Investment of financially distressed firms: the role of trade credit

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This paper

Presentation outline

- ‣ Motivation
  - ‣ Trade credit and investment
- ‣ Theoretical predictions
  - ‣ Financial distress
- ‣ Data and empirical strategy
- ‣ Results
- ‣ Conclusions

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This paper

Presentation outline

Trade credit

Liquidity management and funding

| Assets			Liabilities & equity		
Assets			**Liabilities & equity**		
Fixed assets		322,372	Shareholders funds		233,384
Intangible fixed assets		44,974	Capital		86,230
Tangible fixed assets		198,244	Other shareholders funds		147,154
Other fixed assets		79,154	Non-current liabilities		328,248
Current assets		501,667	Long term debt		60,205
Stock		185,412	Other non-current liabilities		268,043
Debtors		152,551			
Other current assets		163,704	Current liabilities		262,407
			Loans		1,079
			Creditors		100,142
			Other current liabilities		161,186
Total assets		**824,039**	**Total shareh. funds & liab.**		**824,039**

accounts receivable

accounts payable

Balance sheet of VILLEROY & BOCH AG (Germany). Global format extract from ORBIS for financial year 2017. Values in USD.

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60 years

TC along the supply chain

Net trade credit

- ‣ Identify companies as TC lenders or borrowers
  - ‣ NTC = debtors – creditors
  - ‣ NTCS = NTC / sales
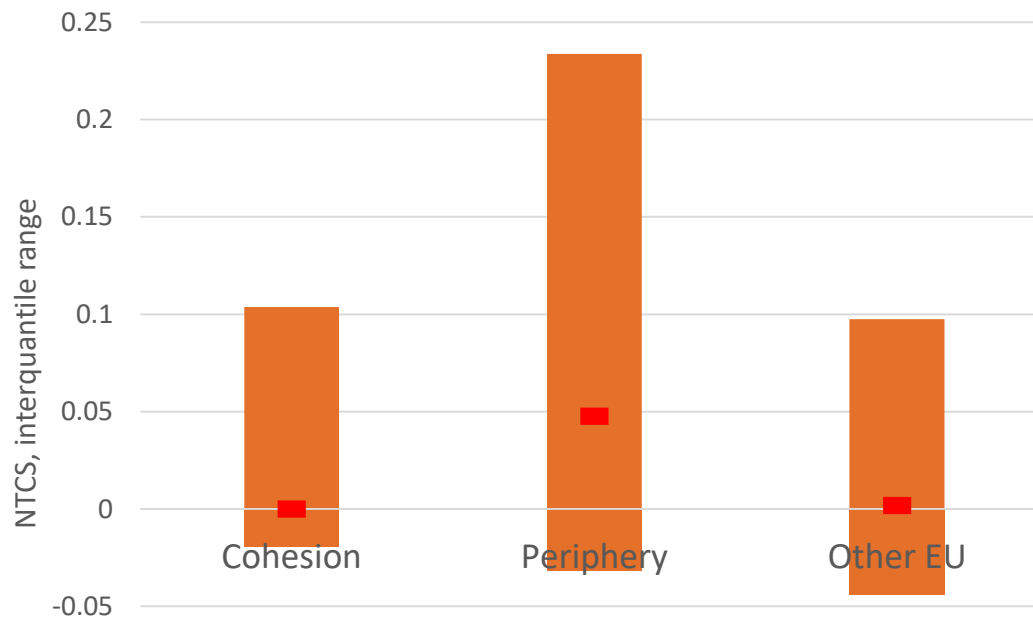
Notes: Cohesion countries: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia. Periphery: Cyprus, Greece, Ireland, Italy, Portugal, Spain. Other EU: Austria, Belgium, Denmark, Germany, Finland, France, Luxembourg, Netherlands, Sweden, UK. Source: ORBIS 2004-2014.

