Banking regulatory constraints and personal bankruptcy filings[1]

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Abstract

The economic well-being of a household depends on its access to credit and to a legal system for managing over-indebtedness. Our hypothesis is that the removal of regulatory constraints on a bank's ability to expand in new geographic markets increases credit access to households, which in turn, contributes to the rise in consumer defaults. We find a *net* increase in Chapter 13 bankruptcies following a loosening of the state's restrictions on multi-branch banking, compared to the increase in Chapter 13 bankruptcies in states that did not change their banking rules. The increased mortgage lending after branch deregulation helps explain this rise in Chapter 13 filings, suggesting that homeowners use the Chapter 13 code to save their houses. Further, the effects of the mortgage supply channel are greater in areas with less bank concentration. Overall, our findings are relevant to policymakers in their efforts to either set up a new personal insolvency regime or modify the existing bankruptcy process.

1. Introduction

The banking industry is arguably the most regulated industry. A bank faces regulation on the interest rate it can pay (charge) on a deposit (loan), products and services it can offer to customers, reserves it must maintain to remain solvent, and on the geographical areas where it can operate. Depending on a bank's charter, it is continuously supervised by a state banking agency and/or by federal agencies such as the Federal Reserve System, Federal Deposit Insurance Corporation (FDIC), and Office of Comptroller of Currency. This paper focuses on a regulatory constraint imposed by a state limiting a bank's ability to expand its operations freely in that state. In the US, prior to the mid-1970s, only 12 states allowed their banks to open branches anywhere in the state (intrastate branching), and none of the states permitted an out-of-state bank to operate in its jurisdiction (interstate banking). These restricted banking rules were gradually relaxed during the 1980s and early 1990s. Our general hypothesis is that a bank's entry into a new geographical market can increase credit access to households that, in turn, can contribute to the rise in consumer defaults. More specifically, we conjecture that the increased bank access can increase Chapter 13 bankruptcies through the mortgage supply channel.[1]

The economic arguments underlying the hypothesis are as follows. By entering a new geographical market, a bank can benefit from diversification and economies of scale. Because local economies are not perfectly correlated, the bank can reduce the overall default risk by lending to consumers of different geographical areas (Cowan and Cowan, 2004; Musto and Souleles, 2006; Desai, 2017). Further, the technological advancements in communication such as long-distance telephone and internet, and the availability of large credit databases of consumers allow a bank to

[1] In the case of Chapter 13 bankruptcy, the borrower retains all their nonexempt wealth (personal assets) and repays the unpaid debt over the debt repayment period of three to five years. In the case of Chapter 7 bankruptcy, the borrower's nonexempted assets are liquidated to repay the unpaid debt.

reduce the average cost per unit of banking service by expanding its customer base. Tewari (2014) shows that mortgage lending, especially to the households with below-average income, increases after a state relaxes its restrictions on intrastate branching. Economic hardships such as job loss, health problems, and change in marital status can force some households to miss their mortgage payments.[2] The filing for personal bankruptcy, especially under the Chapter 13 code, is a legal mechanism to manage debt burden and to save a borrower's house. The foreclosure process immediately halts upon bankruptcy filing. The borrower can repay mortgage arrears during the debt repayment period. Further, the bankruptcy judge can insist that a mortgage lender change mortgage terms and/or to reduce the outstanding principal amount.[3] Filing under Chapter 7 also helps a homeowner save their homes. It allows them to stop paying their unsecured loans, and that "savings" can help them pay mortgage dues (Berkowitz and Hynes, 1999). The help, however, is less substantive than that from filing under Chapter 13. Therefore, our hypothesis is that a state's removal of regulatory constraints on bank-branch expansion increases Chapter 13 bankruptcies through increased mortgage lending.

We test our hypothesis on the U.S. county-level data for the period 1980-2004. The difference-in-difference (diff-in-diff) result shows a *net* increase in Chapter 13 bankruptcies in [treatment] states that removed regulatory constraints on intrastate branching as compared to the increase of Chapter 13 bankruptcies in [control] states that had no such banking rule change. The increase in mortgage supply, as proxied for by the number of mortgages originated, helps explain the rise in Chapter 13 bankruptcy after a state allows intrastate branching. This finding suggests

[2] The correlation coefficient between the number of mortgage borrowers and the number of mortgage borrowers whose payment is due over 90 days is 0.84. (Source: Authors' calculations using county-quarter data of TransUnion LLC for the period 1996-2006).

[3] Prior to the Supreme Court ruling in 1993, bankruptcy judges were allowed to reduce the outstanding principal amount of an underwater mortgage to the current market value of the home, known as mortgage cram-down or strip-down. For the effects of the Supreme Court ruling on the mortgage market, see Li *et al.* (2019).

that mortgage borrowers use Chapter 13 bankruptcy to save their houses. Further, we find that the effects of intrastate branching on Chapter 13 filings through the mortgage supply channel are stronger in counties with low bank concentration. This finding indicates that, after a state removes branching restrictions, a large bank prefers to enter in a local market that was previously dominated by smaller banks. We also find support to our main finding that Chapter 13 filings increase after regulatory restraints on intrastate branching are removed in a sample of 186 contiguous county-pairs that are located in the east region (east of the Great Plains). Although our main focus is on Chapter 13 filings, we also analyze Chapter 7 filings for completeness. Often households decide to file for bankruptcy before they decide which Chapter to use; therefore, Chapter 7 and Chapter 13 filings are generally positively correlated. We find that the effects of intrastate branching and interstate banking on Chapter 7 bankruptcies are statistically insignificant.

To the best of our knowledge, this paper is the first to document an increase in Chapter 13 bankruptcies following a loosening of a state's restrictions on multi-branch banking, compared to the increase in Chapter 13 bankruptcies in states that did not change their banking rules. Dick and Lehnert (2010), using state-level data, find that interstate banking increases Chapter 7 filings. Our paper differentiates from theirs in scope, data aggregation, and methodology. We focus on both Chapter 7 and Chapter 13 filings, test whether homeowners use Chapter 13 in an effort to save their houses, and use county-level data that allows not only to use finer controls but also to employ methodology using a sample of contiguous county-pairs.[4]

Our identification strategy, using the change in a state legislation allowing a bank to open branches anywhere in the state, rests on the exogeneity assumption. In particular, the question can

[4] We replicate the main results of Dick and Lehnert (2010), their Table III on page 668, and find that the interstate banking effect gains traction only when the econometric specification includes unemployment rate as a control variable. The results of the replication exercise are available in the Internet Appendix of this paper.

arise whether a state's timing of intrastate branching is an exogenous event or it might occur in response to bankruptcy filings under Chapter 13 or underlying economic conditions. Boustanifar (2014) shows that a state's preexisting labor market conditions such as employment and wage growth are statistically insignificant determinants of when that state allows intrastate branching. Beck *et al.* (2010) show that a state's income inequality does not influence its decision to remove restrictions on bank branching. Further, Tewari (2014) finds no systematic trends in mortgage market conditions in explaining a state's timing of intrastate branching. We follow these studies to test the exogeneity assumption in our data. Figure 1 shows the timing of a state's removal of restrictions on intrastate branching and the average Chapter 13 bankruptcy rate prior to that reform. This scatter plot indicates no relationship between the prior Chapter 13 bankruptcy rate and the timing of bank branch deregulation. The regression of branch deregulation year on the prior average Chapter 13 bankruptcy rate gives a *t*-statistic of 0.09. Therefore, a state's timing of relaxing regulatory constraints on bank branching is exogenous to its preexisting bankruptcy filings under Chapter 13.

The roadmap of the paper is as follows. Section 2 provides a historical perspective on regulatory constraints on a bank's ability to expand geographically. It also documents the salient features of the personal bankruptcy process in the US. Section 3 describes data and variables. Section 4 shows the results using panel data of all US counties. Section 5 reports the results using a sample of contiguous county-pairs. Section 6 concludes the paper.

[Insert Figure 1 here]

2. History of restrictions on bank expansion and personal bankruptcy process in the US

In this section, we briefly provide the historical perspective on regulations limiting the geographical expansion of a bank in the US.[5] We also highlight the salient features of the personal bankruptcy process in the US and review literature that suggests that Chapter 13 bankruptcy helps a borrower save their house.

2.1. History of regulations limiting geographic expansion of the US banking sector

The US has a dual banking system. A firm interested in pursuing a banking business needs to obtain a charter issued by either a state banking agency or federal agency. If it obtains the charter with a state agency, it is known as a state bank; if it obtains the charter from the Comptroller of Currency, it is known as a national bank. The essence of a dual banking system is that it allows an existing bank to change its charter from state to national and vice versa in order to avoid excessive bank regulations. It needs approval from the chartering agency whose charter it is seeking, not the one that issued it the original charter. This flexibility to a bank generates "regulatory competition" between federal and state chartering agencies. They compete to issue new charters and to retain existing banks in their jurisdictions. To attract a bank's business in its jurisdiction, a charter-granting agency can incentivize the bank by offering it to expand geographically through a branch network. At the same time, state and federal regulators are mindful of possible bank failures and the subsequent loss of public confidence in the banking system. Until 1994, whether to allow a bank to expand in a state was predominantly under the purview of the state legislature.

2.1.1. Intrastate branching

[5] For the US bank deregulation history, we mainly refer to Johnson and Rice (2008), Kane (1996), Ginsburg (1983), Amel and Liang (1992), Kroszner and Strahan (1999), and Kroszner and Strahan (2014).

Till 1922, various comptrollers of currency interpreted the National Bank Act of 1865 as if it prohibits a national bank to open branches. Thus, a national bank was at a competitive disadvantage compared to its counterpart state banks in those states that allowed a state bank to open branches anywhere in the state. To mitigate the losses, numerous national banks became state banks by switching their charters. The passage of the McFadden Act of 1927 and Glass-Stegall Act of 1933 eventually put a national bank at par with a state bank as far as branching is concerned. However, many states still did not permit intrastate branching, and the banks in those states could not grow to their full potential.

Some banks, to an extent, circumvented state and federal branching statutes by innovative contracting. The bank holding company (BHC) structure helps a bank to mimic branch networking structure. Under a BHC structure, a parent firm forms a bank holding company and incorporates subsidiary banks. Each subsidiary bank has its own charter and operates in a designated local area. A BHC with five subsidiary banks is equivalent to a headquarter bank with four separate branch offices. The drawbacks of the BHC structure are the administrative costs of having separate charters, the compliance with regulatory requirements for each subsidiary, and the set up of a board of directors for each subsidiary bank. Further, a customer of subsidiary Bank A cannot withdraw cash from subsidiary Bank B because the parent bank is not allowed to consolidate assets and liabilities of subsidiary banks.

During the 1970s and 1980s, most states relaxed state laws on intrastate branching. One economic reason for this relaxation is that the nonbank finance companies, such as thrifts, could open branches anywhere in a state without any restrictions. These firms offer similar services as offered by a bank such as issuing deposits and retail lending. Another reason is that a 1987 ruling by a federal appellate allowed a national bank to open branches in a state if thrifts were allowed to

do so. To be fair to state-chartered banks, the state legislatures started removing curbs on intrastate branching. The technological advancements in communication and data processing sectors helped banks to serve customers remotely. Finally, during this period, the threat of interstate banking was imminent. State-chartered banks lobbied for intrastate branching so that they could consolidate their assets and liabilities and compete against out-of-state banks.

2.1.2. Interstate banking

"Interstate banking" refers to the regulatory approval for an out-of-state bank to offer banking services in a given state. An out-of-state bank can enter a state by either acquiring an existing bank in the state or by setting up a *de novo* [new] bank after obtaining a charter of the target state. More importantly, an out-of-state bank needs approvals from both target and home states. State regulators, for the most part, have been less willing (a) to allow their in-state banks to cross their state lines, and (b) to embrace out-of-state banks in their jurisdictions.

In the early part of the twentieth century, some banks expanded across state lines using the BHC structure. Specifically, large banks first set up a BHC and then acquired the in-state banks of the target states. At the time of the enactment of the federal BHC Act of 1956, there were 19 BHCs operating in more than one state. Although it "grandfathered" the prevailing BHC set-up, the Douglas amendment of the BHC Act essentially brought interstate banking to a standstill by preventing a BHC from acquiring another bank unless the target state allowed such a merger. Since all states prohibited such mergers, a bank could not expand using the BHC route for the next two decades.

In 1978, Maine became the first state to allow an out-of-state bank to acquire its bank under the reciprocity arrangement.[6] In 1982, New York and Alaska passed a similar law. In the early 1980s, a federal legislation called the Garn-St. Germain Act was passed that allowed a bank to acquire a failed bank irrespective of state law. The states entered into a reciprocity arrangement with other states or with a regional alliance that allowed interstate bank mergers. In a span of just four years between 1985 and 1988, 35 states passed legislation allowing interstate banking.

[Insert Table 1 here]

In Table 1, we provide a list of states by year in which a state allowed intrastate branching and interstate banking. We obtain these data from Dick and Lehnert (2010) and Huang (2008).[7] The passage of the federal legislation Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) of 1994 culminates the restrictions on intrastate branching and interstate banking, allowing a bank to open branches and pursue banking activities anywhere in the US. Therefore, we take the year of intrastate branching and interstate banking as 1994 for Iowa and Hawaii, respectively, because these two states passed legislation allowing a bank to expand geographically after 1994.

