Trade Shocks and Bank Lending: Evidence from Antidumping of Chinese Firms

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Research Questions

- How do trade policy shocks , e.g. antidumping investigations (AD), affect China's bank lending?
  - Do we see more default?
  - How banks respond when making lending decisions?(loan contract & amount)

- How do the corresponding loan adjustments vary across lending relationship or the ownership of firms and banks?

- Do banks transmit trade shocks to non-AD target industries?

Motivation

- One Central Question of trade: how trade would affect the resource reallocation?
  - Import competition has reshaped the labor market, e.g., the famous “China Shock” (Autor, Dorn, and Hanson 2013)
  - Much less is known regarding how trade shocks would be transmitted to the capital market.
- Trade protectionism is on the rise.
  - e.g. AD, China-U.S. Trade Wars
- How trade policy shocks would affect the reallocation of credit has been rarely studied.
  - A notable exception: Federico, Hassan, Rappoport (2019)

Trade protectionism on the rise

There are many more trade restriction (protection) measures than liberalization measures in the past ten years (e.g. China-US trade war).

Figure 1 Worldwide Trade Restriction Policies and Trade liberalization Policies from 2009 to 2019

Source: Global Trade Alert

China is the largest exporter and also the No. 1 target of antidumping investigations

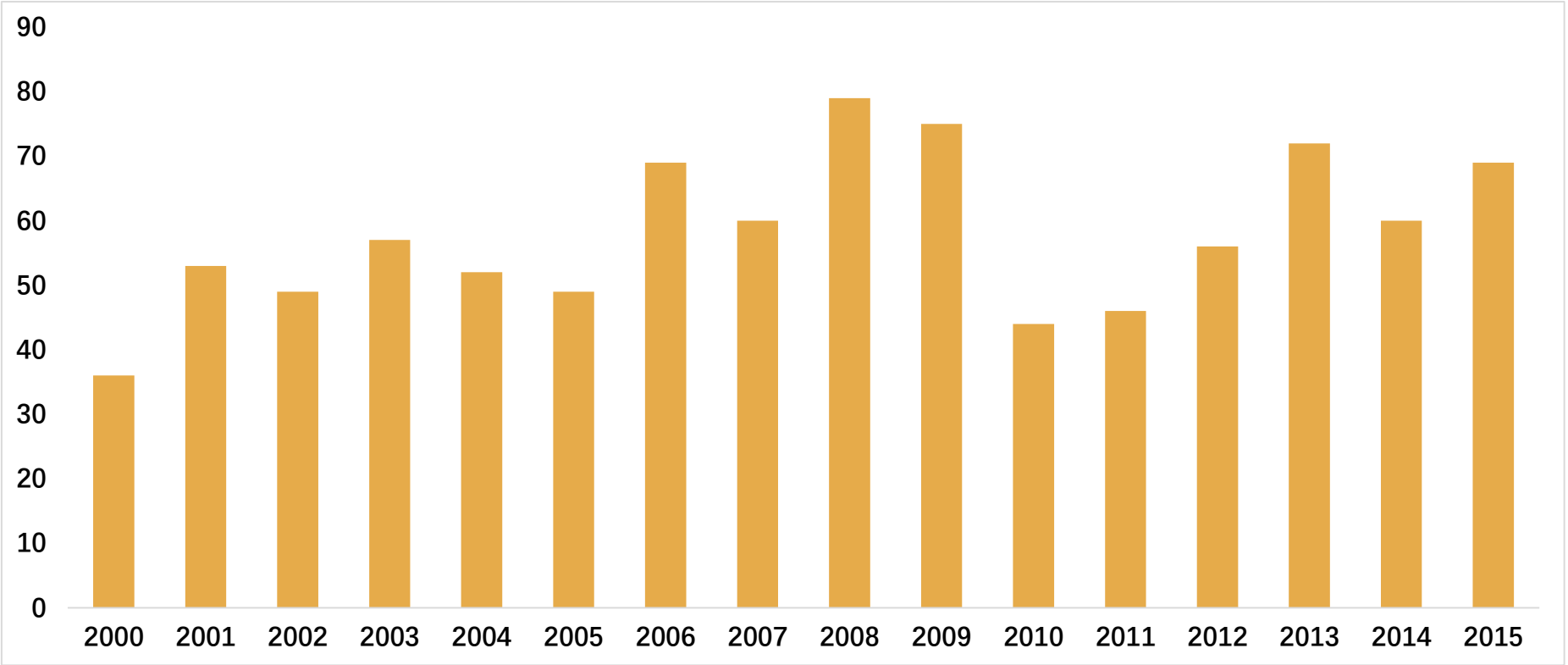


Figure 2 The number of antidumping cases against China from 2000 to 2015

Source: Global Antidumping Database

Antidumping disturbs production of affected firms.

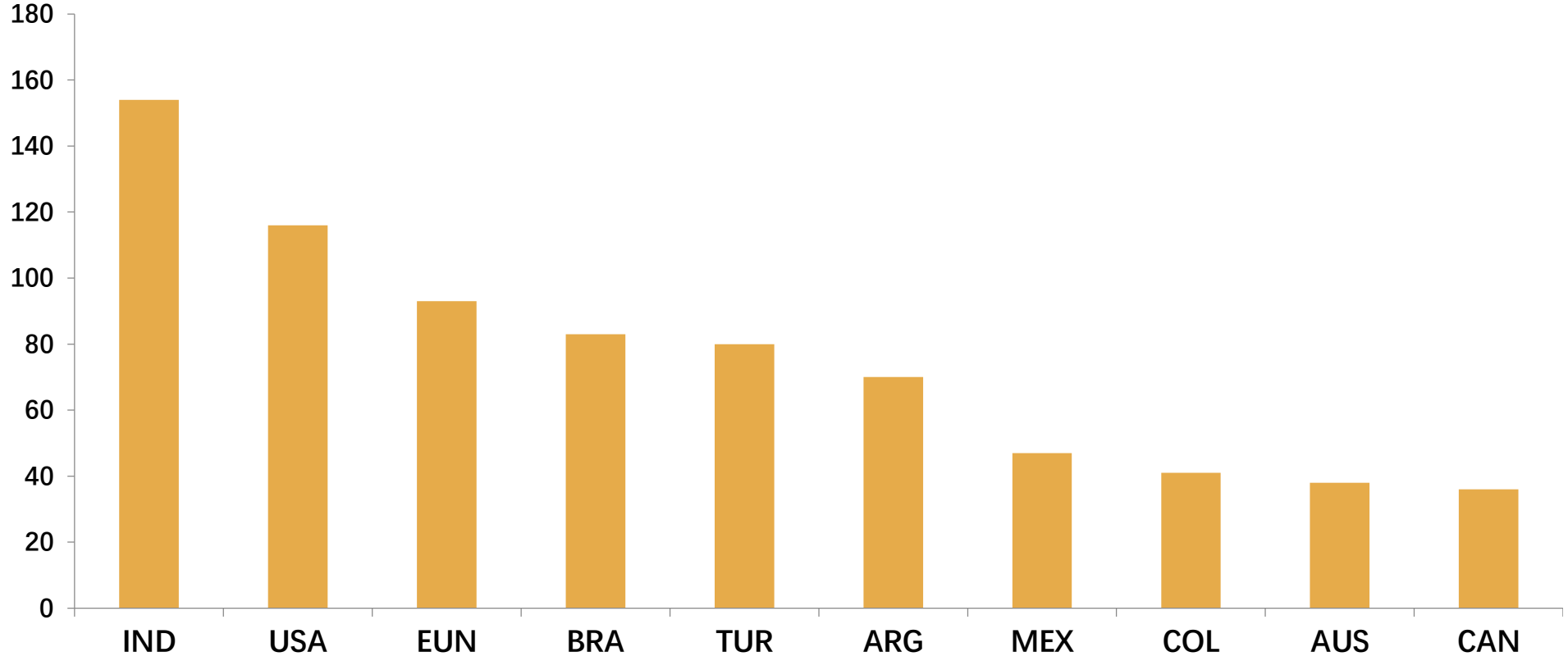


Figure 3 Top 10 economies that mostly use antidumping investigations against China from 2000 to 2015

