

The Effects of Capital Buffers on Bank Lending and Firm Activity: What can we learn from Stress tests results?

Jose Berrospide and Rochelle Edge

Federal Reserve Board

CFSS, Universidad del Pacifico, Lima

January 20, 2020

The views expressed do not necessarily reflect those of the Federal Reserve or its staff.

Motivation

- Bank stress tests and other post crisis capital reforms have increased the resilience of the banking sector.
- Industry stakeholders have increasingly questioned whether stress tests are having unintended effects on bank lending and hindering economic growth.
- Analysis on the effects of CCAR stress-test capital buffers provides insights into the potential effects of the Basel III CCyB on bank lending and firm activity.
- In the U.S. the consequences for banks of not meeting stress-test buffers are similar to those for not satisfying an activated Countercyclical Capital Buffer (CCyB).
 - Our results are also informative for the effects of the CCyB

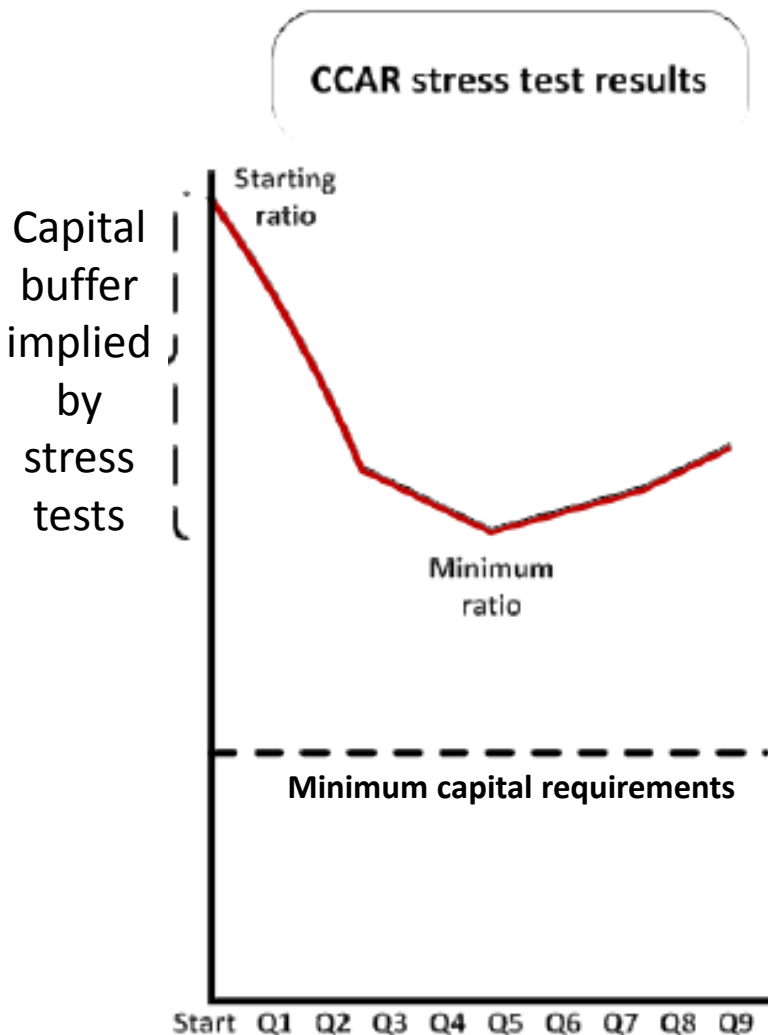
Outline

- Background
 - Bank-specific capital buffer from stress tests
- Related literature
- Data
- Empirical analysis:
 - Different approaches used for:
 - Bank C&I lending
 - Firm loan volumes, overall debt, and investment spending
 - County employment levels
 - Empirical approaches based on Khwaja and Mian (2008)
- Conclusions

Preview of results

- Stress tests capital buffers reduce bank C&I lending: 1 pp. increase in capital buffers results in 2 pp. lower loan growth of utilized amounts and 1 ½ lower growth rate of committed amounts.
- Positive and significant effects of bank capital ratio on lending consistent with previous findings in the literature.
- Effects of capital buffer are larger at the firm level (multibank firms) when we look at total bank borrowing (summing across all their CCAR lenders):
1 pp. increase in capital buffers leads to
 - 4 pp. decline in growth rate of utilized amounts
 - 3 pp. decline in growth rate of committed amounts
- However, we find no impact of larger capital buffers on firm outcomes: overall debt, investment spending and employment.
 - Firms manage to substitute bank loans with other borrowing sources (e.g., smaller banks, nonbank financials, and issuing bonds in capital markets).

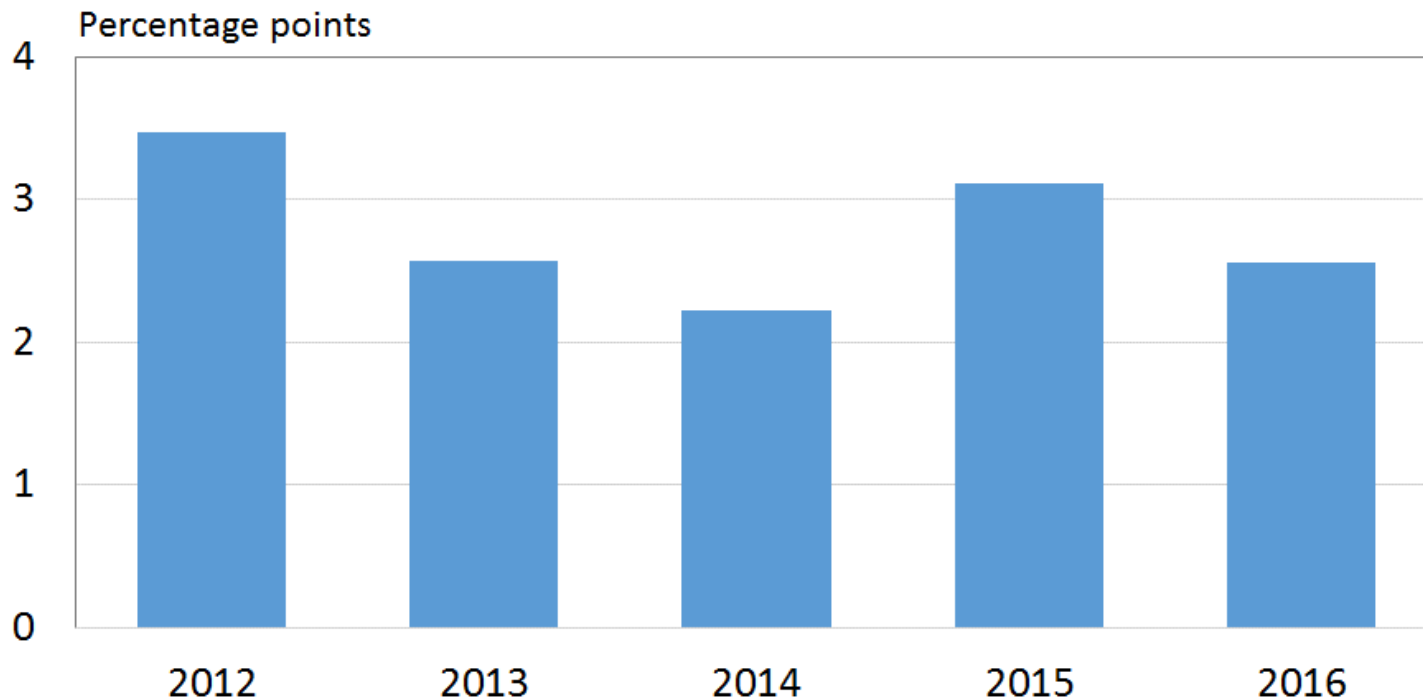
Stress-test capital buffers (*ST Buffers*)



