Real activity forecasts using loan portfolio information

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Background: Banks as information collectors

- Level of financial intermediation is informative about capital accumulation and productivity (e.g., King and Levine 1993; Levine and Zervos 1998).

- Banks collect detailed, and often proprietary, information about their borrowers.
  - A large portion of loans are made to small firms and individuals that do not provide public disclosures (Petersen and Rajan 1994, 2002).

Background: Lending in local markets

- Bank lending is geographically segmented into local markets(e.g., Morgan and Salmolyk 2003).
  - Monitoring costs increase with distance from the borrower (e.g., Laderman et al. 1991; Morgan and Salmolyk 2003).
  - Access to “soft” information is often necessary in credit decisions and much of the lending is local (e.g., Petersen and Rajan 1994,2002; Agarwal and Hauswald 2010).

Research Questions

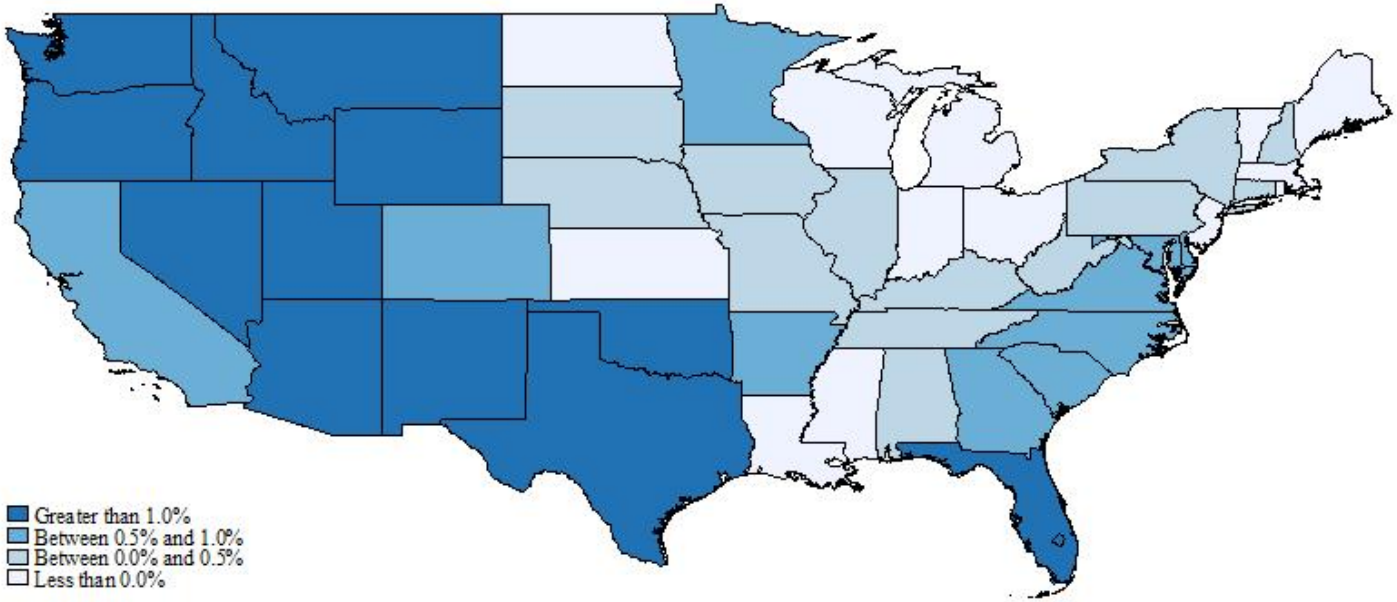
- Is information about banks' loan portfolios associated with local economic conditions?

- Is information about banks' loan portfolios incremental to information contained in other economic indicators used for forecasting local economic growth and recessions?

  – We focus on state-level economic conditions, but also conduct tests at a more granular level (commuting zone).

Significance of predicting local economic conditions

- Local economic conditions affect a wide array of matters from where corporations choose to locate their manufacturing to the outcome of local economic elections.
- Local economic conditions often diverge significantly from national economic conditions.



