Journal of Financial Economics 115 (2015) 189–209

Contents lists available at ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfec

Does banking competition affect innovation? ☆

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ARTICLE INFO

Article history:
Received 25 September 2012
Received in revised form
9 July 2013
Accepted 13 August 2013
Available online 8 September 2014

JEL classifications:
G21
G28
G34
O16
O31

Keywords:
Banking competition
Innovation
Access to finance
Mergers and acquisitions

ABSTRACT

We exploit the deregulation of interstate bank branching laws to test whether banking competition affects innovation. We find robust evidence that banking competition reduces state-level innovation by public corporations headquartered within deregulating states. Innovation increases among private firms that are dependent on external finance and that have limited access to credit from local banks. We argue that banking competition enables small, innovative firms to secure financing instead of being acquired by public corporations. Therefore, banking competition reduces the supply of innovative targets, which reduces the portion of state-level innovation attributable to public corporations. Overall, these results shed light on the real effects of banking competition and the determinants of innovation.

1. Introduction

What drives innovation? Understanding the determinants of innovation is important because innovations establish companies' competitive advantages (Porter, 1992) and are important drivers of economic growth (Solow, 1957). A growing literature takes up this task, documenting positive and negative empirical links between innovation and various company and market characteristics. However, this literature contains few empirical studies examining the link between capital market development and innovation output. We contribute to this nascent literature by examining the effects of state-level banking competition on innovation.

A major challenge facing the empirical innovation literature is that innovation is likely endogenous with company and market characteristics, including state-level banking competition. Thus, a correlation between banking competition and innovation may tell us little about the causal effect of banking competition on innovation. We alleviate endogeneity concerns by exploiting the staggered deregulation of interstate bank branching laws in the

☆ We thank Viral Acharya (our referee), Matthew Billett, Alexander Borisov, Michael Fuerst, Daniel Paravisini, Philip Strahan, Bill Schwert (the editor), Jason Sturgess, Krishnamurty Subramanian, Gregory Udell, and seminar and conference participants at Indiana University, the 2014 Association of Financial Economics meetings, the 2013 Western Finance Association meetings, and the 2012 Financial Management Association meetings for helpful comments. Jess Cornaggia acknowledges financial support from the Anderson Faculty Excellence Fund. Xuan Tian acknowledges research support from the Mary Jane Geyer Cain Faculty Fellowship from Indiana University. All errors belong to the authors.

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http://dx.doi.org/10.1016/j.jfineco.2014.09.001
0304-405X/

United States. The U.S. Congress passed the Interstate Banking and Branching Efficiency Act (IBBEA) in 1994. In addition to allowing unrestricted interstate banking, the IBBEA legalized interstate branching across the U.S. starting in 1997. As Rice and Strahan (2010, p. 861) explain, "Allowing interstate branching was the watershed event of IBBEA." Rice and Strahan show that, when states relax bank branching restrictions, more bank branches open and compete with one another. This increase in competition expands the availability of credit within a state and lowers the cost of capital therein.

We construct tests using these deregulatory events as plausibly exogenous increases in the supply of state-level finance. Given the economic effects documented by Rice and Strahan (2010), we expect state-level innovation to increase following deregulation because companies headquartered within deregulating states could take advantage of the greater supply of finance to increase innovation output. Surprisingly, however, we find robust evidence that increases in banking competition cause states' innovation outputs to decline. We find that states that are completely open to interstate branching generate a total of 30.8% fewer patents (i.e., 920 fewer patents) three years after branching deregulation than states with the most restrictions on interstate branching. We find a similar result when we use patent citations as a proxy for innovation: States that are completely open to interstate branching generate patents that receive a total of 23.2% fewer citations (i.e., 9,068 fewer citations) three years after branching deregulation than states with the most restrictions on interstate branching. These results are robust to controlling for state-level and state-industry-level labor force concentration, banking deregulatory events that precede IBBEA, state fixed effects, and year fixed effects.

To gain a clearer understanding of this result, we decompose state-level patents into patents produced by public corporations and private firms.[1] Private firms could be more sensitive to local banking conditions than public corporations, so the effects of state-level banking competition could be different for these two groups. Indeed, we find the overall negative effect of deregulatory events on state-level innovation is driven by corporations headquartered within deregulating states. In contrast, relative to corporations, private firms experience increases in innovation output following deregulatory events. (We find no direct effect of deregulation on private firms' innovation outputs.) These findings support the notion that small, private firms take advantage of the improved credit conditions to finance innovative projects.

Although the staggered deregulation of interstate bank branching laws provide exogenous changes to banking competition, Kroszner and Strahan (1999) argue that state-level factors that manifest differently across states could have affected the timing of deregulation in different states. Therefore, it is possible that our results are driven by reverse causality, whereby differences in innovation intensities across states triggered deregulation. We employ the methodology of Bertrand and Mullainathan (2003) to address this concern. We examine the dynamics of innovation surrounding the deregulatory events and we find no prior trend in innovation output. This finding indicates reverse causality does not explain our main results.

Another potential explanation for our results is that an omitted variable coinciding with branching deregulation could be the true underlying cause of changes in innovation. If this is the case, then the changes in innovation we attribute to branching deregulation reflect mere associations rather than a causal effect. Our baseline identification strategy employs shocks that affect different states at different times. It is unlikely that an omitted variable unrelated to branching deregulation would fluctuate every time (or even most of the time) a deregulatory event occurs. Therefore, our strategy of using multiple shocks due to staggered banking deregulation across states mitigates the omitted variables concern.

Still, we address this possibility by conducting placebo tests. We begin by obtaining an empirical distribution of years when states deregulated from Rice and Strahan (2010). Next, we randomly assign states into each of these deregulation years (without replacement) following the empirical distribution. This approach maintains the distribution of deregulatory years from our baseline specification, but it disrupts the proper assignment of deregulation years to states. Therefore, if an unobservable shock occurs at approximately the same time as the deregulation events in the mid-1990s, it should still reside in the testing framework, and thus have an opportunity to drive the results. However, if no such shock exists, then our incorrect assignments of deregulatory years to states should weaken our results when we re-estimate the baseline tests. Indeed, we find these falsely assumed deregulatory events have no effect on innovation. These non-results corroborate the notion that the paper's main results are not driven by an omitted variable.

After demonstrating that there is an aggregate decrease in patents and patent citations following increased banking competition from the IBBEA, we examine three possible channels to explain this result. First, we test whether companies' external finance dependence affects the way their innovation outputs respond to changes in state-level banking competition. We expect that banking competition relaxes financing constraints for private firms, mainly in external-finance-dependent industries. Therefore, these private firms should experience increases in innovation output. This is precisely what we find. We use the measure of external finance dependence developed by Duchin, Ozbas, and Sensoy (2010) and find external-finance-dependent private firms located in states that are completely open to interstate branching generate a total of 7.6% more patents and 6.4% more citations three years after branching deregulation than firms in states with the most restrictions on interstate branching. This result is robust to a variety of alternative proxies for external finance dependence. We partition the data by company size, age, and bank dependence following Acharya, Imbs,

[1] To aid in distinction, we use the word "corporation" throughout the remainder of the paper to designate Compustat-reported entities. We reserve the word "firm" for private firms whose stocks are not listed on stock exchanges. We use the word "company" as a general term for either public corporations or private firms.