

Bank Credit Conditions and their Influence on Productivity Growth: Company-level Evidence

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*Seminar, Bank of England
17 February 2015*



Acknowledgements:

The financial support of the Economic and Social Research Council grant reference ES/K00378X/1 is gratefully acknowledged.



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Motivation

- The productivity puzzle – it remains unclear how and to what extent the lack of credit has affected productivity
- Difficult to disentangle what is a change in credit supply and what is a change in credit demand
- A credit supply shock may reduce labour productivity:
 - Bank forbearance (prevalence of zombie companies)
 - Resource reallocation across companies hampered
 - Reduction in investment due to difficulty in accessing finance

A Quasi-Experiment

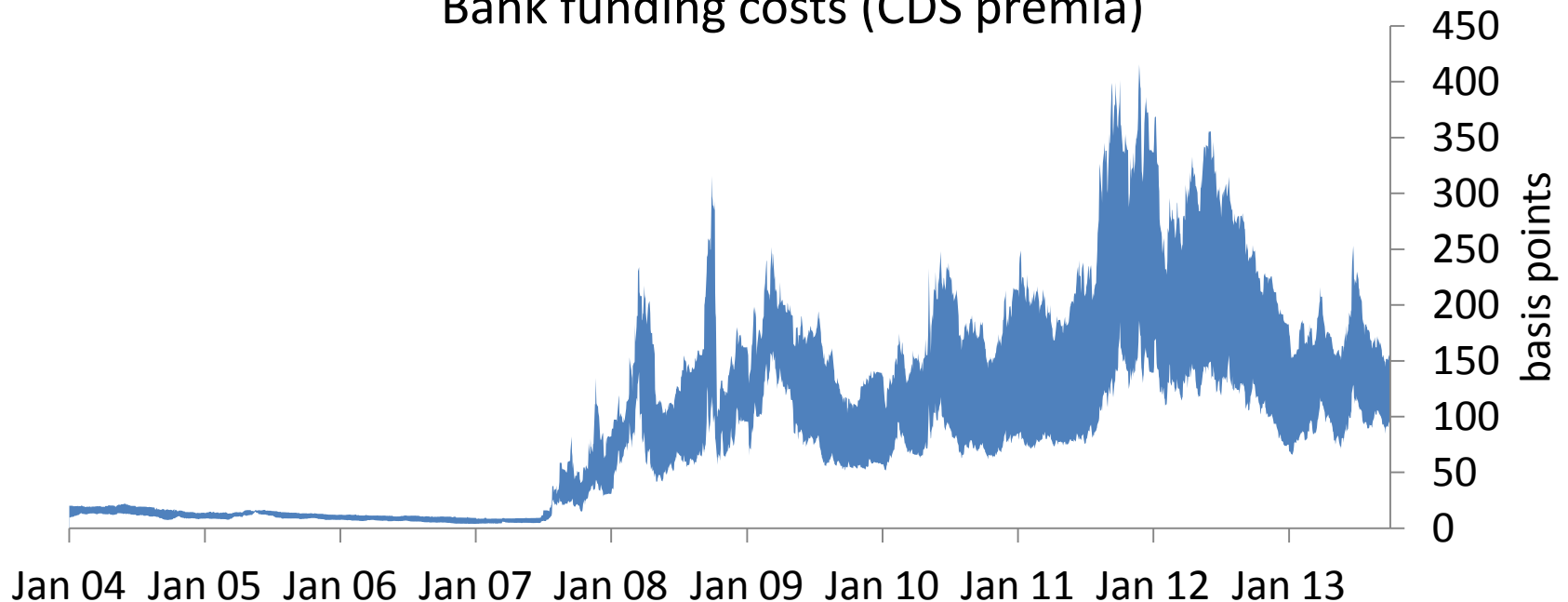
- Exploit exogenous variation induced by the financial crisis in credit availability to companies to investigate impacts of credit supply shocks
- Compare outcomes for companies who were subjected to tougher credit constraints to outcomes for companies that were less likely to be constrained
 - Quasi-experimental 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 and productivity

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 and Ruano, CEPR DP 9776, 2013.
 - Duygan-Bump, B., Levkov, A., and Montoriol-Garriga, J., Federal Reserve Bank of Boston QAU WP QAU10-6, 2011.
 - Investment
 - Almeida, H., Murillo, C., Laranjeira, B. and Weisbenner, S., NBER WP 14990, 2009.
 - Productivity
 - On-going research at the Bank of England (Franklin, J., Rostom, M., and Thwaites, G., 2013)
- The importance of financial circumstances for firms' investment decisions
 - Difficulties in assessment due to issues of reverse causation
 - See review by Bond, S. and J. Van Reenen (2007) in J. Heckman and E. Leamer, eds. *Handbook of Econometrics*
- Growing literature that seeks to understand the reasons for the current productivity puzzle

The Different Experiences of UK Banks

Bank funding costs (CDS premia)