- Stress-test capital buffers (*ST Buffers*) are the decline in capital from start to minimum in the CCAR severely adverse scenario
- The buffers imply that banks can face prolonged stress, experience sizable losses and declines in their regulatory capital ratios, but still have capital ratios above minimum requirements and healthy enough to still lend
 - They are *de facto* buffers
 - They reflect a requirement of CCAR but not the implementation of any buffer via a regulation (*de jure* buffers)

Stress-test capital buffers (*ST Buffers*), contd.

Average drop across banks in capital ratios (excl. bank capital distributions)

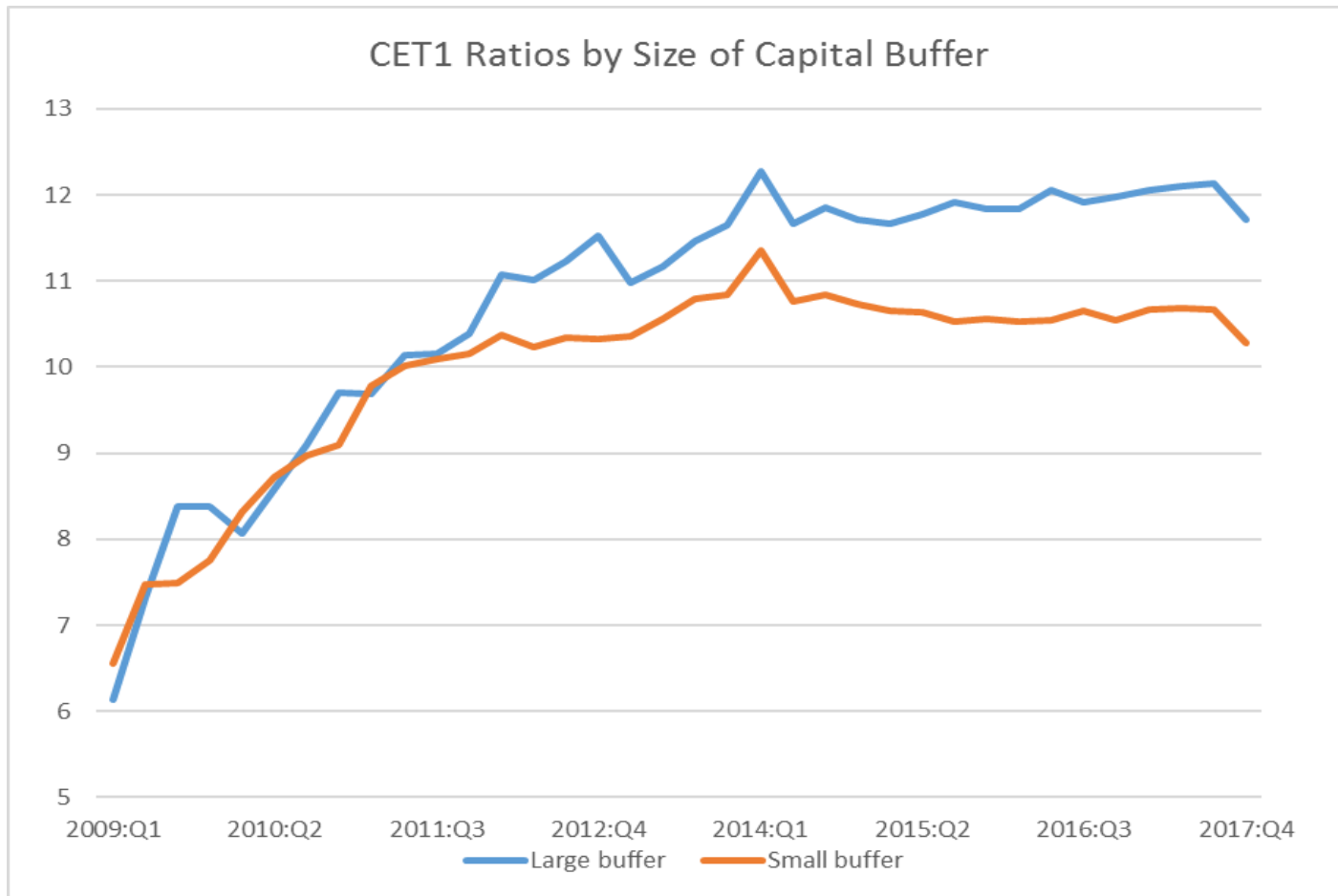


	2012	2013	2014	2015	2016
Mean	3.5	2.6	2.2	3.1	2.6
Median	3.3	2.8	1.2	2.2	2.3
Std. dev.	2.0	2.7	2.5	2.9	2.0

Source: 2012 to 2016 DFAST disclosure documents

Capital Buffers and increase in regulatory capital

- The stress capital decline is a buffer that each CCAR BHC needs to hold in normal times to cover forward-looking risks (severe economic and financial conditions).



