Shocks Abroad, Pain at Home? Bank-Firm Level Evidence on the International Transmission of Financial Shocks

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Motivation

- Globalization of the financial system
  - Banks borrowing on international wholesale market
  - Increased presence of foreign owned banks
- Followed by a global financial crisis with international wholesale liquidity evaporating and Western banks suffering important losses
- Important questions: Did the crisis spread through international bank linkages? What are the implications for the real economy?

Evidence so far

- Studies comparing credit provided by countries/ banks with different exposures to crisis shock suggest international transmission through the banking sector

  Peek and Rosengren (AER 1997, 2000) Cetorelli & Goldberg (IMFER 2011); Kalemli-Ozcan, Papaioannou & Perri (JIE 2010); Cull & Martinez Peria (2012); Claessens and Van Horen (JFP 2013); De Haas & Van Lelyveld (JMCB 2013)

- But level of aggregation might be problematic
  - Banks might lend to different types of firms → important to control for firm fundamentals

    Jimenez, Ongena, Peydro & Saurina (AER 2012) Mian (JF 2006); Giannetti & Ongena (RoF 2009)
  - Aggregate volumes are driven by changes in lending to large firms → can hide credit crunch to small firms only

Evidence so far

- Some recent studies have taken steps to overcome these problems
- Using syndicated loan data studies find that funding constraints lead banks to reduce their cross-border lending

  De Haas & Van Horen (AER 2012, RFS 2013); Giannetti & Laeven (JFE 2012)
- Can account for time-(in)variant country-, bank- and firm-heterogeneity
- But only capture lending of largest international banks to the largest firms

Evidence so far

- However, also evidence from retail banking sector (incl lending by small banks to small firms)
- German savings banks with substantial US subprime exposure decreased lending more between 2006 and 2008

  Puri, Rocholl & Steffen (JFE 2011)
- Transmission of 1998 Russian default via international banks to Peruvian banks and firms

  Schnabl (JF 2012)

Evidence so far

- Convincing evidence that banks transmit financial shocks across borders
- However, very limited evidence on how this affects real economic activity as no firm balance sheet information
  Peek & Rosengren (AER 2000); Klein, Peek & Rosengren (AER 2002); Claessens, Tong & Wei (JIE 2011); Paravisini, Rappoport, Schnabl & Wolfenzon (2012)
- Important: reduction in bank lending does not have to have real effects if firms can find substitutes

This paper

- Extend this literature by studying the impact of the international transmission of financial shocks on the financing and real performance of firms (especially focusing on SMEs)
- Specifically we ask the following questions:
  - Do banks that depend on international wholesale funding cut lending to firms when this market dries up?
  - Do financial problems at the parent bank negatively affect lending by their foreign subsidiaries?
  - Are there consequently real effects for the domestic borrowers?
  - Are there heterogeneous effects across types of firms?

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  - Are there heterogeneous effects across types of firms?

Is a globalized banking sector a shock propagator or shock absorber?

Main take away

- Global financial crisis was transmitted via
  - Dependency on international wholesale funding
  - Foreign bank ownership
- Substantial real consequences for firms dependent on bank credit (but not for credit independent firms)
- Especially small firms, firms with limited tangible assets and firms with single bank relationship affected

Identification strategy

Identification strategy

- If international transmission of financial shocks took place, number of conditions need to hold:
  - Global financial crisis should affect *"international" banks* more → faced with an adverse capital shock these banks have to curtail lending
    - Important: Not necessarily picked up by (aggregate) bank-level data if only affecting credit to e.g. small firms or if banks serve different clients
  - If there are financial frictions this should affect the *performance of firms* that are dependent on loans from these banks
    - This should hold especially for firms that cannot switch to alternative sources of funding
  - Firms that are not dependent on bank loans should not be affected
- We exploit this difference with respect to credit dependence

Santos & Winton (JF 2008) Chava & Purnanandam (JFE 2011))

Identification strategy

- Basic idea: differentiate between 6 types of bank-firm relationships

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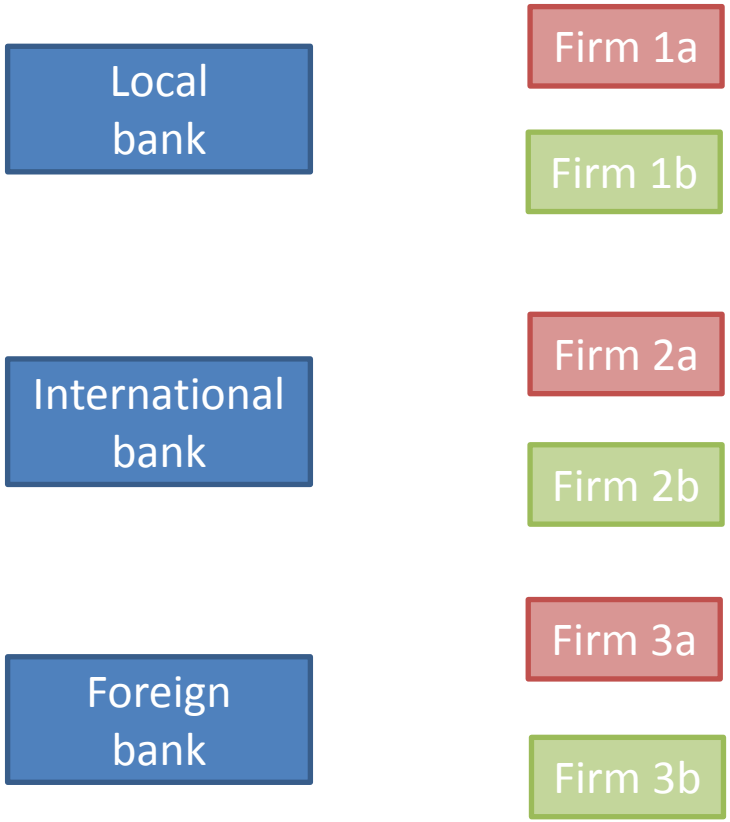
Local bank