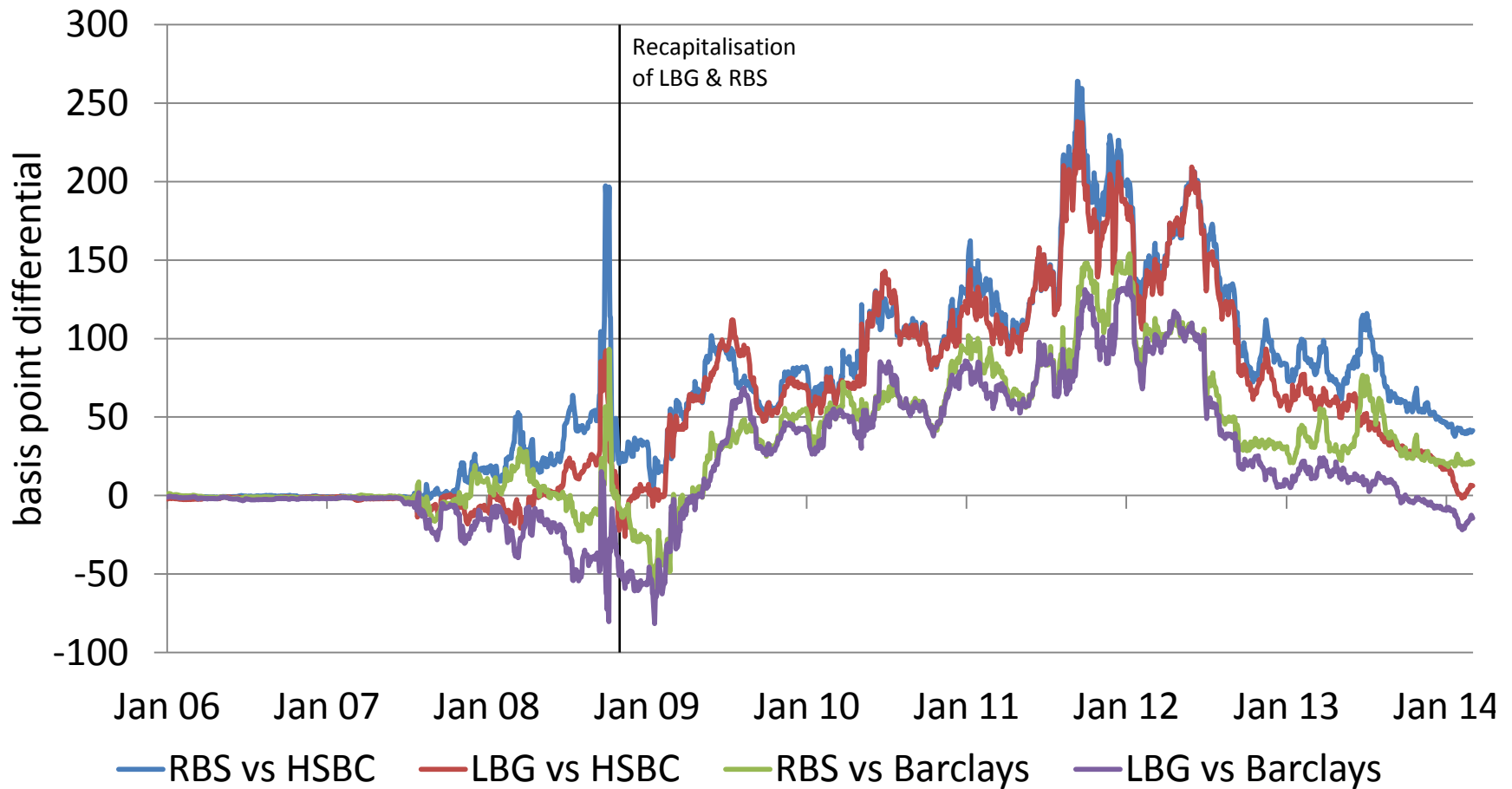


From the Large Review:

Having lent aggressively in the run-up to the crisis, RBS's lending volumes to SMEs have fallen faster than peers and its market share has contracted from an unsustainably high share in 2008, to a level more consistent with its customer base.

The Different Experiences of the Big Four UK Banks

Credit Default Swap Premia Differentials



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

Bank: borrowing company 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.
- Banks may require other security from the directors and may want their personal guarantees.
- Company Accounts record charge-holder information and hence the identity of lending banks

Bank 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

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

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

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

36% of companies with
outstanding charges



Not Distressed Banks

HSBC

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

Barclays

BARCLAYS BANK
WOOLWICH

Other

CLYDESDALE BANK
YORKSHIRE BANK
CO-OPERATIVE BANK
SANTANDER
ABBAY 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

32% of companies with
outstanding charges



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)

$$\begin{aligned} Y_{it} = & \text{cons} + \beta_{DB} DB_i + \beta_{NDB} NDB_i \\ & + \gamma_{post} + \gamma_{DB} post \times DB_i + \gamma_{NDB} post \times NDB_i \\ & + \text{controls}_{it} + u_i + \varepsilon_{it} \end{aligned}$$

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 and stuck with a distressed bank.