Related literature

- **Impact of higher capital requirements on bank lending:** Peek and Rosengreen (1997), Gambacorta and Mistrulli (2004), Jimenez, Ongena, Peydro and Saurina (2017), Aiyar, Calomiris, and Wieladek (2014), Mésonnier and Monks (2015), Gropp, Mosk, Ongena, and Wix (2016), Lambertini and Mukherjee (2016), Fraise, Le and Thesmar (2017), and Calem, Correa, and Lee (2017)
- **Impact of higher capital on bank lending:** Bernanke and Lown (2000), Francis and Osborne (2009), Berrospide and Edge (2010), Carlson, Shan, and Warusawitharana (2013), Chu, Zhang, and Zhao (2017)
- **Impact of stress tests on bank lending and risk taking:** Acharya, Berger and Roman (2017), The Clearing House (2017), Vojtech (2017), Pierret and Steri (2018), Bassett and Berrospide (2018), Cortes, Demyanyk, Li, Loutskina, and Strahan (2018), Connolly (2018), and Niepmann and Stebunovs (2018)

This paper

- We evaluate the impact of the stress test capital buffers on bank loan growth and firm outcomes: bank borrowing, total debt volumes, investment spending and employment.
- Identification strategy based on Khwaja and Mian (2008) using:
 - Matched Firm-bank data (within-firm estimation) between 2012 and 2016.
 - Firm-level data: study the effect of weighted average stress test capital declines (stress test exposure) on firm loan outcomes: total borrowing, overall debt growth and investment.
 - County-level employment data: impact of weighted average stress test capital declines faced by each bank lending to firms in specific counties on employment.
 - Matched FR Y-14 and COMPUSTAT data: impact of firm level stress test exposure on publicly traded firm outcomes: loan growth, overall debt growth and investment, and employment.

Data

- Data sample: 2012 to 2016:
 - Limit likelihood of other capital buffers – that began to phase in in 2016 – influencing our results
- Sources:
 - Balance sheet data for 16 CCAR BHCs (FR Y-9C reports) combined with matched lender-borrower data from FR Y-14 Corporate schedule:
 - C&I loans, utilized and committed amounts, and
 - Firm balance sheet information for both private and publicly traded firms.
 - County-level employment data from the BLS.
 - Balance sheet data for publicly traded firms in COMPUSTAT
 - Used for robustness analysis
- After data cleaning, we have information for about 78,265 firms borrowing from 16 BHCs (248,201 bank-firm observations):
 - Out of these, 10,961 (63,212 bank-firm observations) correspond to multibank firms

Summary statistics

CCAR BHC and FIRM DATA

Variable	Obs.	Mean	Std. Dev.	Min	Max
CCAR BHC VARIABLES					
Total Loan growth	248,201	0.050	0.753	-2.559	2.699
Total committed amount growth	331,430	0.047	0.507	-1.609	1.686
CET1 Capital ratio	331,430	0.106	0.012	0.075	0.163
Tier1 Capital ratio	331,430	0.122	0.011	0.104	0.182
Tier1 Capital ratio Drop	331,430	0.027	0.017	0.000	0.087
Size (log Total assets)	331,430	20.334	1.153	18.288	21.670
Equity / TA	331,430	0.113	0.014	0.077	0.149
ROA	331,430	0.010	0.005	-0.003	0.025
Deposit / TA	331,430	0.614	0.141	0.053	0.796
Liq. Asset / TA	331,430	0.298	0.089	0.146	0.696
Charge-off / TA	331,430	0.377	0.255	-0.001	1.427
C&I Loan / TA	331,430	0.121	0.069	0.002	0.265
Firm Variable					
Size (log Total assets)	257,561	4.273	2.944	-3.972	11.036
Cash / TA	255,956	0.099	0.111	0.000	0.381
Ebitda / TA	256,093	0.077	0.095	-0.064	0.324
Leverage	250,492	0.348	0.260	0.000	0.856
Sales / TA	256,443	2.147	1.530	0.169	5.450
Operating Margin	159,817	0.104	0.112	-0.052	0.398
Tangible Assets/TA	253,060	0.886	0.187	0.347	1.000
Rating A Dummy	324,505	0.146	0.353	0.000	1.000
Rating B Dummy	324,505	0.899	0.301	0.000	1.000
Rating C Dummy	324,505	0.054	0.225	0.000	1.000
Rating D Dummy	324,505	0.005	0.072	0.000	1.000

Empirical approach for bank C&I lending

- We use the following panel regression specification for bank C&I lending

$$\text{Loan growth}_{ijt+1} = \beta_1 \text{ST Buffer}_{it} + \beta_2 \text{K ratio}_{it} + \gamma X_{it} + \alpha_{ij} + \tau_{jt} + \varepsilon_{ijt+1}$$

- *Loan growth*_{ijt} of bank *i* to firm *j* (utilized and committed amounts)
 - The log difference of average C&I loans over the 3 quarters before and after the stress test exercise of year *t*
- *ST Buffer*_{it} is the stress-test buffer of bank *i* in stress test exercise of year *t*
- *Bank controls* (*X*_{it}) include size, ROA, deposits/total assets, charge-offs, and share of C&I loans in total assets. All controls measured at the beginning of the stress test exercise in year *t*
- We include *firm-bank fixed effects* and *firm-time fixed effects*
- Also interact the *ST Buffer* with *year dummies* and *firm-type dummies*
- Hypotheses: $\beta_1 < 0$ and $\beta_2 > 0$

Impact of Capital Buffer on Bank-Firm Loan Growth

Variable	Utilized amounts			Committed amounts		
	(1)	(2)	(4)	(6)	(7)	(9)
ST Buffer	-2.324*** [0.350]	-1.710*** [0.385]		-1.850*** [0.208]	-1.480*** [0.225]	
ST Buffer x year 2012			-1.318* [0.704]			-2.139*** [0.423]
ST Buffer x year 2013			-3.382*** [0.521]			-2.956*** [0.290]
ST Buffer x year 2014			-2.081*** [0.505]			-2.005*** [0.290]
ST Buffer x year 2015			-0.924** [0.465]			-0.719*** [0.263]
ST Buffer x year 2016			-2.659*** [0.862]			-3.057*** [0.445]
Equity Capital ratio		5.656*** [1.046]	5.201*** [1.078]		5.230*** [0.608]	5.147*** [0.627]
Observations	248201	248201	248401	331430	331430	331430
Bank Controls	No	Yes	Yes	No	Yes	Yes
Year - Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.81	0.81	0.81	0.67	0.67	0.67

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results for bank C&I lending

