



# Branching Networks and Geographic Contagion of Commodity Price Shocks

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The views expressed in this paper are solely those of the author and should not be interpreted as reflecting the views of the Board of Governors or the staff of the Federal Reserve System.





## Introduction

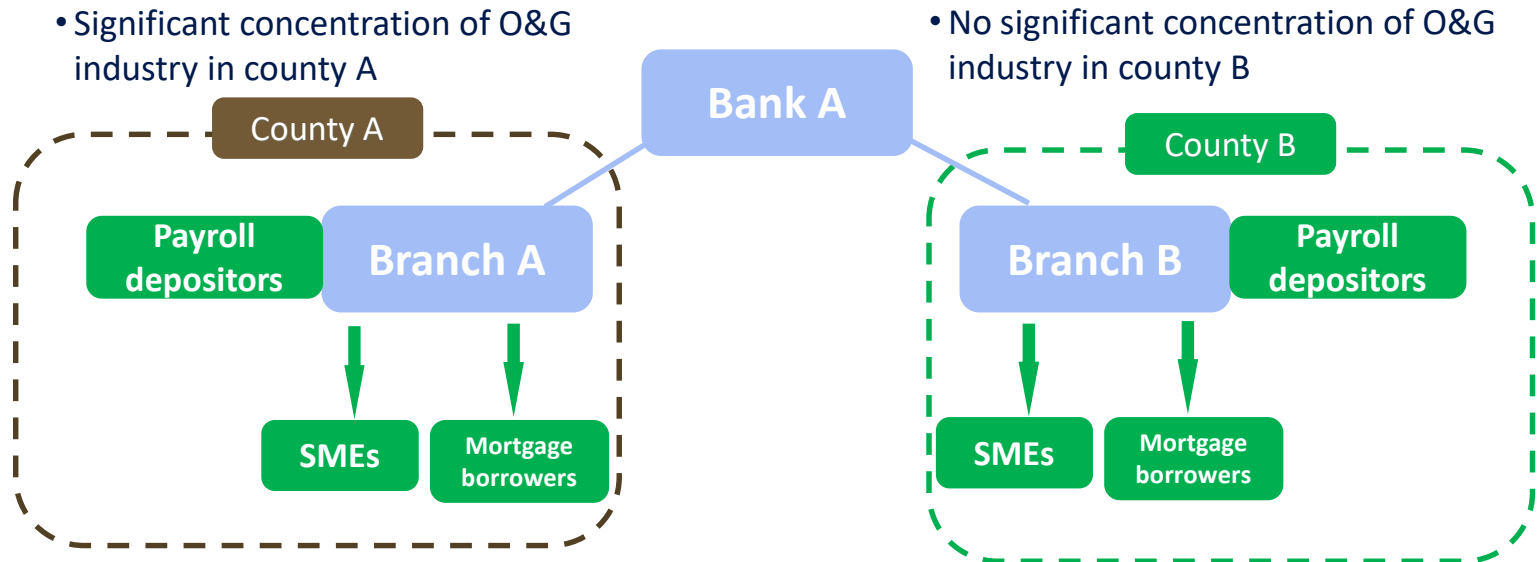
- Small local banks play an important role in supplying credit to local communities
- At the same time, they are vulnerable to negative local economic shocks
- These banks were badly hit during the Great Recession
  - A decade later, are the local banks better prepared now to deal with economic shocks?
- The Great Recession also alarmingly revealed a potential issue related to the ubiquity of the financial system
  - Do these banks transmit the regional shock to areas that were not affected by the shock?