PNFC Switching Between Lenders

Probability of changing lender

after:	1 year	2 years	3 years	4 years
All*	4.2	7.7	10.6	13.2
Big Four	3.3	6.1	8.6	10.7

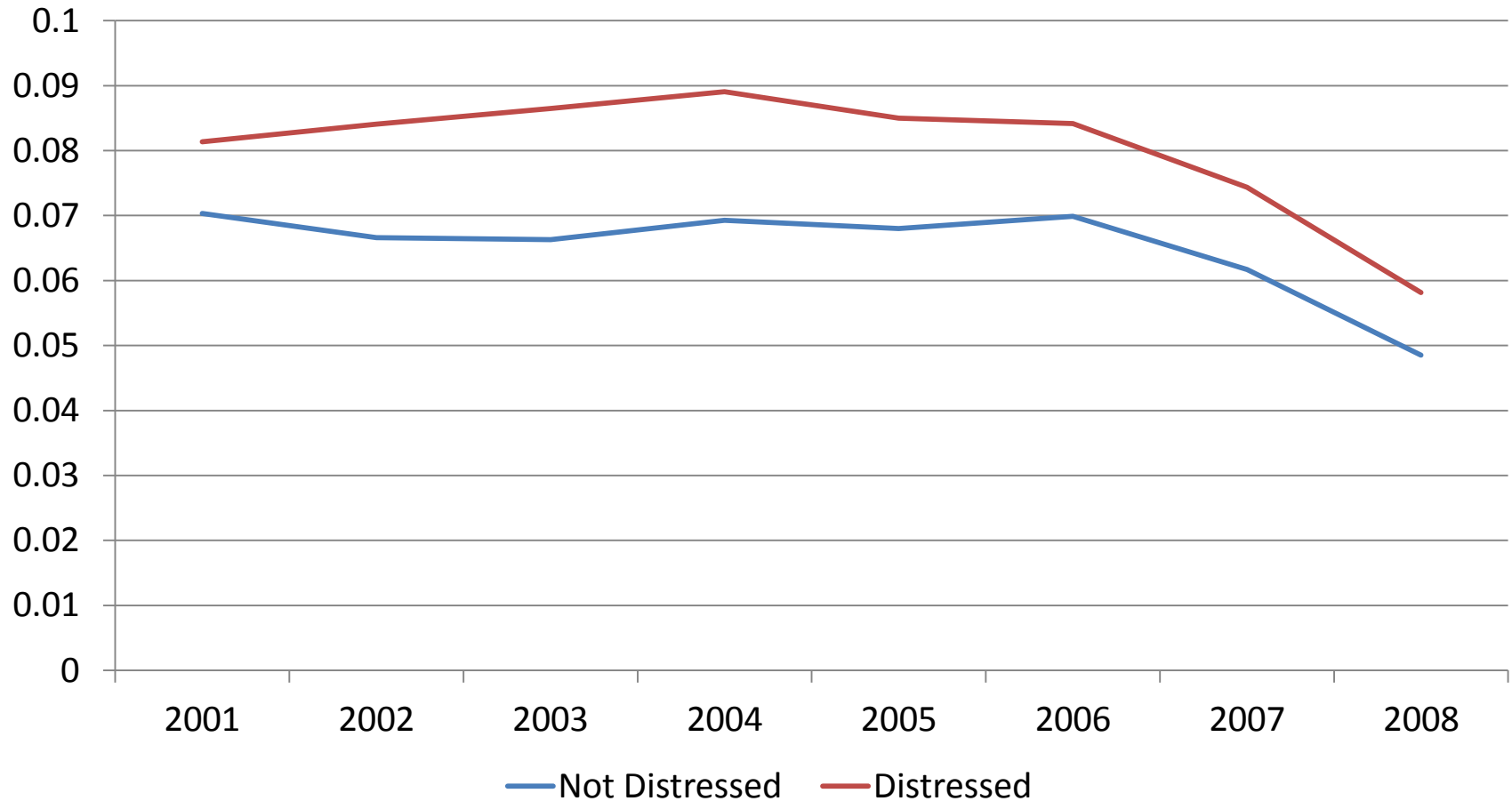
Source: FAME BvD and authors' calculations.

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries.

Companies who do not have an outstanding charge with any other lender. Big Four = RBS, Lloyds, HSBC, Barclays. Switching to another lender evaluated over the period 2001-2011.