International bank

Foreign bank

Identification strategy

- Basic idea: differentiate between 6 types of bank-firm relationships



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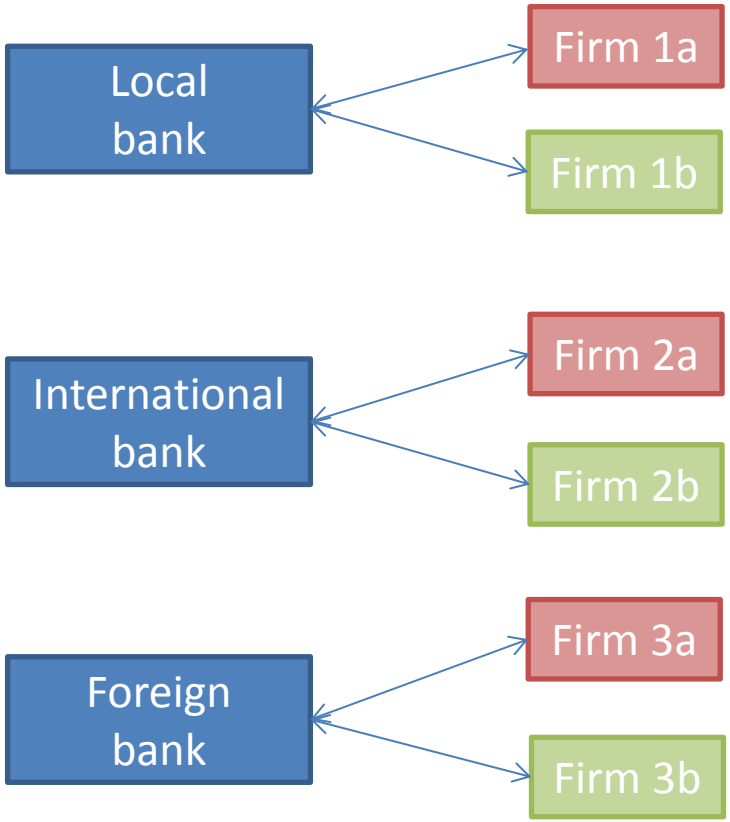

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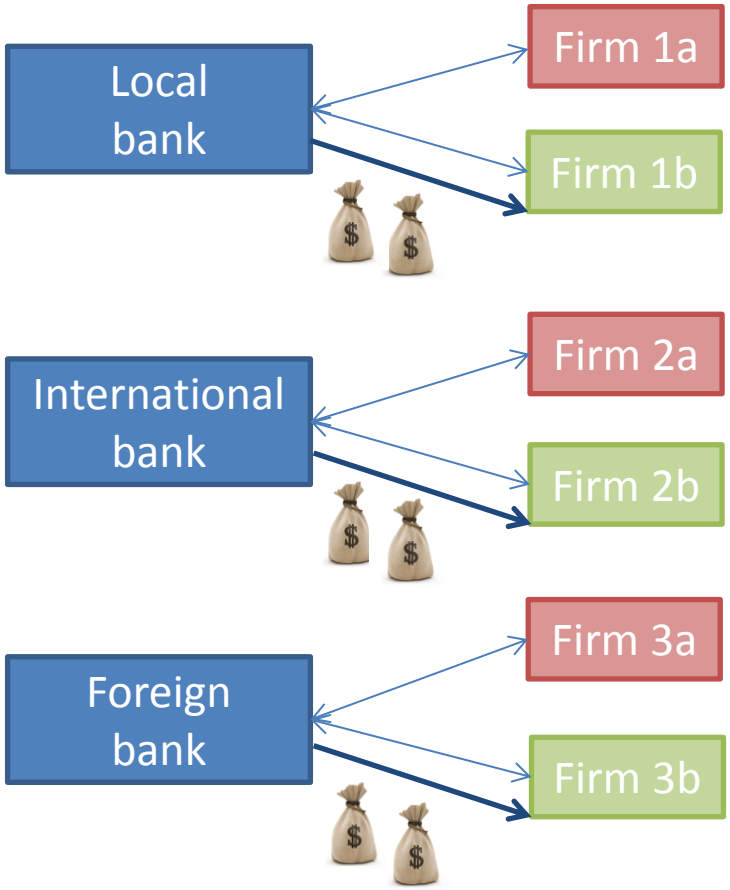