Data

- Sample period: 1990Q1-2010Q4 (quarterly data)

- Measure of changes in state economic conditions (From FED):
  - ΔCOINDEX= Changes in state coincident index

- Measures of the condition of bank loan portfolios (From commercial banks' call report filings):
  - Estimated losses:
    - PLLTL = Aggregate PLLL/ Aggregate Average Total Loans
    - ΔNPLTL= Δ(Aggregate NPL/ Aggregate Total Loans)
  - Risk premium on outstanding loans
    - EXYIELD= (Aggregate Interest Income/Aggregate Average Total Loans) – 3 Month TBILL Rate
  - Loan Growth:
    - LGrowth= (Aggregate Loans_t /Aggregate Loans_{t-1}) -1

Table 3: Association with state economic conditions

	Pred.	$\Delta COINDEX_t$	Cumulative $\Delta COINDEX_{t,t+i}$				Marginal $\Delta COINDEX_{t+i-1,t+i}$			
			i=1	i=2	i=3	i=4	i=1	i=2	i=3	i=4
$PLLTL_{s,t}$	-	-1.216 ***	-1.364 ***	-1.368 ***	-1.297 ***	-1.218 ***	-1.364 ***	-1.360 ***	-1.168 ***	-1.021 ***
		(-4.56)	(-4.62)	(-4.72)	(-4.69)	(-4.72)	(-4.62)	(-4.56)	(-4.50)	(-4.35)
$\Delta NPLTL_{s,t}$	-	-1.331 ***	-1.122 ***	-0.998 ***	-0.934 ***	-0.885 ***	-1.122 ***	-0.882 ***	-0.768 ***	-0.632 ***
		(-4.48)	(-4.05)	(-3.88)	(-4.04)	(-4.20)	(-4.05)	(-3.50)	(-3.61)	(-3.20)
$EXYIELD_{s,t}$	-	-0.089 **	-0.057	-0.038	-0.026	-0.011	-0.057	-0.018	0.003	0.034
		(-2.43)	(-1.43)	(-0.96)	(-0.64)	(-0.27)	(-1.43)	(-0.42)	(0.07)	(0.62)
$LGROWTH_{s,t}$	+	0.022 ***	0.017 ***	0.014 ***	0.010 **	0.009 *	0.017 ***	0.010 **	0.005	0.004
		(3.92)	(3.73)	(3.14)	(2.30)	(1.80)	(3.73)	(2.23)	(0.81)	(0.47)
$ALLTL_{s,t-1}$		0.207 ***	0.325 ***	0.376 ***	0.420 ***	0.440 ***	0.325 ***	0.408 ***	0.467 ***	0.506 ***
		(3.43)	(3.63)	(3.88)	(4.15)	(4.27)	(3.63)	(3.77)	(3.84)	(3.85)
Fixed effects		State	State	State	State	State	State	State	State	State
Clusters		Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter
R-squared		0.416	0.370	0.355	0.345	0.340	0.370	0.299	0.251	0.224
Obs. Count		4,150	4,100	4,050	4,000	3,950	4,100	4,050	4,000	3,950

