Bank Regulation and Monetary Policy Effectiveness: Evidence from the U.S. States Liberalization

Matthew Schaffer*

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Abstract

This paper studies the impact of geographic banking deregulation on the effectiveness of monetary policy. State-level removal of restrictions on interstate banking strengthened the effect of monetary policy on bank lending. This effect was driven by small banks affiliated with bank holding companies. Following interstate deregulation affiliated banks reallocate assets towards securities and away from lending after a contractionary monetary policy shock. Moreover, the least liquid banks are most strongly affected, indicating that interstate banking deregulation strengthened the bank lending channel of monetary policy.

*Department of Economics, Michigan State University, schaff37@msu.edu

1 Introduction

The impact of regulatory changes in recent decades on the U.S. banking industry has been well documented.[1] An unexplored aspect of these regulatory changes has been their effect on the relationship between the banking sector and monetary policy. As a recent literature documents, structural features of the banking sector can influence the sensitivity of lending to monetary policy.[2] Bank lending is an important mechanism through which monetary policy is transmitted to the broader economy. For both policymakers and bank regulators it is therefore important to know how changes in banking regulation may impact the effectiveness of monetary policy. In this paper we focus on one type of deregulation, state-level removal of restrictions on geographic expansion, and examine its impact on the sensitivity of lending to monetary policy.

We find that bank lending becomes more sensitive to monetary policy after a bank's home state removes restrictions on interstate banking. Interstate deregulation allows out-of-state bank holding companies to acquire and operate in-state banks. According to the baseline results, after a state has removed interstate restrictions the response of real lending growth to monetary policy doubles from a 2% to 4% decline for the four quarters following a contractionary policy shock. Intrastate branching deregulation allows banks headquartered within a state to open additional branches through mergers and acquisitions. We find that the sensitivity of lending to monetary policy is unchanged following the removal of intrastate restrictions.

The increased sensitivity of lending to monetary policy following interstate deregulation could be due to changes in loan portfolio composition, changes in average bank characteristics, changes in banking market structure, or changes in bank asset management. We rule out the first three possibilities and find evidence that interstate deregulation strengthened the bank lending channel of monetary policy for relatively small banks affiliated with a bank holding company.

[1] See Jayaratne and Strahan (1998), Berger and DeYoung (2001), and Stiroh and Strahan (2003) among others.
[2] See Adams and Amel (2011), Olivero, Li, and Jeon (2011a), and Amidu and Wolfe (2013).

2 Geographic Banking Regulation

Since the 19th century most U.S. states have imposed restrictions on the ability of banks to expand geographically [3]. These restrictions typically included an outright ban on out-of-state banks owning in-state banks as well as strict limitations on the number of branches that an in-state bank can operate. Deregulation of these restrictions took place in the majority of states from the mid-1970's to mid-1990's. Over this time frame every state other than Hawaii began to allow interstate banking and 35 different states removed restrictions on intrastate branching [4].

Interstate banking was effectively banned by the Douglas amendment to the Bank Holding Company Act of 1956. The amendment stated that a bank holding company (BHC) could not acquire an out-of-state bank unless the state the bank is located in has passed a statue explicitly allowing such transactions. Maine was the first state to pass such a statue and began allowing out-of-state bank holding companies to acquire Maine banks in 1978. Deregulation picked up in the 1980's, particularly after passage of the federal Garn-St Germain Act of 1982, which amended the Bank Holding Company Act to allow out-of-state bank holding companies to acquire failed banks or thrifts in any other state. States began entering reciprocal regional or national agreements through which bank holding companies in any state which had agreed to the arrangement could purchase banks operating in any of the other states. 38 states joined such an agreement between 1984 and 1988 [5].

Restrictions on intrastate branching were often removed in three steps. First, BHC's would be allowed to own multiple banks within one state, with each subsidiary operating as a separate institution - e.g., a depositor at one subsidiary could not access funds at a different subsidiary. Second, banks were allowed to establish additional branches through mergers and acquisitions (M&A). Importantly, this allowed BHC's operating within a state to convert their subsidiaries into branches of a single bank. Finally, unrestricted branching was allowed in which banks

[3] See Kroszner and Strahan (1999) for a detailed history

[4] 14 states already allowed intrastate branching and one, Iowa, did not deregulate at all

[5] Amel (1993)

were free to open new within-state branches as they pleased. The literature has focused on the second step, allowing branching via M&A, as the most important one. Most states had removed restrictions on in-state BHC expansion by the mid-1970's. Of the 15 who removed such restrictions after 1975, this often occurred around the same time that M&A branching restrictions were removed. Similarly, most states allowed unrestricted branching only a short time after allowing M&A branching.

Table 1 lists the year for which each state and the District of Columbia began to allow branching via M&A, unrestricted branching, and interstate banking [6]. Congress passed the Riegle-Neal Interstate Banking and Branching Efficiency Act in 1994, which allowed for national interstate banking and branching, effectively ending the period of state-level deregulation. The legislation went fully into effect in 1997 but many states adopted early in mid-1995. Thus the period of interest for state-level deregulation is from 1976 (when U.S. bank-level data becomes available) to 1994.

3 Data and Estimation

3.1 Monetary Policy Data

Conventional measures of monetary policy, such as the federal funds rate, can be problematic for two principle reasons. First, such measures are endogenous, i.e. they change in response to past and contemporaneous economic conditions. Second and more importantly, they reflect anticipatory movements by the monetary policymaker. Romer and Romer (2004) seek to surmount these issues by devising a new series of monetary policy shocks. First, they construct a series of intended funds rate changes around FOMC meetings by combining information from the *Weekly Report of the Manger of Open Market Operations* and narrative accounts of each FOMC meeting. Second, using the Fed's internal Greenbook forecasts, they purge the series of variation attributable to forecasts of future macroeconomic activity through the following regression:

[6] Dates from Amel (1993) and Kroszner and Strahan (1999).

$$\Delta ff_m = \alpha + \beta ffb_m + \sum_{i=-1}^{2} \gamma_i \Delta \widetilde{y}_{mi} + \sum_{i=-1}^{2} \lambda_i (\Delta \widetilde{y}_{mi} - \Delta \widetilde{y}_{m-1,i}) + \sum_{i=-1}^{2} \varphi \widetilde{\pi}_{mi} + \sum_{i=-1}^{2} \theta (\widetilde{\pi}_{mi} - \widetilde{\pi}_{m-1,i}) + \rho \widetilde{u}_{m0} + \epsilon_m \tag{3.1}$$

where Δff_m is the change in the intended funds rate at meeting m, ffb_m is the level of the intended funds rate prior to meeting m, $\Delta \widetilde{y}$ is forecasted real output growth, $\widetilde{\pi}$ is forecasted inflation, and $\widetilde{u}$ is the forecasted unemployment rate. Note that the previous period and contemporaneous forecasts of output growth and inflation are included in addition to forecasts of the next two quarters [7]. The residual of the above estimated equation, $\widehat{\epsilon}_m$, then becomes a cleaner measure of monetary policy shocks purged of endogenous and anticipatory variation. This measure will be our baseline indicator of monetary policy and will henceforth be referred to as the RR shock series.

Using the change in the effective fed funds rate as a measure of monetary policy may be particularly troublesome when estimating the effect of monetary policy on bank lending. Bluedorn, Bowdler, and Kochc (2017) provide evidence that such estimates at the individual bank-level are quite sensitive to the measure of monetary policy used. They argue that the RR shocks eliminate some of the major sources of endogenous variation plaguing other measures of policy. For instance, suppose the FOMC increases the fed funds rate due to anticipated higher output growth in the coming quarters. Higher output growth is likely to be associated with an increased demand for bank loans. A regression of the change in bank lending on lagged changes in the fed funds rate may therefore show a positive correlation, i.e. that contractionary monetary policy is associated with increased bank lending. Such an increase in the fed funds rate will not show up in the RR shocks however, mitigating such endogeneity concerns.

We use an updated series of RR shocks from Coibion, Gorodnichenko, Kueng, and Silvia (2012). The series is initially calculated at the frequency of FOMC meetings then aggregated to a quarterly average. The updated RR shocks as well as the change in the effective fed funds

[7] The previous period forecasts are typically observed data.

rate are plotted in Figure 1. The RR shock is smaller in magnitude than the change in the fed funds rate over the sample, which is unsurprising given that it is a residual of the latter. The two series typically move together and have a high positive correlation of 0.82. There is a noticeable period of outliers for both series from 1979 to 1982. During this period the Federal Reserve was targeting non-borrowed reserves (NBR) rather than the fed funds rate which resulted in large and volatile gyrations in the funds rate. Our baseline specifications include year or quarter dummy variables to account for this period.

3.2 Banking Data Bank-level data is from the Consolidated Reports of Condition and Income ("Call Reports") which all banks in the U.S. are required to file on a quarterly basis with the Federal Financial Institutions Examinations Council (FFIEC). We follow Kashyap and Stein (2000) and Den Haan, Sumner, and Yamashiro (2002) in defining our sample as all commercial banks which are insured, have positive assets, and are located in the fifty states or Washington, D.C. Since mergers typically create discontinuities in the acquiring bank's balance sheet, a bank observation is dropped from the sample in any quarter in which a merger occurs. To prevent outliers from driving the results a bank-quarter is dropped whenever total loan growth is more than five standard deviations away from that quarter's average loan growth. Additionally, a bank-quarter is dropped if there are not four preceding quarterly observations for total loan growth. This leaves slightly over 900,000 observations from 16,000 different banks in the sample.

Summary statistics for bank-level variables of interest are reported in table 2. The first two columns show summary stats for the entire sample (1976Q2-1994Q4). The third and fourth columns give a snapshot of the beginning of the sample and columns five and six give a snapshot near the end of the sample [8]. The main bank-level variable of interest is real loan growth[9]. Over the entire sample average quarterly loan growth at a single bank is 1.13% with a standard deviation of 7.25%. Average real loan growth across all banks is plotted in figure 2. The series is relatively stable across the sample except for the period of NBR targeting in the early 1980's,

[8] 1993Q4 is the last quarter for which consistent securities data used to calculate the liquidity ratio is available.
[9] Call report loan data is in nominal terms; we adjust for inflation using CPI.

which features a sharp drop. The share of total U.S. credit included in our sample is substantial. Figure 3 plots aggregated commercial bank lending in our data as a share of total private credit in the U.S. Over this time period commercial bank lending in our sample accounts for 30-43% of all private sector credit.

The Call Reports do not directly include data on loan rates. However, following Jayaratne and Strahan (1998) and Zarutskie (2013), a proxy for the average interest rate on a bank's loan portfolio can be calculated as total interest and fee income on loans divided by total loans[10]. Interest and fee income on loans is reported on a year to date basis. Hence, the previous quarter's value is subtracted from the current value to obtain a quarterly measure. Interest and fee income on loans is reported biannually prior to 1983. In order to use our full sample we replace the missing first quarter observations with half of the second quarter value and the missing third quarter observations with the average of the second and fourth quarter values. Regardless, all results below are robust to leaving the missing values empty. The annualized mean of a bank's average loan price is roughly 11.5% for the entire sample, with a standard deviation just over 4%. The average loan rate across all banks is plotted in figure 4. As with real loan growth, there are large variations in the early 1980's before stabilizing for the rest of the sample.

Other bank-level variables of interest include total assets, liquidity ratio, equity ratio, and bank holding company affiliation. Average bank assets increased by about a factor of 4 over this period with a mean of $173 million for the entire sample. Following Kashyap and Stein (2000), liquidity ratio is measured as the ratio of total securities to total assets. There is not a consistent variable tracking securities in the Call Reports over the sample. Prior to 1984 total securities is calculated as the sum of U.S. Treasury securities, U.S. government agency and corporate obligations, obligations of states and political subdivisions, all other bonds, stocks, and securities, and fed funds sold and securities purchased under agreements to resell. From 1984 to 1993 it is calculated as the sum of the book value of total investment securities, assets held in trading accounts, and fed funds sold. A consistent definition is not available for 1994, the final

[10] Jayaratne and Strahan (1998) uses this approach to study the effects of deregulation on loan pricing. Zarutskie (2013) studies the effects of deregulation and securitization on loan pricing.

year of our sample. Liquidity ratio is fairly stable across our sample with a mean of 0.35. Equity ratio is measured as the ratio of total equity to total assets and is stable across the sample with a mean of 0.09. Finally, affiliation with a bank holding company increases greatly over this time frame, as restrictions on bank expansion and acquisition are removed.