## In a nutshell

- The paper looks at the role of the bank branch network in propagating commodity price shocks across regions in the post-crisis era*
- Focus: local banks
- Setting: the oil price collapse of 2014-16



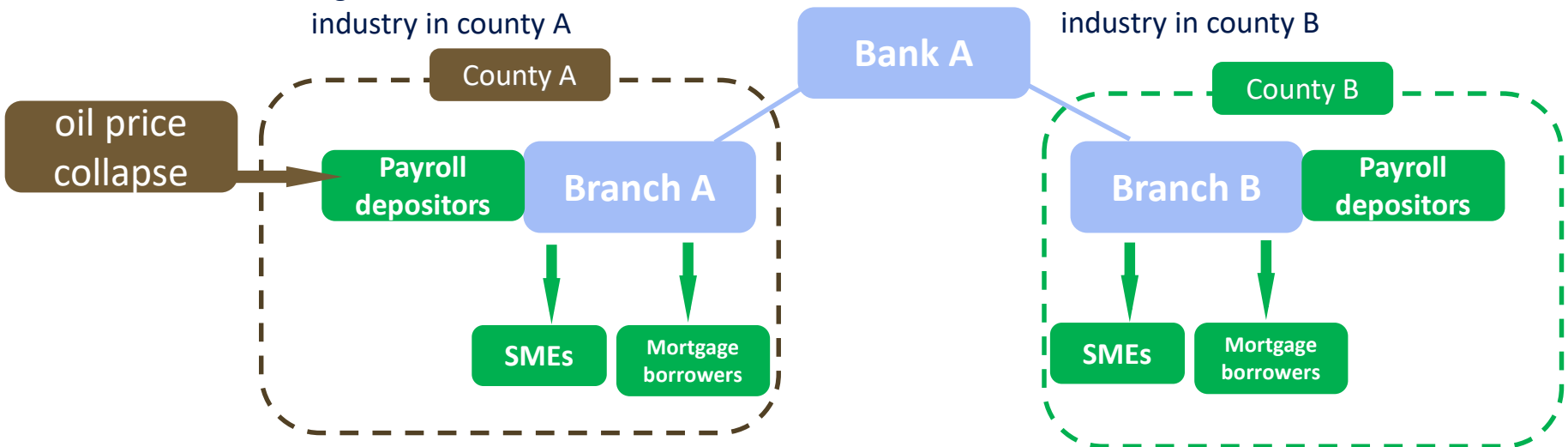


## In a nutshell

- The paper looks at the role of the bank branch network in propagating commodity price shocks across regions in the post-crisis era*
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- Significant concentration of O&G industry in county A

