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Does Local Access to Finance Matter?

Evidence from U.S. Oil and Natural Gas Shale Booms*

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Abstract

I use oil and natural gas shale discoveries as a natural experiment to identify where and when local access to finance is economically important for entrepreneurs and firms. Shale discoveries lead to an increase in local bank deposits and a positive local credit supply shock. After a credit supply shock, business establishments increase in industries with high external finance requirements relative to industries with low external finance requirements, but only in lending markets dominated by small banks. These results indicate that economically important frictions related to local credit supply have the largest impact on areas dominated by small banks, while these frictions are mitigated in other lending markets.

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1 Introduction

In frictionless financial markets, entrepreneurs and firms should be able to obtain funding for all positive net present value projects. In such a world, changes in local credit supply would have no effect on real outcomes. However, if information or agency frictions interfere with capital mobility then suboptimal outcomes can occur. Existing empirical literature has focused on the real effects of these financing frictions.[1] Understanding exactly when and where these frictions are most important, however, has received much less attention.

There are reasons to believe that the importance of lending market frictions may vary, due to the substantial variation that exists across local lending markets. For example, some lending markets have large multi-market banks that can redeploy capital geographically (Gilje et al. (2013)), while other markets are dominated by small banks that rely on local sources of capital for lending (Houston et al. (1997), Kashyap and Stein (2000), Campello (2002)). Do these differences result in different exposures to lending market frictions? Do these differences have real effects? These questions have direct implications for our understanding of how real outcomes are affected by lending market frictions.

The goal of this study is to identify where and when lending market frictions have the largest influence on real outcomes by measuring the effect of *similar* changes in local credit supply on real outcomes in *different* lending markets. I use a novel source of quasi-random variation in local credit supply from oil and natural gas shale discoveries to examine the effect of changes in credit supply on real outcomes. I identify shale discoveries ("booms") at the county level in the seven major shale producing U.S. states between 2003 and 2009 using a unique dataset of 16,731 individual shale wells. Unexpected technological breakthroughs in shale development have caused energy companies to make high payments to individual mineral owners for the right to develop shale discoveries. Figure 1 shows a map of the counties experiencing shale discoveries. These events occur in different places at different points in time.

[1] This literature includes Peek and Rosengren (2000), Petersen and Rajan (2002), Ashcraft (2005), Becker (2007), Khwaja and Mian (2008), Paravisini (2008), Agarwal and Hauswald (2010), Butler and Cornaggia (2011), Chava and Purnanandam (2011), Iyer and Peydro (2011), Schnabl (2011)

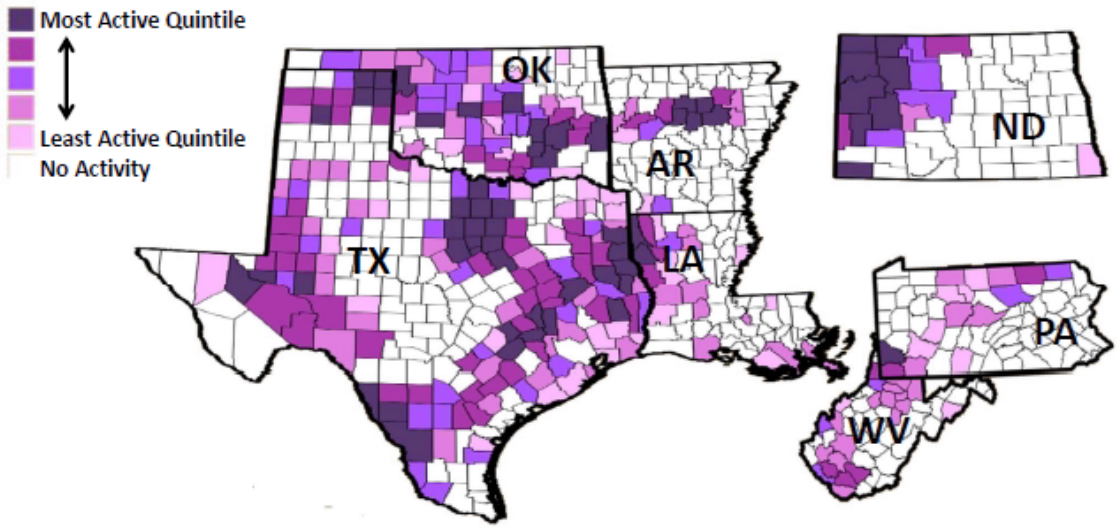

Figure 1: Location and Intensity of Shale Activity
The figure maps the counties of the 7 shale boom states included in this study: OK, TX, LA, WV, PA, ND and AR. White counties are counties with no shale development activity. The remaining counties are shaded based on intensity of activity related to the total number of shale wells drilled through 2009.

