



Geographically Concentrated Banks and the Amplification of Regional Economic Shocks

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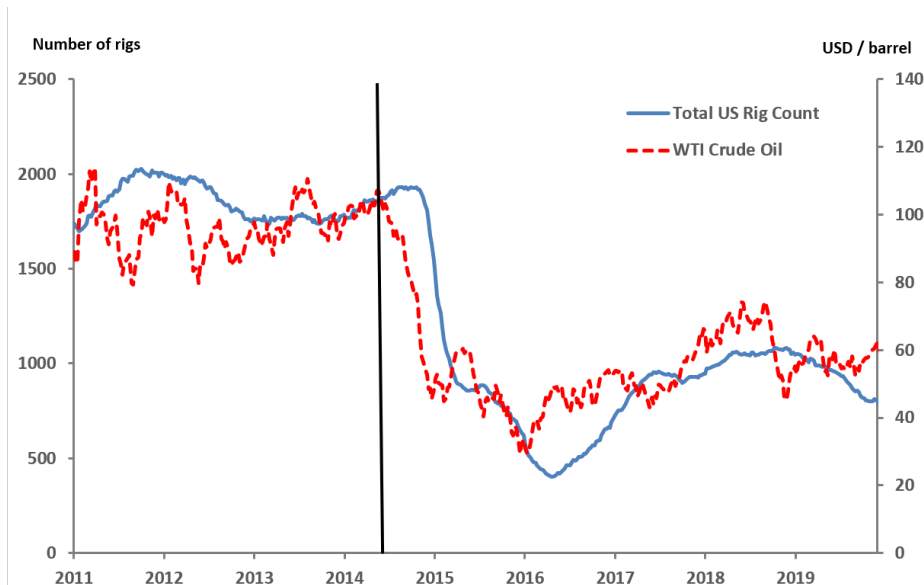
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The views expressed are our own and do not necessarily reflect official positions of the Federal Reserve System or the Federal Reserve Bank of Dallas.





Sharp Decline in Global Oil Prices (2014 - 2016)



Sources: Baker Hughes; Bloomberg

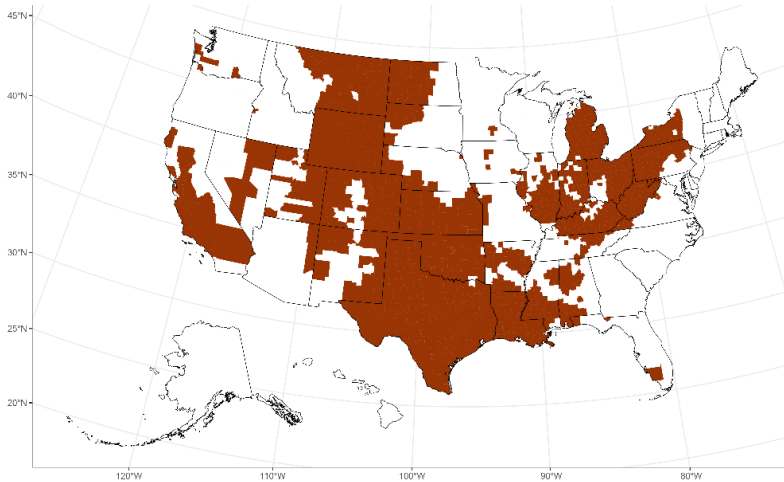
- In June 2014, global oil prices collapsed 75% in 18 months
- In the U.S., rig count fell 80% in tandem—drilling activity collapsed
- The shock hit very specific U.S. regions—creating clear treatment and control groups



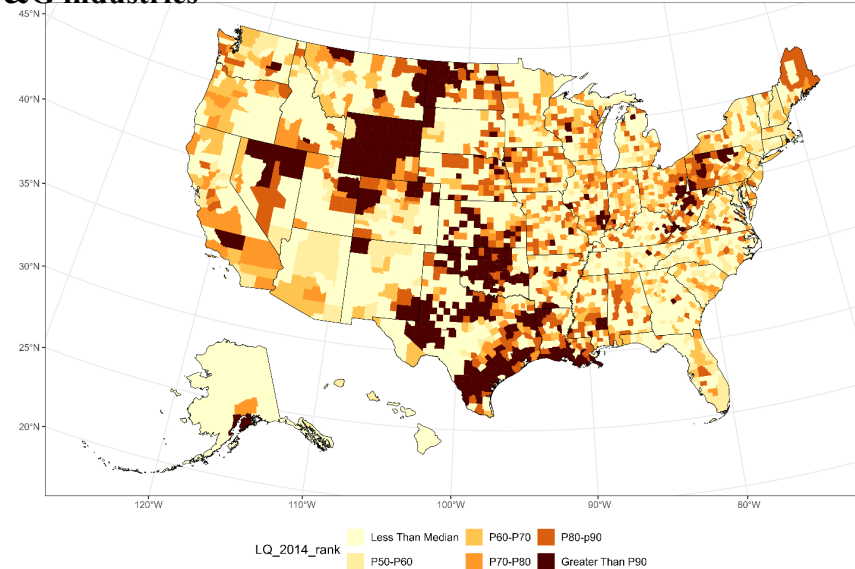


O&G Reserves Create Concentrated Regional Economies

Counties with O&G Reserves



Counties with the largest employment share in the upstream O&G industries



Sources: U.S. Energy Information Administration (U.S. EIA)

