When Losses Turn Into Loans: The Cost of Weak Banks ONLINE APPENDIX

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Table A1: Additional Descriptive Statistics

Firm finance loans		Undereported firms		
	Average		Average	Difference
Loan amount	269,729	Assets (m)	2.01	0.52
	($2x10^6$)			[0.05]
Fraction overdue	0.50	Employees	11.14	-2.07
	(0.42)			[0.97]
Fraction	0.73	Total credit (m)	0.71	0.13
collateralized	(0.44)			[0.05]
Fraction w/	0.79	Share NPLs	0.34	0.11
guarantee	(0.41)			[0.00]
Fraction w/ real	0.32	Return on assets	0.04	-0.01
collateral	(0.47)			[0.00]
Maturity $<$ 1yr	0.23	Sales growth	0.00	-0.10
	(0.42)			[0.01]
Resid maturity $<$ 1yr	0.48	Leverage	0.39	0.05
	(0.50)			[0.01]
		Current ratio	1.78	-0.07
				[0.04]
		Cash/assets	0.10	-0.01
				[0.00]
		Fixed assets/assets	0.44	-0.03
				[0.00]
N	1,332,435		35,982	

Notes. The left panel shows descriptive statistics at the loan-level for firm finance loans that have an overdue loan balance at some point over their lifetime. This is the sample of loans on which we run the algorithm to detect the underreporting of loan losses. The first column of the right panel shows descriptive statistics for firms that are subject to loss underreporting in a given year. The second column of the right panel shows differences in means relative to firms that have overdue loans but are not underreported.

Table A2: Regression Results Firm-Bank Level: Intensive Margin

Growth rate of credit	(1)	(2)	(3)	(4)	(5)	(6)
		Total credit		Performing	Non-perf	New loan
$\text{Pre1}_t \times \text{exposed}_b$		-0.011	-0.010	-0.011	-0.000	-0.012
		[0.008]	[0.010]	[0.008]	[0.002]	[0.005]
$\text{Pre2}_t \times \text{exposed}_b$		-0.003	-0.005	-0.003	-0.000	-0.002
		[0.010]	[0.010]	[0.010]	[0.002]	[0.007]
$\text{EBA}_t \times \text{exposed}_b$		-0.020	-0.022	-0.022	0.001	-0.021
		[0.010]	[0.013]	[0.009]	[0.002]	[0.009]
$\text{Bailout}_t \times \text{exposed}_b$		-0.006	-0.008	-0.004	-0.002	-0.015
		[0.006]	[0.008]	[0.007]	[0.003]	[0.009]
$\text{Post bailout}_t \times \text{exposed}_b$		0.008	0.006	0.009	-0.002	-0.001
		[0.008]	[0.012]	[0.009]	[0.002]	[0.003]
$\text{Pre1}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.008	0.001	0.018	0.007	-0.006	0.021
	[0.013]	[0.013]	[0.012]	[0.013]	[0.007]	[0.012]
$\text{Pre2}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.008	0.006	0.021	0.010	-0.004	0.007
	[0.023]	[0.023]	[0.025]	[0.020]	[0.007]	[0.008]
$\text{EBA}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.041	0.044	0.050	0.038	0.005	0.023
	[0.013]	[0.012]	[0.019]	[0.015]	[0.009]	[0.009]
$\text{Bailout}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.019	0.027	0.027	0.035	-0.008	0.019
	[0.019]	[0.016]	[0.020]	[0.015]	[0.011]	[0.010]
$\text{Post bailout}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.005	0.016	0.023	0.022	-0.007	0.008
	[0.014]	[0.011]	[0.013]	[0.014]	[0.010]	[0.011]
Bank×quarter FE	Y	N	N	N	N	N
Firm×quarter FE	Y	Y	N	Y	Y	Y
Firm, quarter FE	N	N	Y	N	N	N
N	1,981,219	1,981,219	1,981,219	1,981,219	1,981,219	1,981,219
R2	0.381	0.379	0.057	0.383	0.405	0.380
Banks	45	45	45	45	45	45

