Regulation Meets Technology: Evolution of Small Business Lending in Underserved Areas since 2007

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Outline

- Motivation:
  - Since global financial crisis (GFC), "new" digital lenders have grown into major players.
  - Their growth has disproportionately affected underserved populations.
  - How did this growth influence small business credit?

- Goal of this paper:
  1. Document post-GFC evolution of small business lending, focusing on:
     - Underserved areas
     - Role of new lenders
     - Role of bank regulation
  2. Explore how pre-pandemic evolution affected access to public credit support during pandemic

Summary of Main Findings: 2007–2019

- Banks (especially stress-test banks) reduced lending in general over 2007–2019;
- Their pull-back not consistently larger in underserved areas.
  - Underserved: bottom 20% counties by normalized per capita income; top 20% by minority (non-white) population
- Nonbanks, chiefly Merchant Cash Advance (MCA) and Fintech companies, increased lending substantially, more so in underserved areas.

- Bank lending declined partly due to stress-test capital buffers, with about proportionate impact across all counties.
- Nonbanks expanded to fill some gaps left by retreat of stress-test banks, but no differently in underserved counties.

Main Findings: Pandemic Period (2020–2021)

- Banks, MCAs and fintech lenders all scaled back lending during the pandemic...
- ...but nonbank lenders continued to fill gaps, retreating *less* in counties where stress-test banks were hit harder by capital shock.

- Speed of Paycheck Protection Program (PPP) access affected by prior bank/nonbank lending relationships. Relative to none observed by 2020, prior relationships with:
  - *Non*-stress-test bank: over 2 days earlier (2020 PPP);
  - Stress-test bank: 0.3 day later;
  - Finance company or fintech: nearly 1 day later.
- Prior relationships with *any* types of lenders (except fintech) *more* important to PPP borrowers in low-to-moderate-income tracts.
- Implication: Design of public credit support to small businesses should take account of existing structure of small-business financing sources.

Related Literature

- Post-GFC changes in market structure of small business lending (rise of nonbanks, incl. fintechs): Gopal and Schnabl (2022), Beaumont, Tang, Vansteenberghe (2022), Cornelli et al. (2024), Jagtiani and Lemieux (2016)
  - Changes in credit market more generally (e.g. rise of nonbank lending to mid-market firms): Davydiuk, Marchuk, Rosen (2024), Chernenko, Erel, Prilmeier (2022)
- Impact of shocks to bank capital on bank lending and credit supply more generally (incl. substitution across lenders): Bord, Ivashina, Taliaferro (2021), Berrospide, Gupta, Seay (2024), Cortes et al. (2020), Doerr (2021), Irani et al. (2021)
  - Impact of (bank) credit supply on firm decisions (investment, employment, etc.): Berrospide and Edge (2024)
- Lender specialization: Gopal (2021), Blickle, Palatore, Saunders (2023), Paravisini, Rappoport, Schnabl (2023)
- PPP-related (access disparity, etc.): Bartik et al. (2020), Fairlie and Fossen (2021, 2022), Chernenko and Scharfstein (2024), Howell et al. (2024)

Data Sources

- Uniform Commercial Code (UCC) filing of secured lending: Loan originations, 12 million records, 2007–2021
- County-level income and demographics: per capita income, minority share (% of nonwhite population), from decennial census (2000, 2010) and American Community Survey
- Stress test outcome by bank: public release data, 2013–2021
- National Information Center (NIC) database: charter & entity type, financial variables for mostly bank lenders
- PPP loan-level data release from SBA: July 2021 vintage