3.3 Estimation How did deregulation of geographic banking restrictions impact monetary transmission? In answering this question we follow the literature in specifying two distinct types of deregulation: intrastate branching deregulation and interstate banking deregulation. To determine the effect of each type of deregulation on monetary transmission we estimate a dynamic panel regression:

$$\begin{aligned}\Delta log(L_{ist}) = c &+ \sum_{j=1}^{4} \alpha_j \Delta log(L_{ist-j}) + \sum_{j=0}^{4} \mu_j MP_{t-j} + \gamma_1 INTRA_{st} + \gamma_2 INTER_{st} \\ &+ \sum_{j=0}^{4} \phi_j (MP_{t-j} * INTRA_{st}) + \sum_{j=0}^{4} \varphi_j (MP_{t-j} * INTER_{st}) + \sum_{j=0}^{4} \beta_j NATIONAL_{t-j} \\ &+ \sum_{j=0}^{4} \delta_j STATE_{st-j} + \sum_{k=1}^{3} \psi_k QUARTER_{kt} + \sum_{k=1}^{17} \xi_k YEAR_{kt} + \eta_i + \epsilon_{ist}\end{aligned} \tag{3.2}$$

where the dependent variable is real loan growth of bank i, located in state s, in quarter t. The independent variables include 4 lags of bank i's loan growth, the contemporaneous value and 4 lags of monetary policy shocks, a dummy variable equaling 1 if state s permits in-state branching via M&A in quarter t, an analogous dummy variable equaling 1 if interstate banking is allowed in state s during quarter t, and interactions between the monetary policy shocks and deregulation dummies. Also included are the contemporaneous values and 4 lags of national and state control variables, one lag of bank-level control variables, quarter dummy variables, year dummy variables, and a bank fixed effect.

The national-level variables include change in real GDP, change in the personal consumption expenditures (PCE) index, and the CRSP value weighted stock return index. The state-level

variables include percentage change in personal income and change in the U.S. Federal Housing Finance Agency all-transactions house price index. Quarter dummies are included to control for seasonality in lending. Year dummies are included to control for additional macro-level phenomena occurring during this time period, e.g. the gradual phaseout of regulation Q, the Fed regime of targeting non-borrowed reserves, and the Great Moderation. Alternate specifications with varying levels of fixed effects and time dummies are presented below, with the most comprehensive dropping all national-level variables in favor of quarterly fixed effects.

The coefficients of interest are the sum of the $\phi_j's$ and sum of the $\varphi_j's$. A significant $\sum_{j=0}^{4} \phi_j$ would indicate that monetary policy has a significantly different impact on bank lending following intrastate branching deregulation. A significant $\sum_{j=0}^{4} \varphi_j$ would indicate the same for interstate banking deregulation. We have no prior expectation regarding the sign of the coefficients, as the effect of deregulation on loan sensitivity to monetary policy is theoretically ambiguous.

4 Impact of Deregulation

Equation 3.2 is estimated over the sample 1976Q2 - 1994Q4. Results for the summed coefficients of interest are presented in panel (a) of table 4. Results for all coefficients are presented in table 5. Columns (1) through (5) in table 4 display results from a variety of specifications, with column (4) reporting the baseline specification from equation 3.2. In the first four columns the summed coefficients of the monetary policy indicator are negative and jointly significant at the 1% level [11]. A contractionary 100 basis point exogenous monetary policy shock reduces lending by roughly 1-2% over the following four quarters [12]. The summed coefficients of the interaction between intrastate branching deregulation and monetary policy are small and insignificant in all five columns, indicating that intrastate deregulation had no effect on loan sensitivity to monetary policy.

[11] Column (5) reports results including time fixed effects which are perfectly collinear with any national-level variable, such as the monetary policy indicator.

[12] One standard deviation of the monetary policy indicator is 70 basis points, hence a contractionary one standard deviation shock reduces lending by 0.8-1.4% over the next four quarters.

The summed coefficients on the interaction between the interstate banking deregulation dummy and the monetary policy indicator are negative and significant in all five columns. An exogenous, contractionary monetary policy shock reduces lending by an additional 1.38-4.26% for a bank located in a state that has lifted interstate banking restrictions [13]. According to the first four columns, the total effect of a contractionary monetary policy shock on lending for a bank located in a deregulated state is a decline of 2.5-4.1%. The baseline specification in column (4) indicates that the sensitivity of lending to monetary policy essentially doubles following interstate deregulation. Column (5) includes the strongest controls for time-specific macro variation, and indicates that the effect of interstate deregulation is even stronger than that reported in column (4).

There is significant overlap in years that both types of restrictions are deregulated for a given state. To check that the inclusion of both set of deregulation dummies is not biasing the results in panel (a) equation 3.2 is estimated separately for each type of deregulation as well. Panel (b) presents the summed coefficients of interest for estimating equation 3.2 with the interstate deregulation dummy and interactions only. Similarly, panel (c) presents results for estimating equation 3.2 with the intrastate deregulation dummy and interactions only. Both panels are consistent with the baseline results, confirming that lending becomes more sensitive to monetary policy after interstate banking deregulation and that intrastate branching deregulation has no effect.

As discussed in section 3.1, our preferred measure of monetary policy is the RR shock series rather than a traditional measure such as the fed funds rate. To check whether the baseline results are driven by the choice of monetary policy indicator, equation 3.2 is also estimated with the quarterly change in the fed funds rate as the monetary policy indicator. Results using the fed funds rate are presented in panel (d). Once again, a contractionary monetary policy shock leads to a significant decline in lending over the following four quarters. According to columns (1)-(4), a 100 basis point increase in the federal funds rate leads to a 0.37-0.92% decline in lending over

[13] A contractionary one standard deviation shock reduces lending by an additional 1-3%.

the next year.[14] Once again, intrastate deregulation has no effect.

Columns (1)-(3) now report that lending is less sensitive to monetary policy after interstate deregulation. Columns (4) and (5), which more completely control for unobserved macro variation, are consistent with the results in panel (a) however. The summed coefficients in columns (4) and (5) suggest that lending declines by an additional 0.66-1.02% after a state has removed interstate restrictions. The smaller magnitudes and positive coefficients in columns (1)-(3) are not surprising. The endogeneity and anticipatory components of the fed funds rate, which the RR shocks control for, would naturally lead to a less pronounced effect of policy. Regardless, the richer specifications in panel (d) indicate that lending responds more strongly to policy after interstate deregulation, suggesting that the choice of monetary policy variable is not driving our results.

The results in table 4 indicate that lending became more responsive to monetary policy along the quantity dimension following interstate deregulation. Next, we examine how deregulation affected the sensitivity of lending to monetary policy along the price dimension. As discussed in section 3.2, direct data on loan rates is not available through the Call Reports. We can proxy for the average rate on a banks loan portfolio through the ratio of interest income on loans to quantity of total loans however. This ratio is referred to as a bank's average loan rate in the following.

Table 6 presents results for estimating equation 3.2 with average loan rate as the dependent variable.[15] Column (1) of table 6 shows that average loan prices significantly increase following a monetary tightening. For the four quarters following a 100 basis point exogenous and contractionary monetary policy shock average loan rates increase by 69 basis points. The interaction between the intrastate deregulation dummy and monetary policy is small and insignificant in both columns (1) and (2), indicating that the removal of intrastate branching restrictions had no effect on the sensitivity of loan pricing to monetary policy.

[14] This is in line with estimates from Ashcraft (2006), who finds that a 100 basis point increase in the federal funds rate decreases bank lending by 0.45%.

[15] In the following we focus on the richer specifications including year dummies or time fixed effects, i.e. the specifications corresponding to columns (4) and (5) in table 4.

The interaction between the interstate deregulation dummy and monetary policy is positive and significant in both columns, indicating that loan pricing becomes more sensitive to monetary policy after interstate banking restrictions are removed. According to column (1), a bank located in a state that has removed interstate restrictions increases its average loan rate by an additional 113 basis points following a 100 basis point exogenous monetary tightening, which is more than double the average increase for a bank in a state that has not deregulated. Column (2) reports a somewhat smaller magnitude, indicating that a bank in a deregulated state increases its average loan rate by an additional 47 basis points following a monetary tightening. Regardless, this is a meaningful response as it is roughly two-thirds larger than that of a bank in a state which has not deregulated.

From 1976-1982 interest and fee income on loans is only reported in the second and fourth quarters. For the above results, we fill in the missing first and third quarter values so that first quarter average loan rate is equal to the second quarter observation, and so that third quarter average loan rate is equal to the fourth quarter observation. To check that replacing these missing values is not driving the above results we re-estimate equation 3.2 for an abbreviated sample from 1983-1994. Results are presented in columns (3) and (4) of table 6. The summed coefficients on the monetary policy indicator in column (3) are no longer significant at the 10% level, but the magnitude is similar and the standard errors are not large. Interestingly, intrastate branching deregulation leads to a greater sensitivity of loan pricing to monetary policy for this sample. The summed coefficients on the interaction between the interstate deregulation dummy and monetary policy remain positive and significant in both columns (3) and (4). These subsample results therefore reassure that our method of replacing missing observations for 1976-82 is not driving the results in columns (1) and (2).

5 Compositional Effects

Next we aim to explain the baseline results: namely, why does interstate banking deregulation strengthen the effect of monetary policy on lending? The literature suggests several compositional

effects which may be important. Den Haan, Sumner, and Yamashiro (2007) find that certain types of loans are more sensitive to monetary policy than others. Interstate deregulation may therefore have increased certain types of lending which are more sensitive to policy. Second, Kashyap and Stein (1995) and Kashyap and Stein (2000) find that small banks are more sensitive than large banks to monetary policy. Hence, another possibility is that interstate deregulation decreased the average size of banks, leading to a greater average sensitivity of loans to policy.

A recent literature has examined the effect of bank market structure on monetary policy transmission to mixed results. Adams and Amel (2011), Olivero, Li, and Jeon (2011b), andFungáčová, Solanko, and Weill (2014) find that lending is more sensitive to monetary policy in relatively more competitive banking markets. On the other hand Gunji, Miura, and Yuan (2009), Olivero, Li, and Jeon (2011a), and Amidu and Wolfe (2013) find that lending is more sensitive to monetary policy in less competitive markets. We therefore examine whether the greater sensitivity of lending to policy after interstate deregulation can be explained by changes in banking market structure. A fourth possibility is that deregulation altered the way banks adjust the asset side of their balance sheets in the face of macroeconomic shocks. The literature suggests that banks involved in acquisitions tend to engage in less relationship lending.[16] We therefore investigate whether banks affiliated with holding companies respond to shocks differently than stand alone banks.

5.1 Loan Type Den Haan, Sumner, and Yamashiro (2007) examine loan portfolio response to monetary policy at the aggregate level and find differential responses depending on loan type. Real estate and consumer loans decrease following a monetary tightening but commercial and industrial loans actually increase. In explaining these results the authors suggest that adjusting the composition of loan portfolios may be an optimal response of banks to monetary policy shocks for a variety of reasons. Our results in section 4 may therefore be driven by such a compositional effect.

[16]See Berger, Kashyap, Scalise, Gertler, and Friedman (1995), Berger and Udell (2002), and Cole, Goldberg, and White (2004) among others.

Focusing on total lending may hide important compositional effects. To investigate further, equation 3.2 is estimated separately for each of the three main loan categories (commercial and industrial, real estate, and consumer) with results presented in table 7. Interestingly, and inconsistent with Den Haan, Sumner, and Yamashiro (2007), columns (1), (3), and (5) report that each loan category responds negatively to a monetary tightening [17]. While the summed coefficients on the interaction between interstate deregulation and monetary policy are not significant for the baseline specification, the alternate specification including time fixed effects show that each category becomes more sensitive to policy following deregulation, and at a similar magnitude as total lending in table 4.

Each type of loan therefore seems to become more sensitive to monetary policy after the removal of interstate restrictions with a roughly similar magnitude. Moreover, panel (b) of 7 shows the effect of deregulation on the average share of each loan category. Intrastate and interstate deregulation both significantly decreased consumer and industrial and real estate lending as a share of total loans. Interstate deregulation significantly increased the share of consumer lending. The coefficients for each category share are small however, and since consumer lending responds to interstate deregulation in a similar direction and magnitude as C&I and real estate lending, it appears that the greater sensitivity of overall lending to monetary policy after deregulation was not driven by a change in bank loan portfolio composition.