Sources: U.S. Bureau of Labor Statistics

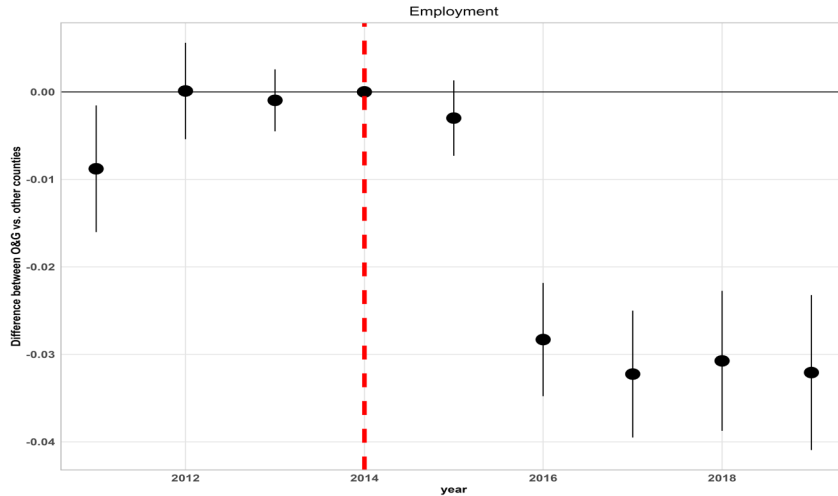




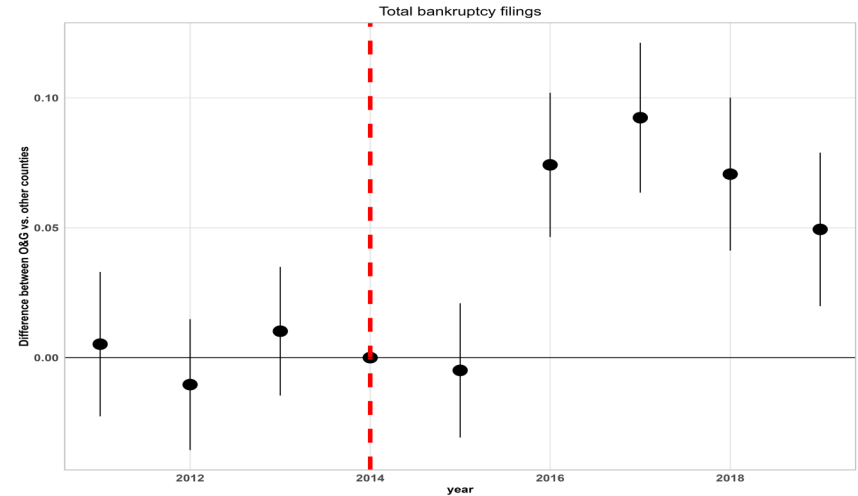
Impact Was Immediate and Persistent

Estimated gap between O&G Counties vs. Non-O&G Counties (2011-2019)

Employment (log)



Total Bankruptcy Filings (log)