Source: Global Antidumping Database

Notes: The mean and the median antidumping tariff rates are 99.2% and 47.2% (VS. U.S. value-weighted average import tariff 2%)

Literature Review

- Access to finance affects Trade
  - Country level (Beck, 2002), Country-Sector Level (Beck, 2003; Manova, 2013), Firm Level (Berman and Héricourt, 2010; Greenaway et al., 2007; Muûls, 2008; Minetti and Zhu, 2011; Feenstra et al., 2014;)
  - Banks & Trade in China: Chen, Poncet, and Xiong (2020), Ru (2021)

- Impact of trade on the financial market
  - Trade shocks: The credit supply (Federico, Hassan, and Rappoport 2019); The pricing of loans (Valta 2012); firms' capital structure (Xu 2012); Comparative advantage and financial development (Do and Levchenko, 2007)

- Impact of AD
  - Trade flows (Lu, Tao, Zhang, 2013; Felbermayr & Sandkamp, 2020; Bown & Crowley, 2007; Chandra, 2016; Liu & Shi, 2019);
  - Prices and Markups (Konings and Vandenbussche 2004);
  - Product Scope (Lu, Tao, Zhang 2019);
  - Firms' productivity (Chandra and Long 2013; Wang, Lin, Li 2021; Pierce 2011);
  - Stock Price (Hua et al. 2020).

Preview of Results

- More intensive antidumping duties lead to a significant increase in loan default frequency. Banks are aware of it by lowering the debtors internal ratings.

- Banks recognize the default risk associated with the exposure to trade shocks (i.e., AD), and respond by reducing the amount of credit, shortening loan maturity and requiring more collateral or guarantee. But the interest rate or the spread do not change.

- Relationship banks are more lenient on firms exposed to such shocks.

- Some evidence in support of the adverse impact of antidumping being transmitted to non AD target industries through banks.

Data

- Antidumping data is obtained from the Global Antidumping Database from World Bank (2007-2015)
  - detailed timing of AD jurisdiction (at year-month level), product codes (HS10, HS8, HS6, HS4…), investigation country, target country, measures, Tariff rates, etc.
  - Concordance between different versions of HS, HS-GB/T using Brandt et al. (2013), different versions of GB/T
  - It covers 3422 GB/T 4-digit industries, after dropping failed cases, we have 1997 GB/T 4-digit industries have been AD investigated at least once

- We obtain the the country-hs6-year export value share of Jiangsu province between 2006 and 2015 from China's Customs Data.

The antidumping intensity (ADI) measure

$$ADI_{s,t} = \sum_k d_{s,k,t} * (m_{s,k,t-1}/M_{s,t-1})$$

- The variable $d_{s,k,t}$ is a dummy indicating whether the industry s is under anti-dumping investigations from country k at month t.
- $m_{s,k,t-1}$ represents the total volume of goods exported to country k by firms in industry s
- $M_{s,t-1}$ represents the total volume of exports to the whole world by firms in industry s
- AD target on country-product, sometimes it varies across country-product-firm
- Only very limited number of firms could get a relative low level of antidumping tariff rate