Table 4: Predicting state-level economic conditions

		Cumulative $\Delta COINDEX_{t,t+i}$				Marginal $\Delta COINDEX_{t+i-1,t+i}$			
	Pred.	i=1	i=2	i=3	i=4	i=1	i=2	i=3	i=4
$PLLTL_{s,t}$	-	-0.218 ***	-0.323 ***	-0.359 ***	-0.372 ***	-0.218 ***	-0.424 ***	-0.436 **	-0.455 **
		(-3.50)	(-3.26)	(-2.94)	(-2.89)	(-3.50)	(-2.86)	(-2.30)	(-2.60)
$\Delta NPLTL_{s,t}$	-	-0.022	0.006	-0.005	-0.006	-0.022	0.021	-0.032	-0.034
		(-0.39)	(0.07)	(-0.05)	(-0.06)	(-0.39)	(0.17)	(-0.22)	(-0.20)
$EXYIELD_{s,t}$	-	-0.033 ***	-0.013	0.001	0.014	-0.033 ***	0.007	0.026	0.053
		(-2.79)	(-0.70)	(0.03)	(0.52)	(-2.79)	(0.25)	(0.73)	(1.15)
$LGROWTH_{s,t}$	+	0.002	-0.000	-0.002	-0.003	0.002	-0.002	-0.005	-0.005
		(1.15)	(-0.07)	(-0.69)	(-0.81)	(1.15)	(-0.69)	(-1.04)	(-0.71)
$ALLTL_{s,t-1}$		0.066 ***	0.120 ***	0.171 ***	0.224 ***	0.066 ***	0.174 ***	0.265 ***	0.354 ***
		(3.65)	(3.47)	(3.54)	(3.75)	(3.65)	(3.21)	(3.20)	(3.27)
$LEADINDEX_{s,t}$		0.505 ***	0.456 ***	0.412 ***	0.374 ***	0.505 ***	0.407 ***	0.321 ***	0.250 ***
		(38.87)	(21.89)	(17.04)	(14.78)	(38.87)	(13.01)	(8.69)	(6.92)
$VWRET_{s,t}$		0.003 ***	0.005 ***	0.006 ***	0.006 ***	0.003 ***	0.007 ***	0.008 ***	0.008 **
		(2.89)	(3.71)	(3.60)	(3.29)	(2.89)	(3.69)	(2.80)	(2.11)
Fixed effects		State	State	State	State	State	State	State	State
Clusters		Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter
R-squared		0.872	0.803	0.744	0.694	0.872	0.648	0.485	0.373
Obs. Count		4,100	4,050	4,000	3,950	4,100	4,050	4,000	3,950

Table 4: Predicting state-level economic conditions

		Cumulative $\Delta COINDEX_{t,t+i}$				Marginal $\Delta COINDEX_{t+i-1,t+i}$			
	Pred.	i=1	i=2	i=3	i=4	i=1	i=2	i=3	i=4
$PLLTL_{s,t}$	-	-0.298 **	-0.439 ***	-0.489 ***	-0.528 ***	-0.298 ***	-0.569 ***	-0.612 ***	-0.656 ***
		(-3.64)	(-4.13)	(-3.82)	(-3.83)	(-3.64)	(-3.81)	(-3.05)	(-3.37)
$\Delta NPLTL_{s,t}$	-	-0.051	-0.030	-0.063	-0.088	-0.051	-0.027	-0.095	-0.123
		(-0.57)	(-0.27)	(-0.57)	(-0.72)	(-0.57)	(-0.19)	(-0.66)	(-0.67)
$EXYIELD_{s,t}$	-	-0.015	-0.011	-0.006	0.004	-0.015	-0.009	0.006	0.035
		(-0.80)	(-0.49)	(-0.24)	(0.12)	(-0.80)	(-0.30)	(0.14)	(0.64)
$LGROWTH_{s,t}$	+	0.001	0.000	-0.001	-0.002	0.001	-0.001	-0.004	-0.003
		(0.47)	(0.11)	(-0.41)	(-0.41)	(0.47)	(-0.16)	(-0.72)	(-0.36)
$ALLTL_{s,t-1}$		0.128 ***	0.200 ***	0.265 ***	0.311 ***	0.128 ***	0.268 ***	0.364 ***	0.434 ***
		(4.13)	(4.60)	(5.13)	(5.07)	(4.13)	(4.59)	(4.55)	(4.09)
$\Delta COINDEX_{s,t}$		1.181 ***	1.050 ***	0.961 ***	0.880 ***	1.181 ***	0.916 ***	0.763 ***	0.600 ***
		(24.26)	(15.52)	(10.94)	(8.93)	(24.26)	(9.14)	(5.23)	(4.04)
$\Delta COINDEX_{s,t-1}$		-0.418 ***	-0.308 ***	-0.283 ***	-0.277 **	-0.418 ***	-0.195 *	-0.227	-0.236
		(-5.55)	(-3.51)	(-2.80)	(-2.40)	(-5.55)	(-1.77)	(-1.49)	(-1.32)
$\Delta COINDEX_{s,t-2}$		0.201 ***	0.103	0.062	0.080	0.201 ***	0.004	-0.022	0.104
		(2.91)	(1.23)	(0.67)	(0.85)	(2.91)	(0.03)	(-0.16)	(0.87)
$\Delta COINDEX_{s,t-3}$		-0.130 ***	-0.105 **	-0.086	-0.107 *	-0.130 ***	-0.084	-0.037	-0.130
		(-3.14)	(-2.00)	(-1.55)	(-1.75)	(-3.14)	(-1.16)	(-0.47)	(-1.44)
$\Delta HOUSING_{s,t}$		0.042 ***	0.066 ***	0.076 ***	0.081 ***	0.042 ***	0.088 ***	0.101 ***	0.103 ***
		(3.19)	(3.51)	(3.46)	(3.36)	(3.19)	(3.42)	(3.14)	(2.82)
$PIGROWTH_{s,t}$		-0.037 **	-0.044 **	-0.053 **	-0.061 **	-0.037 **	-0.051 *	-0.074 *	-0.078 *
		(-2.54)	(-2.10)	(-2.07)	(-2.13)	(-2.54)	(-1.75)	(-1.95)	(-1.77)
$\Delta UNRATE_{s,t}$		0.272 **	0.361 ***	0.358 ***	0.359 **	0.272 **	0.440 ***	0.348 **	0.344 **
		(2.32)	(2.78)	(2.64)	(2.53)	(2.32)	(3.03)	(2.34)	(1.97)
$VWRET_{s,t}$		0.006 ***	0.008 ***	0.008 ***	0.009 ***	0.006 ***	0.009 ***	0.010 ***	0.010 ***
		(3.72)	(4.32)	(4.27)	(4.09)	(3.72)	(4.33)	(3.58)	(2.84)
Fixed effects		State	State	State	State	State	State	State	State
Clusters		Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter
R-squared		0.819	0.744	0.690	0.640	0.819	0.600	0.466	0.368
Obs. Count		3,900	3,850	3,800	3,750	3,900	3,850	3,800	3,750