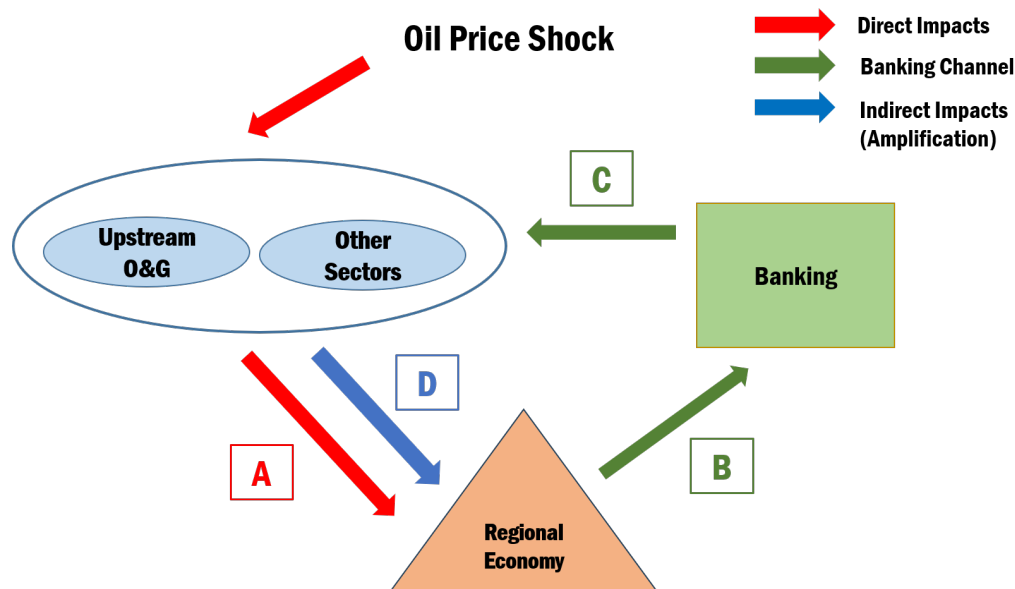


Sources: Authors' calculations





Banking Creates a Destabilizing Feedback Loop



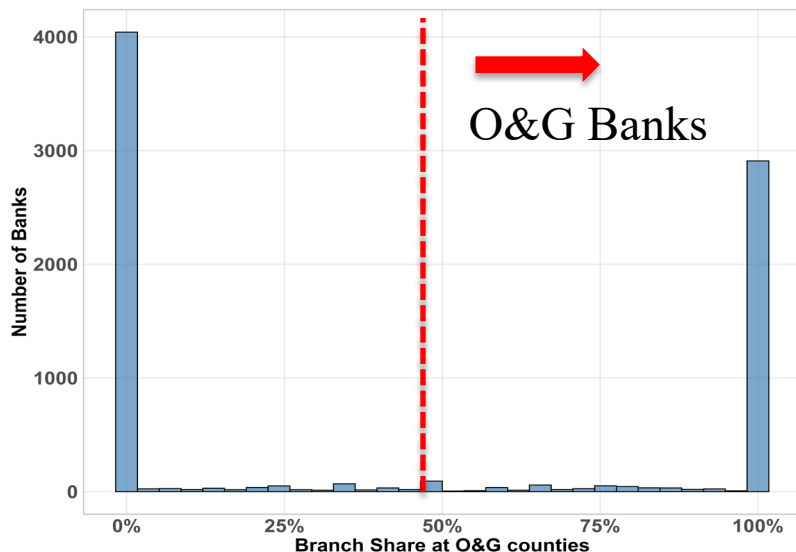
- **A: Impact on regional economy**
 - Lower employment and higher bankruptcies
- **B: Impact on banks**
 - Deteriorated asset quality
- **C: Feedback by banks on regional economy**
 - Lower loan supply
- **D: Amplification on regional economic damages**
 - Deeper, more persistent downturn



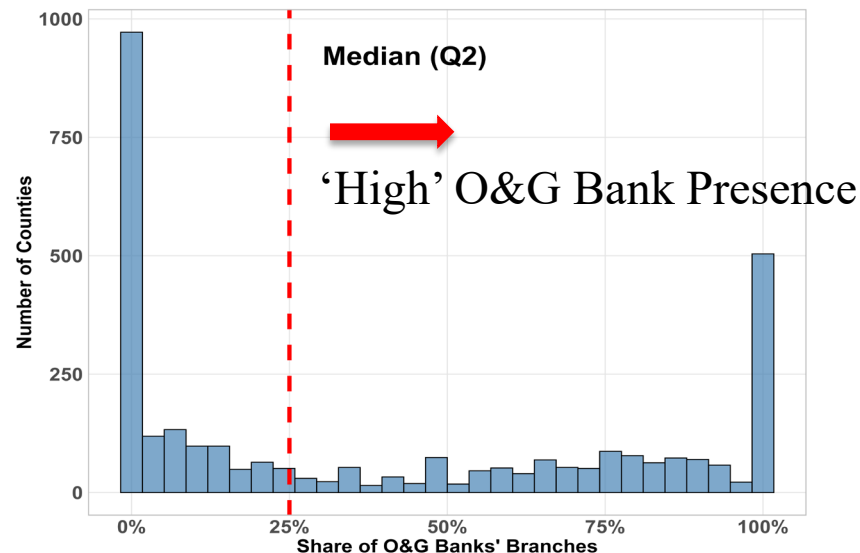


Bifurcated Exposures Enable Identification

Banks' exposures to O&G Counties



Counties' exposures to O&G Banks



Sources: FDIC Summary of Deposits; U.S. EIA





C. O&G Banks Concentrate Cuts in Distressed Regions

Table 7 ('Overall Effect')

Table 9 ('Concentrated Effect')

Geography	All Counties		O&G Counties	
	Loan counts	Loan Amounts	Loan counts	Loan Amounts
All loans	-20.2%	-12.3%	-18.5%	-27.3%
<\$100K	-22.0%	-19.2%	-16.5%	-23.3%
\$100K-\$250K	-2.5%	-1.7%	-17.4%	-17.6%
>\$250K	3.7%	4.4%	-10.6%	-9.5%

- O&G banks reduced small business credit supply by 20%
- Credit cuts concentrated among smallest borrowers: -22% for loans <\$100K
- Credit cuts concentrated geographically in O&G counties: -18.5% relative to non-O&G counties