Net trade credit

Ambiguous investment impact

- Liquidity absorption (negative inv. impact)
  - During the financial crisis companies were left with large outstanding TC which drained liquid resources which could have been otherwise invested (Coricelli & Frigerio, 2016)

- Commitment device (positive inv. impact)
  - With incomplete contracts TC serves as a guarantee device. Upstream company engages in relation-specific investments and commits to deliver better quality goods as otherwise it is not paid back on TC (Dass, Kale & Nanda, 2015)

This paper

Trade credit and financial distress

- Does the relationship between TC and investment depend on the level of financial distress?
  - Theoretical prediction
    - Non-distressed firms are dominated by the liquidity absorption
    - Distressed firms try to maintain the business lines by relationship-specific investments
  - Empirical investigation
    - Net trade credit has an overall negative impact on investments, the effect is less pronounced for financially distressed firms

This paper

Presentation outline

Modelling trade credit

Basics

- ‣ Assets
  - ‣ Regular business expenditures I_{BE}
  - ‣ Relationship-specific business investments I_{TC}
  - ‣ Accounts receivable (participate in the final profits of downstream firms)

- ‣ Liabilities
  - ‣ External financing F_{EXT}
  - ‣ Other capital K
  - ‣ Accounts payable (share profits with upstream firms)

Modelling trade credit

Simple framework

- ‣ Budget constraint
  - ‣ $I_{BE} + I_{TC} + Debtors = F_{EXT} + Creditors + K$

$$NTC$$

- ‣ Liquidity absorption
  - ‣ $I_{BE} + {\color{red}I_{TC}} = F_{EXT} - {\color{red}NTC} + K$
- ‣ External finance shortage
  - ‣ $I_{BE} + {\color{red}I_{TC}} = {\color{red}F_{EXT}} - NTC + K$

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60 years

Modelling trade credit

Simple framework

- ‣ Large NTC and financial distress
  - ‣ $I_{BE} + I_{TC} = F_{EXT} - NTC + K$
- ‣ Why?
  - ‣ Existing TC exposure determine the future stream of profits from existing business partners
  - ‣ Distressed firms find it difficult to compete under normal market conditions and it is costly for them to find switch customers
  - ‣ They are 'locked-in' with existing business partners and the only survival strategy is to sustain the business lines through relationship-specific investments
- ‣ Caveats
  - ‣ We assume that a company draws on other funds or reduces business expenditures to finance the missing investments

This paper

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‣ Theoretical predictions
  ‣ Financial distress

‣ **Data and empirical strategy**

‣ Results

‣ Conclusions

Empirical investigation

Data

- ‣ ORBIS
  - ‣ 2004-2014 (including various vintages to correct for survivorship bias)
  - ‣ Unconsolidated accounts from EU28
    - ‣ Exclude Cyprus, Greece, Lithuania, Malta and Poland (coverage)
    - ‣ Keep 8 sectors: (C) Manufacturing, (F) Construction, (G) Wholesale and Retail Trade, (H) Transportation and Storage, (I) Accommodation and Food Service Activities, (J) Information and Communications, (M) Professional, Scientific and Technical Activities, (N) Administrative and Support Service Activities
    - ‣ Consistency checks (Barbiero, Popov & Wolski, 2018)
    - ‣ Winsorize at 1% and deflate with country HICP
  - ‣ In total 61 million firm-year observations
    - ‣ 10,775,304 unique companies

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Empirical investigation

Definitions of (financial) distress

‣ Financial constraints index (EIB index)
  ‣ Map EIB Investment Survey (2015 and 2016 waves) predictors of financial constraints and extrapolate to full sample of firms

‣ Distressed firms (OECD definition)
  ‣ Firms older than 10 years with negative profit or interest coverage less than 1 over 3 consecutive years

‣ Distressed firms (Bank of England definition)
  ‣ Companies with negative profits for three consecutive years

Financial constraints index (EIB index)

EIB Investment Survey

‣ 12,500 firms surveyed across EU28 (2016 and 2017 waves)

‣ Survey of NFCs (with 5+ employees) in manufacturing, services, construction & infrastructure sector

‣ Information on:
  ‣ Firm characteristics and performance
  ‣ Investment needs and constraints
  ‣ Past investment activities and future focus
  ‣ Investment finance
  ‣ Innovation activity

‣ Representative of the economy (firms weighted by value-added)

‣ Data collected from April-July 2017

Financial constraints index (EIB index)

Predicting financial constraints

‣ Financially constrained when
  ‣ dissatisfied with the amount of finance obtained (received less)
  ‣ sought external finance but did not receive it (rejected)
  ‣ did not seek external finance because they thought borrowing costs would be too high (too expensive)
  ‣ did not seek external finance because they thought they would be turned down (discouraged)

Financial constraints index (EIB index)

Predicting financial constraints

‣ Estimate probit model

$$\Pr(FC_{icst} = 1)$$
$$= \Phi\left(\beta_0 + \beta_1 \frac{\text{Loans}_{icst-1} + LTDebt_{icst-1}}{Assets_{icst-1}} + \beta_2 \frac{CashFlow_{icst-1}}{Assets_{icst-1}} \right.$$