I find that the increase in individual mineral wealth associated with shale booms raises local bank deposits by 9.3%. These deposits from newly wealthy mineral owners enhance a bank's ability to make new loans, resulting in a positive local credit supply shock. Figure 2 plots how bank deposits change over time for the average county experiencing a shale discovery.

To measure how a shale boom credit supply shock affects real outcomes in a lending market I compare the number of business establishments, my outcome measure, before a boom to after a boom across industries with different external financing requirements.[2] Because both credit supply and credit demand may be changing in a shale boom I focus on within county-year comparisons. Specifically, to identify the causal effect of changes in credit supply I include controls for county-year effects, so that any demand effect which impacts industries similarly in a given county in a given year is controlled for.

[2] A business establishment is an operating address of a firm; a single firm may have multiple business establishments. I use this as my primary outcome measure as it is among the most granular economic data available at the county-year-industry level during the sample period.

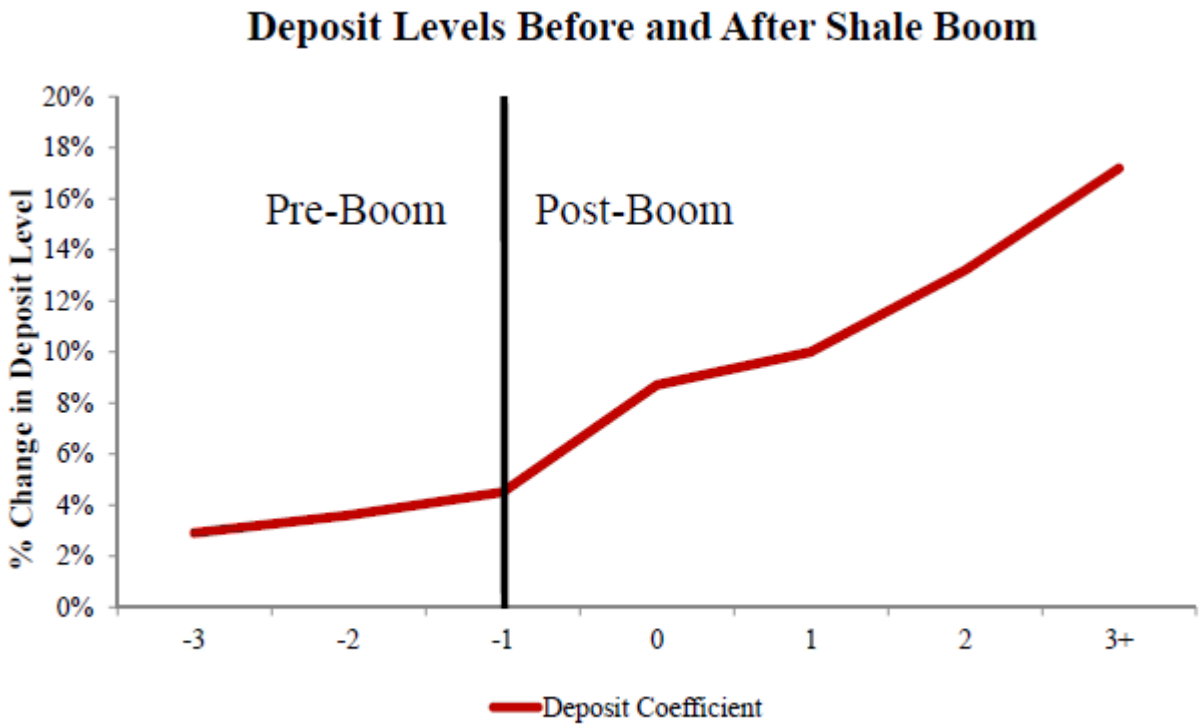

Figure 2: Deposit Levels Before and After Shale Boom

I find that after a shale boom, the number of business establishments in industries with high external finance requirements increases 4.6% relative to industries with low external finance requirements.[3] More importantly, for the purposes of this study, this figure varies across different lending markets. I find that the effect of changes in credit supply on local firms is strongly linked with local banking market structure, with areas dominated by small banks benefiting the most from an expansion in local credit supply. Specifically, after a boom the number of business establishments in industries with high external finance requirements increases 7.1% relative to the number with low external finance requirements in counties dominated by small banks, whereas there is no change in other lending markets. This result indicates that cross sectional variation in the impact of credit supply frictions on real outcomes is linked with a lending market's banking structure. Figure 3 plots how the number of business establishments change for high external finance requirement and low

[3]I have excluded all economic outcome measures directly related to oil and gas extraction, construction, real estate, and financial services, because economic outcomes for these industries potentially improve due to reasons unrelated to better local credit supply.

external finance requirement industries in counties dominated by small bank, as well as other counties.