D. Banking Structure Amplified Distress

	Table 3	Table 10
Geography	O&G Counties	High O&G Bank Presence
Establishments	-0.4%	-2.6%
Employment	-2.3%	-3.2%
Wages	-3.9%	-1.2%
Bankruptcy Filings	5.7%	12.8%

- **Same** oil shock + **different** banking structure = **different** outcomes
 - High O&G bank presence: -3.2% employment
 - Low O&G bank presence: +0.9% employment
- 96% of O&G counties dominated by concentrated banks
 - **Amplification** = **typical** experience, not exception





Contribution

Broader Literature:

- Regional shocks and banking (*Ashcraft 2005; Peek and Rosengren 2000; Cortes and Strahan 2012*)
 - We trace the complete feedback loop; regional shock → bank distress → credit supply cuts → amplified regional outcomes

Oil price shocks and banking (closer to our work):

- *Gilje et al. (2016)*: Shale boom increased credit access
 - We examine the bust, showing banking industry's fundamentally different role
- *Wang (2021)*: Oil shock caused deposit outflows at local banks
 - We find credit supply reduction—not deposit—was primary transmission channel
- *Bidder et al. (2021), Marsh et al. (2024)*: Lending reductions affected real activity
 - We add (1) within-region variation in banking structure, (2) geographic concentration of credit cuts (DDD), (3) full-quantification—1.44M jobs, persistent effects





Policy Implications:

“Preserving Credit Supply Prevents Temporary Shocks Becoming Permanent Damage”

1. MONITOR geographic concentration risk
 - Track banks’ exposures x regional economic correlations
 - Not just sectoral risk (CRE, energy)—geographic correlation matters
 - Incorporate regional scenarios into supervisory stress testing
2. MANAGE capital to preserve credit supply during downturns
 - Counter-cyclical capital buffers calibrated to regional, not just national, cycles
 - Build capital in regional boom periods, release when shocks hit
 - Support community banks’ capacity to maintain lending through downturns
3. CONSIDER banking structure in regional stability policy
 - Banking structure = first-order determinant of regional resilience
 - Regions with diversified banks showed resilience
 - Absence of diversification creates amplification vulnerability





Appendix





O&G vs. Non-O&G Counties, 2011-2019

	2011-2014		2015-2019		Change
	O&G	Non-O&G	O&G	Non-O&G	
Panel A: Economic Outcomes					
Number of establishments	2,415	2,874	2,609	3,042	26
Total employment	31,815	37,396	34,531	41,017	(906)
Average wages	36,819	34,932	40,561	39,228	(555)
Annual bankruptcy filings per million population	2,741	3,130	2,099	2,301	187
Business bankruptcy filings per 1,000 establishments	3.575	4.055	2.885	2.614	0.751
Non-Business bankruptcy filings per million population	2,661	3,036	2,032	2,239	168
Panel B: Industry Composition					
Employment Share (%)- Upstream O&G	7.372	1.092	6.025	1.138	(1.392)
Employment Share (%) - Manufacturing	4.108	4.007	4.025	3.779	0.146
Panel C: Demographics					
Population	92,734	104,167	95,788	107,788	(567)
Housing units per capita	0.473	0.486	0.480	0.492	0.001
Panel D: Banking Presence					
Number of branches per thousand population	0.485	0.473	0.464	0.446	0.007
Deposits per capita	18,630	20,439	20,700	23,616	(1,108)
Small Business Loan amounts per capita	436	490	484	538	(1.803)

Sources: U.S. Energy Information Administration (U.S. EIA); BLS QCEW (employment, wages, establishments); U.S. Courts (bankruptcies); Census ACS (demographics); FDIC Summary of Deposits (branches, deposits); FFIEC CRA disclosures (small business loans).





O&G vs. Non-O&G Banks, 2011-2019

	<u>2011-2014</u>		<u>2015-2019</u>		Change
	O&G	Non-O&G	O&G	Non-O&G	
Panel A: Size and Structures					
Total assets (\$000s)	337,977	399,122	491,874	582,910	(29,891)
Number of branches	9.215	17.216	10.622	19.489	(0.866)
Number of counties with branches	8.838	16.627	10.202	18.911	(0.921)
Geographic concentration:					
Branch share in O&G counties (%)	95.3	2.8	94.4	3.7	(1.8)
Deposit share in O&G counties (%)	96.1	2.4	95.4	3.1	(1.4)
Panel B: Profitability					
Return on assets (%)	0.849	0.684	1.012	0.960	(0.113)
Return on equity (%)	7.872	6.109	9.116	8.533	(1.181)
Net interest margin (%)	3.751	3.686	3.752	3.667	0.019
Yield on earning assets (%)	4.399	4.423	4.279	4.255	0.048
Cost of funding earning assets (%)	0.646	0.735	0.522	0.582	0.030
Panel C: Asset Quality					
Net charge-offs / total loans (%)	0.344	0.475	0.136	0.121	0.146
Noncurrent loans / total loans (%)	1.626	2.141	0.948	0.942	0.522
Loss allowance / loans (%)	1.627	1.704	1.318	1.295	0.101

