Some borrowers are more equal than others:
Bank funding shocks and credit reallocation

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Funding shock and credit supply

- ,, Absorbing the funding shock: domestic credit
  - ⋯ Ivashina and Scharfstein (JFE 2010), Puri, Rocholl and Steffen (JFE 2011), Iyer, da-Rocha-Lopes, Peydró and Schoar (RFS 2014)

- ,, Cross border spillovers of funding shocks
  - ⋯ Cetorelli and Goldberg (IMF ER 2011, A E R P&P 2012), Claessens and van Horen (JFP 2013), De Haas and van Lelyveld (JMCB 2014), Albertazzi and Bottero (JIE 2014), Ongena, Peydro and van Horen (IMF ER2015),...

- ,, Heterogeneity in credit reduction
  - ⋯ **Between foreign-domestic portfolio** (Giannetti and Laeven (JFE 2012))
  - ⋯ **Within foreign portfolio** (De Haas and van Horen (RFS 2013), Liberti and Sturgess, 2016)
  - ⋯ **Within domestic credit portfolio? ⇒ THIS PAPER**

Motivation: Are all borrowers equal?

1. **Sector presence?** (bank's share in a sector)

   ⋯ Higher presence → market power → higher interest rates

   ⋯ **Rent extraction** (Klein (1971), Monti (JMCB 1972))

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   ⋯ Important role for loan portfolio diversification in banking literature
   (e.g. Diamond (REStud 1984), Winton (1999))

   ⋯ Superior information → better screening → lower monitoring costs

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3. **Firm characteristics: risk, size and age?**

   ⋯ Higher likelihood of repayment

   ⋯ Flight to quality

Main findings

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- Does bank funding affect credit supply? **YES!**

  - A 9.2 percent shock (sample average) leads to a 2.3 percentage points decrease in loan growth

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..., A 9.2 percent shock (sample average) leads to a 2.3 percentage points decrease in loan growth

.,. Are all borrowers equal? **NO!**

..., Firms can partly offset credit rationing by

1. matching with a **bank with larger sector presence**
(std. ⇑ reduces impact by 20%)

2. matching with a **bank with larger sector specialization**
(std. ⇑ reduces impact by 13%)

3. **improving** their **financial characteristics**
(std. ⇑ reduces impact by 10%)

Data

- .,. Bank-firm-level credit data: Central Corporate Credit Register
- .,. Bank data: Regulatory Bank Balance Sheets and Income Statements
- .,. Firm data: Central Balance Sheet Office
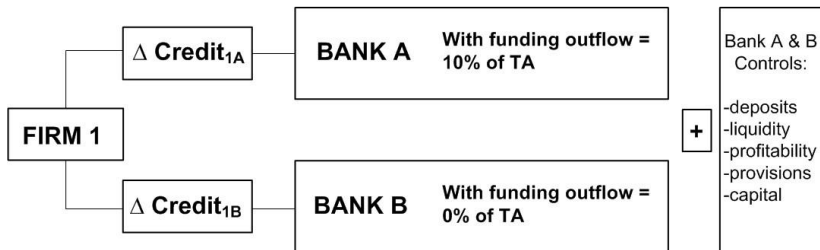   - $\Rightarrow$ 1 year before and after the Lehman collapse in Belgium

Data

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$$CREDIT_{bf} = \quad \beta_1 \ Sector \ Presence_{bs} * \Delta\% \ Funding_b$$
$$+ \ \beta_2 \ Sector \ Specialization_{bs} * \Delta\% \ Funding_b$$
$$+ \ \beta_3 \ Sector \ Presence_{bs} + \beta_4 \ Sector \ Specialization_{bs} + \alpha_{LSS} + \upsilon_b + E_{bf}$$

Empirical setup

➜ **We isolate credit supply** (from credit demand) by investigating how *banks with different degrees of funding outflow* changed their lending towards *the same firm*