‣ Compute the threshold values for predicted values to match country-specific EIB Investment Survey shares of financially constrained firms

‣ Predictive scores larger than threshold indicate the EIB financial constraints index (Ferrando et al., 2015)

Trade credit in distressed firms

EIB index

Net trade credit among financially constrained and not-financially constrained firms.
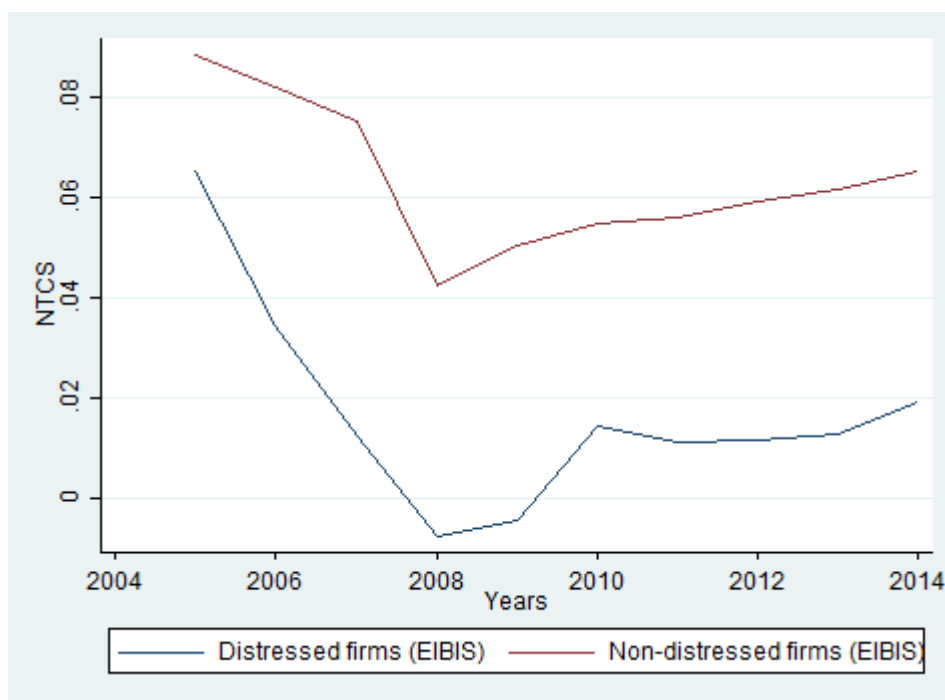
Source: Authors' calculations based on EIBIS 2016 and 2017 and the Bureau van Dijk ORBIS database.

Trade credit in distressed firms

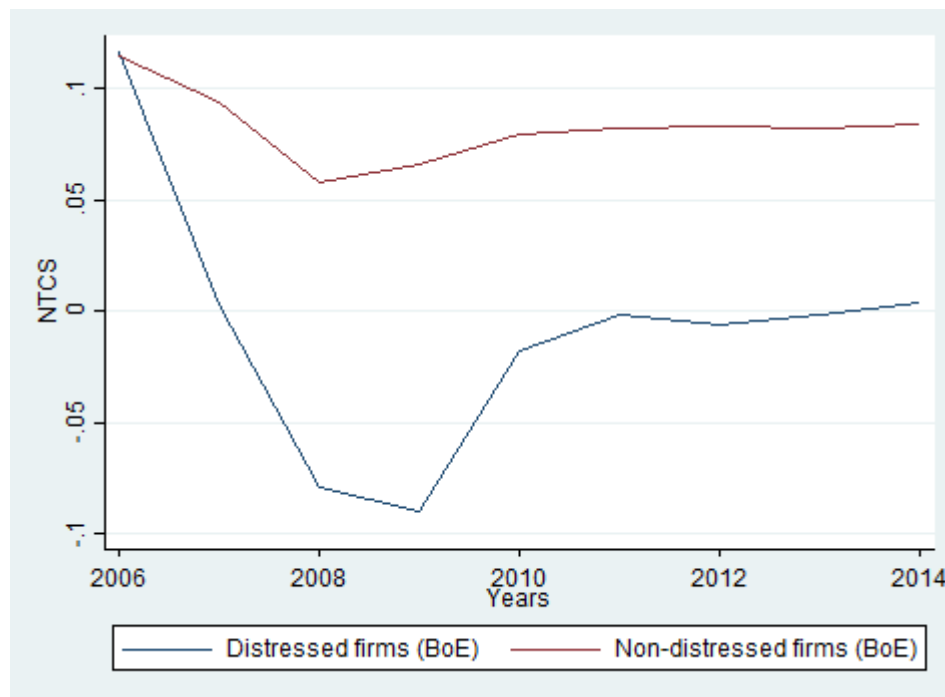## BoE index

Net trade credit among distressed and non-distressed firms.