5.2 Bank Size Kashyap and Stein (1995) finds that small banks are more sensitive to monetary policy than larger banks. Similarly, Kashyap and Stein (2000) find that small and relatively illiquid banks are most strongly affected by monetary policy. Additionally, Cetorelli and Goldberg (2012) report that global banks are less responsive to monetary policy. It is therefore possible that interstate deregulation altered the composition of the banking sector towards a larger share of banks that are more sensitive to policy. To investigate, we estimate equation 3.2 separately for small banks, large banks, and branches of foreign banks operating in the United

[17] There are important differences between this study and Den Haan, Sumner, and Yamashiro (2007) however, as they use aggregated data in a VAR framework for a sample that extends to 2004.

States. Consistent with the literature, we define a small bank as any bank within a given quarter below the cross-sectional 95th percentile in total assets for that quarter. Correspondingly, a large bank is defined as any above the 95th percentile in total assets for a given quarter.

Results are presented in panel (a) of table 8. Columns (1)-2) have results for small banks, (3)-(4) for large banks, and (5)-(6) for foreign banks. The summed coefficients in the first row show that both small and large banks have a roughly 2% decline in lending for the four quarters following a 100 basis point contractionary monetary policy shock prior to deregulation. The response of lending from foreign banks is insignificant however. The second row shows that intrastate branching deregulation has no effect of the sensitivity of small bank lending, although it may have a small negative effect on large bank lending. Interestingly, intrastate branching deregulation seems to make branches of foreign banks much more sensitive to policy. The third row shows that interstate banking deregulation only affects small banks. The coefficients are very similar to the baseline results for all banks, as the response of small bank lending to a monetary shock doubles after deregulation.

The results in panel (a) are consistent with Kashyap and Stein (1995) and Kashyap and Stein (2000). Indeed, they suggest that interstate banking deregulation may be the reason that small banks are more sensitive to monetary policy than large banks. The increased sensitivity of lending to policy documented in the baseline results may therefore be driven by a decrease in average size of banks, or a decline in foreign bank presence. To test for this we regress the two deregulation dummies on log of total bank assets (proxying for size), foreign share of banks within a state, and foreign share of state banking assets, with results presented in panel (b) of table **??**.

The results show that interstate deregulation increased average bank size, increased the presence of foreign banks in a state, and increased foreign bank share of a state's total bank assets. Since relatively small domestic banks are the ones primarily affected by deregulation, and since deregulation actually increased bank size and foreign bank share, we can conclude that the effect of interstate deregulation was not driven by a change in the composition of the banking sector

across size or domestic status. As an additional check, we estimate 3.2 with average loan rate as the dependent variable for both small and large bank samples.[18] Results are presented in table 9.

The first row of table 9 confirms that both small and large banks increase loan rates following a monetary tightening. Columns (1) and (3) suggest that following interstate deregulation the sensitivity of loan pricing to policy increased for both small and large banks. Column (2) confirms this for small banks, however the summed coefficient for the interaction of interstate deregulation and monetary policy is small and insignificant for large banks in column (4). These results for the price dimension of lending provide further support that small banks were primarily impacted by interstate deregulation.

5.3 Market Concentration The effects of geographic banking deregulation have been widely discussed in the literature. Jayaratne and Strahan (1998), Evanoff and Ors (2008) and Chortareas, Kapetanios, and Ventouri (2016) find that deregulation increased efficiency in the banking sector. Stiroh and Strahan (2003) report that deregulation improved competitive dynamics by reallocating market share to better performing banks. Zou, Miller, and Malamud (2011) offer mixed evidence, arguing that deregulation increased efficiency of small banks but decreased efficiency of medium-sized banks. Similarly, Berger and DeYoung (2001) find both positive and negative links between geographic expansion and bank efficiency. Rhoades (2000) argues that nationwide banking concentration increased from 1980-1998, in part due to geographic deregulation, and Jeon and Miller (2003) find that deregulation is significantly correlated with higher state-level concentration.

Additionally, a relatively new literature has examined the relationship between banking market structure and monetary policy transmission. In cross-country studies using bank-level measures of market power Fungáčová, Solanko, and Weill (2014) and Leroy (2014) find that lending is less sensitive to monetary policy when banks have greater market power. On the other hand, Amidu and Wolfe (2013) and Yang and Shao (2016) find that lending is more sensitive to policy

[18]Foreign banks do not report interest and fee income on loans, which is required to calculate average loan rate.

when banks have greater market power. The only published study on bank market structure and monetary transmission in the U.S. is Adams and Amel (2011) which takes market concentration at the local level (MSA or county) as the measure of market structure. They use annual Community Reinvestment Act data on new loan origination for a sample running from 1996-2004, and their results show that monetary policy has a weaker effect on bank lending in more highly concentrated markets.

The effect of geographic deregulation on banking market structure is not clear, nor is the effect of market structure on monetary policy effectiveness. In this section we test how each type of deregulation impacted bank market power and banking concentration, at both the local and state level. Additionally, we examine whether changes in market power and concentration can explain the increased sensitivity of lending to policy following interstate deregulation. The measure of market power used is a bank-level Lerner index and the measures of concentration used are the Herfindahl-Hirschman Index (HHI), calculated at the local (county) and state levels.

The Lerner index is a measure of a banks market power, calculated as the difference between price of output and marginal cost, divided by marginal cost. In calculating the Lerner index we follow Fungáčová, Solanko, and Weill (2014) among others. The average price of bank production is proxied by the ratio of total revenues to total assets. The marginal cost is calculated by estimating a translog cost function with one output and three input prices. The output price is total assets and the input prices are the price of labor, price of fixed assets, and price of borrowed funds (interest on deposits). The cost function is specified as follows:

$$\begin{aligned} log(TC_{it}) = \alpha_0 + \alpha_1 log(y_{it}) + 0.5\alpha_2 (log(y_{it}))^2 + \sum_{j=1}^{3} \beta_j log(w_{j,it}) \\ + \sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} log(w_{j,it}) * log(w_{k,it}) + \sum_{j=1}^{3} \gamma_j log(y_{it}) * log(w_{j,it}) + \rho_t + \eta_i + \epsilon_{it} \end{aligned} \tag{5.1}$$

Where y is total assets and $\sum_{j=1}^{3} w_j$ are the three input prices. Quarter dummies and bank fixed effects are included. As is standard, symmetry and linear homogeneity restrictions are imposed

on input prices. Total cost is the sum of the three input prices. Marginal cost can then be calculated from the estimated coefficients:

$$MC = (TC/y) * (\alpha_1 + \alpha_2 log(y) + \sum_{j=1}^{3} log(w_j)) \tag{5.2}$$

The resulting Lerner index, calculated as (P-MC)/MC, is a bank-level measure of market power, with a value of 0 representing a perfectly competitive bank (P=MC) and a value of 1 representing a pure monopolist. As with the efficiency ratio, since expense data is available only biannually until 1983 we fill the missing first and third quarter observations with the average Lerner Index of the previous and following quarters.

The Herfindahl-Hirschman Index (HHI) is an index of the summed squares of firm market shares within an industry:

$$HHI = \sum_{i=1}^{N} {s_i}^2 \tag{5.3}$$

where s is the market share of firm i and there are N banks in the market. Hence in a monopoly, where a single banks's market share is equal to 100%, the HHI index would be 1. On the opposite end of the spectrum, the HHI for a decentralized market with many firms would be close to zero. We calculate HHI at both the county and state levels, as concentration at the local level and at the state level may be quite different.

Each of the three bank structure measures are regressed on the deregulation dummies and controls in the following specification:

$$BMS_{ist} = c + \gamma_1 INTRA_{st} + \gamma_2 INTER_{st} + \delta STATE_{st} + \beta BANK_{ist-1} + \rho_t + \eta_i + \epsilon_{ist} \tag{5.4}$$

Results are presented in table 10. The first row shows that intrastate branching deregulation increased county-level banking concentration but had no effect on the Lerner index or state-

level concentartion [19]. Interstate deregulation also increased county-level concentration, along with increasing the Lerner index and decreasing state-level concentration. These results indicate that the removal of interstate banking restrictions increased bank market power, increased local concentration, and decreased state concentration.

Now that we have documented the effect of interstate deregulation on a variety of bank market structure measures, we examine how these measures are related to the the sensitivity of loan pricing to monetary policy. To do so we estimate an alternative version of equation 3.2, with the bank market structure variables interacted with the monetary policy indicator. Equation 5.5 is estimated both with and without the deregulation dummies and their interactions with monetary policy:

$$\begin{aligned}\Delta log(L_{ist}) = c + \sum_{j=1}^{4} \alpha_j \Delta log(L_{ist-j}) + \sum_{j=0}^{4} \mu_j MP_{t-j} + \gamma BMS_{ist} + \sum_{j=0}^{4} \phi_j (MP_{t-j} * BMS_{ist}) \\ + \sum_{j=0}^{4} \beta_j NATIONAL_{t-j} + \sum_{j=0}^{4} \delta_j STATE_{st-j} + \sum_{k=1}^{3} \psi_k QUARTER_{kt} \\ + \sum_{k=1}^{17} \xi_k YEAR_{kt} + \eta_i + \epsilon_{ist}\end{aligned} \tag{5.5}$$

The summed coefficients on the interaction between bank market structure and monetary policy, $\sum_{j=0}^{4} \phi_j$, informs us of the differential response of bank loan pricing to monetary policy depending on a banks market power, local market concentration, and state concentration [20]. Results are presented in panel (a) of table 10. Columns (1), (3), and (5) show results for estimating equation 5.4 with each bank market structure variable without the deregulation dummy and interactions. Columns (2),(4), and (6) show results for estimating equation 5.4 with each bank market structure variable as well as the interstate deregulation dummy and interactions.

Across all six columns a contractionary monetary policy shock results in an increase in de-

[19] Note: the state HHI regression is ran at the state-level rather than the bank-level.
[20] Note: The Lerner Index is included with one lag to reduce simultaneity concerns.

crease in lending over the following four quarters, with the decrease being significant for all columns. The first reports that banks with a higher Lerner index (i.e. greater market power) are less sensitive to monetary policy. A bank which is a pure monopolist (Lerner = 1) decreases lending by 0.48% for the four quarters following a monetary tightening whereas a perfectly competitive bank (Lerner = 0) decreases lending by 2.91%. Column (2) confirms however that the effect of policy on lending increases by roughly 2% after interstate deregulation, controlling for bank market power. Columns (3)-(6) report that county-level and state-level concentration have no effect on loan response to monetary policy. Column (4) and column (6) confirm that interstate banking deregulation increases the sensitivity of lending to monetary policy, for banking sector concentration.

The results in table 10 indicate that interstate deregulation did not affect loan sensitivity through banking competition or market structure. Banking concentration has no impact on the sensitivity of lending to monetary policy. Increased bank market power weakens the impact of policy on lending. Since interstate deregulation increased bank market power but strengthened the impact of policy on lending, the effect of deregulation could not have been driven by change in market power. As a final investigation we estimate equation 3.2 for subsamples corresponding to Lerner index quartile and local HHI quartile. While deregulation may not have operated through increasing market power or concentration it is possible that bank were asymmetrically impacted according to their competitive environment.

Table 11 shows the effect of deregulation by Lerner index quartile, with the 1st quartile having the lowest index score/market power (and hence being relatively more competitive) and with the 4th quartile having the highest index score/market power (and hence being relatively less competitive). Panel (a) shows results for all banks, panel (b) shows results for small banks only, and panel (c) shows results for large banks only. There is no clear trend across quartiles, as all four respond more strongly after interstate deregulation, particularly the first and fourth quartiles. Once again, only small banks respond more strongly after interstate deregulation, as there is no effect for large banks. Similarly, table 12 shows the effect of deregulation by county

HHI, with the 1st quartile having the lowest concentration and the 4th quartile having the highest concentration. Panel (a) shows results for all banks, panel (b) shows results for small banks, and panel (c) shows results for large banks. Once again, deregulation has a significant effect across all four quartiles, which is driven by the small banks and does not include the large banks.