Notes. The table shows credit regressions results at the firm-bank level. The dependent variable is the quarterly growth rate in total credit for a given firm-bank pair in columns (1)-(5). Columns (4) and (5) decompose total credit growth into performing and non-performing credit. These growth rates are defined as the quarterly changes scaled by lagged total credit. For example, the growth rate in performing credit is defined as $\Delta c^{perf}_{ibt} / c^{all}_{ib,t-1}$. Column 6 presents results from a linear probability model where the dependent variable is a dummy that is 1 if the number of loans in a firm-bank pair increases (conditional on an increase in loan volume). The explanatory variable exposed is a dummy that is 1 for banks exposed to the EBA shock. The sample period is 2009q1-2014q4. Pre 1 and 2, EBA, bailout and post-bailout are dummies that identify the following time periods: the EBA intervention (2011q4-2012q2), the bailout period (2012q-2012q4), two pre-periods and one post-bailout period all of equal length. Underreported is a firm-bank dummy that identifies relationships subject to loss underreporting in the four quarters prior to the EBA shock. All regressions include bank fixed effects and firm-bank controls (see text for details). Standard errors in parentheses and are two-way clustered by bank and firm. Additional interaction effects are omitted. See equations in section 3 for details on full set of interaction effects included. Significance stars are not shown.

Table A3: Regression Results Firm-Bank Level: Robustness Checks

Growth rate of total credit	(1)	(2)	(3)	(4)
$\text{Pre1}_t \times \text{exposed}_b$	-0.009	-0.009	-0.016	-0.011
	[0.008]	[0.011]	[0.009]	[0.009]
$\text{Pre2}_t \times \text{exposed}_b$	-0.004	-0.002	-0.018	-0.004
	[0.010]	[0.009]	[0.011]	[0.010]
$\text{EBA}_t \times \text{exposed}_b$	-0.022	-0.020	-0.029	-0.022
	[0.010]	[0.013]	[0.011]	[0.010]
$\text{Bailout}_t \times \text{exposed}_b$	-0.009	-0.005	-0.015	-0.009
	[0.006]	[0.008]	[0.008]	[0.006]
Post $\text{bailout}_t \times \text{exposed}_b$	0.006	0.008	0.002	0.008
	[0.007]	[0.011]	[0.009]	[0.008]
$\text{Pre1}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.002	0.012	0.013	0.001
	[0.013]	[0.010]	[0.008]	[0.013]
$\text{Pre2}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.006	0.024	0.012	0.006
	[0.023]	[0.023]	[0.016]	[0.023]
$\text{EBA}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.043	0.051	0.051	0.044
	[0.013]	[0.017]	[0.015]	[0.012]
$\text{Bailout}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.027	0.026	0.034	0.027
	[0.017]	[0.021]	[0.010]	[0.016]
Post $\text{bailout}_t \times \text{exposed}_b \times \text{underreported}_{ib}$	0.016	0.021	0.014	0.017
	[0.012]	[0.014]	[0.010]	[0.011]
Firm×quarter FE	Y	N	N	Y
Firm, quarter FE	N	Y	Y	N
Relationship controls	N	Y	Y	Y
Firm-level controls	N	Y	N	N
N	1,981,219	1,859,321	5,244,714	1,981,219
R2	0.378	0.057	0.069	0.379

Notes. The table shows additional credit regressions results at the firm-bank level for the intensive margin. The dependent variable is the quarterly growth rate in total credit for a given firm-bank pair. The explanatory variable exposed is a dummy that is 1 for banks exposed to the EBA shock. See Table A3 in this appendix for additional details. Relative to column 2 of Table A3 column 1 omits our baseline controls, column 2 adds additional firm-level controls (ebitda/assets, leverage, sales growth - all interacted with the period dummies), column 3 clusters standard errors at the bank-level, and column 4 adds control for the bank-level use of the LTRO program. No significance stars are shown.

