

Internet appendix for:
**Credit Misallocation During the European
Financial Crisis**

Published in the Economic Journal

Fabiano Schivardi* Enrico Sette† Guido Tabellini‡

February 16, 2021

1 Quantifying the aggregate effects of reducing the extent of zombie lending

Define Y^{NZ} as the average product of one unit of input in non-zombie firms. The units can be both firms (extensive margin) or workers/capital (intensive margin). Assume that a zombie's average product is $Y^Z = \theta Y^{NZ}$, $\theta \in [0, 1]$, where $\theta = 0$ is the case in which zombies are totally unproductive and $\theta = 1$ if zombies are as productive as non-zombies.

Consider first the case in which the unit is a firm, so that Y^{NZ} is the average output of non-zombies. Assume that there are n^{NZ} non-zombies and n^Z zombies. Total output is then

$$Y = Y^{NZ} * n^{NZ} + Y^Z * n^Z = Y^{NZ} * (n^{NZ} + \theta * n^Z). \quad (1)$$

Let δ^S , $S = Z, NZ$ be the effect of bank recapitalization on the failure rate of zombies and non-zombies respectively (so that $(1 - \delta^S)$ is the effect on their survival rate). Focusing on the extensive margin only, the effect of increasing bank capital is to bring output at the counterfactual level:

$$Y^{CF} = Y^{NZ} * (n^{NZ}(1 - \delta^{NZ}) + \theta * n^Z(1 - \delta^Z)) \quad (2)$$

Using the notation of equation (6) we have: $\delta^{NZ} = \hat{\gamma}_1 * \overline{\Delta LowCap}$ and $\delta^Z = (\hat{\gamma}_1 + \hat{\gamma}_2) * \overline{\Delta LowCap}$, and by the previous computations $\overline{\Delta LowCap} = -0.241$. When δ^S is

*LUISS University, EIEF and CEPR, fschivardi@luiss.it

†Bank of Italy, enrico.sette@bancaditalia.it.

‡Department of Economics and IGIER, Bocconi University; CEPR and CES-Ifo, guido.tabellini@unibocconi.it.

negative, the number of surviving firms in the counterfactual scenario increases relative to the actual number, and vice versa if positive. We found that recapitalizing banks decreases the failure rate of non-zombies and increases that of zombies.

Define $sh^{NZ} = n^{NZ}/(n^{NZ} + n^Z)$ as the share of non-zombies firms and symmetrically for sh^Z . The growth rate of output in the counterfactual scenario relative to actual output is:

$$\frac{Y^{CF} - Y}{Y} = \frac{-sh^{NZ}\delta^{NZ} - \theta * sh^Z\delta^Z}{sh^{NZ} + \theta * sh^Z} \quad (3)$$

The first term in the numerator is the percentage increase in output coming from the increase in the number of non-zombie firms (provided that δ^{NZ} is negative), while the second term is the decrease coming from the exit of zombie firms, weighted by their relative productivity. The increase is maximal, and equal to δ^{NZ} itself, when $\theta = 0$, i.e., when zombies are totally unproductive, and minimal when $\theta = 1$. Even in this case, however, the increase in the capital ratio of banks can have a positive effect as long as $-sh^{NZ}\delta^{NZ} > sh^Z\delta^Z$. In particular, the fact that the share of non-zombies is four times as large as that of zombies magnifies the effect: even when the treatment has perfectly symmetric effects ($\delta^{NZ} = -\delta^Z$), output increases because there are more non-zombies so that the contraction in output due to the exit of zombies is more than compensated by the expansion in non-zombies.

From the descriptive statistics in Table A2, we have that the share of zombies during the crisis is $sh^Z = 0.19$; regression results in the first column of Table 8 deliver $\hat{\gamma}_1 = 0.444$ and $\hat{\gamma}_1 + \hat{\gamma}_2 = -0.963$, so that $\delta^{NZ} = 0.0011$ and $\delta^Z = -0.0023$. The increase in output for $\theta = 0$ is 0.11% and basically zero for $\theta = 0.5$. These figures indicate that the lower failure rate of healthy firms and the higher failure rate of zombies that would result from the capital injection would increase output growth by at best 0.1% during the crisis.

For the intensive margin, we have shown that the effects on the growth of non-zombies are rather modest. Consistently, if we take the estimates for employment growth in the first column of Table 4, we obtain $\delta^Z = 0.012$ and $\delta^{NZ} = 0.0004$, so the increase in output is negligible for $\theta = 0$ and slightly negative for positive values of θ . We obtain similar results, if not even more negative, when we use capital and sales growth. Overall, the effect coming from the intensive margin is, in the best of cases, rather limited.

2 Construction of the IO Matrix

The Input/output table we use is supplied by the National institute for statistics (Istat) and can be found at <https://www.istat.it/it/archivio/225665>. We use the 2010 sheet of the excel file SIMM_TOT_63BxB.xls. The matrix is expressed in terms of NACE Rev. 2 classification (which corresponds to the Ateco 2007 classification), with the 88 divisions grouped into 63 sectors. We need to re-express the table in terms of our 2-digit sectoral classification (18 sectors), which is Ateco 2002. We proceed in two steps: (i) We find the Ateco 2002 codes corresponding to the Ateco 2007 codes in each of the 63 sectors in the IO matrix; (ii) We aggregate the 63 sectors into our 18.

