E. J. Ourso College of Business
Department of Economics

DEPARTMENT OF ECONOMICS WORKING PAPER SERIES

Effects of U.S. Banking Deregulation on Unemployment Dynamics

Bulent Unel
Department of Economics
Louisiana State University

Working Paper 2019-04
http://faculty.bus.lsu.edu/papers/pap19_04.pdf

Department of Economics
Louisiana State University
Baton Rouge, LA 70803-6306
http://www.bus.lsu.edu/economics/

Effects of U.S. Banking Deregulation on Unemployment Dynamics

Bulent Unel*

May 2019

Abstract

I use state-level banking deregulation in the U.S. to study the causal impact of credit expansion on unemployment through their effects on the average monthly job-finding and job-losing rates. State-level analysis shows that deregulation increased the average job-finding rate and decreased the job-losing rate, and thus led to a lower unemployment rate. Extending the analysis to industry-state level, I find that banking deregulation increased the job-finding rate similarly across industries, but they decreased job-losing rate only in industries with high external finance dependence.

JEL Classification: E24, E44, G21, G28, J64

Keywords: Banking Deregulation, Job-Finding Rate, Job-Losing Rate, External Financial Dependence, Unemployment

*Department of Economics, Louisiana State University, Baton Rouge, LA 70803. E-mail: bunel@lsu.edu; Tel: (225)578-5211. I thank Doug McMillin and Barton Willage for their valuable comments and suggestions.

1 Introduction

The U.S. banking industry was subject to extensive regulation throughout much of the twentieth century. States adopted policies to limit the geographic expansion of banks both within and across state boundaries. In 1970 there were only twelve states that allowed expansion of branches within their borders, and no states allowed cross-state bank ownership. These restrictive policies naturally created local monopolies from which state authorities extracted some rents (Kroszner and Strahan 2014). However, as advances in technology and finance changed the role of banks in the economy, many banks began to lobby for the removal of these geographic restrictions. Starting in early 1970s states began lifting banking restrictions in two main ways. First, they allowed banks to open new branches anywhere within state borders. Second, they permitted out-of-state banks to acquire/open banks within their home state, and the passage of the Interstate Banking and Branching Efficiency Act of 1994 let states complete this process by 1997.[1]

Reforms led to rapid expansion of new banks and branches and increased efficiency by reducing banking costs (Stiroh and Strahan 2003), which in turn increased credit supply, especially for previously excluded businesses and households (Dick and Lenhert 2010, Krishnamurthy 2013, Favra and Imbs 2015). In addition, as Jarayante and Strahan (1996) argue, states did not pass these reforms in anticipation of future economic performance. Kroszner and Strahan (2014) give a detailed discussion about financial and political factors leading to the banking deregulation. Therefore, the banking deregulation has provided a natural experiment for researchers to investigate causal effects of credit constraints on various economic outcomes, including growth, income distribution, entrepreneurship, and so on. However, limited attention is paid to its impact on unemployment dynamics.

This paper investigates the impact of banking deregulation on unemployment through its impact on the job-finding and job-losing rates in the U.S. The first step in my analysis is the construction of these rates, and for this I use the monthly Current Population Survey (CPS) files over the 1977–1999 period. Utilizing the rotating feature of the CPS, I identify employment creation and destruction at the individual level between two consecutive months, and define the

[1] Kroszner and Strahan (2014) give an extensive account of regulation and deregulation of the banking industry in the U.S.

job-finding rate (entry rate) as the average monthly rate of unemployed individuals becoming employed, and the job-losing rate (exit rate) as the average monthly rate of workers becoming unemployed. Exploiting the variation in the timing of intrastate and interstate deregulation in a difference-in-differences (DD) setting, I investigate how the deregulation affected average monthly job-finding and job-losing rates.

Results of this study can be summarized as follows. First, my state-level analysis shows that deregulation lowered the unemployment rate by increasing the average job-finding rate and decreasing in the average job-losing rate. Specifically, the entry rate increased by 6.5 percent and the exit rate decreased by 5 percent (relative to the sample mean) following deregulation, resulting in about a 13 percent reduction in the unemployment rate. I then extend my analysis by examining how deregulation affected job-finding and job-losing rates at the industry-state level. Rajan and Zingales (1998) show substantial variation in needs for external finance across industries. In the present context, therefore, one can expect that the impact of deregulation had been stronger in industries that depend more on external finance. Using data on external finance from Duygan-Bump et al. (2015), I find that deregulation increased the average job-finding rate across all industries by the same amount. However, deregulation decreased the average job-losing rate only in industries that highly depended on external finance.

This paper lies at the intersection of two literatures. It relates to the literature that emphasizes the impact of credit constraints (especially during the recessions) on employment and other macroeconomic variables. This literature is vast and its full review is beyond the purpose of this paper. In this literature, my paper relates to two recent papers, Duygan-Bump et al. (2015) and Siemer (2019), which investigate the impact of the Great Recession of 2007–2009 on (un)employment dynamics in the United States. Duygan-Bump et al (2015), using the March CPS data, show that during the recession workers in industries with high external financial dependence were more likely to become unemployed, and the effect was stronger among small firms in these sectors. Siemer (2019) investigates the impact of the Great Recession on firm entry and employment dynamics. Using firm-level data, he shows that financial constraints considerably reduced employment growth in small relative to large firms. These papers examine the impact of credit constraints created during the Great Recession on employment dynamics, whereas I

investigate the impact of credit expansion through banking deregulation on unemployment.

This paper also relates to a large literature that investigates the implications of US banking deregulation for state economies. Since it provides a natural setting to investigate the causal effects of credit expansion, US banking deregulation has generated a considerable interest among researchers. Previous studies have examined implications of deregulation for various economic outcomes, including per capita income and output growth (Jayarante and Strahan 1996), income and wage inequality (Black and Strahan 2001, Beck et al. 2010), entrepreneurship (Black and Strahan 2002, Kerr and Nanda 2009, Sarker and Unel 2018), volatility in business cycles (Morgan et al. 2004), credit expansion and personal bankruptcy (Dick and Lehnert 2010), mortgage loans (Tewari 2014, Favara and Imbs 2015), educational attainment (Sun and Yannelis 2016), and foreign investment (Kandilov et al. 2016).

In this literature my paper relates to two papers, Cetorelli and Strahan (2006) and Beck et al. (2010). Cetorelli and Strahan (2006) investigate the impact of banking deregulation on industry structure in U.S. manufacturing sectors. They find that banking deregulation led to more establishments and a smaller average establishment size in sectors with high external financial needs. Beck et al. (2010) examine the impact of branch deregulation on income distribution, and find that it substantially tightened income inequality (measured by Gini coefficient or Theil index) by raising incomes in the lower half of the distribution. To explain their findings, they also consider the impact of deregulation on unemployment, and their event-study analysis shows that deregulation significantly lowered the unemployment rate. My paper differs from their work in two key aspects. First, they consider the impact of deregulation on the unemployment rate (a stock variable), whereas I investigate its impact on job-finding and job-losing rates (flow variables). Examining the impact on entry and exit rates helps us to better understand why unemployment changed. Second, I also present an industry-state level analysis and investigate whether the impact differs across industries based on their needs for external finance.

The paper is organized as follows. The next section discusses the data, explains the construction of key variables (e.g., job-finding and job-losing rates), and summary statistics. Section 3 investigates the impact of banking deregulation on employment dynamics at the state level. Section 4 extends the analysis to the industry-state level, and explores possible explanations for

why deregulation affected unemployment dynamics. Section 5 concludes the paper.

2 Data

Data on labor are drawn from the Current Population Survey (CPS) monthly files compiled by Flood et al. (2018).[2] The sample covers 48 states plus the D.C. over the period 1977–1999. I exclude Delaware and South Dakota due to unusually high banking activities stemming from credit-card banks (Kroszner and Strahan 2014). The sample begins in 1977 because state identifiers are not available in prior years, and ends in 1999 because all states (except Hawaii and Iowa) deregulated their banking sectors by 1994 (see Figure 1).[3] In addition, I want to avoid estimates being influenced by financial reforms passed during the 2000s. The CPS provides information on individuals' age, gender, race, marital status, and education level as well as their employment status, worker class, and industry worked.