- No significant concentration of O&G industry in county B

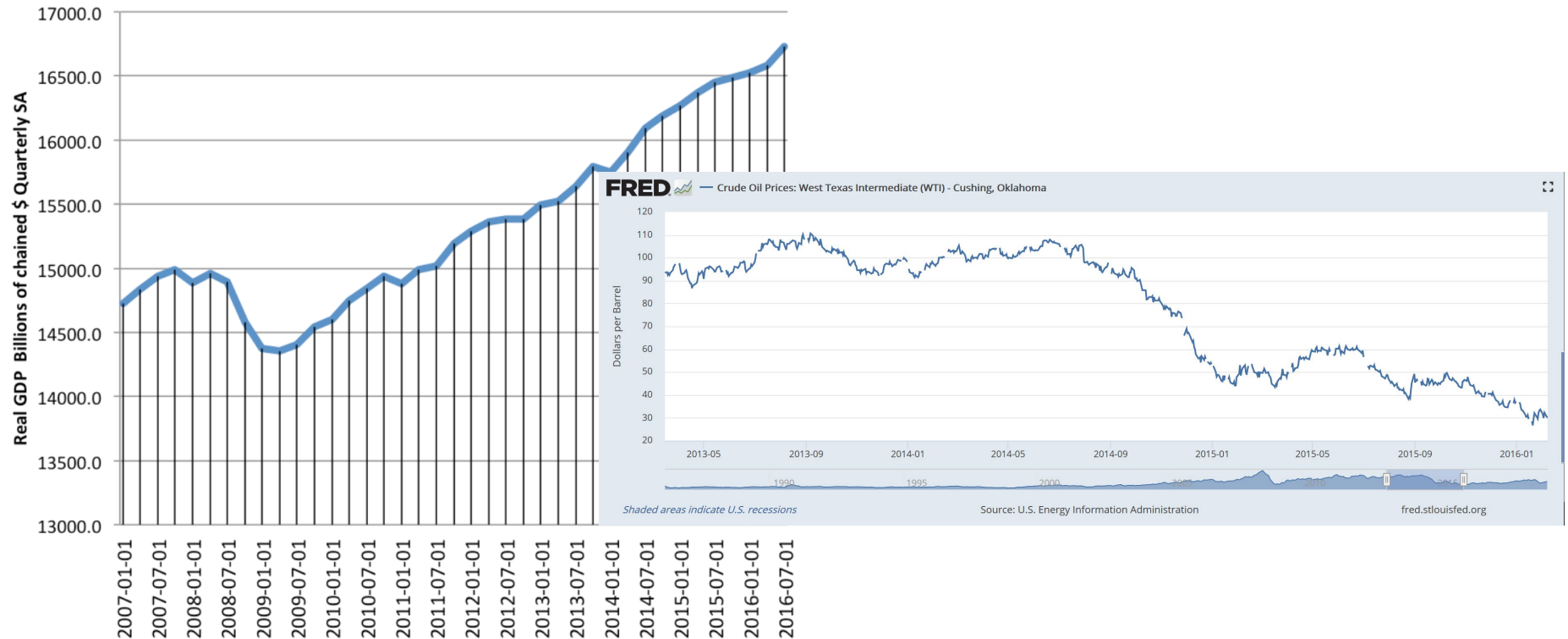




## The setting

*the oil price collapse in 2014 to 2016*

### Real GDP - US



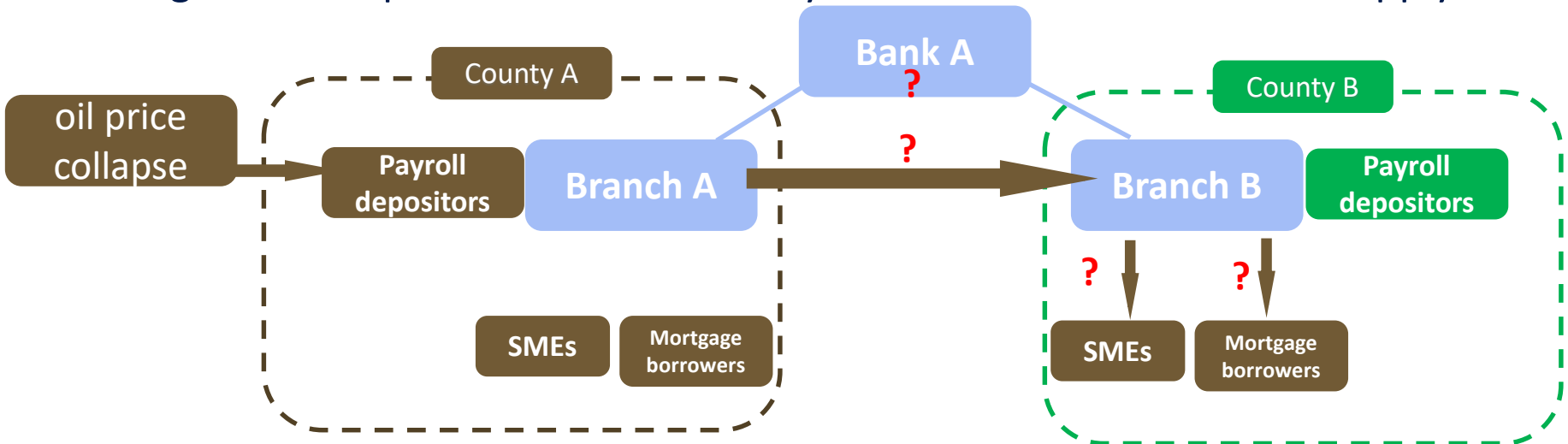


## In a nutshell

Q1: Does the collapse of oil prices cause stress to local Bank A?

Q2: What does bank A do to satisfy the liquidity demand from depositors' withdrawals and borrowers?

Q3: Does Bank A transmit the negative shocks to counties without significant exposure to O&G industry and thus reduce the credit supply?