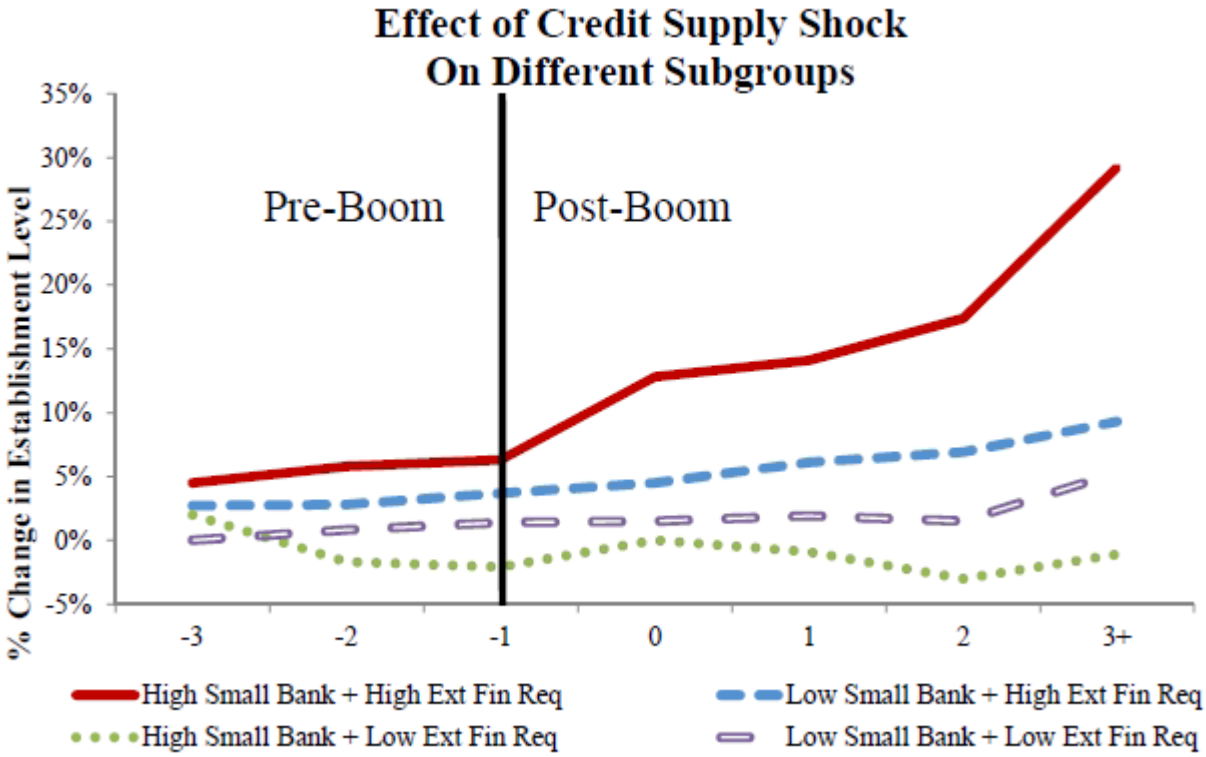

Figure 3: Effect of Credit Supply Shock on Counties with Different Bank Sizes

Why might local credit supply be particularly important in counties dominated by small banks? If local banks are large, capital can be redeployed geographically to fund projects. However, if local banks are small it could be more difficult for capital to be redeployed from other areas to be lent locally.[4] Furthermore, small banks are typically more reliant on deposit funding than large banks, which suggests they may have more challenges in obtaining alternative external capital due to information and agency concerns. Prior research also suggests that small banks may be more adept at lending to "soft" information borrowers (Stein (2002), Berger et al. (2005)). If areas with more small banks have more "soft" information borrowers, the inability of a small bank to obtain outside funding for these types of borrowers would also lead to worse economic outcomes. The results of this study indicate that the ultimate set of information and agency frictions influencing outcomes are both frictions between borrowers

[4]Prior research discussing this issue includes Houston et al. (1997) and Jayaratne and Morgan (2000)

and banks as well as frictions between banks and funding sources.

Non-credit based interpretations of my results may be a concern.[5] For example, some industries could benefit differentially from a shale discovery due to consumer demand shocks, wealth shocks, or other non-credit based shocks associated with a shale discovery. If any of these shocks are correlated with external financing requirements, then a credit supply based interpretation of the results could be problematic. However, for these alternative shocks to alter the interpretation of my empirical design, they would also need to be correlated with the size of a county's local banks. I find no evidence that after booms demand shocks differ across counties with different bank sizes. Specifically, retail sales, a proxy for local demand, increase by similar amounts after booms in counties dominated by small banks as they do in other counties. Additionally, there is no evidence that deposits increase more after booms in counties dominated by small banks than in other counties, as one might expect if demand shocks affected counties differently. More broadly, the empirical design of this study requires an alternative, non-banking based, interpretation of results to reconcile why outcomes for industries with distinct external financing requirements respond differently after a shale boom, and why these different responses are larger in counties dominated by small banks.