Table 5: Predicting state-level recessions

	Pred.	(1)	(2)	(3)
$PLLTL_{s,t}$	+	3.361 ***	1.804 **	2.989 ***
		(4.92)	(2.57)	(3.98)
$\Delta NPLTL_{s,t}$	+	1.405 **	-1.440	-0.195
		(2.49)	(-0.20)	(-0.33)
$EXYIELD_{s,t}$	+	-0.015	-0.161	0.004
		(-0.09)	(-0.94)	(0.02)
$LGROWTH_{s,t}$	-	-0.020	0.005	-0.010
		(-0.81)	(0.22)	(-0.41)
$ALLTL_{s,t-1}$		-2.539 ***	-1.814 ***	-2.443 ***
		(-4.28)	(-3.65)	(-4.23)
$LEADINDEX_{s,t}$			-0.658 ***	
			(-5.24)	
$\Delta COINDEX_{s,t}$				-1.531 ***
				(-3.81)
$\Delta COINDEX_{s,t-1}$				0.674
				(1.60)
$\Delta COINDEX_{s,t-2}$				-0.392
				(-1.20)
$\Delta COINDEX_{s,t-3}$				0.729 **
				(2.35)
$\Delta HOUSING_{s,t}$				-0.278 ***
				(-2.88)
$PIGROWTH_{s,t}$				0.227 *
				(1.88)
$\Delta UNRATE_{s,t}$				-0.718
				(-1.48)
$VWRET_{s,t}$			-0.021 *	-0.028 ***
			(-1.85)	(-2.65)
Fixed Effects		State	State	State
Clusters		Quarter	Quarter	Quarter
Pseudo R-squared		0.20	0.28	0.30
Log Pseudolikelihood		-1,588	-1,417	-1,303
Obs. Count		3,950	3,950	3,750

Table 6: Out-of-sample tests

Panel A: Benchmark based on leading index

	Cumulative $\Delta COINDEX_{t,t+i}$			Marginal $\Delta COINDEX_{t+i-1,t+i}$		
i=	Obs. count	R^2_{os}	|ΔError|	Obs. count	R^2_{os}	|ΔError|
1	3,150	0.161	-0.015***	3,150	0.161	-0.015***
			(-6.91)			(-6.91)
2	3,100	0.171	-0.018***	3,100	0.157	-0.019***
			(-6.04)			(-5.40)
3	3,050	0.182	-0.020***	3,050	0.201	-0.035***
			(-6.45)			(-7.63)
4	3,000	0.237	-0.031***	3,000	0.263	-0.058***
			(-9.31)			(-11.30)