*Switching between 15 categories of lender

Proportion of companies that take on a new charge in next year

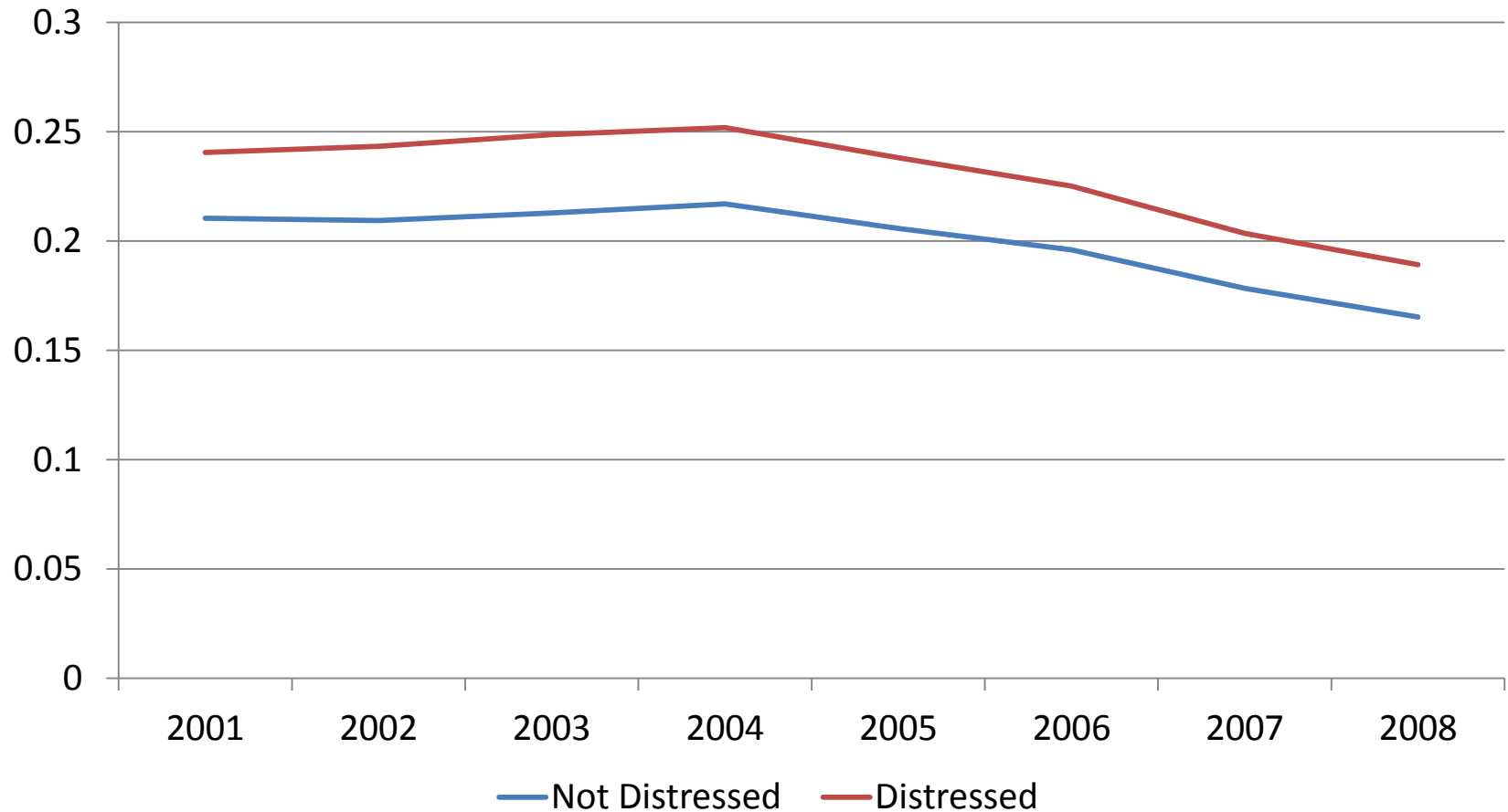


Source: FAME BvD and authors' calculations.

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries.

Companies who do not have an outstanding charge with any other lender.

Proportion of companies that take on a new charge in next 4 years



Source: FAME BvD and authors' calculations.

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries.

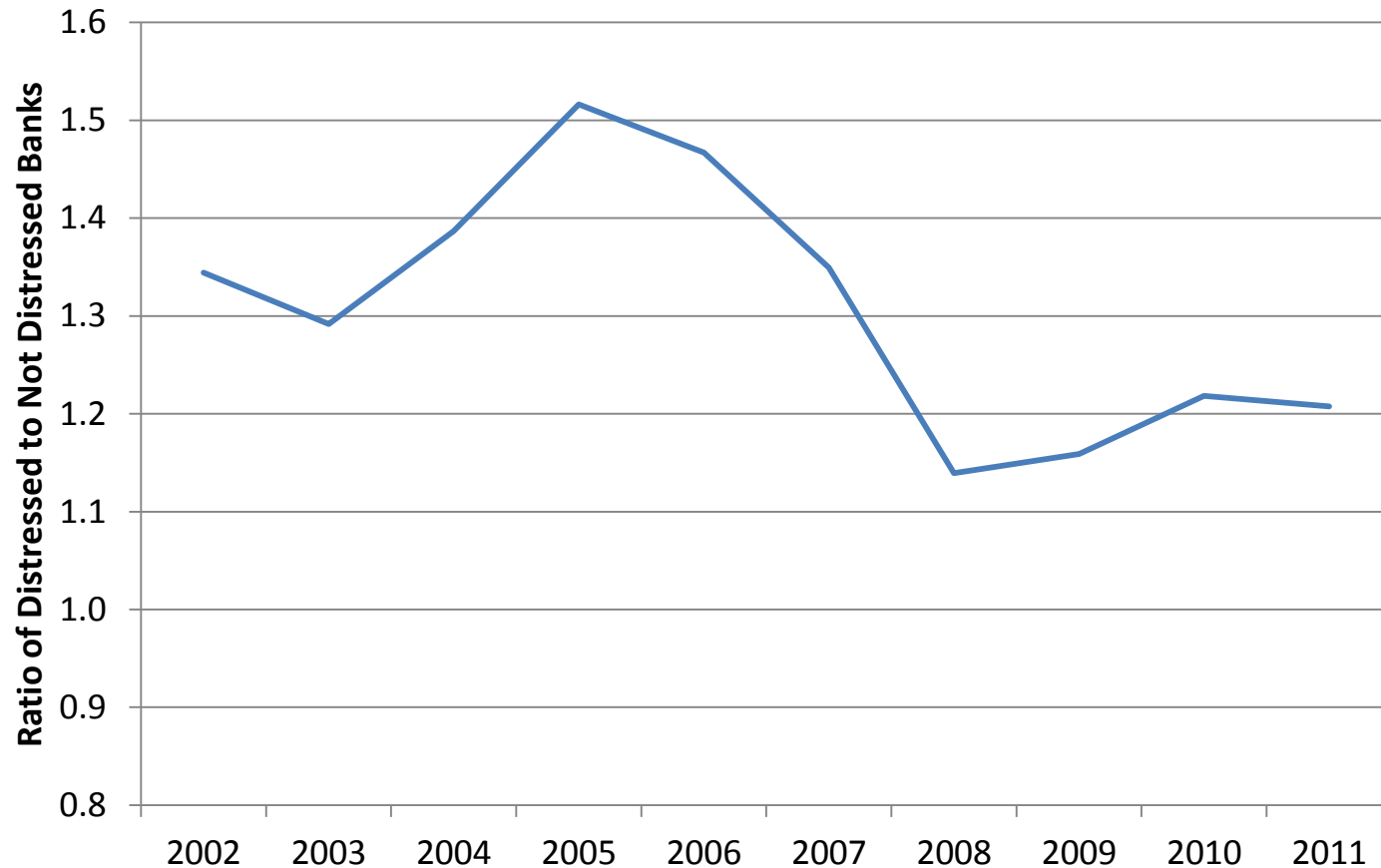
Companies who do not have an outstanding charge with any other lender.