I consider all individuals between the ages of 16 and 64, excluding those with imputed or missing employment status, worker class, and inconsistent reports. To identify employment dynamics, individuals must be tracked over time. However, the CPS is a household survey and does not include individual identifiers. Each household is surveyed on a monthly basis for four consecutive months, resurveyed eight months later for another four consecutive months, and then leaves the sample permanently. Exploiting this rotating future of the survey, Drew et al. (2014) develop individual-level identifiers. Using these identifiers (available in the IPUMS-CPS data) together with information on age, gender, race, and education, I am able to match individuals across two consecutive months and, determine entry and exit of individuals into the employment pool.[4] New workers in month t are individuals who were unemployed in the previous month, and newly unemployed in month t are those who were working in the previous month. For each state and year, I then calculate the average monthly job-finding rate as the weighted fraction of *unemployed* individuals who become workers, and the average monthly job-losing

[2]Data are publicly available on Integrated Public Use Microdata Series' (IPUMS-CPS) website: https://cps.ipums.org/cps/.

[3]Hawaii and Iowa fully deregulated their banking sectors in 1997 and 1999, respectively.

[4]Drew et al. (2014) argue that matching individual identifiers along with their age, gender, race, and education increases the precision of linking individuals across months. After dropping the new entrants and outgoing groups, the success rate of this linking/matching process between two consecutive months is more than 95 percent.

rate as the weighted fraction of *workers* who became unemployed. In all calculations, I use the CPS individual weights. In what follows, I use job-finding rate and entry rate interchangeably; similarly, job-losing rate and exit rate interchangeably.

Table 1 reports the average monthly job-finding and job-losing rates along with the unemployment rate across different groups. Less-educated represents individuals who have at most a high school diploma, while More-educated represents those who have at least some college education. As shall be explained more below, the last two rows show the average entry and exit rates in sectors that have low and high external finance dependency, respectively. The average monthly entry and exit rates for the whole sample are 31.3% and 1.7%, respectively. Note that entry rate is significantly higher among young and whites. The exit rate is higher among males, young, non-white, and less-educated groups.

Figure 2 presents the average monthly entry and exit rates over the sample period 1977-1999. The entry rate fluctuates without showing any trend, and note that it usually increases (decreases) during expansion (recession) years. Although the exit rate increases during recessions, it has secularly declined since the early 1980s –from about 2.5 percent in 1983 to about 1.2 percent in 1999. Note that decline in the entry rate during recessions is more substantial than the increase in the exit rate. Thus, consistent with Shimer (2012), the fluctuations in unemployment are mainly driven by the transition from unemployment to employment.

Data on external financial dependence come from Duygan-Bump et al. (2015). Using Compustat, they construct this variable as the proportion of capital expenditures financed with external funds, as in Rajan and Zingales (1998) and Cetorelli and Strahan (2006). The values can be negative, indicating that firms have free cash and thus have no needs for external financing. Duygan-Bump et al. calculate external financial dependence for all non-agricultural, non-banking private industries (at two-digit SIC), and I match them with industry codes in the CPS data. In Table 1, Low-dependence (High-dependence) represents industries whose external financial dependence is below (above) the median value. Average job-finding and job-losing rates are higher in the industries with high external finance dependence.

Finally, data on U.S. state banking deregulation are from Amel (2008). Figure 1 presents the cumulative number of states (including D.C. but excluding Delaware and South Dakota) that

deregulated interstate banking and intrastate branching through mergers and acquisitions over the 1977–1999 period. Note that most deregulation (especially, interstate banking deregulation) happened throughout the 1980s. All states but Iowa passed intrastate deregulation by 1993, and Iowa passed it in 1999. With the exception of Hawaii (that deregulated in 1997), all states permitted out-of-state banks to acquire/open banks within their home state by 1994, in which the Riegle-Neal Interstate Banking and Branching Efficiency Act passed.

3 State-Level Analysis

This section studies the impact of banking deregulation on employment dynamics at state-level. Analyzing the problem at aggregate level gives us an idea about how unemployment changed in response to the reforms.

3.1 Econometric Framework

To investigate the effects of banking deregulation on employment dynamics, I consider two sets of regressions. I first use the following difference-in-differences (DD) specification to obtain point estimates of the average effect:

$$Y_{st} = \alpha \text{Inter}_{st} + \beta \text{Intra}_{st} + \gamma Z_{st} + \eta_s + \eta_t + \varepsilon_{st}, \tag{1}$$

where in separate regressions Y_{st} represents the average monthly entry rate (i.e., employment creation rate), the average monthly exit rate (i.e., employment destruction), and unemployment rate in state s and year t. Inter_{st} (Intra_{st}) is a dummy that equals one if interstate (intrastate) deregulation is in effect.[5]

Variable Z_{st} denotes the set of time-varying demographics (such as fraction of males in labor force, black share in population, etc).[6] State fixed effects (η_s) are included to control for fixed

[5]The year of deregulation is partially treated, and I assume that $\text{Inter}_{st} = 0$ and $\text{Intra}_{st} = 0$. However, assuming $\text{Inter}_{st} = 1$ and $\text{Intra}_{st} = 1$ for the year of deregulation, or dropping all observations in that year from the sample yields qualitatively the same results.

[6]Variables such as personal income, education, minimum wage, and unionization rate are not included into the model because they pose serious reverse causality problem. For example, low unemployment rate among college educated people may induce others to have more education. Furthermore, some of these variables are outcome variables (e.g., personal income), and thus considered as bad controls (Angrist and Pischke 2009). However, including these variables into the model does not have substantial effects on results.

factors that can affect employment dynamics across states, and time fixed effects (η_t) to control for common macroeconomics shocks and trends that affects employment dynamics.

Finally, ε_{st} denotes the error term. Bertrand et al. (2004) show that inferences in a difference-in-differences model with multiple periods can be problematic due to the possible serial correlation in the error term. To potentially address this concern, I use heteroskedasticity robust standard errors clustered at the state level. All regressions are weighted by the average state labor share in the U.S. labor force over the sample period.

The impact of deregulation on labor-market outcomes may take time to fully materialize. Therefore, I also consider the following dynamic extension of equation (1) (known as event-study analysis) through which I can assess the year-by-year effects of interstate deregulation on employment dynamics:

$$Y_{st} = \sum_{\tau=-8}^{8} \alpha_\tau \text{Inter}_{st}^{\tau} + \sum_{\tau=-8}^{8} \beta_\tau \text{Intra}_{st}^{\tau} + +\gamma Z_{st} + \eta_s + \eta_t + \varepsilon_{st}, \tag{2}$$

where the dummy Inter_{st}^{τ} for $\tau < 0$ (for $\tau > 0$) equals one in the τth year before (after) the interstate deregulation in state s, and zero otherwise. Intra_{st}^{τ} is defined similarly. The end points include all earlier and later years. Since the year of deregulation is partially treated, I exclude the dummy for the year prior to deregulation so that coefficients measure yearly effects of deregulation on employment dynamics relative to the year prior to deregulation.

The above dynamic model also provides a test to see whether labor-market conditions had any predictable power on deregulation. If the identification assumption that deregulation affects entry and exit rates is valid, the estimated coefficients on $\hat{\alpha}_\tau$ and $\hat{\beta}_\tau$ for $\tau < 0$ (i.e., years prior to deregulation) should not be statistically different from zero.

3.2 Results

Table 2 reports the impact of banking deregulation on employment dynamics based on equation (1). All regressions include state and year fixed effects. Each control variable represents the share of that group in the state labor force. For example, Male represents the fraction of state labor force that is male. Young (Prime) represents the fraction of state labor force that is 16-24

(25-55) years old, and Others represents other race groups (including Asians, Hispanics, mixed races, etc).