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$$+ \beta_3 \, Sector \, Presence_{bs} + \beta_4 \, Sector \, Specialization_{bs} + \alpha_{LSS} + \upsilon_b + E_{bf}$$

$$CREDIT_{bf} = \text{4 measures of bank-firm level credit growth}$$

$$\Delta\% \, Funding_b = \frac{[\text{post shock funding - pre shock funding}]}{\text{pre shock total assets}}$$

$$Sector \, Presence_{bs} = \frac{\text{pre shock credit granted to sector s by bank b}}{\text{pre shock total credit granted to sector s}}$$

$$Sector \, Specialization_{bs} = \frac{\text{pre shock credit granted to sector s by bank b}}{\text{pre shock total credit granted by bank b}}$$

Bank sector presence
= the importance of a bank for a sector

Bank sector specialization
= the importance of a sector for a bank

Table 1: Variable definition

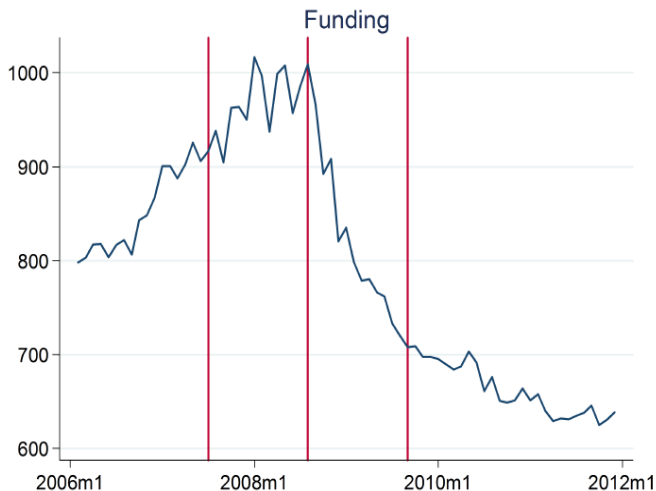|	
CREDIT VARIABLES	
$\Delta\%$ Credit$_{bf}$	natural logarithm of time averaged credit granted post shock - natural logarithm of time averaged credit granted pre shock
Increase in credit$_{bf}$	A dummy = 1 if $\Delta\%$ Credit$_{bf}$ > 0, and 0 otherwise
Large decrease in credit$_{bf}$	A dummy = 1 if $\Delta\%$ Credit$_{bf}$ is in the lowest quartile of the distribution, and 0 otherwise
New relationships$_{bf}$	A dummy = 1 if a bank-firm pair exists in 2009m9 but not yet in 2008m8, and 0 otherwise
BANK VARIABLES	
$\Delta\%$ Funding$_{b}$	[(time averaged interbank liabilities + deposits post shock) - (time averaged interbank liabilities + deposits pre shock)] / time averaged total assets pre shock
Capital to total assets$_{b}$	time averaged common equity pre shock / time averaged total assets pre shock
Return on equity$_{b}$	time averaged quarterly return on average equity pre shock
Provision to total loans$_{b}$	time averaged net flow of new impairment for credit losses expressed as a percentage of time-averaged total loans pre shock
Interbank assets to total assets$_{b}$	time averaged interbank assets pre shock / time averaged total assets pre shock
Deposits to total assets$_{b}$	time averaged demand and savings deposits pre shock / time averaged total assets pre shock
Interbank liabilities to total assets$_{b}$	time averaged interbank liabilities pre shock / time averaged total assets pre shock
Bank size$_{b}$	natural logarithm of time averaged total assets pre shock
BANK-SECTOR VARIABLES	
Sector presence$_{bs}$	time averaged total credit granted pre shock by bank b in sector s / time averaged total credit granted pre shock in sector s
Sector specialization$_{bs}$	time averaged total credit granted pre shock by bank b in sector s / time averaged total credit granted pre shock by bank b
FIRM VARIABLES	
Total assets$_{f}$	pre shock natural logarithm of total assets
Age$_{f}$	pre shock number of years since incorporation
Leverage$_{f}$	pre shock total debt / pre shock total assets
Pledged collateral to fixed assets$_{f}$	pre shock pledged collateral / pre shock tanbible fixed assets
Financial Pressure$_{f}$	pre shock total interest payments / pre shock EBIT
$\Delta\%$ Fixed assets$_{f}$	(post shock tangible fixed assets - pre shock tangible fixed assets) / pre shock total assets
$\Delta\%$ Assets$_{f}$	(post shock total assets - pre shock total assets) / pre shock total assets