Sources: FFIEC Call Reports (Panels A-E), FDIC Summary of Deposits (geographic concentration), FFIEC CRA disclosures (Panel F)





O&G vs. Non-O&G Banks, 2011-2019 - continued

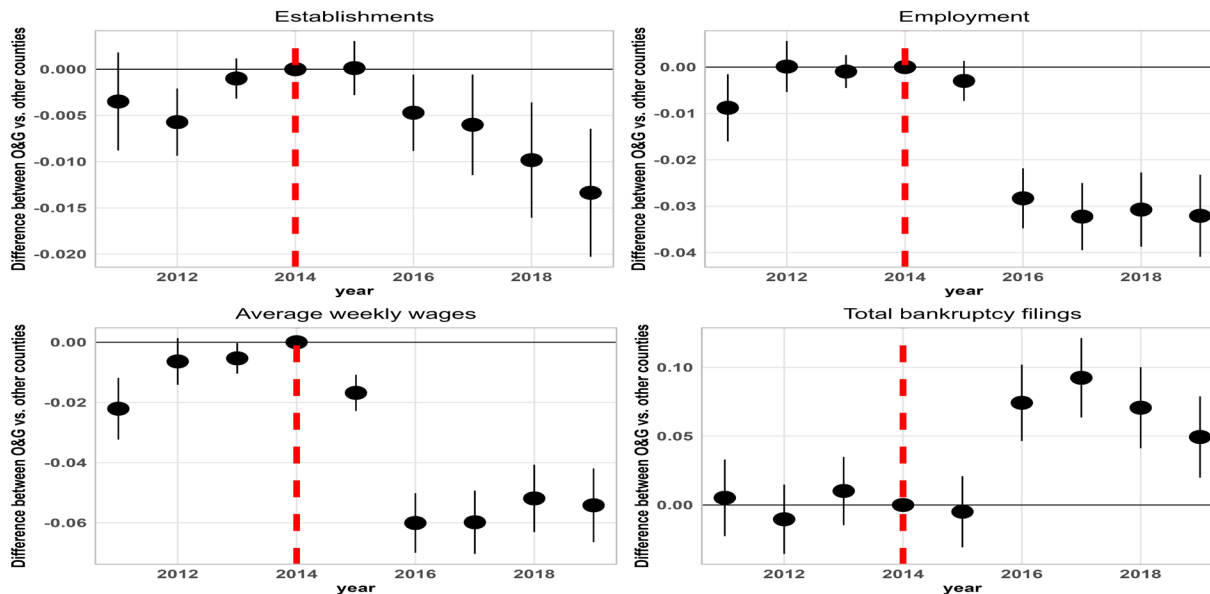
	<u>2011-2014</u>		<u>2015-2019</u>		Change
	O&G	Non-O&G	O&G	Non-O&G	
Panel D: Balance Sheet Composition					
Loans to total assets ratio	57.752	61.741	62.530	66.134	0.385
Deposits to total assets ratio	84.717	83.664	84.170	83.218	(0.102)
Panel E: Capital Adequacy					
Tier 1 risk-based capital ratio (%)	17.663	16.826	17.756	17.052	(0.133)
Total risk-based capital ratio (%)	18.791	17.983	18.930	18.251	(0.129)
Leverage ratio (Tier 1 / avg. assets) (%)	10.567	10.627	11.283	11.356	(0.013)
Equity/ total assets (%)	11.032	11.047	11.536	11.616	(0.065)
Panel F: Small Business Lending					
Total loan amounts (\$000s)	187,707	307,291	226,938	426,412	(79,891)
Number of loans originated	1,493	9,314	1,778	14,404	(4,804)
Average loan size (\$000s)	178.577	202.139	187.961	215.093	(3.569)
Share of loans below \$100K(%)	17.506	16.364	16.367	15.985	(0.760)

Sources: FFIEC Call Reports (Panels A-E), FDIC Summary of Deposits (geographic concentration), FFIEC CRA disclosures (Panel F)