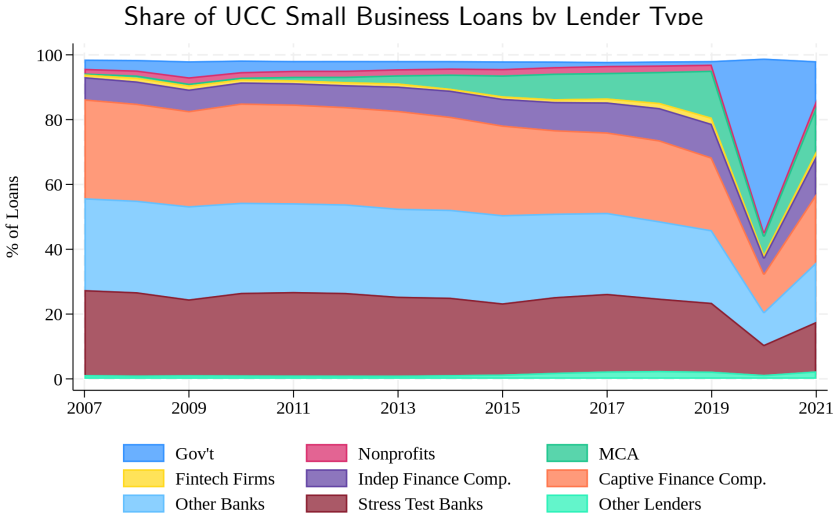
Data construction: Identify Lenders & Underserved Areas

- Identify lenders: Manual & algorithmic name matching
  - Banks: matching banks between UCC and NIC databases
  - Finance companies: independent vs. captive
  - Fintech: lenders that rely primarily on digital technology to screen applicants, underwrite loans, service loans, etc.
  - Merchant Cash Advance lenders (MCAs): advance funds in exchange for a fraction of future sales

- Define underserved areas: Counties with relatively low income or high shares of minority population.
  - Low income (relative to state average): bottom 20% of cross-county distribution; Very low income: bottom 5%
  - High minority: top 20% of cross-county distribution by share of nonwhite population; Very high minority: top 5%

▸ Low-Income Map
▸ High-Minority Map

Evolution of Lender Types over 2007–2021



Source: UCC filings 2007–2019, authors' calculations.

▸ Lender Specialization

Lending Growth in Underserved Areas: 2007–2019

	Banks			Non-Banks							
2007–2019	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	-4	-1	-2	86	-10	1187	183	60	22	-16	7
Low Income	8	-1	3	119	-8	1220	252	-4	21	27	13
Very Low Income	-4	-15	-11	108	-13	1625	243	28	17	21	4
High Minority	-4	5	0	109	-9	1514	236	72	39	32	16
Very High Minority	5	-1	2	116	-19	1907	285	108	40	15	17

Notes: % growth of UCC loans per million population. ST banks: subject to one or more stress tests as of end 2021; Captive: finance companies owned by nonfinancial firms; Indep.: Independent finance companies not owned by banks or nonfinancial firms; MCA: Merchant Cash Advance businesses; Nonprofits: credit unions, trade association sponsored lenders, and charity lenders; Gov.: Government agencies, mainly the Small Business Administration and the Farm Credit System.

▸ Annual Rate ▸ Counts ▸ Changes

Lending Growth in Underserved Areas: 2020–2021

	Banks			Non-Banks						
2020–2021	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	-23	-10	-16	26	6	-48	-12	15	6	432	10
Low Income	-16	-11	-13	50	6	-44	-4	20	15	227	16
Very Low Income	-16	-8	-11	68	4	-38	35	7	20	292	23
High Minority	-31	-12	-21	30	1	-49	-15	14	4	1228	14
Very High Minority	-40	-15	-27	29	6	-49	-21	6	4	2768	22

Notes: % growth of UCC loans per million population. ST banks: subject to one or more stress tests as of end 2021; Captive: finance companies owned by nonfinancial firms; Indep.: Independent finance companies not owned by banks or nonfinancial firms; MCA: Merchant Cash Advance businesses; Nonprofits: credit unions, trade association sponsored lenders, and charity lenders; Gov.: Government agencies, mainly the Small Business Administration and the Farm Credit System.

Bank Credit Supply Shocks & Nonbank Lending

- Was post-GFC rise of nonbanks as small business credit sources in part driven by retreat of banks?
- Were underserved areas particularly affected?

