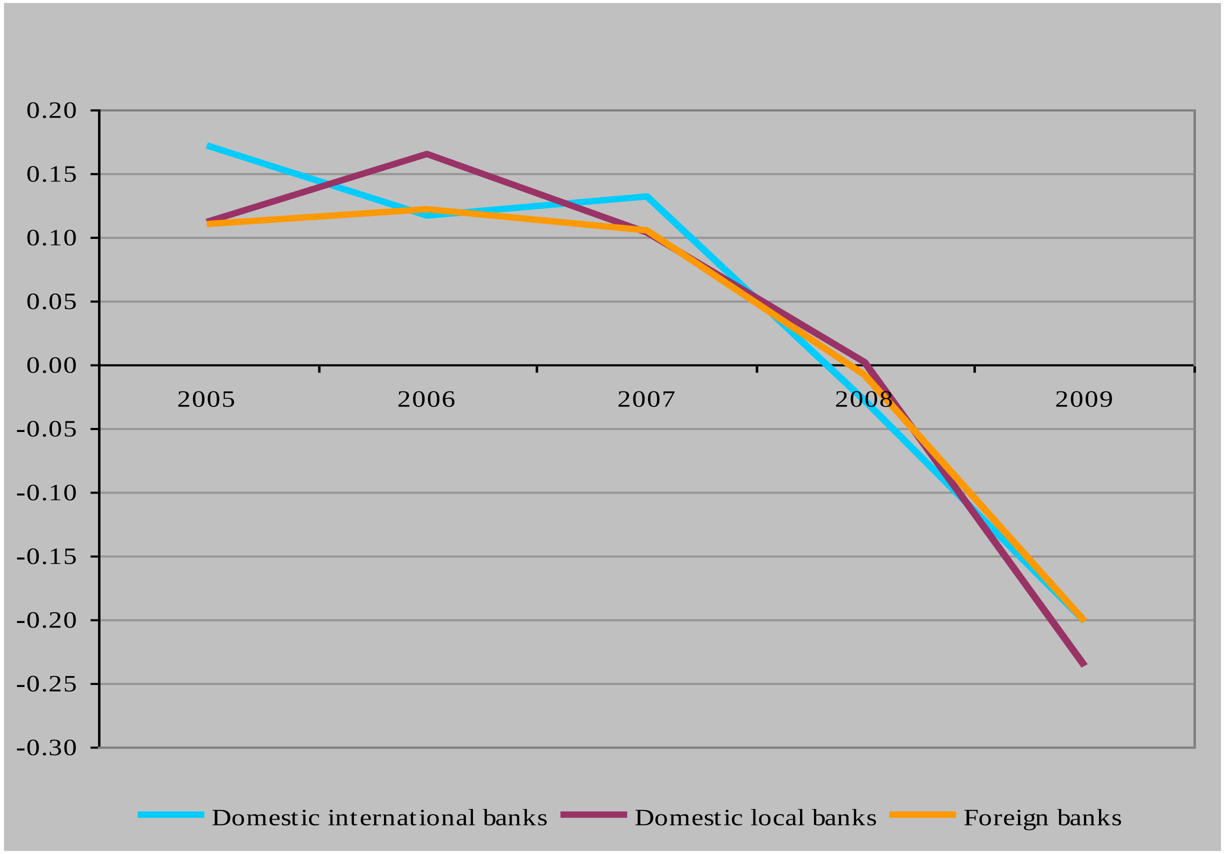
International (and Foreign) banks contract lending more

if they are <u>more liquid</u> (above median) and <u>less funded</u> by deposits (below median).

