Trade Shocks and Credit Reallocation

Stefano Federico[1]   Fadi Hassan[2]   Veronica Rappoport[3]

[1]Bank of Italy

[2]Bank of Italy and CEP

[3]LSE, CEP and CEPR

Macroeconomic Implications of Trade Policies and Trade Shocks

PIIE and Clausen Center
Berkeley, February 2020

Starting point: a classical question in economics

- How does trade liberalization affect welfare and economic activity?

- One of the key sources for gains from trade is the reallocation channel.

- There is large evidence in the literature of frictions of labor mobility across regions and sectors that hinder the reallocation channel and the gains from trade.

- We contribute to this debate by analysing a novel friction that can affect the reallocation channel and gains from trade: the allocation of credit.

Starting point: a classical question in economics

- How does trade liberalization affect welfare and economic activity?

- One of the key sources for gains from trade is the reallocation channel.

- There is large evidence in the literature of frictions of labor mobility across regions and sectors that hinder the reallocation channel and the gains from trade.

- We contribute to this debate by analysing a novel friction that can affect the reallocation channel and gains from trade: the allocation of credit.

Starting point: a classical question in economics

- How does trade liberalization affect welfare and economic activity?

- One of the key sources for gains from trade is the reallocation channel.

- There is large evidence in the literature of frictions of labor mobility across regions and sectors that hinder the reallocation channel and the gains from trade.

- We contribute to this debate by analysing a novel friction that can affect the reallocation channel and gains from trade: the allocation of credit.

Starting point: a classical question in economics

- How does trade liberalization affect welfare and economic activity?

- One of the key sources for gains from trade is the reallocation channel.

- There is large evidence in the literature of frictions of labor mobility across regions and sectors that hinder the reallocation channel and the gains from trade.

- We contribute to this debate by analysing a novel friction that can affect the reallocation channel and gains from trade: the allocation of credit.

Research question

- What happens to credit allocation in the aftermath of a trade shock and how does this relate to the reallocation channel?

- There is going to be an effect

    - on the demand of credit

    - on the supply of credit as the trade shock can affect banks through the firms they are related to.

- Credit matters both for working capital and investments, so it contributes to the reallocation of both labor and physical capital.

- Looking at banks and credit is key to better understand short-medium term frictions that may harm gains from trade.

Research question

- What happens to credit allocation in the aftermath of a trade shock and how does this relate to the reallocation channel?

- There is going to be an effect
  - ▶ on the demand of credit
  - ▶ on the supply of credit as the trade shock can affect banks through the firms they are related to.

- Credit matters both for working capital and investments, so it contributes to the reallocation of both labor and physical capital.

- Looking at banks and credit is key to better understand short-medium term frictions that may harm gains from trade.

Research question

- What happens to credit allocation in the aftermath of a trade shock and how does this relate to the reallocation channel?

- There is going to be an effect
  - on the demand of credit
  - on the supply of credit as the trade shock can affect banks through the firms they are related to.

- Credit matters both for working capital and investments, so it contributes to the reallocation of both labor and physical capital.

- Looking at banks and credit is key to better understand short-medium term frictions that may harm gains from trade.

Research question

- What happens to credit allocation in the aftermath of a trade shock and how does this relate to the reallocation channel?

- There is going to be an effect
  - on the demand of credit
  - on the supply of credit as the trade shock can affect banks through the firms they are related to.

- Credit matters both for working capital and investments, so it contributes to the reallocation of both labor and physical capital.

- Looking at banks and credit is key to better understand short-medium term frictions that may harm gains from trade.

What we do (in a nutshell):

- We take the entry of China into the WTO as an exogenous shock to Italy.

- We measure firms' exposure to import competition from China according to the sector they operate, as in Autor et al. (2013).

- We define banks' exposure to the China shock according to the portfolio composition of loans on the onset of the shock.

- We identify the effects on the *supply* of credit distinguishing between firms that should shrink or expand and estimate the real effects of this bank lending channel.

We find that:

- More exposed banks supply less credit to both expected losers and "winners" from trade liberalization.

- There are endogenous financial constraints arising from trade liberalization that we were not aware of and that hinder the reallocation channel.

- The lower credit supply has real effects on firms' employment, investments and revenues and relevant aggregate effects.

- Main channel is the increase in non-performing loans that erodes the core capital of exposed banks, undermining their lending capacity.

We find that:

- More exposed banks supply less credit to both expected losers and "winners" from trade liberalization.

- There are endogenous financial constraints arising from trade liberalization that we were not aware of and that hinder the reallocation channel.

- The lower credit supply has real effects on firms' employment, investments and revenues and relevant aggregate effects.

- Main channel is the increase in non-performing loans that erodes the core capital of exposed banks, undermining their lending capacity.

We find that:

- More exposed banks supply less credit to both expected losers and "winners" from trade liberalization.

- There are endogenous financial constraints arising from trade liberalization that we were not aware of and that hinder the reallocation channel.

- The lower credit supply has real effects on firms' employment, investments and revenues and relevant aggregate effects.

- Main channel is the increase in non-performing loans that erodes the core capital of exposed banks, undermining their lending capacity.

We find that:

- More exposed banks supply less credit to both expected losers and "winners" from trade liberalization.

- There are endogenous financial constraints arising from trade liberalization that we were not aware of and that hinder the reallocation channel.

- The lower credit supply has real effects on firms' employment, investments and revenues and relevant aggregate effects.

- Main channel is the increase in non-performing loans that erodes the core capital of exposed banks, undermining their lending capacity.