- To evaluate, must isolate bank supply shocks from demand shocks.
  - Identify exogenous shocks to bank credit supply
  - Estimate effects of these shocks on nonbanks' supply
- Use capital regulation as a source of supply shock:
  1. **Stress-Test Buffer**: *Bank-level* capital shock = maximal "drop" in capital ratios for each stress-test (ST) bank under the Severely Adverse Scenario
  2. **Loan Supply Shock**: *County-level* shock = average Stress-Test Buffer weighted by ST bank market share within each county

▸ Stress-Test Buffer

Estimate Nonbanks' Gap Filling Role via Bank Supply Shock

$$\text{Lending Growth}_{m,c,t} = \alpha + \beta \cdot \text{Loan Supply Shock}_{c,t} + \beta_1 \cdot I^j_{c,t} \times \text{Loan Supply Shock} + \gamma \cdot X_{c,t-1} + \lambda_c + \lambda_t + \varepsilon_{m,c,t},$$

- **Lending Growth**$_{m,c,t}$: loan count growth by lender type m in county c, year t over $t-1$, $t = 2008, \ldots, 2019$;
- **Loan Supply Shock**$_{c,t}$: year-$(t-1)$ market share weighted average Stress-Test Buffer in county c, year t
- $I^j_{c,t}$: high-minority ($j = 1$) or low-income ($j = 2$) county indicator;
- $X_{c,t-1}$: lagged county unemployment rate, house price growth, per capita income growth;
- λ_c, λ_t: county, year fixed effects

Nonbanks Helped Fill Credit Gaps for Small Businesses, But No Differently in High-Minority Counties

Dependent Variable: Lending Growth (Annual Rate, 2007–2019)

	Other Banks	Indep. Fin.Co.	Captive Fin.Co.	Fintech	MCA	Non-profit	Gov't
Loan Supply Shock	0.205***	0.196***	0.341***	-0.303	0.197***	-0.155	0.299***
	(0.039)	(0.060)	(0.028)	(0.190)	(0.064)	(0.177)	(0.109)
Supply Shock × High Minority	0.123	0.063	-0.085	0.219	0.011	0.451	0.162
	(0.081)	(0.092)	(0.062)	(0.193)	(0.091)	(0.317)	(0.204)
Supply Shock × Very High Minority	-0.121	0.203	-0.090	-0.532	-0.263	1.613**	-0.238
	(0.242)	(0.252)	(0.203)	(0.708)	(0.235)	(0.804)	(0.584)
Adjusted R-Squared	-0.014	-0.050	0.012	0.326	0.231	0.007	-0.115
Number of Observations	8,966	3,596	11,672	564	2,499	997	5,311

Notes: All include county, year FEs. Robust SEs in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

▸ Low-Income ▸ First-Stage

Nonbank Lending during the Pandemic: Less Gap Filling in High-Minority Counties

Dependent Variable: Lending Growth Rate during the Pandemic (Annual Rate, 2020–2021)

	Other Banks	Indep. Fin.Co.	Captive Fin.Co.	Fintech	MCA	Non-profit	Gov't
Loan Supply Shock	0.273	0.308	0.263**	1.545***	0.708***	-0.503	2.720***
	(0.170)	(0.243)	(0.129)	(0.583)	(0.200)	(0.682)	(0.226)
Supply Shock × High Minority	-0.698***	-0.568**	-0.479**	-0.006	-0.316*	-0.647	-0.114
	(0.240)	(0.249)	(0.192)	(0.383)	(0.183)	(0.634)	(0.266)
Supply Shock × Very High Minority	0.032	-0.846	-0.608	-0.313	-0.160	-0.011	-1.063
	(0.739)	(0.714)	(0.627)	(0.737)	(0.499)	(1.252)	(0.791)
Adjusted R-Squared	-0.131	0.135	-0.310	-0.109	0.535	-0.352	0.917
Number of Observations	3,092	1,228	4,166	188	842	336	1,878

Notes: All include county, year FEs. Robust SEs in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Post-GFC Rise of Nonbank Small Business Lending & The PPP

- Paycheck Protection Program (PPP) provided forgivable loans to small businesses disrupted by COVID-19.
- Funds were disbursed through private lenders.
  - Phase 1: Mostly banks
  - Phases 2 and 3: Expanded to nonbanks (CDFIs, fintechs, etc.)
- Small businesses previously reliant on nonbank credit might lack relationships with banks to receive timely PPP funds during Phase 1.
- Post-GFC increase in nonbanks' market share could disadvantage more small businesses than otherwise.