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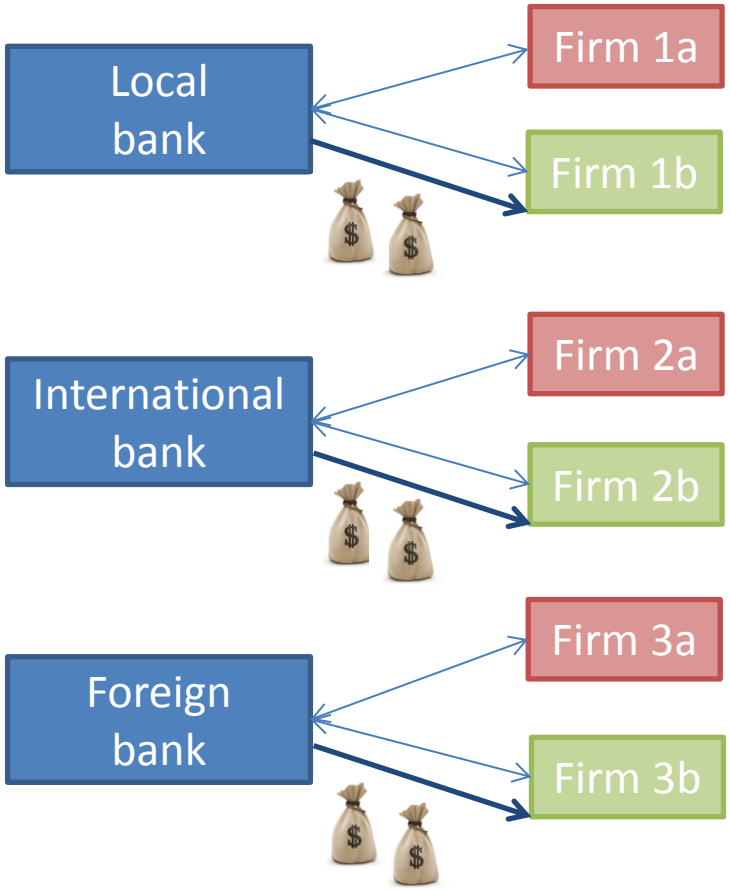

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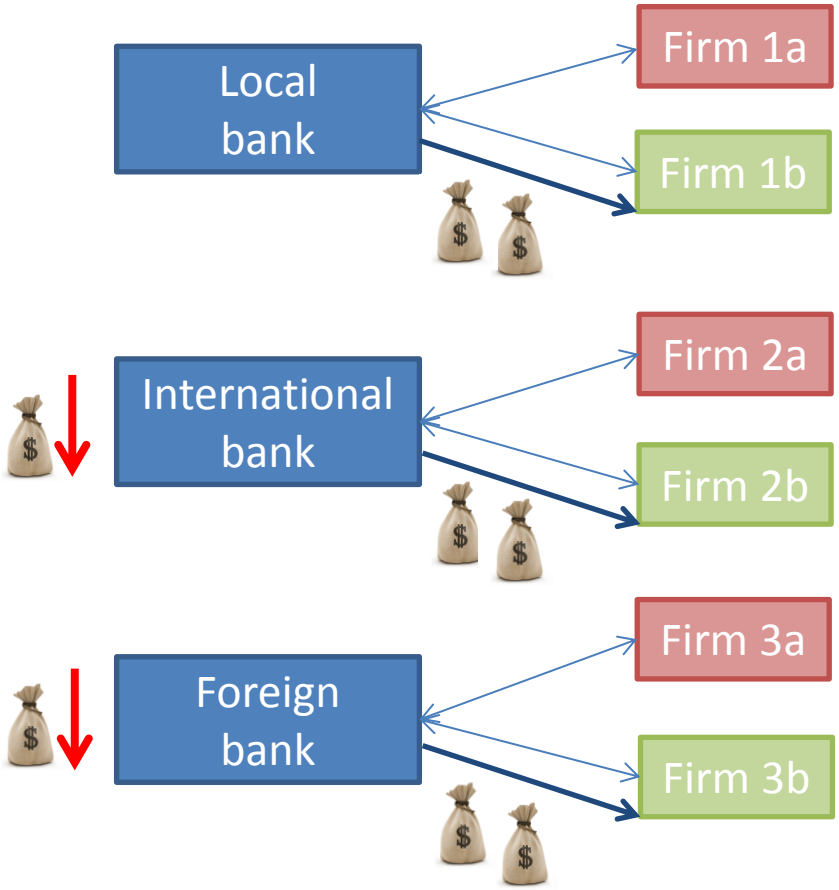

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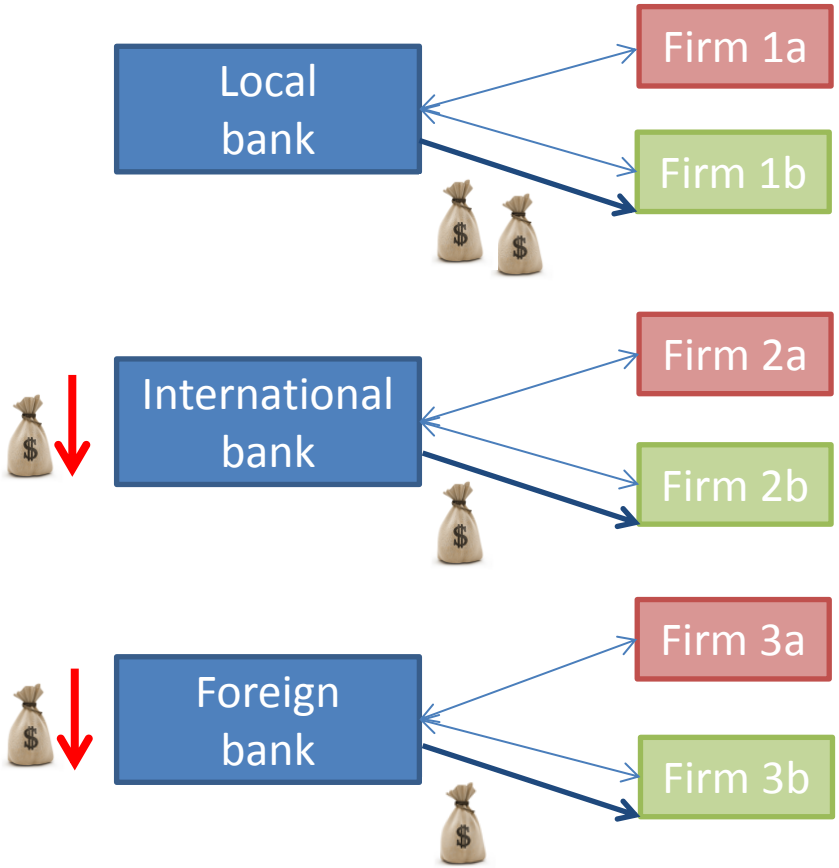

