Distressed Banks, Distorted Decisions?

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Motivation

How do credit market imperfections contribute to aggregate productivity weakness?

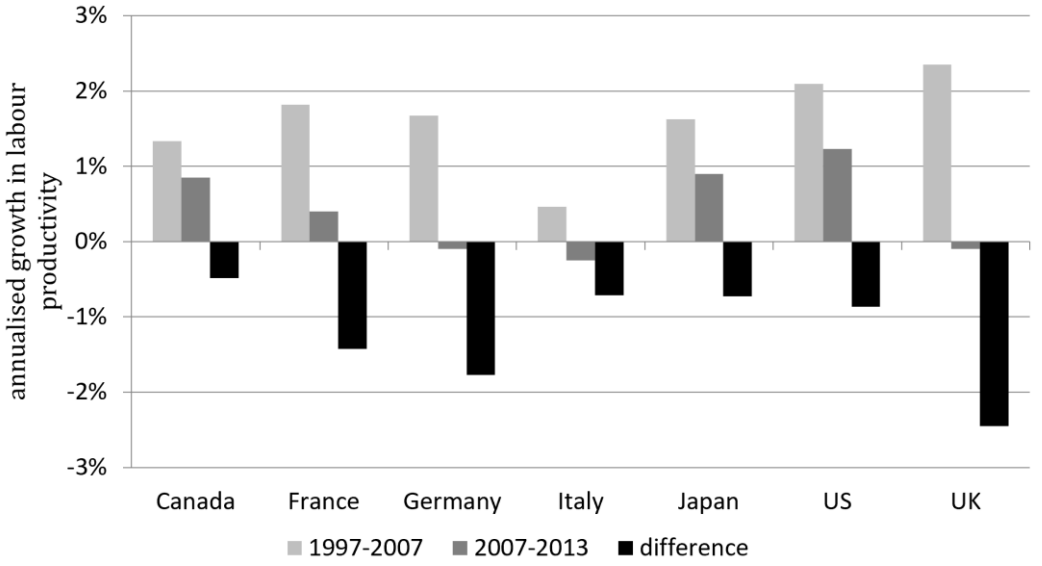
Banking sector weakness may reduce labour productivity:

- Reduction in investment due to difficulty in accessing finance
  - Bond & Van Reenen (2007)
- Bank forbearance (prevalence of zombie companies)
  - Peek & Rosengreen (2003), Caballero, Hoshi & Kashyap (2008)
- Resource reallocation across companies hampered
  - Barlevy (2003), Haldane (2017)

Background:

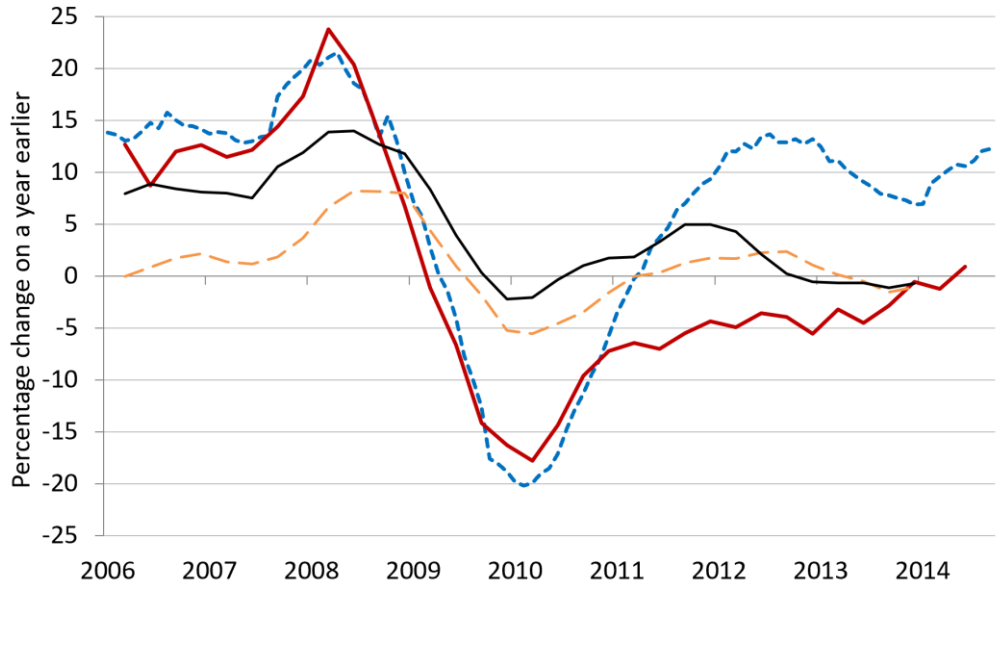
The global financial crisis of 2008 as it played out in the UK

Pronounced productivity decline in the UK



Source: Table 3 Constant price GDP per hour worked, in *International Comparisons of Productivity, Final Estimates for 2013*, ONS Statistical Bulletin, 20 February (2015).

Related to a sharp contraction in credit supply?