Prior Credit Relationship & Small Business Access to PPP Funds

$$T_{i,t}^{PPP} = \sum_{j} \sum_{\tau} \beta_{j,\tau} \mathbf{I}(\text{UCC}_{j,\tau}) + \gamma X_i + \alpha_{n,t} + \alpha_{c,t} + \alpha_{s,t} + \alpha_{a,t} + \varepsilon_{i,t},$$

- $T_{i,t}^{PPP}$: PPP loan date for borrower i in year t ($t = 2020, 2021$);
- $\mathbf{I}(\text{UCC}_{j,\tau})$: indicator equal to 1 if i had a UCC loan from a type-j lender over period τ before 2020, 0 otherwise.
- X_i: borrower-level controls (low-to-moderate-income [LMI] tract, urban tract, etc.)
- α_n, α_c, α_s, α_a: industry, county, firm-size, firm-age fixed effects.

Prior Relationships Important to LMI Small Businesses in PPP

	2020 Loan Date		2021 Loan Date	
ST Bank Loans: Any Year	0.351***	(0.126)	0.497	(0.307)
Other Bank Loans: Any Year	-2.291***	(0.114)	-0.727***	(0.261)
Fin. Company Loans: Any Year	0.765***	(0.162)	1.985***	(0.524)
Fintech, MCA Loans: Any Year	1.042***	(0.147)	1.654***	(0.630)
Other NBFI Loans: Any Year	-0.200	(0.202)	-0.148	(0.512)
SBA Loans: Any Year	-1.146***	(0.303)	0.280	(1.927)
All Oth. Gov. Loans: Any Year	1.678***	(0.285)	-1.934***	(0.393)
ST Bank Loans: Any Year *LMI	-1.749***	(0.239)	-0.278	(0.454)
Other Bank Loans: Any Year *LMI	-1.827***	(0.217)	0.968**	(0.394)
Fin. Company Loans: Any Year *LMI	-1.294***	(0.235)	-1.183**	(0.477)
Fintech, MCA Loans: Any Year *LMI	-0.334	(0.256)	-2.773***	(0.650)
Other NBFI Loans: Any Year *LMI	-1.093***	(0.306)	1.758	(1.271)
SBA Loans: Any Year *LMI	-1.181**	(0.510)	-0.788	(4.046)
All Oth. Gov. Loans: Any Year *LMI	-1.296***	(0.359)	2.269**	(0.900)
LMI Tract	3.285***	(0.392)	4.494***	(0.514)
Urban Tract	1.920***	(0.284)	2.789***	(0.370)
Observations (R^2_a)	4345348	(0.206)	2009302	(0.256)

Notes: All include industry, county, firm-size, age FEs, & add. controls. County-industry clustered SEs.

Recap of Findings

- Since the GFC (2007–2019), banks curtailed lending to small businesses, in part due to stress-test-induced capital constraints.
- But they did not pull back more in low-income or high-minority counties.
- MCA and fintech lenders grew from negligible to major sources of small business credit, especially in underserved counties.
- Nonbank lenders helped fill gaps left by stress-test banks.
- During the pandemic (2020–2021), banks and most nonbanks slashed lending.
- Nonetheless, nonbank lenders continued to lend more where banks retreated more.
- Prior relationships with non-stress-test banks expedited small businesses' access to PPP; relationships with nonbanks resulted in a slight delay.
- Prior relationships with *any* lenders more important to PPP applicants from underserved areas.

Discussion: Further Research, Policy Implications

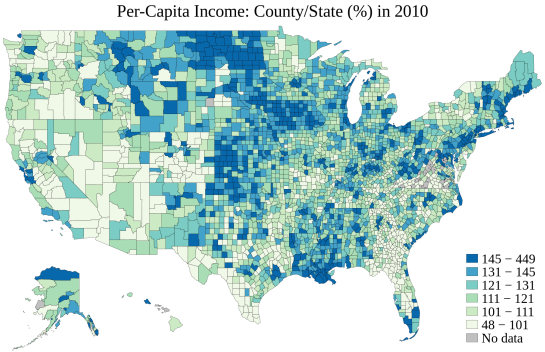
- We find nonbanks' extraordinary expansion in underserved counties largely independent of bank supply shortfalls.
- Further research to understand the driving forces (incl. differences across nonbank lenders), possibly disparate benefits/costs for local economies, particularly underserved communities and small businesses.