Key descriptives for groups of firms

	All		NDB		DB	
	mean	median	mean	median	mean	median
Debt per head	116.0	24.4	56.2	18.4	65.8	20.2
Working Capital per head	48.5	13.4	29.3	13.4	33.3	12.6
Labour Productivity	41.1	33.2	38.0	32.8	39.1	33.3
Capital Labour Ratio	125.3	30.6	72.9	26.6	75.3	28.3
Employment	908	113	344	101	369	106

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who report all variables listed. Financial years 2006-2008.

Short term loans and overdrafts held by companies with outstanding charges in DISTRESSED and NOT DISTRESSED banks

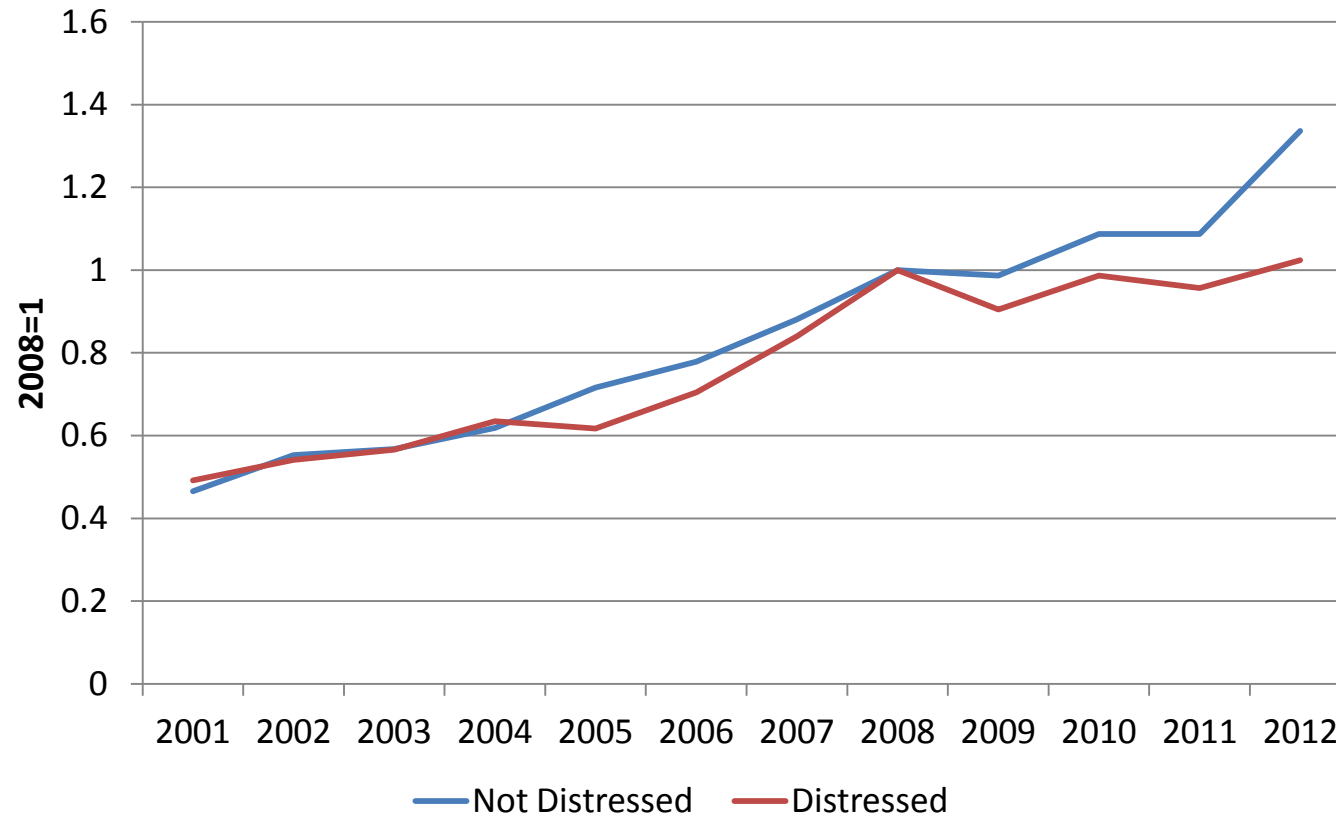


Source: FAME BvD and authors' calculations.

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries.

Companies who do not have an outstanding charge with any other lender and who report their loans.