Variable	Utilized amounts			Committed amounts		
	(1)	(2)	(4)	(6)	(7)	(9)
ST Buffer	-2.324*** [0.350]	-1.710*** [0.385]		-1.850*** [0.208]	-1.480*** [0.225]	
ST Buffer x year 2012			-1.318* [0.704]			-2.139*** [0.423]
ST Buffer x year 2013			-3.382*** [0.521]			-2.956*** [0.290]
ST Buffer x year 2014			-2.081*** [0.505]			-2.005*** [0.290]
ST Buffer x year 2015			-0.924** [0.465]			-0.719*** [0.263]
ST Buffer x year 2016			-2.659*** [0.862]			-3.057*** [0.445]
Equity Capital ratio		5.656*** [1.046]	5.201*** [1.078]		5.230*** [0.608]	5.147*** [0.627]
Observations	248201	248201	248401	331430	331430	331430
Bank Controls	No	Yes	Yes	No	Yes	Yes
Year - Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.81	0.81	0.81	0.67	0.67	0.67

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results for bank C&I lending

Variable	Utilized amounts			Committed amounts		
	(1)	(2)	(4)	(6)	(7)	(9)
ST Buffer	-2.324*** [0.350]	-1.710*** [0.385]		-1.850*** [0.208]	-1.480*** [0.225]	
ST Buffer x year 2012			-1.318* [0.704]			-2.139*** [0.423]
ST Buffer x year 2013			-3.382*** [0.521]			-2.956*** [0.290]
ST Buffer x year 2014			-2.081*** [0.505]			-2.005*** [0.290]
ST Buffer x year 2015			-0.924** [0.465]			-0.719*** [0.263]
ST Buffer x year 2016			-2.659*** [0.862]			-3.057*** [0.445]
Equity Capital ratio		5.656*** [1.046]	5.201*** [1.078]		5.230*** [0.608]	5.147*** [0.627]
Observations	248201	248201	248401	331430	331430	331430
Bank Controls	No	Yes	Yes	No	Yes	Yes
Year - Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.81	0.81	0.81	0.67	0.67	0.67

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results for bank C&I lending

Variable	Utilized amounts			Committed amounts		
	(1)	(2)	(4)	(6)	(7)	(9)
ST Buffer	-2.324*** [0.350]	-1.710*** [0.385]		-1.850*** [0.208]	-1.480*** [0.225]	
ST Buffer x year 2012			-1.318* [0.704]			-2.139*** [0.423]
ST Buffer x year 2013			-3.382*** [0.521]			-2.956*** [0.290]
ST Buffer x year 2014			-2.081*** [0.505]			-2.005*** [0.290]
ST Buffer x year 2015			-0.924** [0.465]			-0.719*** [0.263]
ST Buffer x year 2016			-2.659*** [0.862]			-3.057*** [0.445]
Equity Capital ratio		5.656*** [1.046]	5.201*** [1.078]		5.230*** [0.608]	5.147*** [0.627]
Observations	248201	248201	248401	331430	331430	331430
Bank Controls	No	Yes	Yes	No	Yes	Yes
Year - Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.81	0.81	0.81	0.67	0.67	0.67

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results for bank C&I lending, contd.

Variable	Utilized amounts				Committed amounts			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
ST Buffer x Private Firm	-3.400*** [0.536]	-2.848*** [0.546]			-3.000*** [0.404]	-2.658*** [0.412]		
ST Buffer x Public Firm	-1.644*** [0.460]	-0.994** [0.491]			-1.364*** [0.240]	-0.985*** [0.255]		
ST Buffer x Inv. Grade firm			-2.384*** [0.388]	-1.764*** [0.428]			-1.818*** [0.215]	-1.441*** [0.234]
ST Buffer x Non-Inv. Grade firm			-2.153*** [0.544]	-1.570*** [0.552]			-1.946*** [0.365]	-1.595*** [0.372]
Equity Capital ratio		5.789*** [1.049]		5.619*** [1.051]		5.285*** [0.606]		5.227*** [0.608]
Observations	248201	248201	243978	243978	331430	331430	324505	324505
Bank Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year - Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.81	0.81	0.81	0.81	0.67	0.67	0.67	0.67

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Empirical approach for firm outcomes

- We use the following panel regression specification for firm outcomes

$$Firm\ Outcome_{jt+1} = \beta Firm\ ST\ Buffer\ Exposure_{jt} + \gamma X_{jt} + \alpha_j + \tau_{mt} + \varepsilon_{jt+1}$$

- *Firm Outcome*_{jt+1} is either (i) growth of total firm borrowing from CCAR banks, (ii) overall firm debt growth, and (iii) firm investment growth
 - Measured as log differences between the average over 3 quarters before and after the stress-test exercise of year *t*
- *Firm ST Buffer Exposure*_{jt} for firm *j* is

$$Firm\ ST\ Buffer\ Exposure_{jt} = \sum_{i=1}^N \frac{loan\ amount_{ijt-1}}{\sum_{all\ i} loan\ amount_{ijt-1}} \times ST\ Buffer_{it}$$

- *Firm controls* (*X*_{jt}) include size, cash to total assets, the leverage ratio, and the ratios of EBITDA, sales, and tangible assets to total assets
- We include *firm fixed effects* and *industry-year fixed effects*

Summary statistics

FIRM LEVEL DATA

Variable	Obs.	Mean	Std. Dev.	Min	Max
Firm Variable					
Exposure to Reg. Capital change	31,758	0.025	0.015	-0.014	0.088
Total Loan growth	31,758	0.080	0.842	-2.614	2.694
Total Committed amount growth	38,713	0.072	0.532	-1.637	1.729
Growth in total debt	30,981	0.107	0.553	-2.290	2.540
Growth in Capex	22,571	0.100	1.513	-8.454	8.880
Growth in Fixed Assets	32,109	0.086	0.409	-1.624	2.246
Growth in Employment					
Size (log Total assets)	28,167	5.620	2.519	-5.185	10.387
Cash / TA	33,375	0.085	0.100	0.000	0.381
Ebitda / TA	33,419	0.062	0.084	-0.064	0.324
Leverage	32,728	0.368	0.239	0.000	
Sales / TA	33,477	1.690	1.372	0.169	5.450
Operating Margin	20,733	0.094	0.099	-0.052	0.398
Tangible Assets/TA	33,287	0.840	0.213	0.347	1.000
Rating A Dummy	38,246	0.202	0.402	0.000	1.000
Rating B Dummy	38,246	0.907	0.291	0.000	1.000
Rating C Dummy	38,246	0.073	0.260	0.000	1.000
Rating D Dummy	38,246	0.007	0.083	0.000	1.000