Table A4: Regression Results Firm-bank Level:
Extensive Margin

Pr(relationship cut)	(1)	(2)	(3)
$EBA_t \times exposed_b$	0.057	0.056	0.058
	[0.011]	[0.011]	[0.012]
$Bailout_t \times exposed_b$	0.041	0.042	0.043
	[0.009]	[0.008]	[0.008]
Post $bailout_t \times exposed_b$	0.029	0.030	0.029
	[0.010]	[0.009]	[0.009]
$EBA_t \times exposed_b \times underreported_{ib}$	-0.217	-0.202	-0.219
	[0.034]	[0.027]	[0.057]
$Bailout_t \times exposed_b \times underreported_{ib}$	-0.106	-0.090	-0.105
	[0.033]	[0.030]	[0.047]
Post $bailout_t \times exposed_b \times underreported_{ib}$	-0.053	-0.041	-0.050
	[0.018]	[0.015]	[0.024]
Firm FE	Y	N	Y
Firm controls	N	Y	N
N	2,973,566	2,538,082	3,045,629
R2	0.706	0.137	0.776
Banks	46	45	46

Notes. The table shows credit regressions results at the firm-bank level for the extensive margin (linear probability model). The dependent variable is a dummy that turns one when the relationship is cut, defined by the performing loan balance dropping to zero. The explanatory variable exposed is a dummy that is 1 for banks exposed to the EBA shock. Pre period 1 and 2, EBA, bailout and post-bailout are dummies that identify the following time periods: The EBA shock (2011q4-2012q2), the bailout period (2012q-2012q4), and one post-bailout period all of equal length. We cannot estimate pre-trends in this regression since we condition on a sample of relationships that have positive loan balances in the pre-periods. underreported is a dummy that identifies relationships subject to underreported losses in the four quarters prior to the EBA shock. All regressions include bank and quarter fixed effects. Column 1 and 3 contain firm fixed effects. Column 2 includes industry×quarter fixed effects and firm-level sales growth and leverage interacted with the time period to allow for flexible time trends. Standard errors in parentheses and are two-way clustered by bank and firm. Additional interaction effects are omitted. See section 3 for details on full set of interaction effects included. No significance stars are shown.

Table A5: Real Effects: Persistence and Placebo Tests

	(1)	(2)	(3)	(4)
Labor	2013	2014	2011	2009
Δ log credit$_i$	-2.033	-2.176	-0.106	0.161
	[0.636]	[2.082]	[0.049]	[0.039]
First stage F-statistic	9.96	1.10	117.40	381.90
N	93,237	83,383	104,443	93,268
Capital	2013	2014	2011	2009
Δ log credit$_i$	-1.059	-2.713	0.077	-0.028
	[0.376]	[3.021]	[0.080]	[0.032]
First stage F-statistic	11.71	0.69	117.4	379.3
N	93,465	84,1639	104,4435	94,106
Controls	Y	Y	Y	Y
Industry, size FE	Y	Y	Y	Y

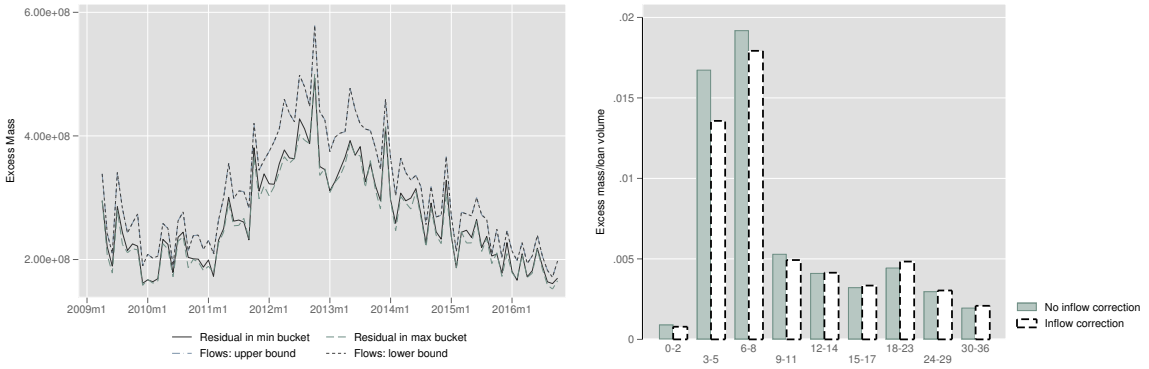
Notes. The table shows IV regression results at the annual firm-level for different years. The dependent variable is the symmetric growth rate of employment or fixed assets, which is a second order approximation to the log difference growth rate and incorporates observations that turn to 0 (firm exit). We instrument for the log change in credit using the (normalized) firm-level borrowing share from banks exposed to the EBA shock prior to the shock interacted with the underreporting dummy. Controls consist of firm-size and 2-digit industry FE, as well as firm-level log total assets, interest/ebitda, capital/assets, current ratio, cash/assets and sales growth all averaged over 2008-2010. Standard errors are clustered by industry. No significance stars are shown.