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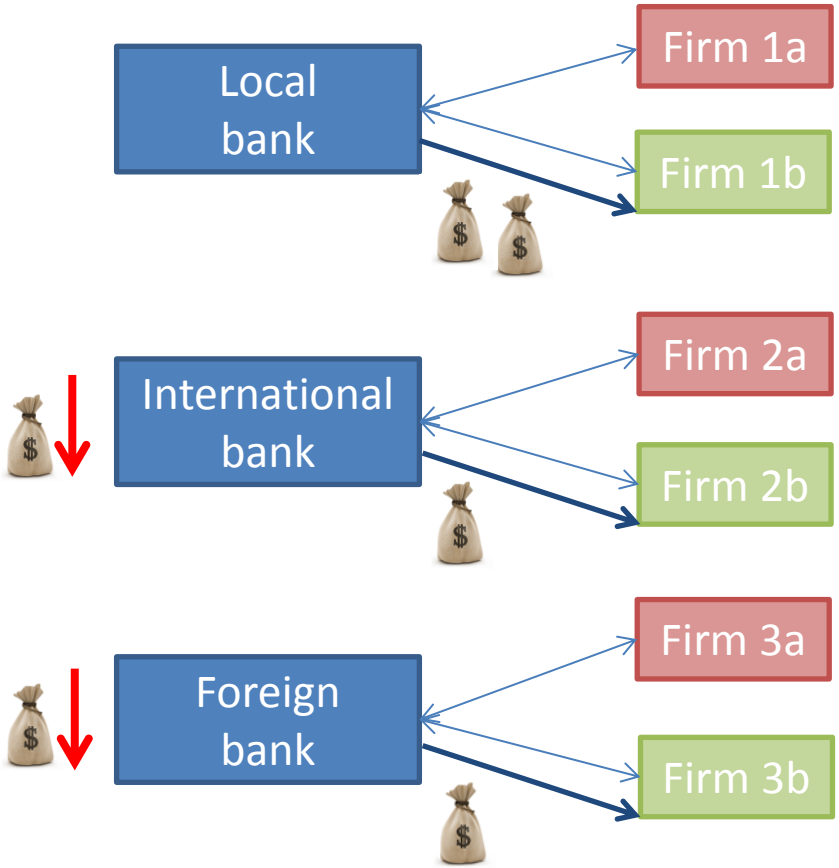

If there are financial frictions …

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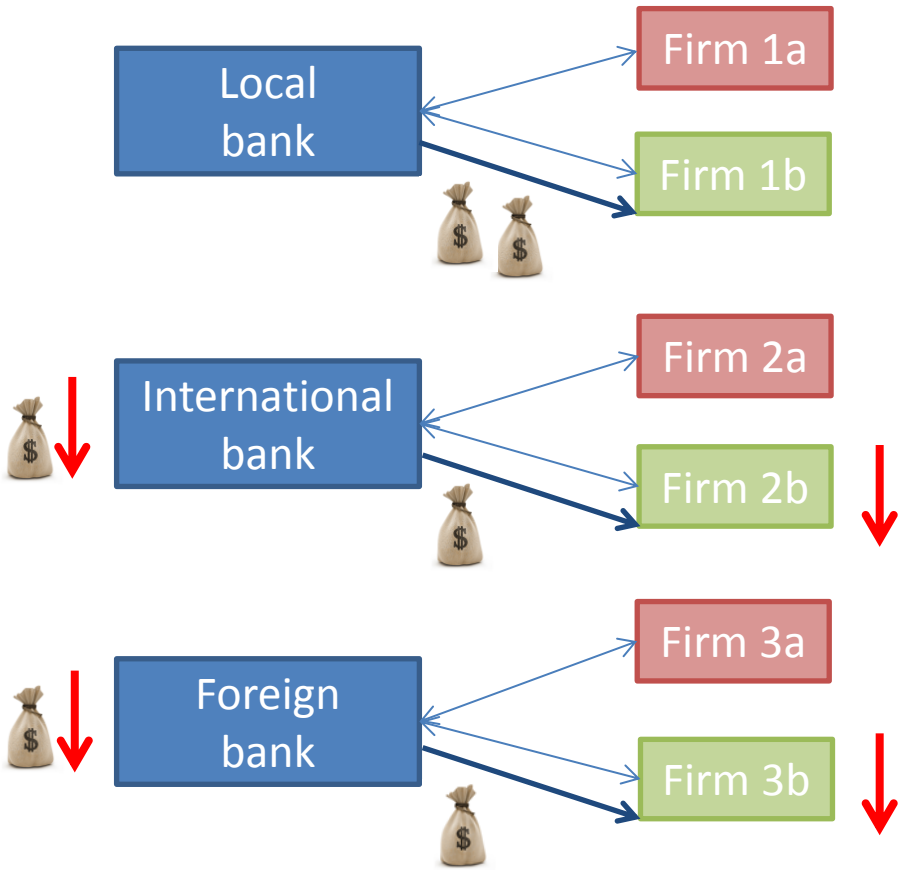