The first two columns report results when the dependent variable is the average monthly entry rate (i.e., employment creation rate). Both reforms have positive effects on the entry rate, but only the interstate deregulation has a significant impact.[7] After including time-varying controls, I find interstate bank deregulation increased the entry rate by 1.9 percentage points. Since the average entry rate prior to interstate reform is 29.5 percent, the estimated coefficient on Inter in column 2 implies that the reform increased the entry rate by 6.5 percent. According to column 2, the entry is lower among other races (relative to whites) and higher among young people (relative to old ones).

Columns 3 and 4 report the impact of reforms on the exit rate (i.e., employment destruction rate). Estimated coefficients on both reforms are negative, but only the interstate deregulation has significant effect at the 10% level. Including controls does not seem to have any significant effects on estimates. The joint impact of the two types of deregulation is significant at the 5-percent level.[8] Since the average exit rate prior to the reforms is about 2.0 percent, the estimated coefficient on Inter in column 4 implies that the reform lowered the exit rate by 5 percent. The exit rate is higher among young and prime-age workers relative to old ones (aged between 55 and 64). It is also higher among blacks.

Results in columns 1–4 imply that banking reforms increase the employment creation rate and decrease the destruction rate, which in turn lower the unemployment rate. The effect on unemployment can be determined in two ways. First, in a simple model of unemployment, the steady-state level of unemployment rate is given by $u = x/(e + x)$, where e and x denote the entry and exit rates, respectively. Using the estimates in columns 2 and 4 imply that bank deregulation lowered the steady-state unemployment rate by 10 percent. However, this approach calculates the effect on the steady-state level of unemployment.

A direct way to measure this is to run equation (1), where the dependent variable is unemployment rate. Results are reported in the last two columns of Table 2. The estimated

[7] I also consider regressions without Intra term, and the estimated coefficient on Inter in each regression is very similar to that in the corresponding column in Table 2.

[8] The F-Statistics for the hypothesis $\hat{\alpha} + \hat{\beta} = 0$ is 4.7 with the p-value of 0.034.

coefficients on both reforms are negative, but only the coefficient on Inter is statistically significant. Estimated coefficient on Inter in the last implies that the interstate deregulation lowered unemployment rate by 13 percent (since the average unemployment rate prior to the reform was about 5.9 percent).[9] Consistent with basic statistics in Table 1, estimated coefficients on controls indicate that the unemployment rate is higher among males and non-whites.

Simple DD specification (1) gives point estimates of the average treatment effect, and assumes that labor-market conditions prior to deregulation have no predictable power on estimates. I now turn to estimating dynamic equation (2). Figures 3.a plots the estimated coefficients on pre- and post-interstate deregulation dummies when the dependent variable is the average monthly entry rate. Point estimates are represented by dots, and the bar around each point represents the 95-percent confidence interval. According to Figure 3.a, estimates on pre-deregulation dummies are very small and statistically insignificant. Notice that point estimates on dummies after the reform get substantially larger, and the difference is statistically significant (see column 2 in Table 2). Figure 3.b plots estimates measuring yearly effects of intrastate deregulation on the average monthly entry rate. There is no discernible trend in coefficients on pre- and post-deregulation dummies, and all estimates are statistically insignificant.

Figures 4.a and 4.b plot the estimated coefficients that measure yearly effects of reforms on the average monthly exit rate. The estimates on pre-deregulation dummies are statistically insignificant in both figures, suggesting that banking deregulation was not implemented as a response to changes in exit rates. Estimated coefficients on post-deregulation dummies do not show any clear pattern in either case, and they are also mostly insignificant.

Finally, Figures 5.a and 5.b plot estimated coefficients of dynamic equation (2) when the dependent variable is the unemployment rate. In Figure 5.a, the estimated coefficients on pre-deregulation dummies show a noisy pattern, but they are mostly insignificant. Estimates on post-interstate deregulation dummies stay essentially flat and below zero, and many of them are statistically *significant*. Figure 5.b reports dynamic effects of intrastate deregulation on unemployment. Although there is an upward trend in the estimated coefficients on pre-deregulation

[9] Unemployment rate of 5.9 percent may look a bit high, but note that most of interstate deregulation happened around the mid-1980s (see Figure 1). The adverse impact of the 1973-75 recession on U.S. labor markets continued until the late 1970s, and the U.S. economy experienced two more recessions between 1980 and 1985.

dummies and a downward trend in estimates on post-intrastate deregulation, the points estimates are mostly statistically insignificant. The average yearly effect prior to the intrastate deregulation is close to that after the deregulation; thus, the simple DD model can not find any effect of intrastate deregulation on unemployment rate (see column 6 in Table 2).[10]

In sum, the analysis in this section finds that banking deregulation has significant effects on unemployment by affecting both the job-finding and job-losing rates. Two remarks are in order. First, this aggregate-level analysis usually masks considerable heterogeneity across subgroups (e.g., industries) within each state. In this case, state averages distort standard errors by eliminating all within-state variation in entry/exit rates. In addition, state-fixed effects and common time trends may not fully control for variation across states and over time, and thus estimates are possibly subject to omitted variable bias. The next section presents an industry-state-level analysis, in which additional fixed effects are included into the model to potentially address these concerns. Second, the state-level analysis provides a general picture about the impact of bank deregulation on unemployment dynamics, but it does not provide an explanation about where these findings come.

As discussed in the introduction, several studies have shown that banking deregulation increased credit supply, which in turn can affect employment in different ways. For example, Dick and Lehnert (2010) and Tewari (2014) find that deregulation increased competition among banks, which helped previously excluded households to enter the market and receive loans. Sun and Yannelis (2016) show that households benefited from increased credit supply and were more likely to send their children to college. Specifically, they show that banking deregulation raised college enrollment by 2.6 percentage points between 1972 and 1992.[11] Since the exit rate is lower

[10] In explaining how intrastate branching deregulation has affected income distribution in the U.S., Beck et al. (2010) also investigate the impact of the intrastate deregulation on unemployment. They only plot results based on a dynamic equation similar to (2) without including any time-varying covariates Z_{sy}. Estimated coefficients plotted in Figure 5.b look slightly different from that in Figure 6 in their paper. The main reason behind the difference between these two figures is that they plot coefficients after removing the pre-deregulation trend from them. If I de-trend coefficients as they do, Figure 5.b will be similar to their Figure 6. I do not de-trend the estimates because it yields implausibly large estimates for coefficients on post-deregulation dummies. In addition, there is no reason to assume that the trend would continue if there were no policy changes, and estimates are mostly insignificant.

[11] Including two education dummies (high school graduates and some college or above) into the model does not have any significant impact on results. For example, the estimated coefficient on Inter in column 6 becomes 0.0079^{***} (0.0027). However, this finding does not imply that education did not have any effects on employment dynamics because, as discussed in footnote 12, it is an outcome variable and also poses reverse causality problem.

among college educated people, an increase in college enrollment may lower unemployment.

Credit expansion can affect employment dynamics in a more direct way by helping financially constrained firms to expand their business and create new jobs. The CPS data not provide any firm-level information, but industries where individuals work are reported in the CPS.[12] Using data from Standard and Poor's Compustat, Rajan and Zingales (1998) show substantial variation across industries in their dependence on external finance, and argue that financial development should disproportionately help industries dependent on external finance for their growth. Consequently, one can expect that the impact of banking deregulation on employment is more significant in sectors that depend more on external finance. I now turn to investigate this point following a strategy where I interact deregulation and industry variables for identification. This approach is similar to the one employed by Rajan and Zingales (1998), Duygu-Bump et al. (2015), among many others.