2.2. U.S. personal bankruptcy process and Chapter 13 bankruptcy to save a borrower's house

According to the United States constitution, bankruptcy legislation falls under the purview of the federal government. The personal bankruptcy code involves consumer bankruptcy and unincorporated business bankruptcy. Our focus is on consumer bankruptcy, which is the legal

[6] In a reciprocity arrangement, a bank of State X can be acquired by a bank of State Y. However, State Y must allow an acquisition of its bank by any given bank of State X.
[7] Their original data source, like several other studies on bank geographic deregulation, is Amel (1993).

process through which an individual can discharge their unpaid debt.[8] All forms of unsecured debt such as credit card bills, medical bills, installment loans to finance durables, and utility bills are discharged. Secured loans such as mortgages and automobile loans are discharged only if the debtor gives up the collateral in the bankruptcy. Student debt, child support obligations, and debt incurred due to fraud are not discharged in the bankruptcy. An individual can file for consumer bankruptcy protection using the Chapter 7 or Chapter 13 code.

Chapter 7 bankruptcy is similar to the liquidation feature of corporate bankruptcy. In Chapter 7 bankruptcy, a debtor surrenders all their nonexempt wealth. This nonexempt wealth is used to recover unpaid debt. The amount of nonexempt wealth is dependent on the debtor's state of residence. A state can set its own homestead and property exemptions, which is the only aspect of bankruptcy legislation that is under the purview of state government. After Chapter 7 bankruptcy proceedings, all unsecured debts are discharged and future wages of the debtor are protected. The Chapter 7 code is also known as the 'fresh-start' code.

On the other hand, Chapter 13 bankruptcy is similar to the reorganization feature of corporate bankruptcy. In Chapter 13 bankruptcy, a debtor submits a debt repayment plan at the time of filing. In this plan, they commit to repay the unpaid debt over the next three to five years from their future wages. In return, all their nonexempt wealth is protected. As per the "best-interest-of-creditors test," when a debtor files under the Chapter 13 code, a creditor must receive the same amount of unpaid debt as they would have received in case the debtor had filed under the Chapter 7 code.

[8] The number of unincorporated business bankruptcies is very low compared to that of consumer bankruptcies. And to remain consistent with the literature, we use terms 'consumer bankruptcy' and 'personal bankruptcy' interchangeably.

A financially-distressed homeowner may use Chapter 13 bankruptcy to save their home. Filing for a bankruptcy petition immediately halts the debt collection process including foreclosure. The decision on whether to approve or reject a Chapter 13 petition takes time since bankruptcy filing involves extensive paper work (Porter, 2012). This period gives the debtor breathing space to either arrange for funds from relatives or friends, thereby remaining current on their mortgage. If the debt repayment plan is approved by the bankruptcy judge, then the debtor can include all the unpaid mortgage payments and late fees as mortgage arrears in the debt repayment plan. White (2006) conjectures that debtors who are behind on their mortgage or car payments file for Chapter 13 to delay the foreclosure process. As she explains on page 245, "under Chapter 13, car lenders can be forced to reduce the principal value of the loan to the car's current market value, and mortgage lenders sometimes voluntarily agree to easier repayment terms."

Using Chapter 13 filings of Delaware for 2006, White and Zhu (2010) report that 96 percent of Chapter 13 filers are homeowners, and 79 percent of Chapter 13 filers repay mortgage debt during their repayment plans. Dobbie and Song (2015) use the random assignment of a Chapter 13 bankruptcy judge as an identification strategy. Using the leniency of a bankruptcy judge as an instrumental variable, they separate otherwise comparable individuals in two groups. In the first group, the individual's Chapter 13 petition has been approved by a lenient judge and in the second group, the individual's Chapter 13 petition has been denied by a strict judge. They follow individuals of both groups for a five-year period. They find that the number of foreclosures is low for the group of individuals who were allowed to file Chapter 13 bankruptcies, suggesting that the Chapter 13 code helps reduce the foreclosures.[9]

[9] In an extension study, Dobbie *et al.* (2017) compare Chapter 13 filing outcome of an individual with their credit bureau data for the next five years. They find the future credit access significantly improves for the Chapter 13 filers and the probability of remaining in the same house is also higher after Chapter 13 filing.

Berkowitz and Hynes (1999) hypothesize that mortgage borrowers are more likely to default on their unsecured debt and file for bankruptcy but remain current on their mortgage obligations. The bankruptcy filing will allow a debtor to discharge all or some of the unsecured loans, and that "savings" will help them pay mortgage dues. Using the Home Mortgage Disclosure Act (HMDA) data on mortgage loans and state-level bankruptcy exemptions, Berkowitz and Hynes find support to their hypothesis.

Overall, the institutional features of the Chapter 13 bankruptcy code and empirical research suggest that homeowners use Chapter 13 filings to save their houses.

3. Data and variables

3.1. Dependent and independent variables of interest

The county-level data on consumer bankruptcy filings are from the Report F-5A of the Administrative Office of the U.S. Courts. The dependent variables are the Chapter 7 bankruptcy rate and the Chapter 13 bankruptcy rate, which is the number of bankruptcy filings under the Chapter 7 and Chapter 13 procedure in a given year per 1,000 population, respectively. The population data are from the U.S. Census. The county-level personal bankruptcy data are not available prior to 1980.

The independent variables of interest are two indicator variables capturing a bank's ability to expand geographically in a state. The indicator variable for interstate banking takes on a value of one for a given year if a state allows interstate banking in that year, and zero otherwise. The indicator variable for intrastate branching takes on a value of one in a given year if a state permits

intrastate bank branching in that year, and zero otherwise. We exclude Delaware and South Dakota in our analyses due to their consumer finance laws favoring credit card companies.[10]

3.2. Trends in personal bankruptcy rate and geographic bank deregulation

Figure 2 shows the time trends in average personal bankruptcy rates for both Chapter 7 and Chapter 13 for states that permit intrastate branching and those that restrict intrastate branching. The numbers in square (curly) brackets next to markers are the number of counties of states that allow (restrict) intrastate branching. This data visualization exercise suggests the following. First, there is an overall upward trend in Chapter 7 and Chapter 13 filings, regardless of whether a state permits or restricts intrastate branching. Second, for the period 1980-1989, which is the majority part of the branch deregulation period, the differences in Chapter 7 bankruptcies of states allowing and restricting intrastate branching is indistinguishable from zero. This observation indicates trivial or no impact of intrastate branching on Chapter 7 filings. Third, Chapter 13 bankruptcies in the states that allow intrastate branching are more than that in the states that restrict intrastate branching for each year. Overall, Figure 2 indicates a relation between a state's removal of regulatory constraints on intrastate branching and the number of Chapter 13 filings by its residents.

[Insert Figures 2 and 3 here]

Figure 3 shows the time trends in average personal bankruptcy rate of counties based on whether a state relaxes its regulatory constraints on interstate banking. As shown in the figure, prior to 1984, the average Chapter 7 and Chapter 13 bankruptcy rates are higher when a state

[10] In a landmark case of *Marquette National Bank of Minneapolis v. First Omaha Service* in 1978, the Supreme Court ruled that a lender is allowed to charge interest rate as per the usury laws of its home state, regardless of the domicile of borrowers. In the case of credit card loans, unlike the small business lending, the borrowers are dispersed throughout the nation. To bring credit card companies in their states, Delaware and South Dakota removed their usury limits entirely (Kroszner and Strahan, 2014).

restricts interstate banking. The trends seem to be reversed after 1987. As mentioned earlier, 35 states passed legislation allowing interstate banking in a span of just four years between 1985 and 1988.

3.3. Control variables

The control variables reflect the local economic conditions and state-level personal bankruptcy exemptions. A county's unemployment rate and income growth are the reliable predictors of its default and bankruptcy rates (Desai, 2017). The unemployment rate is the ratio of people seeking a job to the total number of people in the labor market, and is expressed in percentages. The income growth is the change in per capita real income relative to the previous year. We deflate the nominal income to the 1978 level using the Consumer Price Index (CPI). The income and unemployment data are from the Bureau of Economic Analysis and Bureau of Labor Statistics, respectively. We also use a county's house price growth as a control variable. It provides a measure of whether homeowners are likely to want to save their homes (because they have a positive equity) versus preferring to give them up. It is the annual percentage change in the House Price Index® of the Federal Housing Finance Agency. We use one-year lag values of unemployment, income growth, and house price growth. Following Hynes *et al.* (2004), we define the homeowner exemption as the sum of homestead and personal property exemptions. The bankruptcy exemptions data are from state statutes. We deflate the state-level homeowner exemption to the 1978 level and use its natural logarithm in our regressions. The bankruptcy exemption data exclude the District of Columbia.[11] We winsorize the county-level data at the one percentile values on both sides to minimize the impact of outliers.

[11] We are grateful to Richard Hynes for providing us with not only the bankruptcy exemptions data for the period 1980-1996 but also the spreadsheet of their calculation. For the period 1997-2004, we manually collect the data by

3.4. Summary statistics

Our sample period is 1980-2004 for the panel data analysis of all US counties. We use 2004 as the cut-off year, which helps us avoid the influence of the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 and the 2007-08 financial crisis.

[Insert Table 2 here]

Table 2 reports the summary statistics. The mean and median Chapter 7 bankruptcy rates are 1.904 and 1.529 of a typical county, respectively. These statistics are 0.727 and 0.284 for the Chapter 13 bankruptcy rate. In our sample, on average, 28% personal bankruptcies are Chapter 13 bankruptcies. In a typical county, the average unemployment rate is 6.9%, the average real income growth is 1.5% during our sample period. For 38,899 county-year observations where data are available, the average house price growth is 4.18% in our sample.

4. Results using panel data of all county-year observations

4.1. Baseline results

We begin the empirical analysis with the following diff-in-diff model using the panel data of all U.S. counties.

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going over the annual editions of Elias *et al.* (2004) and follow the computation process of Hynes *et al.* (2004). For property exemptions, we consider exemptions on motor vehicles, jewelry, wedding and engagement rings, watches, tools-general, tools-farming, furniture, and wild-card (that can be applied toward real or personal property). The unlimited exemptions pose difficulties in quantification. As an example, Texas has unlimited homestead exemption, whereas Louisiana has unlimited exemption on motor vehicles. For quantifying the unlimited homestead exemption of Texas, we use the following process. First, for our sample period 1980-2004, we deflate homestead exemptions of all the states that have homestead exemptions to the 1978 level. Second, we take the average of the first two highest monetary amounts for two different states. These are the average of $126,709 (for North Dakota year 1980) and $108,817 (for Massachusetts year 2002). Finally, we inflate (take the nominal value) for a given year using the CPI. We follow the same process for property exemptions such as motor vehicles, watches, etc. We refer the reader to Hynes *et al.* (2004) for a detailed discussion on the state-level bankruptcy exemptions in the US and on the computation of the homeowner exemption. We also exclude the District of Columbia because its exemption levels are set by the U.S. Congress, not by an independent state legislature.

$$Y_{cst} = \alpha + \beta D_{st} + \delta X_{cst} + \gamma Z_{st} + A_c + B_t + \varepsilon_{cst} \,, \quad (1)$$

where the dependent variable, Y_{cst}, is either the Chapter 7 bankruptcy rate or Chapter 13 bankruptcy rate of county c of state s in a given year t. The variables of interest, D_{st}, are the indicator variables of interstate banking and intrastate branching. The vector, X_{cst}, is for the time-variant local economic conditions of a county. The variable Z_{st} is for the state-level bankruptcy exemptions. The vectors A_c and B_t are the dummy variables controlling for county and year fixed effects, respectively, and the error term is ε. The coefficient β is the estimate of diff-in-diff. The less-populated counties can generate noisy estimates of the state-specific legislation. Therefore, we run population-weighted regressions using the average population a county during the sample period (1980-2004) as its weight.

[Insert Table 3 here]

Table 3 reports our baseline results of equation (1). The dependent variables for specifications (i) to (v) and specifications (vi) to (xi) are Chapter 7 and Chapter 13 bankruptcy rates, respectively. The local economic conditions help explain the variation in personal bankruptcy filings. A county's income growth and house price growth are inversely related to its Chapter 7 and Chapter 13 bankruptcies. An increase in a county's unemployment rate is associated with an increase in its Chapter 7 bankruptcy rate. As shown in specifications (i) to (v), the coefficients on interstate banking and intrastate branching are statistically indistinguishable from zero. These results indicate that removal of statewide restrictions on a bank's ability to expand geographically seems to have no effect on Chapter 7 bankruptcy filings, which contrasts the earlier findings of Dick and Lehnert (2010).

As shown in specifications (vi) to (xi), the coefficient on intrastate branching is positive and statistically significant, suggesting the effect of a state's removal of restrictions on intrastate

branching on its Chapter 13 bankruptcy rate. For example, the coefficient on intrastate branching in specification (vi) is 0.085. This diff-in-diff result gives an additional increase of around 9 bankruptcy filings under Chapter 13 in a county of 10,000 population following a loosening of the state's restrictions on multi-branch banking rules, compared to the increase in Chapter 13 bankruptcies in states that did not change their banking rules. This change is statistically significant at the 10% level. The average value of the Chapter 13 bankruptcy rate in a typical county before the branching deregulation is 0.195 (this statistic is untabulated). The 0.085 magnitude of the diff-in-diff result indicates an economic significance of around 44%.