## Findings

- Banks that were exposed to the oil shock through their operations in O&G-concentrated counties experienced a liquidity drainage
  - A declining amount of demand deposit inflow
  - An increasing percentage of troubled loans
- These banks sold a significant amount of assets to replenish liquidity shortfalls
  - Decrease in holdings is most significant for securities that are the most liquid
- These banks substantially contracted their lending in counties that did not experience the negative shocks from oil price decline
  - Smaller banks with less-liquid assets cut lending the most compared to larger banks with more-liquid assets







## Data

- To conduct the analyses, I use data from a number of different sources
- The analyses cover the period from January 2010 to December 2016
  - FFIEC Reports of Income and Condition
  - FFIEC data on small-business loan and mortgage loan originations
  - FDIC Summary of Deposits provides data on banks' branch locations
  - Census CBP provides detailed information on county-level payroll data for each industry
  - I control for various local economic and political conditions such as:
    - *Per capita income, size of local firms, local economic growth perspectives, unemployment rate, population using a combination of sources including: Census, BEA, BLS, FFIEC, House of Representatives, etc.*







## Identify banks' exposure to oil price collapse (i)

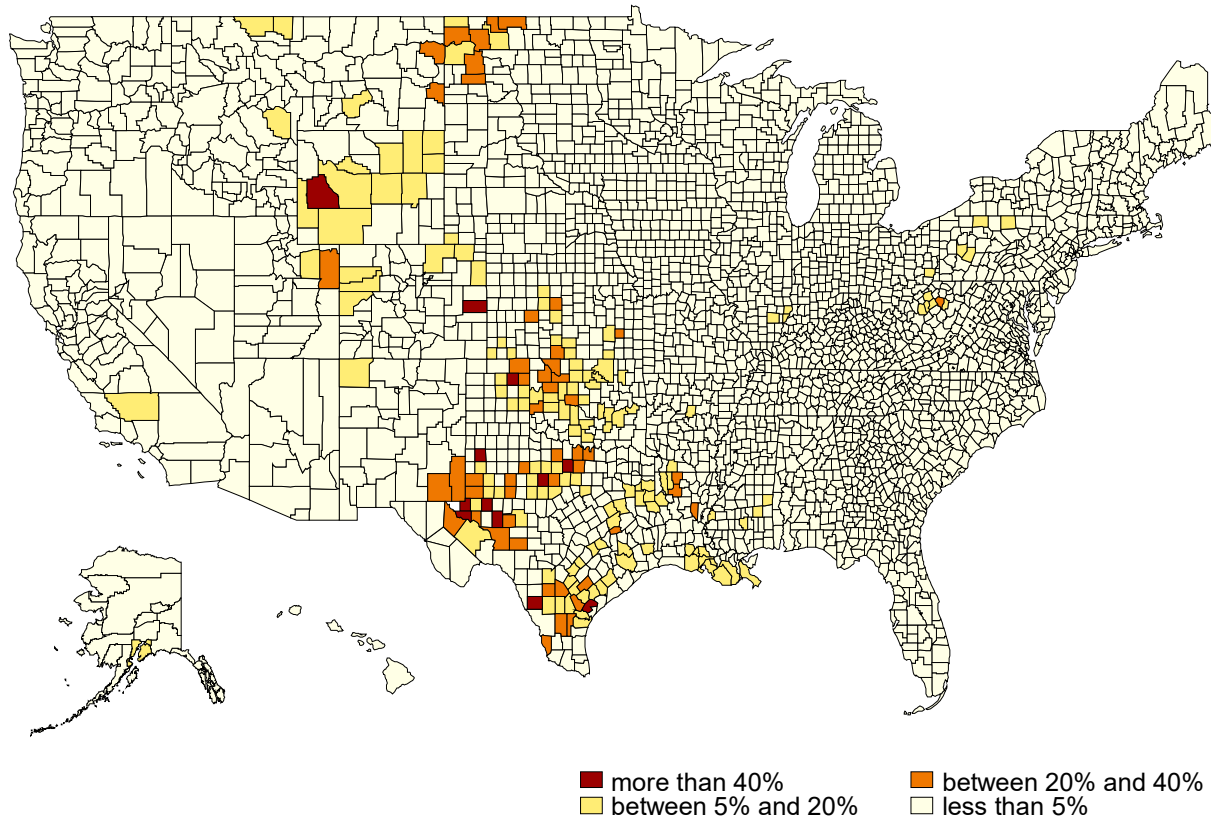
- Identify regions negatively affected by the collapse in oil price
  - A sharp decline in oil prices reduces revenue and profitability for:
    - Firms that are involved in O&G extraction activities
    - Firms that supply equipment to oil producers
  - Forcing firms to cut production and slash employment, reflected in *a decline in the payroll*
- Identify effect on banks' liquidity to oil price collapse by looking at their deposit-taking branch location
  - Payroll is a primary source of deposits into banks' local branches
  - A sharp decline in the oil price negatively affects the payroll deposits into bank branches in counties with higher concentration of oil and gas industry