Table A6: Are MRPK Differences Driven by Risk?

		Risk measure		
MPRK		Cyclicality	Vol(firm sales)	Default risk
Underreported loss	-0.120	-0106	-0.101	-0.099
	[0.002]	[0.002]	[0.002]	[0.002]
Risk measure		0.091	-0.058	-0.364
		[0.001]	[0.001]	[0.006]
3-digit industry FE	Y	N	Y	Y
1-digit industry FE	N	Y	N	N
N	922,971	707,140	876,967	906,125

Notes. The table shows results from a regression of the marginal revenue product of capital on various measures of firm risk and a dummy for whether a firm has an underreported loss. Sample period is 2009-2012. All results include year fixed effects. Cyclicality is a 3-digit industry measure of the cyclicality of sales. Vol(firm sales) measures firm-level sd(log sales). Default risk is a default risk based on the Bank of Portugal's credit risk prediction model developed by Antunes et al. 2016. No significance stars are shown.

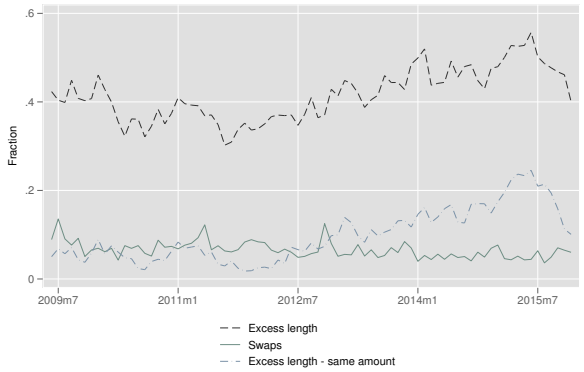
Figure A1: Robustness Checks on Algorithm



(a) Robustness of Algorithm (b) Underreporting by Reporting Buckets

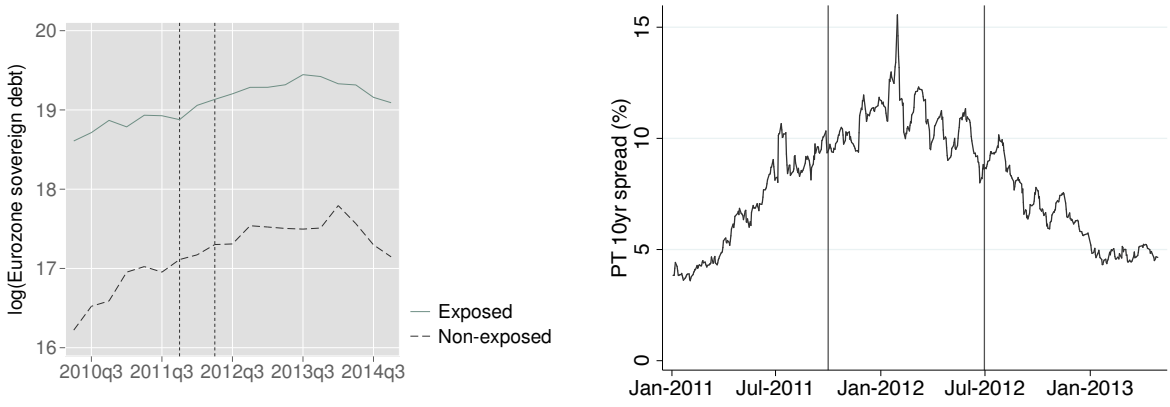
Notes. Panel a shows the aggregate amount of excess mass when varying different assumptions. The first two lines show the results when we allocate residual flows to the lowest (highest) reporting bucket. The remaining lines show the effect of choosing the bounds on flows such that they have the minimum (maximum) impact on excess mass. Panel b shows the distribution of excess mass (or underreporting) across reporting buckets. We scale the amount of excess mass by the total loan balance of that firm-bank pair. We compare the results of the algorithm with and without incorporating the effects of flows (repayments, new installments falling overdue, debt write-offs or restructuring) in the data.