4 Industry-Level Analysis

This section studies how banking deregulation have affected employment dynamics at the industry-state level, focusing on cross-industry differences in dependence on external finance. Industries in the CPS data are coded at 3-digit SIC, and I first classified them into 60 sub-industries at 2-digit SIC to match data on external financial dependence in Duygu-Bump et al. (2015). The analysis excludes agriculture, banking, and public sectors. Using the matched CPS data (as described in the previous section), for each industry i in state s and year t, I calculate the average monthly entry rate as the weighted fraction of *unemployed* individuals who become workers in industry i, and the average monthly exit rate as the weighted fraction of *workers* in industry i who become unemployed. In all calculations, I use the CPS individual weights.

4.1 Econometric Framework

Let Y_{ist} denote the average monthly entry or exit rate in industry i in state s and year t. First, I consider the following extension of equation (1) to estimate the impact of banking deregulation

[12] The only exception is the CPS-March files that provide information about firm size where individuals worked last year.

on entry and exit rates:

$$Y_{ist} = \alpha \text{Inter}_{st} + \beta \text{Intra}_{st} + \gamma Z_{ist} + \eta_{is} + \eta_{it} + \varepsilon_{ist}, \tag{3}$$

where Inter_{st} and Intra_{st} again denote dummies for interstate and intrastate banking deregulation, respectively. The variable Z_{ist} includes time-varying covariates at industry-state level, similar to Z_{st} in the state-level analysis.

Variables η_{is} and η_{it} denote industry-state and industry-year fixed effects, respectively. The former effects are included to control for industry-state level time-invariant factors that can affect entry and exit rates, and industry-year fixed effects are included to control for any other industry-level time-varying confounding factors that can affect estimates. Note that year fixed effects are dropped, because industry-year fixed effects fully absorb them. In addition, state-year fixed effects are not included because they will absorb direct effects of banking deregulation (captured by Inter_{st} and Intra_{st}). Finally, ε_{ist} is the error term. I continue to cluster standard errors at state level, and regressions are weighted by the average industry share of employment over 1977–1999.[13]

In investigating how banking deregulation can affect the entry and exit rates, I consider the following extension of the above model:

$$\begin{aligned} Y_{ist} =& \alpha \text{Inter}_{st} + \alpha_H D_i^H \times \text{Inter}_{st} + \beta \text{Intra}_{st} + \beta_H D_i^H \times \text{Intra}_{st} + \\ & \gamma Z_{ist} + \gamma_H D_i^H \times Z_{ist} + \eta_{is} + \eta_{it} + \varepsilon_{ist}, \end{aligned} \tag{4}$$

where D_i^H is dummy that equals one if industry i's external finance dependence is high, and zero otherwise. Specifically, I assume D_i^H equals one if industry i's external financial dependence is above the median value, and zero otherwise. Note that D^H is not separately included into the above equation, because it would be subsumed by state-industry fixed effects η_{is}. The estimated coefficients $\hat{\alpha}_H$ and $\hat{\beta}_H$ measure the differential impact of interstate and intrastate deregulation, respectively, in industries with high-dependence of external finance.

I also present results based on a division where I classify industries into three groups based on the financial-dependence distribution: low-dependence (49th percentile and below), medium-dependence (50th-74th percentile), and high-dependence (75th percentile and above). In this

[13]Industry share of employment in a given state and year equals the total employment in that industry-state cell divided by the total employment in that year.

case, one can investigate whether there is a monotonic relationship between entry/exit rate and external-finance dependence.

4.2 Results

Table 3 reports the impact of deregulation on the average entry rate, and all regressions include industry-state and industry-year fixed effects. Columns 1 and 2 report results based on equation (3). Column 2 reports the results when control variables Z_{ist} are included, and for brevity, estimates on controls are not reported. Note that the estimated coefficients and the overall fit remain mostly the same after introducing controls. Estimated coefficients on Inter and Intra are positive, but only the one on Inter is significant (at the 5-percent level). The average entry rate prior to deregulation is about 1.25 percent, and the estimate on Inter in column 2 implies that interstate deregulation increased the entry rate by 6.4 percent, which is very close to that obtained in the state-level analysis.

Figures 6.a and 6.b plot the coefficients from the event analysis based on equation (2) with additional industry-year fixed effects. Estimated coefficients on pre-deregulation dummies are insignificant and mostly small, suggesting that the identification assumption is not violated. A comparison with Figures 3.a and 3.b, respectively, reveals that both estimated coefficients and their standard errors now are substantially smaller. But the patterns in these plots are mostly similar to that in Figures 3.a and 3.b.

Columns 3 and 4 report results based on equation (4), where I investigate the differential impact of deregulation on industries classified by their dependence on external finance. Here the coefficients on Inter and Intra measure the impact on the entry rate among low dependence industries and the coefficient on D^H is the additional impact on high-dependence industries. For industries with low-dependence, the effects of interstate and intrastate deregulation on entry rate are positive and significant at the 5-percent level, respectively. Estimated coefficients on the interaction terms are negative but insignificant, suggesting industries with high finance dependence were not differentially affected by the banking reforms.

Columns 6 and 7 report results when I classify industries into three category based on their dependence on external finance, as discussed in the previous section. Estimated coefficients on

base group (i.e., industries with low-dependence on external finance) are positive and statistically significant at the 5-percent level. Estimated coefficients on the interaction terms, which measure how other groups differ from the base group, are negative and insignificant.

In sum, banking deregulation had a positive and significant impact on the average monthly entry rate, but the results suggest that the impact has been more or less the same across industries with different levels of dependence on external finance. One possible explanation for this could be that the analysis did not control for firm size. Several studies have emphasized the importance of firm-size distribution on financial frictions. For example, using data on U.S. establishments, Cetorelli and Strahan (2006) find that increases in bank competition lead to increases in the share of small firms at the expense of large firms in the firm-size distribution. Duygan-Bump et al. (2015) show that workers in small firms that are in industries with high financing needs were more likely to be unemployed during the Great Recession than other comparable workers. Unfortunately, the monthly CPS data do not provide information about firm-size, and I cannot explore the heterogeneity based on firm-size distribution.

I now turn to investigate the impact of deregulation on the exit rate, and results are reported in Table 4. In columns 1 and 2, the estimated coefficients on Inter and Intra are negative, but only the one on Inter is statistically significant (at the 5-percent level). As in the entry case, note that including additional control variables does not have any significant effects on estimated coefficients and the fit of the model. The average exit rate prior to the interstate deregulation is about 2.1 percent, and the estimate in column 2 implies that the deregulation lowered the exit rate by 6.2 percent.

Figures 7.a and 7.b plot the coefficients from the event analysis based on equation (2) when the dependent variable is the average monthly exit rate. Note that the pattern in these figures are similar to Figures 4.a and 4.b, although point estimates on post-interstate deregulation dummies are somewhat smaller in Figure 7.a. Estimates on pre-deregulation dummies under both policies are insignificant, suggesting that pre-treatment labor market conditions did not have predictable power on deregulation.

Columns 3 and 4 investigate the differential impact of deregulation on industries' dependence on external finance. As in Table 3, D^H represents industries with high-dependence on external

finance. The effects of interstate and intrastate deregulation on the average exit rate in industries with low-dependence are negative, but statistically insignificant. Estimated coefficients on the interaction terms are negative and large, but only the coefficient on $D^H \times Inter$ is significant (at the 10-percent level). Observe that adding controls do not have any effects on estimated coefficients.

The finding that deregulation had a more significant effect on the exit rate in industries with high-dependence on external finance suggests that the effect gets stronger if one defines high-dependence in a more strict way. Columns 5 and 6 report results when industries are classified into three groups based on their dependence on external finance: low-dependence (49th percentile and below), medium-dependence (50th-74th percentile), and high-dependence (75th percentile and above). According to column 6, estimated coefficients on the interaction terms indicate that bank deregulation only had effects on the exit rate in industries with high-dependence on external finance –both banking reforms lowered the exit rate in the latter industries.