In placebo tests I show that the results of this study are not driven by pre-existing growth trends. I also demonstrate that the main results of this study are not driven by any single industry or industry exposure to economic fluctuations as proxied by industry asset beta. Additionally, I conduct robustness tests related to local banking structure and find that my main results are not driven by changes to local banking markets after a boom, different small bank size definitions, or banks that are part of holding companies.

How are shale booms different than other types of economic growth? I argue that the key differentiator of shale booms is the significant relative increase in local credit supply in

[5] I follow the approach of other studies and focus on economic outcome variables, because detailed bank level loan data is typically unavailable in the United States. Among banks which have all of their branches in a shale boom county, which plausibly suggests that a significant portion of the lending activity reported in Call Report disclosures occurs in a shale county, I do confirm that Commercial and Industrial loans increase after a shale discovery.

shale counties, relative to other types of growth shocks. Because county banking market structure is not randomly assigned, a concern may be that the real outcomes I observe are not driven by a deposit effect, but instead, an omitted variable which affects how certain counties or certain industries respond to economic growth (e.g. rural and underdeveloped areas may respond differently when there is growth). To attempt to identify how this might be influencing my tests, I examine whether non-shale growth shocks affect counties dominated by small banks differently or firms with greater external financing requirements differently. I find no evidence of differential affects linked to county banking market composition or industry external financing requirements in response to non-shale growth shocks. This result is consistent with the credit supply component of shale booms being a key factor for real outcomes, relative to other types of economic growth.

Are banks using shale deposit windfalls to fund positive net present value projects? While difficult to test empirically, there are at least two pieces of suggestive evidence which indicate that banks are not making bad loans. First, an analysis of banks which have all of their operations in shale counties, for which Call Report data may be considered plausibly representative of the loans a bank may be making in a shale county, I find no evidence that a bank's non-performing loan ratio increases after a shale boom. Second, establishments in industries with high external finance requirements represent a smaller portion of the economy in lending markets dominated by small banks. Specifically, in non-shale counties dominated by small banks they comprise 37.8% of all establishments in 2009. In lending markets dominated by small banks that have benefited from a shale boom, this figure is 40.8%. This amount is nearly equal to the 40.7% they comprise in lending markets with a greater presence of large banks. Thus, these additional establishments increase only to an amount similar to their proportion in counties with a greater presence of large banks, the control group, they are not increasing to a level significantly higher than the control group, which might be a cause for concern.

One should be cautioned against interpreting the results of this study as suggesting that the existence of small banks is suboptimal. Due to the type of borrowers small banks may serve, and the potential difference in borrowers in counties dominated by small banks relative

to other counties, it is not clear that more big banks would improve outcomes. Alternatively, this study does suggest that improved access to funding in areas dominated by small banks does lead to improved outcomes.

This study also highlights a bright side, linked to the limited impact of frictions in some lending markets, as areas with a significant presence of large banks are largely unaffected by changes in local credit supply. This suggests that some economically important lending frictions in some places have been mitigated, relative to what prior studies have found (Becker (2007), Peek and Rosengren (2000)).

The United States has one of the most developed banking systems in the world. Prior research has demonstrated that deregulation, the adoption of lending technology and securitization, have led to improved economic outcomes. However, this study provides new evidence that, after these improvements, there is significant cross sectional variation in the effect of information and agency frictions in the banking system. To identify this variation I use oil and gas shale discoveries to obtain quasi-random variation in local credit supply to document where and when changes in local credit supply have the largest effect on local firms. If capital were able to flow, absent frictions, to fund positive net present value projects, changes in local credit supply would not affect local firms. Given that changes in local credit supply do affect local firms, it suggests that economically important frictions adversely affect the flow of capital in the banking system.

I find that cross sectional variation in the effect of changes in credit supply is strongly linked to local bank size. Areas dominated by small banks experience the biggest benefit, in the form of more business establishments in industries with greater external financing requirements, indicating that these lending markets suffer the most from information and agency frictions in the banking system. However, this study also highlights an important bright side, as other lending markets with a greater presence of large banks do not experience changes in economic activity linked to changes in credit supply. This indicates that many of the advances in financial innovation, such as securitization and credit score models, may

have served to mitigate economically important frictions in lending in these markets.

The evidence presented in this study suggests that information and agency frictions in lending affect economic outcomes along two dimensions. In particular, the greater importance of local credit supply in areas dominated by small banks suggests that the combination of small banks facing frictions in obtaining external capital and borrowers in areas dominated by small banks facing frictions in obtaining loans has the biggest overall adverse impact on economic outcomes. These results would suggest that additional tools or innovations which could mitigate information or agency frictions for small banks in obtaining funding, may improve outcomes in areas dominated by small banks.

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