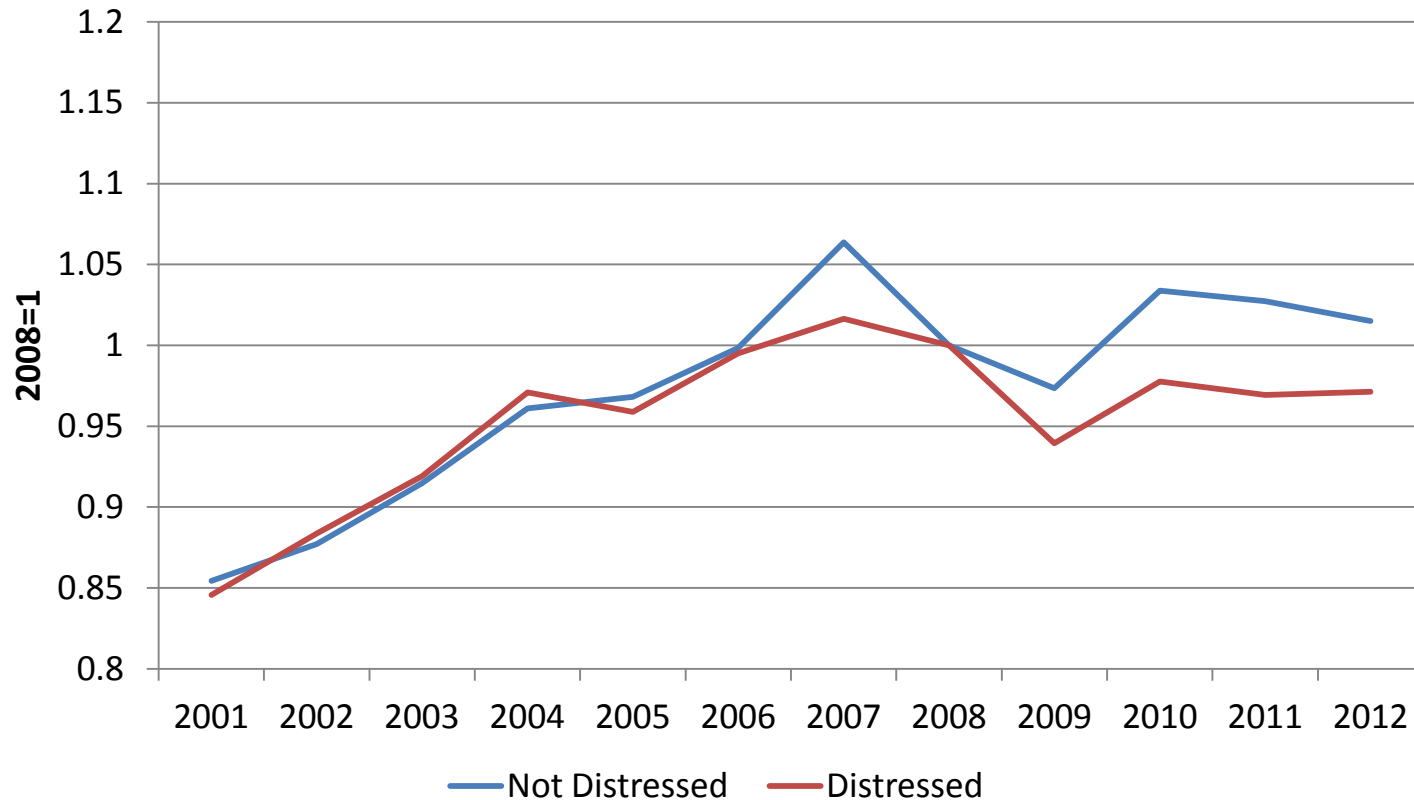
Median short term loans and overdrafts held by companies with outstanding charges in DISTRESSED and NOT DISTRESSED banks



Source: FAME BvD and authors' calculations.

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who do not have an outstanding charge with any other lender and who report their debt.

Median labour productivity for companies with outstanding charges in DISTRESSED and NOT DISTRESSED banks



Source: FAME BvD and authors' calculations.

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who do not have an outstanding charge with any other lender and who report their debt.

Diff-in-Diff coefficients for repeated cross-sections (2010-12 compared to 2006-8)

	2010-2012 vs 2006-2008		2006-2008 vs 2002-2004	
	coeff	pval	coeff	pval
Labour productivity	-0.024	(0.045)	-0.002	(0.857)
GVA	-0.078	(0.004)	-0.052	(0.101)
Debt per head	-0.055	(0.112)	-0.017	(0.618)
Debt (long and short)	-0.106	(0.011)	-0.064	(0.160)
Employment	-0.050	(0.063)	-0.038	(0.211)
Capital labour ratio	-0.063	(0.032)	0.025	(0.406)
Observations	27997		26180	

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who do not have an outstanding charge with any other lender and who report short term loans and overdrafts. Control group equals companies with an outstanding charge with a not distressed bank. Treatment group equals companies with an outstanding charge with a distressed bank. Financial years 2010-12 compared to 2006-2008. 2-digit industry*year controls. Robust regression.