Results for growth of firm borrowing from CCAR banks

Variable	Utilized amounts				Committed amounts			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Exposure x Private Firm	-3.979*** [0.650]	-3.355*** [0.687]			-3.412*** [0.361]	-3.140*** [0.397]		
Exposure x Public Firm	-5.232*** [1.428]	-6.173** [1.569]			-3.135*** [0.487]	-2.867** [0.528]		
Exposure x Inv. Grade firm			-2.395*** [0.849]	-1.955** [0.935]			-1.908*** [0.413]	-1.983*** [0.450]
Exposure x Non-Inv. Grade firm			-5.277*** [0.682]	-5.068*** [0.751]			-3.818*** [0.314]	-3.428*** [0.343]
Observations	31758	27385	31459	27385	38173	32563	38246	32563
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Multi-bank firms only	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.3	0.4	0.3	0.32	0.35	0.4	0.36	0.4

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results for overall firm debt growth and firm investment

Variable	Overall Debt growth				Investment			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Exposure x Private Firm	-0.629 [0.432]	-0.464 [0.422]			-0.343 [0.342]	-0.138 [0.349]		
Exposure x Public Firm	0.083 [0.526]	0.190 [0.465]			-0.380 [0.295]	-0.212 [0.293]		
Exposure x Inv. Grade firm			-0.135 [0.468]	-0.804* [0.447]			-0.185 [0.320]	-0.359 [0.313]
Exposure x Non-Inv. Grade firm			-0.365 [0.362]	0.004 [0.340]			-0.279 [0.260]	-0.100 [0.263]
Observations	32154	31170	31904	31170	33359	31979	33071	31979
Firm Controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Multi-bank firms only	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.29	0.37	0.29	0.37	0.31	0.35	0.31	0.35

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Empirical approach for county employment

- We use the following panel regression specification for county employment

$$\text{County Emp. Growth}_{ct+1} = \beta \text{County ST Buffer Exposure}_{ct} + \gamma Z_{ct} + \alpha_c + \varepsilon_{jt+1}$$

- County Emp. Outcome* $_{ct+1}$ is the growth in the number of employees at industrial firms in the county
- County ST Buffer Exposure* $_{ct}$ for county c is

$$\text{County ST Buffer Exposure}_{ct} = \frac{\sum_{\forall j} w. HQ \text{ in county } c \sum_{\forall i} \text{loan amount}_{ijt-1}}{\sum_{\forall j} w. HQ \text{ in county } c \sum_{\forall i} \text{loan amount}_{ijt-1}} \times ST \text{ Buffer}_{it}$$

- County controls* (Z_{ct}) include log wages, log population, and the log house price index
- We include *county fixed effects*

Results for county employment

	(1)	(2)	(3)	(4)
Exposure	0.016 [0.038]		0.037 [0.038]	
Exposure_12		0.005 [0.063]		0.016 [0.062]
Exposure_13		0.026 [0.061]		0.022 [0.062]
Exposure_14		0.017 [0.062]		0.031 [0.063]
Exposure_15		-0.062 [0.091]		-0.014 [0.093]
Exposure_16		0.052 [0.062]		0.108 [0.066]
Log Wages			-0.023** [0.010]	-0.023** [0.010]
Log Population			-0.223*** [0.062]	-0.224*** [0.063]
House price index			0.014*** [0.003]	0.014*** [0.003]
Observations	13025	13025	12764	12764
R-squared	0.33	0.33	0.33	0.33

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Results for county employment

	(1)	(2)	(3)	(4)
Exposure	0.016 [0.038]		0.037 [0.038]	
Exposure_12		0.005 [0.063]		0.016 [0.062]
Exposure_13		0.026 [0.061]		0.022 [0.062]
Exposure_14		0.017 [0.062]		0.031 [0.063]
Exposure_15		-0.062 [0.091]		-0.014 [0.093]
Exposure_16		0.052 [0.062]		0.108 [0.066]
Log Wages			-0.023** [0.010]	-0.023** [0.010]
Log Population			-0.223*** [0.062]	-0.224*** [0.063]
House price index			0.014*** [0.003]	0.014*** [0.003]
Observations	13025	13025	12764	12764
R-squared	0.33	0.33	0.33	0.33

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Robustness analysis

- We repeat our analysis based on data that matches bank and loan information from the FR Y-14 with financial data on borrowing firms from COMPUSTAT
- In this analysis the set of firms
 - Is smaller (≈ 3000 versus $\approx 11,000$ multi-bank firms)
 - Is a little different (all publicly traded, larger, lower leverage, *etc.*)
- Findings using the merged FR Y-14 and COMPUSTAT databases are consistent with those using the larger FR Y-14 dataset
- Larger firm exposure to stress-test capital buffers
 - Implies lower total firm borrowing from CCAR banks
 - Appears to not impact on overall firm debt growth and firm investment

Impact of Capital Buffer on Firm Loan Growth – COMPUSTAT

	Utilized Amounts				Committed Amounts			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure	-7.265*** [1.948]	-4.923** [2.311]			-2.445*** [0.476]	-1.583*** [0.546]		
Exposure_12			-6.774** [3.119]	-4.243 [3.419]			-3.200*** [0.731]	-3.098*** [0.848]
Exposure_13			-7.840*** [2.889]	-7.504** [3.290]			-3.091*** [0.882]	-1.19 [0.984]
Exposure_14			-8.982*** [2.602]	-6.891** [3.020]			-1.746** [0.764]	-0.84 [0.866]
Exposure_15			-6.007** [2.371]	-3 [2.873]			-2.070*** [0.609]	-1.502** [0.697]
Exposure_16			-10.219*** [3.525]	-3.655 [4.291]			-2.572*** [0.921]	-0.73 [1.020]
Firm size		-0.139 [0.095]		-0.137 [0.095]		-0.094*** [0.030]		-0.093*** [0.030]
Firm Cash/TA		1.213*** [0.447]		1.210*** [0.448]		-0.175 [0.141]		-0.183 [0.142]
Firm Leverage		-1.093*** [0.297]		-1.109*** [0.298]		-0.468*** [0.092]		-0.470*** [0.091]
Firm Ebitda		0.682 [0.734]		0.652 [0.736]		0.575** [0.270]		0.581** [0.269]
Firm Sales/TA		-0.538*** [0.160]		-0.534*** [0.161]		-0.160*** [0.057]		-0.168*** [0.056]
MTB Assets		0.547 [0.398]		0.55 [0.398]		-0.171 [0.131]		-0.162 [0.131]
Tang. Asset/TA		0.066 [0.045]		0.064 [0.045]		0.078*** [0.016]		0.078*** [0.016]
Observations	6344	4879	6344	4879	8270	6181	8270	6181
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.26	0.27	0.26	0.27	0.35	0.36	0.35	0.36