Source: Bank of England.
Notes: Bank lending to private non-financial corporations. UK and US data exclude commercial real estate loans. Germany and France data exclude loans to the construction sector.

What we do

Exploit exogenous variation induced by the financial crisis in credit availability to companies to investigate impacts of credit supply shocks

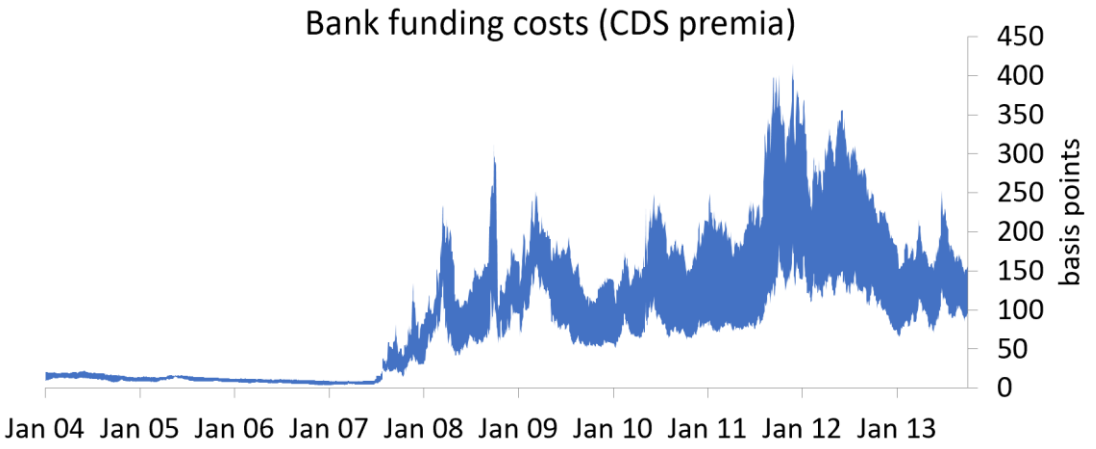
Compare outcomes for companies who were subjected to tougher credit constraints to outcomes for companies that were less likely to be constrained

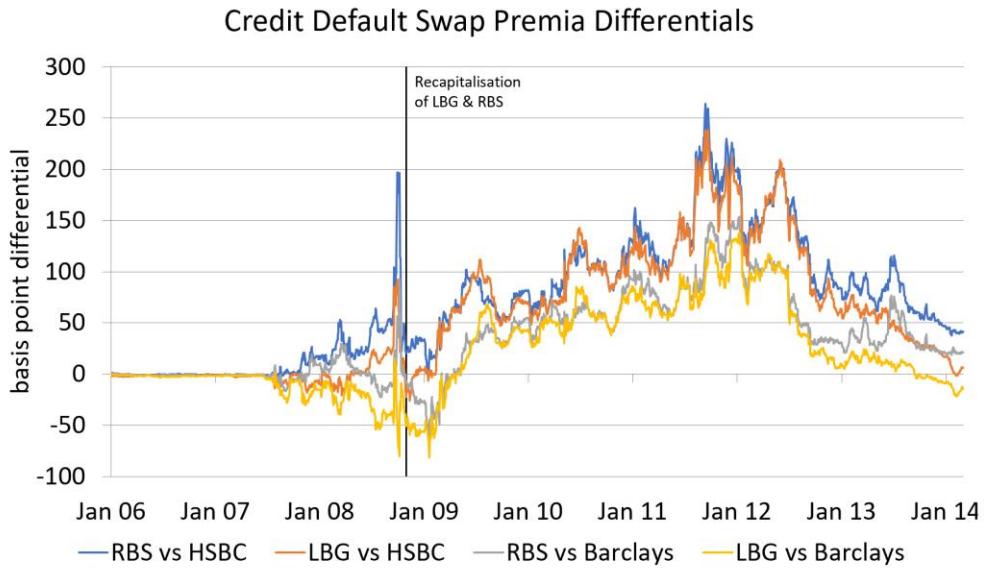
- Quasi-experimental approach
- Divide firm observations into 'treatment' and 'control' groups based on main bank lender
- Difficulty switching to a new lender during the crisis

Provide direct estimates of the impact of credit constraints on UK firms

- Here we consider impacts on firm survival for firms in different parts of the productivity and leverage distributions

The Different Experiences of UK Banks





Related Literature

Assessing the impact of credit constraints on real economic outcomes using variation in ease of access to external finance induced by the financial crisis in a natural experiment type approach

- Employment, unemployment and firm closure
  - Bentolila, Jansen & Jiménez (2018), Chodorow-Reich (2014), Duygan-Bump, Levkov & Montoriol-Garriga (2011)
- Investment
  - Almeida, Murillo, Laranjeira & Weisbenner (2012), Duchin, Ozbas, Sensoy (2010)
- Labour productivity
  - Franklin, Rostom & Thwaites (2019)