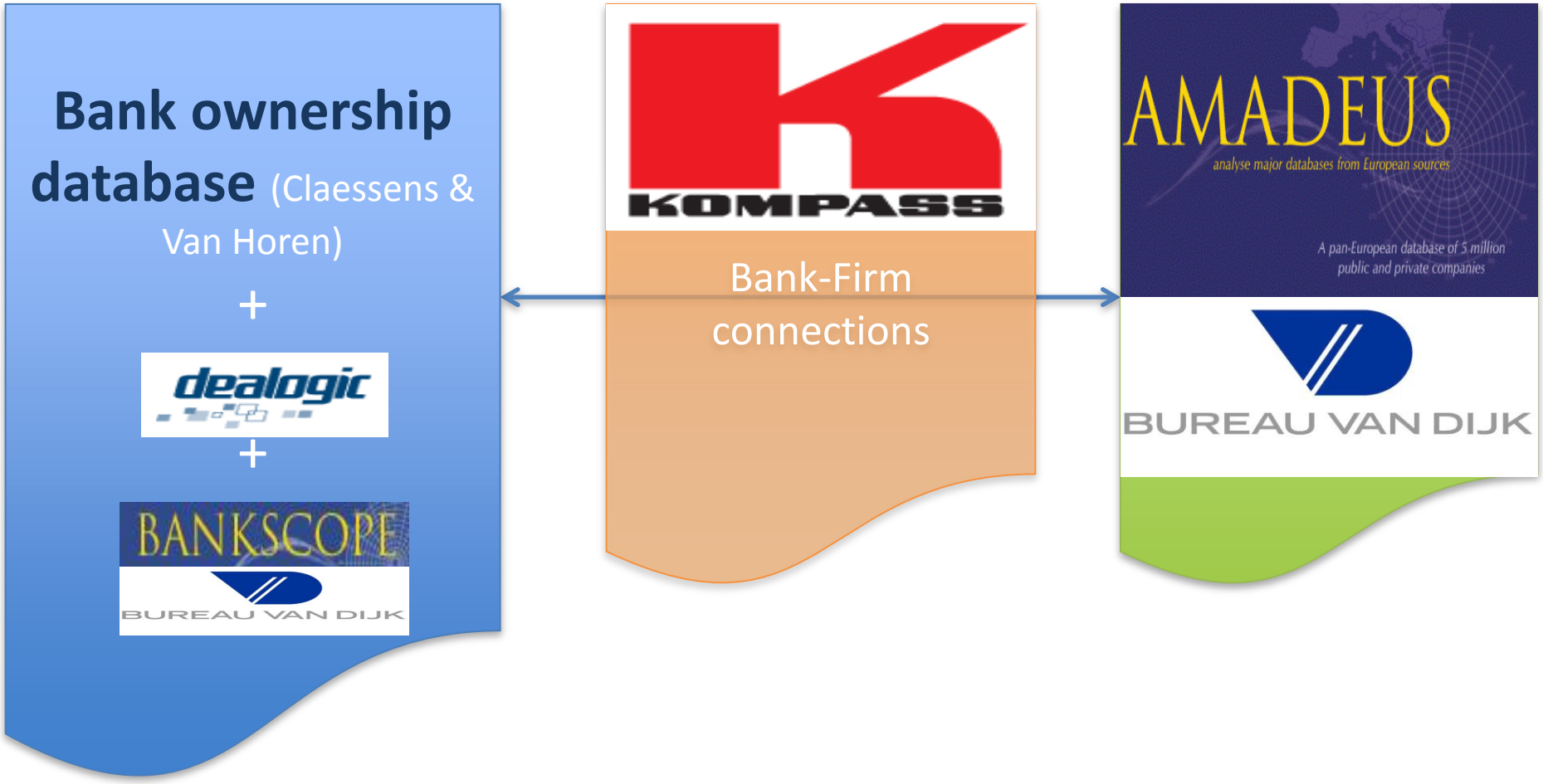
If there are financial frictions …

Data

Data

- Data on banks and firms active in 14 countries in Eastern Europe and Central Asia.
- Region especially suitable for identification
  - Not directly affected by banking crisis in the West
  - Credit boom fuelled by international wholesale funding
  - Large presence of foreign banks

Data


Bank ownership database (Claessens & Van Horen)
+
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

- Identify three types of banks
  - *Foreign bank*: >50% shares held by foreigners in 2007 (*Bank ownership database*)
  - *International borrowing domestic bank*: borrowed at least once from syndicated loan or bond market between 2004 and 2007 (*Dealogic*)
  - *Locally funded domestic bank*: only funded locally
- Total 256 banks (130 foreign, 39 internationally borrowing and 87 locally funded)
  - In eight countries *three types of banks* present (160 banks); use as main sample (better within-country interpretation of results)
- Balance sheet information from *Bankscope*

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
- Includes information on firm address, management, industry, date of incorporation and *firm-bank relationships* but *no balance sheet information*
- Use the directory from 2010
  - Firm-bank relationship often recorded prior to 2010
  - Firm-bank relationships even during non-crisis times often last many years Ongena & Smith, 2001; Degryse, Kim & Ongena, 2009
  - Do not know whether banks switch, but
    - If information pre-dates the crisis and well-performing firms managed to switch from shocked to unaffected banks our estimates will be conservative
    - We exploit observable firm characteristics to proxy for probability of switching

Firm-level data

- Identify six types of firms
  - *Credit dependent firm*: total borrowing positive at least one year between 2005 and 2007 (*Amadeus*)
    - Having a relationship with one of the three types of banks (*Kompass*)
  - *Credit independent firm*: no borrowing → rely only on bank for checking or savings account (*Amadeus*)
    - Having a relationship with one of the three types of banks (*Kompass*)
- Total 30,529 credit dependent and 14,364 credit independent firms (in three-bank type countries 15,454 and 10,639 firms)