To build the conversion table from Ateco 2002 to Ateco 2007 we rely on code descriptions and on the document “ Tabella trascodifica Ateco 2002-2007 del 12-12-2008” provided by Istat at https://www.istat.it/it/files/2011/03/Tavola_raccordo_Ateco2007-2002_12-12-08.pdf, which associates each 5-digit Ateco 2002 code to a 5-digit Ateco 2007 code. Most matches are precise but some required decisions on where to allocate categories that are split between two different codes. The main cases are listed below:

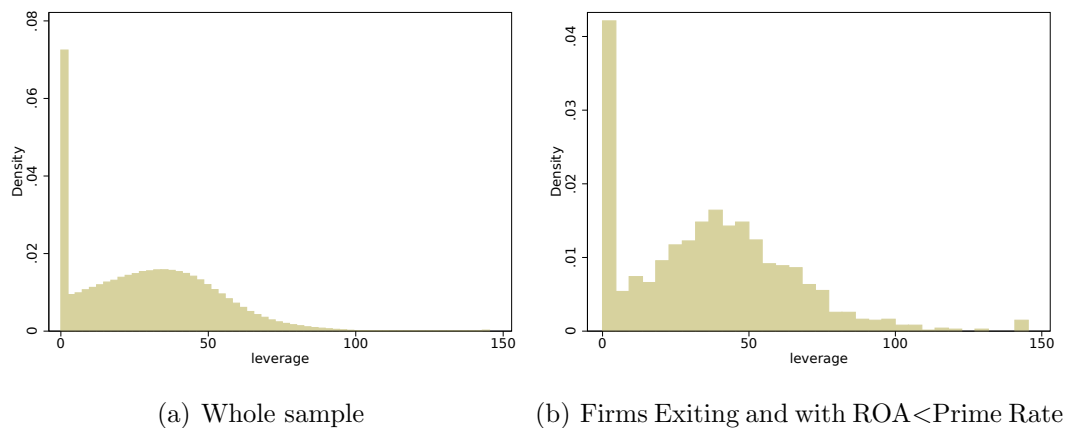
- Ateco07 58 “ Attività editoriali” is split between Ateco02 22 “ Editoria, stampa e riproduzione di supporti registrati” and 72 “ Informatica e attività connesse”, because it includes “ Edizione di software” (58.2). We associate it with Ateco02 22.
- Ateco07 81 “ Attività di servizi per edifici e paesaggio” is split between Ateco02 74 “ Attività di servizi alle imprese” (main category), Ateco02 01 “ Agricoltura, caccia e relativi servizi”, Ateco02 70 “ Attività immobiliari” and Ateco02 90 “ Smaltimento rifiuti solidi, delle acque di scarico e simili” (in particular, the class 90.03 “ Pulizia delle aree pubbliche, decontaminazione e disinquinamento dell’ambiente”). We associate it with Ateco02 74.
- Ateco07 38 “ Attività di raccolta, trattamento e smaltimento dei rifiuti; recupero dei materiali” is split between Ateco02 37 “ Recupero e preparazione per il riciclaggio” and Ateco02 90 “ Smaltimento dei rifiuti solidi, delle acque di scarico e simili”. We associate it with Ateco02 90.
- Ateco07 75 “ Servizi veterinari” corresponds to Ateco02 85.20, so it is included in the two-digit Ateco02 85 in our sectoral classification. However, in the NACE

classification at 63 sectors of the IO matrix we have a single class V74.75 “ Altre attività professionali, scientifiche e tecniche; servizi veterinari”, which is matched to Ateco02 74 “ Attività di servizi alle imprese” (following Istat’s “ Tabella trascodifica Ateco 2002-2007”). So even if Ateco07 75 is technically associated with Ateco02 85, when we aggregate the data it is included in Ateco02 74.

To aggregate the data, we use the conversion table to map each of the 63 ateco07 codes into a unique code of our sectoral classification and sum the values accordingly.

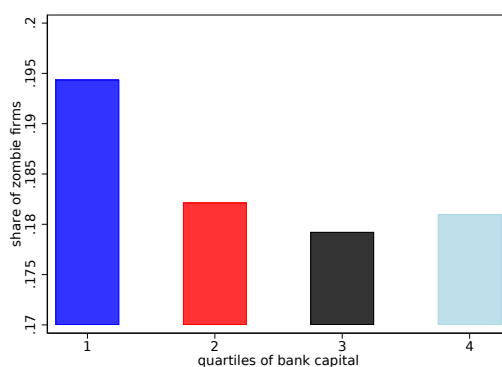
3 Additional Figures

Figure A1: Leverage of Firms



Panel (a) shows the distribution of leverage (the ratio of debt from banks and from other financiers, excluding trade debt and debt towards shareholders, to total assets) for the whole sample of firms included in the firm register. Panel (b) shows the distribution of leverage of firms with the moving average of ROA below the prime rate in at least one year between 2004 and 2005 and that exited the market in 2006 or 2007 due to default or liquidation. The threshold on leverage used to define zombie firms is the median of this distribution. Data are from the year 2005.

Figure A2: Share of zombie firms by quartiles of bank capital



The figure shows the share of zombie firms by quartiles of bank capital. The share is computed using bank-firm relationships from the Italian Credit Register. Bank capital is the ratio of regulatory capital to risk weighted assets. Data cover the period 2004-2013.