5.4 Bank Holding Company Affiliation The banking literature has established evidence that banks are less likely to engage in relationship lending after being involved in an acquisition. This suggests that acquired banks may more promptly restrict lending following an adverse shock. On the other hand, Ashcraft (2006) has found that banks affiliated with a bank holding company (BHC) respond less sensitively to monetary policy. Banks affiliated with a BHC are more likely to be able to access external funds through their parent company, and hence better protect their loan portfolio from shortfalls in reserves. Banks that are owned by a parent company are more likely to have been involved in an acquisition however (i.e., they have been purchased by the holding company at some point), suggesting that they may be more willing to pull back on lending in the face of an adverse policy shock.

In this section we estimate equation 3.2 for two subsamples: banks that are affiliated with a BHC in a given quarter and stand alone banks that are unaffiliated with a parent company. Results are presented in panel (a) of table 13. Columns (1)-(2) show results for stand alone banks and columns (3)-(4) show results for BHC affiliated banks. Consistent with Ashcraft (2006), columns (1) and (3) show that stand alone banks respond more strongly to monetary policy than affiliated banks pre-deregulation. Intrastate deregulation has no effect on either group. Columns (3) and (4) indicate that affiliated banks become significantly more responsive to monetary policy after deregulation, by a relatively large magnitude of 2.7-5.16%. Column (1) indicates that interstate deregulation does not significantly impact stand alone banks. Column (2) suggests stand alone banks are affected as well, though to a lesser degree than BHC affiliated banks. We also test for the effect of deregulation on the likelihood that a bank is affiliated with a BHC, with results presented in panel (b). Both intrastate and interstate deregulation make it more likely that an individual bank is affiliated with a BHC.

Table 13 suggests that BHC-affiliated banks are more strongly impacted by interstate deregulation. Table 14 breaks the sample down further by both size and BHC-affiliation. Panel (a) shows results for small banks and panel (b) for large banks. The results indicate that small, BHC-affiliated banks seem to be most strongly impacted by interstate deregulation. Table 15 breaks the sample down further by liquidity ratio quartile. Liquidity ratio is defined as the ratio of total cash and reserves to total liabilities, where the 1st quartile is the least liquid and the 4th quartile is the most liquid. Panel (a) of table 15 shows the effect of interstate deregulation by liquidity quartile for small, BHC-affiliated banks; panel (b) for small, stand alone banks; panel (c) for large, BHC-affilaited banks; and panel (d) for large, stand alone banks.

The results in table 15 confirm that it is primarily small banks affiliated with BHC's who become more sensitive to policy after interstate deregulation. Moreover, it is the least liquid banks who are most strongly impacted (i.e. the 1st quartile).[21] Next, we test why small, affiliated banks are the most strongly affected. To do so we look at the asset side of a bank's balance sheet more broadly. We once again estimate equation 3.2 across liquidity quartile for small banks based upon their BHC affiliation, but now with total asset growth or securities growth as the dependent variable. If the relationship lending hypothesis is correct - i.e., that after interstate deregulation banks affiliated with a BHC are more likely to withdraw lending following an adverse shock - we would expect to see small affiliated banks shuffle their asset portfolio away from lending and towards interest-bearing securities.

Table 16 presents results. Panel (a) shows how interstate deregulation impacts the sensitivity of asset growth to monetary policy for small and affiliated banks. Panel (b) shows the same effect for small, stand alone banks. Panel (c) shows how interstate deregulation impacts the sensitive of securities growth to monetary policy for small and affiliated banks. Panel (d) shows the same effect for small, stand alone banks. Noticeably, small and affiliated banks adjust both assets and securities in response to a monetary shock whereas small, stand alone banks do not adjust either. Small and affiliated banks below the 4th quartile in liquidity see a relatively small

[21] The least liquid small, stand alone banks also become more sensitive.

decline in assets for the four quarters following a monetary policy shock. As seen in table 15, these banks are reducing lending to a relatively large degree. On the other hand, panel (c) shows that they increase securities holdings in response to a contractionary shock (except for the 3rd quartile).

Thus, small banks affiliated with a BHC are primarily impacted by interstate banking deregulation. Following deregulation, they decrease lending and increase securities holdings following a contractionary monetary policy shock, resulting in a slight decline in overall assets. This is supportive of the lending relationship hypothesis; i.e. that banks which may have previously engaged in relationship lending are more likely to be acquired after the removal of interstate banking restrictions. After being acquired by a parent company a bank is less likely to engage in relationship lending and hence more likely to reshuffle their assets in the face of an adverse shock.

6 Aggregate Effects

We have documented that bank lending becomes more sensitive to monetary policy following interstate banking deregulation, particularly for small banks and banks affiliated with a bank holding company. In this section we aggregate our bank level data to the state-level to investigate the aggregate effects of deregulation. Table 17 presents results for estimating equation 3.2 with state-level variables. Columns (1)-(2) present results with the dependent variable being all loans occurring in a state, columns (3)-(4) with the dependent variable being all loans from small banks occurring in a state, and columns (5)-(6) being all loans from large banks occurring in a state.

The results are consistent with those found at the bank-level. The summed coefficient on the interaction between interstate deregulation and monetary policy in column 2 for all bank loans indicates that lending in a state decreases by 12.38% for the four quarters after a 100 basis point contrationary monetary policy shock. Column (4) supports that this effect is being driven by the response of small banks. We also analyze how the aggregate effect is related to BHC affiliation. Columns (1)-(2) in table 18 present results with the dependent variable being all loans from stand

alone banks occurring in a state. Columns (3)-(4) presnet results with the dependent variable being all loans from BHC-affiliated banks occurring in a state. The results confirm those at the bank-level; that the aggregate effect is driven by lending from affiliated banks.

7 Conclusion

This paper examines how loan sensitivity to monetary policy changed following geographic banking deregulation. From the mid-1970's to mid-1990's a majority of states removed restrictions on geographic bank expansion. There were two types of restrictions: those on out-of-state ownership of in-state banks (interstate) and those on within-state branching (intrastate). Our results show that interstate banking deregulation, but not intrastate branching deregulation, increased the sensitivity of lending to monetary policy. The response of real lending growth to a contractionary monetary policy shock roughly doubles following interstate deregulation. Average loan pricing becomes more sensitive to monetary policy after interstate deregulation as well.

The increased sensitivity of lending to monetary policy cannot be attributed to changes in loan portfolio composition, changes in banking sector composition, or changes in banking market structure. The banks most strongly affected are small banks affiliated with a bank holding company. Moreover, the least liquid banks within this category are the most strongly impacted, suggesting that interstate banking deregulation strengthened the bank lending channel. Further investigation into the relationship between financial regulation and monetary policy remains a promising avenue for future work.

References

Adams, R. M., and D. F. Amel (2011): "Market structure and the pass-through of the federal funds rate," *Journal of Banking & Finance*, 35(5), 1087–1096.

Amel, D. F. (1993): *State laws affecting the geographic expansion of commercial banks*. Unspecified.

Amidu, M., and S. Wolfe (2013): "The effect of banking market structure on the lending channel: Evidence from emerging markets," *Review of Financial Economics*, 22(4), 146–157.

Ashcraft, A. B. (2006): "New Evidence on the Lending Channel," *Journal of Money, Credit, and Banking*, 38(3), 751–775.

Berger, A. N., and R. DeYoung (2001): "The effects of geographic expansion on bank efficiency," *Journal of Financial Services Research*, 19(2), 163–184.

Berger, A. N., A. K. Kashyap, J. M. Scalise, M. Gertler, and B. M. Friedman (1995): "The transformation of the US banking industry: What a long, strange trip it's been," *Brookings papers on economic activity*, 1995(2), 55–218.

Berger, A. N., and G. F. Udell (2002): "Small business credit availability and relationship lending: The importance of bank organisational structure," *The economic journal*, 112(477).

Bluedorn, J. C., C. Bowdler, and C. Kochc (2017): "Heterogeneous Bank Lending Responses to Monetary Policy: New Evidence from a Real-Time Identification," *International Journal of Central Banking*.

Cetorelli, N., and L. S. Goldberg (2012): "Banking globalization and monetary transmission," *The Journal of Finance*, 67(5), 1811–1843.

Chortareas, G., G. Kapetanios, and A. Ventouri (2016): "Credit market freedom and cost efficiency in US state banking," *Journal of Empirical Finance*, 37, 173–185.

Coibion, O., Y. Gorodnichenko, L. Kueng, and J. Silvia (2012): "Innocent bystanders? Monetary policy and inequality in the US," Discussion paper, National Bureau of Economic Research.

Cole, R. A., L. G. Goldberg, and L. J. White (2004): "Cookie cutter vs. character: The micro structure of small business lending by large and small banks," *Journal of financial and quantitative analysis*, 39(2), 227–251.

Den Haan, W., S. Sumner, and G. Yamashiro (2002): "Construction of aggregate and regional bank data using the call reports: data manual," *Unpublished manuscript, University of Amsterdam*.

Den Haan, W. J., S. W. Sumner, and G. M. Yamashiro (2007): "Bank loan portfolios and the monetary transmission mechanism," *Journal of Monetary Economics*, 54(3), 904–924.

Evanoff, D. D., and E. Ors (2008): "The competitive dynamics of geographic deregulation in banking: Implications for productive efficiency," *Journal of Money, Credit and Banking*, 40(5), 897–928.

Fungáčová, Z., L. Solanko, and L. Weill (2014): "Does competition influence the bank lending channel in the euro area?," *Journal of Banking & Finance*, 49, 356–366.

Gunji, H., K. Miura, and Y. Yuan (2009): "Bank competition and monetary policy," *Japan and the World Economy*, 21(1), 105–115.

Jayaratne, J., and P. E. Strahan (1998): "Entry restrictions, industry evolution, and dynamic efficiency: Evidence from commercial banking," *The Journal of Law and Economics*, 41(1), 239–274.

Jeon, Y., and S. M. Miller (2003): "Deregulation and structural change in the US commercial banking industry," *Eastern Economic Journal*, 29(3), 391–414.

Kashyap, A. K., and J. C. Stein (1995): "The impact of monetary policy on bank balance sheets," in *Carnegie-Rochester Conference Series on Public Policy*, vol. 42, pp. 151–195. Elsevier.

——— (2000): "What do a million observations on banks say about the transmission of monetary policy?," *American Economic Review*, pp. 407–428.

Kroszner, R. S., and P. E. Strahan (1999): "What drives deregulation? Economics and politics of the relaxation of bank branching restrictions," *The Quarterly Journal of Economics*, 114(4), 1437–1467.

Leroy, A. (2014): "Competition and the bank lending channel in Eurozone," *Journal of International Financial Markets, Institutions and Money*, 31, 296–314.

Olivero, M. P., Y. Li, and B. N. Jeon (2011a): "Competition in banking and the lending channel: Evidence from bank-level data in Asia and Latin America," *Journal of Banking & Finance*, 35(3), 560–571.

——— (2011b): "Consolidation in banking and the lending channel of monetary transmission: Evidence from Asia and Latin America," *Journal of International Money and Finance*, 30(6), 1034–1054.

Rhoades, S. A. (2000): "Bank mergers and banking structure in the United States, 1980-98," Discussion paper, Board of Governors of the Federal Reserve System (US).

Romer, C. D., and D. H. Romer (2004): "A New Measure of Monetary Shocks: Derivation and Implications," *The American Economic Review*, 94(4), 1055.

Stiroh, K. J., and P. E. Strahan (2003): "Competitive dynamics of deregulation: Evidence from US banking," *Journal of Money, Credit, and Banking*, 35(5), 801–828.

Yang, J., and H. Shao (2016): "Impact of bank competition on the bank lending channel of monetary transmission: Evidence from China," *International Review of Economics & Finance*, 43, 468–481.

Zarutskie, R. (2013): "Competition, financial innovation and commercial bank loan portfolios," *Journal of Financial Intermediation*, 22(3), 373–396.

Zou, Y., S. M. Miller, and B. Malamud (2011): "Geographic deregulation and commercial bank performance in US state banking markets," *The quarterly review of economics and finance*, 51(1), 28–35.