Related literature
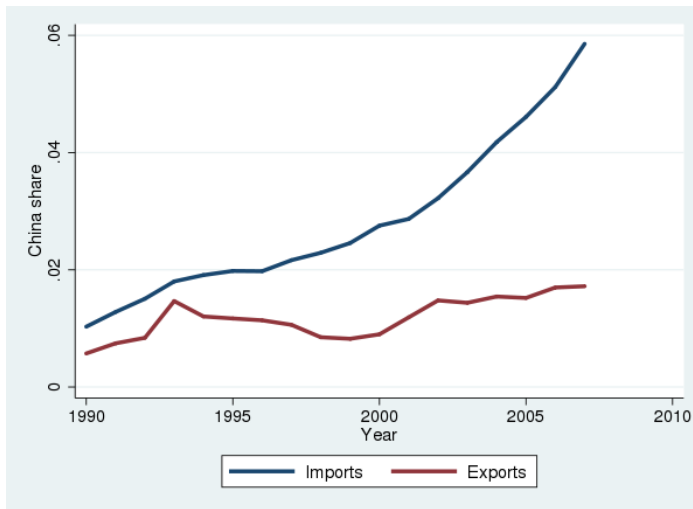
- Adjustment to trade shocks (e.g. 'China shock' or trade liberalization)
    - Workers: Menezes-Filho and Muendler (2011), Autor et al. (QJE 2014), Dix-Carneiro (ECTA 2014), Pierce and Schott (AER, 2016), Acemoglu et al. (JLE 2016), Utar (REStat 2018).
    - Local markets: Topalova (AEJ-AE 2010), Kovak (AER 2013), Hakobyan and McLaren (REStat 2016), Dix-Carneiro and Kovak (AER 2017).
    - "Capital": Antras and Caballero (JPE 2009), Lanteri et al. (2019).
- Credit and trade
    - Credit constraints and exports: Manova (JIE 2008), Amiti and Weinstein (QJE 2011), Minetti and Zhu (JIE 2011), Manova (REStud 2012), Chor and Manova (JIE 2012), Paravisini et al. (REStud 2015), Antras and Foley (JPE 2015).
- Credit shocks and real outcomes
    - From banks to firms: Khwaja and Mian (AER 2008), Paravisini (JF 2008), Amiti and Weinstein (QJE 2011), Schnabl (JF 2012), Chodorow-Reich (QJE 2014), Paravisini et al. (REStud 2015), Cingano et al. (RFS 2016), Amiti and Weistein (JPE 2017).
    - Trasmission of liquidity shocks across markets: Gilje et al. (JF 2016), Romero Cortees and Strahan (JFE 2017), Bustos et al. (2017).
- Banking
    - Loan portfolio management by banks: Froot et al. (JF 1993), Froot and Stein (JFE 1998), Holmstrom and Tirole (QJE 1998), Deyoung et al. (JF 2015).

Outline

1. Background and Measurement

2. Identification

3. Results

4. Mechanism

The China Shock in Italy

Measurement: firms and banks' exposure to China

- Sectoral (4-digit) measure of exposure to the China shock, change in imports 2002-07 vs. 1994–2001:

$$China\ Exposure_s^{IT} = \frac{\Delta M_s^{IT-CH}}{L_{s,1991}^{IT}}$$

- Definition of treated firm:

$$D_s^{IT} = \begin{cases} 1, & \text{if } China\ Exposure_s^{IT} > Median \\ 0, & \text{otherwise} \end{cases}$$

- We measure the bank exposure to the China shock as the share of loans to treated firms in the period 1998-2000 (before China entrance in the WTO):

$$Bank\ Exposure_b^{IT} = \frac{\sum_i C_{ib} D_{is}^{IT}}{\sum_i C_{ib}}$$

Measurement: firms and banks' exposure to China

- Sectoral (4-digit) measure of exposure to the China shock, change in imports 2002-07 vs. 1994-2001:

$$China\ Exposure_s^{IT} = \frac{\Delta M_s^{IT-CH}}{L_{s,1991}^{IT}}$$

- Definition of treated firm:

$$D_{is}^{IT} = \begin{cases} 1, & \text{if } China\ Exposure_s^{IT} > \text{Median} \\ 0, & \text{otherwise} \end{cases}$$

- We measure the bank exposure to the China shock as the share of loans to treated firms in the period 1998-2000 (before China entrance in the WTO):

$$Bank\ Exposure_b^{IT} = \frac{\sum_i C_{ib} D_{is}^{IT}}{\sum_i C_{ib}}$$

Measurement: firms and banks' exposure to China

- Sectoral (4-digit) measure of exposure to the China shock, change in imports 2002-07 vs. 1994-2001:

$$China\ Exposure_s^{IT} = \frac{\Delta M_s^{IT-CH}}{L_{s,1991}^{IT}}$$

- Definition of treated firm:

$$D_{is}^{IT} = \begin{cases} 1, & \text{if } China\ Exposure_s^{IT} > \text{Median} \\ 0, & \text{otherwise} \end{cases}$$

- We measure the bank exposure to the China shock as the share of loans to treated firms in the period 1998-2000 (before China entrance in the WTO):

$$Bank\ Exposure_b^{IT} = \frac{\sum\limits_i C_{ib} D_{is}^{IT}}{\sum\limits_i C_{ib}}$$

◂ How banks should react

Measurement: firms and banks' exposure to China, instrument

- Classical instrument based on imports of other advanced countries:

$$China\ Exposure_s^{OC} = \frac{\Delta M_s^{OC-CH}}{L_{s,1991}^{IT}}$$

- Definition of treated firm:

$$D_{is}^{OC} = \begin{cases} 1, & \text{if } China\ Exposure_s^{OC} > \text{Median} \\ 0, & \text{otherwise} \end{cases}$$

- Instrumented bank exposure:

$$Bank\ Exposure_b^{OC} = \frac{\sum\limits_i C_{ib} D_{is}^{OC}}{\sum\limits_i C_{ib}}$$

Bank exposure, density distribution

Density distribution bank exposure

kernel = epanechnikov, bandwidth = 0.0512
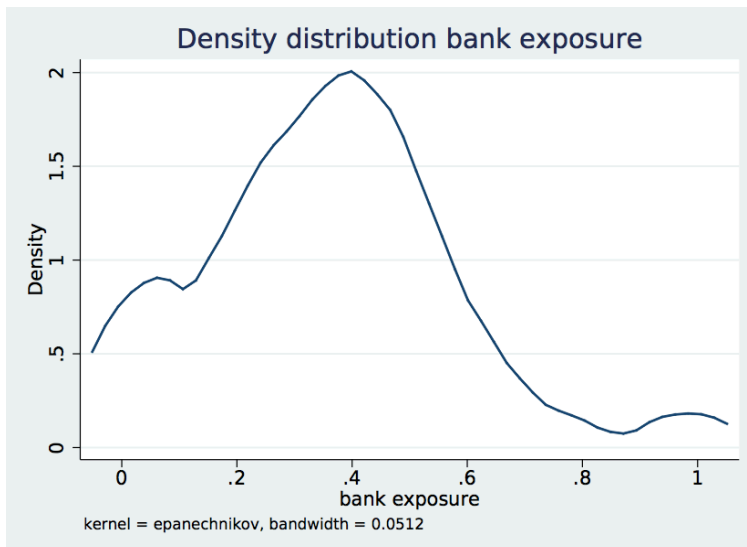
Banking sector's characteristics

Table: Sample summary

# Banks per year	560
Share of firms with multiple banking	73%
# Banking relations per firm	4.3
Average outstanding credit per firm	493,000 Euro

Share of credit to NFCs by type of bank:	
Private	69%
Foreign	5%
Cooperative	23%
Mutual	3%