4 Descriptive statistics and additional results

Table A1: Descriptive statistics of firms

	Mean	S.D.	Median	25pct	75pct	N
Non-Zombie Firms						
Leverage	23.915	19.093	23.051	6.715	36.364	582,406
ROA	5.541	8.498	5.258	1.767	9.458	582,406
EBIT/Int Exp	6.099	12.281	2.714	1.082	6.741	569,568
Cash Hold/Assets	6.965	10.268	2.713	0.616	8.852	551,970
Liquidity/Assets	13.181	62.097	6.073	2.328	14.141	582,265
Assets (000 Euros)	9,414	119,134	1,999	896	5,049	582,406
Zombie Firms						
Leverage	56.843	15.065	52.895	45.882	63.580	119,488
ROA	-1.340	7.981	1.091	-3.348	3.354	119,488
EBIT/Int Exp	-0.449	4.158	0.479	-1.364	1.441	118,875
Cash Hold/Assets	3.184	6.152	0.939	0.226	3.304	109,909
Liquidity/Assets	9.109	65.193	3.203	1.051	8.616	119,463
Assets (000 Euros)	12,896	79,031	3,156	1,245	8,653	119,488

The table shows descriptive statistics of firms according to zombie status. A firm is classified as zombie in any given year if, in that year, ROA is below PRIME, and if leverage exceeds 40%. This threshold corresponds to the median value of leverage in 2005 in the sample of firms that exited the market during 2006-2007 (i.e. just before the financial crisis) due to default or liquidation, and that during the previous two years had $ROA < PRIME$ at least once. Data are from the Firm Register (Cerved) available at annual frequency from firms' balance sheets. Leverage is total financial debt over total assets; ROA is profits to assets ratio; Ebit/Int Exp is the ratio of Earnings before interest and taxes to interest expenses; Cash Holdings to Assets is the ratio of cash and cash equivalents to total assets; Liquidity to Assets is the share of liquidity and short term assets to total assets.

Table A2: Descriptive Statistics of the variables used in the credit regressions

	Mean	S.D.	Median	25pct	75pct	N
Dependent variables:						
Delta Log Credit	-8.063	50.128	0	-15.771	0.000	2,287,690
D(Cut=1)	9.433	29.229	0.000	0.000	0.000	2,636,764
D(Cut Rev=1)	9.844	29.790	0.000	0.000	0.000	2,095,046
D(Bad loan=1)	1.778	13.216	0.000	0.000	0.000	2,698,744
D(Non-perf=1)	3.722	18.929	0.000	0.000	0.000	2,698,744
Interest rate on credit lines	9.929	4.246	9.34	6.551	12.731	966,838
Firm regressors:						
Zombie (<i>Z</i>)	0.193	0.395	0.000	0.000	0.000	2,287,690
Zombie 2	0.108	0.310	0.000	0.000	0.000	2,224,741
PC ROA-leverage (PC 1)	0.065	0.839	0.106	-0.473	0.596	2,287,690
PC EBIT/Int.-leverage (PC 2)	0.093	0.991	0.281	-0.382	0.727	2,224,741
Score	0.059	0.236	0.000	0.000	0.000	2,281,296
Banks regressors:						
LowCap	0.241	0.428	0.000	0.000	0.000	2,287,690
Capital Ratio	11.321	2.365	11.094	10.164	12.09	2,287,690
LowCap yby	0.439	0.496	0.000	0.000	1.000	2,287,690
LowCap9	0.040	0.195	0.000	0.000	0.000	2,287,690
Liquidity ratio	9.042	4.335	9.211	5.637	11.090	2,287,690
Interbank ratio	7.916	8.137	5.939	3.563	9.061	2,286,616
Bank Roa	0.026	0.658	0.221	0.066	0.441	2,286,616
Bank Size	11.579	1.819	11.801	10.395	13.303	2,287,690
Bank-firm regressors:						
Share bank	29.387	21.449	23.942	12.284	42.350	2,287,690
Share credit line	24.162	30.503	11.111	3.498	30.708	2,287,690