Figure 1: The funding shock and its impact: aggregate statistics

This figure depicts the evolution of the aggregate volume (all banks active in Belgium, in billion euro) of bank funding (interbank liabilities + deposit funding) over the period 2006:1 - 2011:12. The vertical lines correspond to the estimation window (pre-shock window and post-shock-window of thirteen months) around the shock in August 2008, the month prior to the collapse of Lehman Brothers

Funding shocks and credit supply

| | (1) | (2) | (3) | (4) |
| | | Increase in | Large decrease | New |
	$\Delta\%$ Credit$_{bf}$	credit$_{bf}$	in credit$_{bf}$	relationships$_{bf}$
Panel A				
$\Delta\%$ Funding$_b$	0.259***	0.267*	-0.355***	0.218**
	(0.0806)	(0.135)	(0.130)	(0.101)
Bank controls	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	47,205	47,205	47,205	59,951
R-squared	0.455	0.463	0.481	0.489
Panel B				
$\Delta\%$ Funding$_b$				
Bank controls Location-sector-size FE				
Observations				
R-squared				

Bank clustered standard errors in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1

Funding shocks and credit supply

	(1) $\Delta\%$ Credit$_{bf}$	(2) Increase in credit$_{bf}$	(3) Large decrease in credit$_{bf}$	(4) New relationships$_b$ f
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Panel B				
$\Delta\%$ Funding$_b$				
Bank controls	YES	YES	YES	YES
Location-sector-size FE	YES	YES	YES	YES
Observations	160,224	160,224	160,224	188,800
R-squared				

Bank clustered standard errors in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1
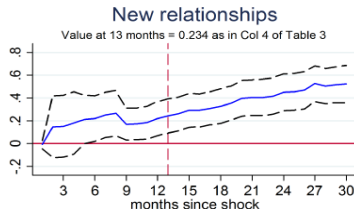
Funding shocks and credit supply

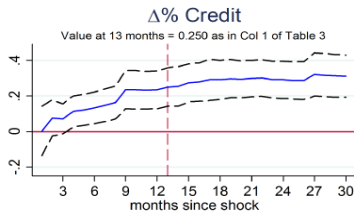|	(1)	(2)	(3)	(4)
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Bank controls	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	47,205	47,205	47,205	59,951
R-squared	0.455	0.463	0.481	0.489
Panel B				
Δ% Funding$_{b}$	0.250***	0.316*	-0.480***	0.234**
	(0.0653)	(0.156)	(0.112)	(0.0912)
Bank controls	YES	YES	YES	YES
Location-sector-size FE	YES	YES	YES	YES
Observations	160,224	160,224	160,224	188,800
R-squared	0.295	0.276	0.289	0.244

Bank clustered standard errors in parentheses. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$

Figure 2: Timing of the funding shock pass-through

This graph illustrates the impact of the total funding shock on the four credit supply indicators: $\Delta\%$ Credit$_{bf}$, Increase in credit$_{bf}$, Large decrease in credit$_{bf}$, and New relationships$_{bf}$. We plot the coefficients and 90% confidence bounds (dashed lines) for the effect of a shock to bank funding ($\Delta\%$ Funding$_b$). The coefficients plotted are obtained from 30 separate estimations. The estimations differ from each other in terms of the length of the post-shock horizon, which expands from one to 30 months post Lehman, whereas the pre-shock horizon remains fixed at thirteen months. The x-axis indicates the sample length after the Lehman failure. The coefficients at month thirteen coincide with the results reported in panel A of Table 3.

Impact of $\Delta\%$ Funding on ...