## Identify banks' exposure to oil price collapse (ii)

Figure 1 Counties with significant exposure to the oil and gas industry  
% payroll from oil and gas industries 2014





## Empirical results (i): Banks' exposure to oil price collapse

- Oil price collapse caused significant stress to banks operating in the regions with a high concentration of its workforce in the O&G industry
  - local banks document a higher rate of loan defaults and lower deposit inflow into their branches

	(1)	(2)	(3)	(4)
Dependent Variable:	Demand deposit	Interest expense on deposit	Loan loss provision	Bank loan charge-offs
<i>Exposed banks</i> × Post oil price collapse	-0.581*** (0.172)	0.047*** (0.004)	0.089*** (0.011)	0.059*** (0.013)

*Various local economic factors and trends have been controlled for*





## Empirical results (i): Banks' exposure to oil price collapse

- Oil price collapse caused significant stress to banks operating in the regions with a high concentration of its workforce in the O&G industry
  - Facing severe liquidity pressure, banks tend to sell their most-liquid securities to satisfy the demand from depositors' withdrawals and lending

	(1)	(2)	(3)
Dependent Variable:	Cash	Treasury bonds	MBS
<i>Exposed banks</i> × Post oil price collapse	-0.664*** (0.227)	-0.337** (0.181)	-0.236 (0.238)

*Various local economic factors and trends have been controlled for*

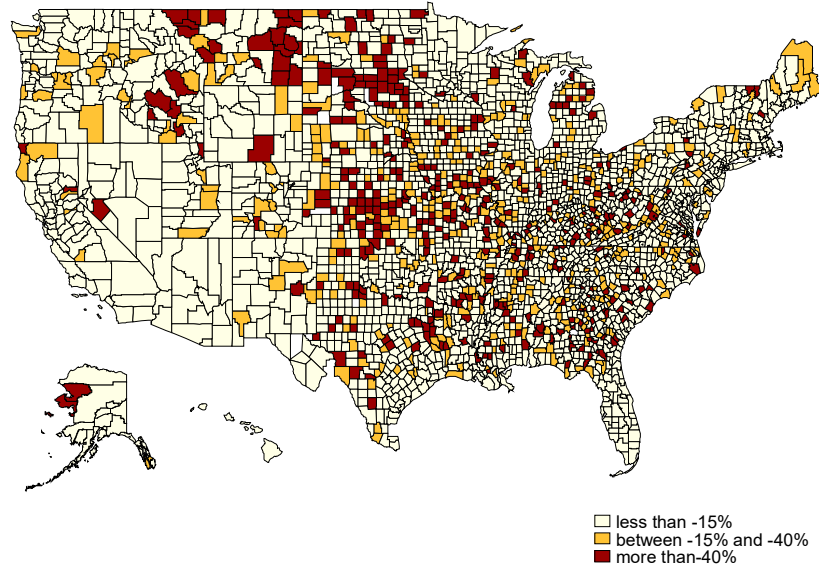




## Empirical results (ii): Transmission of liquidity shocks

- Banks transmitted the negative shocks across regions
  - Exposed banks decreased the supply of small business loans in areas that were not affected by oil shocks
  - On average, each exposed bank branch decreased lending to small businesses in non-affected areas by over \$1 million every year after the shock