4.2. Dynamic impact of intrastate branching of Chapter 13 bankruptcy rate

In this subsection, we analyze the effect of a state's removal of restrictions on intrastate branching on its Chapter 13 filings in a dynamic setting. This exercise also allows us to check the evidence of anticipatory effects prior to the actual branch deregulation event and whether the common trend assumption is satisfied in our data. We run the specification (vi) of Table 3 using the following diff-in-diff regression with leads and lags.

$$Y_{cst} = \alpha + \beta_1 D_{st}^{-8} + \cdots + \beta_7 D_{st}^{-2} + \beta_9 D_{st}^{0} + \cdots + \beta_{12} D_{st}^{+12} + A_c + B_t + \varepsilon_{cst} \,, \qquad (2)$$

where the dummy variable D_{st}^{0} takes on a value of one for all the counties of state *s* in the event year *t*, and zero otherwise. The event year is the year in which a state enacts a legislation removing geographic restrictions on its banks to open branches anywhere in the state (intrastate branching). Similarly, the dummy variable $D^{\mp J}$ takes on a value of one if the year *t* is *J* years prior to or posterior to the event year of the state *s*. The negative sign is for the prior year and the positive sign is for the posterior year. For estimation purposes, we follow the norm and omit the "-1" year (that is, the year right before treatment). We consider a 20-year span starting from the eighth year

prior to and ending on the 12th year posterior to the intrastate branching year. For all the county-year observations before the eighth year prior to the event year, the dummy variable D_{st}^{-8} takes on a value of one. Similarly, for all the county-year observations after the 12th year posterior to the branching deregulation year, the dummy variable D_{st}^{+12} takes on a value of one. The coefficients, β, on the dummy variables $D^{\mp J}$ are the parameters of interest. Their significance indicates whether the Chapter 13 bankruptcy rate, Y, in a given year differs from that in the one-year prior to the branch deregulation (event) year.

[Insert Figure 4 here]

Figure 4 plots a trend in the effect of branch deregulation on Chapter 13 filings. The y-axis shows the change in average Chapter 13 bankruptcy rate relative to that during the one-year prior to the intrastate branching year. The black dots are the magnitude of the coefficients on dummy variables, $D^{\mp J}$ of Equation (2), and the dashed vertical spikes refer to the 95% confidence interval. The effect is significant if the vertical spike fails to cross the horizontal line passing from zero. During the period prior to branching deregulation by a state, the average Chapter 13 bankruptcy rate is almost the same as that in the one-year prior to the branching deregulation year. This trend shows that, in our data, there is no evidence for anticipatory effects prior to the occurrence of the branch deregulation event. It also indicates that the common (parallel) trend assumption is satisfied in our data. However, after a state relaxes restrictions on intrastate branching, the Chapter 13 bankruptcies gradually increase. In all posterior years, the 95% confidence intervals, as shown by the vertical spikes, are above the horizontal line passing from zero. It shows that the average Chapter 13 bankruptcy rate for any given year after a state relaxes restrictions on bank branching is significantly higher than that for the one-year prior to the branching legislation was passed.

To summarize, the results based on all county-year observations indicate that removal of regulatory constraints on a bank's ability to open branches anywhere in the state leads to an increase in Chapter 13 bankruptcies.

4.3. Mortgage lending and the effects of branch deregulation on personal bankruptcy filings

In the previous subsection, we document that the relaxation of regulatory constraints on intrastate branching by a state causes an increase in number of Chapter 13 filings in that state. In this subsection, we assess whether the increased mortgage lending, if any, following a state's loosening of its multi-branch banking rule helps to explain the rise in Chapter 13 filings. The main reason for focusing on mortgage supply is that the institutional features of Chapter 13 bankruptcy, such as shielding current wealth but taxing future income to recover the unpaid debt, provide an opportunity to financially-distressed homeowners to save their houses.[12]

The HMDA dataset provides data on county-level mortgage lending starting 1981. For the period 1981-89, they are available at the census tract level, and after 1990 at the individual loan level. We consider conventional, single-family home purchases, and owner-occupied mortgage loans originated.[13] For 51,923 county-year observations for the period 1981-2004, the mean, median, standard deviation, 25th percentile, and 75th percentile values of the number of mortgage loans originated are 876, 126, 2108, 23, and 628, respectively [These statistics are not tabulated].

[12] We note the expansion of credit card lending during the period of branch deregulation (1980-94), mainly after the *Marquette National Bank of Minneapolis v. First Omaha Service* case (see footnote 10), which can affect personal bankruptcies. Unfortunately, we have a data limitation. From TransUnion LLC, we could obtain county-level data on revolving credit from 1992 onwards. Kozak and Sosyura (2015) are the only researchers, to the best of our knowledge, who have access to credit card data starting in 1982 (Panel A- Table 2 of their paper). We reached out to them as well as other academics, credit bureau sales teams, and various government agencies, but still could not obtain the data.

[13] The HMDA dataset provides mortgage originations by agencies such as commercial banks, credit unions, independent mortgage companies, and state government agencies. Since Chapter 13 bankruptcy can be filed by mortgage borrowers of any financial agency, we consider all the mortgage originations in our analyses. We find qualitatively similar results using mortgage originations by only commercial banks.

[Insert Figure 5 here]

Figure 5 shows the dynamic impact of a state legislation allowing intrastate branching on its mortgage lending. The empirical specification is the same as the one shown earlier in Equation (2). The dependent variable is the natural logarithm of one plus the number of mortgages originated (Tewari, 2014).[14] The omitted year is "-1", which is one-year prior to the branch deregulation (event) year. As shown in Figure 5, during the period prior to a state's branching deregulation, the mortgage supply in a county is either lower or at the same level than that in the one-year prior to the branch deregulation (event) year. However, after a state loosens its intrastate branching restrictions, the mortgage supply in a county gradually increases. In a year posterior to the branch deregulation year (except the first year), the 95% confidence intervals, as shown by the vertical spikes, are above the horizontal line passing from zero. This trend shows that the number of mortgage borrowers has increased after a state removes its regulatory constraints on bank-branch expansion. This result supports the findings of Tewari (2014).

Next, we test whether the mortgage supply channel contributes to the increase in Chapter 13 bankruptcy filings following a state's decision to eliminate regulatory constraints on intrastate branching. For that, we modify the fixed effects estimation of Equation (1) by including an interaction term of intrastate branching and mortgage supply. Specifically, we run the following diff-in-diff regression.

$$Y_{cst} = \alpha + \beta D_{st} + \theta M_{cst} + \kappa D_{st} \times M_{cst} + \delta X_{cst} + \gamma Z_{st} + A_c + B_t + \varepsilon_{cst} \,, \qquad (3)$$

where the notations for variables Y_{cst}, X_{cst}, Z_{st}, A_c, and B_t are the same as those shown earlier in Equation (1). The continuous variable M_{cst} measures the mortgage lending of a county c of state s

[14] Our data of mortgage originations are skewed to the right due to some of the counties with high values of mortgage originations. By taking the natural logarithm, we spread out the clumps of data and bring closer the data with high values. The log-transformation of mortgage originations also allows us to interpret the results better.

at the beginning of year *t*. We take the beginning-period mortgage supply values to capture the time difference in taking a mortgage and filing for Chapter 13. The variable D_{st} is the indicator variable measuring a state's removal of restrictions on intrastate branching.[15] The coefficients θ and κ are of interest. They capture the magnitude of the change in the dependent variable for either the Chapter 13 bankruptcy rate or the Chapter 7 bankruptcy rate for a given change in mortgage supply in a state allowing intrastate branching relative to a state still imposing regulatory constraints on intrastate branching.

[Insert Table 4 here]

Table 4 reports the results of the analysis determining the role of the mortgage supply channel in explaining the effect of branch deregulation on personal bankruptcy filings. The dependent variable is the Chapter 13 bankruptcy rate for specifications (i) to (v), whereas it is the Chapter 7 bankruptcy rate for specifications (vi) to (x). As shown in specifications (i) to (v), for explaining the variation in the Chapter 13 bankruptcy rate, the coefficient on the interaction term (Intrastate branching x Mortgage supply) is positive and statistically significant, which provides evidence of the mortgage supply channel. As an example, as per the specification (i) of Table 4, the coefficient on the variable 'Mortgage supply' is -0.001 and that on the interaction term is 0.043. Together these coefficients suggest that a 10% increase in the number of mortgage originations increases the Chapter 13 bankruptcy rate by 0.004, when a treatment state loosens its multi-branch banking rule.[16] In the case of a control state that does not change its banking rule a similar 10% increase in the number of mortgage originations decreases the Chapter 13 bankruptcy rate by 0.0001. The *net* increase in the Chapter 13 bankruptcy rate in a treatment state is statistically

[15] We use an indicator variable 'interstate banking' as a control variable for this analysis.
[16] It is $\ln(1.10) \times [0.043 - 0.001]$.

significant at the 5% level. The average Chapter 13 bankruptcy rate in a control state that restricts intrastate branching is 0.315 (this statistic is untabulated). Therefore, the net increase of 0.004 in the Chapter 13 bankruptcy rate suggests an economic significance of 1.3%.

When we use Chapter 7 bankruptcy rate as a dependent variable as shown in specifications (vi) to (x) of Table 4, we find a negative and statistically insignificant value of the coefficient on the interaction term in most regressions. These findings suggest that the effect of branch deregulation on Chapter 7 bankruptcy rate through the channel of mortgage supply is negligible.

To summarize, we show that the bank access increases Chapter 13 bankruptcy rates through the mortgage supply channel. Using a state legislation that allows intrastate branching as an exogenous shock, we provide supporting evidence to the hypothesis that homeowners use Chapter 13 filings in an effort to save their houses.

4.4. Mortgage supply channel in the areas of high versus low bank concentration

In the previous subsection, we document that, after a state relaxes regulatory constraints on intrastate branching, an increased mortgage lending also increases Chapter 13 bankruptcies. In this subsection, we analyze whether this mortgage supply channel differs in areas with high and low bank concentrations.

The economic rationale of undertaking this analysis is as follows. As Kane (1996) argues on the regulatory dialectic topic, *de facto* avoidance usually precedes *de jure* deregulation. The prior authorization of multi-bank holding companies and the expansion of the thrift industry had already increased bank concentration in many areas of a state, especially in an urban/populated county. When intrastate branching was finally allowed, the main effect was to allow consolidation

into the lead bank of a group of bank subsidiaries across a holding company and thereby to reduce the legal costs of multi-office governance going forward. Amel (1989) shows that the probability of a new bank entry in a highly concentrated market is low. That may not be the case for a county with less bank concentration, especially a county with many small banks. Lawrence and Watkins (1986) show that bank holding companies prefer entering into growing and less-concentrated markets. After a state removes restrictions on intrastate branching, these markets are likely to experience a growth in the number of large banks. This can increase the number of *de novo* branches and/or conversion of a small bank into a branch of a large acquiring bank. Therefore, the impact of the mortgage supply channel is larger in the case of counties with less bank concentration.

We first analyze how the number of banks changed in response to changes in the state branching rules for high versus low bank concentration counties separately. We compute a county's bank concentration using bank deposits data from the FDIC- Summary of Deposits. Our measure of bank concentration is the Herfindahl-Hirschman Index (HH-index). Following Meyer (2018) and Tewari (2014), a county's HH-index for a given year is the sum of the squares of the deposits share of banks operating in that county. The deposits share of a bank is the ratio of its deposits to the total bank deposits of that county times 100. A county with an HH-index of 10,000 is the county with the highest bank concentration, whereas a county with an HH-index close to zero is the one with the lowest bank concentration.[17] We categorize counties in two groups using their HH-index at the beginning of each year. A county with HH-index above the median HH-index of all counties in a given year is considered as a county with 'High' bank concentration.

[17] For the sample period 1980-2004, we have data of HH-index for 65,657 county-years. After winsorizing the data at one percentile level on both sides, the mean, standard deviation, median, 25th percentile, and 75th percentile values are 5,293, 2,893, 4,712, 2,974, and 7,206, respectively.

Similarly, a county with a below median HH-index is considered as the one with 'Low' bank concentration. The data on the number of banks at the county-level are also available from the FDIC's Summary of Deposits.[18]

[Insert Figure 6 here]

Figure 6 shows the dynamic effect of branch deregulation on the number of banks in a county with high bank concentration (Panel A) and low bank concentration (Panel B). Specifically, for subsamples of counties with high and low bank concentrations, we separately run the regression specification as shown in Equation (2) with the dependent variable as the number of banks of county *c* of state *s* for year *t*. Again, we use one-year prior to the branch deregulation (event) year "-1" as the omitted year. Panel A of Figure 6 indicates that the number of banks had not changed significantly prior to branch deregulation in a county with high bank concentration. After the branch deregulation, there is some decline in the number of banks in this market. A plausible explanation is that after the branch deregulation some large banks might have converted their subsidiary banks into their branches, thereby reducing the fixed overhead of operating a separate bank. As shown in Panel B of Figure 6, for counties with low bank concentration, there is a gradual declining trend in the number of banks, which had already started prior to the branch deregulation year. After the event year, the trend continues its downward path, but at a faster rate. It suggests that the counties with less bank concentration might have experienced drastic changes in their banking sector, for example, an increase in mergers and acquisitions of smaller banks by large banks.