Source: Authors' calculations based on the Bureau van Dijk ORBIS database.

Trade credit in distressed firms

OECD index

Net trade credit among distressed and non-distressed firms.
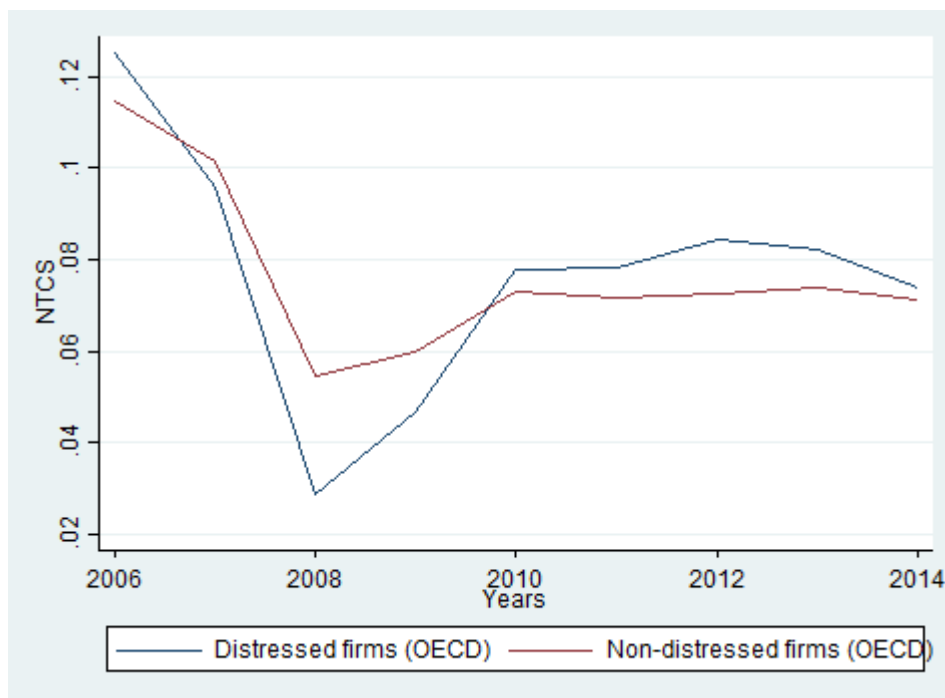
Source: Authors' calculations based on the Bureau van Dijk ORBIS database.

Empirical investigation

Identification

‣ The main specification

$$\frac{I_{icst}}{K_{icst-1}} = \beta_1 NTCS_{icst} \times FD_{icst} + \beta_2 NTCS_{icst} + \beta_3 FD_{icst} + \beta_4 X_{icst-1}$$
$$+\nu_i + \mu_{cst} + \varepsilon_{icst},$$

‣ Robustness
   ‣ Alternative definitions of distress
   ‣ Additional controls
   ‣ Endogeneity bias
   ‣ Account for noise in fin. constraints index (bootstrap)

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Results

Main specification (EIB index)

1sd increase in NTCS reduces the investment rate by 4.5pp for non-distressed and by 4pp for distressed firms

	(1)	(2)	(3)	(4)
	Investment/Capital	Investment/Capital	Investment/Capital	Investment/Capital
NTCS x FIN_CONS	0.055***	0.048***		
	-0.005	-0.005		
NTCS x FIN_CONS (lag)			0.023***	0.020***
			-0.006	-0.007
FIN_CONS	-0.213***	-0.214***		
	-0.004	-0.004		
FIN_CONS (lag)			-0.090***	-0.079***
			-0.004	-0.004
NTCS	-0.130***	-0.113***	-0.114***	-0.100***
	-0.002	-0.002	-0.002	-0.003
Controls	YES	YES	YES	YES
Company FE	YES	YES	YES	YES
Country x Sector x Year FE	NO	YES	NO	YES
Firm-level clustering of SE	YES	YES	YES	YES
N	15,138,499	13,481,857	11,930,793	10,598,616
R-sq	0.214	0.219	0.202	0.207
adj. R-sq	0.037	0.041	0.013	0.017

Note: The table reports estimates of Model 1 where the dependent variable is the value of firm-specific investment at time t divided by the value of firm-specific tangible capital at time $t-1$. Financially constrained companies are determined by the EIB Investment Survey methodology. Standard errors are clustered at the company level and they are reported in parentheses, where $\cdot p < 0.1$, $\cdot\cdot p < 0.05$, $\cdot\cdot\cdot p < 0.01$.