Figure A2: Decomposition of Underreported Losses by Mechanism



Notes. The graph shows the decomposition of underreported losses by the mechanisms discussed in section 2. Excess length refers to spells of overdue reporting in a bucket that exceed the permissible length (e.g. loan reported to be overdue 3-5 months for 4 months in a row). Excess length - same amount refers to spells that exceed the permissible length where the loan balance does not change. Swaps refer to cases where there is a decrease in the overdue balance equal to an increase in the performing loan balance. This captures the last mechanism where banks grant new credit in exchange for the firm repaying the longest overdue credit portion. All numbers are scaled by the total amount of excess mass.

Figure A3: Potential Identification Threats from Sovereign Debt

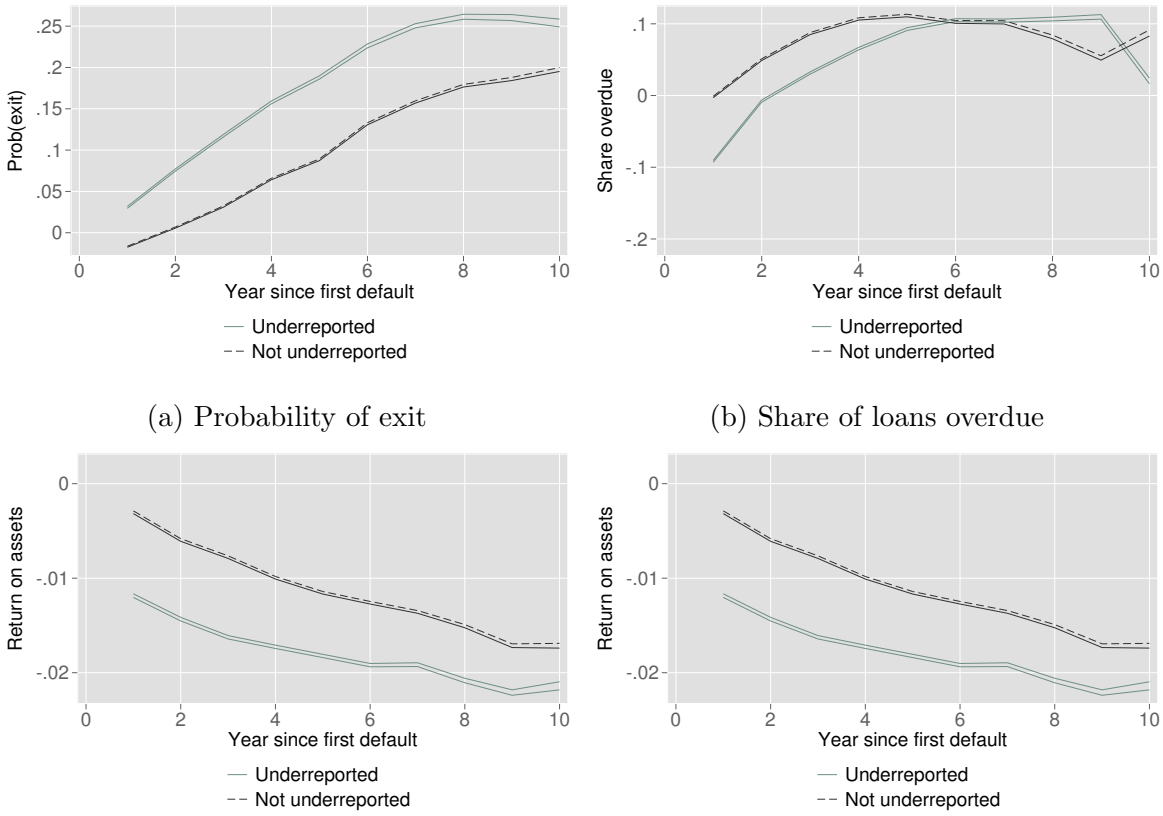


(a) Evolution of Sovereign Debt Holdings

(b) Evolution of Sovereign Spread

Notes. Panel a shows the holdings of Eurozone sovereign debt of EBA *eligible* banks exposed and not exposed to the EBA Special Capital Enhancement exercise. Panel b shows the evolution of spreads on Portuguese sovereign debt (10-year bond relative to German 10-yr bond). Vertical lines denote the EBA regulatory intervention dates: the first denotes the announcement and the second the compliance deadline.