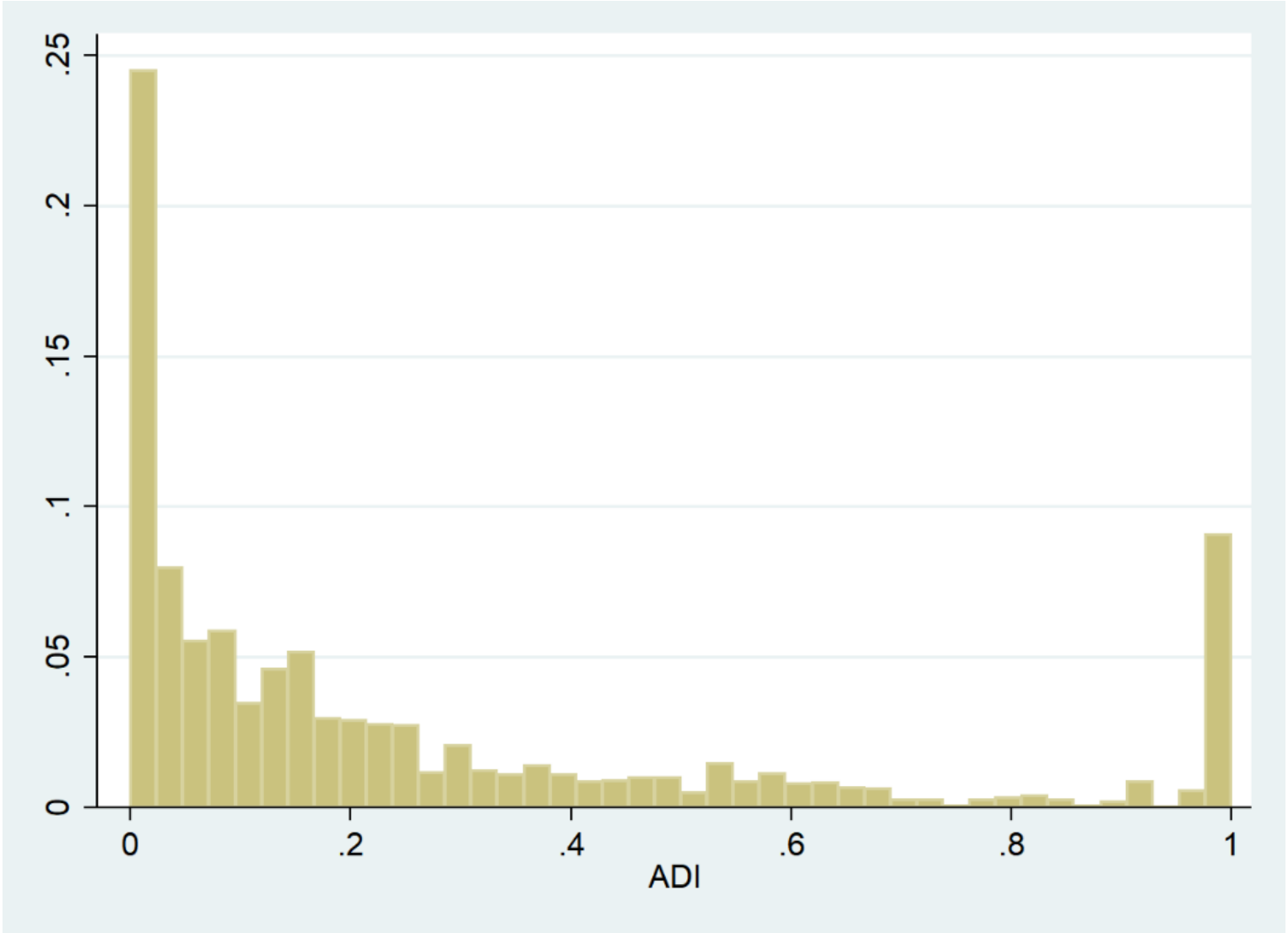
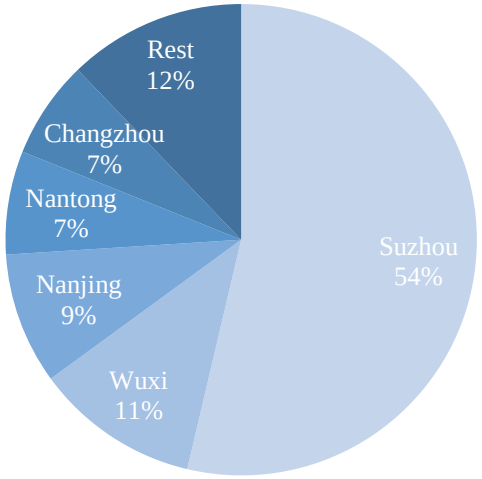