Funding shock impact and credit reallocation

$$CREDIT_{bf} = \beta_1 \; Sector \; Presence_{bs} * \Delta\% \; Funding_b + \beta_2 \; Sector \; Specialize_{bs} * \Delta\% \; Funding_b$$

$$+ \; \beta_3 \; Sector \; Presence_{bs} + \beta_4 \; Sector \; Specialize_{bs} + \alpha_f + \upsilon_b + E_{bf}$$

	(1) $\Delta\%$ Credit$_{bf}$	(2) $\Delta\%$ Credit$_{bf}$	(3) Increase in credit$_{bf}$	(4) Large decrease in credit$_{bf}$	(5) New relationships$_{bf}$
$\Delta\%$ **Funding**$_b$	**0.250*****				
	(0.065)				
Sec presence$_{bs}$ * $\Delta\%$ **Fund**$_b$		**-0.612*****	**-1.130*****	**1.043*****	**0.290****
		(0.175)	(0.237)	(0.304)	(0.134)
Sec specialize$_{bs}$ * $\Delta\%$ **Fund**$_b$		**-0.210*****	**-0.529*****	**0.539*****	**0.177**
		(0.076)	(0.170)	(0.106)	(0.142)
Bank FE	NO	YES	YES	YES	YES
Bank Controls	YES	NO	NO	NO	NO
Location-sector-size FE	YES	YES	YES	YES	YES
Observations	160,224	160,224	160,224	160,224	188,827
R-squared	0.295	0.298	0.282	0.292	0.248

Bank clustered standard errors in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1

Funding shock impact and credit reallocation

$$CREDIT_{bf} = \beta_1\ Sector\ Presence_{bs} * \Delta\%\ Funding_b + \beta_2\ Sector\ Specialize_{bs} * \Delta\%\ Funding_b$$
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Sec specialize$_{bs}$ * $\Delta\%$ **Fund**$_b$		-0.210*** (0.076)	-0.529*** (0.170)	0.539*** (0.106)	0.177 (0.142)
Bank FE	NO	YES	YES	YES	YES
Bank Controls	YES	NO	NO	NO	NO
Location-sector-size FE	YES	YES	YES	YES	YES
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- .,. std. ⇑ in **sector presence** reduces impact average funding shock with 20% (2.5% ⇒ 2.0%)

- .,. std. ⇑ in **sector specialization** reduces impact average funding shock with 13% (2.5% ⇒ 2.18%)

Rent extraction

Table: Sector presence, sector specialization and rent seeking

VARIABLES	(1)	(2)	(3)
	Debt burden$_f$	Debt burden$_f$	Debt burden$_f$
Sector presence$_{bs}$	0.0444**	0.0408*	0.0347*
	(0.0218)	(0.0235)	(0.0188)
Sector specialization$_{bs}$	0.00447	-0.000661	0.0126
	(0.0296)	(0.0253)	(0.0280)
Observations	89,986	89,986	89,986
R-squared	0.186	0.221	0.222
Location-sector-size FE	Yes	Yes	Yes
Firm Controls	No	Yes	Yes
Bank Controls	No	No	Yes

Figure 3: Timing reallocation effects: bank sector presence and specialization

This graph displays the timing and magnitude of the reallocation across sectors. The panels contain information on the interaction effect of the total funding shock and either the banks' sector presence or the banks' sector specialization. We plot the coefficients and 90% confidence bounds (dashed lines) for the interaction coefficients obtained from 30 separate estimations. The estimations differ from each other in terms of the length of the post-shock horizon, which expands from one to 30 months post Lehman, whereas the pre-shock horizon remains fixed at thirteen months. The coefficients at month thirteen coincide with the results reported in column 6 of Table 6.

Impact of Interaction of Δ% Funding with
Bank Sector Presence
Value at 13 months = -0.520 as in Col 6 of Table 5

Impact of Interaction of Δ% Funding with
Bank Sector Specialization
Value at 13 months = -0.252 as in Col 6 of Table 5
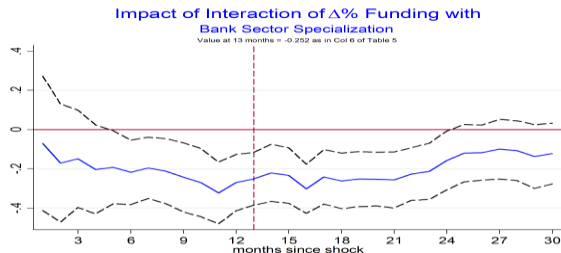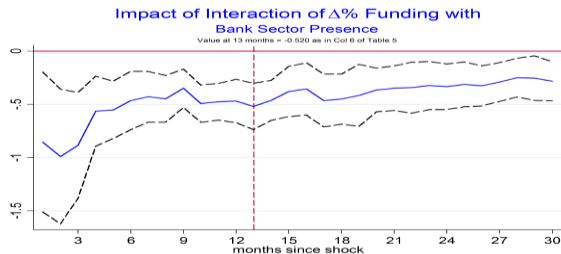
" What role for firm risk, size and age? Further redistribution?