Credit constraints and cleansing effects over the business cycle

- Eslava, Galindo, Hofstetter & Izquierdo (2010), Hallward-Driemeier & Rijkers (2013), Riley, Rosazza-Bondibene & Young (2015), Harris & Moffat (2016), Foster, Grim & Haltiwanger (2016)

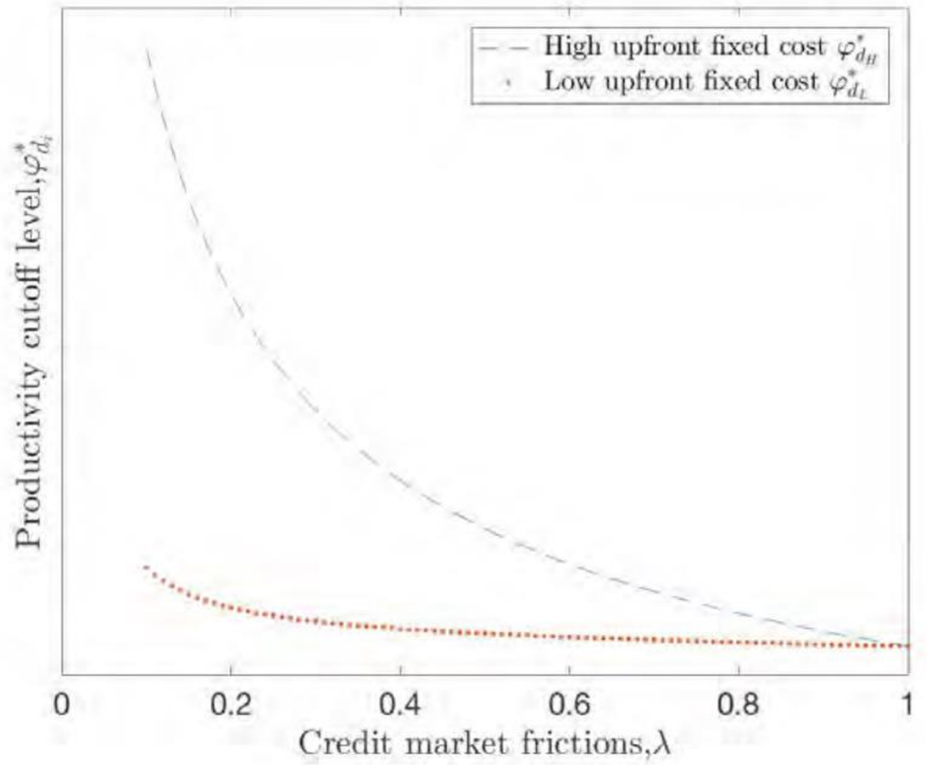
Zombie companies and growth

- Blattner, Farinha & Rebelo (2018), Acharya, Eisert, Eufinger & Hirsch (2019)

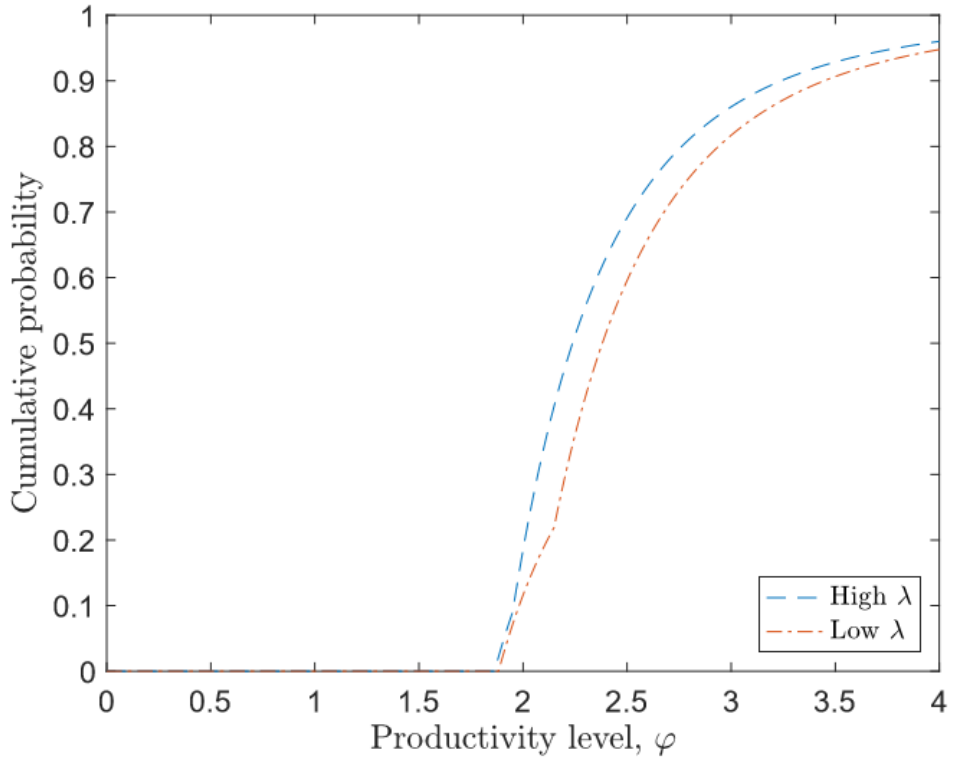
A simple model of firm dynamics

(Heterogeneous credit demand in a closed economy Melitz model)