Figure 4: Industry-level Antidumping Intensity

Loan data

- Credit registry maintained by the Jiangsu branch of CBIRC (Chinese Bank and Insurance Regulatory Commission).
  - Covering the universe of bank loans (~2 million) issued to firms located in six prefectures of Jiangsu.
- The data contains basic loan contract terms.
  - principal amount, maturity, interest rate, security, the loan type, the name of the lender, and internal credit ratings, etc.
  - In particular, we can trace the solvency status of the loan over its maturity, including pass (*zheng chang*), special-mention(*guan zhu*), substandard (*ci ji*), doubtful(*ke yi*) and loss (*sun shi*).
  - NPL are defined as doubtful and loss.



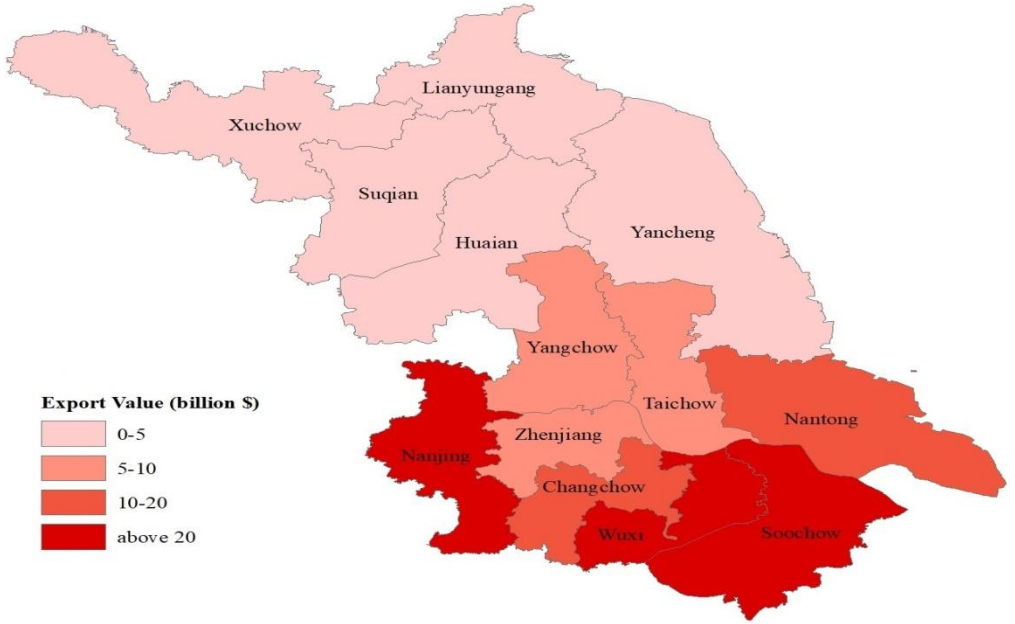


Figure 1: City-level exports of Jiangsu Province

Notes: Export volume is obtained from the China Customs Office. In Panel (a), the rest includes the prefectures of Yangzhou (2.5%), Zhenjiang (2.1%), Taizhou (1.9%), Xuzhou (1.5%), Yancheng (1.4%), Lianyungang (1.3%), Huaian (0.8%), and Suqian (0.6%).

Advantages of our loan data

- All the loans in the six prefectures. Due to geographic restrictions of banking business, we can trace multi-banking firms' behavior.

- Detailed loan contract information.

- Half of the loans are from small banks such as city or rural banks.

Loan Sample used in the Paper

- Banks in our loan sample code industries on all levels of aggregation, i.e., from 1-digit to 4-digit GB/T.
- As our anti-dumping intensity measure is defined on the GB/T 4-digit level, we delete loans for which the industry is expressed on more aggregated levels.
- In our final full sample, there are 500,572 loans.
- In our restricted sample, we require at least one 4-digit industry with positive AD under the 2-digit industry. There are 251,368 loans left.