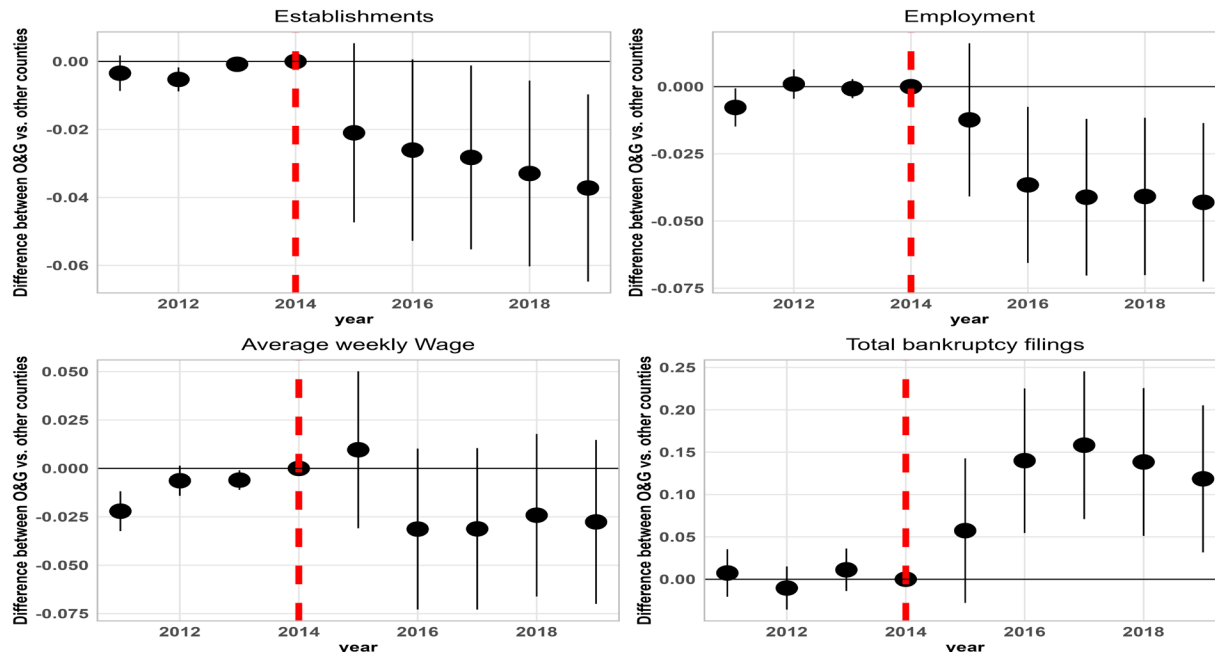


Parallel Trends – O&G vs. Non-O&G Counties



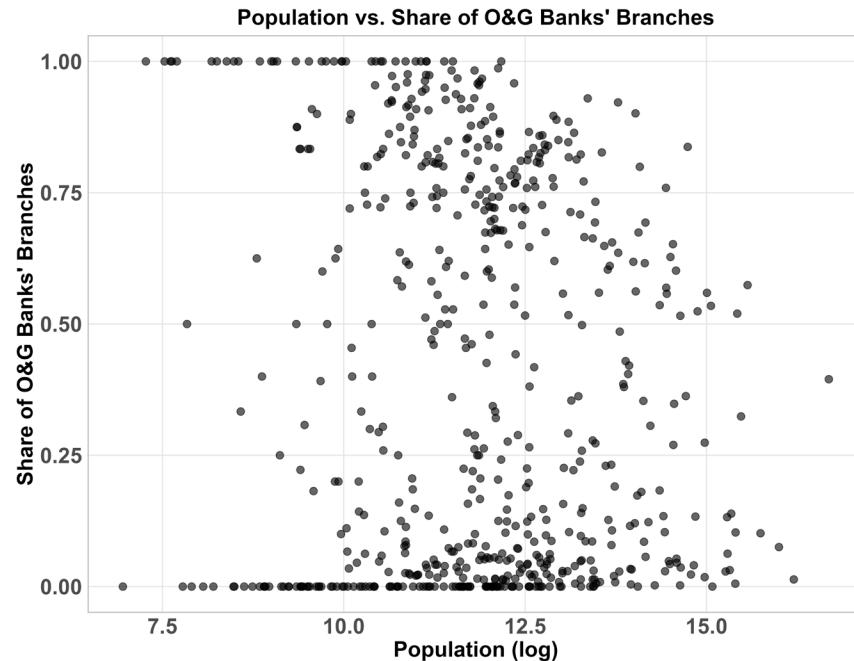
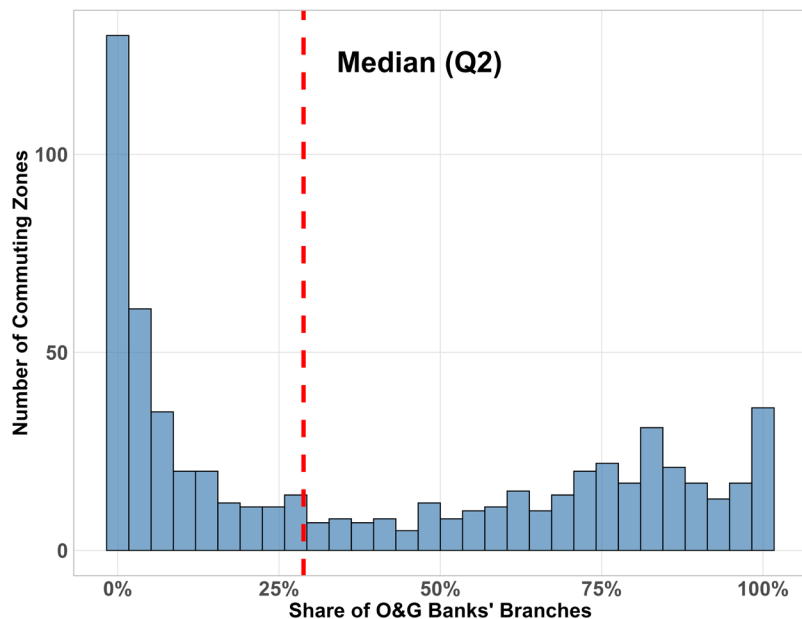