[18] For the sample period 1980-2004, we have data on the number of banks for 65,657 county-years. After winsorizing the data at one percentile level on both sides, the mean, standard deviation, median, 25th percentile, and 75th percentile values are 4.09, 4.13, 3, 1, and 5, respectively. For 'High' bank concentration counties, the mean, standard deviation, median, 25th percentile, and 75th percentile values are 1.98, 1.38, 2, 1, and 2, respectively for 32,186 county-year observations. For 'Low' bank concentration counties, the mean, standard deviation, median, 25th percentile, and 75th percentile values are 6.22, 4.82, 5, 3, and 7, respectively, for 32,806 county-year observations.

[Insert Table 5 here]

Table 5 shows the effects of branch deregulation on Chapter 13 bankruptcies through the channel of mortgage supply for the subsamples of counties with high and low bank concentrations. The empirical specifications are the same as those shown earlier in Table 4 using Equation (3). The only differences are that the sample size is smaller and that the dependent variable is Chapter 13 bankruptcy rate in all specifications. The specifications (i) to (v) are for the subsample of counties with high bank concentration, whereas specifications (vi) to (x) are for the subsample of counties with low bank concentration. As shown in specifications (i) to (v), the coefficient on the interaction term (Intrastate branching x Mortgage supply) is statistically insignificant. This finding suggests that, in the case of counties with high bank concentration, an increase in mortgage lending after the branch deregulation does not correspond to an increase in Chapter 13 bankruptcies.

That is not the case for the counties with low bank concentration. As shown in specifications (vi) to (x), the coefficient on the interaction term is positive and statistically significant. As an example, as shown in specification (vi), the coefficients on the interaction term and on the variable 'Mortgage supply' are 0.056 and -0.011, respectively. Together, they suggest that, in the case of counties with low bank concentration, after a state relaxes restrictions on intrastate branching, a 10% increase in mortgage originations increases Chapter 13 bankruptcy rate by 0.0043.[19] On the other hand, a similar 10% increase in mortgage originations in a control state where intrastate branching is prohibited decreases Chapter 13 bankruptcy rate by 0.001. The *net* increase of 0.0053 in the Chapter 13 bankruptcy rate is statistically significant at the 5% level. The mean value of Chapter 13 bankruptcy rate in counties with low bank concentration of control

[19] More specifically, it is $ln(1.10) \times (0.056 - 0.011)$.

states is 0.298 [this statistic is untabulated]. Therefore, the net change of 0.0053 indicates an economic impact of around 1.8%.

To summarize, using a county's HH-index as a measure of bank concentration, we find the effects of branch deregulation on Chapter 13 bankruptcies through increased mortgage lending in a subsample of counties with low bank concentration.

5. Results using a sample of contiguous county-pairs

In the previous section, we show that the main finding of our paper is that Chapter 13 bankruptcy filings increase after states relax their bank branching restrictions, relative to the increase in control states where no such banking rules have changed. In this section, we validate that main finding using a sample of contiguous county-pairs. We use the research methodology as suggested in Huang (2008).[20,21] We also report the results of Chapter 7 bankruptcy filings for completeness.

The research design involves identifying a border segment and contiguous county-pairs along that segment. A border segment separates a treatment and its control state. In the intrastate branch deregulation (event) year, a treatment state removes restrictions on intrastate branching. The event window consists of the pre-event period, event year, and the post-event period. Throughout the event window, the control state restricts intrastate branching; however, the

[20] We thank Rocco Huang for providing a list of contiguous county-pairs on his website (http://www.roccohuang.com/ , last accessed on 04/15/20).

[21] For this approach, it is essential to have a time difference between the years in which two neighboring states undertake a deregulation event. As shown earlier in Table 1, in the US, 35 states passed legislation allowing interstate banking in a span of just four years between 1985 and 1988. Consequently, the contiguous county-pairs approach is not feasible for assessing the impact of interstate banking.

treatment state restricts intrastate branching only in the pre-event period.[22] Therefore, a contiguous county-pair has a treatment county and a control county, and the state border separates them.

As an example, the border segment of Georgia and Florida is in the treatment sample. Georgia permitted an instate bank to open branches anywhere in the state (intrastate branching) in 1983. Five years later, Florida did the same. The event year is 1983, Georgia is a treatment state, and Florida is a control state. Grady County of Georgia (treatment county) and Leon County of Florida (control county) is a contiguous county-pair. Then, for Grady County, we compute the difference in Chapter 13 bankruptcy rates between the post-period and pre-period. For Leon County also, we do the same. Then, we take the difference of these two differences (diff-in-diff). It is the treatment effect – the *net* change in the Chapter 13 bankruptcy rate of a treatment (Grady) county due to the treatment (intrastate branching) taken by treatment state (Georgia).

The rationale for matching based on geographic proximity is that the observable county-specific factors, such as labor market conditions, demographics, cultural factors, and weather conditions, are similar in the treatment and control counties. Therefore, these counties are likely to have similar unobservable (but fixed) county-specific confounding factors. The difference-in-differences approach on contiguous county-pairs will cancel out the effects of (unobservable and observable) county-specific fixed confounding factors.[23]

[22] There is an alternative perspective. A county can be both a treatment observation and a control observation in different years during the branch deregulation period (1980-1994). A particular county can be a treatment observation in the years before and after the branching rules change in the relevant state (assuming that the rules stay the same during that period in the neighboring state) and a control observation in other years when the neighboring state changes its branching rules. It doesn't matter whether control states have or have not loosened their branching regulations, as long as the rules don't change over the particular time period. We impose a stricter restriction mainly to maintain homogeneity, in terms of sample selection criteria, across all the observations. We also prefer to remain consistent in our sample selection with that of Huang (2008).

[23] Following Huang (2008), we exclude borders of the western states (i.e., Montana, Wyoming, Colorado, New Mexico, and all states to the west of them) from the treatment sample as the counties in the western states tend to be large in areas.

[Insert Table 6 here]

Table 6 reports the border segments and their number of contiguous county-pairs of the treatment sample. For the period 1981-1990, 17 U.S. states qualify as a treatment state, and among them, there are 23 border segments and 186 contiguous county-pairs. Alabama, Tennessee, and Missouri have the highest number (27, 25, and 28, respectively) of contiguous county-pairs. The lowest numbers of county-pairs are for Texas, Massachusetts, and West Virginia (2, 3, and 4, respectively). A state can be a treatment and/or control state depending on its intrastate branching deregulation year and that of its neighboring state. For example, Missouri allowed intrastate branching in 1990. Its border segments with Nebraska, Tennessee, and Kansas make it a control state, whereas its border segments with Arkansas and Iowa make it a treatment state.

[Insert Figure 7 here]

Figure 7 shows the contiguous county-pairs on the U.S. map that excludes the West. The treatment counties are in green (relatively light gray in the grayscale printout) and their comparison [control] counties are in red (relatively dark gray). The reason of showing all 186 contiguous county-pairs on a map is twofold. First, the border segments of a given treatment state can be found with less effort. For example, it is relatively easy to decipher that the border segment of Alabama with Georgia is not considered, when the former is considered as a treatment state. Second, by looking at a given county-pair, we can convince ourselves that a treated county and its comparison (untreated) county are similar in size. It is an important criterion of implementing diff-in-diff on a sample of contiguous county-pairs. We also note that there are separate maps for different years. For example, if we are interested in drawing a similar map only for the deregulation year 1981, then 27 contiguous county-pairs of Alabama will appear on that map.

The pre-event period is defined as the three years prior to branching deregulation. However, due to data limitations this period may be shorter but not less than one year.[24] The post-event period is defined as the three years after the branching deregulation year. However, we allow only two years in some cases due to the subsequent removal of intrastate branching restrictions in the control state.[25] By requiring a minimum of two years for the post-period, a reasonable amount of time is given for the intrastate branch deregulation to show its effect on Chapter 13 bankruptcy. It also helps avoid overlapping of the post-event period of the treatment state and the year in which the control state allows intrastate branching. In all analyses, the intrastate branch deregulation year is excluded in both pre- and post-periods.

With the chosen criteria of pre- and post-event periods, the number of contiguous county-pair and year observations is 1,207. Out of this total, there are five missing observations. Therefore, the paired sample is 1,202 x 2 = 2,404 county-year observations.

5.1. Personal bankruptcy trends for contiguous county-pairs during the event window

Figure 8 shows trends in the average Chapter 7 and Chapter 13 bankruptcy rates for treatment and control counties relative to the year in which the treatment states relax the restrictions on intrastate branching. The two short-dashed lines (on the left) show the pre-event period, the long-dashed line (in the center) shows the intrastate branching deregulation year, and two dashed-dot lines (on the right) show the post-event period. The number next to a marker is the number of counties used to compute the average. The number of counties is not the same for each

[24] As examples, in the case of Alabama, Pennsylvania, Georgia, the pre-event period is a minimum of one year (1980), two years (1980 and 1981), and a maximum of three years (1980, 1981, and 1982), respectively.
[25] As an example, in the case of the Massachusetts (treatment)-New Hampshire (control) border segment, the post-event period is two years (1985 and 1986).

year due to data unavailability for the pre-event period and truncation of the post-event period in some cases.

[Insert Figure 8 here]

Throughout the period [-3, +3], the average Chapter 7 and Chapter 13 bankruptcy filings in the treatment sample are more than those for the control sample. The divergence in the Chapter 7 filings path for the treatment and control groups is noticeable in the third year after the event year. In the case of Chapter 13, the trends in average bankruptcy filings are parallel for the treatment and control groups during the pre-event period, suggesting the common (parallel) trend assumption holds in the data. The average Chapter 13 bankruptcy rate for the control group increases marginally during the post-event period. However, for the treatment group, the average Chapter 13 bankruptcy rate increases more noticeably during the post-event period.

5.2. Results of regression-based diff-in-diff using contiguous county-pairs

This subsection reports the results of regressions on the sample of 186 contiguous county-pairs. For that, we use the following linear specification.

$$Y_{cst} = \beta_0 + \beta_1 \times Treat_s + \beta_2 \times Post_t + \delta \times Treat_s \times Post_t + \gamma \times X_{cst} + \kappa \times Z_{st} + \varepsilon_{cst} \quad (4)$$

, where *Y* is the personal bankruptcy rate – either the Chapter 13 bankruptcy rate or the Chapter 7 bankruptcy rate, and the subscripts *c*, *s,* and *t* index for county, state, and year, respectively. The treatment indicator variable (*Treat*) takes on a value of one when the state *s* of county *c* is a treatment (allowing intrastate branching) state, and zero when it is a control state. The post-period indicator variable (*Post*) takes on a value of one if the year *t* is in the post-event period and zero if it is in the pre-event period. The vector *X* reflects the county-level economic conditions: previous year unemployment rate, real income growth, and house price growth. The variable *Z* captures the

state-level bankruptcy exemptions. The variable of interest is the interaction term of the indicator variables *Treat* and *Post*. Its positive value indicates the *net* increase in the dependent variable (either the Chapter 13 or Chapter 7 bankruptcy rate) after a state relaxes restrictions on intrastate branching. In all regressions, robust standard errors pooled at the highest level of aggregation possible are used to control for heteroscedasticity. The intrastate branch deregulation (event) year is excluded; therefore, the sample size is 2,034. The data set is not the traditional panel data set of county-year observations of the entire sample period. The time component has a cohort dimension, and it is measured relative to the intrastate branching event year. Further, since the unit of analysis is a contiguous county-pair of a border segment, some states are considered as both treatment and controls depending on which border segment is under consideration.

[Insert Table 7 here]

Table 7 reports the results of regressions using our sample of contiguous county-pairs. The dependent variables for the specifications (i) to (iv) and (v) to (vii) are the Chapter 13 and the Chapter 7 bankruptcy rates, respectively. As shown in specification (i), the coefficient on the constant term is 0.154. It is the average Chapter 13 bankruptcy rate for the control group in the pre-event period. The sum of the coefficients on the constant and post-period indicator is 0.154 + 0.112 = 0.266; it is the average Chapter 13 bankruptcy rate for the control group in the post-event period. The sum of the coefficients on the constant term and the treatment indicator is 0.263, which is the average Chapter 13 bankruptcy rate in the pre-event period for the treatment group. The sum of the coefficients on the constant, post-period indicator, treatment indicator, and the interaction of two indicator variables is 0.524. It is the average of Chapter 13 filings for the treatment group in the post-event period. The difference-in-differences of 0.149 [(0.524 – 0.263) – (0.266 – 0.154)]

is the *net* increase in average Chapter 13 bankruptcy rate of the treatment states that had a banking rule (intrastate branching) change relative to the increase in control states that had no rule change.

This net increase in Chapter 13 filings is not only statistically significant at the 1 percent level but also economically significant. The average Chapter 13 bankruptcy rate is 0.263 in treatment states before the removal of regulatory constraints on intrastate branching. The net increase is 0.149 shows an economic significance of over 50%. As shown in specifications (ii) and (iii), the bank branching effect on Chapter 13 filing rate holds even after controlling for local economic variables and statewide bankruptcy exemptions. When we add house price growth as a control variable (specification (iv)), our results remain qualitatively similar.

In contrast, we do not find an effect of a state's removal of restrictions on intrastate branching on Chapter 7 bankruptcy filings. Regarding the control variables, the positive correlation between income growth and Chapter 13 bankruptcy rate (specifications (ii) and (iv)) suggests that in our contiguous county sample, some borrowers file Chapter 13 bankruptcy for a strategic reason to benefit from the borrower-friendly state bankruptcy exemptions. The high unemployment/low Chapter 7 filings (specifications (vi) and (vii)) suggest the prevalence of "informal bankruptcy" in our contiguous county-pairs sample. Dawsey and Ausubel (2004) define informal bankruptcy as those instances when a financially-distressed borrower simply walks away from loan repayment obligations and does not seek protection through the formal bankruptcy process.