Summary statistics

Panel A: Restricted sample

Statistics	N	Mean	P50	P25	P75	S.D.
ADI	251,368	0.151	0.000	0.000	0.144	0.280
Amount	251,368	4.748	2.000	1.000	5.000	83.380
Maturity	251,368	9.752	11.100	6.033	12.133	6.528
Status	251,368	1.107	1.000	1.000	1.000	0.418
NPL (Y/N)	251,368	0.021	0.000	0.000	0.000	0.144
Rating	86,820	2.660	3.000	2.000	3.000	1.012
Interest	251,368	7.286	7.080	6.000	8.100	2.126
Spread	251,368	0.266	0.200	0.050	0.398	0.332
Secured (Y/N)	251,368	0.917	1.000	1.000	1.000	0.276
Firm age	251,368	9.521	9.000	6.000	12.000	5.309
Relationship (Y/N)	251,368	0.823	1.000	1.000	1.000	0.381
SOE (Y/N)	251,368	0.001	0.000	0.000	0.000	0.034
SOB (Y/N)	251,368	0.336	0.000	0.000	1.000	0.472
JEB (Y/N)	251,368	0.084	0.000	0.000	0.000	0.278
ADEXP	238,895	0.040	0.000	0.000	0.085	0.065

Summary statistics

Panel B: Full sample

Statistics	N	Mean	P50	P25	P75	S.D.
ADI	500,572	0.091	0.000	0.000	0.020	0.230
Amount	500,572	8.638	2.500	1.000	6.000	69.011
Maturity	500,572	12.745	11.667	6.067	12.133	16.274
Status	500,572	1.103	1.000	1.000	1.000	0.410
NPL (Y/N)	500,572	0.020	0.000	0.000	0.000	0.139
Rating	179,722	2.702	3.000	2.000	3.000	0.981
Interest	500,572	7.302	7.020	6.000	8.100	2.167
Spread	500,572	0.262	0.200	0.035	0.391	0.347
Secured (Y/N)	500,572	0.915	1.000	1.000	1.000	0.279
Firm age	500,572	9.107	8.000	5.000	12.000	5.556
Relationship (Y/N)	500,572	0.733	1.000	0.000	1.000	0.442
SOE (Y/N)	500,572	0.019	0.000	0.000	0.000	0.137
SOB (Y/N)	500,572	0.344	0.000	0.000	1.000	0.475
JEB (Y/N)	500,572	0.100	0.000	0.000	0.000	0.300
ADEXP	468,401	0.033	0.000	0.000	0.056	0.065

Why does AD affect bank loans?

- For example, Firm A exports to U.S., Firm B exports to EU, Firm C sells domestically. A, B, C belong to the same industry.
- When U.S. imposed AD tax on China, it affects Firm A most directly
- Firm B gets hurt indirectly: Firm A may divert its trade flow to EU (trade diversion)
- Firm C gets hurt indirectly: Firms A and B may divert their trade flows back to China (trade depression)
- We cannot distinguish Firms A, B, C in the data.

- AD provides a negative exogenous demand shock
- Ideally, a credit-firm matched data may provide direct influence
- Due to the constraints of the data, trade and loan are merged at the industry level
- If we don’t find any influence of AD on loans, it might not be strong enough to conclude there is no impact.
- If we do find the negative influence of AD on loans, our results provide the lower bound of the influence.

Empirical Specification: loan-level

$$Y_{i,j,l,t} = \alpha_j + \gamma_t + c_{j,t} + b_{j,t} + \beta ADI_{l,t} + \Gamma X_{i,j,t} + \varepsilon_{i,j,l,t}$$

- i denotes a specific loan
- j stands for the firm which gets the loan
- l is the industry which firm j belongs to, 4-digit industry (GB/T2011)
- t stands for the specific year-month t the loan was issued.
- $c_{j,t}$ city-time fixed effect
- $b_{j,t}$ bank-time fixed effect
- $Y_{i,j,l,t}$ denotes the outcomes variables of each loan, including default risk, loan contract terms etc.