Impact of Credit Market Frictions on Productivity Cut-offs



Impact of Credit Market Frictions on the Productivity Distribution



Data

Financial Analysis Made Easy (FAME)

- Company Accounts information held by Companies House
  - provided by Bureau Van Dijk
  - annual historical discs
  - subsidiaries removed from the dataset
- Chargeholder recorded
  - tells us which banks a company is borrowing from
- Data issues
  - selective reporting of key accounts information
  - reporting of employment and output is particularly sparse (for smaller companies)
  - decline over time in tendency to report detailed accounting information
  - self-reporting of SIC codes

Banking relationships are identified using information on registered charges

- Standard business practice is for banks to take all-monies debentures, secured by either fixed charges on particular assets or floating charges on all other assets of borrowing companies. Recognised as best form of security for lenders.
- Company Accounts record charge-holder information and hence the identity of lending banks
- Bank of England SME forbearance project found:
  - Chargeholder information is a reliable means of identifying lending relationships – of 4,500 borrowing companies identified in this way for one lender, only 21 were not recognised by lender
  - Strong positive correlation between quantity of lending on banks' books and loans recorded in company accounts, and between implied aggregate lending for each bank and Bank aggregate data

Distressed Banks

LBG (17%)

BANK OF SCOTLAND
LLOYDS TSB
LLOYDS BANK
TSB BANK
BANK OF WALES

HALIFAX
HBOS
TRUSTEE SAVINGS BANK
TSB COMMERCIAL FINANCE
TSB ENGLAND & WALES
TSB ASSET FINANCE

RBS (32%)

NATIONAL WESTMINSTER BANK
ROYAL BANK OF SCOTLAND
ROYAL BANK OF SCOTLAND COMMERCIAL SERVICES
WESTMINSTER BANK
RBS INVOICE FINANCE

LOMBARD NORTH CENTRAL
WILLIAMS & GLYN'S BANK
ROYAL BANK OF SCOTLAND SECURITY TRUSTEE
NATIONAL PROVINCIAL BANK
ULSTER BANK

Other (4%)

AIB GROUP
GOVERNOR AND COMPANY OF BANK OF IRELAND
ANGLO IRISH BANK CORPORATION
ALLIED IRISH BANKS
CAPITAL HOME LOANS

FIRST TRUST BANK

NORRN ROCK
ALLIANCE & LEICESTER
BRADFORD & BINGLEY BUILDING SOCIETY
MORTGAGE EXPRESS

Not Distressed Banks

HSBC (22%)

HSBC BANK
MIDLAND BANK
HSBC INVOICE FINANCE
HSBC INVOICE FINANCE SECURITY HOLDER

Barclays (16%)

BARCLAYS BANK
WOOLWICH

Other (8%)

CLYDESDALE BANK
YORKSHIRE BANK
CO-OPERATIVE BANK
SANTANDER
ABBEY NATIONAL

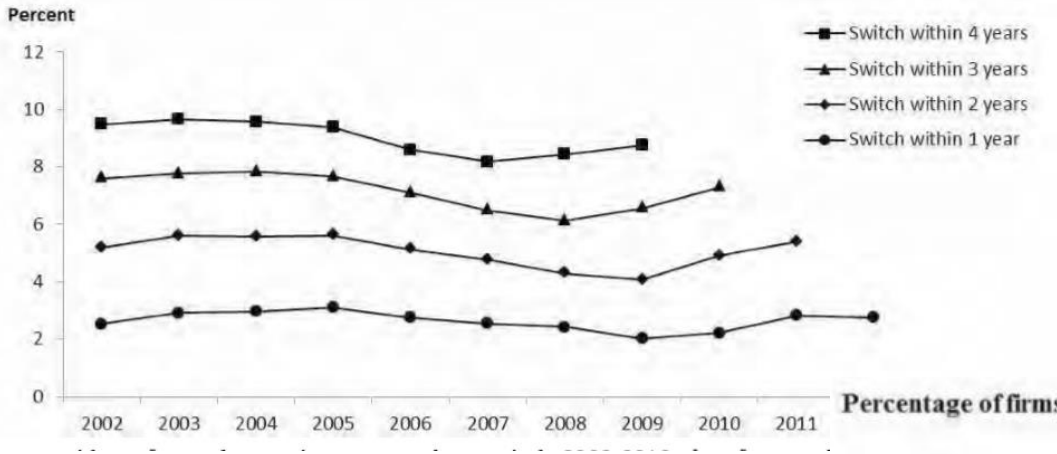
NATIONWIDE BUILDING SOCIETY
MORTGAGE WORKS
PARAGON MORTGAGES
MORTGAGE TRUST
COUTTS & CO