The finding that banking deregulation lowered the job-losing rate more in sectors that depend on external finance complements findings in Duygan-Bump et al. (2015) and Siemer (2019). Both studies investigate how financing constraints affected the unemployment/employment dynamics during the Great Recession in the United States. Using the CPS-March data, Duygan-Bump show that credit constraints of small firms played an important role in raising the likelihood of becoming unemployed during the recession.[14] Siemer (2019), using confidential firm-level data, shows financial constraints reduced employment growth substantially in small firms. My analysis complements theirs by showing that lowering financing constraints increases the job-finding rate and decreases the job-losing rate, and the decrease in the latter stems from sectors with high financing needs.

5 Conclusion

The importance of well-functioning financial markets for economic activity has long been recognized by policymakers and academics. Previous studies have argued that credit constraints

[14] As mentioned in footnote 12, the CPS-March data include information about firm size where individuals worked last year, but monthly CPS data do not have information about firm size.

have significant effects on key macroeconomic variables (such as investment spending and employment), especially during recessions. However, identifying the causal impact of financial constraints on economic activity is challenging because the estimation approach is usually subject to reverse causality and omitted variable bias. Therefore, researchers have tried to find natural settings created by exogenous shocks or policy changes to investigate causal effects of credit constraints.

I used state-level banking deregulation implemented in the U.S. from the early 1970s to the mid-1990s as a natural experiment to investigate how credit expansion affected unemployment dynamics. Using data on employment from the monthly CPS files, I measured the average monthly job-finding and job-losing rates for each state and in each year over the 1977–1999 period. My analysis shows that banking deregulation increased the average job-finding rate (entry rate) and reduced the job-losing rate (exit rate), which in turn led to a significantly lower unemployment rate. I then extended my analysis to industry-by-state level to study whether the effects of deregulation vary across industries. In particular, I investigate whether the effect has been more prominent in industries with high external financial needs. I find that deregulation had similar effects on job-finding rate across industries, but the job-losing rate declined only in industries with high-dependence on external finance.

References

Amel, Dean F., "State Laws Affecting the Geographic Expansion of Commercial Banks," 2008, Unpublished.

Angrist, Joshua D. and Jörn-Steffen Pischke, "Mostly Harmless Econometrics." Princeton University Press, Princeton, NJ, 2009.

Beck, Thorsten, Ross Levine and Alexey Levkov, "Big Bad Banks? The Winners and Losers from Bank Deregulation in the United States," *Journal of Finance*, 2010, *65*, 1637–67.

Bertrand, Marianne, Esther Duflo and Sendhil Mullainathan, "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 2004, *119*, 249–275.

Black, Sandra E. and Philip E. Strahan, "The Division of Spoils: Rent-sharing and Discrimination in Regulated Industry," *American Economic Review*, 2001, *91*, 814–31.

Black, Sandra E. and Philip E. Strahan, "Entrepreneurship and Bank Credit Availability," *Journal of Finance*, 2002, *57*, 2807–33.

Cetorelli, Nicola and Philip E. Strahan, "Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local U.S. Markets," *Journal of Finance*, 2006, *61*, 437–61.

Dick, Astrid A. and Andreas Lehnert ,"Personal Bankruptcy and Credit Market Competition," *Journal of Finance*, 2010, *65*, 655–686.

Drew, Julia A. R., Sarah Flood, John R. Warren, "Making Full Use of the Longitudinal Design of the Current Population Survey: Methods for Linking Records Across 16 Months," *Journal of Economic and Social Measurement*, 2014, *39*, 121–44.

Duygan-Bump, Burcu, Alexey Levkov, and Judit Montoriol-Garriga, "Financial Constraints and Unemployment: Evidence from the Great Recession," *Journal of Monetary Economics*, 2015, *75*, 89–105.

Favara, Giovanni and Jean Imbs , "Credit Supply and the Price of Housing," *American Economic Review*, 2015, *105*, 958–92.

Flood, Sarah, Miriam King, Steven Ruggles, and J. Robert Warren, 2017. *Integrated Public Use Microdata Series, Current Population Survey: Version 5.0*, Minneapolis, MN: University of Minnesota.

Jayaratne, Jith and Strahan, Philip E, "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation," *Quarterly Journal of Economics*, 1996, *111*, 639–70.

Kandilov, Ivan T., Asli Leblebicioglu and Neviana Petkova, "The Impact of Banking Deregulation on Inbound Foreign Direct Investment: Transaction-level Evidence from the United States," *Journal of International Economics*, 2016, *100*, 138–59.

Kerr, William R. and Ramana Nanda , "Banking Deregulations, Financing Constraints, and Firm Entry Size," *Journal of Financial Economics*, 2009, *94*, 124–49.

Krishnamurthy, Prasad, "Banking Deregulation, Local Credit Supply, and Small-Business Growth," *Journal of Law and Economics*, 2013, *58*, 935–67.

Kroszner, Randall S. and Philip E. Strahan, "What Drives Deregulation? Economics And Politics of the Relaxation of Bank Branching Restrictions," *Quarterly Journal of Economics*, 1999, *114*, 1437–67.

Kroszner, Randall S. and Philip E. Strahan, "Regulation and Deregulation of the US Banking Industry: Causes, Consequences, and Implications for the Future," 2014. In N. L. Rose (Ed.), *Economic Regulation and Its Reform: What Have We Learned?* (pp. 485–543). Chicago, IL: The University of Chicago Press.

Morgan, David P., Bertrand Rime and Philip E. Strahan, "Bank Integration and State Business Cycles," *Quarterly Journal of Economics*, 2004, *119*, 1555–85.

Rajan, Raghuram G. and Luigi Zingales, "Financial Dependence and Growth," *American Economic Review*, 1998, *88*, 559–86.

Sarker, Anindo and Bulent Unel, 2017. "The Impact of Bank Expansion on Self-Employed Business Owners: Evidence from US States." Working Paper, Louisiana State University.

Shimer, Robert, "Reassessing the Ins and Outs of Unemployment," *Review of Economic Dynamics*, 2012, *15*, 127–48.

Siemer, Michael, "Employment Effects of Financial Constraints during the Great Recession," *Review of Economics and Statistics*, 2019, *101*, 16–29.

Stiroh, Kevin J. and Philip E. Strahan, "Competitive Dynamics of Deregulation: Evidence from U.S. Banking," *Journal of Money, Credit, and Banking*, 2003, *35*, 801–28.

Sun, Stephen T. and Constantine Yannelis, "Credit Constraints and Demand for Higher Education: Evidence from Financial Deregulation," *Review of Economics and Statistics*, 2016, *1*, 12–24.

Tewari, Ishani, "The Distributive Impacts of Financial Development: Evidence from Mortgage Markets during US Bank Branch Deregulation," *American Economic Journal: Applied Economics*, 2014, *6*, 175–96.

Table 1. Summary Statistics on Employment Dynamics (%), 1977–1999

	Job-finding Rate	Job-losing Rate	Unemployment Rate
All	31.6	1.8	5.0
Female	31.3	1.5	4.7
Male	32.0	2.0	5.2
Age: 16-24	35.7	3.5	9.9
Age: 25-64	29.4	1.4	3.9
White	34.1	1.6	4.4
Non-white	24.5	2.9	9.6
No College	31.3	2.3	6.6
Some College	32.6	1.1	3.0
Low-Dependence	0.7	1.5	
High-Dependence	1.7	2.1	

Notes: The data draw on the CPS-Monthly Files compiled by Flood et al. (2018). Some College represents all individuals who have at least some college education. Low-Dependence (High-Dependence) represents sectors that depend on less (more) external finance.