Empirical Specification: firm-level

$$AMTOTD_{j,l,t} = \alpha_j + \gamma_t + c_{j,t} + b_{j,t} + \pi ADIAN_{l,t} + \Gamma X_{j,t} + \varepsilon_{j,l,t}$$

- Total loan amount outstanding is calculated at the end of each year;
- $ADIAN_{l,t}$, is also calculated on a yearly frequency;
- Fixed effect: firm (α_j), year (γ_t), city-year ($c_{j,t}$), bank-year ($b_{j,t}$)

The impact on loan default

NPL equals one if solvency status is doubtful or loss, and zero otherwise.

	(1)	(2)	(3)
Dependent variable	*NPL*	*NPL*	*NPL*
ADI	**0.6174****	**0.6064****	**0.5430***
	(0.3096)	**(0.3010)**	**(0.3090)**
log(age)	3.0366***	2.9053***	2.5884***
	(0.6085)	(0.6284)	(0.6101)
Firm FE	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes
City-month FE	No	Yes	Yes
Bank-month FE	No	No	Yes
Observations	251,368	251,368	251,368
R-squared	0.328	0.330	0.350

A one-sigma increase in ADI → **0.17%** increase in default likelihood (or **8%** in relative terms).

We obtain very similar results using the continuous version of solvency status.

Loan rating adjustment

Banks tend to downgrade loans that go to firms with higher ADI.

	(1)	(3)	(4)
Dependent variable	*Rating*	*Rating*	*Rating*
ADI	**-0.0909*** **	**-0.0820*** **	**-0.0597** **
	(0.0301)	**(0.0293)**	**(0.0244)**
log(age)	0.1973***	0.2480***	0.1896***
	(0.0702)	(0.0742)	(0.0621)
Firm FE	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes
City-month FE	No	Yes	Yes
Bank-month FE	No	No	Yes
Observations	101,829	101,829	101,829
R-squared	0.510	0.515	0.749

The impact on loan contract terms

We investigate the impact of antidumping on **interest rate**, **maturity** and **security**.

Specification	Firm, month, type FE	w. city-month FE	w. bank-month FE
Outcome var. = interest rate			
ADI	-0.2196	-0.1458	-0.1822
	(0.4803)	(0.4315)	(0.2165)
Outcome var. = maturity			
ADI	**-0.1963****	**-0.2137****	**-0.1939****
	(0.0902)	**(0.0899)**	**(0.0876)**
Outcome var. = security			
ADI	**1.2217****	**1.4765*****	**0.8865*****
	(0.5964)	**(0.4407)**	**(0.3230)**

- A one-sigma increase in ADI $\rightarrow$ **3%** shorter maturity, **0.24%** increase in the likelihood of pledging collateral or seeking third-party guarantee

The impact on credit supply

The dependent variable, AMTOTD, is defined as the total principal amount of loans outstanding at the end of each year for each firm-bank pair (in natural log).

	(1)	(3)	(4)
Dependent variable	*AMTOTD*	*AMTOTD*	*AMTOTD*
ADI	**-0.0286***	**-0.0335****	**-0.0319****
	(0.0147)	**(0.0134)**	**(0.0140)**
log(age)	0.2076***	0.1881***	0.1896***
	(0.0259)	(0.0257)	(0.0261)
Firm FE	Yes	Yes	Yes
Calendar month FE	Yes	Yes	Yes
City-month FE	No	Yes	Yes
Bank-month FE	No	No	Yes
Observations	110,345	110,345	110,338
R-squared	0.157	0.159	0.209

- A one-sigma increase in ADI → **1.5%** decline in loan amount

The heterogeneity of the impact: Relationship & SOE

We investigate how the impact of antidumping varies with respect to lending relationship, the ownership of firms.