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Impact of Capital Buffer on Firm Outcomes - COMPUSTAT

	Total debt				Investment				Employment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Exposure	-0.754** [0.350]	-0.329 [0.385]			-0.152 [0.138]	-0.05 [0.154]			-0.228** [0.096]	0.034 [0.106]		
Exposure_12			-0.121 [0.615]	-0.088 [0.730]			0.14 [0.236]	0.121 [0.276]			-0.086 [0.157]	0.332* [0.178]
Exposure_13			-0.857 [0.637]	-0.756 [0.700]			-0.147 [0.230]	0.005 [0.248]			-0.176 [0.159]	0.111 [0.180]
Exposure_14			-1.503** [0.648]	-0.889 [0.638]			-0.142 [0.223]	0.072 [0.242]			-0.462*** [0.149]	-0.134 [0.156]
Exposure_15			-0.583 [0.421]	-0.048 [0.447]			-0.390** [0.178]	-0.360* [0.191]			-0.155 [0.132]	-0.081 [0.148]
Exposure_16			-1.306** [0.551]	-0.094 [0.625]			-0.094 [0.257]	0.294 [0.289]			-0.430** [0.189]	-0.069 [0.200]
Firm size		-0.087*** [0.026]		-0.087*** [0.026]		-0.030*** [0.011]		-0.031*** [0.011]		-0.065*** [0.008]		-0.066*** [0.008]
Firm Cash/TA		0.131 [0.127]		0.129 [0.127]		0.189*** [0.052]		0.190*** [0.052]		0.173*** [0.034]		0.174*** [0.034]
Firm Leverage		-1.097*** [0.084]		-1.099*** [0.084]		-0.128*** [0.036]		-0.128*** [0.036]		-0.094*** [0.025]		-0.094*** [0.025]
Firm Ebitda		-0.045 [0.236]		-0.051 [0.236]		0.585*** [0.123]		0.588*** [0.122]		0.233*** [0.061]		0.233*** [0.061]
Firm Sales/TA		-0.103 [0.078]		-0.102 [0.079]		-0.008 [0.021]		-0.008 [0.021]		-0.013 [0.015]		-0.012 [0.015]
MTB Assets		0.031 [0.123]		0.032 [0.122]		-0.187*** [0.047]		-0.186*** [0.047]		-0.051 [0.038]		-0.052 [0.038]
Tang. Asset/TA		0.092*** [0.016]		0.092*** [0.016]		0.059*** [0.006]		0.059*** [0.006]		0.027*** [0.004]		0.027*** [0.004]
Observations	7560	6077	7460	6077	7833	6442	7833	6442	7516	6230	7516	6230
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.32	0.39	0.32	0.39	0.51	0.56	0.51	0.56	0.56	0.6	0.56	0.6

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Concluding remarks

- Stress tests capital buffers lead to material reductions in bank C&I lending: 1 pp. increase in capital buffers results in 2 pp. lower loan growth of utilized amounts and 1 ½ lower growth rate of committed amounts.
- Positive and significant effects of bank capital ratio on lending. This positive effect is larger than the negative effect of the stress test capital buffer.
- Using firms in both FR Y-14 and COMPUSTAT we find:
 - Effects of capital buffer are larger at the firm level (multibank firms) on total bank loan growth (summing across all their CCAR lenders): 1 pp. increase in capital buffers leads to:
 - 4 pp. decline in growth rate of utilized amounts
 - 3 pp. decline in growth rate of committed amounts
 - No impact of larger capital buffers on firm outcomes such as overall debt, investment spending and employment.
 - This result suggests that firms manage to substitute their bank loans with other borrowing sources from smaller banks, nonbank financials and issuing bonds in capital markets.

Appendix

Impact of Capital Buffer on Firm Loan Growth

	Utilized Amounts				Committed Amounts			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure	-4.351*** [0.655]		-4.256*** [0.724]		-3.302*** [0.298]		-3.025*** [0.329]	
Exposure_12		-4.055*** [1.204]		-4.063*** [1.385]		-1.579*** [0.521]		-1.173** [0.547]
Exposure_13		-5.147*** [0.956]		-5.235*** [1.037]		-3.815*** [0.481]		-3.847*** [0.502]
Exposure_14		-5.073*** [0.878]		-4.865*** [0.982]		-3.529*** [0.459]		-3.118*** [0.497]
Exposure_15		-3.014*** [0.960]		-2.502** [1.086]		-3.132*** [0.420]		-2.661*** [0.461]
Exposure_16		-5.184*** [1.417]		-6.390*** [1.614]		-5.678*** [0.615]		-5.902*** [0.668]
Firm size			-0.064*** [0.013]	-0.065*** [0.013]			-0.055*** [0.008]	-0.055*** [0.008]
Firm Cash/TA			0.812*** [0.153]	0.812*** [0.153]			0.146** [0.071]	0.144** [0.071]
Firm Leverage			-0.560*** [0.055]	-0.562*** [0.055]			-0.236*** [0.030]	-0.238*** [0.030]
Firm Ebitda			0.396*** [0.144]	0.395*** [0.144]			0.231*** [0.078]	0.230*** [0.078]
Firm Sales/TA			0.02 [0.015]	0.019 [0.015]			0.001 [0.009]	0 [0.009]
Observations	31758	31758	27385	27385	38713	38713	32563	32563
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.26	0.26	0.27	0.27	0.32	0.32	0.35	0.35