See note to table on next page

The table shows descriptive statistics of the variables used in the regressions, relative to the estimating sample. The statistics are taken over the distribution of firm-bank-year observations. Data on credit and on bank-firm relationships are from the Italian Credit Register. Data on firm characteristics are from the Firm Register. Data on bank characteristics are from the Supervisory Reports. The sample period includes bank-firm relationships at the year frequency between 2008 and 2013. Delta log credit is the yearly difference in log credit granted; D(Cut= 1) is a dummy equal to one if a credit relationship is severed in the next year; D(Cut Rev= 1) is a dummy equal to one if a credit line is severed in the next year; D(Bad loan= 1) is a dummy equal to 1 if the bank classifies a loan as bad loan between year t and $t + 1$; D(Non-perf= 1) is a dummy equal to 1 if the bank classifies a loan as non performing between year t and $t + 1$; Interest rate on credit lines is the interest rate on revolving credit lines (inclusive of fees and commissions) by bank j to firm i ; Zombie (Z) is a dummy equal to 1 if the firm's ROA (2 years moving average) is below the prime rate (2 years moving average) and the firm's leverage is above the median leverage, as of the end of 2005, computed on the sample of firms that had ROA below prime rate in at least 1 year between 2004 and 2005 and that exited the market in 2006 or 2007 due to default or liquidation. Zombie 2 is a dummy equal to 1 if the firm EBIT to interest expenses ratio (2 years moving average) is below 1 and the firm's leverage is above the median leverage, as of the end of 2005, computed on the sample of firms that had the EBIT to interest expenses ratio below 1 in at least 1 year between 2004 and 2005 and that exited the market in 2006 or 2007 due to default or liquidation; PC ROA-leverage (PC 1) is the principal component of the moving average of ROA and leverage; PC EBIT/Int-Leverage (PC 2) is the principal component of the moving average of the EBIT to interest expenses ratio and leverage; Score is a dummy variable equal to 1 if the firm has a Z-score in the bottom 2 notches of the distribution (which includes 9 notches) indicating high risk of default; LowCap is a dummy equal to 1 if the capital ratio is below the median capital ratio of the distribution as of 2008; Capital Ratio is the ratio of regulatory capital to risk weighted assets; LowCap9 is a dummy equal to 1 if the capital ratio is below 9 (the regulatory threshold is 8); LowCap yby is a dummy equal to 1 if the capital ratio is below the median capital ratio computed year by year; Liquidity ratio is the ratio of cash plus government securities to total assets; Interbank ratio is the ratio of interbank deposits to total assets; Bank Roa is the ratio of bank profit to total assets; Bank size is the log of total assets; Share bank is the share of total credit to the firm by the bank; Share credit line is the share of overdraft loans out of total loans within the bank-firm relationship.

Table A3: Additional tests on zombie lending

	(1) collateral	(2) no collateral	(3) interest rates
LowCap	-1.194 (1.012)	-1.293** (0.645)	0.060 (0.103)
LowCap*Z	0.405 (0.743)	1.619*** (0.547)	0.009 (0.046)
Share bank	-0.040*** (0.007)	-0.304*** (0.013)	-0.020*** (0.001)
Share credit line	0.088*** (0.007)	0.146*** (0.008)	-0.019*** (0.002)
Liquidity ratio	0.285*** (0.105)	0.303*** (0.087)	0.002 (0.022)
Interbank ratio	0.161** (0.067)	0.161** (0.072)	-0.002 (0.022)
Bank Roa	-2.200*** (0.575)	-0.705 (0.621)	-0.108 (0.102)
Bank size	-4.911* (2.832)	-4.128 (3.018)	-0.119 (0.853)
$H_0 : \text{LowCap} + \text{LowCap} * Z = 0$			
p-value	0.556	0.672	0.516
Firm*year FE	Y	Y	Y
Bank FE	Y	Y	Y
Observations	144,789	1,878,353	966,838
R^2	0.470	0.389	0.654

The table shows OLS regressions of different outcome variables on the dummy for banks with capital ratio below the median (LowCap) and its interaction with the dummy for zombie firms (Z). The median capital ratio is computed on the distribution as of 2008. In columns (1) and (2) the dependent variable is the change in the log of credit granted (credit commitments). Column (1) includes firm*bank relationships in which some credit is collateralized (i.e. the share of collateralized credit is positive). Column (2) includes firm*bank relationships in which no credit is collateralized (i.e. the share of collateralized credit is zero). The change in the log of credit granted is computed as the difference between total credit granted to the firm by the bank in period t and period $t + 1$. In column (3) the outcome variable is the level of interest rate on revolving credit lines (inclusive of fees and commissions). These regressions represent a test of evergreening. All regressions include firm*year fixed effects and bank fixed effects (the same specification as in column (4) of Table 1), the share of total credit to the firm granted by the bank and the share of credit line out of total credit to the firm by the bank. Firm and bank level controls are measured as of year t , and are defined in the notes to Table 1. The sample includes yearly data between 2008 and 2013. Standard errors double clustered at the bank and firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Credit Growth - Alternative definitions of zombie firm

	(1) Zombie 2	(2) Zombie3	(3) PC 1	(4) PC 2	(5) Score
Panel A: Basic specification					
LowCap	-1.136 (0.698)	-1.225* (0.684)	-1.020 (0.680)	-1.051 (0.681)	-1.127 (0.696)
LowCap*Z	2.104*** (0.498)	1.812*** (0.491)	1.097*** (0.269)	1.019*** (0.252)	3.780*** (0.799)
$H_0 : \text{LowCap} + \text{LowCap} * Z = 0$					
p-value	0.202	0.476	0.918	0.965	0.004
Observations	2,223,379	2,286,282	2,286,282	2,223,379	2,281,296
R^2	0.373	0.376	0.376	0.373	0.376
Panel B: Saturated specification					
LowCap*Z	1.061*** (0.318)	0.268 (0.262)	0.478*** (0.120)	0.323*** (0.105)	1.781*** (0.457)
Observations	2,046,629	2,107,882	2,107,882	2,046,629	2,102,990
R^2	0.628	0.629	0.629	0.628	0.629