- At onset of pandemic, public credit support to small businesses intermediated mostly via banks, delaying access for borrowers with prior relationships with nonbanks exclusively.
- Design public credit support to small businesses to reflect actual structure of small business funding (e.g., less bank-centric) in the future? Harness latest digital/financial technology to disburse funds directly?

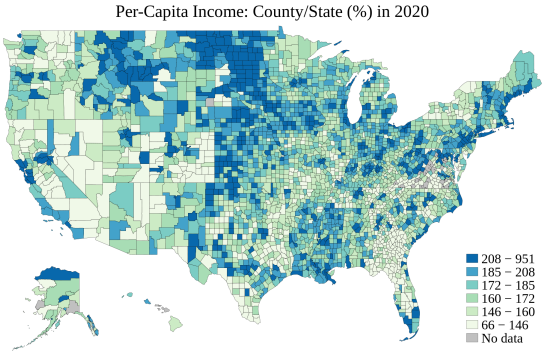
APPENDIX

Geographic Distribution of Low-Income Counties

(a) 2010



(b) 2020

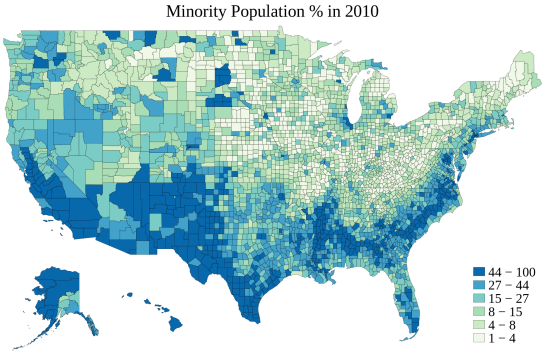


Note: County per-capita income normalized by state average, 2010 and 2020.
Source: Census Bureau/ACS, authors' calculations.

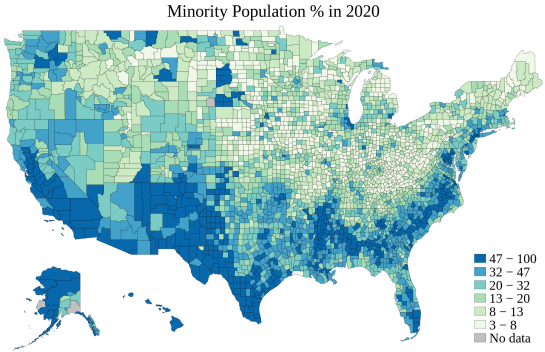
▸ Minority Shares
▸ Back

Geographic Distribution of High-Minority Counties

(a) 2010



(b) 2020

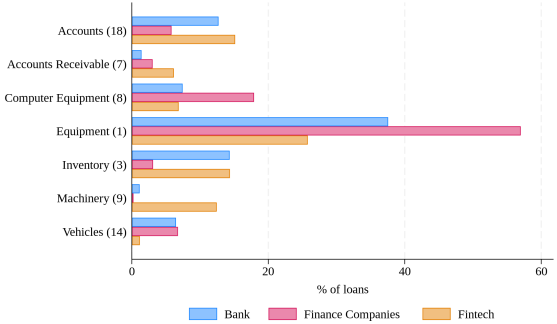


Note: County shares of minorities (nonwhite population), 2010 and 2020.
Source: Census Bureau/ACS, authors' calculations.

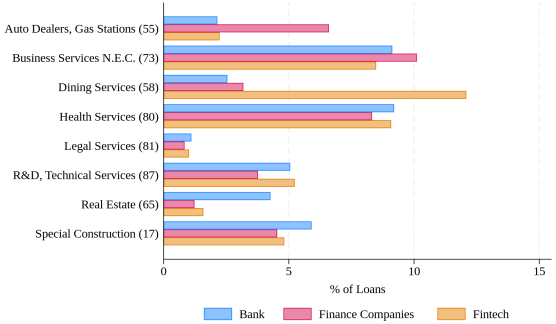
Back

Lender Specialization: Collateral, Industry

(a) Collateral Distribution



(b) Borrower Industries



Note: loan collateral & borrower industry distribution across 3 major lender types.
Source: UCC filings 2007–2019, authors' calculations.