International * 2009	-0.049	-0.024	-0.053	-0.024	-0.006
	(0.442)	(0.389)	(0.492)	(0.696)	(0.920)
International * 2009 * d(Size)	-0.028		0.001	-0.023	
	(0.505)		(0.994)	(0.726)	
International * 2009 * d(Market Share)					-0.042
					(0.450)
International * 2009 * d(Liquidity)	-0.124***		-0.182***	-0.190***	-0.178***
	(0.005)		(0.000)	(0.000)	(0.001)
International * 2009 * d(Deposits)	0.098***		0.164***	0.163***	0.143***
	(0.000)		(0.000)	(0.000)	(0.001)
Foreign * 2009	-0.079**	-0.078*	-0.081	-0.070	-0.099**
	(0.012)	(0.071)	(0.134)	(0.325)	(0.033)
Foreign * 2009 * d(Size)		0.031	0.031	0.013	
		(0.416)	(0.608)	(0.821)	
Foreign * 2009 * d(Market Share)					0.050
					(0.359)
Foreign * 2009 * d(Liquidity)		-0.041	-0.092**	-0.066	-0.056
		(0.365)	(0.031)	(0.136)	(0.105)
Foreign * 2009 * d(Deposits)		0.026	0.088*	0.086**	0.079**
		(0.448)	(0.059)	(0.015)	(0.028)
Foreign * 2009 * Vienna Initiative		1.562***	1.569***	-0.457***	-0.455***
		(0.000)	(0.000)	(0.003)	(0.003)
Bank Fixed Effects	yes	yes	yes	yes	yes
Country * Year Fixed Effects	yes	yes	yes	yes	yes
Bank level controls	yes	yes	yes	yes	yes
Number of Observations	1,022	1,022	1,022	807	807
R^2	0.776	0.775	0.777	0.828	0.828

Are there any real effects?

Firms operational revenue growth, by bank type, 2005-2009



- On average not much difference between firms linked to different types of banks
- Maybe due to firm heterogeneity?

Firm selection?

Do "international" and "foreign" banks lend to different firms prior to the crisis?

- Cross-section regression: Firm characteristic 2007
  - ROA, Size, Solvency and Liquidity
  - d=1 if characteristic below quartile value in 2007, =0 otherwise
- Firms banking with:
  - International (borrowing) bank
  - Foreign bank
- Controls:
  - Firm characteristics (other dependent variables, past operational revenue growth, age, public)
  - Bank characteristics (size, liquidity deposits)
  - Industry and country fixed effects
- OLS, cluster by bank and country

International and foreign banks do not select firms that perform differently than local banks

Model Dependent Variable	(1) d(ROA)	(2) d(Size)	(3) d(Solvency)	(4) d(Liquidity)
Independent Variables				
International	0.013	-0.058	0.028	-0.026
	(0.024)	(0.039)	(0.033)	(0.022)
Foreign	-0.011	-0.057**	0.023	-0.026
	(0.018)	(0.026)	(0.027)	(0.023)
d(ROA)		0.023**	0.204***	0.121***
		(0.009)	(0.041)	(0.012)
d(Size)	0.005		0.023***	-0.031***
	(0.010)		(0.004)	(0.012)
d(Solvency)	0.202***	0.032***		0.172***
	(0.020)	(0.009)		(0.010)
d(Liquidity)	0.115***	-0.024***	0.166***	
	(0.008)	(0.005)	(0.017)	
Constant	0.572	-0.288	-0.108	1.118
	(0.426)	(0.292)	(0.240)	(1.297)
Other Firm Characteristics	yes	yes	yes	yes
Bank Characteristics	yes	yes	yes	yes
Industry Fixed Effects	yes	yes	yes	yes
Country Fixed Effects	yes	yes	yes	yes
H_0: International = Foreign (p-value)	0.06	0.96	0.71	0.98
Number of Observations	31,179	30,807	31,179	31,179
R2	0.133	0.210	0.167	0.107