Panel A replicates the regressions in column (4) (with firm*year and bank fixed effects) and Panel B those in column (6) (with firm*year, bank*year and firm*bank fixed effects) of Table 1 using alternative definitions of zombie firms. In column (1) the dummy for a zombie firm (Zombie 2) equals one if both a) the firm EBIT to interest coverage ratio (two-year moving average) is below 1; and b) the firm's leverage is above the median leverage, as of the end of 2005, computed on the sample of firms with EBIT to interest coverage ratio below 1 in at least one year between 2004 and 2005 and that exited the market in 2006 or 2007 due to default or liquidation; in column (2) the dummy for a zombie firm is equal to *Zombie* (*Z*) except that we impose the additional condition that revenues do not increase for the next three consecutive years (this allows to define as non-zombies fast growing firms such as start-ups and the like); in column (3) the continuous indicator for zombie firms PC 1 is the principal component of the moving average of ROA and leverage (the share of variance accounted for by *PC ROA Leverage* is 62%); in column (4) PC 2 is the principal component of the moving average of the EBIT to interest coverage ratio and leverage (the share of variance accounted for by *PC EBIT/INT leverage* is 54%); in column (5) Score is a dummy variable equal to 1 if the firm has a Z-score in the bottom 2 notches of the distribution (which includes 9 notches) indicating high risk of default. See the note to Table 1 for the definition of the other variables. Standard errors double clustered at the bank and firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Credit Growth - Robustness on the definition of banks strength

	(1)	(2)	(3)	(4)	(5)	(6)
	Low Cap yby	Capital Ratio	LowCap9	Low Roa	High Lever.	High Bad Loans
Panel A: Basic specification						
Capital Measure	-1.846** (0.794)	0.662** (0.262)	-0.930 (0.645)	1.189** (0.496)	-0.071 (0.849)	-0.029 (0.629)
Capital Measure*Zombie	1.429*** (0.480)	-0.273* (0.163)	2.676*** (0.647)	0.046 (0.664)	-0.356 (0.605)	1.729** (0.669)
$H_0 : \text{LowCap} + \text{LowCap}^*Z=0$						
p-value	0.666	0.198	0.0710	0.140	0.673	0.0462
Observations	2286282	2286282	2286282	2286282	2286282	2285554
R^2	0.376	0.376	0.376	0.376	0.376	0.376
Panel B: Saturated specification						
Capital Measure*Zombie	0.645*** (0.198)	-0.268*** (0.078)	0.604 (0.476)	0.650** (0.268)	-0.661*** (0.237)	0.719*** (0.265)
Observations	2107882	2107882	2107882	2106342	2108008	2107227
R^2	0.629	0.629	0.629	0.626	0.629	0.629

Panel A replicates the regressions in column (4) (with firm*year and bank fixed effects) and Panel B those in column (6) (with firm*year, bank*year and firm*bank fixed effects) of Table 1 using alternative definitions of banks strength. In column (1) the indicator of banks strength is a dummy equal to one if the capital ratio in a year is below the median capital ratio in that year; in column (2) is the continuous capital ratio; in column (3) is a dummy equal to one if the capital ratio is below 9 (the minimum regulatory threshold is 8%); in column (4) a dummy for banks with ROA below the median of the distribution as of 2008; in column (5) a dummy equal to one if the bank has leverage (total assets to capital) above the median of the distribution as of 2008; in column (6) a dummy equal to one if the ratio of bad loans to assets is above the median of the distribution as of 2008. The sample includes years between 2008 and 2013 (the change in log credit in the last year is computed between 2012 and 2013). Standard errors double clustered at the bank and firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Credit Growth – Pre-crisis

	(1)	(2)	(3)	(4)	(5)	(6)
LowCap	0.702 (1.260)	-0.681 (1.635)	-0.476 (1.593)	0.651 (1.630)		
LowCap*Z	-1.519** (0.629)	-0.438 (0.509)	-0.234 (0.532)	-0.143 (0.505)	-0.078 (0.277)	-0.339 (0.358)
Z	-4.723*** (0.393)					
Share bank			-0.466*** (0.023)	-0.465*** (0.023)	-0.453*** (0.003)	-2.642*** (0.009)
Share credit line			0.101*** (0.011)	0.101*** (0.011)	0.109*** (0.002)	0.284*** (0.007)
Liquidity ratio				0.586 (0.365)		
Interbank ratio				-0.012 (0.138)		
Bank Roa				1.754 (1.343)		
Bank size				-5.375 (3.599)		
<hr/>						
$H_0 : \text{LowCap} + \text{LowCap} * \text{Z} = 0$						
p-value	0.536	0.565	0.710	0.790	0.778	0.344
Observations	1,620,443	1,368,511	1,368,511	1,368,511	1,368,501	1,126,271
R^2	0.160	0.336	0.364	0.364	0.377	0.661

The table shows regressions of the change in the log of credit granted (credit commitments) on the dummy for zombie firms (Z), the dummy for banks with capital ratio below the median (LowCap) and their interactions. The median capital ratio is computed on the distribution as of 2004. The change in the log of credit granted is computed as the difference between total credit granted to the firm by the bank in period t and period $t + 1$. Firm and bank level controls are measured as of year t . The dummy for a zombie firm (Z) is defined as in Table 1. The capital ratio is the ratio of bank regulatory capital and risk weighted assets. Share bank is the share of total credit to the firm by the bank; Share credit line is the share of overdraft loans out of total loans within the bank-firm relationship; Liquidity ratio is the ratio of cash and government bonds to total assets; Interbank ratio is the ratio of interbank deposits and repos with banks (excluding those with central banks) and total assets; Bank Roa is the ratio of profits to total assets; Bank size is the log of total assets. The sample includes years between 2004 and 2007. Standard errors double clustered at the bank and firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Credit growth – Effect at the firm level - Average bank capital at the sector-province level