COUTTS & COMPANY
CLOSE BRORS
CLOSE INVOICE FINANCE
SKIPTON BUILDING SOCIETY
NORWICH UNION MORTGAGE FINANCE

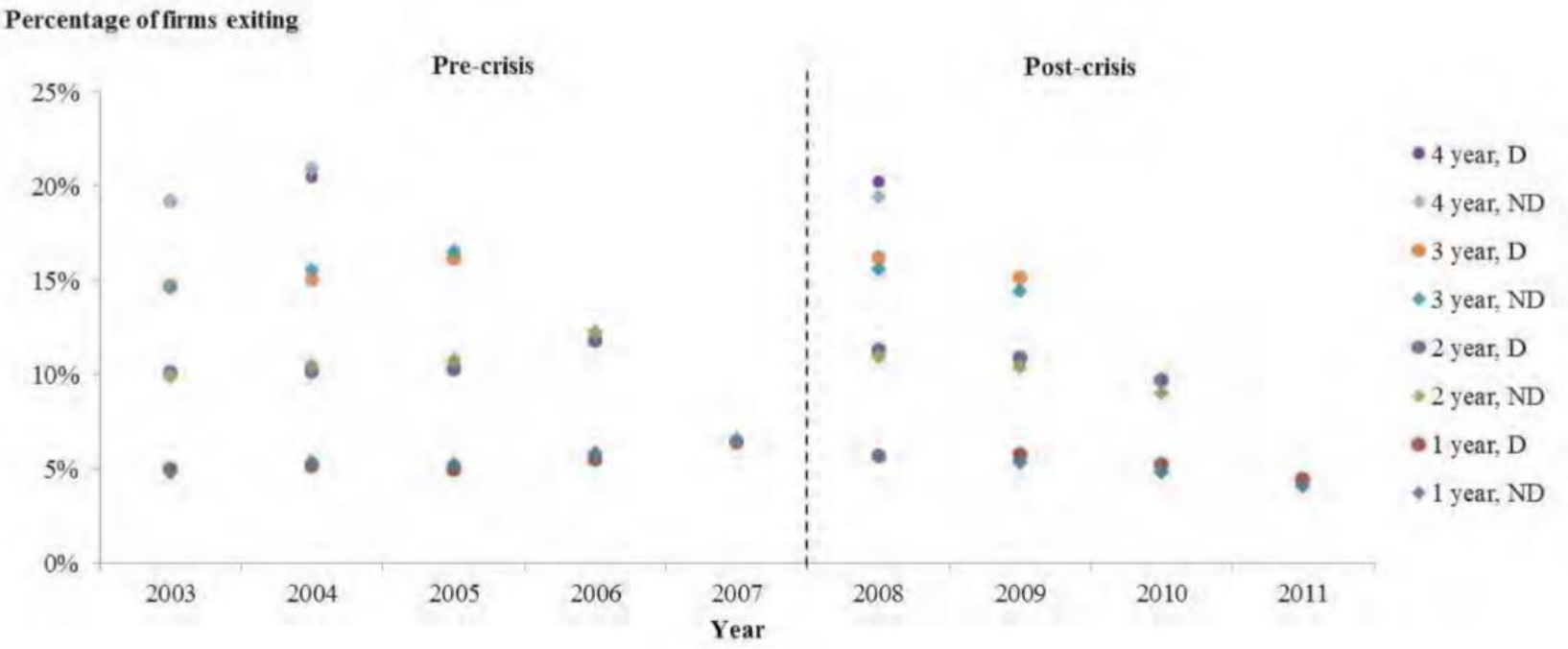
BIBBY FINANCIAL SERVICES
VENTURE FINANCE
GRIFFIN CREDIT SERVICES
ROYAL TRUST CORPORATION OF CANADA TRUSTEE
SVENSKA HANDELSBANKEN AB PUBL

Identifying assumption:
Lending relationships are sticky

Switching rates for firms with distressed banks



Exit rates and banking relationships



Summary statistics by banking group

	2004			2006			2008		
	ND	D	No Bank	ND	D	No Bank	ND	D	No Bank
Exit in 2 years	10%	10%	12%	12%	12%	15%	11%	11%	14%
Exit in 4 years	21%	20%	25%	22%	22%	27%	19%	20%	24%
Start-Up	14%	12%	31%	8%	8%	21%	6%	7%	23%
Young	33%	32%	56%	31%	30%	59%	25%	27%	55%
Foreign Owned	3%	3%	3%	2%	3%	3%	3%	3%	3%
Exporter	1%	2%	1%	1%	1%	1%	2%	2%	1%
Median Assets (£000)	301	382	54	276	356	56	301	382	54
Median Leverage Ratio	0.75	0.76	0.71	0.75	0.74	0.68	0.75	0.76	0.71
Credit Rating									
Lowest Quintile	25%	24%	18%	12%	12%	15%	12%	12%	17%
Quintile 2	26%	26%	18%	13%	12%	26%	12%	11%	27%
Quintile 3	17%	17%	18%	16%	15%	20%	17%	16%	22%
Quintile 4	14%	14%	15%	23%	23%	21%	18%	18%	19%
Highest Quintile	16%	15%	28%	33%	35%	15%	39%	40%	14%
Observations	70441	76649	429468	78240	85604	500601	75528	88791	574633