Dynamic Effects – High vs. Low O&G Bank Presence





Distribution of O&G Bank Presence (CZ-level)





Empirical Set-up

- Sample period: 2011-2019, annual
 - County: employment, wages, total bankruptcy filings
 - Bank: variables capturing bank performance and activities
 - Also deposits and small business loan amounts at the county level
- Empirical specification:
 - Difference-in-differences ('DD')
 - Difference-in-difference-in-differences ('DDD')
- Fixed effects: county (α_c), bank (α_b), year (γ_t)
 - Bank-year ($\gamma_{b,t}$): Control for deposit demand at the bank level
 - County-year ($\gamma_{c,t}$): Control for loan demand at the county level
- Notation: c (county), b (bank), t (year)





Empirical Specification – Regional Analysis

$Y_{c,t} = \beta_1(Post_t \times O\&G\ County_c) + \beta_2(Post_t \times Z_c) + \alpha_c + \gamma_t + \varepsilon_{c,t}$, where

- $Y_{c,t}$ represents the outcome of interest such as log establishments, log employment, log average weekly wages, and log total bankruptcy filings
- $O\&G\ County_c = 1$ if county c has O&G reserves and 0 otherwise
- $Post_t = 1$ for years 2015–2019 ('post-shock) and 0 otherwise
- Z_c is a set of county characteristics as of 2010
- α_c and γ_t are county- and time-fixed effects

$$\beta_1 = \overbrace{(E[Y_{c,t}|O\&G, Post] - E[Y_{c,t}|O\&G, Pre])}^{\text{first difference - O\&G counties}} - \overbrace{(E[Y_{c,t}|NonO\&G, Post] - E[Y_{c,t}|NonO\&G, Pre])}^{\text{first difference - NonO\&G counties}}$$





Empirical Specification - Event Study

$Y_{c,t} = \sum_{\tau \neq 2014} \theta_{\tau} \times (O\&G\ County_c \times 1[t = \tau]) + \beta_2(Post_t \times Z_c) + \alpha_c + \gamma_t + \varepsilon_{c,t}$, where

- $Y_{c,t}$ represents the outcome of interest such as log establishments, log employment, log average weekly wages, and log total bankruptcy filings
- $O\&G\ County_c = 1$ if county c has O&G reserves and 0 otherwise
- $1[t = \tau] = 1$ if the observation is from year τ and 0 otherwise
- Z_c is a set of county characteristics as of 2010
- α_c and γ_t are county- and time-fixed effects
- Used to test a key identification assumption underlying DD estimation – O&G and non-O&G counties would have followed parallel trends in the absence of the oil price shock





Empirical Specification – Banking Analysis

$Y_{b,t} = \beta_1(Post_t \times O\&G\ Bank_b) + \beta_2(Post_t \times Z_b) + \delta X_{b,t-1} + \alpha_b + \gamma_t + \varepsilon_{b,t}$, where

- $Y_{b,t}$ represents the outcome of interest from bank balance sheet and income statements
- $O\&G\ Bank_b = 1$ if bank b has more than 50% branches at O&G counties and 0 otherwise
- $Post_t = 1$ for years 2015–2019 ('post-shock') and 0 otherwise
- Z_b is a set of bank characteristics as of 2010
- $X_{b,t-1}$ is a time-varying bank characteristics (lagged)
- α_c and γ_t are county- and time-fixed effects





Empirical Specification – Deposit Stability

$\text{Log}(\text{Deposits}_{b,c,t}) = \beta_1(\text{Post}_t \times \text{O\&G County}_c) + \beta_2(\text{Post}_t \times Z_c) + \alpha_c + \gamma_{b,t} + \varepsilon_{b,c,t}$, where

- $\text{Deposits}_{b,c,t}$ represents bank b's deposits at county c in year t
- $\text{O\&G County}_c = 1$ if county c has O&G reserves and 0 otherwise
- $\text{Post}_t = 1$ for years 2015–2019 ('post-shock') and 0 otherwise
- Z_c is a set of county characteristics as of 2010
- α_c is county- fixed effects
- $\gamma_{b,t}$ is a bank-year fixed effects that absorb all factors affecting *a bank's overall deposit demand* in a given year
 - Identification comes from within-bank variation across counties!