Aggregate credit, exposed vs. non-exposed banks
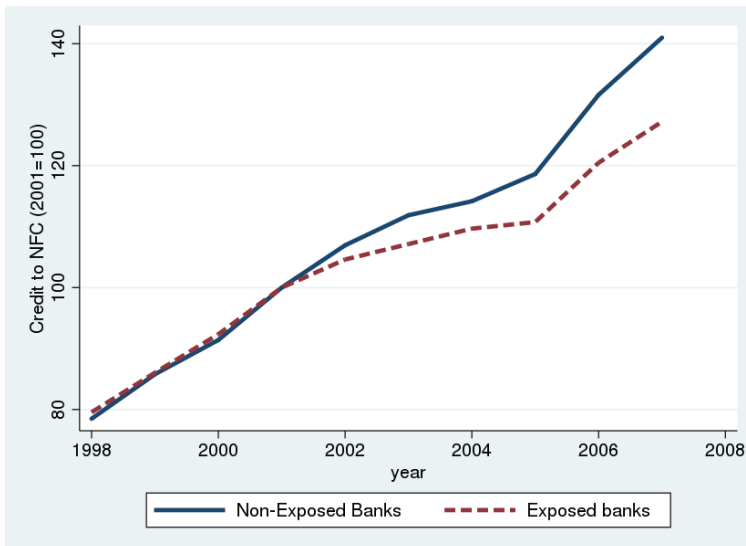
Aggregate credit, exposed vs. non-exposed banks & treated vs. non-treated firms
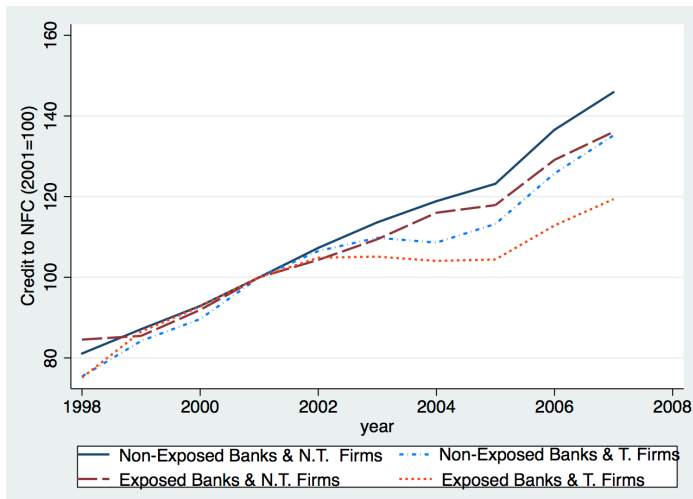
Identification

Empirical strategy

1. Identifying the effect of bank exposure on the supply of credit:

- Intensive margin (credit between existing bank-firm relations)

- Extensive margin (probability to start/end a new bank-firm relation)

- Aggregate credit (combining both margins and looking at total credit by firm)

Baseline specification: intensive margin

$$\ln C_{ibt} = \beta_1 \ Exp^{IT}_{-i,b} \times Post_t + \beta_2 \ Spec_{bst} + X'_b \delta \times Post_t + \gamma_{ib} + \alpha_{it} + \epsilon_{ibt}$$

- γ_{ib} is a set of firm-bank fixed effects to capture any time-invariant aspect that affects credit (e.g. relational banking).

- α_{it} is a set of firm-year fixed effect that capture any factor that can affect the demand of credit.

- $Spec_{bst}$ is a dummy equal to 1 if a firm operates in a sector where a bank is specialized in. This accounts for the fact that that demand shocks may not be equally distributed (in expectation) across banks (Paravisini et al. 2017)

- X_b: is a set of bank controls including log-assets, share of NPLs, share of core funding, and capital ratio, 1998-2000 average.

- Errors double-clustered at the bank-sector (2 digits) level.

Baseline specification: intensive margin across winners and losers

$$\ln C_{ibt} = \sum_d \beta_{1d} \; D_{di} \times \; Exposure^{IT}_{-i,b} \times Post_t + \beta_2 \; Spec_{ibt} + X'_b \delta \times Post_t + \alpha_{it} + \gamma_{ib} + \epsilon_{ibt}$$

Alternative groups definition:

- Control and treated firms defined by sectoral exposure to China (below and above median).
- Comparative advantage and disadvantage (by control and treated firms).
- High and low productivity firms (by control and treated firms).
- Services vs. manufacturing.

Extensive margin

Aggregate credit: can firms hedge bank-specific shocks?

- It may be the case that firms can compensate the lower credit they get from an exposed bank, with credit from non-exposed banks.

- To check this we construct a measure of firm exposure to the bank lending channel as a weighted average of its lenders' exposure:

$$Exposure\ Firm_i = \sum_b Exp^{IT}_{-i,b} \ \frac{Credit_{ib}}{Total\ Credit_i}$$

$$\ln C_{ist} = \beta_1\ Exposure\ Firm_i \times Post_t + X'_i \delta \times Post_t + \hat{\alpha}_{it} + \gamma_i + \hat{\delta}_{st} + \epsilon_{ist}$$

- Errors double-clustered at the sector-main bank level.

Aggregate credit: can firms hedge bank-specific shocks?

- It may be the case that firms can compensate the lower credit they get from an exposed bank, with credit from non-exposed banks.

- To check this we construct a measure of firm exposure to the bank lending channel as a weighted average of its lenders' exposure:

$$Exposure \ Firm_i = \sum_b Exp_{-i,b}^{IT} \ \frac{Credit_{ib}}{Total \ Credit_i}$$

$$\ln C_{ist} = \beta_1 \ Exposure \ Firm_i \times Post_t + X_i' \delta \times Post_t + \hat{\alpha}_{it} + \gamma_i + \delta_{st} + \epsilon_{ist}$$

- Errors double-clustered at the sector-main bank level.

Identification challenges

- Italy's exposure to the trade shock

- Isolating credit supply and demand

- Endogeneity and shock randomness

- Confounding factors

Identification challenges (1): endogeneity and randomness of the shock

- Italian imports from China can themselves be influenced by bank credit:
  - ▶ We instrument bank exposure using other advanced countries' imports.
  - ▶ In the regressions, the measure of bank exposure leaves out the credit to that specific firm (and sector).

- Bank exposure to China can be correlated with other bank characteristics that affect the supply of credit.
  - ▶ We run balancing tests on banks and borrowers' characteristics.
  - ▶ We saturate the regressions with a series of controls that capture bank characteristics that may be correlated to exposure to China and affect credit supply at the same time.
  - ▶ We run a dynamic diff-in-diff and find that bank exposure matters only 1-2 years after China entrance in the WTO.