Difference-in-differences set-up

Treatment (T) and Control (C) group

- T = Companies with an outstanding charge with a DISTRESSED BANK at the time the bank was rescued
- C = Companies with an outstanding charge with a NOT DISTRESSED BANK at the same time

Track difference in the development of outcomes between the T and C groups since bank rescue/financial crisis

- FY 2007/8 or FY 2008/9 (PRE-period) - FY 2011/12 or FY 2012/13 (POST-period)

And compare this to differences in the development of outcomes between these two groups before the crisis

Difference-in-differences set-up (continued)

$$Y_{it} = cons + \beta_{DB} DB_i + \beta_{NDB} NDB_i$$

$$+ \gamma post + \gamma_{DB} post \times DB_i + \gamma_{NDB} post \times NDB_i$$

$$+ controls_{it} + u_i + \varepsilon_{it}$$

where $(\gamma_{DB} - \gamma_{NDB})$ identifies the effect of being stuck with a distressed bank.

Further interactions included to distinguish the treatment effect by additional characteristics

$$+ \beta_H H_i + \gamma_H post \times H_i + \alpha_{DB} H_i \times DB_i + \alpha_{NDB} H_i \times NDB_i + \lambda_{DB} post \times H_i \times DB_i + \lambda_{NDB} post \times H_i \times NDB_i$$

where $(\lambda_{DB} - \lambda_{NDB}) + (\gamma_{DB} - \gamma_{NDB})$

identifies the effect of being type *H* (e.g. high leverage, high productivity) and stuck with a distressed bank.

Effect of a Distressed Bank Relationship on Firm Exit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1 Year	1 Year	2 Year	2 Year	3 Year	3 Year	4 Year	4 Year
Distressed	-0.003	0.001	-0.007***	-0.000	-0.006**	0.000	-0.007**	0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)	(0.003)
Post-Crisis	-0.008***	-0.006***	-0.011***	-0.003	-0.007**	0.014***	-0.012***	0.024***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)
Distressed * Post-Crisis	0.002	0.000	0.007***	0.004**	0.008***	0.006**	0.011***	0.009***
	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
Mean Exit Rate	0.060	0.046	0.116	0.100	0.161	0.149	0.202	0.190
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
R-Squared	0.072	0.101	0.136	0.174	0.188	0.226	0.230	0.270
Observations	329428	322069	328163	320485	324530	315623	311409	302870

Effect of a Distressed Bank Relationship on Firm Exit, by Leverage Quartile

	1 Year	2 Year	3 Year	4 Year
	*Distressed * Post-Crisis*			
Q1	-0.001	0.001	0.005	0.006
Q2	0.001	.006**	0.001	0.004
Q3	0.000	0.000	0.002	0.004
Q4	0.002	0.007	.015**	.019***
	Mean Exit Rate			
Q1	0.026	0.066	0.104	0.137
Q2	0.021	0.057	0.094	0.128
Q3	0.039	0.099	0.151	0.192
Q4	0.081	0.179	0.253	0.310
Observations	322069	320485	315623	302870

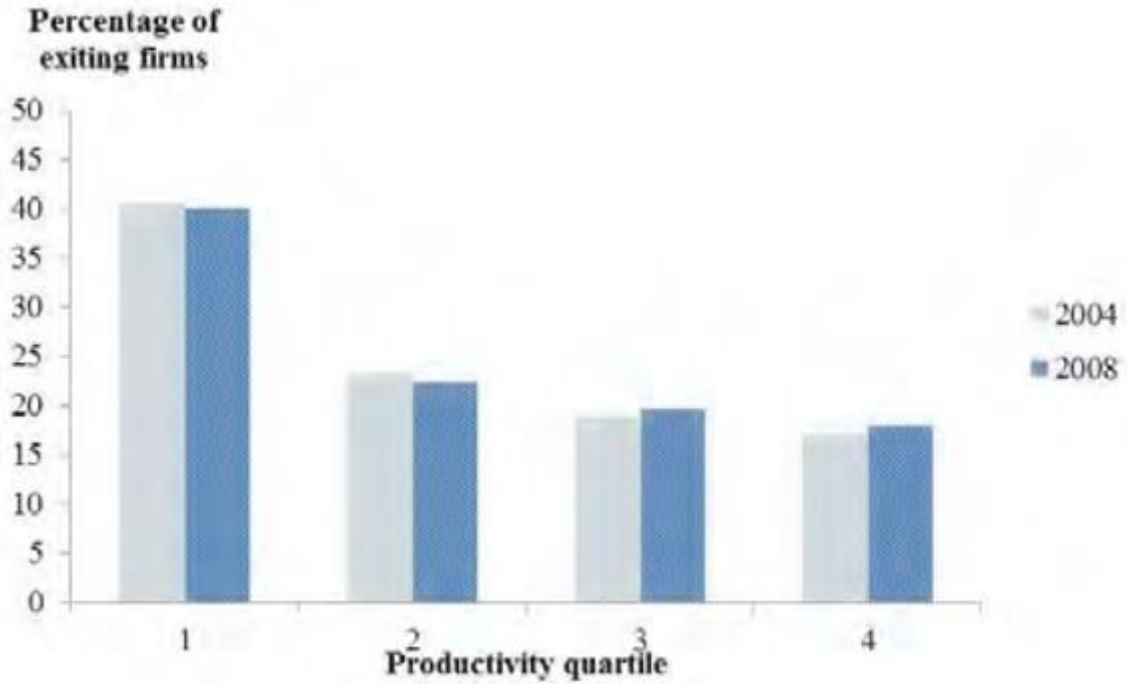
Summary statistics for productivity sample by banking group