Empirical Specification – Loan Supply

$\text{Log}(\text{Lending}_{b,c,t}) = \beta_1(\text{Post}_t \times \text{O\&G Bank}_b) + \delta X_{b,t-1} + \alpha_b + \gamma_{c,t} + \varepsilon_{b,c,t}$, where

- $\text{Lending}_{b,c,t}$ represents bank b's small business loan amounts (\$1M) at county c in year t
- $\text{O\&G Bank}_b = 1$ if bank b has more than 50% branches at O&G counties and 0 otherwise
- $\text{Post}_t = 1$ for years 2015–2019 ('post-shock) and 0 otherwise
- $X_{b,t-1}$ is a time-varying bank characteristics (lagged)
- α_b is bank-fixed effects
- $\gamma_{c,t}$ is a county-year fixed effects that absorb all factors affecting *a county's overall small business loan demand* in a given year
 - Identification comes from within-county variation across banks!





Empirical Specification – Loan Supply

$$\text{Log}(\text{Lending}_{b,c,t}) = \beta_1(\text{Post}_t \times \text{O\&G Bank}_b \times \text{O\&G County}_c) + \beta_2(\text{Post}_t \times \text{O\&G Bank}_b) + \beta_3(\text{O\&G Bank}_b \times \text{O\&G County}_c) + \alpha_b + \gamma_{c,t} + \varepsilon_{b,c,t}, \text{ where}$$

- $\text{Lending}_{b,c,t}$ represents bank b's small business loan amounts (\$1M) at county c in year t
- $\text{O\&G Bank}_b = 1$ if bank b has more than 50% branches at O&G counties and 0 otherwise
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- $\text{Post}_t = 1$ for years 2015–2019 ('post-shock) and 0 otherwise
- $X_{b,t-1}$ is a time-varying bank characteristics (lagged)
- α_b is bank-fixed effects
- $\gamma_{c,t}$ is a county-year fixed effects that absorb all factors affecting *a county's overall small business loan demand* in a given year
 - Identification comes from within-county variation across banks!





Empirical Specification – Amplification

$$Y_{c,t} = \beta_1(Post_t \times High\ O\&G\ Bank\ Presence_c \times O\&G\ County_c) + \beta_2(Post_t \times High\ O\&G\ Bank\ Presence_c) + \beta_3(Post_t \times O\&G\ County_c) + \beta_4(Post_t \times Z_c) + \alpha_c + \gamma_t + \varepsilon_{c,t}, \text{ where}$$

- $Y_{c,t}$ represents the outcome of interest such as log establishments, log employment, log average weekly wages, and log total bankruptcy filings
- $High\ O\&G\ Bank\ Presence_c$ is an indicator variable equal to one if a county's O&G bank branch share exceeds the median (25%)
- $O\&G\ County_c = 1$ if county c has O&G reserves and 0 otherwise
- $Post_t = 1$ for years 2015–2019 ('post-shock) and 0 otherwise
- Z_c is a set of county characteristics as of 2010
- α_c and γ_t are county- and time-fixed effects





B. Deteriorated Asset Quality

Net Interest Margin (%)	Yield on Earning Assets (%)	Cost of Funding Earning Assets (%)	Return on Assets (%)
1.24 pp	3.45 pp	2.17 pp	-7.17 pp
Noncurrent Loans Ratio (%)	Net Charge-offs Ratio (%)	Loss Allowance Ratio (%)	Equity Capital Ratio (%)
33.75 pp	8.5 pp	2.88 pp	0.82 pp

- Funding costs increased, but with higher yields on earning assets
- Deteriorated asset quality resulted in lower profitability for impacted banks





Stable Deposit Flows Despite the Oil Price Shock

Table 6

	Log Deposits	Log Deposits	Log Deposits
Post $\times$ O&G County	-0.0152 (0.0178)	-0.0176 (0.017)	-0.0184 (0.0177)
County characteristics	No	Yes	Yes
Bank $\times$ Year fixed effects	Yes	Yes	Yes
County fixed effects	Yes	Yes	No
Commuting Zone fixed effects	No	No	Yes
Observations	239,611	239,611	239,611
R-squared	0.591	0.591	0.502

- County deposits reduced by 1.76%, but not statistically significant after controlling for deposit demand
- Statistically insignificant under a less strict specification – bank and year fixed effects separately





Credit Supply Reduction by Bank Capital Position

	Below Median Capital Ratio	Above Median Capital Ratio	Difference (p- value)
Panel A: By Risk-Based Tier 1 Capital Ratio			
Post x O&GBank:	-0.2107** (0.0828)	-0.0173 (0.1025)	-0.1934* (0.08)
N	547,408	252,246	
Pre-shock mean (%)	11.90%	18.30%	
N banks	421	344	
Panel B: By Leverage Ratio			
Post x O&GBank:	-0.1937** (0.091)	-0.1370* (0.0801)	-0.0567 (0.48)
N	444,527	355,304	
Pre-shock mean (%)	8.82%	12.00%	
N banks	406	359	