% decline in exposed banks' sme lending 2014-16



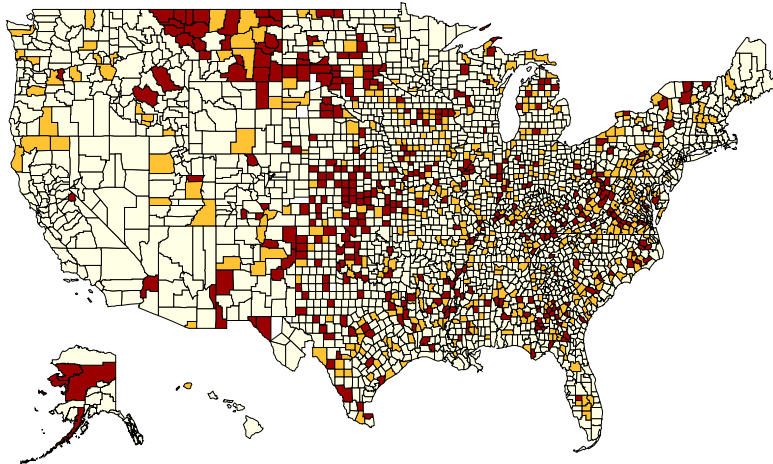




## Empirical results (ii): Transmission of liquidity shocks

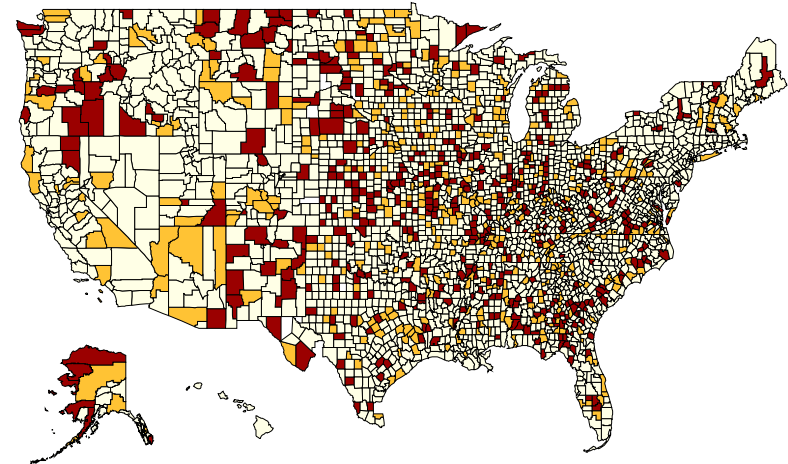
- Banks transmitted the negative shocks across regions
  - In the mortgage market, exposed banks were forced to cut the number of mortgages originated as well as the approval rate of these loans

% decline in exposed banks' mortgage loan granted 2014-16



□ less than -15%  
■ between -15% and -40%  
■ more than -40%

% decline in exposed banks' mortgage loan approval 2014-16



□ less than -13%  
■ between -13% and -30%  
■ more than -30%





## Empirical results (iii): Variation in transmission of liquidity shocks

- I further find that banks facing liquidity constraints cut lending more in markets:
  - With a higher percentage of small-sized firms
  - Where smaller firms with higher asset intangibility operate
  - Where banks have weaker links with the community
- Further tests show that smaller banks with less liquid assets, and weaker capital are more likely to transmit the liquidity shocks through lending







## Conclusions

- The 2014–16 oil price collapse featured a significant, sudden drop in commodity prices
  - The drop in asset prices had significant adverse effects on certain O&G-concentrated regions of the U.S.
  - A large number of smaller shale gas producers who emerged from the shale gas boom were badly hit by the sharp decline in oil prices
- I find that O&G-concentrated counties had a significant decrease in deposit inflow into local bank branches
  - Lower deposit inflows, higher interest costs, and loan losses for local banks
  - Facing severe liquidity pressure, banks tend to sell their most-liquid securities
  - “Exposed” banks transmitted the shock to other markets with a minimum O&G exposure





## Implications and Caveat

- Small local banks are crucial in supplying credit to local communities
- They are vulnerable to regional shocks
  - It is important to consider various policy options such as providing temporary liquidity to these banks during the regional economic downturns
- Caveat: the credit gap may be filled by other providers
  - The analyses is limited to banks that file the Call Report, CRA, and HMDA data