" What about the real impact for firms?

Further channels and implications

	RISK REALLOCATION	REAL EFFECTS	
	(1)	(2)	(3)
	Δ **% Credit**$_{bf}$	Δ% **Fixed assets**$_f$	Δ% **Assets**$_f$
Δ% **Funding**$_b$			
Sec presence$_{bs}$ * Δ% **Funding**$_b$	-0.520***		
	(0.132)		
Sec specialization$_{bs}$ * Δ% **Funding**$_b$	-0.252***		
	(0.081)		
Total assets$_f$ * Δ% Funding$_b$	0.003		
	(0.021)		
Age$_f$ * Δ% Funding$_b$	0.001		
	(0.001)		
Leverage$_f$ * Δ% Funding$_b$	0.102***		
	(0.031)		
Pledged collateral$_f$ * Δ% Funding$_b$	0.020***		
	(0.006)		
Financial pressure$_f$ * Δ% Funding$_b$	0.033***		
	(0.011)		
Observations	141,364		
R-squared	0.368		
Firm controls	YES		
Bank FE	YES		
Location-sector-size FE	YES		
Sector FE	NO		

Robust standard errors in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1

Further channels and implications

| | RISK REALLOCATION | REAL EFFECTS | |
| | (1) | (2) | (3) |
	Δ % **Credit**$_{bf}$	Δ% **Fixed assets**$_f$	Δ% **Assets**$_f$
Δ% **Funding**$_b$		**0.730****	**0.771***
		(0.311)	(0.454)
Sec presence$_{bs}$ * Δ% **Funding**$_b$	**-0.520*****	**-0.517***	**-0.549**
	(0.132)	(0.264)	(0.335)
Sec specialization$_{bs}$ * Δ% **Funding**$_b$	**-0.252*****	-0.004	0.170
	(0.081)	(0.106)	(0.156)
Total assets$_f$ * Δ% Funding$_b$	0.003	**-0.044****	**-0.053***
	(0.021)	(0.020)	(0.030)
Age$_f$ * Δ% Funding$_b$	0.001	-0.002	-0.001
	(0.001)	(0.001)	(0.001)
Leverage$_f$ * Δ% Funding$_b$	**0.102*****	-0.108	-0.095
	(0.031)	(0.089)	(0.120)
Pledged collateral$_f$ * Δ% Funding$_b$	**0.020*****	-0.006	-0.012
	(0.006)	(0.015)	(0.016)
Financial pressure$_f$ * Δ% Funding$_b$	**0.033*****	-0.006	-0.011
	(0.011)	(0.011)	(0.024)
Observations	141,364	114,436	114,436
R-squared	0.368	0.157	0.341
Firm controls	YES	YES	YES
Bank FE	YES	NO	NO
Location-sector-size FE	YES	NO	NO
Sector FE	NO	YES	YES

Robust standard errors in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1

Robustness

What about potential bias due to correlation of sector position with alternative explanations?

- .,. Bank fixed effects rule out bank specific events (e.g. bank re-capitalizations).

- .,. Control for average loan maturity of a bank in a given sector (share $\geq$ 1y).

- .,. Control for geographical specialization and presence (provincial level).

- .,. Control for bank-firm relationships: length of relationship and main bank.

Robustness

What about potential bias due to correlation of sector position with alternative explanations?

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Alternative shock definitions?

- ,,, Interbank liabilities shock or net funding shock.

- ,,, Change the length of the shock from 1 month to 30 months.

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Alternative shock definitions?

- „ Interbank liabilities shock or net funding shock.