Panel B: Benchmark based on state-level economic indicators

	Cumulative $\Delta COINDEX_{t,t+i}$			Marginal $\Delta COINDEX_{t+i-1,t+i}$		
i=	Obs. count	R^2_{os}	|ΔError|	Obs. count	R^2_{os}	|ΔError|
1	2,950	0.180	0.018***	2,950	0.180	0.018***
			(9.32)			(9.32)
2	2,900	0.211	0.026***	2,900	0.221	0.035***
			(10.35)			(10.77)
3	2,850	0.253	0.037***	2,850	0.258	0.056***
			(12.71)			(14.16)
4	2,800	0.292	0.048***	2,800	0.294	0.072***
			(15.17)			(15.29)

Table 7: Predicting unemployment at CZ-level

		$\Delta UNRATE_{cz,t,t+4}$	
	Pred.	(1)	(2)
$PLLTL_{cz,t}$	+	0.221 **	0.247 ***
		(2.13)	(2.64)
$\Delta NPLTL_{cz,t}$	+	0.106 ***	0.116 ***
		(3.29)	(3.81)
$EXYIELD_{cz,t}$	+	0.203	0.023 *
		(1.55)	(1.79)
$LGROWTH_{cz,t}$	-	-0.007	-0.001
		(-0.40)	(-0.59)
$ALLTL_{cz,t-1}$		-0.120 ***	-0.124 ***
		(-2.91)	(-3.01)
$\Delta UNRATE_{cz,t-4,t}$			-6.000
			(-1.33)
Clusters		CZ and Quarter	CZ and Quarter
R-squared		0.07	0.07
Obs. Count		47,272	47,272

Summary

- Information about bank loan portfolios is associated with local economic conditions.
- Provision for loan and lease losses contains information that can improve predictions of local economic growth and recessions.
- Results hold at both the state- and commuting-zone levels.

Appendix and descriptive statistics

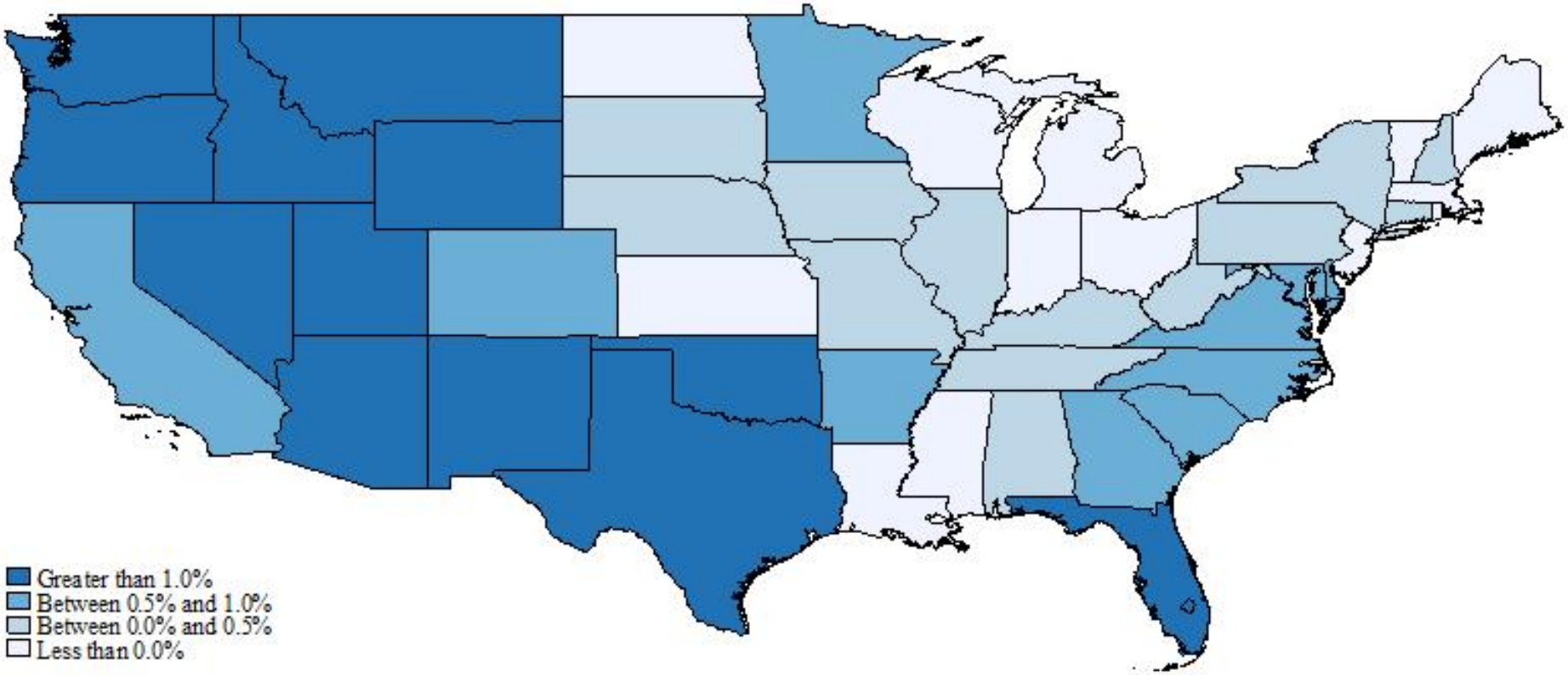
Appendix (# of banks by state)