To summarize, the results of diff-in-diff regressions using a sample of contiguous county-pairs show that Chapter 13 filings increase following the removal of regulatory constraints on intrastate branching, while the effect on Chapter 7 bankruptcy filings is insignificant.

5.3. Results of the non-parametric randomization test

To address the concerns of data snooping and data mining, we follow Huang (2008) and perform a non-parametric randomization test similar to the one used in clinical trials. It involves the following five steps. First, we identify (non-event) border segments of those 17 treatment states that were *not part* of the original treatment sample. In the second step, we form a placebo sample of contiguous county-pairs on these non-event border segments. In the third step, using the placebo sample, we generate a data set of fictitious treatment years and contiguous county-pairs (counterfactuals). The selection criteria for a fictitious treatment year are (1) the fictitious treatment year should not be part of the actual treatment windows of the treatment and its control states, and (2) the fictitious treatment year should be within the branch deregulation period (1980-1994). In the fourth step, we prepare a distribution of the fictitious treatment effect and compute critical values of this distribution, which we use on the actual treatment sample to assess the intrastate branching effect on Chapter 13 bankruptcy. We provide the details of each step in the Internet Appendix of the paper. Here, we briefly state the results for Chapter 13 filings.

Using a placebo sample of 1,765 counterfactuals involving 385 contiguous county-pairs, we obtain the cut-off value of the treatment effect at the 99th percentile level as $0.138 = \frac{1.878}{\sqrt{186}}$, when the treatment sample is of 186 contiguous county-pairs. This number suggests that the magnitude of the actual treatment effect must be above 0.138 in order to confirm that our finding of the actual treatment effect is free from data snooping and data mining biases at the one percent level of statistical significance. As reported earlier, the *net* effect of intrastate branching on Chapter 13 bankruptcy rate is 0.149 (Table 7, specification (i)). Therefore, when evaluated using the critical values obtained from the non-parametric randomization test, the Chapter 13 bankruptcy filings, on

aggregate, increase following intrastate branching and this change is statistically significant at the 1 percent level.

To summarize, the results using the sample of 186 contiguous county-pairs confirm our earlier results using the sample of all U.S. counties. A diff-in-diff result gives the increase in Chapter 13 bankruptcies in treatment states that had a banking rule (intrastate branching) change relative to the increase in Chapter 13 bankruptcies in control states that had no rule change.

6. Conclusions

The staggered removal of restrictions on intrastate branching in the U.S. provides a quasi-experimental setting to analyze the impact of increased credit access on an economic outcome of interest. We contribute to the banking and consumer credit literature by demonstrating that the removal of regulatory restrictions on intrastate bank branching increases Chapter 13 filings. We identify a mortgage supply channel that contributes to the rise in Chapter 13 filings, which supports the hypothesis that homeowners use Chapter 13 filings in an effort to save their houses. We also find that the effect of the relaxation of intrastate branching on Chapter 13 filings through mortgage lending is higher in the counties with low bank concentration. Our main finding of an increase in Chapter 13 after allowing intrastate branching holds in the sample of contiguous county-pairs.

Our findings contribute to policy debates in both developed and emerging economies. For example, the proponents of a mortgage cram-down in the US argue that allowing a bankruptcy judge to reduce the mortgage principal in Chapter 13 filings can help to reduce the foreclosure crisis (Eggum *et al.*, 2008; White and Zhu, 2010). We show that, in our sample period when a cram-down was allowed, the mortgage borrowers file for Chapter 13 bankruptcies to save their houses. Using the Equity Bank of Kenya as an example, Allen *et al.* (2020) show that a strategy

of opening branches mainly in the underserved area has a positive impact on a household's access to credit. In India, the first phase of the Insolvency and Bankruptcy Code of 2016 focused on streamlining corporate insolvency. In the second phase, the policymakers are working on developing an efficient mechanism to solve personal insolvencies (Feibelman, 2019; Sahoo, 2019).

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Table 1: States by year of removal of restrictions on entry and expansion of a bank

Year	Intrastate branching	Interstate banking
Before 1980	AK, AZ, CA, DC, DE, ID, MD, ME, NC, NJ, NV, NY, OH, RI, SC, SD, VA, VT	ME
1980	CT	
1981	AL, UT	
1982	PA	AK, NY
1983	GA	CT, MA
1984	MA	KY, RI, UT
1985	NE, OR, TN, WA	DC, FL, GA, ID, MD, NC, NV, OH, TN, VA
1986	HI, MS	AZ, IL, IN, MI, MN, MO, NJ, OR, PA, SC
1987	KS, MI, ND, NH, WV	AL, CA, LA, NH, OK, TX, WA, WI, WY
1988	FL, IL, LA, OK, TX, WY	CO, DE, MS, SD, VT, WV
1989	IN	AR, NM
1990	KY, MO, MT, WI	NE
1991	CO, NM	IA, ND
1992		KS
1993	MN	MT
1994	AR, IA	HI

Source: Dick and Lehnert (2010) and Huang (2008).

Table 2: Summary Statistics

Variables	Mean	Std. dev.	Median	25th percentile	75th Percentile	Observations
Personal bankruptcy filings						
Chapter 7 filing rate (per 1,000)	1.904	1.495	1.529	0.750	2.713	75,970
Chapter 13 filing rate (per 1,000)	0.727	1.171	0.284	0.075	0.810	75,970
Local economic conditions						
Personal income (real) growth (t-1)	0.015	0.050	0.015	-0.009	0.037	75,928
Unemployment rate (%) (t-1)	6.86	3.45	6.10	4.38	8.55	75,951
House price growth (%) (t-1)	4.18	4.97	3.73	1.59	6.33	38,899
State-level bank geographic deregulation						
Interstate banking indicator (0/1)	0.742	0.438				1,225
Intrastate branching indicator (0/1)	0.806	0.396				1,225
State-level bankruptcy exemptions						
Homeowner exemption ($)	42,010	42,710	26,515	11,013	51,262	1,200

Notes: The Chapter 7 (Chapter 13) bankruptcy rate is the number of Chapter 7 (Chapter 13) bankruptcy filings per 1,000 population. The personal income growth is the ratio of change in per capita income (adjusted to the 1978 level) to the per capita income of the previous year. The unemployment rate is the ratio of people seeking a job to the total number of people in the labor market, expressed as percentages. The house price growth is the percentage change in annual House Price Index® of the Federal Housing Finance Agency. We take one-year lag values of unemployment rate, income growth, and change in house price. The interstate banking deregulation takes on a value of one for a given year if a state allows interstate banking in that year, and zero otherwise. The intrastate branching deregulation takes on a value of one in a given year if a state permits intrastate bank branching in that year, and zero otherwise. The sample period is 1980-2004. The sample includes 48 states and the District of Columbia, and excludes Delaware and South Dakota. The number of counties is 3,040. The homeowner exemption is the sum of homestead and personal property exemptions and it is in US dollars deflated to the 1978 level. It excludes District of Columbia in addition to Delaware and South Dakota.

Table 3: Removal of bank expansion restrictions and personal bankruptcy filings using county-year data

Dependent variables:	Chapter 7 bankruptcy rate					Chapter 13 bankruptcy rate					
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)
Intrastate branching	-0.004	0.023	0.042	0.027	0.045	0.085*	0.088*	0.095*	0.166***	0.095*	0.168***
	(0.058)	(0.054)	(0.066)	(0.053)	(0.066)	(0.050)	(0.051)	(0.051)	(0.060)	(0.052)	(0.060)
Interstate banking	-0.061	-0.024	0.085	-0.029	0.079		-0.022	-0.014	-0.013	-0.014	-0.017
	(0.043)	(0.045)	(0.062)	(0.044)	(0.060)		(0.040)	(0.040)	(0.043)	(0.040)	(0.043)
Income growth		-2.271***	-1.901***	-2.258***	-1.877***			-1.074***	-1.039***	-1.077***	-1.042***
		(0.278)	(0.356)	(0.276)	(0.353)			(0.236)	(0.315)	(0.237)	(0.315)
Unemployment rate		0.034***	0.006	0.034***	0.006			0.001	-0.005	0.001	-0.006
		(0.010)	(0.011)	(0.010)	(0.011)			(0.007)	(0.011)	(0.007)	(0.011)
House price growth			-0.039***		-0.038***				-0.010***		-0.010***
			(0.002)		(0.002)				(0.002)		(0.002)
Ln (Homeowner exem.)				0.061*	0.064*					-0.005	0.028
				(0.033)	(0.034)					(0.044)	(0.046)
Constant	0.939***	0.675***	1.392***	0.071	0.751**	0.284***	0.283***	0.248***	0.407***	0.300	0.126
	(0.030)	(0.077)	(0.109)	(0.358)	(0.360)	(0.036)	(0.036)	(0.054)	(0.079)	(0.438)	(0.462)
Observations	75,970	75,918	38,892	75,893	38,867	75,970	75,970	75,918	38,892	75,893	38,867
R-squared (within)	0.74	0.75	0.77	0.75	0.77	0.39	0.39	0.39	0.41	0.39	0.41
R-squared (overall)	0.46	0.46	0.43	0.45	0.42	0.13	0.13	0.12	0.09	0.13	0.08

Notes: The table reports the results of bank deregulation effects on bankruptcy filings using all county-year observations. The sample includes 3,040 counties excluding those of Delaware and South Dakota, and the sample period is 1980-2004. The dependent variables for the columns (i) to (v) and (vi) to (xi) are the Chapter 7 bankruptcy rate and the Chapter 13 bankruptcy rate, respectively. The variable description is in the notes to Table 2. All specifications control for county and year fixed effects. Regressions are weighted by the average population of a county during the sample period. Robust standard errors, pooled at the highest level of aggregation possible, are in parentheses below the coefficients. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The homeowner exemptions data also exclude the District of Columbia.

Table 4: Mortgage supply, personal bankruptcy filings, and branching deregulation

Dependent variables:	Chapter 13 bankruptcy rate					Chapter 7 bankruptcy rate				
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Intrastate branching	-0.197*	-0.178*	-0.197	-0.175*	-0.195	0.173	0.285**	0.157	0.289**	0.158
	(0.104)	(0.102)	(0.159)	(0.101)	(0.157)	(0.130)	(0.128)	(0.192)	(0.129)	(0.193)
Mortgage supply	-0.001	0.001	-0.016	0.002	-0.015	0.024	0.051*	0.042	0.053*	0.044
	(0.022)	(0.022)	(0.027)	(0.022)	(0.027)	(0.027)	(0.029)	(0.034)	(0.029)	(0.035)
Intrastate branching x Mortgage supply	0.043**	0.042**	0.048*	0.043**	0.049*	-0.033	-0.042*	-0.018	-0.041*	-0.017
	(0.019)	(0.019)	(0.026)	(0.019)	(0.026)	(0.023)	(0.023)	(0.031)	(0.023)	(0.031)
Interstate banking		0.001	0.006	-0.005	-0.001		0.014	0.111	0.004	0.102
		(0.052)	(0.050)	(0.052)	(0.050)		(0.060)	(0.072)	(0.058)	(0.070)
Income growth		-1.533***	-1.341***	-1.528***	-1.334***		-2.828***	-1.853***	-2.808***	-1.835***
		(0.319)	(0.325)	(0.317)	(0.325)		(0.377)	(0.387)	(0.373)	(0.385)
Unemployment rate		0.001	-0.010	0.001	-0.009		0.056***	0.007	0.056***	0.007
		(0.009)	(0.011)	(0.009)	(0.011)		(0.012)	(0.012)	(0.012)	(0.012)
House price growth			-0.011***		-0.010***			-0.045***		-0.045***
			(0.002)		(0.002)			(0.003)		(0.003)
ln(Homeowner exemption)				0.043	0.056				0.079**	0.072**
				(0.045)	(0.046)				(0.038)	(0.036)
Constant	1.317***	1.299***	1.514***	0.858*	0.943*	3.720***	3.130***	3.546***	2.321***	2.812***
	(0.230)	(0.227)	(0.254)	(0.494)	(0.503)	(0.230)	(0.302)	(0.288)	(0.589)	(0.539)
Observations	48,900	48,898	34,009	48,875	33,986	48,900	48,898	34,009	48,875	33,986
R-squared (within)	0.39	0.40	0.41	0.40	0.41	0.72	0.73	0.76	0.73	0.76
R-squared (overall)	0.07	0.07	0.07	0.05	0.05	0.33	0.33	0.39	0.32	0.38

Notes: The table reports the effects of mortgage supply on personal bankruptcy filings after the intrastate branching deregulation. The dependent variables for the columns (i) to (v) and (vi) to (x) are the Chapter 13 bankruptcy rate and the Chapter 7 bankruptcy rate, respectively. The variable Mortgage supply is the natural logarithm of one plus the number of mortgages originated in a county for a given year. We use one-year lag values of mortgage supply, income growth, and unemployment rate. The description of other variables is in the notes to Table 2. Regressions are weighted by the average county population for the sample period 1981-2004. Each regression controls for year and county fixed effects. Robust standard errors, pooled at the highest level of aggregation possible, are in parentheses below the coefficients. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 5: Branch deregulation and Chapter 13 filings through mortgage supply for high and low bank concentration counties