	(1)	(2)	(3)	(4)
$\overline{\text{LowCap}}$	-1.637* (0.937)	-1.627* (0.940)	-1.364 (0.942)	-2.352*** (0.851)
$\overline{\text{LowCap}}*Z$	7.638*** (0.718)	8.071*** (0.713)	8.056*** (0.714)	10.322*** (0.780)
Z	-10.480*** (0.344)	-10.225*** (0.336)	-10.218*** (0.336)	-12.558*** (0.345)
Share bank		0.264*** (0.014)	0.259*** (0.014)	0.681*** (0.008)
Share credit line		0.752*** (0.016)	0.749*** (0.016)	0.679*** (0.010)
Liquidity ratio			0.167*** (0.041)	0.163*** (0.033)
Interbank ratio			-0.218*** (0.039)	-0.029 (0.026)
Bank Roa			-0.549*** (0.212)	-0.230 (0.159)
Bank size			0.350* (0.203)	-0.201 (0.131)
$H_0 : \text{LowCap} + \text{LowCap}*Z=0$				
p-value	0	0	0	0
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	618,201	618,201	618,201	1,122,403
R^2	0.319	0.349	0.349	0.369

The table shows regressions of the change in the log of credit granted (credit commitments) on banks' capital ratio ($\overline{\text{LowCap}}$), the dummy for zombie firms (Z), and their interactions. $\overline{\text{LowCap}}$ is defined as the average at the province-sector-year (of the province-sector in which the firm operates) of a dummy equal to one for banks with a capital ratio below the median capital ratio. The average is computed using the share of credit in the province-sector-year as weights. The median capital ratio is computed on the distribution as of 2008. The change in the log of credit granted is computed as the difference between total credit granted to the firm by all banks in period t and period $t+1$. Firm and bank level controls are measured as of year t and are defined in the notes to Table 1. Bank level and relationship-level controls are averaged at the firm level using the share of credit of the bank as weight. Columns 1 to 3 include the same firms as those included in Table 1 (firms borrowing from at least two banks in both period t and $t+1$). Column 4 also includes single bank firms. All columns include firm and year fixed effects. $\text{LowCap} + \text{LowCap} * Z$ is the sum of the coefficients in the first two rows in the column. The sample includes yearly data between 2008 and 2013 (the change in log credit in the last year is computed between 2012 and 2013). Standard errors clustered at the firm level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Summary Statistics for the Effects of Zombie Lending

	Mean	S.D.	Median	25pct	75pct	N
Panel A: Firm level variables						
Non-zombie Firms						
Δ labor	0.002	0.273	0.012	-0.097	0.115	850,784
Δ capital	-0.016	0.391	-0.058	-0.206	0.079	805,464
Δ sales	-0.039	0.270	-0.023	-0.164	0.102	851,064
Δ Trade debit	-0.010	0.453	-0.004	-0.241	0.223	725,370
Δ Non-bank financial debt	-0.059	0.803	0.000	-0.318	0.135	297,929
Δ Cash holdings	-0.007	1.242	0.000	-0.651	0.632	772,595
Dummy capital injection	0.076	0.265	0.000	0.000	0.000	879,750
Failure	0.026	0.158	0.000	0.000	0.000	950,679
Down	0.029	0.030	0.021	0.009	0.037	809,332
Zombie Firms						
Δ labor	-0.045	0.291	-0.020	-0.155	0.087	116,501
Δ capital	-0.023	0.339	-0.048	-0.149	0.035	111,272
Δ sales	-0.086	0.302	-0.058	-0.230	0.080	115,015
Δ Trade debit	-0.067	0.465	-0.049	-0.301	0.181	112,942
Δ Non-bank financial debt	0.026	0.789	0.000	-0.215	0.237	64,351
Δ Cash holdings	-0.101	1.344	0.000	-0.831	0.651	101,682
Dummy capital injection	0.130	0.336	0.000	0.000	0.000	122,817
Failure	0.077	0.266	0.000	0.000	0.000	199,982
Down	0.034	0.034	0.024	0.012	0.042	112,350
Panel B: Sector-province-year variables						
Capital ratio below median ($\overline{\text{LowCap}}$)	0.267	0.202	0.202	0.125	0.336	1,002,527
Share of zombies (ShZ)	0.200	0.083	0.197	0.148	0.243	1,002,527
Standard Deviation of TFP	0.596	0.203	0.563	0.484	0.656	10,900
TFP growth	-0.020	0.177	-0.017	-0.084	0.046	10,972

The table shows descriptive statistics of the variables used in regressions of the effects of zombie lending. Panel A reports growth rate of the wage bill, the capital stock, sales, trade debit, non-bank financial debt and cash holdings, all at constant prices; a dummy for capital injections, equal to 1 if the firm recorded an increase in the book value of equity, a dummy equal to 1 if a firm fails, and the variable Down, defined in equation 5. Panel B report indicators at the province-sector-year levels. CR below median is the share of credit extended by banks with a capital ratio below the median value of the banks' capital ratio; Share of zombies is the share of firms classified as zombies according to our preferred definition (see description in the paper and in Table 1). All statistics are computed at the firm-year level, except standard deviation of TFP and TFP growth, that are computed at the province-sector-year level (the unit of observation in the regressions). Variables refer to the years 2008-2013.