	Total Number of Bank-Quarters	Average Quarterly Number of Banks	Average Bank's % of Operations in the State
AK	680	8.2	86.7%
AL	14,633	176.3	95.0%
AR	16,319	196.6	97.5%
AZ	3,940	47.5	80.5%
CA	27,610	332.7	96.6%
CO	18,634	224.5	94.4%
CT	6,124	73.8	91.1%
DE	2,735	33.0	86.1%
FL	25,650	309.0	93.4%
GA	28,665	345.4	97.1%
HI	971	11.7	91.1%
IA	37,027	446.1	98.0%
ID	2,138	25.8	66.9%
IL	67,051	807.8	97.8%
IN	16,359	197.1	92.0%
KS	33,852	407.9	97.3%
KY	21,195	255.4	95.4%
LA	13,917	167.7	97.9%
MA	17,692	213.2	97.2%
MD	7,736	93.2	82.9%
ME	2,707	32.6	94.6%
MI	14,961	180.3	95.2%
MN	41,466	499.6	98.1%
MO	33,896	408.4	96.2%
MS	8,890	107.1	94.8%
MT	7,888	95.0	98.0%

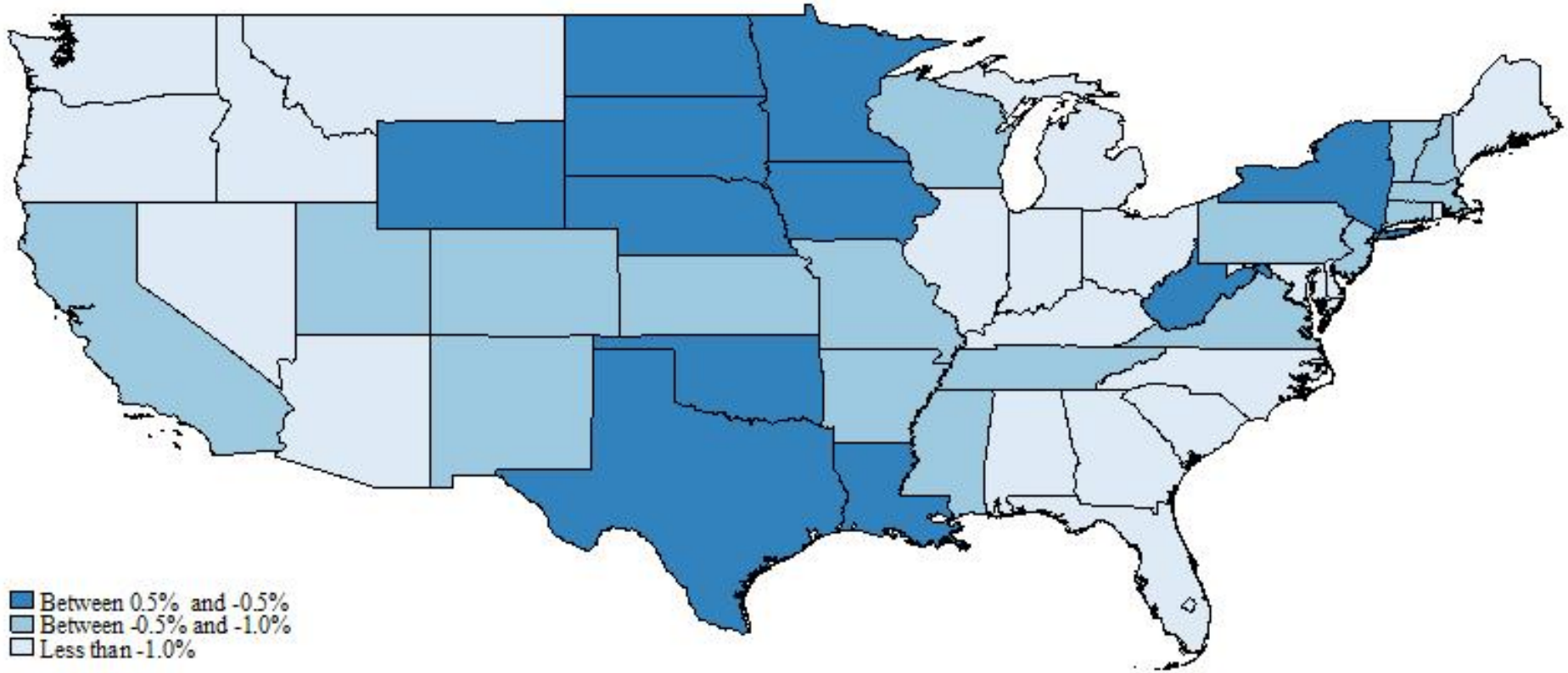
Appendix (# of banks by state)