Subsamples:	High bank concentration counties					Low bank concentration counties				
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Intrastate branching	0.087	0.123	0.251	0.124	0.249	-0.244*	-0.228*	-0.245	-0.226*	-0.244
	(0.104)	(0.108)	(0.236)	(0.108)	(0.237)	(0.135)	(0.131)	(0.187)	(0.130)	(0.186)
Mortgage supply	0.008	0.012	0.007	0.013	0.009	-0.011	-0.010	-0.019	-0.010	-0.019
	(0.022)	(0.023)	(0.035)	(0.023)	(0.035)	(0.025)	(0.026)	(0.030)	(0.026)	(0.030)
Intrastate branching x Mortgage supply	-0.015	-0.017	-0.033	-0.017	-0.033	0.056**	0.056**	0.061**	0.056**	0.061**
	(0.021)	(0.021)	(0.036)	(0.022)	(0.036)	(0.023)	(0.023)	(0.029)	(0.023)	(0.029)
Interstate banking		0.019	0.020	0.015	0.010		0.005	0.015	0.003	0.013
		(0.091)	(0.102)	(0.089)	(0.099)		(0.052)	(0.047)	(0.052)	(0.047)
Income growth		-1.492***	-1.288***	-1.492***	-1.278***		-1.684***	-1.574***	-1.688***	-1.577***
		(0.323)	(0.435)	(0.323)	(0.433)		(0.451)	(0.441)	(0.450)	(0.440)
Unemployment rate		0.013	0.018	0.013	0.018		-0.002	-0.017	-0.002	-0.018
		(0.013)	(0.016)	(0.013)	(0.016)		(0.011)	(0.013)	(0.011)	(0.013)
House price growth			-0.005**		-0.005**			-0.011***		-0.011***
			(0.002)		(0.002)			(0.002)		(0.002)
ln(Homeowner exemption)				0.019	0.048				0.025	0.026
				(0.037)	(0.040)				(0.049)	(0.049)
Constant	1.581***	1.445***	1.464***	1.261***	0.991**	1.220***	1.218***	1.415***	0.962	1.146*
	(0.168)	(0.172)	(0.265)	(0.423)	(0.488)	(0.306)	(0.316)	(0.322)	(0.623)	(0.613)
Observations	19,215	19,215	12,045	19,212	12,042	21,773	21,771	17,014	21,751	16,994
R-squared (within)	0.38	0.39	0.39	0.39	0.39	0.40	0.40	0.42	0.40	0.42
R-squared (overall)	0.04	0.05	0.04	0.04	0.03	0.07	0.07	0.07	0.06	0.06

Notes: The table reports the effects of intrastate branching on Chapter 13 bankruptcies through the mortgage supply channel for subsamples of counties based on high and low bank concentrations. The dependent variable is the Chapter 13 bankruptcy rate. A county is considered as a high (low) bank concentration county in a given year if its Herfindahl-Hirschman Index (HH-index) at the beginning of the year is above (below) the median HH-index all the counties. The variable HH-index is the sum of the squares of the deposits shares of banks in a given county-year. The deposits share of a bank is the ratio of its deposits to the total bank deposits of that county times 100. We use one-year lag values of income growth, house price growth, and unemployment rate. The description of other variables is in the notes to Table 2. Regressions are weighted by the average county population for the sample period 1981-2004. Each regression controls for year and county fixed effects. Robust standard errors, pooled at the highest level of aggregation possible, are in parentheses below the coefficients. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 6: Treatment sample description

Treatment border segment (Treatment state - Neighboring control state)	Branch deregulation (allowing intrastate branching) in treatment state	Branch deregulation in control state	Number of contiguous county- pairs in border segment
Alabama – Tennessee	1981	1985	6
Alabama – Mississippi	1981	1986	14
Alabama – Florida	1981	1988	7
Pennsylvania - West Virginia	1982	1987	6
Georgia – Florida	1983	1988	12
Massachusetts - New Hampshire	1984	1987	3
Nebraska – Missouri	1985	1990	2
Nebraska – Iowa	1985	1994	9
Tennessee – Kentucky	1985	1990	20
Tennessee – Missouri	1985	1990	2
Tennessee – Arkansas	1985	1994	3
Mississippi – Arkansas	1986	1994	5
Kansas – Missouri	1987	1990	11
Michigan – Wisconsin	1987	1990	5
North Dakota – Minnesota	1987	1993	6
West Virginia – Kentucky	1987	1990	4
Illinois – Iowa	1988	1994	9
Louisiana – Arkansas	1988	1994	8
Oklahoma – Arkansas	1988	1994	8
Texas – Arkansas	1988	1994	2
Missouri – Arkansas	1990	1994	16
Missouri – Iowa	1990	1994	12
Wisconsin – Minnesota	1990	1993	12
Wisconsin – Iowa	1990	1994	4
		Total	186

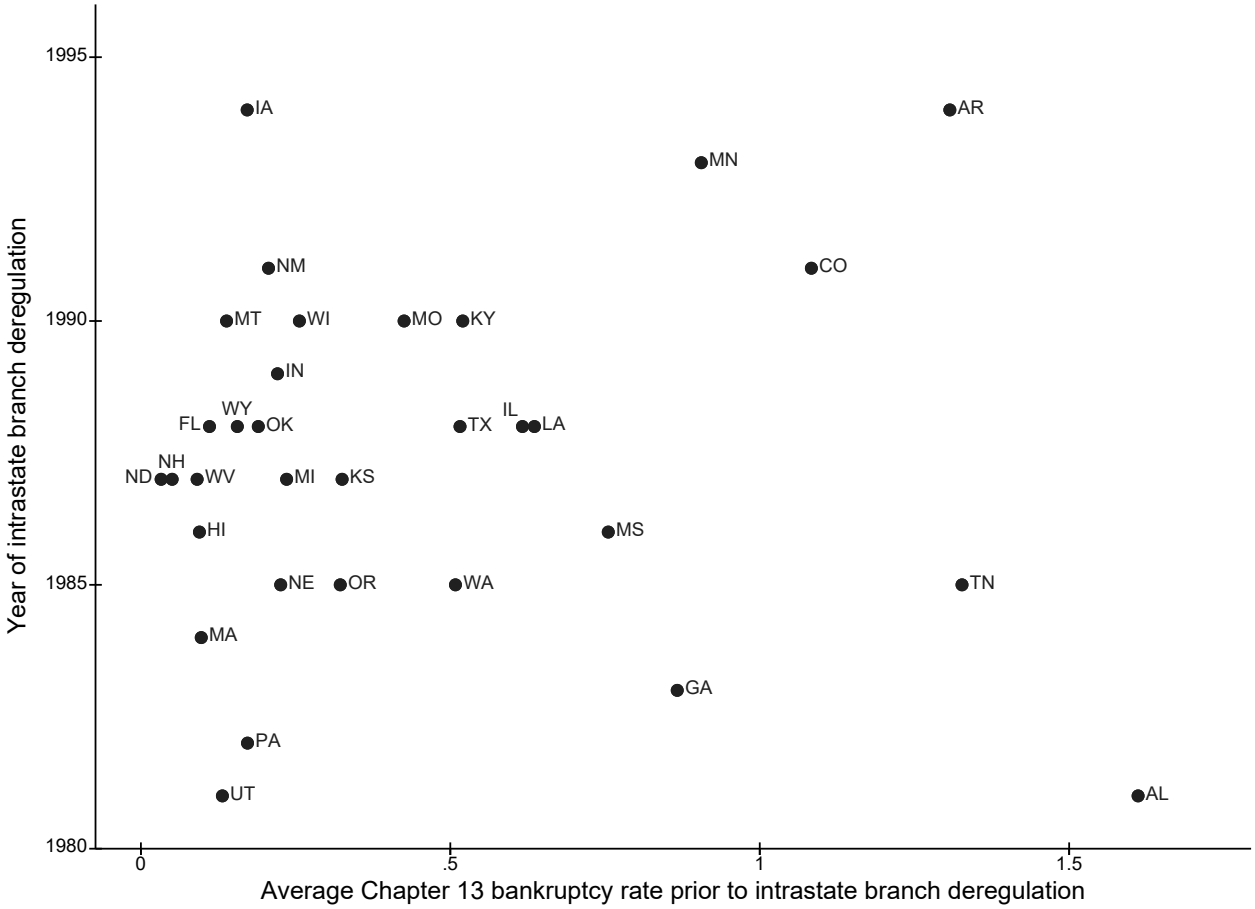
Notes: The table reports border segments of the treatment sample and the number of contiguous county-pairs on a border segment. The first state of a border segment is a treatment state and the second state is its control (comparison) state. As an example, Alabama is a treatment state and Tennessee is a control state for the Alabama-Tennessee border segment. Branch deregulation year refers to the year in which a given treatment or control state removes the restrictions on intrastate branching. In a contiguous county-pair, the counties are separated by a state border, and one county is in a treatment state and the other is in a control state.

Table 7: Regression-based difference-in-differences using contiguous county-pairs

Dependent variables:	Chapter 13 bankruptcy rate				Chapter 7 bankruptcy rate		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Treatment	0.109***	0.107***	0.113***	0.217***	0.028	0.043	0.045
	(0.025)	(0.025)	(0.025)	(0.079)	(0.036)	(0.036)	(0.041)
Post	0.112***	0.114***	0.114***	0.208***	0.289***	0.287***	0.287***
	(0.021)	(0.021)	(0.021)	(0.054)	(0.043)	(0.042)	(0.042)
Treatment x Post	0.149***	0.148***	0.149***	0.157	0.066	0.063	0.064
	(0.050)	(0.050)	(0.049)	(0.145)	(0.058)	(0.058)	(0.058)
Unemployment rate		0.004	0.004	0.025**		-0.021***	-0.021***
		(0.003)	(0.003)	(0.010)		(0.003)	(0.003)
Income growth		0.246*	0.241*	2.580**		-0.248	-0.250
		(0.129)	(0.130)	(1.147)		(0.206)	(0.207)
Ln (Homeowner exemption)			0.006	0.007			0.002
			(0.009)	(0.026)			(0.013)
House price growth				-0.001			
				(0.006)			
Constant	0.154***	0.117***	0.048	-0.066	0.863***	1.047***	1.022***
	(0.010)	(0.024)	(0.107)	(0.308)	(0.027)	(0.038)	(0.164)
Observations	2,034	2,034	2,034	475	2,034	2,034	2,034
R-squared	0.054	0.056	0.056	0.068	0.058	0.074	0.074

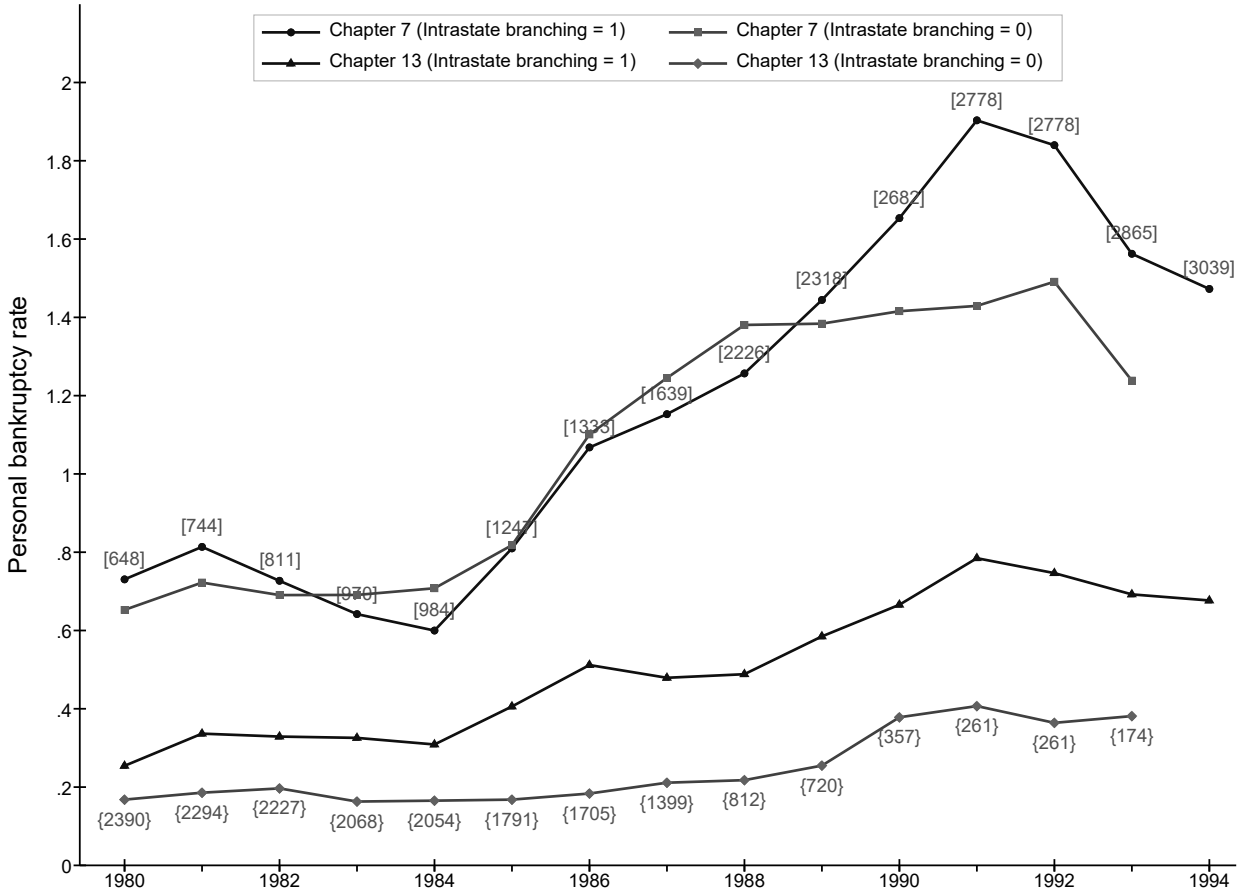
Notes: This table reports the results of diff-in-diff regressions using the treatment sample of 186 contiguous county-pairs and econometric specification of Equation (4). The dependent variables for the columns (i) to (iv) and (v) to (vii) are the Chapter 13 bankruptcy rate and the Chapter 7 bankruptcy rate, respectively. The treatment county indicator (variable Treatment) takes on a value of one for a treatment county and zero for a contiguous control county. The post-period indicator (Post) takes on a value of one for the post-deregulation period, and zero for the pre-deregulation period. The post-deregulation period contains the three years after the year in which a treatment state allowed intrastate bank branching. The pre-period consists of the three years prior to the deregulation year of the treatment state. The deregulation year is excluded from the analyses. The variable of interest, difference-in-differences, is the interaction term of the treatment county indicator and post-period indicator (Treatment x Post). The other variable definitions are in the notes to Table 2. Robust standard errors, pooled at the highest level of aggregation possible, are below the coefficients in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Figure 1: Intrastate branch deregulation year and preexisting Chapter 13 bankruptcy rate