- „ Change the length of the shock from 1 month to 30 months.

$\Rightarrow$ **Reallocation based on sector presence, sector specialization and firm risk is very robust.**
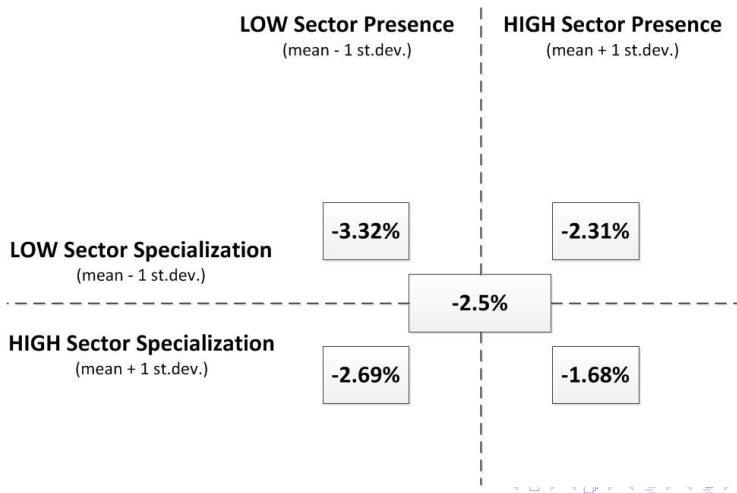
Conclusions

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Conclusions

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Impact of a 10% funding outflow on credit growth

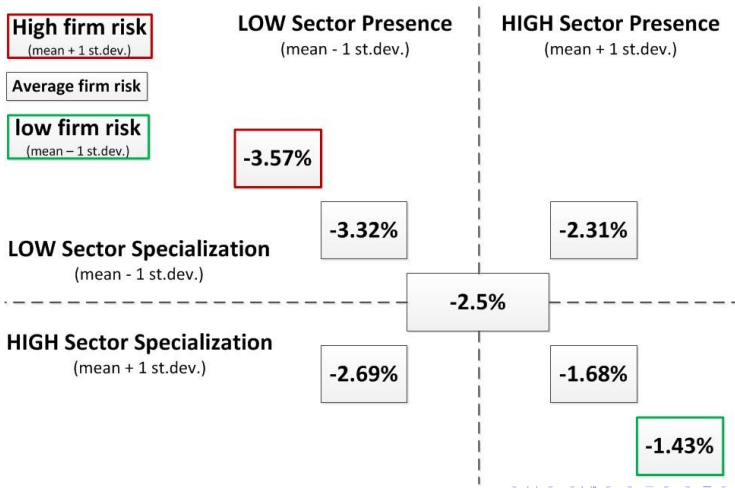|	**LOW Sector Presence** (mean - 1 st.dev.)	**HIGH Sector Presence** (mean + 1 st.dev.)
LOW Sector Specialization (mean - 1 st.dev.)	**-3.32%**	**-2.31%**
	-2.5%	
HIGH Sector Specialization (mean + 1 st.dev.)	**-2.69%**	**-1.68%**

Conclusions

- Does bank funding affect credit supply? **YES!**
- Are all borrowers equal? **NO!**

Impact of a 10% funding outflow on credit growth

	LOW Sector Presence (mean - 1 st.dev.)	HIGH Sector Presence (mean + 1 st.dev.)

High firm risk (mean + 1 st.dev.)

Average firm risk

low firm risk (mean – 1 st.dev.)

-3.57%

LOW Sector Specialization (mean - 1 st.dev.)

-3.32%   -2.31%

-2.5%

HIGH Sector Specialization (mean + 1 st.dev.)

-2.69%   -1.68%

-1.43%

Policy Implications

- ⁙ Bank market power and credit supply

  - ⁘ Higher cost of credit/lower credit volumes

    Stability of access to credit in times of crisis

  - ⁘ Focus on geographical dimension

    Focus on sectoral dimension

- ⁙ Lending concentration and credit supply (Basel Committee, 2006)

  - ⁘ Portfolio concentration limits

    Having sufficient information

- ⁙ Design of SME lending guarantee programs