- Anticipation unlikely to affect our results because of i) uncertainty about the trade agreement (Bloom et al. 2016), ii) uncertainty about firms' ability to cope with the shock, iii) stickiness in credit relations.

Identification challenges (1): endogeneity and randomness of the shock

- Italian imports from China can themselves be influenced by bank credit:
  - ▶ We instrument bank exposure using other advanced countries' imports.
  - ▶ In the regressions, the measure of bank exposure leaves out the credit to that specific firm (and sector).

- Bank exposure to China can be correlated with other bank characteristics that affect the supply of credit.
  - ▶ We run balancing tests on banks and borrowers' characteristics. ◀ Go
  - ▶ We saturate the regressions with a series of controls that capture bank characteristics that may be correlated to exposure to China and affect credit supply at the same time.
  - ▶ We run a dynamic diff-in-diff and find that bank exposure matters only 1-2 years after China entrance in the WTO.

- Anticipation unlikely to affect our results because of i) uncertainty about the trade agreement (Bloom et al. 2016), ii) uncertainty about firms' ability to cope with the shock, iii) stickiness in credit relations

Identification challenges (1): endogeneity and randomness of the shock

- Italian imports from China can themselves be influenced by bank credit:
  - ▶ We instrument bank exposure using other advanced countries' imports.
  - ▶ In the regressions, the measure of bank exposure leaves out the credit to that specific firm (and sector).

- Bank exposure to China can be correlated with other bank characteristics that affect the supply of credit.
  - ▶ We run balancing tests on banks and borrowers' characteristics. ◄ Go
  - ▶ We saturate the regressions with a series of controls that capture bank characteristics that may be correlated to exposure to China and affect credit supply at the same time.
  - ▶ We run a dynamic diff-in-diff and find that bank exposure matters only 1-2 years after China entrance in the WTO.

- Anticipation unlikely to affect our results because of i) uncertainty about the trade agreement (Bloom et al. 2016), ii) uncertainty about firms' ability to cope with the shock, iii) stickiness in credit relations.

Identification challenges (2): confounding factors

- We can control for confounding factors from the firm side through firm-year fixed effects (e..g historical trends in external financial needs; declining vs. raising sectors).

- We should worry about shocks to banks that happened at a similar time as China access to the WTO and that can affect the credit allocation of exposed and non-exposed banks.

- We are particularly concerned about:
  - ▸ The raise in cross-border banking that happened in Italy since the end of 2002. ‹ Go ›
  - ▸ The slowdown of GDP growth in 2002-03. ‹ Go ›
  - ▸ The securitization boom. ‹ Go ›

Data source: Bank of Italy

- Credit registry (matched bank-firm data): it covers the universe of loans between Italian banks and firms - as well as households - above 75,000Euro.

- Banks' accounts (Matrice dei Conti): it provides detailed data about banks' liabilities and assets.

- Firm level data: it is the universe of incorporated firms. It includes balance sheet data such as revenues, investment, employment, wage-bill, etc.

Descriptive Statistics

Results

Baseline results: intensive margin

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.078*** (0.008)	-0.11*** (0.014)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.075*** (0.009)	-0.10*** (0.015)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.082*** (0.012)	-0.11*** (0.024)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
		First stage		
AR-Wald test, F		32.1		28.3
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.83	0.83	0.83	0.83

Dynamic effects

Dynamic diff-in-diff (2SLS, 95% C.I.)
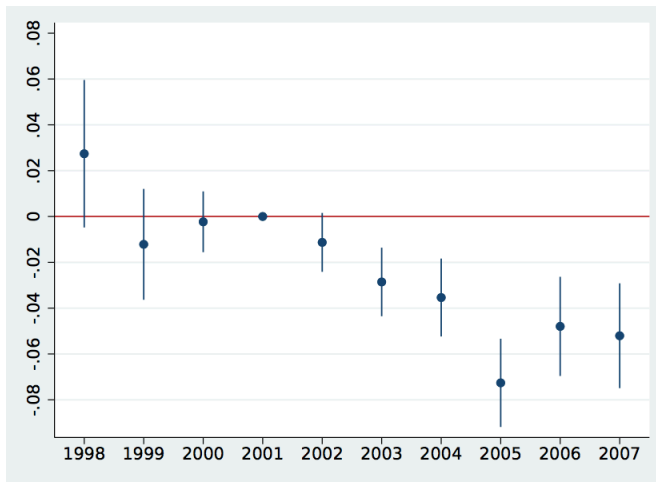
Extended baseline results

- We find a reduction of the relative supply of credit also for the other potential "winners":

  - Control firms in comparative advantage sectors. Go

  - Control firms with high productivity. Go

  - Firms in services. Go

Robustness: alternative measurements and specifications

- Input-output linkages   Go

- Confounding factors   Go

- Exposure defined over total assets   Go

- Exposure defined leaving out firms' sector   Go

- Continuous measure of firms' treatment   Go

- Instrument using US imports only   Go

- Specification in first difference   Go

- Alternative clustering   Go

- Weighted least squares   Go

Geographical dimension

Dependent variable: ln C_{ibt}	High exposed provinces		Low exposed provinces	
	(1)	(2)	(3)	(4)
	Full sample	Treated vs. Control	Full sample	Treated vs. Control
$Exposure^{IT}_{-i,b} \times Post_t$	-0.122***		-0.097***	
	(0.022)		(0.016)	
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$		-0.118***		-0.092***
		(0.02)		(0.019)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$		-0.128***		-0.104***
		(0.039)		(0.025)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-Time F.E.	✓	✓	✓	✓
Firm-Bank F.E.	✓	✓	✓	✓
	First stage			
AR-Wald test, F	26.1	15.8	32.3	16.8
Observations	1,006,653	1,006,653	937,021	937,021
$Adj.R^2$	0.90	0.90	0.90	0.90

Total effect on firms' credit: firms do not compensate from other banks

Dependent: ln C_{it}	(1) Full-sample	(2) Control	Treated	(3) Comparative Adv. Control	(4) High Product. Control	(5) Services
$Exposure_i^{IT} \times Post_t$	-0.083***	-0.071***	-0.096***	-0.068**	-0.093***	-0.12**
	(0.014)	(0.016)	(0.016)	(0.019)	(0.017)	(0.052)
Credit demand	✓	✓	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓	✓	✓
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
			First stage			
AR-Wald test, F	34.3		18.2	10.9	19.2	24.2
Observations	451,145		451,145	400,886	451,145	899,397
$Adj.R^2$	0.96		0.96	0.94	0.95	0.95

Real effects on firms: employment

Dependent: $\ln E_{it}$	(1) Full-sample	(2) Control	Treated	(3) Comparative Adv. Control	(4) High Product. Control	(5) Services
$Exposure_i^{IT} \times Post_t$	-0.082***	-0.061***	-0.11***	-0.064**	-0.12***	-0.039***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
			First stage			
AR-Wald test, F	20.8	11.5		7.4	43.3	19.5
Observations	451,145	451,145		400,886	451,145	899,397
$Adj.R^2$	0.96	0.91		0.92	0.91	0.90

‹ Investments   ‹ Revenues

Aggregate real effects

- Define counterfactual (CF): we fix a counterfactual threshold of firms exposure to the bank lending channel equal to the bottom 10% of firms exposed (as in Chodrow-Reich, 2014).