Results
Alternative definitions of distress (BoE)

	(1)	(2)	(3)	(4)
	Investment/Capital	Investment/Capital	Investment/Capital	Investment/Capital
NTCS x DISTRESS	0.053***	0.048***		
	-0.003	-0.003		
NTCS x DISTRESS (lag)			0.045***	0.040***
			-0.004	-0.004
DISTRESS	-0.222***	-0.166***		
	-0.003	-0.003		
DISTRESS (lag)			-0.152***	-0.115***
			-0.003	-0.003
NTCS	-0.114***	-0.101***	-0.107***	-0.093***
	-0.002	-0.002	-0.002	-0.003
Controls	YES	YES	YES	YES
Company FE	YES	YES	YES	YES
Country x Sector x Year FE	NO	YES	NO	YES
Firm-level clustering of SE	YES	YES	YES	YES
N	15,145,397	13,546,387	11,992,660	10,704,082
R-sq	0.198	0.202	0.204	0.209
adj. R-sq	0.017	0.020	0.010	0.014

Note: The table reports estimates of Model 1 where the dependent variable is the value of firm-specific investment at time t divided by the value of firm-specific tangible capital at time t-1. Financially constrained companies are determined by the Bank of England's methodology. Standard errors are clustered at the company level and they are reported in parentheses, where * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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Results
Alternative definitions of distress (OECD)

	(1)	(2)	(3)	(4)
	Investment/Capital	Investment/Capital	Investment/Capital	Investment/Capital
NTCS x DISTRESS	0.043***	0.043***		
	-0.004	-0.004		
NTCS x DISTRESS (lag)			0.042***	0.039***
			-0.004	-0.004
DISTRESS	-0.131***	-0.057***		
	-0.002	-0.002		
DISTRESS (lag)			-0.175***	-0.119***
			-0.002	-0.002
NTCS	-0.099***	-0.088***	-0.094***	-0.080***
	-0.003	-0.003	-0.003	-0.003
Controls	YES	YES	YES	YES
Company FE	YES	YES	YES	YES
Country x Sector x Year FE	NO	YES	NO	YES
Firm-level clustering of SE	YES	YES	YES	YES
N	9,995,620	8,806,021	8,078,304	7,103,737
R-sq	0.208	0.215	0.214	0.221
adj. R-sq	0.023	0.029	0.016	0.023

Note: The table reports estimates of Model 1 where the dependent variable is the value of firm-specific investment at time t divided by the value of firm-specific tangible capital at time $t-1$. Financially constrained companies are determined by the OECD methodology. Standard errors are clustered at the company level and they are reported in parentheses, where $\cdot\, p < 0.1$, $\cdot\cdot\, p < 0.05$, $\cdot\cdot\cdot\, p < 0.01$.

Results

Additional controls

	(1)	(2)	(3)	(4)
	Investment/Capital	Investment/Capital	Investment/Capital	Investment/Capital
NTCS x FIN_CONS (lag)	0.012*	0.023	0.090***	0.083***
	-0.007	-0.016	-0.023	-0.028
FIN. CONS. (lag)	-0.015***	0.116***	-0.047***	-0.018
	-0.005	-0.01	-0.014	-0.016
NTCS	-0.132***	-0.194***	-0.196***	-0.237***
	-0.003	-0.005	-0.008	-0.009
MACRO CONTROLS	GDP growth	Unempl. rate	Sov. yield	All
Controls	YES	YES	YES	YES
Company FE	YES	YES	YES	YES
Country x Sector x Year FE	YES	YES	YES	YES
Firm-level clustering of SE	YES	YES	YES	YES
N	10,303,988	10,303,988	10,104,122	10,104,122
R-sq	0.259	0.259	0.259	0.259
adj. R-sq	0.081	0.081	0.080	0.080

Note: The table reports estimates of Model 2 where the dependent variable is the value of firm-specific investment at time t divided by the value of firm-specific tangible capital at time t-1. Financially constrained companies are determined by the EIB Investment Survey methodology. Tangibility ratio is taken as the ratio of tangible fixed assets to total assets and financial leverage is the ratio of loans and long-term debt to total assets. Macro controls are added in levels and in interactions with the main variables of interest. Standard errors are clustered at the company level and they are reported in parentheses, where * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Results