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

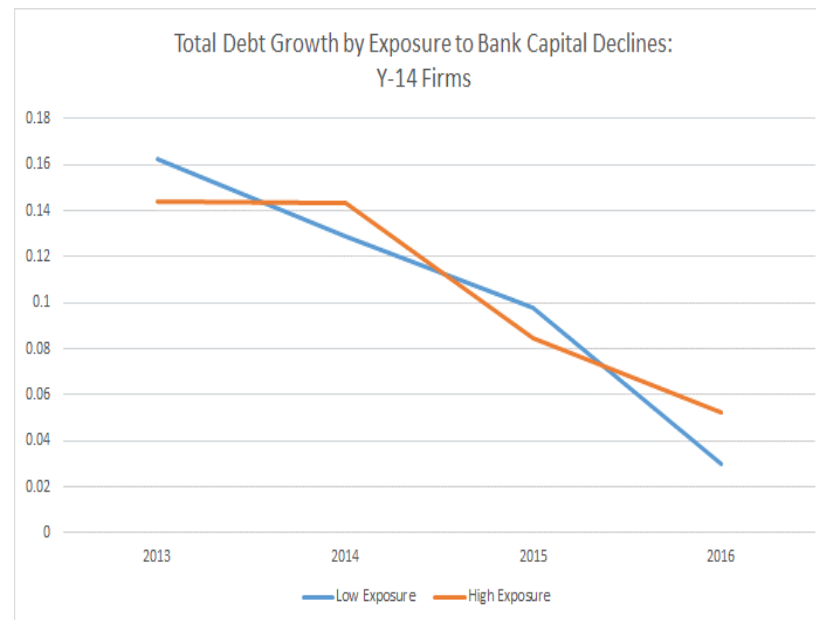
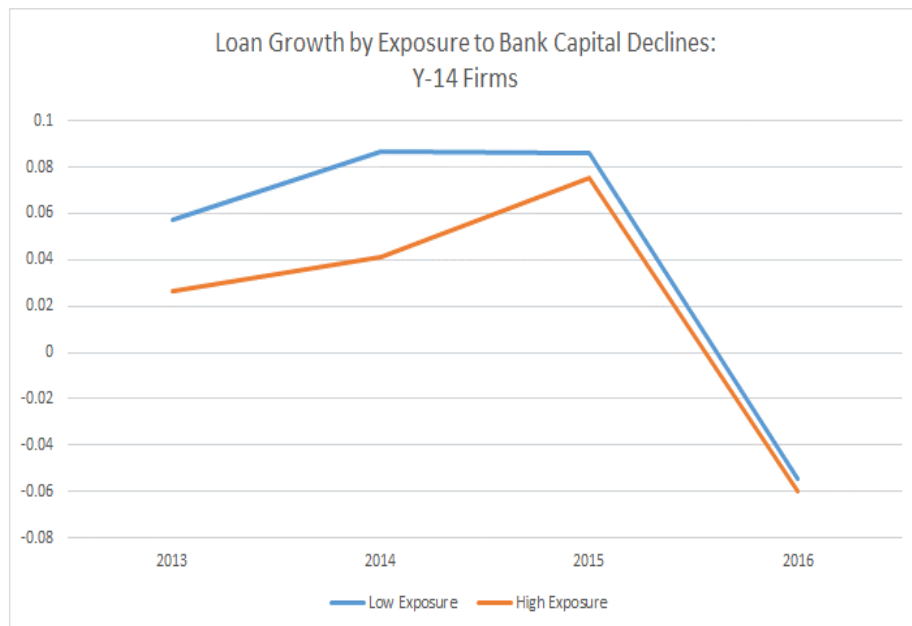
Impact of Capital Buffer on Firm Overall Debt Growth

	All Firms				Public				Private			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Exposure	-0.349 [0.341]		-0.205 [0.320]		-0.185 [0.539]		0.023 [0.474]		-0.767* [0.450]		-0.639 [0.441]	
Exposure_12		0.069 [0.549]		0.077 [0.534]		0.064 [0.849]		0.383 [0.802]		-0.318 [0.739]		-0.541 [0.732]
Exposure_13		-1.008 [0.626]		-1.046* [0.577]		0.37 [1.027]		0.484 [0.922]		-1.798** [0.794]		-1.861** [0.738]
Exposure_14		0.087 [0.553]		0.212 [0.524]		-0.243 [0.846]		0.171 [0.774]		0.091 [0.740]		0.096 [0.715]
Exposure_15		-0.875* [0.495]		-0.536 [0.456]		-0.393 [0.650]		-0.34 [0.578]		-2.022*** [0.779]		-1.193 [0.744]
Exposure_16		0.654 [0.770]		1.033 [0.752]		-0.574 [1.004]		-0.249 [0.962]		1.257 [1.178]		1.681 [1.156]
Firm size			-0.271*** [0.018]	-0.271*** [0.018]			-0.201*** [0.029]	-0.200*** [0.029]			-0.296*** [0.023]	-0.296*** [0.023]
Firm Cash/TA			0.074 [0.104]	0.078 [0.104]			0.292* [0.163]	0.294* [0.164]			-0.03 [0.132]	-0.022 [0.132]
Firm Leverage			-1.250*** [0.046]	-1.250*** [0.046]			-1.381*** [0.073]	-1.381*** [0.073]			-1.205*** [0.058]	-1.203*** [0.058]
Firm Ebitda			0.231** [0.094]	0.231** [0.094]			0.243 [0.165]	0.243 [0.165]			0.234** [0.114]	0.234** [0.114]
Firm Sales/TA			-0.022 [0.014]	-0.023 [0.014]			-0.072** [0.032]	-0.071** [0.032]			-0.014 [0.016]	-0.014 [0.016]
Observations	32154	32154	31170	31170	12110	12110	11791	11791	20044	20044	19379	19379
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.25	0.25	0.33	0.33	0.25	0.25	0.33	0.33	0.25	0.26	0.34	0.34

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Impact of Capital Buffer on Firm Bank Loan and Debt Growth



- Firms with low exposure to bank capital buffers show a larger growth of their bank loans relative to firms with large exposure.
- Total debt has grown at a decreasing rate for all firms. There is no significant difference in growth rates between low- and high-exposure firms.
- Most of the differences in bank loan growth occurs at private firms (not shown):
 - Publicly traded firms (particularly those with high exposure to capital buffers) managed to sustain or grow their total debt between 2013 and 2015.