- For a given outcome Y_{it}, counterfactual is given by:

$$\widehat{Y_{it}^{CF}} - \widehat{Y_{it}} = \widehat{\beta}_1 * (Exposure\ Firm_i^{CF} - Exposure\ Firm_i)$$

- Total losses in sample:

$$Aggr\ Losses = \sum_i (\widehat{Y_{it}^{CF}} - \widehat{Y_{it}})$$

Aggregate real effects

- Aggregate losses in sample (confidence interval)
  - ▶ Employment: between 1.2% and 3.0% per cent of total employment.
  - ▶ About 1/3 coming from control firms and 2/3 from treated firms

- Caveats
  - ▶ Partial equilibrium (total effects equal to the sum of direct effects measured at each firm).
  - ▶ Aggregate effects in sample (not in population).

Mechanism

The underlying mechanism: the role of NPLs
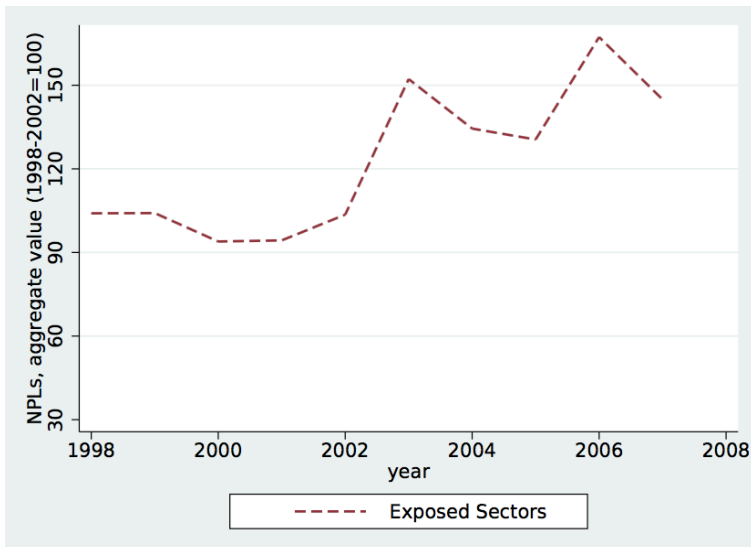
The underlying mechanism: the role of NPLs
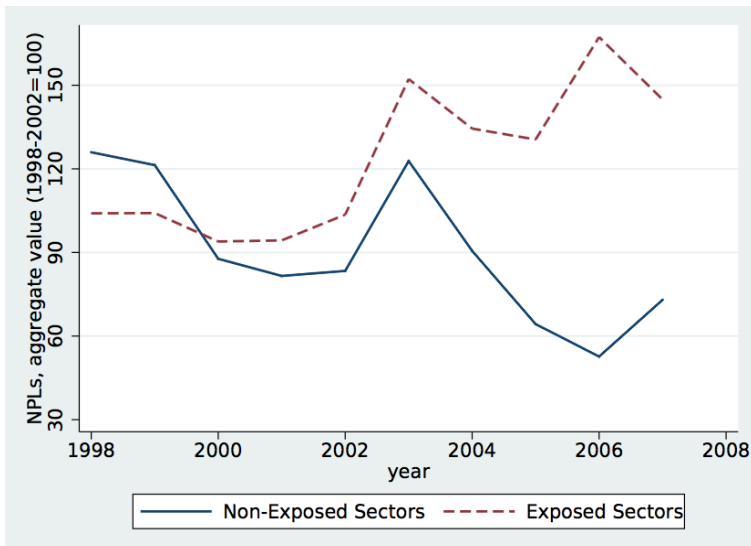
How do NPLs affect the lending activity?

- NPLs can affect the lending activity of banks because of:
    - "Regulatory" constraint (e.g. NPLs erode core capital)

    - Funding constraints (e.g. other banks decrease funding or households and firms reduce their deposits.)

    - Behavioural response

Bank exposure and banks' balance sheet

- We look at the correlation of bank exposure with a series of balance sheet characteristics (NPLs, deposits, interbank funding, and core capital):

$$Y_{bt} = \beta_1 \; Exp_b^{IT} \times Post_t + X_b^{'}\delta \times Post_t + \gamma_b + \alpha_t + \epsilon_{bt}$$

- $X_b^{'}$ is a vector of bank controls pre-shock.

- We instrument Exp_b^{IT} with Exp_b^{OC}.

- Errors clustered at the bank level.

Bank exposure and balance sheet effects

Dependent variable:	(1) NPLs	(2) Core funding	(3) Interbank	(4) Core capital
$Exposure_b^{IT} \times Post_t$	0.03***	-0.01	0.02	-0.034**
	(0.008)	(0.02)	(-0.012)	(-0.015)
Bank controls	✓	✓	✓	✓
Bank F.E.	✓	✓	✓	✓
Time F.E.	✓	✓	✓	✓
	First stage			
K-P Wald rk F	57	57	57	57
Observations	5,014	5,014	5,014	5,014
$Adj.R^2$	0.84	0.84	0.84	0.84

Baseline effects with banks' tier 1 capital ratio

	(1)	(2)	
Dependent variable: ln C_{ibt}	Full-sample	Control firms	Treated firms
$Exposure^{IT}_{-i,b} \times Post_t$	-0.217***	-0.24***	-0.19***
	(0.028)	(0.03)	(0.05)
$Exposure^{IT}_{-i,b} \times Post_t \times Tier\ 1\ Ratio_b$	1.74***	1.98***	1.56**
	(0.37)	(0.42)	(0.68)
$Tier\ 1\ Ratio_b \times Post_t$	0.31	0.15	0.16
	(0.22)	(0.23)	(0.44)
Bank-firm specialization	✓	✓	✓
Bank controls	✓	✓	✓
Firm-time F.E.	✓	✓	✓
Firm.bank F.E.	✓	✓	✓
		First stage	
AR-Wald test, F	20.1	14	
Observations	1,945,334	1,945,334	
$Adj.R^2$	0.87	0.90	

Conclusions

- There are negative spillovers between losers from trade and other firms in the economy that go through banks.