Table 2. Impact of Banking Deregulations on Unemployment Dynamics, State-level (1977–1999)

	Entry Rate		Exit Rate		Unemp Rate	
Variable	1	2	3	4	5	6
Inter	0.0254***	0.0187***	−0.0010*	−0.0010*	−0.0084***	−0.0075***
	(0.0085)	(0.0069)	(0.0006)	(0.0005)	(0.0024)	(0.0021)
Intra	0.0127	0.0082	−0.0008	−0.0005	−0.0035	−0.0021
	(0.0098)	(0.0092)	(0.0005)	(0.0004)	(0.0026)	(0.0025)
Male		0.0718		0.0083		0.0431
		(0.2471)		(0.0124)		(0.0540)
Young		0.8328**		0.0220		−0.1116
		(0.3495)		(0.0228)		(0.0972)
Prime		−0.1603		0.0358*		0.0523
		(0.3097)		(0.0210)		(0.0828)
Black		0.0247		0.0128*		0.0243
		(0.1159)		(0.0075)		(0.0266)
Others		−0.5378***		0.0272**		0.1400***
		(0.1685)		(0.0115)		(0.0383)
Adjusted R^2	0.572	0.598	0.649	0.655	0.699	0.712

Notes: Number of observations in each column is 1,127. All regressions include state and year fixed effects, and regressions are weighted by the average state labor share in total labor force over the period 1977–1999. Numbers in parentheses are the robust standard errors clustered at the state level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3. Differential Impact of Banking Deregulations on Entry Rate, Industry-level (1977–1999)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Inter	0.0009**	0.0008**	0.0011***	0.0010***	0.0011***	0.0010***
	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
$D^M \times$Inter					−0.0002	−0.0002
					(0.0006)	(0.0006)
$D^H \times$Inter			−0.0003	−0.0003	−0.0004	−0.0005
			(0.0006)	(0.0006)	(0.0009)	(0.0009)
Intra	0.0006	0.0005	0.0007**	0.0007**	0.0007**	0.0007**
	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
$D^M \times$Intra					0.0008	0.0007
					(0.0006)	(0.0006)
$D^H \times$Intra			−0.0002	−0.0003	−0.0010	−0.0011
			(0.0005)	(0.0005)	(0.0008)	(0.0008)
Controls Z_{ist}		Yes		Yes		Yes
Adjusted R^2	0.768	0.769	0.768	0.769	0.768	0.770

Notes: Number of observations in each column is 63,552. All regressions include industry-state and industry-year fixed effects, and are weighted by the average industry-state labor share in total labor force over the period 1977–1999. Numbers in parentheses are the robust standard errors clustered at the state level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4. Differential Impact of Banking Deregulations on Exit Rate, Industry-level (1977–1999)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Inter	−0.0012**	−0.0013**	−0.0004	−0.0004	−0.0004	−0.0004
	(0.0005)	(0.0006)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
$D^M \times$Inter					−0.0008	−0.0009
					(0.0008)	(0.0008)
$D^H \times$Inter			−0.0014*	−0.0014*	−0.0019**	−0.0019**
			(0.0006)	(0.0007)	(0.0009)	(0.0009)
Intra	−0.0006	−0.0006	−0.0001	−0.0001	−0.0001	−0.0002
	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
$D^M \times$Intra					0.0001	0.0001
					(0.0005)	(0.0005)
$D^H \times$Intra			−0.0008	−0.0008	−0.0016**	−0.0015**
			(0.0005)	(0.0005)	(0.0007)	(0.0007)
Controls Z_{ist}		Yes		Yes		Yes
Adjusted R^2	0.338	0.339	0.338	0.339	0.338	0.339

Notes: Number of observations in each column is 63,552. All regressions include industry-state and industry-year fixed effects, and are weighted by the average industry-state labor share in total labor force over the period 1977–1999. Numbers in parentheses are the robust standard errors clustered at the state level, and ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