Sample Characteristics (loan sample 2006-8)

	NDB	DB		NDB	DB
Exit rate (4 years)	0.202	0.197	Start-up	0.070	0.080
Exit rate (3 years)	0.162	0.155	Young	0.280	0.288
Total asset distribution			Foreign owned	0.045	0.052
2nd quintile	0.050	0.028	Exporter	0.042	0.040
3rd quintile	0.115	0.078	Count court judgment 0-24 mths	0.042	0.045
4th quintile	0.271	0.252	Normal credit score	0.801	0.807
5th quintile	0.549	0.628	Short term gearing >50th pctile	0.442	0.449
Group accounts	0.032	0.039	Short term gearing >75th pctile	0.180	0.182
Full accounts	0.122	0.144			
Companies	64991	75789			

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who do not have an outstanding charge with any other lender and who report short term loans and overdrafts. Control group equals companies with an outstanding charge with a not distressed bank. Treatment group equals companies with an outstanding charge with a distressed bank. Financial years 2006-2008.

Sample Characteristics (productivity sample 2006-8)

	NDB	DB		NDB	DB
Exit rate (4 years)	0.108	0.109	Start-up	0.043	0.046
Exit rate (3 years)	0.083	0.082	Young	0.144	0.156
Total asset distribution			Foreign owned	0.171	0.160
2nd quintile	0.007	0.003	Exporter	0.208	0.182
3rd quintile	0.021	0.015	Count court judgment 0-24 mths	0.037	0.045
4th quintile	0.059	0.047	Normal credit score	0.953	0.960
5th quintile	0.913	0.935	Short term gearing >50th pctile	0.356	0.356
Group accounts	0.186	0.198	Short term gearing >75th pctile	0.106	0.100
Full accounts	0.441	0.441	Labour productivity >50th pctile	0.539	0.559
			Labour productivity >75th pctile	0.239	0.247
Companies	10195	13566			

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who do not have an outstanding charge with any other lender and who report short term loans and overdrafts and for whom we can measure labour productivity and fixed assets. Control group equals companies with an outstanding charge with a not distressed bank. Treatment group equals companies with an outstanding charge with a distressed bank. Financial years 2006-2008.

Exit Rate effect of being with a nationalised bank

Exit period		Full sample	Loan sample	Productivity sample		
4-year		0.006 *** (0.0019)	0.011 *** (0.0037)	0.009 (0.0070)		
3-year		0.007 *** (0.0016)	0.009 *** (0.0030)	0.005 (0.0053)		
	Leverage position				Productivity position	
4-year	BELOW 50th		0.010 ** (0.0045)	0.018 ** (0.0079)	BELOW 50th	-0.007 (0.0117)
4-year	ABOVE 50th		0.012 * (0.0061)	-0.007 (0.0135)	ABOVE 50th	0.023 *** (0.0083)
3-year	BELOW 50th		0.011 *** (0.0035)	0.013 ** (0.0058)	BELOW 50th	-0.003 (0.0086)
3-year	ABOVE 50th		0.007 (0.0051)	-0.012 (0.0104)	ABOVE 50th	0.012 * (0.0061)
4-year	BELOW 75th		0.013 *** (0.0039)	0.014 * (0.0071)	BELOW 75th	0.008 (0.0085)
4-year	ABOVE 75th		0.002 (0.0103)	-0.027 (0.0275)	ABOVE 75th	0.016 (0.0112)
3-year	BELOW 75th		0.010 *** (0.0031)	0.008 (0.0053)	BELOW 75th	0.006 (0.0064)
3-year	ABOVE 75th		0.006 (0.0085)	-0.022 (0.0210)	ABOVE 75th	0.000 (0.0083)

Notes: OLS regression; robust standard errors in brackets clustered by firm.

3-6 %points added to the exit rate

Exit Rate effects (pre-crisis falsification test)

Exit period		Full sample		Loan sample		Productivity sample			
4-year		-0.002	(0.0019)	-0.003	(0.0034)	-0.008	(0.0067)		
3-year		-0.003 *	(0.0019)	-0.001	(0.0032)	-0.007	(0.0060)		
	Leverage position							Productivity position	
4-year	BELOW 50th			-0.001	(0.0044)	-0.003	(0.0078)	BELOW 50th	-0.004 (0.0109)
4-year	ABOVE 50th			-0.006	(0.0058)	-0.016	(0.0131)	ABOVE 50th	-0.012 (0.0085)
3-year	BELOW 50th			0.000	(0.0039)	-0.005	(0.0067)	BELOW 50th	-0.008 (0.0099)
3-year	ABOVE 50th			-0.002	(0.0054)	-0.011	(0.0119)	ABOVE 50th	-0.006 (0.0073)
4-year	BELOW 75th			0.000	(0.0037)	-0.005	(0.0069)	BELOW 75th	-0.009 (0.0080)
4-year	ABOVE 75th			-0.018 *	(0.0098)	-0.036	(0.0261)	ABOVE 75th	-0.005 (0.0124)
3-year	BELOW 75th			0.001	(0.0034)	-0.003	(0.0061)	BELOW 75th	-0.010 (0.0072)
3-year	ABOVE 75th			-0.011	(0.0093)	-0.036	(0.0238)	ABOVE 75th	0.003 (0.0105)

Notes: OLS regression; robust standard errors in brackets clustered by firm.