- This is a novel effect and it has important consequence for the reallocation channel of gains from trade.

- We still need to understand better the interaction with other frictions in the economy and think about policy solutions that may mitigate its impact.

- We hope to motivate further theoretical and empirical research on this issue.

Thank You!

The reallocation channel: winners and losers

- Which firms should shrink?

  - Firms and sectors exposed to competition from China (Autor et al., 2013).

- Which firms should expand? (or at least not being negatively affected)

  - Firms in non-exposed sectors (Ricardo-Viner).

    - In particular firms in exporting sectors.

  - More productive firms within sectors (Melitz, 2003).

How should banks reallocate credit? Some theoretical consideration

Case 1:

- Assumption: we are in a world without frictions
  - ▶ Banks can hedge all the risk associated to a loan in the capital markets.
  - ▶ Banks have no costs in raising funds.

- Implication: the MB and the MC of financing a given firm are the same across banks.

- Prediction: we should observe no differential lending behavior between exposed and non-exposed banks.

Case 1:

- Assumption: we are in a world without frictions
  - ▶ Banks can hedge all the risk associated to a loan in the capital markets.
  - ▶ Banks have no costs in raising funds.

- Implication: the MB and the MC of financing a given firm are the same across banks.

- Prediction: we should observe no differential lending behavior between exposed and non-exposed banks.

Case 2:

- Assumptions:
  - ▶ Loans are illiquid (not all risk can be hedged in the capital markets).
  - ▶ Once the China shock materialises, there is uncertainty about firms' adjustment process.

- Implication: banks shift away from assets positively correlated with their net worth.

- Predictions:
  - ▶ Exposed banks *move away from treated firms* more strongly than non-exposed banks.
  - ▶ Exposed banks *move into non-treated firms* more strongly than non-exposed banks.

Case 2:

- Assumptions:
  - ▶ Loans are illiquid (not all risk can be hedged in the capital markets).
  - ▶ Once the China shock materialises, there is uncertainty about firms' adjustment process.

- Implication: banks shift away from assets positively correlated with their net worth.

- Predictions:
  - ▶ Exposed banks *move away from treated firms* more strongly than non-exposed banks.
  - ▶ Exposed banks *move into non-treated firms* more strongly than non-exposed banks.

How should banks reallocate credit? Some theoretical consideration (2)

Case 2:

- Assumptions:
    - ▸ Loans are illiquid (not all risk can be hedged in the capital markets).
    - ▸ Once the China shock materialises, there is uncertainty about firms' adjustment process.

- Implication: banks shift away from assets positively correlated with their net worth.

- Predictions:
    - ▸ Exposed banks *move away from treated firms* more strongly than non-exposed banks.
    - ▸ Exposed banks *move into non-treated firms* more strongly than non-exposed banks.

Case 3:

- Assumption: banks face costly external funding.

  - We are in standard banking models as in Froot et al. (1993); Froot and Stein (1998); Deyoung et al. (2015); Holmstrom and Tirole (1997).

- Implication: if exposed banks that suffer losses cannot rebuild capital without costs and this may harm their lending capacity.

- Prediction: exposed banks may supply less credit to both treated and control firms.

Case 3:

- Assumption: banks face costly external funding.

  ▸ We are in standard banking models as in Froot et al. (1993); Froot and Stein (1998); Deyoung et al. (2015); Holmstrom and Tirole (1997).

- Implication: if exposed banks that suffer losses cannot rebuild capital without costs and this may harm their lending capacity.

- Prediction: exposed banks may supply less credit to both treated and control firms.

How should banks reallocate credit? Some theoretical consideration (3)

Case 3:

- Assumption: banks face costly external funding.

  ▸ We are in standard banking models as in Froot et al. (1993); Froot and Stein (1998); Deyoung et al. (2015); Holmstrom and Tirole (1997).

- Implication: if exposed banks that suffer losses cannot rebuild capital without costs and this may harm their lending capacity.

- Prediction: exposed banks may supply less credit to both treated and control firms.

◂ Go Back

Summary statistics

	Unit	Mean	S.D.	p25	p50	p75
Bank characteristics						
Total Assets	Millions	4,701	36,002	109	229	535
Liquid Assets	% Assets	30.5	14.1	21.8	27.9	37.9
Nonperforming Loans	% Assets	2.6	2.6	1.1	1.9	3.3
Credit to Firms	% Assets	37.6	13.1	28.8	39.3	47.3
Profits	% Assets	1	0.5	0.7	1	1.2
Core capital	% Assets	1.4	3.2	0.01	0.2	1.5
Core Funding	%Liabilities	52.5	17.7	44.4	51.9	64.4
Bank exposure to China	% Loans	35.8	21.8	21.8	35	48
Firm characteristics						
Bank Credit	Millions	0.82	3.74	0.27	0.38	0.57
Revenues	Thousands	4,173	5,673	743	1,751	4,708
Fixed Assets	Thousands	870	1,388	71	258	928
Gross operating margin	% Revenues	7.9	2.4	7.1	7.6	8.3
Credit Score	Units	5.4	0.6	5.1	5.4	5.7

Note: The table reports the relevant statistics (1998-2007, average) of banks and firms in the firm-bank matched sample. Bank balance sheet data are from the Supervisory Reports submitted by banls to the Bank of Italy. Credit data are from the Italian Credit Register. Firm balance sheet data are from CERVED. Liquid assets include cash, interbank deposits, and bond holdings. Core funding refers to deposits. Firm's credit score is computed by CERVED based on past defaults and firms balance sheet information.

‹ Go Back

Balancing tests

	Unit	Exposed Banks Mean	S.D.	Non-exposed banks Mean	S.D.	Normalized difference
Bank characteristics						
Total Assets	Millions	5,780	3,671	3,430	1,228	0.22
Liquid Assets	% Assets	18.5	11.7	19.9	11.9	-0.12
Nonperforming Loans	% Assets	3.2	4.9	3.3	3.5	-0.02
Credit to Firms	% Assets	39.9	13.9	38.0	14.2	0.13
Profits	% Assets	1.5	0.8	1.8	2.4	-0.16
Core capital	% Assets	2.1	5.1	1.6	5.9	0.09
Core Funding	%Liabilities	55.5	19.4	60.3	18.2	-0.25
Borrower characteristics						
Bank Credit	Millions	0.80	2.1	0.84	4.8	-0.01
Revenues	Thousands	5,230	3,780	4,864	3,942	0.09
Fixed Assets	Thousands	1,337	1,050	1,387	1,070	-0.04
Gross operating margin	% Revenues	7.9	6.9	8.3	2.5	-0.07
Credit Score	Units	5.3	0.6	5.4	0.7	-0.09

Note: The table reports the relevant statistics to compute the balance of banks and firms characteristics (1998-2000, average pre China entrance in the WTO) by exposed and non-exposed banks. The last column shows the Normalized difference between the two groups as specified in Imbens and Woolridge (2008); an absolute value above 0.25 indicates an imbalance between the two groups. Exposed (non-exposed) banks have a share of loans to firms subject to competition from China above (below) median over the period 1998-2000.