	2004		2006		2008	
	ND	D	ND	D	ND	D
Exit in 2 Years	6%	5%	7%	7%	5%	6%
Exit in 4 years	14%	13%	13%	13%	11%	11%
Start-Up	5%	5%	3%	4%	3%	4%
Young	17%	17%	13%	14%	11%	13%
Foreign Owned	16%	15%	16%	15%	19%	17%
Exporter	18%	18%	18%	17%	19%	17%
Median Assets (£000)	2526	2734	3191	3408	3851	3952
Median Leverage Ratio	0.70	0.71	0.68	0.69	0.66	0.68
Credit Rating						
Lowest Quintile	17%	16%	2%	2%	1%	1%
Quintile 2	25%	27%	2%	2%	1%	1%
Quintile 3	20%	21%	2%	1%	1%	2%
Quintile 4	16%	16%	6%	6%	3%	4%
Highest Quintile	18%	17%	85%	87%	91%	91%
Observations	5140	6714	4853	6526	4629	6586

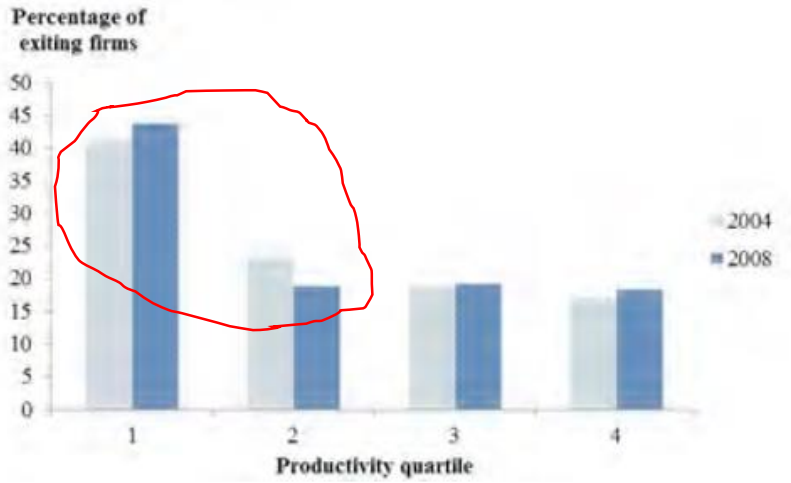
Labour productivity sample versus full sample:

Lower exit rates
Older firms
Internationalisation
Larger assets

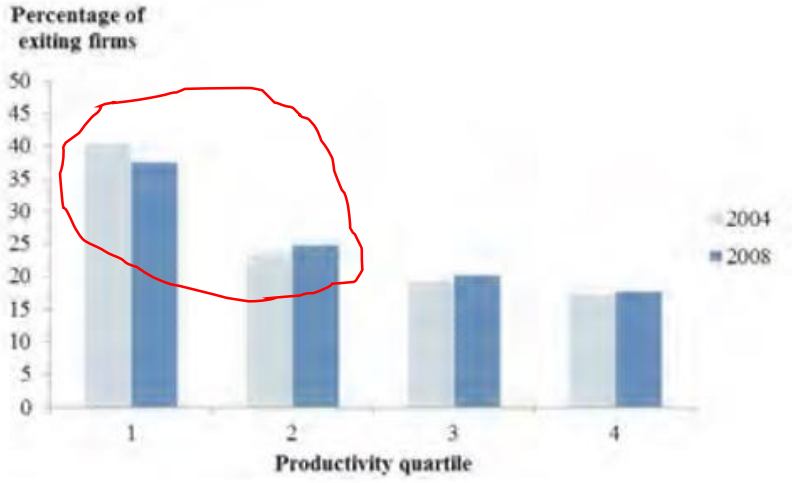
Productivity distribution of exiting firms, by productivity quartile



with Non Distressed Banks



with Distressed Banks



Effect of a Distressed Bank Relationship on Firm Exit, by Productivity Quartile

(no effect on exit rate for full sample)