State	Intrastate branching via M&A	Interstate banking
Alabama	1981	1987
Alaska	<1970	1982
Arizona	<1970	1986
Arkansas	1994	1989
California	<1970	1987
Colorado	1991	1988
Connecticut	1980	1983
Delaware	<1970	1988
Washington, DC	<1970	1985
Florida	1988	1985
Georgia	1983	1985
Hawaii	1986	*
Idaho	<1970	1985
Illinois	1988	1986
Indiana	1989	1986
Iowa	*	1991
Kansas	1987	1992
Kentucky	1990	1984
Louisiana	1988	1987
Maine	1975	1978
Maryland	<1970	1985
Massachusetts	1984	1983
Michigan	1987	1986
Minnesota	1993	1986
Mississippi	1986	1988
Missouri	1990	1986
Montana	1990	1993
Nebraska	1985	1990
Nevada	<1970	1985
New Hampshire	1987	1987
New Jersey	1977	1986
New Mexico	1991	1989
New York	1976	1982
North Carolina	<1970	1985
North Dakota	1987	1991
Ohio	1979	1985
Oklahoma	1988	1987
Oregon	1985	1986
Pennsylvania	1982	1986
Rhode Island	<1970	1984
South Carolina	<1970	1986
South Dakota	<1970	1988
Tennessee	1985	1985
Texas	1988	1987
Utah	1981	1984
Vermont	1970	1988
Virginia	1978	1985
Washington	1985	1987
West Virginia	1987	1988
Wisconsin	1990	1987
Wyoming	1988	1987

Table 1: Column 1 lists the year that each state allowed branch banking through mergers and acquisitions. Column 2 lists the year each state entered into an interstate banking agreement with other states. * indicates that a state had not deregulated before 1994. Dates from Amel (1993) and Kroszner and Strahan (1999).

	Whole Sample		1976-1985		1986-1994	
All banks	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Real loan growth - Total (%)	1.13	(7.25)	1.39	(7.30)	0.81	(7.17)
Avg loan rate (annualized %)	11.43	(4.06)	11.99	(4.77)	10.74	(2.83)
Real loan growth - C&I (%)	0.76	(24.13)	1.63	(24.32)	-0.33	(23.85)
Real loan growth - RE (%)	2.16	(15.08)	2.18	(16.77)	2.13	(12.66)
Real loan growth - Con (%)	0.46	(17.35)	1.04	(17.58)	-0.27	(17.03)
C&I Share of Lending	0.21	(0.14)	0.22	(0.14)	0.20	(0.13)
RE Share of Lending	0.40	(0.19)	0.34	(0.17)	0.47	(0.18)
Con share of lending	0.24	(0.14)	0.26	(0.14)	0.20	(0.13)
Assets ($)	173 mil	(2 bil)	122 mil	(1.6 bil)	235 mil	(2.5 bil)
Securities ($)	38 mil	(269 mil)	27 mil	(183 mil)	54 mil	(355 mil)
Liquidity Ratio	0.09	(0.23)	0.10	(0.06)	0.08	(0.34)
Equity Ratio	0.09	(0.03)	0.09	(0.03)	0.09	(0.04)
BHC Affiliation	0.53	(0.50)	0.39	(0.49)	0.70	(0.46)
Lerner Index	0.31	(0.09)	0.30	(0.08)	0.32	(0.09)
County HHI	0.33	(0.22)	0.31	(0.21)	0.35	(0.23)
State HHI	0.11	(0.11)	0.10	(0.10)	0.12	(0.12)
Number of banks	16,014		14,835		14,242	

Table 2: This table reports summary statistics for bank-level variables of interest. The first two columns have statistics for the entire sample (1976Q2 - 1994Q4). The third and fourth columns have statistics for the early part of the sample (when the majority of states had not deregulated). The fifth and sixth columns have statistics for the later part of the sample (when the majority of states had deregulated).

	Whole Sample		1976-1985		1986-1994	
Panel (a): small banks	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Real loan growth - Total (%)	1.15	(7.31)	1.40	(7.38)	0.83	(7.20)
Avg loan rate (annualized %)	11.43	(0.04)	11.98	(4.77)	10.74	(2.63)
Real loan growth - C&I (%)	0.78	(24.51)	1.66	(24.79)	-0.32	(24.12)
Real loan growth - RE (%)	2.20	(15.30)	2.24	(17.09)	2.16	(12.70)
Real loan growth - Con (%)	0.48	(17.54)	1.07	(17.85)	-0.26	(17.11)
C&I Share of Lending	0.21	(0.14)	0.22	(0.14)	0.20	(0.13)
RE Share of Lending	0.40	(0.19)	0.35	(0.17)	0.47	(0.18)
Con share of lending	0.24	(0.14)	0.27	(0.14)	0.20	(0.13)
Assets($)	51 mil	(58 mil)	38 mil	(40 mil)	68 mil	(72 mil)
Securities ($)	17 mil	(20 mil)	13 mil	(14 mil)	23 mil	(26 mil)
Liquidity Ratio	0.10	(0.24)	0.10	(0.06)	0.08	(0.35)
Equity Ratio	0.09	(0.03)	0.09	(0.03)	0.09	(0.04)
BHC Affiliation	0.51	(0.50)	0.37	(0.48)	0.69	(0.46)
Lerner Index	0.30	(0.09)	0.29	(0.08)	0.31	(0.09)
County HHI	0.33	(0.22)	0.31	(0.21)	0.35	(0.23)
State HHI	0.11	(0.11)	0.10	(0.10)	0.12	(0.12)
Number of banks	15,481		14,264		13,625	
Panel (b): large banks	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Real loan growth - Total (%)	0.86	(6.09)	1.13	(5.63)	0.52	(6.61)
Avg loan rate (annualized %)	11.53	(5.09)	12.17	(4.78)	10.74	(5.35)
Real loan growth - C&I (%)	0.39	(15.16)	1.15	(12.59)	-0.59	(17.86)
Real loan growth - RE (%)	1.30	(10.07)	1.09	(8.50)	1.58	(11.75)
Real loan growth - Con (%)	0.08	(13.35)	0.44	(11.42)	-0.38	(15.41)
C&I Share of Lending	0.30	(0.14)	0.32	(0.13)	0.27	(0.15)
RE Share of Lending	0.36	(0.17)	0.32	(0.14)	0.41	(0.19)
Con share of lending	0.24	(0.16)	0.25	(0.12)	0.23	(0.19)
Assets($)	2.5 bil	(8.7 bil)	1.7 bil	(6.8 bil)	3.4 bil	(10.5 bil)
Securities ($)	447 mil	(1.1 bil)	306 mil	(765 mil)	640 mil	(1.5 bil)
Liquidity Ratio	0.12	(0.08)	0.14	(0.08)	0.09	(0.07)
Equity Ratio	0.07	(0.02)	0.07	(0.02)	0.07	(0.03)
BHC Affiliation	0.83	(0.37)	0.75	(0.43)	0.94	(0.24)
Lerner Index	0.37	(0.11)	0.34	(0.09)	0.41	(0.12)
County HHI	0.33	(0.20)	0.31	(0.19)	0.35	(0.21)
State HHI	0.11	(0.11)	0.10	(0.10)	0.12	(0.12)
Number of banks	1,215		931		1,023	

Table 3: This table reports summary statistics for bank-level variables of interest. Panel (a) reports statistics for small banks, defined as all banks under the 95th percentile in total assets in a given quarter. Panel (b) reports statistics for large banks, defined as all banks above the 9th percentile in total assets in a given quarter. The first two columns have statistics for the entire sample (1976Q2 - 1994Q4). The third and fourth columns have statistics for the early part of the sample (when the majority of states had not deregulated). The fifth and sixth columns have statistics for the later part of the sample (when the majority of states had deregulated).

sum of coefficients	(1)	(2)	(3)	(4)	(5)
Panel (a): baseline results					
MP	-0.0111***	-0.0115***	-0.0121***	-0.0202***	-
	(0.0014)	(0.0013)	(0.0014)	(0.0021)	
Intra*MP	0.0023	0.0026	0.0022	-0.0005	-0.0010
	(0.0029)	(0.0027)	(0.0029)	(0.0030)	(0.0031)
Inter*MP	-0.0142***	-0.0139***	-0.0138***	-0.0208**	-0.0426***
	(0.0046)	(0.0043)	(0.0045)	(0.0094)	(0.0112)
Panel (b): interstate deregulation only					
MP	-0.0109***	-0.0109***	-0.0116***	-0.0203***	-
	(0.0014)	(0.0014)	(0.0015)	(0.0022)	
Inter*MP	-0.0126***	-0.0122***	-0.0124***	-0.0209**	-0.0424***
	(0.0041)	(0.0040)	(0.0042)	(0.0084)	(0.0113)
Panel (c): intrastate deregulation only					
MP	-0.0108***	-0.0112***	-0.0118***	-0.0205***	-
	(0.0013)	(0.0012)	(0.0012)	(0.0018)	
Intra*MP	-0.0013	-0.0008	-0.0012	-0.0023	-0.0032
	(0.0025)	(0.0024)	(0.0026)	(0.0027)	(0.0033)
Panel (d): fed funds rate as MP indicator					
MP	-0.0092***	-0.0091***	-0.0099***	-0.0037***	-
	(0.0007)	(0.0008)	(0.0009)	(0.0014)	
Intra*MP	0.0015	0.0014	0.0017	0.0006	0.0006
	(0.0011)	(0.0012)	(0.0012)	(0.0010)	(0.0010)
Inter*MP	0.0051***	0.0051***	0.0053***	-0.0066**	-0.0102***
	(0.0014)	(0.0014)	(0.0015)	(0.0028)	(0.0030)
observations	823,659	823,659	823,659	823,659	823,659
STATE	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	Yes	Yes	Yes	-
State Fixed Effects	-	Yes	-	-	-
Bank Fixed Effects	-	-	Yes	Yes	Yes
Linear Time Trend	Yes	Yes	Yes	-	-
Year Dummies	-	-	-	Yes	-
Time Fixed Effects	-	-	-	-	Yes

Table 4: This table reports results from estimating equation 3.2. Panel (a) reports the baseline results. Row 1 reports $\sum_{j=0}^{4} \widehat{\mu}_j$, row 2 reports $\sum_{j=0}^{4} \widehat{\phi}_j$, row 3 reports $\sum_{j=0}^{4} \widehat{\varphi}_j$. Panel (b) reports results for estimating equation 3.2 with interstate deregulation only and panel (c) reports results for estimating equation 3.2 with intrastate deregulation only. Panel (d) reports results using the quarterly change in the fed funds rate as the monetary policy indicator, rather than the RR shocks. Robust standard errors clustered at the state-level are in parentheses. * indicates statistical significance at the 10% level. ** indicates statistical significance at the 5% level. *** indicates statistical significance at the 1% level.

Dependent variable: Real Loan Growth (1976Q2 - 1994Q4)							
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
Loan Growth (t-1)	0.100***	CRSP(t-4)	0.0491**	INTRA*MP	-0.000882	1983 Dummy	0.00975***
	(0.0126)		(0.0186)		(0.000764)		(0.00267)
Loan Growth (t-2)	0.0157	PI	0.000959***	INTRA*MP(t-1)	-0.000437	1984 Dummy	0.00646***
	(0.0105)		(0.000293)		(0.000745)		(0.00220)
Loan Growth (t-3)	0.0395***	PI(t-1)	0.00150***	INTRA*MP(t-2)	0.000659	1985 Dummy	-0.0129***
	(0.00487)		(0.000403)		(0.000844)		(0.00189)
Loan Growth (t-4)	0.166***	PI(t-2)	0.00187***	INTRA*MP(t-3)	0.000435	1986 Dummy	-0.00734***
	(0.0114)		(0.000299)		(0.000844)		(0.00138)
GDP	-4.85e-07	PI(t-3)	0.000437*	INTRA*MP(t-4)	-0.000322	1987 Dummy	-0.00888***
	(6.31e-06)		(0.000220)		(0.000927)		(0.00222)
GDP(t-1)	-1.64e-06	PI(t-4)	0.000708***	INTER*MP	-0.00878***	1988 Dummy	0.00219
	(8.31e-06)		(0.000209)		(0.00262)		(0.00259)
GDP(t-2)	-4.23e-05***	HPI	0.000477***	INTER*MP(t-1)	0.00108	1989 Dummy	-0.00105
	(6.47e-06)		(8.85e-05)		(0.00261)		(0.00245)
GDP(t-3)	3.73e-05***	HPI(t-1)	0.000588***	INTER*MP(t-2)	0.000507	1990 Dummy	-0.00739***
	(5.19e-06)		(0.000107)		(0.00243)		(0.00237)
GDP(t-4)	1.29e-05*	HPI(t-2)	0.000726***	INTER*MP(t-3)	-0.00653***	1991 Dummy	-0.00166
	(6.66e-06)		(8.75e-05)		(0.00213)		(0.00298)
PCE	-0.00388*	HPI(t-3)	0.000608***	INTER*MP(t-4)	-0.00713***	1992 Dummy	-0.00758**
	(0.00214)		(9.15e-05)		(0.00197)		(0.00305)
PCE(t-1)	-0.000401	HPI(t-4)	0.000333***	Q2 Dummy	0.0208***	1993 Dummy	-0.000698
	(0.00229)		(6.50e-05)		(0.00184)		(0.00392)
PCE(t-2)	0.0114***	MP	0.00224***	Q3 Dummy	0.00834***	1994 Dummy	0.0147***
	(0.00263)		(0.000685)		(0.00150)		(0.00495)
PCE(t-3)	-0.0229***	MP(t-1)	-0.00866***	Q4 Dummy	0.00400***	Constant	-0.00467
	(0.00295)		(0.000613)		(0.00137)		(0.00510)
PCE(t-4)	-0.00294	MP(t-2)	-0.00855***	1978 Dummy	-0.0120***		
	(0.00274)		(0.000600)		(0.00106)	Observations	823,659
CRSP	0.0156	MP(t-3)	-0.00286***	1979 Dummy	-0.0283***	Number of banks	15,990
	(0.0115)		(0.000456)		(0.00237)	R-squared	0.124
CRSP(t-1)	0.0553***	MP(t-4)	-0.00241***	1980 Dummy	-0.0296***		
	(0.0156)		(0.000440)		(0.00268)		
CRSP(t-2)	0.0552***	INTRA	-0.000335	1981 Dummy	0.0101**		
	(0.0143)		(0.00185)		(0.00420)		
CRSP(t-3)	0.102***	INTER	0.00172	1982 Dummy	0.00766***		
	(0.0144)		(0.00163)		(0.00192)		