Heterogeneity var.	Relationship	SOE
Outcome var. = interest rate		
ADI * heterogeneity var.	**-0.5480*** **	3.5023
	(0.2031)	(7.1881)
Outcome var. = maturity		
ADI * heterogeneity var.	-0.0088	-0.9451
	(0.0683)	(1.5757)
Outcome var. = security		
ADI * heterogeneity var.	**-0.5611*** **	5.0471
	(0.2121)	(5.7415)
Outcome var. = loan amount		
ADI * heterogeneity var.	**0.0521***	0.0762
	(0.0308)	(0.1046)

The heterogeneity of the impact: Bank type

Heterogeneity var.	SOB	JEB
Outcome var. = Spread		
ADI * heterogeneity var.	0.7615*	-1.2919*
	(0.4140)	(0.6885)
Outcome var. = maturity		
ADI * heterogeneity var.	-0.0802	0.2413**
	(0.0884)	(0.1100)
Outcome var. = security		
ADI * heterogeneity var.	0.7817*	1.9584*
	(0.4616)	(1.0468)
Outcome var. = loan amount		
ADI * heterogeneity var.	-0.0415	-0.0475*
	(0.0285)	(0.0287)

Robustness

- Within-industry estimation
  - Alternative explanation: industry-level over-capacity $\rightarrow$ AD
  - We control for industry-year fixed effects for which industries are defined on the GB/T 2-digit level.
- Results continue to hold when controlling for sector-specific growth of credit supply during the last two years. (Alternative explanation: mean reversion of credit)
- Results are also robust to the following.
  - Lagged ADI
  - Solvency status at maturity
  - An alternative measure of loan supply, i.e., the failure to roll over maturing debt.

Spillover through financial intermediaries

- Due to the impairment of balance sheet, banks that are more exposed to these sectors are expected to become less capable of providing credit.
  - Federico, Hassan, and Rappoport (2019) find that banks whose loan portfolio tilts toward sectors that are more exposed to import competition from China have higher ratios of non-performing loans.

- Bank's trade shock exposure($EXPBK_{b,t}$)

  The fraction of loan portfolio allocated to industries subject to AD at the end of last year

$$EXPBK_{b,t} = \frac{\sum_i Amt_{i,b,t-1} * ADI_{i,t-1}}{\sum_i Amt_{i,b,t-1}}$$

- Following Khwaja and Mian (2008), we control for firm-year fixed effects to absorb time-varying firm-level demand shocks. => The same firm borrow from different banks with different trade shock exposure

Spillover Effect: credit supply

- We compare the difference in the amount of credit allocated to the same (Non AD Target) firm in the same year between more affected and less affected banks.

Dependent variable	(1) *AMTOTD*	(2) *AMTOTD*
$EXPBK_{b,t}$	-0.9744** (0.3970)	-0.7872** (0.3747)
Industries	restricted	All
Firm-year FE	**Yes**	**Yes**
Observations	41,484	78,751
R-squared	0.489	0.647

- When lending to the same firm at the same year, banks that are subject to more severe shocks to their loan portfolio as a result of antidumping investigations cut lending more.
- A one-sigma increase in $EXPBK \rightarrow$ a 5.3% decrease in loan amount, or 0.3 million RMB

Spillover effect: loan contract terms

Dependent variables	(1) *Spread*	(2) *Maturity*	(3) *Secured*
$EXPBK_{b,t}$	0.8312*** (0.2643)	2.9055 (2.0244)	0.1963 (0.1345)
Firm-year FE	Yes	Yes	Yes
Loan-type FE	Yes	Yes	Yes
Observations	310,957	310,957	310,957
R-squared	0.695	0.792	0.366

- Firms have to pay extra costs of funds when borrowing from banks that are more exposed to trade shocks, given the same credit demand.
- A one-sigma increase in ADEXP → 5.4% increase in (relative) loan spread
- Neither loan maturity nor the collateral/guarantee requirements seem to be related to banks' exposure to antidumping investigations.

Take-aways

- Trade policy shock leads to sizeable deterioration in firms' credit quality.
- Banks respond by shrinking the supply of credit (non-refinance, amount), and adjusting loan contract terms (maturity, collateral and guarantee, but not the interest rate).
- Existing Bank-Firm relationship may be helpful when firms suffer from AD.
- Financial intermediaries transmit external demand shocks to unaffected sectors.

Thanks!

Comments and suggestions are welcome!