Characteristics of the firms

CHARACTERISTICS OF THE SIX FIRM TYPES

3-Bank Type Countries						
	Credit-Dependent Firms			*Credit-Independent Firms*		
With a Relationship with a	*Domestic Bank*		*Foreign Bank*	*Domestic Bank*		*Foreign Bank*
	Locally-Funded	*Internationally-Borrowing*		*Locally-Funded*	*Internationally-Borrowing*	
Number of Firms	1,513	4,911	9,030	1,725	2,268	6,646
Firm Size (Total Assets, in th EUR)	9,688	11,709	12,319	3,891	3,569	5,120
Multiple Banks	0.41	0.36	0.33	0.28	0.28	0.37
Share Tangible Assets	0.38	0.36	0.34	0.39	0.32	0.28
Export Activities	0.28	0.28	0.28	0.12	0.14	0.15
Foreign Owned	0.12	0.22	0.20	0.22	0.21	0.24
Young Firm	0.17	0.16	0.17	0.20	0.20	0.21
Liquidity Ratio	0.01	0.01	0.01	0.02	0.02	0.02
Solvency Ratio	0.40	0.41	0.43	0.47	0.53	0.50

- Large differences *between* groups (especially size, export activities and number of banks)

- Differences *within* groups limited (except for ownership and number of relationship banks)


How did banks react?

Bank-level regressions

$$Loan\ Growth_{b,2009} = \beta_1 International_b + \beta_2 Foreign_b + \gamma' X_b + \varphi_j + \varepsilon_{b,2009}$$

- Dependent variable: loan growth between 2008 and 2009
- Controls:
  - Country characteristics (real GDP growth and inflation) or country fe, bank characteristics (size, liquidity, deposits and solvency) and lagged dependent variable
- OLS, cluster by country, winsorize 1th and 99th percentile

Loan growth of banks between 2008 and 2009

Model	(1)	(2)	(3)
Sample	*3-Bank Type Countries*		
Internationally-Borrowing Domestic Bank	-0.118***	-0.120***	-0.064***
	(0.000)	(0.000)	(0.003)
Foreign Bank	-0.227***	-0.214***	-0.142***
	(0.000)	(0.001)	(0.000)
Country Characteristics	Yes	--	--
Bank Characteristics	No	No	Yes
Lagged Dependent Variable	No	No	Yes
Country Fixed Effects	No	Yes	Yes
R-squared	0.281	0.300	0.443
Number of Observations	160	160	140

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Result:

- International-borrowing domestic and foreign banks contract lending more

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- With 6.4 and 14.2 percentage points respectively

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Result:

- International-borrowing domestic and foreign banks contract lending more
- With 6.4 and 14.2 percentage points respectively
- All bank sample similar results


What are the real effects?

Firm-level regressions

$$Y_{i,2009} = \beta_1 International_i + \beta_2 Foreign_i + \beta_3 Credit\ Dependent_i + \beta_4 International_i * Credit\ Dependent_i + \beta_5\ Foreign_i * Credit\ Dependent_i + \gamma' X_i + \varphi_j + \psi_k + \varepsilon_{i,2009}$$

- Evidence of international transmission implies:
  - *Negative interactions*
    - Credit dependent firms that have relationship with internationally-borrowing domestic or foreign bank should be more affected than firms that are credit dependent and have a relationship with a locally-funded domestic bank
  - *Insignificant bank relationship dummies*
    - Credit supply shock should not affect firms that are linked to these banks but are not credit dependent

Firm-level regressions

- Dependent variables (2008-2009):
  - Short-term debt growth
  - Change ROA
  - Asset growth
  - Operational revenue growth
- Controls:
  - Firm characteristics (size, export, foreign ownership, liquidity, solvency and age), country and industry fe, and lagged dependent variable
- OLS, cluster by bank, winsorize 1st and 99th percentile

Financing and performance of firms between 2008 and 2009

Model	(1)	(2)	(3)	(4)
Dependent Variables: Firm	Δ%Short-Term Debt	ΔROA	Δ%Operational Revenue	Δ%Assets
Sample	*3-Bank Type Countries*			
Firm with Internationally-Borrowing Domestic Bank	0.055**	0.517	0.024*	0.014
	(0.020)	(0.178)	(0.092)	(0.164)
Firm with Foreign Bank	0.020	0.487	0.002	-0.002
	(0.299)	(0.170)	(0.787)	(0.827)
Firm Is Credit-Dependent	0.067***	1.326***	0.035***	0.025***
	(0.000)	(0.001)	(0.003)	(0.005)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.086***	-1.035**	-0.053***	-0.036***
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Firm with Foreign Bank * Firm Is Credit-Dependent	-0.061***	-1.200**	-0.037***	-0.025**
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Firm Characteristics and Lagged Dependent Variable	Yes	Yes	Yes	Yes
Industry Fixed Effects and Country Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.053	0.164	0.072	0.031
Number of Observations	21,117	20,811	21,053	21,122

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Result 1a:

Credit dependent firms connected to international and foreign banks lower rate of growth in short-term debt

Financing and performance of firms between 2008 and 2009

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Result 1b:

No differential (or even opposite) effect credit independent firms connected to international-borrowing and foreign banks

Financing and performance of firms between 2008 and 2009

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Result 2a:

Credit dependent firms connected to international and foreign banks more affected wrt profitability, operational revenue and asset growth

Financing and performance of firms between 2008 and 2009

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Result 2b:

No differential (or even opposite) effect for credit independent firms connected to international and foreign banks

Key result

- Results consistent with the idea that the global financial crisis was transmitted to firms via two international bank lending channels
- With important consequences for the real economy