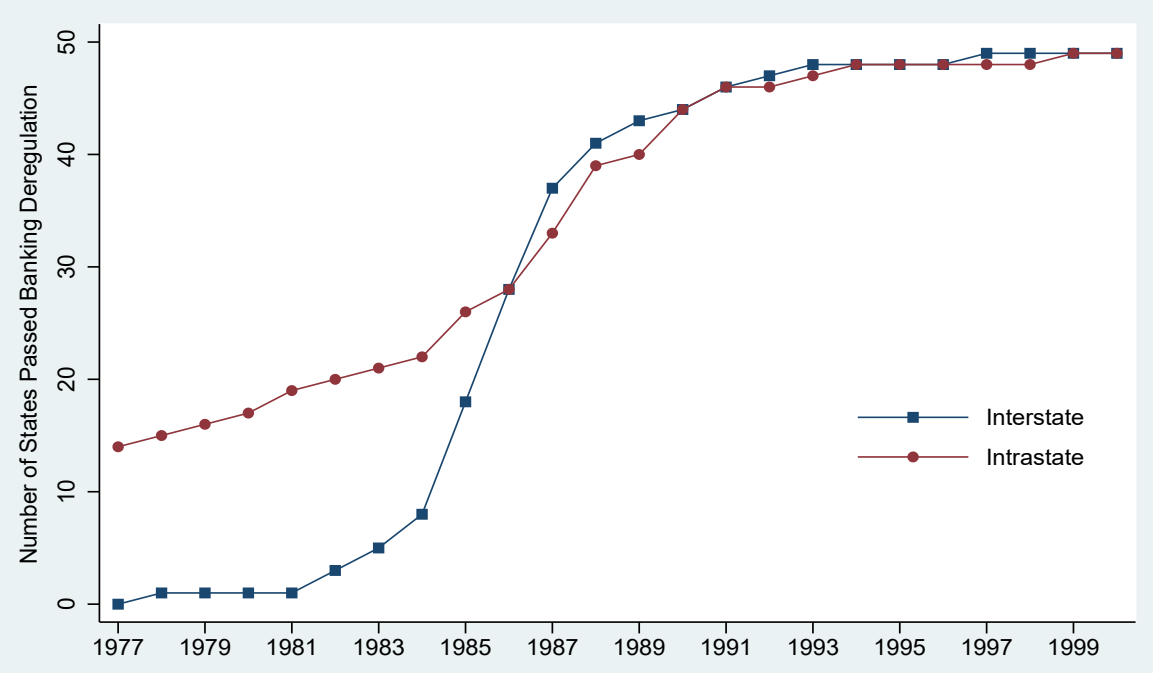


Figure 1. Number of States with Interstate and Intrastate Banking Deregulation

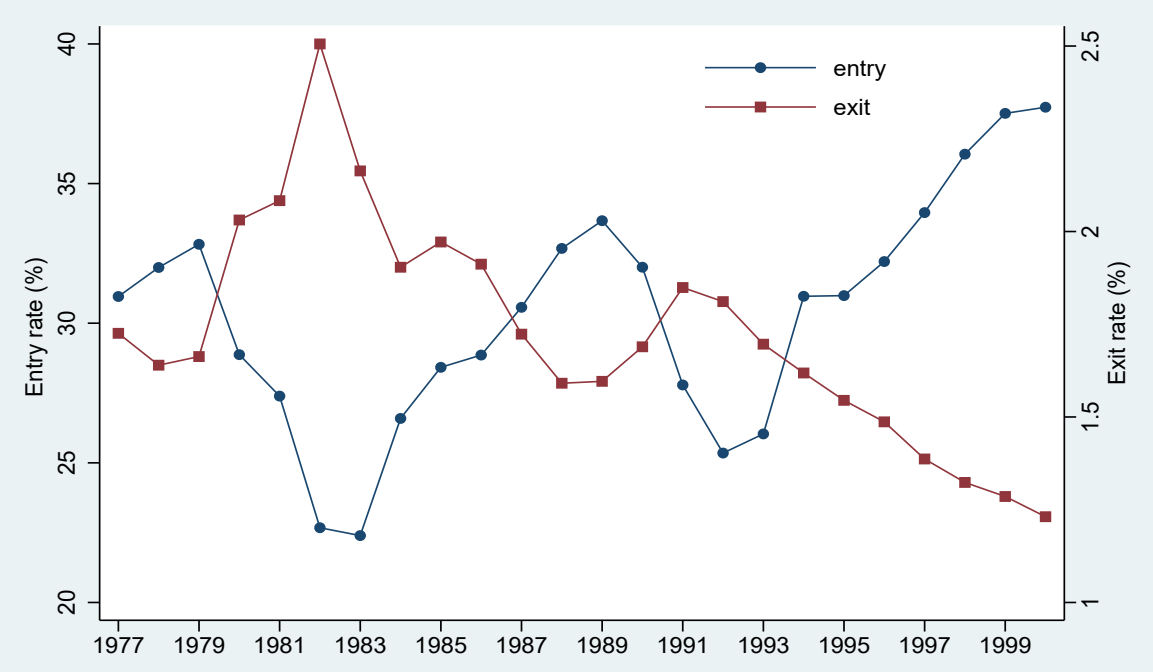
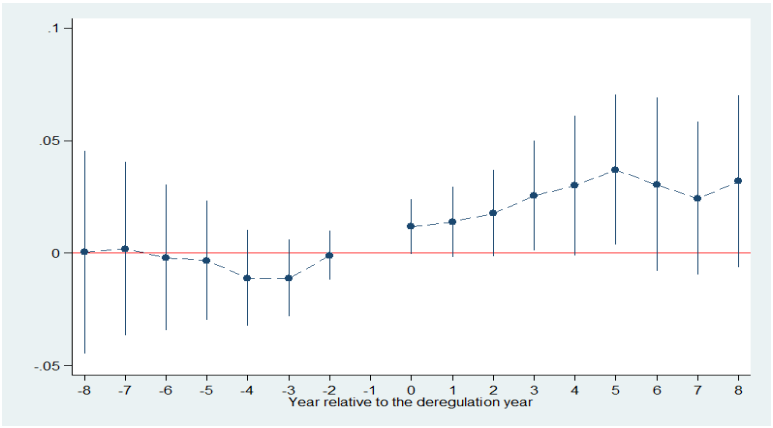
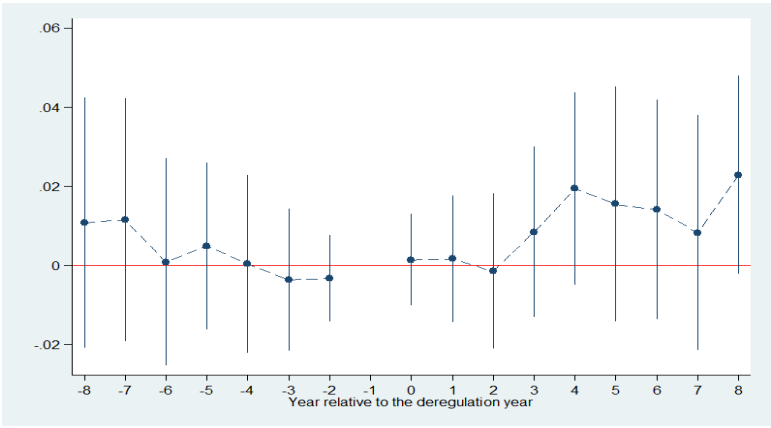