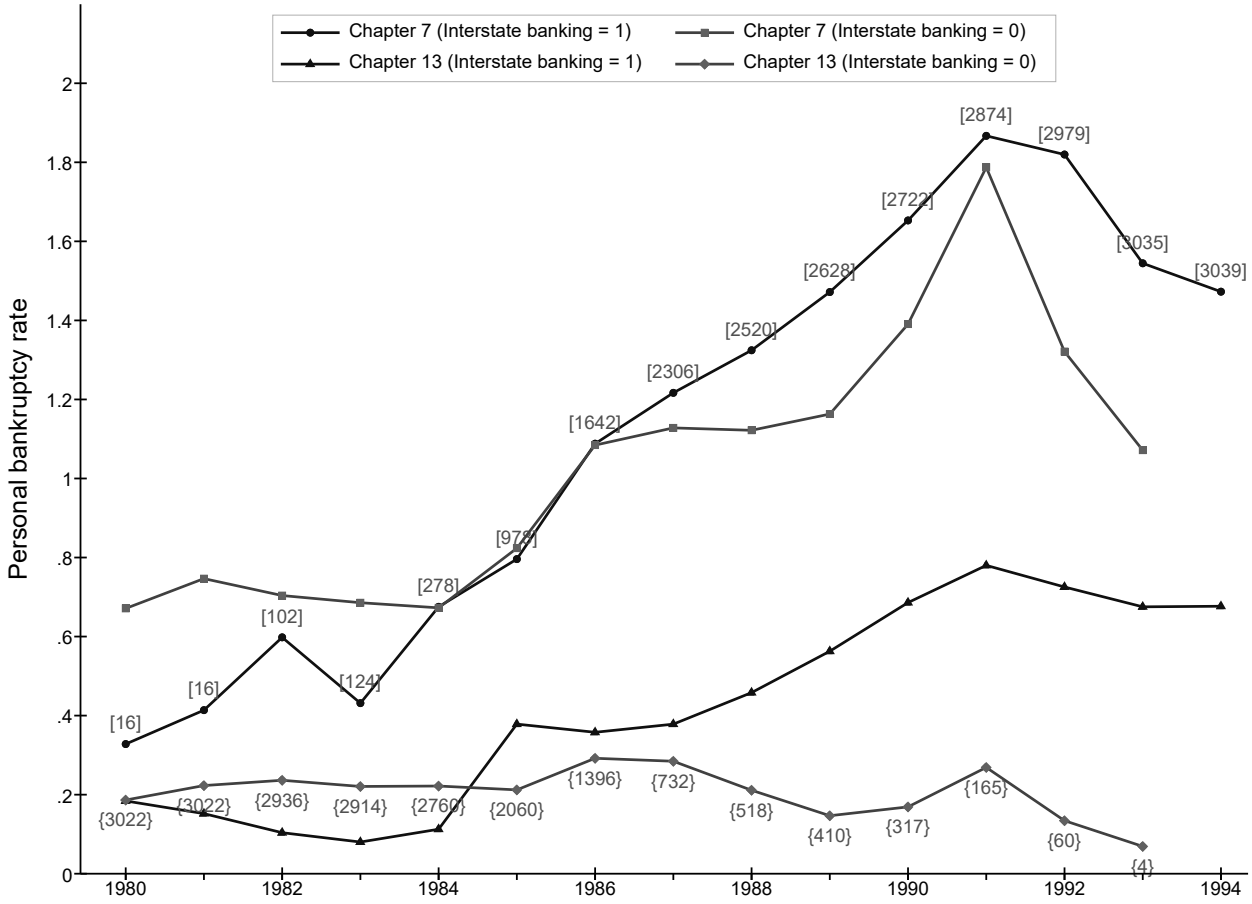
Notes: This figure shows a scatter plot of a year in which a state removes its regulatory constraints on intrastate branching (branch deregulation year) and its average Chapter 13 bankruptcy rate prior to that year. For computing the average value, we use three years prior to the branch deregulation year. However, due to data limitations, for states with branch deregulation years 1981 and 1982, we use one and two prior years, respectively. The Chapter 13 bankruptcy rate of a state in a given year is the number of bankruptcy filings under Chapter 13 per 1,000 population.

Figure 2: Trends in personal bankruptcy rate and intrastate branching



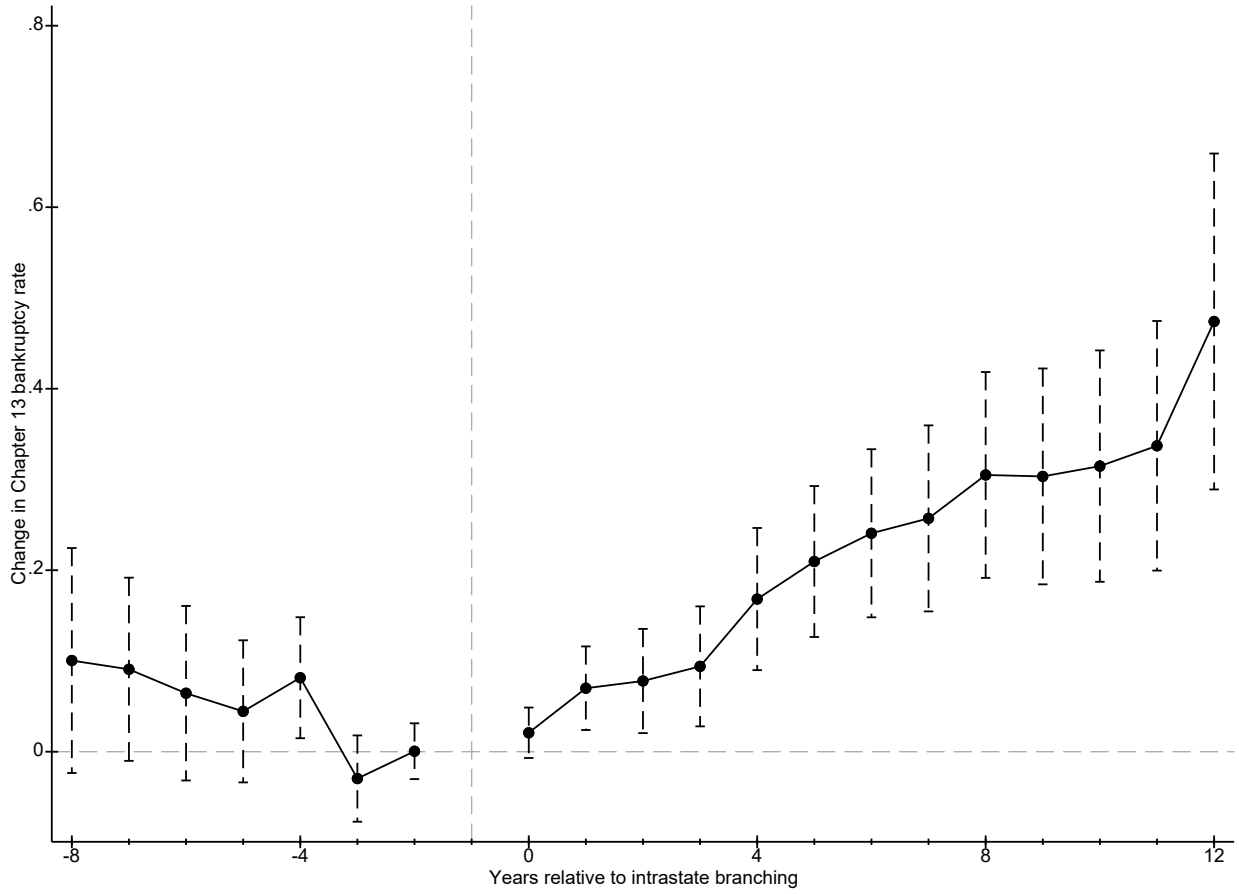
Notes: This figure shows the trends in the average Chapter 7 bankruptcy rate and Chapter 13 bankruptcy rate using county-level data. The Chapter 7 (Chapter 13) bankruptcy rate of a county is the number of Chapter 7 (Chapter 13) filings per 1,000 population. The shown trends are for the states that restrict intrastate branching and the states that allow intrastate branching. The numbers in square (curly) brackets next to markers are the number of counties of states that allow (restrict) intrastate branching.

Figure 3: Trends in personal bankruptcy rate and interstate banking



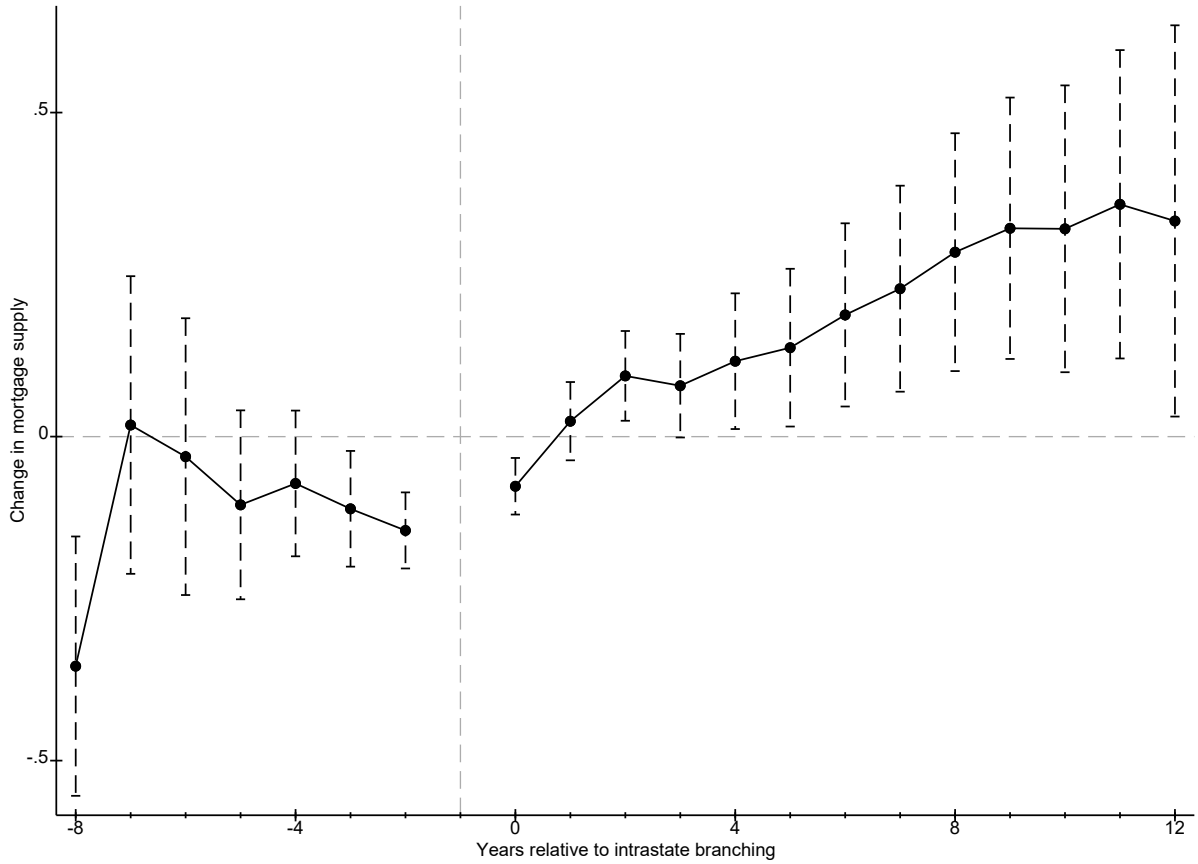
Notes: This figure shows the trends in the average Chapter 7 bankruptcy rate and Chapter 13 bankruptcy rate using county-level data. The Chapter 7 (Chapter 13) bankruptcy rate of a county is the number of Chapter 7 (Chapter 13) filings per 1,000 population. The shown trends are for the states that restrict interstate banking and the states that allow interstate banking. The numbers in square (curly) brackets next to markers are the number of counties of states that allow (restrict) interstate banking.