◂ Go Back

Baseline results: comparative advantage

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Advantage_i$	-0.075*** (0.01)	-0.11*** (0.018)		
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Adv.\ Control_i$			-0.061*** (0.011)	-0.092*** (0.018)
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Adv.\ Treated_i$			-0.083*** (0.016)	-0.095*** (0.03)
$Exposure^{IT}_{-i,b} \times Post_t \times Comp.\ Disadvantage_i$	-0.086*** (0.013)	-0.093*** (0.024)	-0.085*** (0.013)	-0.092*** (0.02)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
		First stage		
AR-Wald test, F		22		15.8
Observations	1,740,734	1,740,734	1,740,734	1,740,734
$Adj.R^2$	0.83	0.83	0.83	0.83

◄ Go Back

Baseline results: productivity

Dependent : ln C_{ibt}	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t \times High\ Productivity_i$	-0.078*** (0.01)	-0.11*** (0.018)		
$Exposure^{IT}_{-i,b} \times Post_t \times High\ Prod.\ Control_i$			-0.066*** (0.011)	-0.115*** (0.018)
$Exposure^{IT}_{-i,b} \times Post_t \times High\ Prod.\ Treated_i$			-0.092*** (0.016)	-0.124** (0.03)
$Exposure^{IT}_{-i,b} \times Post_t \times Low\ Productivity_i$	-0.078*** (0.009)	-0.095*** (0.018)	-0.078*** (0.009)	-0.095*** (0.018)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
		First stage		
AR-Wald test, F		24.8		18.6
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.83	0.83	0.83	0.83

◂ Go Back

Baseline results: services

Dependent : ln C_{ibt}	(1) OLS	(2) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t \times Services_i$	-0.061***	-0.06***
	(0.005)	(0.009)
$Exposure^{IT}_{-i,b} \times Post_t \times Manufacturing_i$	-0.068***	-0.086***
	(0.006)	(0.01)
Bank-firm specialization	✓	✓
Bank controls	✓	✓
Firm-time F.E.	✓	✓
Firm-bank F.E.	✓	✓
Instrument		*First stage*
AR-Wald test, F		18.2
Observations	3,584,419	3,584,419
$Adj.R^2$	0.83	0.83

◂ Go Back

Extensive margin

$$Entry_{ib}^{post} = \beta_1\ Exposure_b + \beta_2\ Spec_{bs} + X_b'\delta + \gamma_i + \epsilon_{ib}$$

$$Exit_{ib}^{post} = \beta_1\ Exposure_b + \beta_2\ Spec_{bs} + X_b'\delta + \gamma_i + \epsilon_{ib}$$

Go Back

Firms entry and exit (2SLS)

Dependent: $Entry_{ib}$ & $Exit_{ib}$	Entry		Exit	
	(1)	(2)	(3)	(4)
$Exposure^{IT}_{-i,b} \times Post_t$	-0.059***		-0.011*	
	(0.008)		(0.005)	
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$		-0.037***		-0.002
		(0.01)		(0.006)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$		-0.086***		-0.021**
		(0.01)		(0.009)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm F.E.	✓	✓	✓	✓
Time F.E.	✓	✓	✓	✓
	First stage			
AR-Wald test, F	44.8	24.1	3.6	2.5
Observations	416,549	416,549	416,549	416,549
$Adj.R^2$	0.14	0.14	0.12	0.12

Accounting for input-output linkages

Dependent : ln C_{ibt}	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.056*** (0.007)	-0.072*** (0.016)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.053*** (0.009)	-0.080*** (0.020)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.061*** (0.012)	-0.059** (0.024)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
		First stage		
AR-Wald test, F		19.2		10.1
Observations	1,945,334	1,945,334	1,945,334	1,945,334
Adj.R^2	0.83	0.83	0.83	0.83

◂ Go Back

Robustness to confounding factors

Dependent variable: ln C_{ibt}	(1) Baseline	(2) Foreign funding	(3) Recession	(4) Securitization	(5) All
$Exposure^{IT}_{-i,b} \times Post_t$	-0.11***	-0.116***	-0.108***	-0.109***	-0.105***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Foreign Funding Share$_b \times Post_t$		0.24***			0.10**
		(0.06)			(0.05)
Recession Share$_b \times Post_t$			-0.11**		-0.20***
			(0.05)		(0.05)
Securitization Share$_b \times Post_t$				-0.96***	-1.01***
				(0.08)	(0.09)
Bank-firm specialization	✓	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓	✓
Firm.bank F.E.	✓	✓	✓	✓	✓
			First stage		
AR-Wald test, F	32.1	73.2	55.9	62.7	51.5
Observations	1,945,334	1,945,334	1,945,334	1,945,334	1,945,334
Adj.R^2	0.82	0.82	0.83	0.83	0.83

◂ Go Back

Baseline results: bank exposure relative to total assets

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.064***	-0.066***		
	(0.004)	(0.004)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.059***	-0.061***
			(0.004)	(0.005)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.068***	-0.070***
			(0.005)	(0.005)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$		*First stage*		
F-Stat		261.1		132.6
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.83	0.83	0.83	0.83

◄ Go Back

Baseline results: bank exposure leaving out firm's sector

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.078*** (0.008)	-0.103*** (0.015)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.078*** (0.012)	-0.100*** (0.009)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.078*** (0.024)	-0.105*** (0.015)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$		*First stage*		
F-Stat		47.3		26.6
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.83	0.83	0.83	0.83

Dependent : ln C_{ibt}	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.050*** (0.008)	-0.049*** (0.014)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.073*** (0.011)	-0.088*** (0.016)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.026** (0.012)	-0.015 (0.021)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$		First stage		
$Exposure^{OC}_{-i,b} \times Post_t$		1.04*** (0.09)		
$Exposure^{OC}_{-i,b} \times Post_t \times Control_i$				1.23*** (0.02)
$Exposure^{OC}_{-i,b} \times Post_t \times Treated_i$				0.92*** (0.12)
F-Stat		8.5		15.4
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.83	0.83	0.83	0.83