Figure 2. Average Monthly Entry and Exit Rates

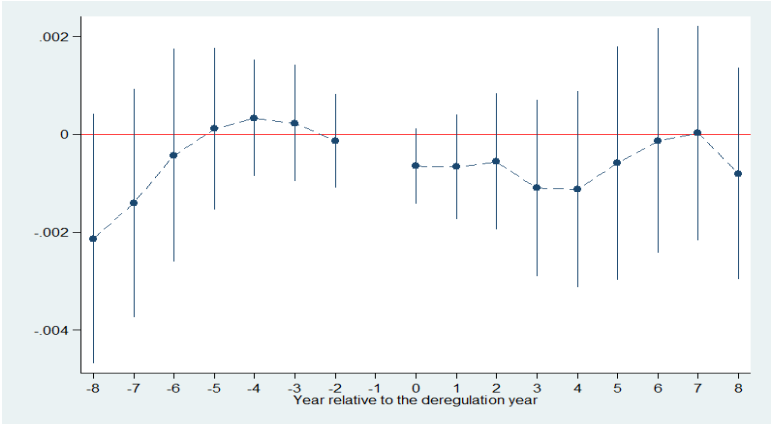


a. Interstate Deregulation

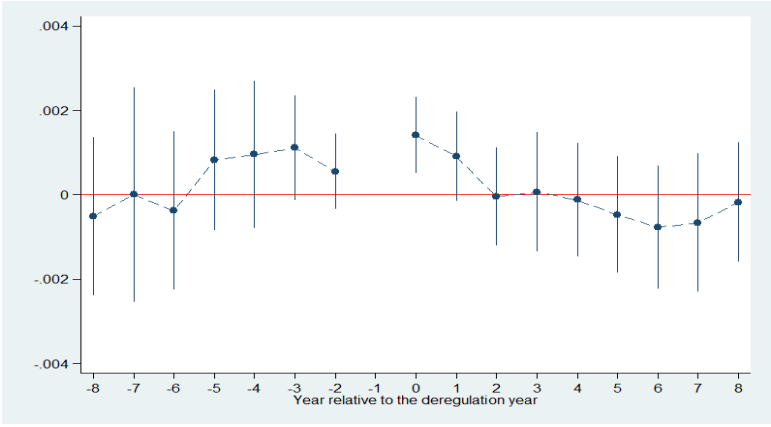


b. Intrastate Deregulation

Figure 3. Impact of Banking Deregulations on the Average Monthly Entry Rate

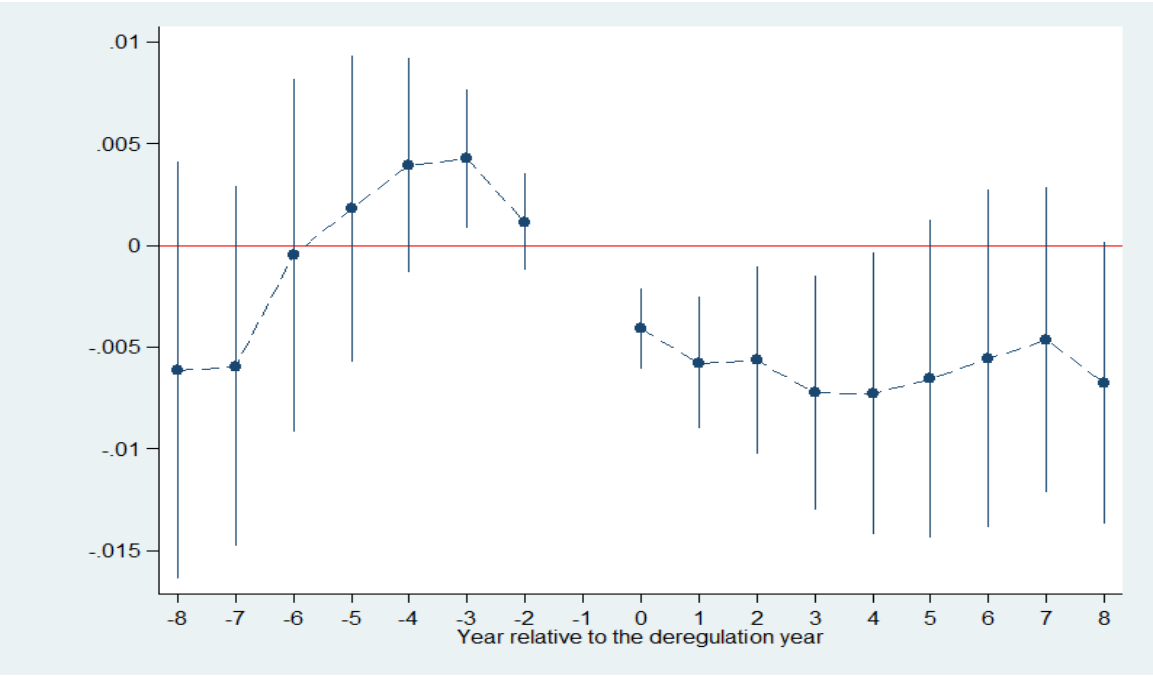


a. Interstate Deregulation

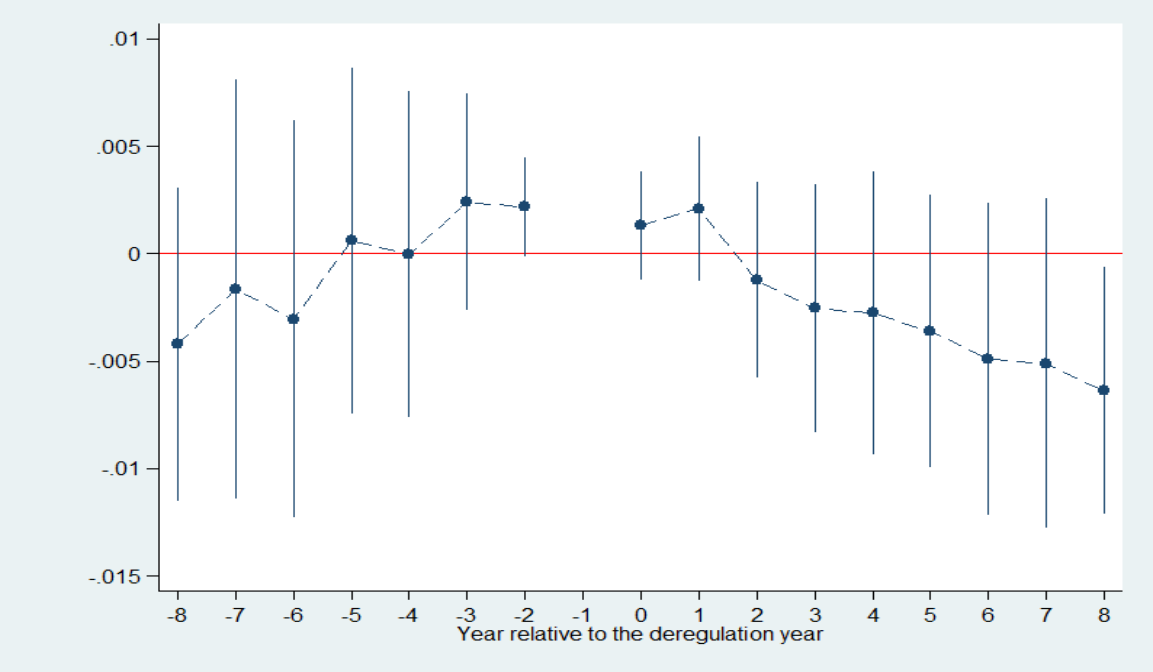


b. Intrastate Deregulation

Figure 4. Impact of Banking Deregulations on the Average Monthly Exit Rate

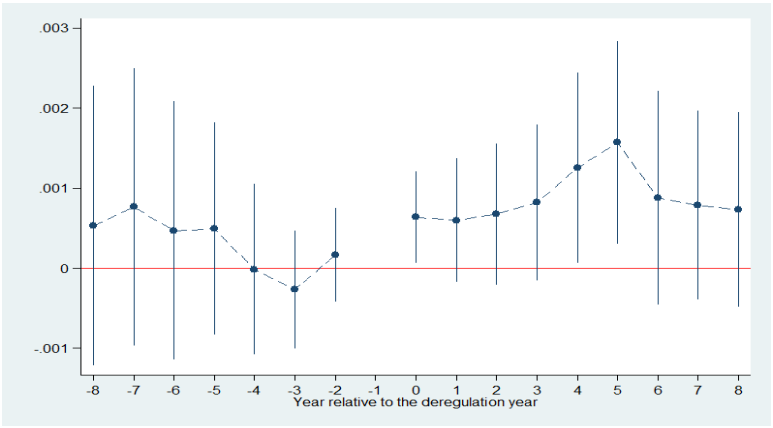


a. Interstate Deregulation

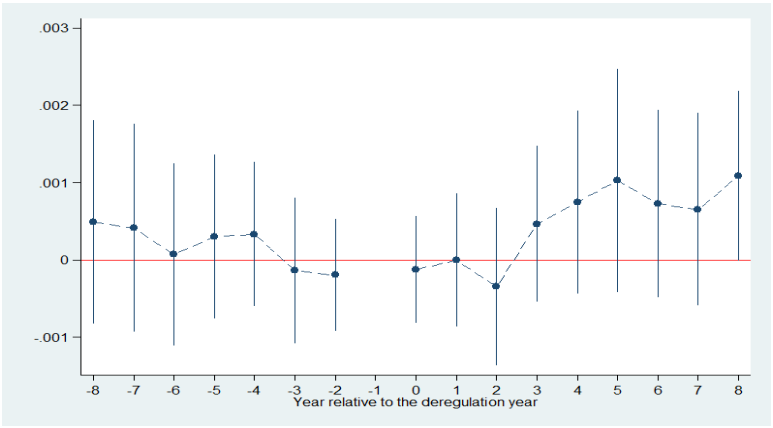


b. Intrastate Deregulation

Figure 5. Impact of Banking Deregulations on Unemployment Rate

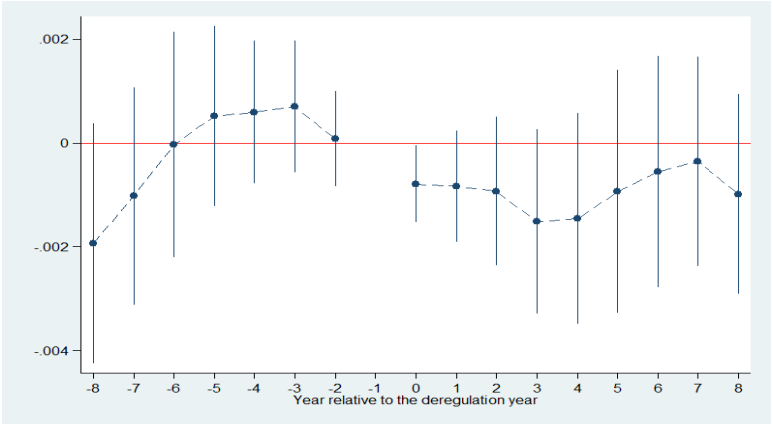


a. Interstate Deregulation

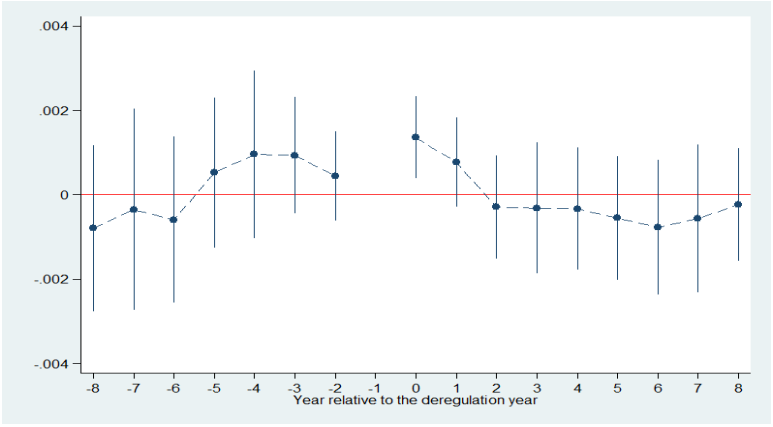


b. Intrastate Deregulation

Figure 6. Impact of Banking Deregulations on Entry Rate, Industry-level Analysis



a. Interstate Deregulation



b. Intrastate Deregulation

Figure 7. Impact of Banking Deregulations on Exit Rate, Industry-level Analysis