Table 5: This table reports full results from estimating equation 3.2 with the baseline specification. Robust standard errors clustered at the state-level are in parentheses. * indicates statistical significance at the 10% level. ** indicates statistical significance at the 5% level. *** indicates statistical significance at the 1% level.

	Dependent variable: Avg Loan Rate			
	1976-1994		**1983-1994**	
sum of coefficients	(1)	(2)	(3)	(4)
MP	0.0069***	-	0.0074	-
	(0.0008)		(0.0046)	
Intra*MP	0.0006	0.0005	0.0080***	0.0081***
	(0.0021)	(0.0011)	(0.0023)	-0.0014
Inter*MP	0.0113***	0.0047**	0.0055*	0.0036**
	(0.0020)	(0.0018)	(0.0028)	(0.0016)
observations	822,792	822,792	494,975	494,975
STATE	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-
Quarter Dummies	-	Yes	-	Yes

Table 6: This table reports results from estimating equation **??** with average loan rate as the dependent variable. Columns (1) and (2) report results for the full sample with missing Q1 and Q3 observations filled for 1976-1982. Columns (3) and (4) report reports with an abbreviated sample for robustness. Row 1 reports $\sum_{j=0}^{4} \widehat{\mu}_j$, row 2 reports $\sum_{j=0}^{4} \widehat{\phi}_j$, row 3 reports $\sum_{j=0}^{4} \widehat{\varphi}_j$. Robust standard errors clustered at the state-level are in parentheses. * indicates statistical significance at the 10% level. ** indicates statistical significance at the 5% level. *** indicates statistical significance at the 1% level.

By loan category						
Panel (a)	**C&I Loans**		**Real Estate Loans**		**Consumer Loans**	
sum of coefficients	(1)	(2)	(3)	(4)	(5)	(6)
MP	-0.0225***	-	-0.0158***	-	-0.0379***	-
	(0.0043)		(0.0031)		(0.0029)	
Intra*MP	-0.0141**	-0.0152***	0.0024	0.0012	0.0020	0.0007
	(0.0070)	(0.0055)	(0.0038)	(0.0030)	(0.0037)	(0.0045)
Inter*MP	-0.0230	-0.0434**	-0.0104	-0.0401***	0.0046	-0.0365***
	(0.0189)	(0.0194)	(0.0088)	(0.0102)	(0.0104)	(0.0127)
observations	737,753	737,753	795,076	795,076	778,630	778,630
STATE	Yes	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes	-	Yes
Effect of deregulation on category share of total loans						
Panel (b)	**C&I Share**		**RE Share**		**Con Share**	
Intra	-0.0043***		-0.0060***		0.0017	
	(0.0008)		(0.0020)		(0.0015)	
Inter	-0.0064***		-0.0174***		0.0037*	
	(00013)		(0.0023)		(0.0022)	
observations	857,525		857,525		857,525	
BANK	Yes		Yes		Yes	
STATE	Yes		Yes		Yes	
Bank Fixed Effects	Yes		Yes		Yes	
Time Fixed Effects	Yes		Yes		Yes	

Table 7: Panel (a) reports results from estimating equation 3.2 for the three major loan categories: commercial and industrial loans, real estate loans, and consumer loans. Row 1 reports $\sum_{j=0}^{4} \widehat{\mu}_j$, row 2 reports $\sum_{j=0}^{4} \widehat{\phi}_j$, row 3 reports $\sum_{j=0}^{4} \widehat{\varphi}_j$. Panel (b) reports the effect of deregulation on each category's share of total loans. Robust standard errors clustered at the state-level are in parentheses. * indicates statistical significance at the 10% level. ** indicates statistical significance at the 5% level. *** indicates statistical significance at the 1% level.

By bank size						
Panel (a)	**Small Banks**		**Large Banks**		**Foreign Banks**	
sum of coefficients	(1)	(2)	(3)	(4)	(5)	(6)
MP	-0.0202***	-	-0.0216***	-	0.0157	-
	(0.0022)		(0.0037)		(0.0644)	
Intra*MP	0.0001	-0.0005	-0.0056	-0.0058*	-0.0997***	-0.0940***
	(0.0033)	(0.0032)	(0.0034)	(0.0032)	(0.0231)	(0.0252)
Inter*MP	-0.0212**	-0.0439***	-0.0092	-0.0081	-0.0467	-0.0417
	(0.0093)	(0.0110)	(0.0097)	(0.0131)	(0.0274)	(0.0390)
observations	787,027	787,027	36,632	36,632	12,679	12,679
STATE	Yes	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes	-	Yes

Effect of deregulation on bank size/foreign bank share			
Panel (b)	**Size**	**Foreign Share**	**Foreign Asset Share**
Intra	-0.0505***	-0.0078***	0.0014
	(0.0064)	(0.0019)	(0.0017)
Inter	0.0465***	0.0102***	0.0136***
	(0.0117)	(0.0029)	(0.0031)
observations	857,525	834,541	834,541
BANK	Yes	-	-
STATE	Yes	Yes	Yes
State Fixed Effects	-	Yes	Yes
Bank Fixed Effects	Yes	-	-
Time Fixed Effects	Yes	Yes	Yes

Table 8: Panel (a) reports results from estimating equation 3.2 broken into three categories: small banks (those under the 95th percentile in total assets), large banks (those above the 95th percentile in total assets), and branches of foreign banks. Row 1 reports $\sum_{j=0}^{4} \widehat{\mu_j}$, row 2 reports $\sum_{j=0}^{4} \widehat{\phi_j}$, row 3 reports $\sum_{j=0}^{4} \widehat{\varphi_j}$. Panel (b) report the effect of deregulation on average bank size (measured by total assets), share of foreign banks within a state, and foreign bank share of total assets within a state. Robust standard errors clustered at the state-level are in parentheses. * indicates statistical significance at the 10% level. ** indicates statistical significance at the 5% level. *** indicates statistical significance at the 1% level.

Dependent variable: avg loan rate				
	Small		Large	
sum of coefficients	**(1)**	**(2)**	**(3)**	**(4)**
MP	0.0067***	-	0.0110***	-
	(0.0009)		(0.0014)	
Intra*MP	0.0010	0.0009	-0.0045*	-0.0045***
	(0.0022)	(0.0012)	(0.0022)	(0.0010)
Inter*MP	0.0111***	0.0042**	0.0129***	0.0011
	(0.0020)	(0.0019)	(0.0029)	(0.0020)
observations	786,207	786,207	36,585	36,585
STATE	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-
Quarter Dummies	-	Yes	-	Yes

Table 9

Panel (a)	Dependent variable: real loan growth					
sum of coefficients	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
MP	-0.0291***	-0.0287***	-0.0204***	-0.0200***	-0.0197***	-0.0193***
	(0.0034)	(0.0034)	(0.0020)	(0.0024)	(0.0023)	(0.0025)
LI*MP	0.0243***	0.0253***	-	-	-	-
	(0.0084)	(0.0081)				
County_HHI*MP	-	-	-0.0019	-0.0012	-	-
			(0.0031)	(0.0031)		
State_HHI*MP	-	-	-	-	-0.0272	-0.0245
					(0.0200)	(0.0203)
Inter*MP	-	-0.0206**	-	-0.0205**	-	-0.0199**
		(0.0085)		(0.0085)		(0.0085)
observations	819,992	819,992	823,659	823,659	823,659	823,659
STATE	Yes	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Panel (b)	Effect of deregulation on market structure		
Dependent Variable:	**Lerner Index**	**County HHI**	**State HHI**
Intra	-0.0020	0.0181***	-0.0055
	(0.0021)	(0.0018)	(0.0106)
Inter	0.0043*	0.0079***	-0.0193*
	(0.0023)	(0.0020)	(0.0104)
observations	853,404	857,525	3,825
State Fixed Effects	-	Yes	Yes
Bank Fixed Effects	Yes	-	-
Quarter Dummies	Yes	Yes	Yes

Table 10

All banks - by lerner index quartile								
Panel (a):	**1st**		**2nd**		**3rd**		**4th**	
sum of coefficients	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MP	-0.0184***	-	-0.0201***	-	-0.0214***	-	-0.0211***	-
	(0.0025)		(0.0025)		(0.0027)		(0.0032)	
Intra*MP	0.0027	0.0021	0.0015	0.0013	0.0006	0.0000	-0.0049	-0.0055
	(0.0038)	(0.0040)	(0.0037)	(0.0031)	(0.0030)	(0.0039)	(0.0036)	(0.0033)
Inter*MP	-0.0235*	-0.0537***	-0.0197**	-0.0355***	-0.0066	-0.0271**	-0.0160	-0.0405***
	(0.0129)	(0.0130)	(0.0075)	(0.0123)	(0.0080)	(0.0107)	(0.0122)	(0.0143)
observations	202,018	202,018	207,650	207,650	207,048	207,048	206,943	206,943
Small banks - by lerner index quartile								
Panel (b):	**1st**		**2nd**		**3rd**		**4th**	
sum of coefficients	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MP	-0.0182***	-	-0.0199***	-	-0.0211***	-	-0.0216***	-
	(0.0025)		(0.0025)		(0.0028)		(0.0033)	
Intra*MP	0.0028	0.0022	0.0018	0.0016	0.0003	-0.0004	-0.0027	-0.0034
	(0.0040)	(0.0042)	(0.0038)	(0.0033)	(0.0032)	(0.0042)	(0.0041)	(0.0031)
Inter*MP	-0.0246*	-0.0567***	-0.0200***	-0.0363***	-0.0065	-0.0286***	-0.0180	-0.0434***
	(0.0129)	(0.0132)	(0.0075)	(0.0124)	(0.0082)	(0.0108)	(0.0125)	(0.0150)
observations	199,197	199,197	202,937	202,937	199,059	199,059	185,843	185,843
Large banks - by lerner index quartile								
Panel (c):	**1st**		**2nd**		**3rd**		**4th**	
sum of coefficients	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MP	-0.0300**	-	-0.0304***	-	-0.0306***	-	-0.0177***	-
	(0.0142)		(0.0093)		(0.0059)		(0.0064)	
Intra*MP	0.0094	0.0084	-0.0020	-0.0020	0.0100*	0.0101**	-0.0172***	-0.0172**
	(0.0088)	(0.0090)	(0.0066)	(0.0050)	(0.0053)	(0.0042)	(0.0052)	(0.0071)
Inter*MP	-0.0238	0.0538	-0.0206	0.0063	-0.0056	-0.0043	-0.0076	-0.0148
	(0.0667)	(0.0931)	(0.0221)	(0.0285)	(0.0129)	(0.0152)	(0.0118)	(0.0153)
observations	2,821	2,821	4,713	4,713	7,989	7,989	21,109	21,109
STATE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes	-	Yes	-	Yes