Table A9: Capital ratio and local shocks

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Bank-province-sector-year regressions						
Shock _t	-0.000 (0.005)	0.001 (0.006)	0.001 (0.006)	-0.008 (0.006)	0.001 (0.006)	-0.007 (0.007)
Shock _{t-1}		0.004 (0.006)			0.007 (0.006)	0.008 (0.006)
Shock _{t-2}			0.000 (0.006)		0.001 (0.006)	0.004 (0.007)
Shock _{t-3}				0.004 (0.007)		0.005 (0.008)
$H_0 : \sum_i \text{Shock}_{t-i} = 0$ p-value		0.568	0.902	0.665	0.416	0.578
Province-Sector FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	325,425	285,905	232,634	186,230	230,970	183,093
R ²	0.259	0.268	0.304	0.334	0.306	0.338
Panel B: Bank-year regressions						
Shock _t	-0.051 (0.059)	-0.055 (0.055)	-0.072 (0.057)	-0.110** (0.055)	-0.073 (0.054)	-0.110** (0.053)
Shock _{t-1}		-0.003 (0.057)			0.002 (0.055)	-0.014 (0.056)
Shock _{t-2}			-0.004 (0.061)		-0.007 (0.060)	0.001 (0.059)
Shock _{t-3}				0.043 (0.071)		0.040 (0.070)
$H_0 : \sum_i \text{Shock}_{t-i} = 0$ p-value		0.582	0.480	0.528	0.616	0.687
Year FE	Y	Y	Y	Y	Y	Y
Observations	1,261	1,083	920	767	916	760
R ²	0.009	0.012	0.019	0.030	0.019	0.029

The table reports regressions of banks' capital ratio on local-sectoral shocks, computed by regressing sales growth at the firm level on a set of year-province-sector dummies and using the estimated dummies as shocks. In panel A the unit of observation is the bank-province-sector-year. For example, if bank 1 is active in markets 1, 4 and 10 in year t , the dataset has bank 1 capital ratio repeated 3 times and associated with the corresponding shocks in market 1, 4 and 10 in that year. To account for the different exposure of the bank to the different markets, observations are weighted by the share of lending in each market of a bank's total lending. All columns include province-sector and year fixed effects. Standard errors are clustered at the level of the bank-year. In panel B, the dataset is collapsed at the bank-year level, using the share of lending in each market of a bank's total lending as weights. All columns include year fixed effects. The sample includes yearly data between 2008 and 2013. Standard errors are clustered at the bank level. The p-value is * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Employment growth and banks capital ratio

	(1)	(2)
	$\Delta\text{Employees}$	
$\overline{\text{LowCap}}$	-0.003 (0.004)	
$\overline{\text{LowCap}}*Z$	0.022*** (0.004)	0.021*** (0.004)
Z	-0.041*** (0.002)	-0.041*** (0.002)
$H_0 : \overline{\text{LowCap}} + \overline{\text{LowCap}}*Z=0$		
p-value	.001	
Prov-Sect FE	Y	N
Year FE	Y	N
Prov-Sect-Year FE	N	Y
Observations	835,719	835,378
R^2	0.016	0.030

The table shows regressions of employment growth, defined as the delta log of the number of employees, on banks' capital ratio $\overline{\text{LowCap}}$, defined as the average at the province-sector-year of a dummy equal to one for banks with a capital ratio below the median capital ratio as of 2008. The average is computed using the share of credit in the province-sector-year as weights. The dummy zombie firms (Z) is computed as described in Table 1. Column (1) includes province-sector and year fixed effects, while column (2) includes province-sector-year fixed effects. $\overline{\text{LowCap}} + \overline{\text{LowCap}} * Z$ is the sum of the coefficients in the first two rows in the column. The sample includes yearly data between 2008 and 2013. Standard errors clustered at the province-sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A11: Firms growth and zombie lending with the alternative definition of banks capital ratio

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔLabour		$\Delta\text{Capital}$		ΔSales	
$\widehat{\text{LowCap}}$	0.006 (0.006)		-0.002 (0.003)		0.008 (0.008)	
$\widehat{\text{LowCap}}*Z$	0.035*** (0.004)	0.035*** (0.004)	0.024*** (0.003)	0.026*** (0.003)	0.016*** (0.005)	0.019*** (0.005)
Z	-0.057*** (0.002)	-0.056*** (0.002)	-0.021*** (0.001)	-0.021*** (0.001)	-0.052*** (0.002)	-0.052*** (0.002)
$H_0 : \widehat{\text{LowCap}} + \widehat{\text{LowCap}}*Z=0$	p-value		0		0.006	
Prov-Sect FE	Y	N	Y	N	Y	N
Year FE	Y	N	Y	N	Y	N
Prov-Sect-Year FE	N	Y	N	Y	N	Y
Observations	967,280	967,004	972,396	972,110	966,075	965,791
R ²	0.036	0.058	0.024	0.034	0.083	0.122