International and foreign banks do not majorly differ in choice of firm type

Model Dependent Variable	(1) d(ROA)	(2) d(Size)	(3) d(Solvency)	(4) d(Liquidity)
Independent Variables				
International	0.013	-0.058	0.028	-0.026
	(0.024)	(0.039)	(0.033)	(0.022)
Foreign	-0.011	-0.057**	0.023	-0.026
	(0.018)	(0.026)	(0.027)	(0.023)
d(ROA)		0.023**	0.204***	0.121***
		(0.009)	(0.041)	(0.012)
d(Size)	0.005		0.023***	-0.031***
	(0.010)		(0.004)	(0.012)
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	(0.020)	(0.009)		(0.010)
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Firm performance

- Panel regression: operational revenue and asset growth 2005-2009
- Firms banking with:
  - International (borrowing) bank
  - Foreign bank
- Two crisis years: 2008 and 2009
- Controls:
  - Consecutively controlling for firm fixed effects, year fixed effects, country*year and industry*year fixed effects
- OLS, cluster by bank

Firms clearly affected by the crisis

Model	(1)	(2)	(3)	(4)
Dependent Variable	Operational Revenue Growth		Asset Growth	
Independent Variables				
International	0.010		-0.016	
	(0.682)		(0.586)	
International * 2008	-0.040	0.001	-0.040	-0.004
	(0.380)	(0.939)	(0.386)	(0.659)
International * 2009	0.026	-0.003	0.042	-0.009
	(0.593)	(0.782)	(0.299)	(0.322)
Foreign	-0.016		-0.023	
	(0.442)		(0.401)	
Foreign * 2008	0.005	-0.015	0.008	-0.009
	(0.831)	(0.108)	(0.786)	(0.163)
Foreign * 2009	0.051	-0.023**	0.025	-0.019**
	(0.206)	(0.033)	(0.512)	(0.019)
2008	-0.126***		-0.124***	
	(0.000)		(0.000)	
2009	-0.365***		-0.214***	
	(0.000)		(0.000)	
Constant	0.129***	-0.125***	0.169***	0.033***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Fixed Effects	no	yes	no	yes
Industry * Year Fixed Effects	no	yes	no	yes
Country * Year Fixed Effects	no	yes	no	yes
Number of Observations	188,320	188,320	192,223	192,223
R2	0.107	0.369	0.070	0.365

Firms connected to international banks no differential impact

Model	(1)	(2)	(3)	(4)
Dependent Variable	Operational Revenue Growth		Asset Growth	
Independent Variables				
International	0.010		-0.016	
	(0.682)		(0.586)	
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	(0.206)	(0.033)	(0.512)	(0.019)
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	(0.000)		(0.000)	
2009	-0.365***		-0.214***	
	(0.000)		(0.000)	
Constant	0.129***	-0.125***	0.169***	0.033***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Fixed Effects	no	yes	no	yes
Industry * Year Fixed Effects	no	yes	no	yes
Country * Year Fixed Effects	no	yes	no	yes
Number of Observations	188,320	188,320	192,223	192,223
R2	0.107	0.369	0.070	0.365

Firms connected to foreign banks stronger affected compared to firms connected to local banks

Model	(1)	(2)	(3)	(4)
Dependent Variable	Operational Revenue Growth		Asset Growth	
Independent Variables				
International	0.010		-0.016	
	(0.682)		(0.586)	
International * 2008	-0.040	0.001	-0.040	-0.004
	(0.380)	(0.939)	(0.386)	(0.659)
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Foreign	-0.016		-0.023	
	(0.442)		(0.401)	
Foreign * 2008	0.005	-0.015	0.008	-0.009
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Foreign * 2009	0.051	-0.023**	0.025	-0.019**
	(0.206)	(0.033)	(0.512)	(0.019)
2008	-0.126***		-0.124***	
	(0.000)		(0.000)	
2009	-0.365***		-0.214***	
	(0.000)		(0.000)	
Constant	0.129***	-0.125***	0.169***	0.033***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm Fixed Effects	no	yes	no	yes
Industry * Year Fixed Effects	no	yes	no	yes
Country * Year Fixed Effects	no	yes	no	yes
Number of Observations	188,320	188,320	192,223	192,223
R2	0.107	0.369	0.070	0.365