Figure A4: Long-run Trends: Underreported vs Non-underreported Firms

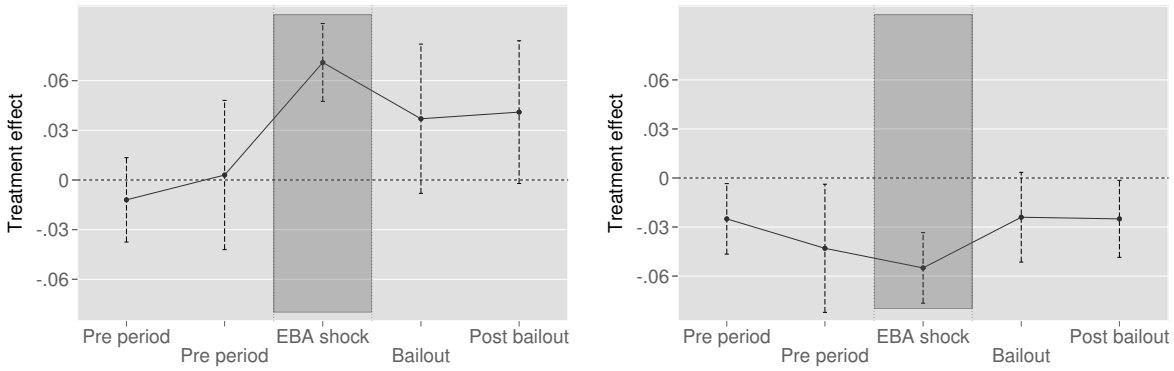


(a) Probability of exit (b) Share of loans overdue

(c) Return on assets (d) Sales growth

Notes. The graphs show the average evolution of firm-level measures over time. We plot the 95 confidence intervals of the residualized mean for each group. The variables are residualized on year×industry fixed effects and firm size. The x-axis are years following the first time we observe an overdue loan in the data (for a given firm). The upwards trend in sales is likely due to a survivorship bias since firms that exit drop out of the sample.

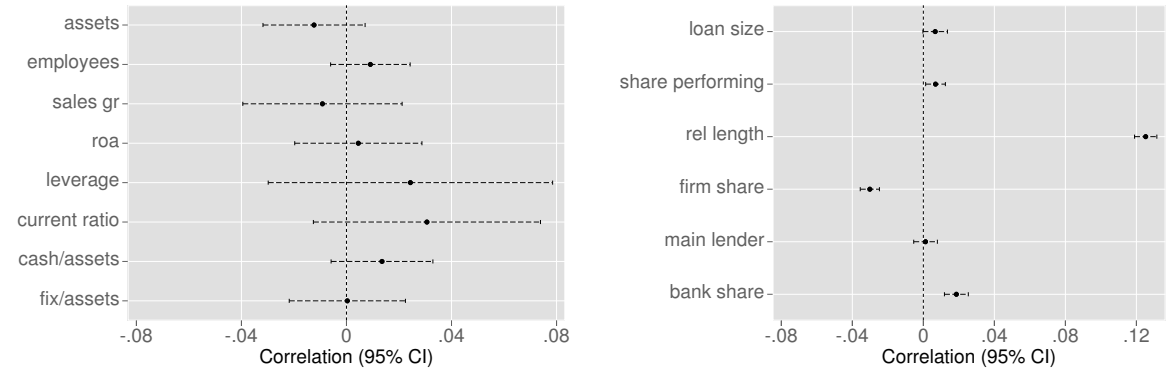
Figure A5: Firm-bank Results by Sub-Sample



(a) Underreported firm-bank relationships (b) Non-underreported firm-bank relationships

Notes. The graphs shows results of the firm-bank level credit regression in section 3 of the main text. The regression includes firm×time and bank fixed effects as well as firm-bank-level controls. The dependent variable is quarterly credit growth. We plot the coefficients on the exposed bank dummy interacted with the time period: $(\text{period}_\tau \times \text{exposed}_b)$ in two sub-samples. Standard errors are clustered at firm and bank level. The shaded area marks the period of the EBA intervention.