Exit Rates by Big-4 Lender (Bilateral Comparisons)

Exit period	Bank							
	Treatment	Comparison	Full sample		Loan sample		Productivity sample	
4-year	RBS	HSBC	0.008 ***	(0.0026)	0.015 ***	(0.0053)	0.009	(0.0113)
4-year	LBG	HSBC	0.007 **	(0.0031)	0.018 ***	(0.0062)	0.011	(0.0124)
4-year	Barclays	HSBC	-0.002	(0.0030)	0.006	(0.0060)	-0.003	(0.0118)
4-year	RBS	Barclays	0.010 ***	(0.0028)	0.009	(0.0054)	0.012	(0.0094)
4-year	LBG	Barclays	0.009 ***	(0.0033)	0.013 **	(0.0063)	0.014	(0.0107)
4-year	RBS	Lloyds	0.001	(0.0029)	-0.004	(0.0056)	-0.002	(0.0101)
3-year	RBS	HSBC	0.009 ***	(0.0023)	0.015 ***	(0.0044)	0.008	(0.0085)
3-year	LBG	HSBC	0.008 ***	(0.0028)	0.023 ***	(0.0051)	0.011	(0.0095)
3-year	Barclays	HSBC	0.000	(0.0027)	0.012 **	(0.0050)	0.003	(0.0091)
3-year	RBS	Barclays	0.009 ***	(0.0024)	0.003	(0.0044)	0.004	(0.0072)
3-year	LBG	Barclays	0.008 ***	(0.0028)	0.011 **	(0.0052)	0.008	(0.0083)
3-year	RBS	Lloyds	0.001	(0.0025)	-0.008	(0.0046)	-0.004	(0.0077)

Notes: OLS regression; robust standard errors in brackets clustered by firm.

Summary

- Companies that borrowed from banks that became distressed (and nationalised) were
 - more likely to exit the market in the years following nationalisation compared to a counterfactual where they had borrowed from a bank that did not become distressed
- Some evidence that nationalised banks differed from other banks in contributing to the exit of
 - Lower leverage companies
 - Higher productivity companies
- Productivity in surviving companies
 - Looking at companies that stay in business we do not detect a general effect on short term loans, capital intensity, or productivity of being associated with a distressed bank (comparing several years before and after the crisis)
 - Data weaknesses may be contributing to this (mainly larger firms)
 - Some negative effects on debt and capital stocks for smaller (defined by total assets) companies?
 - Small sample sizes, unbalanced panel.
 - Separately, focusing on highly leveraged companies

Surviving firms

(unbalanced panel, outside top 10 percent of asset distribution)

	2010-2012 vs 2006-2008	
	coeff	pval
Labour productivity	0.128	(0.325)
GVA	0.114	(0.565)
Debt (long and short)	-0.028	(0.645)
Debt (long)	-0.656	(0.034)
Employment	0.096	(0.566)
Capital labour ratio	-0.383	(0.214)
Capital stock	-0.444	(0.067)
Observations	920	

Notes: Companies in the non-financial non-farm business sectors excluding the Mining and Real Estate industries. Companies who do not have an outstanding charge with any other lender and who report all variables shown. Control group equals companies with an outstanding charge with a not distressed bank in 2006-2008. Treatment group equals companies with an outstanding charge with a distressed bank in 2006-2008. Financial years 2010-12 compared to 2006-2008. 2-digit industry*year controls. Robust regression.

Conclusions

- Did a credit supply shock contribute to a reduction in productivity?
 - Maybe yes, by contributing to the exit of potentially productive companies
 - Less differential across banks in contribution to exit of high leverage companies
 - Evidence of forbearance?
 - Or is it just that high leverage companies are more likely to exit in a recession (regardless of the lender)?
- Are credit constraints a key driver of recent productivity weakness?
 - Key explanations of recent productivity weakness need to be able to explain the weakness of productivity *within* companies
 - No obvious negative correlation at the sector level between the productivity deviation from trend and bank dependence
- 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.

Context: Accounting for the labour productivity gap

Labour productivity growth 2007-12 less labour productivity growth 2002-7

	Total	Within	Reallocation	share within
Accommodation & Food	-0.125	-0.179	0.054	1.43
Construction	-0.206	-0.083	-0.122	0.41
Wholesale & Retail	-0.248	-0.194	-0.054	0.78
Manufacturing	-0.272	-0.204	-0.068	0.75
Transport & Storage	-0.125	-0.205	0.080	1.64
Arts & Entertainment	-0.266	-0.172	-0.093	0.65
Administration & Support	-0.020	0.082	-0.102	-4.07
Professional & Scientific	-0.251	-0.302	0.051	1.20
Information & Communication	-0.417	-0.414	-0.003	0.99
All	-0.212	-0.174	-0.038	0.82

Source: ARD and authors' calculations.

Notes: Diewert-Fox Hybrid composition of GR and MP.

Context: Reallocation in manufacturing (now and then)

Relationship between employment growth and productivity deviations from industry/year mean

	Change in log(1+E) (All firms)	Change in log(1+E) (Continuers)	Survival probability			
(Note - changes/survival measured over next 5 years)						
productivity deviation	0.0015	-0.3380	0.0032	0.0000	0.0006	-0.1670
productivity deviation*(2002 or 2007)	0.0069	-0.0020	0.0005	-0.5740	0.0014	-0.0100
productivity deviation*(1989 or 2007)	0.0012	-0.6490	0.0007	-0.4340	0.0007	-0.3080
productivity deviation*(2007)	-0.0045	-0.1630	-0.0028	-0.0190	-0.0013	-0.0810
Sample size	33701		20383		33701	

Notes:

Start years included in the sample: 1984, 1989, 2002, 2007;

Industry*year effects included; OLS; robust standard errors; p-values in brackets;

Observations weighted to population totals.