Back

Annual Growth of UCC Loan Counts: 2007–2019, 2020–2021

	Banks			Non-Banks							
2007–2019	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	-0.3	0.0	-0.2	5	-1	24	9	4	2	-1	1
Low Income	0.6	-0.1	0.2	7	-1	24	11	0	2	2	1
Very Low Income	-0.3	-1.3	-0.9	6	-1	27	11	2	1	2	0
High Minority	-0.3	0.4	0.0	6	-1	26	11	5	3	2	1
Very High Minority	0.4	-0.1	0.1	7	-2	28	12	6	3	1	1

	Banks			Non-Banks							
2020–2021	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	-12	-5	-8	12	3	-28	-6	7	3	131	5
Low Income	-8	-6	-7	23	3	-25	-2	10	7	81	8
Very Low Income	-8	-4	-6	30	2	-21	16	4	10	98	11
High Minority	-17	-6	-11	14	1	-29	-8	7	2	264	7
Very High Minority	-23	-8	-15	14	3	-29	-11	3	2	435	10

Notes: %AR growth in loan counts per mil. pop. ST: stress-test banks; Captive, Indep.: Captive & Independent finance companies; MCA: Merchant Cash Advance; Nonprofits: trade assoc. lenders, etc.; Gov.: Government.

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Normalized UCC Loan Counts: 2007 versus 2021

2007	Banks			Non-Banks							
	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	527	588	1115	146	653	6	18	31	857	91	2064
Low Income	319	472	791	124	674	5	14	46	864	89	1743
Very Low Income	275	483	758	129	669	3	11	31	844	80	1682
High Minority	508	492	999	139	482	6	19	19	669	27	1696
Very High Minority	417	485	902	121	414	5	17	20	581	19	1502

2021	Banks			Non-Banks							
	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	388	529	917	344	620	43	44	57	1109	408	2435
Low Income	289	417	707	407	660	35	47	53	1203	370	2280
Very Low Income	223	380	603	451	606	32	53	42	1184	378	2165
High Minority	336	454	790	378	443	51	54	38	967	479	2235
Very High Minority	261	407	668	337	357	54	51	45	846	618	2132

Notes: UCC loan counts per million population. ST: stress-test banks; Captive, Indep.: Captive & Independent finance companies; MCA: Merchant Cash Advance; Nonprofits: trade assoc. lenders, etc.; Gov.: Government.

Back

Changes in UCC Loan Counts: 2007–2019, 2020–2021

2007–2019	Banks			Non-Banks							
	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	-21	-3	-25	126	-66	76	32	18	186	-14	147
Low Income	24	-4	21	147	-54	57	35	-2	184	24	228
Very Low Income	-11	-71	-82	140	-85	49	28	8	140	17	75
High Minority	-21	25	4	151	-44	93	45	14	258	9	271
Very High Minority	20	-4	16	141	-79	101	48	22	233	3	251

2020–2021	Banks			Non-Banks							
	ST	Other	All	Indep.	Captive	MCA	Fintech	Nonprofit	All	Gov.	All
All Counties	-117	-56	-173	71	32	-40	-6	8	65	332	224
Low Income	-54	-51	-104	136	40	-27	-2	9	156	257	308
Very Low Income	-41	-32	-73	182	22	-20	14	3	200	281	408
High Minority	-151	-63	-214	88	5	-48	-10	5	40	443	269
Very High Minority	-177	-74	-250	76	21	-52	-13	2	33	596	379

Notes: Changes in loan counts per million pop. ST: stress-test banks; Captive, Indep.: Captive & Independent finance companies; MCA: Merchant Cash Advance; Nonprofits: trade assoc. lenders, etc.; Gov.: Government.