	Total Number of Bank-Quarters	Average Quarterly Number of Banks	Average Bank's % of Operations in the State
NC	8,572	103.3	89.0%
ND	9,755	117.5	96.4%
NE	24,669	297.2	98.4%
NH	3,183	38.3	87.8%
NJ	9,629	116.0	88.2%
NM	5,193	62.6	93.7%
NV	2,525	30.4	81.2%
NY	15,813	190.5	92.2%
OH	19,941	240.3	95.1%
OK	25,730	310.0	98.5%
OR	3,997	48.2	81.0%
PA	21,209	255.5	94.5%
RI	1,035	12.5	76.1%
SC	6,675	80.4	92.5%
SD	8,386	101.0	96.9%
TN	18,227	219.6	94.0%
TX	67,184	809.4	98.0%
UT	4,375	52.7	89.4%
VA	12,777	153.9	88.5%
VT	1,865	22.5	87.1%
WA	8,533	102.8	88.5%
WI	29,064	350.2	98.1%
WV	8,761	105.6	90.0%
WY	4,251	51.2	94.4%
Total	794,085	9,567.3	95.5%

State economic growth (June-Sept. 2005)



State economic growth (June-Sept. 2008)



Descriptive statistics (bank-level)

	Obs. Count	Mean	St. Dev	25%	50%	75%
Total assets	758,851	746	15,105	38	80	184
Total loans	758,851	439	7,569	21	47	117
Loan growth	758,851	2.75	8.00	-0.92	1.72	4.75
Provision for loan losses	758,851	0.14	0.44	0.00	0.05	0.13
Allowance for loan losses	758,851	1.61	1.19	1.06	1.35	1.81
Nonperforming loans	758,851	1.42	2.17	0.24	0.76	1.75
Yield	758,851	8.76	1.98	7.45	8.76	9.84

		(1)	(2)	(3)	(4)	(5)
(1)	Loan growth	-	0.02	-0.19	-0.23	0.05
			(0.00)	(0.00)	(0.00)	(0.00)
(2)	Provision for loan losses	-0.00	-	0.07	0.23	0.05
		(0.15)		(0.00)	(0.00)	(0.00)
(3)	Allowance for loan losses	-0.12	0.23	-	0.31	0.15
		(0.00)	(0.00)		(0.00)	(0.00)
(4)	Nonperforming loans	-0.17	0.28	0.42	-	0.08
		(0.00)	(0.00)	(0.00)		(0.00)
(5)	Yield	0.07	0.08	0.16	0.00	-
		(0.00)	(0.00)	(0.00)	(0.19)	

Descriptive statistics (state-level)