Table 11

All banks - by HHI quartile								
Panel (a):	**1st**		**2nd**		**3rd**		**4th**	
sum of coefficients	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MP	-0.0202***	-	-0.0178***	-	-0.0194***	-	-0.0232***	-
	(0.0030)		(0.0033)		(0.0022)		(0.0026)	
Intra*MP	0.0155	0.0129**	-0.0037	-0.0038	-0.0227	-0.0034	0.0018	0.0013
	(0.0091)	(0.0064)	(0.0032)	(0.0041)	(0.0042)	(0.0035)	(0.0026)	(0.0031)
Inter*MP	-0.0154	-0.0264*	-0.0205***	-0.0411**	-0.0207**	-0.0448***	-0.0210*	-0.0406***
	(0.0145)	(0.0148)	(0.0068)	(0.0182)	(0.0101)	(0.0133)	(0.0107)	(0.0130)
observations	204,761	204,761	206,920	206,920	206,337	206,337	205,641	205,641
Small banks - by HHI quartile								
Panel (b):	**1st**		**2nd**		**3rd**		**4th**	
sum of coefficients	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MP	-0.0196***	-	-0.0178***	-	-0.0191***	-	-0.0238***	-
	(0.0030)		(0.0035)		(0.0023)		(0.0026)	
Intra*MP	0.0111	0.0122*	-0.0025	-0.0026	-0.0021	-0.0030	0.0021	0.0015
	(0.0089)	(0.0071)	(0.0037)	(0.0040)	(0.0046)	(0.0036)	(0.0028)	(0.0031)
Inter*MP	-0.0162	-0.0307*	-0.0176***	-0.0373**	-0.0207**	-0.0457***	-0.0224**	-0.0430***
	(0.0147)	(0.0156)	(0.0065)	(0.0184)	(0.0103)	(0.0132)	(0.0108)	(0.0132)
observations	196,482	196,482	197,437	197,437	196,086	196,086	197,022	197,022
Large banks - by HHI quartile								
Panel (c):	**1st**		**2nd**		**3rd**		**4th**	
sum of coefficients	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
MP	-0.0228***	-	-0.0258***	-	-0.0262***	-	-0.0099	-
	(0.0080)		(0.0064)		(0.0052)		(0.0094)	
Intra*MP	0.0008	0.0011	0.0018	0.0019	-0.0068	-0.0067	-0.0030	-0.0036
	(0.0187)	(0.0142)	(0.0071)	(0.0071)	(0.0045)	(0.0044)	(0.0091)	(0.0046)
Inter*MP	-0.0099	-0.0038	-0.0312	-0.0233	-0.0226	-0.0157	-0.0126	-0.0165
	(0.0378)	(0.0516)	(0.0200)	(0.0268)	(0.0142)	(0.0145)	(0.0158)	(0.0101)
observations	8,279	8,279	9,483	9,483	10,251	10,251	8,619	8,619
STATE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes	-	Yes	-	Yes

Table 12

By BHC affiliation				
Panel (a)	**Stand Alone**		**Affiliated**	
sum of coefficients	(1)	(2)	(3)	(4)
MP	-0.0236***	-	-0.0151***	-
	(0.0020)		(0.0026)	
Intra*MP	0.0004	0.0003	-0.0018	-0.0032
	(0.0026)	(0.0026)	(0.0057)	(0.0047)
Inter*MP	-0.0057	-0.0252**	-0.0269***	-0.0516***
	(0.0098)	(0.0125)	(0.0098)	(0.0125)
observations	376,569	376,569	447,090	447,090
STATE	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes

Effect of deregulation on BHC affiliatiom	
Panel (b)	**BHC Affiliation**
Intra	0.0093**
	(0.0041)
Inter	0.0161***
	(0.0055)
observations	857,525
BANK	Yes
STATE	Yes
Bank Fixed Effects	Yes
Time Fixed Effects	Yes

Table 13: Panel (a) reports results from separately estimating equation 3.2 for stand alone banks and banks affiliated with a bank holding company (BHC) in a given quarter. A bank is affiliated with a BHC if they have a direct or regulatory holder identification number in a given quarter. Row 1 reports $\sum_{j=0}^{4} \widehat{\mu_j}$, row 2 reports $\sum_{j=0}^{4} \widehat{\phi_j}$, row 3 reports $\sum_{j=0}^{4} \widehat{\varphi_j}$. Panel (b) report the effect of deregulation on the probability that a bank is affiliated with a BHC. Robust standard errors clustered at the state-level are in parentheses. * indicates statistical significance at the 10% level. ** indicates statistical significance at the 5% level. *** indicates statistical significance at the 1% level.

Small banks - by BHC affiliation				
Panel (a):	**Stand Alone**		**Affiliated**	
sum of coefficients	(1)	(2)	(1)	(2)
MP	-0.0236***	-	-0.0149***	-
	(0.0020)		(0.0028)	
Intra*MP	0.0004	0.0003	-0.00003	-0.0022
	(0.0026)	(0.0027)	(0.0072)	(0.0054)
Inter*MP	-0.0053	-0.0253**	-0.0283***	-0.0548***
	(0.0100)	(0.0126)	(0.0099)	(0.0125)
observations	370,452	370,452	416,575	416,575
Large banks - by BHC affiliation				
Panel (b):	**Stand Alone**		**Affiliated**	
sum of coefficients	(1)	(2)	(1)	(2)
MP	-0.0172	-	-0.0207***	-
	(0.0116)		(0.0040)	
Intra*MP	-0.0018	-0.0023	-0.0062*	-0.0063
	(0.0067)	(0.0037)	(0.0033)	(0.0042)
Inter*MP	-0.0394	-0.0389*	-0.0055	-0.0049
	(0.0266)	(0.0223)	(0.0114)	(0.0144)
observations	6,117	6,117	30,515	30,515
STATE	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes

Table 14

Dependent Variable: Real Loan Growth				
Panel (a):	Small, BHC Affiliated - by liquidity ratio quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	-0.0780***	-0.0683***	-0.0318**	-0.0235
	(0.0241)	(0.0124)	(0.0141)	(0.0169)
observations	110,076	106,942	103,685	95,872
Panel (b):	Small, Stand Alone - by liquidity ratio quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	-0.0395***	-0.0143	-0.0132	-0.0265
	(0.0139)	(0.0119)	(0.0132)	(0.0181)
observations	94,483	94,184	91,622	90,163
Panel (c):	Large, BHC Affiliated - by liquidity ratio quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	-0.0015	0.0260	0.0178	-0.0263
	(0.0586)	(0.0223)	(0.0131)	(0.0219)
observations	3,045	5,057	8,615	13,798
Panel (d):	Large, Stand Alone - by liquidity ratio quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	-0.0820	-0.1319*	0.0562	-0.0221
	(0.2522)	(0.0774)	(0.0506)	(0.0561)
observations	669	1,323	2,017	2,108
Bank Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes

Table 15

Dependent Variable: Asset Growth				
Panel (a):	Small, BHC Affiliated - by liquidity quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	-0.0165*	-0.0168*	-0.0253**	0.0197*
	(0.0093)	(0.0093)	(0.0100)	(0.0108)
Panel (b):	Small, Stand Alone - by liquidity ratio quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	-0.0129	-0.0110	-0.0012	-0.0127
	(0.0111)	(0.0121)	(0.0124)	(0.0154)
observations	91,670	91,315	88,679	86,892
Dependent Variable: Securities Growth				
Panel (c):	Small, BHC Affiliated - by liquidity quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
sum of coefficients	(2)	(2)	(2)	(2)
Inter*MP	0.0617*	0.0698**	-0.0626**	0.0773*
	(0.0371)	(0.0283)	(0.0298)	(0.0456)
Panel (d):	Small, stand alone - by alternate liquidity ratio quartile			
Quartile:	**1st**	**2nd**	**3rd**	**4th**
Inter*MP	0.0161	-0.0368	0.0037	0.0456
	(0.0371)	(0.0403)	(0.0397)	(0.0448)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes

Table 16

State-level Regressions						
	All Bank Loans		Small Bank Loans		Large Bank Loans	
sum of coefficients	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
MP	-0.0130	-	-0.0128	-	0.0888	-
	(0.0332)		(0.0260)		(0.0997)	
Intra*MP	-0.0397	-0.0415	-0.0140	-0.0157	-0.1055	-0.1030
	(0.0254)	(0.0252)	(0.0110)	(0.0108)	(0.0690)	(0.0691)
Inter*MP	-0.0421	-0.1238**	-0.2360	-0.1067***	-0.1096	-0.0864
	(0.0668)	(0.0506)	(0.0533)	(0.0335)	(0.2493)	(0.2064)
observations	3,570	3,570	3,570	3,570	2,356	2,356
STATE	Yes	Yes	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-	Yes	-
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes	-	Yes

Table 17

State-level Regressions				
	Stand Alone		Affiliated	
sum of coefficients	**(1)**	**(2)**	**(1)**	**(2)**
MP	-0.0254	-	-0.0392	-
	(0..0303)		(0.0486)	
Intra*MP	-0.0782*	-0.0770**	0.0203	0.0181
	(0.0459)	(0.0337)	(0.0687)	(0.0342)
Inter*MP	-0.1008	-0..0652	-0.0551	-0.1442**
	(0.0990)	(0.1263)	(0.0788)	(0.0669)
observations	3,565	3,565	3,570	3,570
STATE	Yes	Yes	Yes	Yes
NATIONAL	Yes	-	Yes	-
State Fixed Effects	Yes	Yes	Yes	Yes
Year Dummies	Yes	-	Yes	-
Time Fixed Effects	-	Yes	-	Yes

Table 18

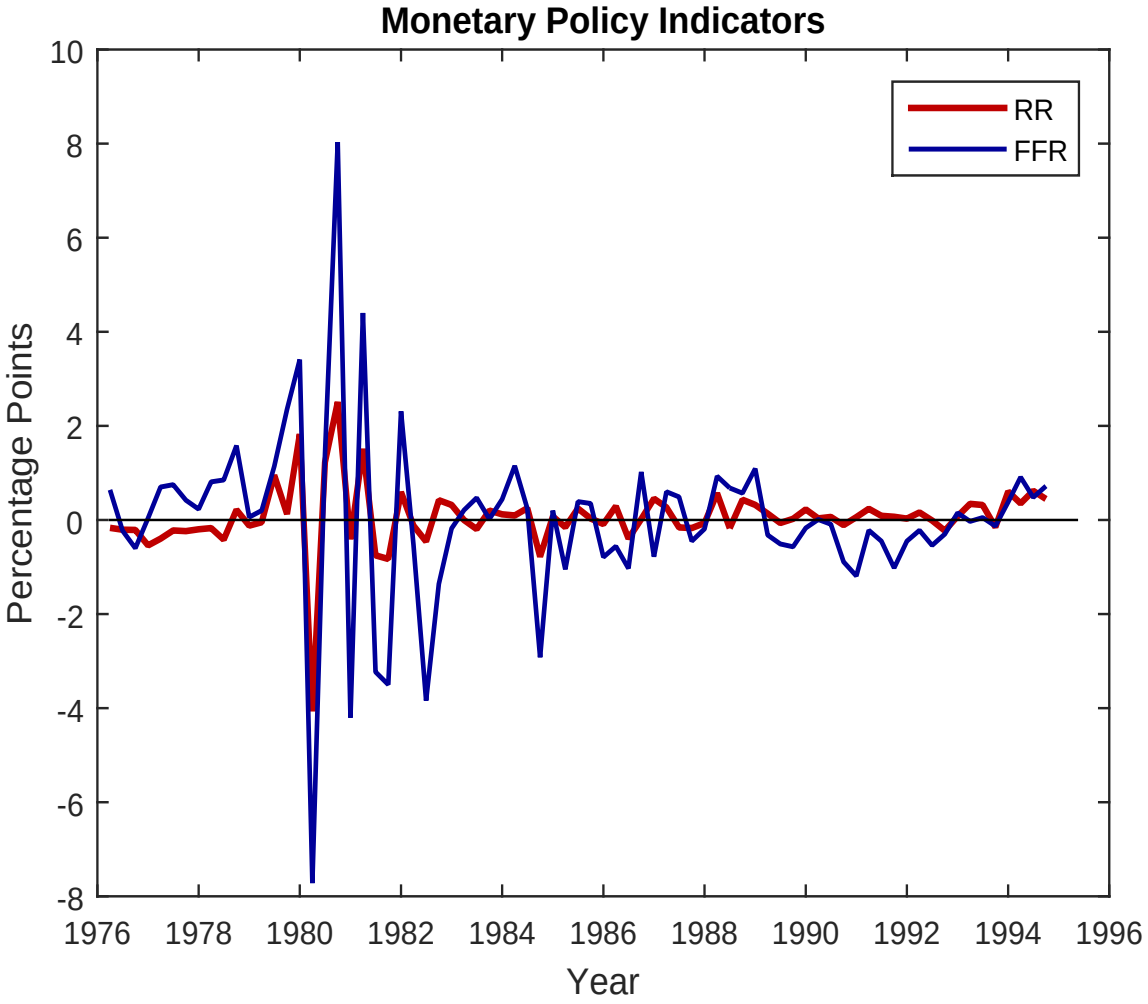

Figure 1: This figure plots the RR shock series in red and the quarterly change in the fed funds rate in blue from 1976-1994.