Figure 4: Dynamic impact of intrastate branching deregulation on Chapter 13 bankruptcy



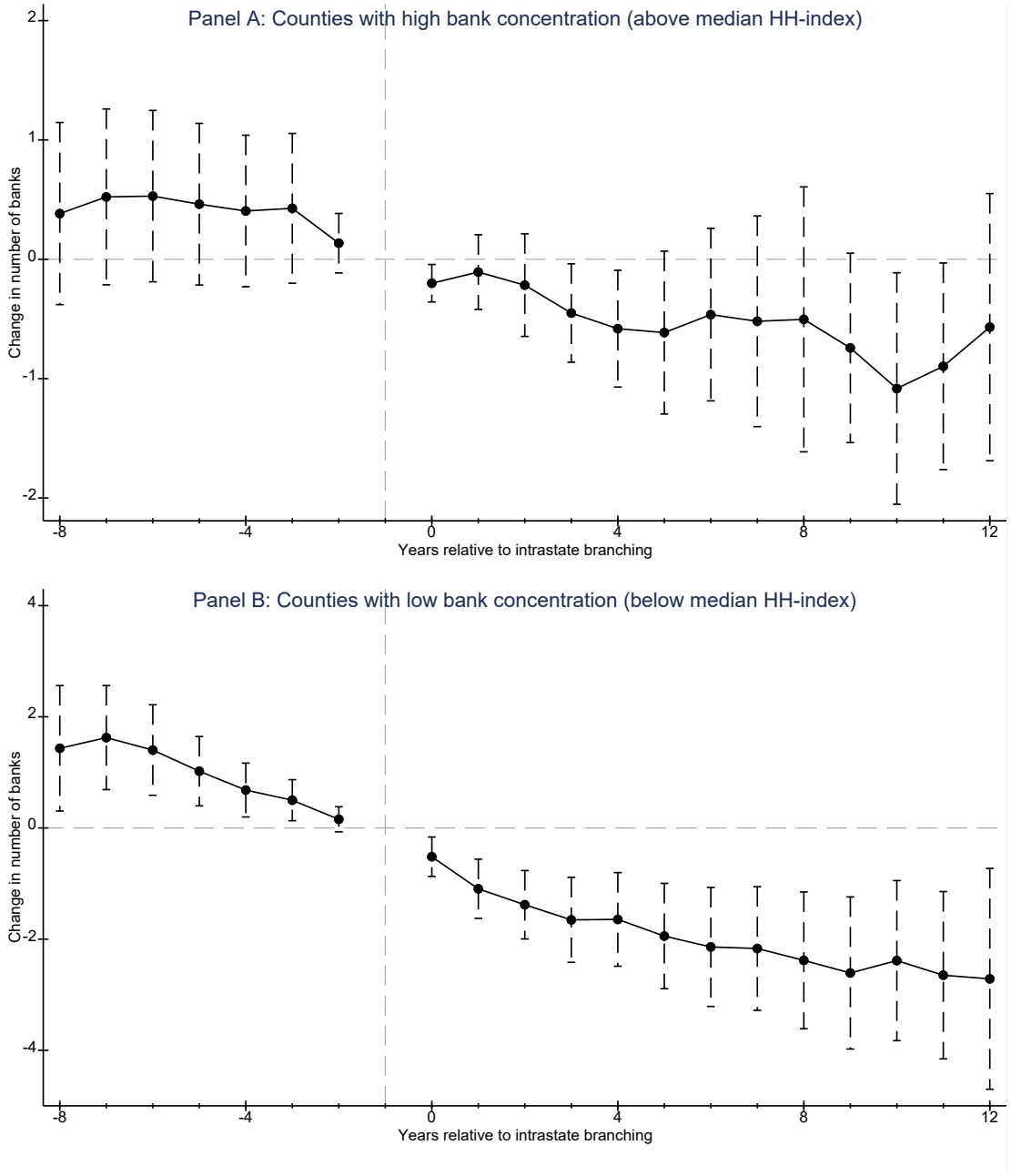
Notes: The figure plots a dynamic effect of intrastate branching deregulation on the Chapter 13 bankruptcy rate using the county-level data. The black dots are the coefficients on dummy variables $D^{\mp J}$ of Equation (2). That dummy variable takes on a value of one if the given year is J^{th} year prior to or posterior to the branch deregulation (event) year of the state *s*. The omitted year is "-1" which is one-year prior to the event year. The negative sign is for the prior year and the positive sign is for the posterior year. The dashed vertical spike represents the 95% confidence interval.

Figure 5: Dynamic impact of intrastate branching deregulation on mortgage supply



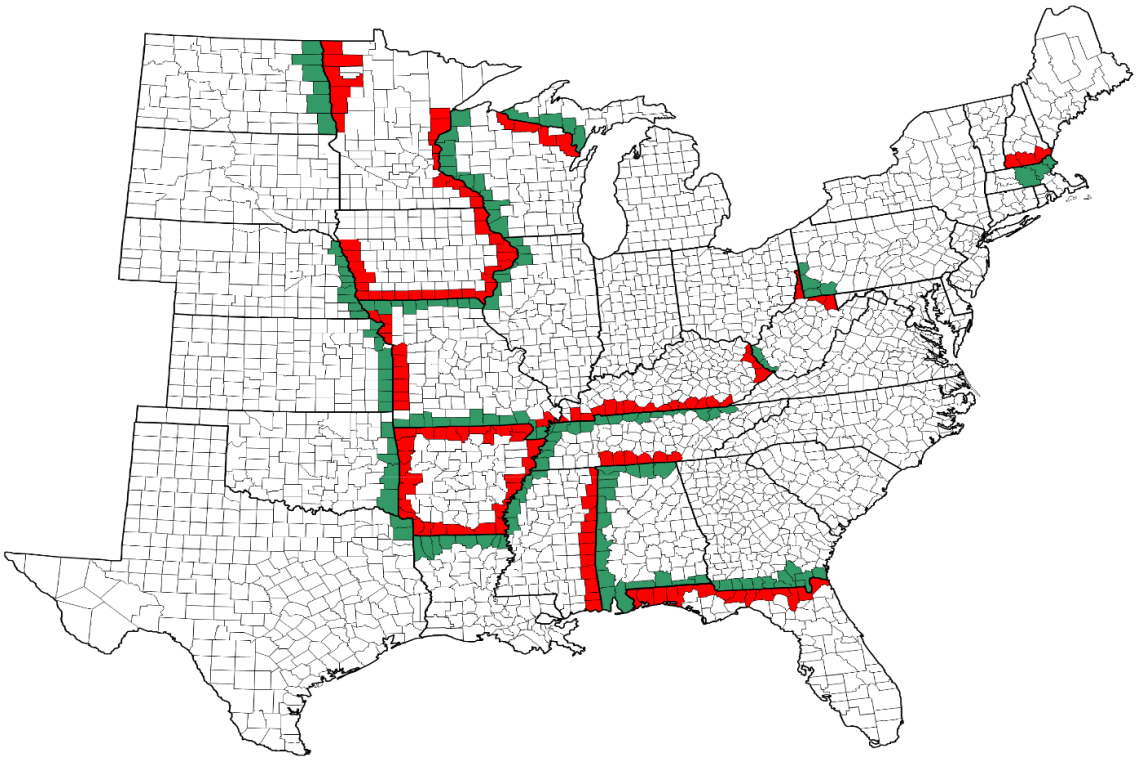
Notes: The figure plots a dynamic effect of intrastate branching deregulation on mortgage supply using the county-level data. The mortgage supply is defined as the natural logarithm of one plus the number of mortgages originated. The number of mortgage originations are from the HMDA dataset. The black dots are the coefficients on dummy variables $D^{\mp J}$ of Equation (2), where the dependent variable is the mortgage supply of a county in a given year. That dummy variable takes on a value of one if the given year is J^{th} year prior to or posterior to the branch deregulation (event) year of the state s. The omitted year is "-1" which is one-year prior to the event year. The negative sign is for the prior year and the positive sign is for the posterior year. The dashed vertical spike represents the 95% confidence interval.

Figure 6: Dynamic impact of intrastate branching deregulation on the number of banks



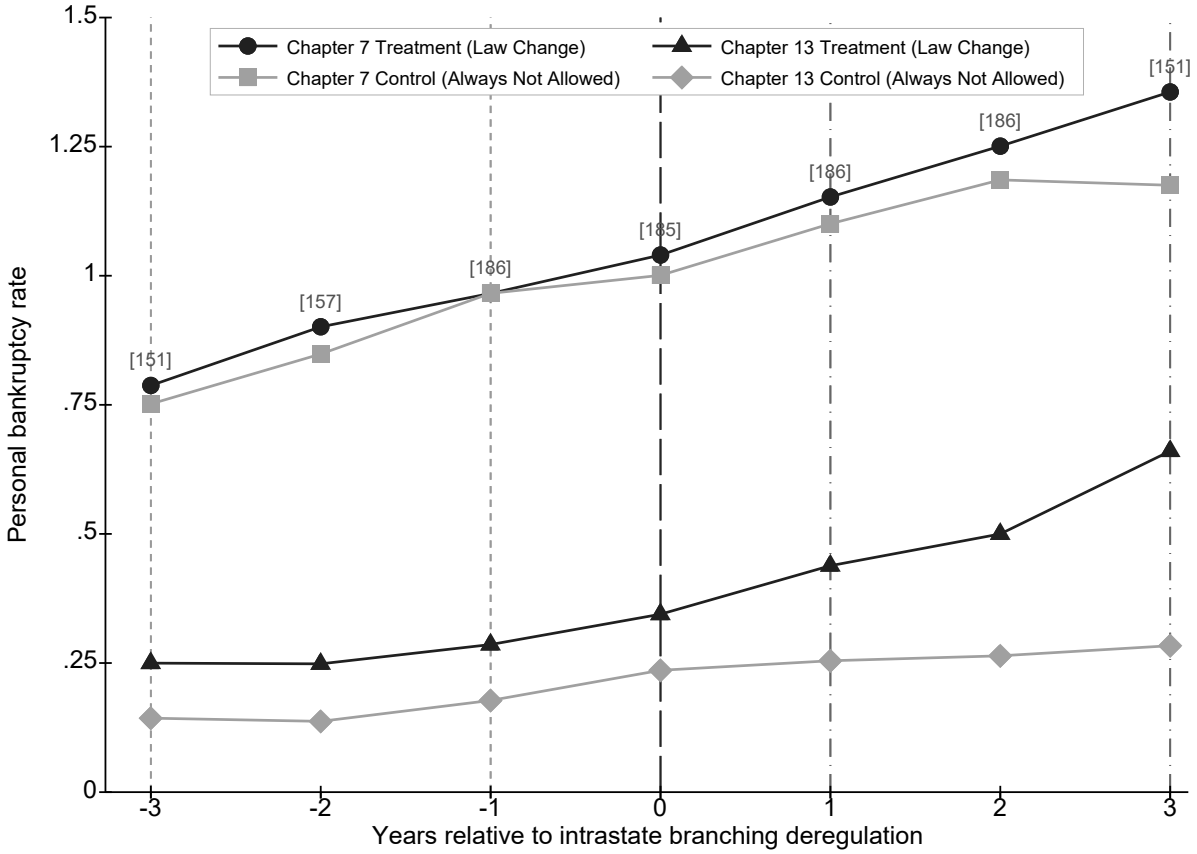
Notes: This figure plots a dynamic effect of intrastate branching deregulation on the number of banks using the subsamples of counties with high bank concentration (Panel A) and counties with low bank concentration (Panel B). A county is considered as a high (low) bank concentration county if in a given year its beginning period Herfindahl-Hirschman Index (HH-index) is above (below) the median HH-index of all the counties for that year. The HH-index is the sum of the squares of the deposits shares of banks in a given county-year. The deposits share of a bank is the ratio of its deposits to the total bank deposits of that county times 100. The black dots are the coefficients on dummy variables $D^{\mp J}$ of Equation (2), where the dependent variable is the number of banks of a county in a given year. That dummy variable takes on a value of one if the given year is J^{th} year prior to or posterior to the intrastate branching deregulation (event) year of the state *s*. The omitted year is "-1" which is one-year prior to the event year. The negative sign is for the prior year and the positive sign is for the posterior year. The dashed vertical spike represents the 95% confidence interval.

Figure 7: Map of 186 contiguous-county pairs of the treatment sample



Note: The green color (relatively light gray in the grayscale printout) is for the treatment counties and the red color (relatively dark gray) is for the comparison / control counties.

Figure 8: Bankruptcy trends relative to the event year for treatment and control groups



Notes: This figure shows the trend in average Chapter 7 and Chapter 13 bankruptcy rates for treatment and control counties. The year 0 refers to the year in which a treatment state removes restrictions on intrastate branching. The short-dashed lines are for the pre-period, the long-dashed line is for the event (intrastate branching) year, and the dashed-dot lines are for the post-period. The sample size is 186 counties for each treatment and control groups. The number in square parenthesis next to a black circle marker is the number of county-pairs used in computing the averages for a given year.