	Obs. Count	Mean	St. Dev	25%	50%	75%
$LGROWTH_{s,t}$	4,150	2.076	5.035	0.096	1.938	3.680
$PLLTL_{s,t}$	4,150	0.256	0.304	0.079	0.142	0.321
$ALLTL_{s,t-1}$	4,150	1.865	0.823	1.386	1.638	2.090
$\Delta NPLTL_{s,t}$	4,150	0.030	0.243	-0.075	-0.002	0.081
$EXYIELD_{s,t}$	4,150	4.486	1.581	3.372	4.511	5.358
$\Delta COINDEX_{s,t}$	4,150	0.476	0.920	0.078	0.637	1.047
$LEADINDEX_{s,t}$	4,150	0.994	1.609	0.231	1.239	1.975
$\Delta HOUSING_{s,t}$	3,950	0.859	1.719	0.146	0.951	1.720
$PIGROWTH_{s,t}$	4,150	1.241	1.198	0.655	1.272	1.866
$\Delta UNRATE_{s,t}$	4,150	0.040	0.370	-0.200	0.000	0.200
$VWRET_{s,t}$	4,150	2.669	11.800	-3.262	3.094	9.017

Descriptive statistics (state-level)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	$LGROWTH_{s,t}$	-	-0.20	-0.17	-0.13	-0.07	0.25	0.21	0.17	0.14	-0.17	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.77)
(2)	$PLLTL_{s,t}$	-0.04	-	0.51	0.24	0.62	-0.35	-0.28	-0.27	-0.19	0.32	-0.02
		(0.01)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.22)
(3)	$ALLTL_{s,t-1}$	-0.02	0.65	-	-0.23	0.52	0.05	0.13	-0.10	-0.03	-0.03	0.10
		(0.20)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.07)	(0.00)
(4)	$\Delta NPLTL_{s,t}$	-0.10	0.34	-0.11	-	-0.02	-0.39	-0.41	-0.20	-0.24	0.36	-0.09
		(0.00)	(0.00)	(0.00)		(0.24)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(5)	$EXYIELD_{s,t}$	0.11	0.63	0.60	0.04	-	-0.19	-0.07	-0.08	-0.15	0.17	0.00
		(0.00)	(0.00)	(0.00)	(0.02)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.90)
(6)	$\Delta COINDEX_{s,t}$	0.18	-0.35	-0.01	-0.53	-0.15	-	0.88	0.30	0.49	-0.63	0.09
		(0.00)	(0.00)	(0.61)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(7)	$LEADINDEX_{s,t}$	0.16	-0.29	0.06	-0.51	-0.06	0.90	-	0.27	0.39	-0.58	0.14
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
(8)	$\Delta HOUSING_{s,t}$	0.11	-0.24	-0.09	-0.29	-0.07	0.39	0.39	-	0.21	-0.14	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.96)
(9)	$PIGROWTH_{s,t}$	0.07	-0.17	-0.03	-0.30	-0.12	0.49	0.40	0.24		-0.28	0.04
		(0.00)	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	-	(0.00)	(0.01)
(10)	$\Delta UNRATE_{s,t}$	-0.12	0.29	-0.01	0.44	0.15	-0.71	-0.66	-0.25	-0.31	-	-0.09
		(0.00)	(0.00)	(0.69)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
(11)	$VWRET_{s,t}$	0.03	-0.02	0.07	-0.10	-0.03	0.13	0.21	0.04	0.10	-0.15	-
		(0.07)	(0.11)	(0.00)	(0.00)	(0.11)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	

Descriptive statistics (CZ-level)

	Obs. Count	Mean	St. Dev	25%	50%	75%
$PLLTL_{cz,t}$	47,276	0.168	0.222	0.057	0.097	0.181
$\Delta NPLTL_{cz,t}$	47,276	0.044	0.343	-0.079	0.007	0.118
$LGROWTH_{cz,t}$	47,276	1.703	5.935	-0.208	1.803	3.698
$EXYIELD_{cz,t}$	47,276	4.384	1.416	3.379	4.353	5.349
$ALLTL_{cz,t-1}$	47,276	1.587	0.591	1.282	1.459	1.722
$\Delta UNRATE_{cz,t}$	47,276	0.036	0.322	-0.131	-0.006	0.148