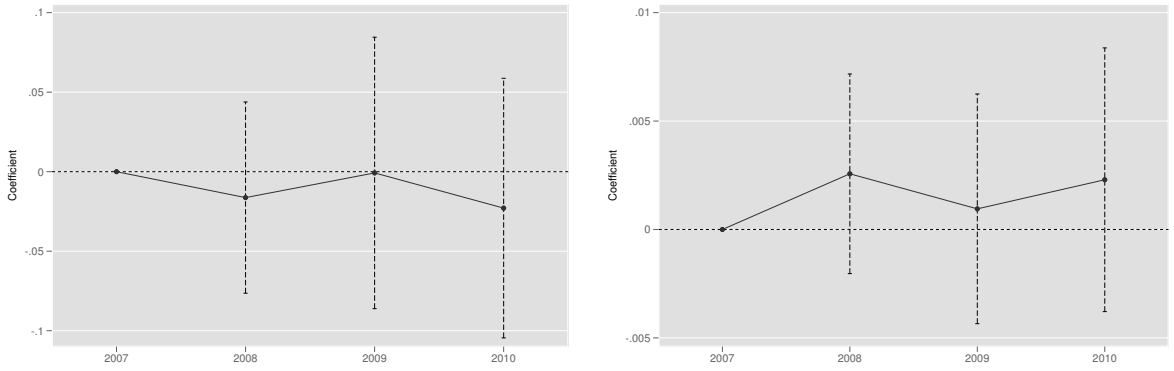
Figure A6: Correlations with Borrowing Share from Exposed Banks



(a) Firm-level (b) Relationship-level

Notes. Panel a shows the correlation of normalized firm-level observables with the (normalized) firm-level treatment variable for the subset of firms subject to loss underreporting. Treatment is the borrowing share from banks exposed to the EBA intervention. The correlations are conditional on 2-digit industry fixed effects and firm size buckets. All variables are averaged over 2008-2010. The right panel shows the correlation of normalized relationship-level variables with a bank exposure dummy for the subset of relationships subject to loss underreporting. share performing refers to the share of total credit that is not in default. rel length refers to relationship length. firm share refers to the share of the firm's loan balance in the bank's loan portfolio. main lender is a dummy if the bank is the firm's largest lender. bank share refers to the share of the bank in the firm's loan portfolio.

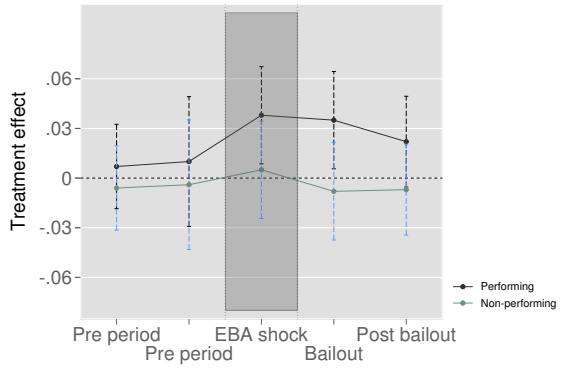
Figure A7: Liquidity and Credit Pre-trends



(a) Current Ratio (b) Cash/Assets

Notes. Panels a and b show results from a dynamic differences-in-differences specification where we interact the firm-level borrowing share from banks exposed to the EBA shock with year dummies for the period prior to the EBA shock. We run the regression in the subset of firms subject to loss underreporting. The two panels show two different liquidity measures. Standard errors are clustered at the firm-level.

Figure A8: Additional Results: Firm-level Regression



Notes. The graphs show regression results at the quarterly firm-level.The dependent variables are the quarterly log of performing and non-performing credit, respectively. We plot the coefficients on the interaction $\text{treatment}_i \times \text{quarter}_t \times \text{underreported}_i$, which are the treatment effects for the group of firms subject to loss underreporting. The vertical lines denote the EBA announcement and compliance deadline. The specification, equation in section 3 of the main text, includes the full set of interactions, industry×quarter and firm fixed effects, as well as firm-level controls interacted with quarter. All coefficients should be interpreted as changes in the dependent variable relative to the (normalized) base quarter 2011Q3. Standard errors are clustered at the firm-level. N= 1,346,771.