Impact of Capital Buffer on Firm Investment

	All Firms				Public				Private			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Exposure	-0.358 [0.241]		-0.168 [0.244]		-0.251 [0.299]		-0.073 [0.299]		-0.543 [0.358]		-0.334 [0.364]	
Exposure_12		1.060*** [0.409]		1.170*** [0.396]		0.353 [0.498]		0.607 [0.511]		1.535** [0.613]		1.633*** [0.583]
Exposure_13		-0.722 [0.450]		-0.673 [0.444]		-0.4 [0.587]		-0.1 [0.575]		-1.017 [0.634]		-1.075* [0.626]
Exposure_14		-0.869** [0.412]		-0.659 [0.416]		-0.172 [0.520]		-0.038 [0.498]		-1.474** [0.600]		-1.256** [0.623]
Exposure_15		-0.552* [0.325]		-0.351 [0.321]		-0.368 [0.381]		-0.351 [0.370]		-0.8 [0.543]		-0.361 [0.549]
Exposure_16		-0.814 [0.508]		-0.406 [0.503]		-0.741 [0.635]		-0.302 [0.633]		-1.15 [0.791]		-0.767 [0.779]
Firm size			-0.186*** [0.015]	-0.186*** [0.015]			-0.154*** [0.021]	-0.154*** [0.021]			-0.201*** [0.020]	-0.201*** [0.020]
Firm Cash/TA			0.152** [0.071]	0.153** [0.071]			0.326*** [0.105]	0.329*** [0.105]			0.072 [0.094]	0.069 [0.093]
Firm Leverage			-0.149*** [0.030]	-0.152*** [0.030]			-0.099** [0.042]	-0.100** [0.042]			-0.178*** [0.040]	-0.182*** [0.040]
Firm Ebitda			0.278*** [0.070]	0.279*** [0.070]			0.301*** [0.094]	0.301*** [0.094]			0.273*** [0.090]	0.276*** [0.090]
Firm Sales/TA			-0.012 [0.012]	-0.012 [0.012]			-0.012 [0.025]	-0.012 [0.025]			-0.012 [0.014]	-0.013 [0.014]
Observations	33359	33359	31979	31979	12802	12802	12355	12355	20557	20557	19624	19624
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.27	0.27	0.3	0.3	0.28	0.28	0.31	0.31	0.26	0.26	0.3	0.3

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Comments on Berrospide and Edge (2019)

“The Effects of Bank Capital Buffers on Bank Lending and Firm Activity: What Can We Learn from Five Years of Stress-Test Results”

by Jose M. Berrospide & Rochelle M. Edge

Raffi E. García

Rensselaer Polytechnic Institute

2020 First Conference on Financial Stability and Sustainability
Lima, Peru

January 20, 2020

Paper Summary & Contribution

General Feedback: Enjoyed reading the paper, it is well-organized and written, and makes a significant contribution to the literature on bank stress tests.

Main Focus: The paper investigates the effect of higher capital requirements (through capital buffers) as part of the CCAR stress tests on bank's commercial & industrial lending and their implications on the broader economy through firms' loan volumes, overall debt, investment, and employment.

Data:

- FR Y-14 quarterly reports filed by the 30 or so CCAR stress-tested BHCs. These reports have bank-loan-firm information, including balance sheet and expenditure information. Given the different changes in regulations, the authors decided to use only the 16 banks that have been part of CCAR for all of the five stress-test cycles.
- COMPUSTAT data is used for robustness checks purposes.
- For county-level employment data - Bureau of Labor Statistics and county-level housing price index data from Core Logic.

Paper Summary & Contribution

Identification strategy: The paper matches bank-firm loans and uses an approach similar to Khwaja and Mian (2008).

Key contribution of the paper is that it helps to shed some light on the effects of stress testing on firm-level loan volumes, overall debt volumes, and their impacts on investments and employment. I believe this is the first paper that I have seen so far that tries to study those potential implications.

Summary of Key Findings

The main findings are the following:

- Stress-test capital buffers have a negative and significant effect on loan growth (an increase of 1% in the capital buffers reduces loan growth rates of utilized and committed loans by 2% and 1.5% respectively).
- Positive and significant effect on bank lending - a 1% increase in capital buffer leads to an increase of 5.5% in bank lending. This is consistent with recent literature.
- Firm overall debt, investment spending, and local employment, seem to not be affected by the exposure to the stress-test capital buffers movements.

(1): Endogeneity, Econometric Identification, and Sample Selection?

- The loans market face supply and demand movements, hence should control for potential endogeneity issues.
- The authors follow an approach similar to Khwaja and Mian (2008) that uses firms that borrow from multiple banks and within-firm loan-growth comparisons across banks. However, the data used here is limited to only stress-tested banks plus only 14% of firms in the sample are multibank firms.
- The authors also do control for some demand-side movement variables. However, significant endogeneity still persists since the amount of loans from stress-tested and non-stress-tested banks to the same firm, still faces an endogeneity issues (for example, loans in the data are the ones that have been approved and not total loan demand, etc.)
 - **A potential solution:** Try to control for demand changes by constructing a proxy using the "one-out approach" at the county-level for all counties in the state, where you take the aggregate demand of all counties within the state and exclude the county where the firm is located.

(2): Data Limitation & Robustness Checks: Can The Authors Get More from Data?

- The authors are using only their first 16 BHCs that have gone through the first five stress-test cycles.
 - Why not include the others? The focus of the paper is on whether changes in capital buffers as a result of CCAR affect lending and borrowing firms' behavior. The 30 or so BHCs in the FR Y-14 can then be stacked together.
 - A possible robustness check could be include the BHCs incrementally to see how the effects change.
- Using the firm's headquarter location might introduce measurement error when trying to identify the effect of the capital buffers on employment. Need to have a more localized measure based on the firm business activities.
 - **A suggestion:** Use a similar approach to Addoum, Ng, and Ortiz-Bobea (2019) - "Temperature shocks and earnings news" paper in RFS.

(3): Firm Size, Loan Volumes, Dealscan Matching - Suggestions

- It would be interesting to see the impact by firm size quantiles based on total revenue or total assets. As well as the interaction of firm-size and amount borrowed.
- The authors can break the different firms into groups: small borrower and small firm; small borrower and large firm; large borrower and small firm; large borrower and large firm.
- Is it possible to match the Dealscan loan data to the firm-level data (COMPUSTAT) to help answer some of your key questions?
 - If so it would be possible to do use a difference-in-differences or other methodologies to help you answer the question.
 - I would suggest taking a look at the papers by Acharya, Berger, and Roman (2018) and the paper by Mehrnoush Shahhosseini (2019) in which they use Dealscan data.

(4): Other Minor Comments

- The authors suggest that a key reason why there is no impact on debt volumes, investment spending, and employment might be because firms are substituting to other sources of funding (p. 5). But they do not provide themselves some evidence of that.
 - Could it be that banks themselves are selling or trading their debt?
- Is it possible to study the effect on within firm employment?

Conclusion

- The paper has a lot of potential and I enjoyed reading it.
- I look forward to reading the finished version.