Back

Nonbanks Helped Fill Credit Gaps for Small Firms, But No Differently in Low-Income Areas

Dependent Variable: Lending Growth (Annual Rate, 2007–2019)

	Other Banks	Indep. Fin.Co.	Captive Fin.Co.	Fintech	MCA	Non-profit	Gov't
Stress-Test Supply Shock	0.209***	0.213***	0.337***	-0.201	0.194***	-0.078	0.329***
	(0.038)	(0.057)	(0.029)	(0.166)	(0.061)	(0.169)	(0.106)
Supply Shock × Low Income	0.072	-0.022	-0.011	-0.571	-0.004	0.065	-0.049
	(0.070)	(0.109)	(0.049)	(0.678)	(0.126)	(0.277)	(0.212)
Supply Shock × Very Low Income	0.063	0.053	-0.134	0.186	0.161	0.999*	-0.126
	(0.157)	(0.189)	(0.092)	(0.459)	(0.189)	(0.558)	(0.393)
Adjusted R-Squared	-0.014	-0.050	0.012	0.325	0.231	0.003	-0.115
Number of Observations	8,966	3,596	11,672	564	2,499	997	5,311

Notes: All include county, year FEs. Robust SEs in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Back

First Stage: Stress-Test Banks Curtailed Lending due to ST Capital Shocks, But No Differently in Underserved Areas

$$\text{Lending Growth}_{l,c,t} = \alpha + \beta_0 \cdot \text{Stress-Test Buffer}_{l,t} + \beta_1 \cdot I^1_{c,t} \times \text{Stress-Test Buffer}_{l,t} + \\ + \beta_2 \cdot I^2_{c,t} \times \text{Stress-Test Buffer}_{l,t} + \gamma \cdot X_{c,t-1} + \lambda_l + \lambda_c + \lambda_t + \varepsilon_{l,c,t}.$$

	(1)	(2)	(3)	(4)	(5)
Stress-Test Buffer	-0.009**	-0.018***	-0.018***	-0.020***	-0.017***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)
Buffer × High Minority				0.005	
				(0.007)	
Buffer × Very High Minority				-0.013	
				(0.015)	
Buffer × Low Income					-0.015
					(0.016)
Buffer × Very Low Income					-0.000
					(0.032)
Adjusted R-Squared	0.004	0.012	0.012	0.012	0.012
Number of Observations	12,312	12,312	12,160	12,160	12,160

Notes: All include lender, county, year FEs. Robust SEs in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

▸ ST Buffer ▸ Back

Define Stress-Test Capital Shock

- Capital shocks defined as: stress-test capital buffer = Maximum decline in capital ratios under Severely Adverse Scenario
  - Stress test: Forward-looking quantitative exercise assessing adequacy of bank capitalization to absorb losses under *hypothetical* adverse economic conditions while continuing to lend & meet obligations.
    - 3 hypothetical economic scenarios: 1) baseline, 2) adverse, 3) severely adverse, typically most binding for most banks.
  - Alternative shock measure: risk-based capital buffer (T1C or CET1 ratio), directly affected by risky small business loans.
    - Multiple capital ratios tested: tier-one common (T1C), common equity tier-one (CET1), T1, total capital, etc.

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Nonbank Lending during the Pandemic: Similar or Less Gap Filling in Low-Income Areas

Dependent Variable: Lending Growth Rate during the Pandemic (Annual Rate, 2020–2021)

	Other Banks	Indep. Fin.Co.	Captive Fin.Co.	Fintech	MCA	Non-profit	Gov't
Stress-Test Supply Shock	0.175	0.156	0.169	1.517***	0.600***	-0.678	2.679***
	(0.166)	(0.235)	(0.126)	(0.566)	(0.195)	(0.659)	(0.220)
Supply Shock × Low Income	-0.466	-1.341***	0.027	-0.529	-0.148	1.182	0.346
	(0.304)	(0.461)	(0.231)	(1.020)	(0.385)	(1.359)	(0.475)
Supply Shock × Very Low Income	0.226	0.187	-0.296	1.911	-0.537	-1.260	-1.893
	(0.889)	(1.201)	(0.501)	(3.710)	(0.925)	(3.271)	(1.197)
Adjusted R-Squared	-0.136	0.137	-0.315	-0.104	0.532	-0.355	0.917
Number of Observations	3,092	1,228	4,166	188	842	336	1,878

Notes: All include county, year FEs. Robust SEs in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.