The table shows regressions of different measures of firm growth on banks' capital ratio, $\widehat{\text{LowCap}}$, computed as the average at the province-sector-year of a dummy equal to one for banks with a capital ratio below the median capital ratio as of 2008. The average is computed using the share of credit in the province-sector for the period 2004-2007 as weights. The dependent variable is the delta log of the wage bill in column (1)-(2), of the book value of the capital stock in columns (3)-(4), of sales in columns (5)-(6). The dummy for zombie firms (Z) is defined as in Table 1. Odd columns include province-sector and year fixed effects, while even columns include province-sector-year fixed effects. $\widehat{\text{LowCap}} + \widehat{\text{LowCap}}*Z$ is the sum of the coefficients in the first two rows in the column. The sample includes yearly data between 2008 and 2013. Standard errors clustered at the province-sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Firms failure and banks alternative definition of capital ratio

	(1)	(2)	(3)
	Linear probability		Probit
\widehat{LowCap}	0.231 (0.208)		0.232 (0.215)
$\widehat{LowCap*Z}$	-1.311*** (0.322)	-1.336*** (0.331)	-0.864*** (0.183)
Z	5.601*** (0.181)	5.605*** (0.182)	4.209*** (0.096)
$H_0 : \widehat{LowCap} + \widehat{LowCap*Z}=0$			
p-value	0.003		0.009
Prov-Sect FE	Y	N	Y
Year FE	Y	N	Y
Prov-Sect-Year FE	N	Y	N
Observations	1,150,765	1,150,718	1,150,684
R ²	0.016	0.020	0.038

The table shows regressions of a dummy equal to 100 for firms that go bankrupt on banks capital ratio, so that all coefficients can be read as percentages. \widehat{LowCap} is the average at the province-sector-year of a dummy equal to one for banks with a capital ratio below the median capital ratio as of 2008. The average is computed using the share of credit in the province-sector for the period 2004-2007 as weights. The dummy for zombie firms (Z) is defined as in Table 1. Odd columns include province-sector and year fixed effects, while column (2) includes province-sector-year fixed effects. The first two columns are OLS estimates, while column (3) is a probit estimate, with marginal effects reported. $\widehat{LowCap} + \widehat{LowCap*Z}$ is the sum of the coefficients in the first two rows in the column. The sample includes yearly data between 2008 and 2011. Standard errors clustered at the province-sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A13: TFP dispersion and banks capitalization with the alternative definition of capital ratio

	(1)	(2)	(3)	(4)
$\widehat{\text{LowCap}}$	0.000 (0.008)	-0.003 (0.006)	-0.030*** (0.011)	-0.025*** (0.008)
$\widehat{\text{LowCap}}*\text{ShZ}$			0.134*** (0.040)	0.106*** (0.027)
ShZ			0.001 (0.021)	0.052*** (0.017)
TFP growth	-0.054*** (0.013)	-0.076*** (0.008)	-0.054*** (0.013)	-0.074*** (0.008)
Prov-Sect FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	9,194	10,885	9,194	10,885
R ²	0.824	0.871	0.825	0.872

The table shows regressions of the standard deviation of TFP at the province-sector-year level on the share of zombies and banks capital ratio. Specifically, ShZ is the share of firms that are classified as zombies in the province-sector-year and $\widehat{\text{LowCap}}$ is the average at the province-sector-year of a dummy equal to one for banks with a capital ratio below the median capital ratio as of 2008. The average is computed using the share of credit in the province-sector for the period 2004-2007 as weights. TFP growth is Delta log of the average TFP at the province-sector level. Odd columns exclude province-sector-years with less than 10 firms. Even columns include all province-sector-years but weigh them according to the number of firms. All regressions include year and province-sector fixed effects. The sample includes yearly data between 2008 and 2013. Standard errors clustered at the province-sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A14: Firms growth and share of zombie firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Labour		Δ Capital		Δ Sales	
ShZ	-0.112*** (0.014)		-0.015** (0.007)		-0.115*** (0.017)	
ShZ*Z	0.068*** (0.013)	0.059*** (0.013)	-0.006 (0.009)	-0.010 (0.010)	0.080*** (0.013)	0.073*** (0.013)
Z	-0.062*** (0.003)	-0.060*** (0.003)	-0.013*** (0.002)	-0.012*** (0.002)	-0.065*** (0.003)	-0.064*** (0.003)
$H_0 : ShZ + ShZ*Z=0$						
p-value	0.015		0.040		0.092	
Prov-Sect FE	Y	N	Y	N	Y	N
Year FE	Y	N	Y	N	Y	N
Prov-Sect-Year FE	N	Y	N	Y	N	Y
Observations	967,243	966,973	972,358	972,078	966,039	965,762
R ²	0.036	0.058	0.024	0.034	0.083	0.122

The table shows regressions of different measures of firm growth on the share of zombies at the province-sector-year level ShZ. The dependent variable is the delta log of the wage bill in column (1)-(2), of the book value of the capital stock in columns (3)-(4), of sales in columns (5)-(6). The dummy for zombie firms (Z) is defined as in Table 1. Odd columns include province-sector and year fixed effects, while even columns include province-sector-year fixed effects. $ShZ + ShZ * Z$ is the sum of the coefficients in the first two rows in the column. The sample includes yearly data between 2008 and 2013. Standard errors clustered at the province-sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.