◂ Go Back

Baseline results: instrument using US imports only

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.078*** (0.008)	-0.089*** (0.014)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.075*** (0.009)	-0.084*** (0.014)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.082*** (0.012)	-0.088** (0.023)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{US}_{-i,b} \times Post_t$		*First stage*		
F-Stat		36.4		21.3
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.84	0.83	0.83	0.83

◂ Go Back

Baseline results: first difference

Dependent : $\ln C_{ibt}$	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure_{-i,b}^{IT}$	-0.077***	-0.093***		
	(0.007)	(0.014)		
$Exposure_{-i,b}^{IT} \times Control_i$			-0.073***	-0.08***
			(0.011)	(0.024)
$Exposure_{-i,b}^{IT} \times Treated_i$			-0.081***	-0.102***
			(0.01)	(0.016)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure_{-i,b}^{OC} \times Post_t$		*First stage*		
AR-Wald test, F		12.1		7.3
Observations	188,664	188,664	188,664	188,664
$Adj.R^2$	0.19	0.41	0.19	0.41

◂ Go Back

Baseline results: shift-share clustering (OLS and 2SLS)

Dependent : $\ln C_{ibt}$	Full sample		Treated		Control	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	2SLS	OLS	2SLS	OLS	2SLS
$Exposure_b^{IT} \times Post_t$	-0.088***	-0.109**	-0.099***	-0.119*	-0.007***	-0.094*
	(0.010)	(0.049)	(0.016)	(0.070)	(0.010)	(0.049)
Observations	2,080	2,080	2,080	2,080	2,080	2,080
$Adj.R^2$	0.10	0.10	0.10	0.09	0.05	0.05

‹ Go Back

Baseline results: weighted least squares

| Dependent : ln C_{ibt}	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
$Exposure^{IT}_{-i,b} \times Post_t$	-0.078*** (0.009)	-0.11*** (0.016)		
$Exposure^{IT}_{-i,b} \times Post_t \times Control_i$			-0.076*** (0.01)	-0.10*** (0.026)
$Exposure^{IT}_{-i,b} \times Post_t \times Treated_i$			-0.081*** (0.014)	-0.11*** (0.02)
Bank-firm specialization	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓
Firm-time F.E.	✓	✓	✓	✓
Firm-bank F.E.	✓	✓	✓	✓
Instrument: $Exposure^{OC}_{-i,b} \times Post_t$		*First stage*		
F-Stat		12.1		12.3
Observations	1,945,334	1,945,334	1,945,334	1,945,334
$Adj.R^2$	0.84	0.83	0.83	0.83

◂ Go Back

Real effects on firms: investment

| Dependent: $\ln I_{it}$	(1) Full-sample	(2) Control	Treated	(3) Comparative Adv. Control	(4) High Product. Control	(5) Services
$Exposure_i^{IT} \times Post_t$	-0.11***	-0.075***	-0.17***	-0.09**	-0.15***	-0.026
	(0.02)	(0.02)	(0.04)	(0.03)	(0.03)	(0.02)
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
		First stage				
AR-Wald test, F	26.1	11.8		6.4	31.3	14.2
Observations	451,145	451,145		400,886	451,145	899,397
$Adj.R^2$	0.96	0.987		0.88	0.88	0.87

Real effects on firms: revenues

Dependent: ln R_{it}	(1) Full-sample	(2) Control	Treated	(3) Comparative Adv. Control	(4) High Product. Control	(5) Services
$Exposure_i^{IT} \times Post_t$	-0.10***	-0.06**	-0.16***	-0.076**	-0.13***	-0.034
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Firm-F.E.	✓	✓	✓	✓	✓	✓
Sector-time F.E.	✓	✓	✓	✓	✓	✓
			First stage			
AR-Wald test, F	25.8	13.8		8.6	35.7	12.4
Observations	451,145	451,145		400,886	451,145	899,397
$Adj.R^2$	0.96	0.96		0.88	0.88	0.84

‹ Go Back

Possible confounding factor: cross-border capital flows
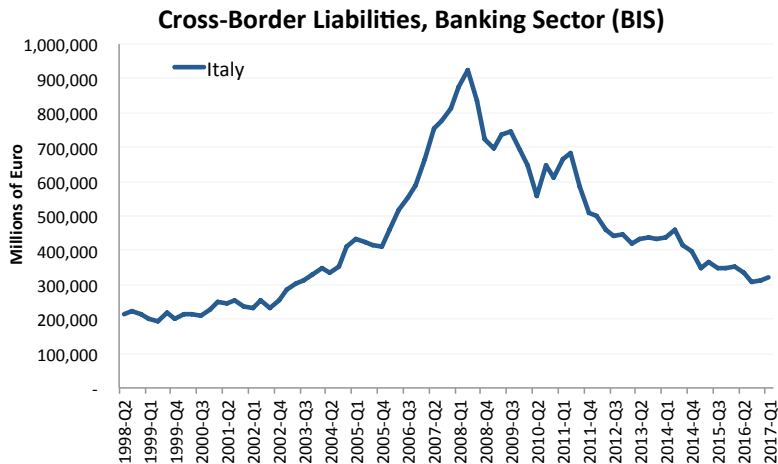
Cross-Border Liabilities, Banking Sector (BIS)

Possible confounding factor: slowdown of GDP growth

Real GDP Growth, Italy
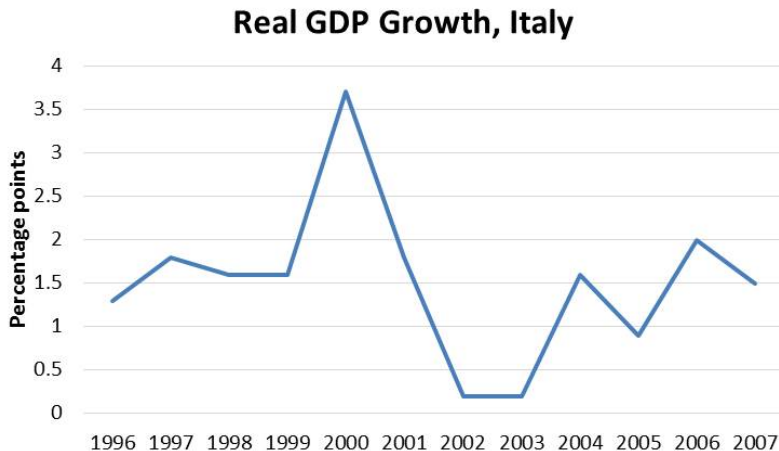
Possible confounding factor: slowdown of GDP growth

SECURITIZED LENDING IN ITALY BY SECTOR OF ECONOMIC ACTIVITY
(annual flows as a percentage of the stock of lending at the beginning of the period)