	1 Year	2 Year	3 Year	4 Year
	*Distressed * Post-Crisis*			
Q1	-0.024**	-0.029*	-0.037	-0.024
Q2	0.015**	0.020*	0.047***	0.037**
Q3	0.015**	0.017*	0.000	0.009
Q4	0.009	0.002	-0.011	0.012
	Mean Exit Rate			
Q1	0.031	0.078	0.129	0.178
Q2	0.019	0.048	0.075	0.100
Q3	0.011	0.036	0.058	0.087
Q4	0.010	0.033	0.057	0.080
Observations	20845	20882	21154	21271

Effect of a Distressed Bank Relationship on Firm Exit, by Productivity and Leverage

(one and two year exit rates)

	(1)	(2)	(3)	(4)	(5)	(6)
	Lowest Leverage Tercile		Middle Leverage Tercile		Highest Leverage Tercile	
	1 Year Exit	2 Year Exit	1 Year Exit	2 Year Exit	1 Year Exit	2 Year Exit
Lowest Productivity Quartile						
Distressed * Post-Crisis	-0.011	-0.024	-0.004	-0.007	-0.036*	-0.045*
	(0.012)	(0.021)	(0.018)	(0.029)	(0.018)	(0.027)
Productivity Quartile 2						
Distressed * Post-Crisis	-0.008	0.008	0.021*	-0.003	0.029	0.059***
	(0.009)	(0.015)	(0.011)	(0.020)	(0.018)	(0.022)
Productivity Quartile 3						
Distressed * Post-Crisis	0.006	0.026**	0.017	0.001	0.020	0.022
	(0.007)	(0.012)	(0.011)	(0.016)	(0.015)	(0.023)
Highest Productivity Quartile 4						
Distressed * Post-Crisis	0.003	-0.011	-0.011	-0.002	0.040*	0.040*
	(0.009)	(0.015)	(0.008)	(0.014)	(0.020)	(0.021)

Effect of a Distressed Bank Relationship on Firm Exit, by Productivity and Leverage

(three and four year exit rates)

	(1)	(2)	(3)	(4)	(5)	(6)
	Lowest Leverage Tercile		Middle Leverage Tercile		Highest Leverage Tercile	
	3 Year Exit	4 Year Exit	3 Year Exit	4 Year Exit	3 Year Exit	4 Year Exit
Lowest Productivity Quartile						
Distressed * Post-Crisis	-0.028	0.006	-0.014	-0.017	-0.058	-0.041
	(0.027)	(0.038)	(0.041)	(0.044)	(0.039)	(0.033)
Productivity Quartile 2						
Distressed * Post-Crisis	0.020	0.001	0.013	0.037	0.101***	0.064*
	(0.021)	(0.025)	(0.025)	(0.027)	(0.032)	(0.035)
Productivity Quartile 3						
Distressed * Post-Crisis	0.001	0.012	0.015	0.010	-0.024	0.004
	(0.017)	(0.020)	(0.020)	(0.025)	(0.037)	(0.045)
Highest Productivity Quartile 4						
Distressed * Post-Crisis	-0.008	0.015	-0.020	0.002	-0.001	0.009
	(0.019)	(0.019)	(0.021)	(0.023)	(0.028)	(0.034)

Robustness

Placebo tests before the financial crisis (full sample)

2 year exit rates

	(1) Placebo "Crisis"=2004	(2) Placebo "Crisis"=2006	(3) Actual Crisis=2008
Distressed * Placebo Crisis	-0.002	-0.000	0.004**
	(0.003)	(0.002)	(0.002)
Mean Exit Rate	0.089	0.098	0.100
Industry Fixed Effects	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes
R-Squared	0.147	0.167	0.174
Observations	280057	301887	320485

3 year exit rates

	(1) Placebo "Crisis"=2005	(2) Actual Crisis=2008
Distressed * Placebo Crisis	-0.003	0.006**
	(0.003)	(0.003)
Mean Exit Rate	0.142	0.149
Industry Fixed Effects	Yes	Yes
Firm Controls	Yes	Yes
R-Squared	0.208	0.226
Observations	292810	315623

Placebo tests on productivity sample: Common trends for highly leveraged companies

Similar results with modified models:

Probit models

Definition of the treatment group

- Assignment April 2008 - March 2009
- Bank Recapitalisation Scheme was announced in October 2008
- Alternative assignment using lagged relationships

Weighted regression to account for sample selection

Conclusions

Did a credit supply shock contribute to a reduction in labour productivity?

- Maybe yes, by contributing to the exit of potentially productive companies
- And by protecting less productive companies from exit (forbearance)

Are credit constraints a key driver of UK productivity weakness?

- Key explanations of UK productivity weakness need to be able to explain the weakness of productivity *within* companies
- Consistent with evidence that weakened reallocation across firms contributed to aggregate UK productivity weakness

To what extent are these results applicable more widely?

- Not clear that we can extrapolate from this experiment to credit shocks more generally
  - Banks could de-leverage in alternate ways.
  - Credit tightening by good banks might also have contributed to productivity weakness.
- Data issues
- But we have highlighted some links from credit to aggregate productivity

Other considerations

- Bank stickiness across the productivity distribution, TFP, productivity quartiles defined on time averages, alternate definitions of zombies, growth at the intensive margin