Firm performance by bank type and firm characteristics

Interaction: d=1 if firm above 25th quartile in 2007, =0 otherwise

Model	(1)	(2)
Dependent Variable / Independent Variables	Operational revenue growth	Asset growth
International * 2009	0.005	0.004
	(0.722)	(0.723)
International * 2009 * d(Size)	0.010	0.002
	(0.750)	(0.909)
International * 2009 * d(Solvency)	0.059***	0.067***
	(0.007)	(0.000)
International * 2009 * d(Liquidity)	0.025	-0.001
	(0.310)	(0.954)
Foreign * 2009	-0.020*	-0.023**
	(0.073)	(0.026)
Foreign * 2009 * d(Size)	-0.064***	-0.044***
	(0.010)	(0.001)
Foreign * 2009 * d(Solvency)	0.027	0.023
	(0.134)	(0.100)
Foreign * 2009 * d(Liquidity)	0.021	0.001
	(0.281)	(0.951)
Firm Fixed Effects	yes	yes
Country * Year Fixed Effects	yes	yes
Firm level controls	yes	yes
Number of Observations	179,779	182,844
R2	0.365	0.363

Firms with lower capital connected to international banks suffer more

Model	(1)	(2)
Dependent Variable Independent Variables	Operational revenue growth	Asset growth
International * 2009	0.005	0.004
	(0.722)	(0.723)
International * 2009 * d(Size)	0.010	0.002
	(0.750)	(0.909)
International * 2009 * d(Solvency)	0.059***	0.067***
	(0.007)	(0.000)
International * 2009 * d(Liquidity)	0.025	-0.001
	(0.310)	(0.954)
Foreign * 2009	-0.020*	-0.023**
	(0.073)	(0.026)
Foreign * 2009 * d(Size)	-0.064***	-0.044***
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Foreign * 2009 * d(Solvency)	0.027	0.023
	(0.134)	(0.100)
Foreign * 2009 * d(Liquidity)	0.021	0.001
	(0.281)	(0.951)
Firm Fixed Effects	yes	yes
Country * Year Fixed Effects	yes	yes
Firm level controls	yes	yes
Number of Observations	179,779	182,844
R2	0.365	0.363

Especially large firms (low margins) connected to foreign banks suffer more

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Dependent Variable Independent Variables	Operational revenue growth	Asset growth
International * 2009	0.005	0.004
	(0.722)	(0.723)
International * 2009 * d(Size)	0.010	0.002
	(0.750)	(0.909)
International * 2009 * d(Solvency)	0.059***	0.067***
	(0.007)	(0.000)
International * 2009 * d(Liquidity)	0.025	-0.001
	(0.310)	(0.954)
Foreign * 2009	-0.020*	-0.023**
	(0.073)	(0.026)
Foreign * 2009 * d(Size)	-0.064***	-0.044***
	(0.010)	(0.001)
Foreign * 2009 * d(Solvency)	0.027	0.023
	(0.134)	(0.100)
Foreign * 2009 * d(Liquidity)	0.021	0.001
	(0.281)	(0.951)
Firm Fixed Effects	yes	yes
Country * Year Fixed Effects	yes	yes
Firm level controls	yes	yes
Number of Observations	179,779	182,844
R^2	0.365	0.363

Main results

- Evidence of presence of *international contagion*:
  - International wholesale liquidity channel interacted with firm balance sheet channel (flight to quality)
  - Foreign bank ownership – especially for larger firms

Conclusions

- Bank-level results suggest credit contraction by international borrowers and foreign banks
  - *Indicates **credit supply shock***
- But bank-level results can be misleading
  - Misses both firm heterogeneity and real effects!
  - Need **bank-firm level data** to study the **international transmission** of bank shocks!