Allowing for firm heterogeneity

- For further evidence we exploit firm heterogeneity
- Use observable characteristics that proxy for the ability of the firm to access alternative sources of finance and/or switch banks
  - Firms *with single and with multiple bank relationships*
    - Firms that have established relationships with multiple banks are more likely to be able to switch when their main bank is curtailing credit
    - Expect impact larger for firms with single bank relationship
  - *Small versus large* firms:
    - Ample evidence that large firms are more likely to have access to alternative sources of funding
    - Expect impact to be larger for small firms
  - Firms *with and without tangible assets*
    - In times of crises having collateral becomes more important
    - Expect impact larger for firms with limited tangible assets

Allowing for firm heterogeneity – number bank relationships

Dependent Variables: Firm	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets
Panel A	*Single Bank Firms*				*Multiple Bank Firms*			
Firm with Internationally-Borrowing Domestic Bank	0.064**	0.045	0.021	0.007	0.044*	1.432***	0.031	0.035***
	(0.020)	(0.932)	(0.167)	(0.552)	(0.050)	(0.010)	(0.241)	(0.002)
Firm with Foreign Bank	0.016	0.782*	0.004	-0.011	0.025	-0.385	-0.008	0.015
	(0.481)	(0.094)	(0.753)	(0.274)	(0.165)	(0.445)	(0.558)	(0.123)
Firm Is Credit-Dependent	0.086***	1.384***	0.060***	0.030***	0.038*	0.975*	-0.014	0.016
	(0.000)	(0.007)	(0.000)	(0.008)	(0.053)	(0.052)	(0.489)	(0.180)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.107***	-0.764	-0.068***	-0.038***	-0.056**	-1.613***	-0.032	-0.044***
	(0.000)	(0.264)	(0.000)	(0.007)	(0.023)	(0.004)	(0.257)	(0.005)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.080***	-1.422**	-0.053***	-0.026**	-0.028	-0.331	-0.001	-0.023*
	(0.000)	(0.013)	(0.001)	(0.037)	(0.138)	(0.541)	(0.974)	(0.066)
R-squared	0.057	0.176	0.080	0.028	0.053	0.137	0.064	0.049
Number of Observations	14,129	13,910	14,102	14,143	6,988	6,901	6,951	6,979

Allowing for firm heterogeneity – number bank relationships

Dependent Variables: Firm	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets
Panel A	*Single Bank Firms*				*Multiple Bank Firms*			
Firm with Internationally-Borrowing Domestic Bank	0.064**	0.045	0.021	0.007	0.044*	1.432***	0.031	0.035***
	(0.020)	(0.932)	(0.167)	(0.552)	(0.050)	(0.010)	(0.241)	(0.002)
Firm with Foreign Bank	0.016	0.782*	0.004	-0.011	0.025	-0.385	-0.008	0.015
	(0.481)	(0.094)	(0.753)	(0.274)	(0.165)	(0.445)	(0.558)	(0.123)
Firm Is Credit-Dependent	0.086***	1.384***	0.060***	0.030***	0.038*	0.975*	-0.014	0.016
	(0.000)	(0.007)	(0.000)	(0.008)	(0.053)	(0.052)	(0.489)	(0.180)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.107***	-0.764	-0.068***	-0.038***	-0.056**	-1.613***	-0.032	-0.044***
	(0.000)	(0.264)	(0.000)	(0.007)	(0.023)	(0.004)	(0.257)	(0.005)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.080***	-1.422**	-0.053***	-0.026**	-0.028	-0.331	-0.001	-0.023*
	(0.000)	(0.013)	(0.001)	(0.037)	(0.138)	(0.541)	(0.974)	(0.066)
R-squared	0.057	0.176	0.080	0.028	0.053	0.137	0.064	0.049
Number of Observations	14,129	13,910	14,102	14,143	6,988	6,901	6,951	6,979

Result:

Impact in general stronger for firms with single bank relationship

Allowing for firm heterogeneity – firm size

Dependent Variables: Firm	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets
Panel B	*Small Firms*				*Large Firms*			
Firm with Internationally-Borrowing Domestic Bank	0.065**	0.393	0.028*	0.015	0.014	0.485	0.011	-0.004
	(0.016)	(0.396)	(0.084)	(0.126)	(0.626)	(0.490)	(0.706)	(0.779)
Firm with Foreign Bank	0.027	0.861**	0.012	-0.005	0.006	-0.725	-0.017	-0.001
	(0.221)	(0.033)	(0.338)	(0.556)	(0.796)	(0.247)	(0.257)	(0.948)
Firm Is Credit-Dependent	0.051***	1.878***	0.057***	0.027**	0.084***	0.312	0.013	0.028**
	(0.003)	(0.000)	(0.000)	(0.011)	(0.000)	(0.727)	(0.552)	(0.029)
Firm with Internationally-Borrowing Domestic Bank	-0.100***	-1.202**	-0.067***	-0.037***	-0.046	-0.658	-0.028	-0.018
* Firm Is Credit-Dependent	(0.001)	(0.048)	(0.000)	(0.004)	(0.104)	(0.473)	(0.389)	(0.203)
Firm with Foreign Bank	-0.046***	-2.041***	-0.045***	-0.020*	-0.063**	0.607	-0.011	-0.021
* Firm Is Credit-Dependent	(0.006)	(0.000)	(0.003)	(0.085)	(0.011)	(0.490)	(0.651)	(0.164)
R-squared	0.059	0.148	0.063	0.029	0.054	0.178	0.086	0.041
Number of Observations	10,558	10,402	10,525	10,561	10,559	10,409	10,528	10,561