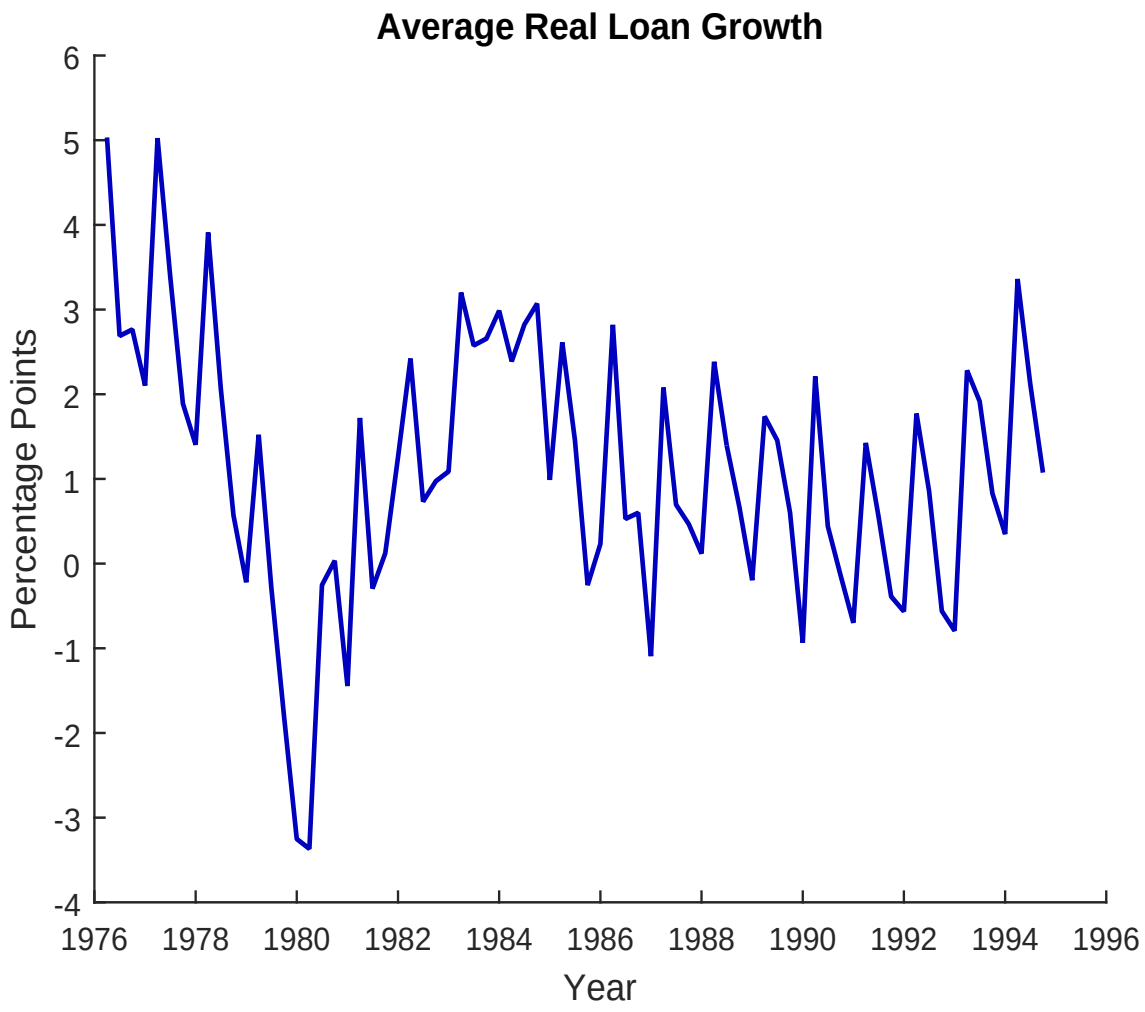

Figure 2: This figure plots average real loan growth from 1976-1994.

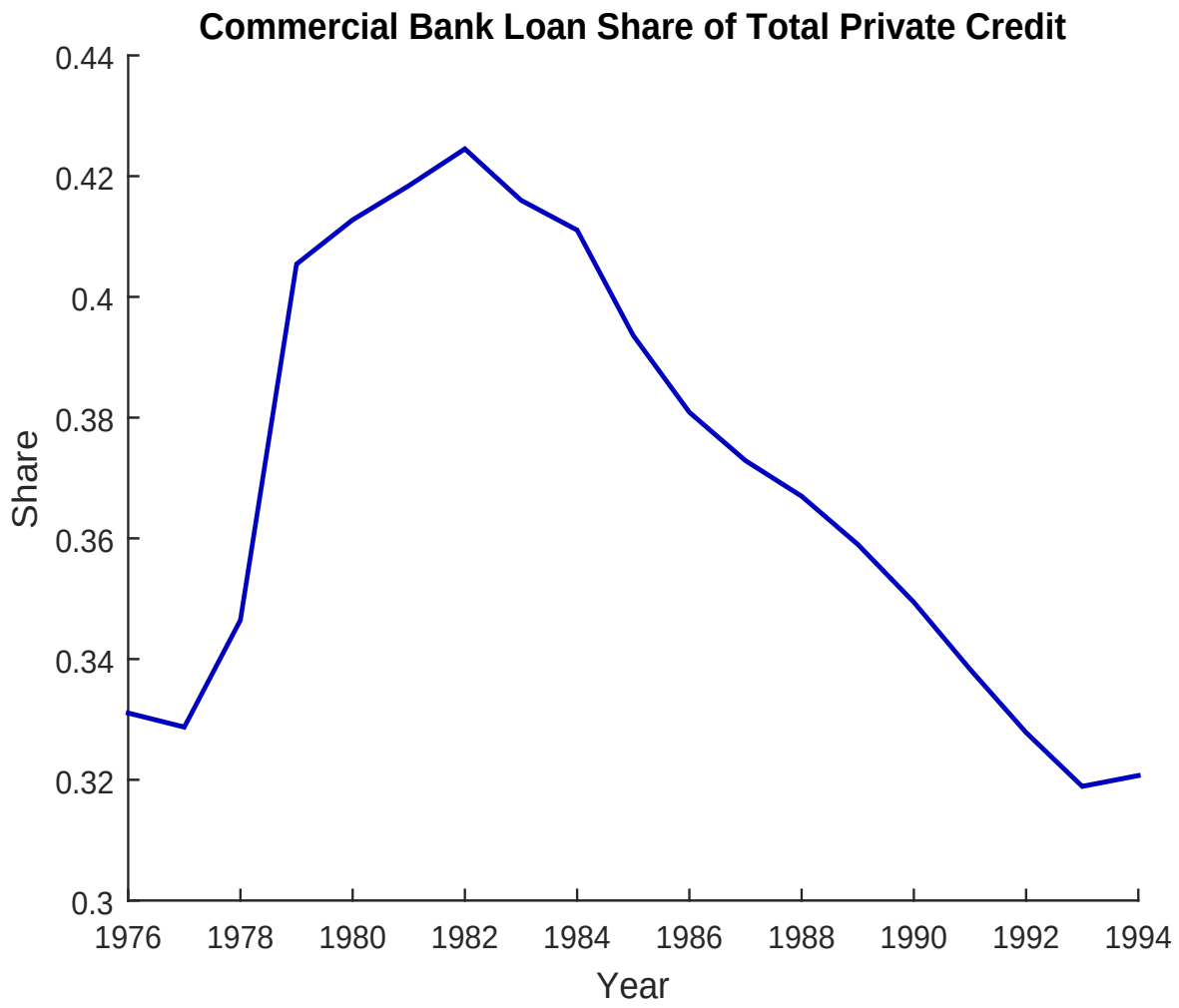

Figure 3: This figure plots aggregate bank lending in our sample as a share of total private credit in the U.S. from 1976-1994.

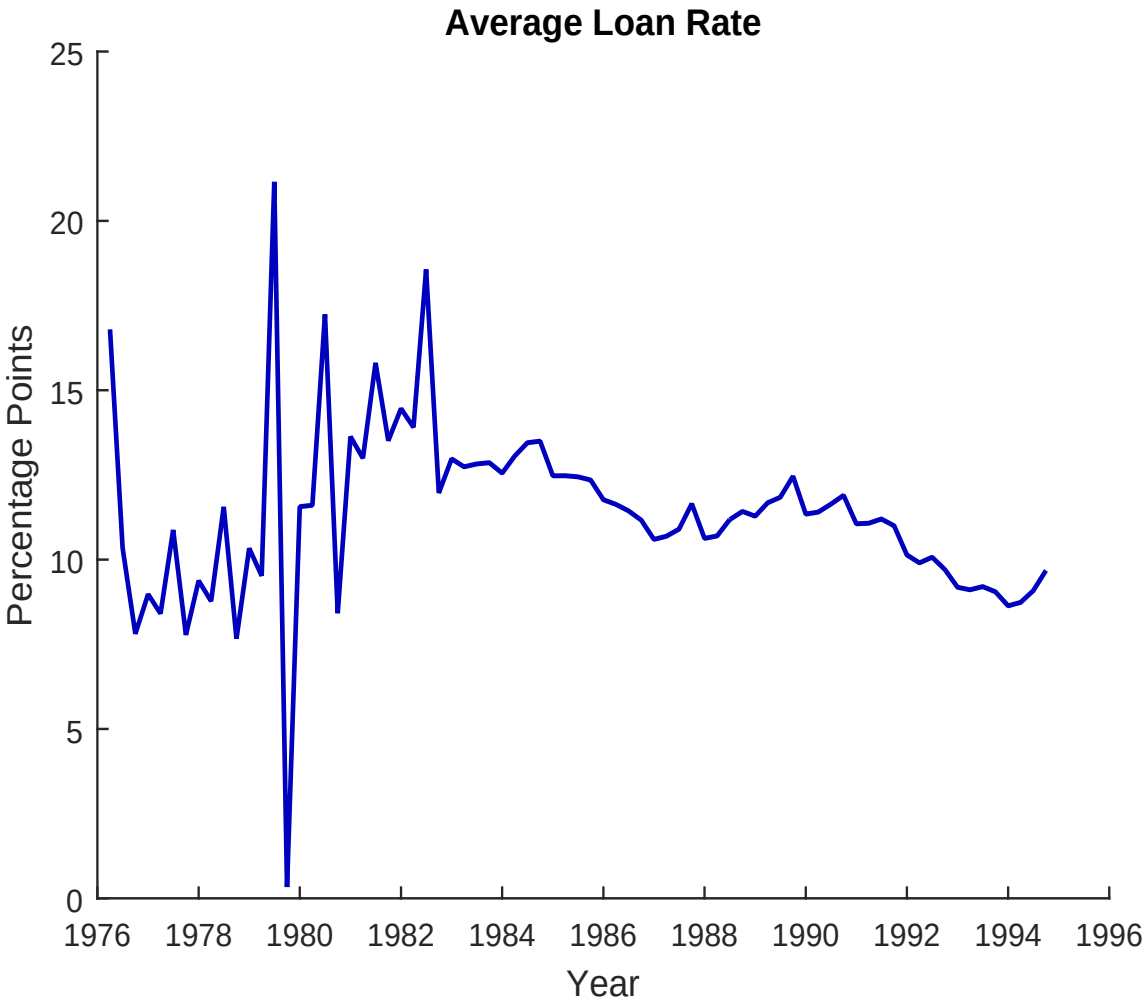

Figure 4: This figure plots the average ratio of interest and fee income on loans to total loans for 1976-1994.