Endogeneity bias

- ‣ Problem
    - ‣ Short-term nature of TC can be a source of endogeneity bias in the estimates

- ‣ Possible solution
    - ‣ Bank-specific stress conditions as instruments to the investment levels (Storz et al., 2017)
    - ‣ Equity ratio, NPL ratio, ROAA and bank total assets

- ‣ Caveats
    - ‣ Fuzzy bank-name matching with threshold accuracy >50%
    - ‣ Only a fraction of firms report corresponding banks (556,708 companies and 2,372 banks)
    - ‣ Small sample correction

Results

Endogeneity bias

	(1)	(2)	(3)
	Investment/Capital	Investment/Capital	Investment/Capital
NTCS x FIN_CONS (lag)	2.753***	1.313*	1.295*
	-0.555	-0.731	-0.778
FIN_CONS (lag)	-0.116***	-0.126***	-0.125***
	-0.031	-0.033	-0.033
NTCS	-7.323***	-4.033**	-4.025*
	-1.392	-1.961	-2.186
Controls	YES	YES	YES
Company FE	YES	YES	YES
Country x Year FE	NO	YES	NO
Sector x Year FE	NO	YES	NO
Country x Sector x Year FE	NO	NO	YES
Firm-level clustering of SE	YES	YES	YES
Bank-level clustering of SE	YES	YES	YES
N	302,958	266,664	266,511
Sargan p-value	0.102	0.516	0.410

Note: The table reports estimates of Model 1 with NTCS variable being instrumented by bank-specific equity ratio, NPL ratio, returns on average assets and bank size. The dependent variable is the value of firm-specific investment at time t divided by the value of firm-specific tangible capital at time $t-1$. Financially constrained companies are determined by the EIB Investment Survey methodology. Sargan test of over-identifying restrictions. Standard errors are clustered at the company and bank levels and they are reported in parentheses, where $p < 0.1$, $p < 0.05$, $p < 0.01$.

Results

Bootstrap

- ‣ Problem
  - ‣ EIB index is effectively stochastic
  - ‣ Possible consistency problems of the estimators

- ‣ Possible solutions
  - ‣ 2 Sample 2 SLS (Pacini and Windmeijer, 2016)
    - ‣ Fixed effects mismatch
  - ‣ Bootstrap confidence intervals (100 draws)

- ‣ Caveats
  - ‣ Computationally intensive

Results
Bootstrap

	(1)	(2)	(3)	(4)
	Investment/Capital	Investment/Capital	Investment/Capital	Investment/Capital
NTCS x FIN_CONS	0.052***	0.045***		
	(0.011)	(0.009)		
NTCS x FIN_CONS (lag)			0.021*	0.017*
			(0.011)	(0.010)
FIN_CONS	-0.208***	-0.210***		
	(0.034)	(0.034)		
FIN_CONS (lag)			-0.092***	-0.081***
			(0.019)	(0.022)
NTCS	-0.125***	-0.108***	-0.110***	-0.096***
	(0.003)	(0.003)	(0.002)	(0.002)
Controls	YES	YES	YES	YES
Company FE	YES	YES	YES	YES
Country x Sector x Year FE	NO	YES	NO	YES
Firm-level clustering of SE	YES	YES	YES	YES
N	15,355,896	13,700,523	12,102,662	10,771,365

Note: The table reports estimates of Model 1 where the dependent variable is the value of firm-specific investment at time t divided by the value of firm-specific tangible capital at time $t-1$. Financially constrained companies are determined by the EIB Investment Survey methodology. Bootstrapped (100 replications) standard errors and clustered at the company level and they are reported in parentheses, where $p < 0.1$, $p < 0.05$, $p < 0.01$.

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Conclusions

The main take aways

‣ The relation between trade credit and investment levels differs between distressed and non-distressed firms
  ‣ Non-distressed firms are dominated by the liquidity absorptive effect of TC hence reduce investments
  ‣ Distressed firms are 'locked-in' with existing customers hence relationship-specific investments are their survival strategy
‣ Policy message
  ‣ Trade credit is important for investment decisions of distressed firms
  ‣ The existence of some distressed firms might be prolonged, locking in capital and labor resources
‣ Next steps
  ‣ The impact on allocative efficiency

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Thank you!

More information at
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60 years