Allowing for firm heterogeneity – firm size

Dependent Variables: Firm	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets
Panel B	*Small Firms*				*Large Firms*			
Firm with Internationally-Borrowing Domestic Bank	0.065**	0.393	0.028*	0.015	0.014	0.485	0.011	-0.004
	(0.016)	(0.396)	(0.084)	(0.126)	(0.626)	(0.490)	(0.706)	(0.779)
Firm with Foreign Bank	0.027	0.861**	0.012	-0.005	0.006	-0.725	-0.017	-0.001
	(0.221)	(0.033)	(0.338)	(0.556)	(0.796)	(0.247)	(0.257)	(0.948)
Firm Is Credit-Dependent	0.051***	1.878***	0.057***	0.027**	0.084***	0.312	0.013	0.028**
	(0.003)	(0.000)	(0.000)	(0.011)	(0.000)	(0.727)	(0.552)	(0.029)
Firm with Internationally-Borrowing Domestic Bank	-0.100***	-1.202**	-0.067***	-0.037***	-0.046	-0.658	-0.028	-0.018
* Firm Is Credit-Dependent	(0.001)	(0.048)	(0.000)	(0.004)	(0.104)	(0.473)	(0.389)	(0.203)
Firm with Foreign Bank	-0.046***	-2.041***	-0.045***	-0.020*	-0.063**	0.607	-0.011	-0.021
* Firm Is Credit-Dependent	(0.006)	(0.000)	(0.003)	(0.085)	(0.011)	(0.490)	(0.651)	(0.164)
R-squared	0.059	0.148	0.065	0.029	0.054	0.178	0.086	0.041
Number of Observations	10,558	10,402	10,525	10,561	10,559	10,409	10,528	10,561

Result:

Impact much more pronounced when firms are small

Allowing for firm heterogeneity – tangible assets

Dependent Variables: Firm	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets
Panel C	*Intangible Firms*				*Tangible Firms*			
Firm with Internationally-Borrowing Domestic Bank	0.089***	0.627	0.025	0.013	0.019	0.419	0.026	0.016
	(0.000)	(0.343)	(0.257)	(0.410)	(0.574)	(0.483)	(0.101)	(0.150)
Firm with Foreign Bank	0.045*	0.874**	0.006	0.005	0.002	0.552	0.008	-0.002
	(0.070)	(0.032)	(0.687)	(0.700)	(0.920)	(0.245)	(0.386)	(0.831)
Firm Is Credit-Dependent	0.116***	1.976***	0.064***	0.056***	0.013	0.351	0.005	-0.002
	(0.000)	(0.000)	(0.004)	(0.000)	(0.565)	(0.512)	(0.805)	(0.861)
Firm with Internationally-Borrowing Domestic Bank	-0.140***	-1.647**	-0.081***	-0.057***	-0.035	-0.402	-0.034	-0.022
* Firm Is Credit-Dependent	(0.000)	(0.022)	(0.002)	(0.001)	(0.262)	(0.591)	(0.156)	(0.133)
Firm with Foreign Bank	-0.119***	-2.054***	-0.068***	-0.063***	-0.014	-0.802	-0.019	-0.002
* Firm Is Credit-Dependent	(0.000)	(0.000)	(0.003)	(0.000)	(0.464)	(0.189)	(0.367)	(0.869)
R-squared	0.050	0.146	0.056	0.029	0.064	0.197	0.105	0.042
Number of Observations	10,516	10,369	10,486	10,518	10,517	10,368	10,486	10,519

Allowing for firm heterogeneity – tangible assets

Dependent Variables: Firm	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets	D%Short-Term Debt	DROA	Δ%Operational Revenue	Δ%Assets
Panel C	*Intangible Firms*				*Tangible Firms*			
Firm with Internationally-Borrowing Domestic Bank	0.089***	0.627	0.025	0.013	0.019	0.419	0.026	0.016
	(0.000)	(0.343)	(0.257)	(0.410)	(0.574)	(0.483)	(0.101)	(0.150)
Firm with Foreign Bank	0.045*	0.874**	0.006	0.005	0.002	0.552	0.008	-0.002
	(0.070)	(0.032)	(0.687)	(0.700)	(0.920)	(0.245)	(0.386)	(0.831)
Firm Is Credit-Dependent	0.116***	1.976***	0.064***	0.056***	0.013	0.351	0.005	-0.002
	(0.000)	(0.000)	(0.004)	(0.000)	(0.565)	(0.512)	(0.805)	(0.861)
Firm with Internationally-Borrowing Domestic Bank	-0.140***	-1.647**	-0.081***	-0.057***	-0.035	-0.402	-0.034	-0.022
* Firm Is Credit-Dependent	(0.000)	(0.022)	(0.002)	(0.001)	(0.262)	(0.591)	(0.156)	(0.133)
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* Firm Is Credit-Dependent	(0.000)	(0.000)	(0.003)	(0.000)	(0.464)	(0.189)	(0.367)	(0.869)
R-squared	0.050	0.146	0.056	0.029	0.064	0.197	0.105	0.042
Number of Observations	10,516	10,369	10,486	10,518	10,517	10,368	10,486	10,519

Result:

Impact only when firm has limited tangible assets

Robustness

- Continuous variable for credit-dependency
- Different dependent variable
  - Compare 2007 and 2009
  - Benchmark against a pre-crisis period (05-06)
- Placebo test (compare growth 2005-2006)
  - No differential effect
- Continuous variables as controls
- Cluster by country
- Winsorize 5^{th} and 95^{th} percentile

Conclusions

- Global financial integration contributed to the international transmission of financial shocks with important implications for the real economy
- Policy implications
  - For banks
    - Less reliance on international wholesale funding
    - More local funding of foreign subsidiaries
  - For firms:
    - Reliance on bank credit (at the expense of informal financing) can increase firm vulnerability to shocks