

# Can the Supply of Small Business Loans be Increased?

*By Jim Wilkinson and Jon Christensson*

Small and new businesses, widely credited as engines for job growth, have struggled during the recovery. One reason, say some analysts, is that bank lending to small businesses has declined steadily since the start of the recession. If, as many small businesses claim, the supply of credit from banks has contracted, then increasing the supply of small business loans may allow these businesses to grow and create new jobs. Understanding the factors that affect loan supply may help policymakers design policies to increase the supply of small business loans and, therefore, support further job growth.

This article analyzes the potential effectiveness of two strategies that policymakers can use to expand the supply of small business loans: increasing bank capital and reducing problem assets. A review of recent policy initiatives suggests that influencing bank capital may be easier than addressing problem assets. However, reducing problem assets may lead to a larger and more persistent increase in the supply of loans.

Section I examines the connection between job growth and small business lending. Section II reviews supply and demand factors that affect lending decisions at banks. It focuses on two supply factors—

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capital and problem assets—and provides examples of policies that have attempted to influence these factors during the crisis. Section III describes the statistical analysis and data used to measure the importance of the policy variables while controlling for the influence of demand and other market factors. Section IV presents the results of the analysis and the likely effect that changes in capital and problem assets may have on small business lending.

## I. JOB GROWTH AND SMALL BUSINESS LENDING

The U.S. economy lost 9 million jobs in the recent recession and initial months of the recovery. The Bureau of Labor Statistics estimates that total employment fell from a peak of 138 million in January 2008 to a low of 129 million as of February 2010.<sup>1</sup> Further, job growth over the next few years is expected to be anemic. The consensus Blue Chip forecast (July 2011) anticipates that the unemployment rate will fall to only 8.1 percent in 2012.

Many policymakers are looking to new and small businesses to generate jobs. Small businesses employ roughly 50 percent of all Americans (Bernanke, 2010). Small businesses are also widely perceived as engines for job growth. According to Karen Mills, administrator of the U.S. Small Business Administration, “Small businesses create 2 of every 3 new jobs each year.” Recent research also suggests that new firms are responsible for job growth.<sup>2</sup> Of course, these new firms start as small firms.

Small businesses have struggled to retain their workers during this recovery. From 2008:Q1 through 2010:Q1, employment in establishments with less than 100 employees fell by 3.9 million or 6 percent. By another measure, establishments employing up to nine employees accounted for 22 percent of all job losses nationally from 2008:Q1 to 2009:Q2.<sup>3</sup>

One reason for the losses may be that small businesses are more dependent on bank credit than large businesses, and lending to small businesses has declined.<sup>4</sup> Although there is surprisingly little direct data on bank lending to small businesses, data are available for loans to all businesses and for small loans to all businesses (not necessarily loans to small businesses). These data show that lending to all U.S. businesses declined 22 percent from September 2008 to June 2010 and that small loans to businesses fell 8 percent over the same period.<sup>5</sup>

## II. SUPPLY AND DEMAND FOR SMALL BUSINESS LENDING

Given the slow pace of the recovery and rising levels of problem loans, many banks have become more risk averse. Many have tightened their lending standards and moved away from loans and into securities. Falling capital levels, due in large part to losses on problem loans, have reduced the lending capacity of many banks.<sup>6</sup> As a result, small businesses have found it difficult to secure loans.

At the same time, many bankers have reported weak demand from qualified small business borrowers. Businesses with weak sales or poor prospects are more likely to cut back rather than expand their business, thereby reducing demand for credit. A recent survey of small businesses by the National Federation of Independent Businesses (NFIB) showed that “weak sales” is the biggest concern for 27 percent of respondents, while only 3 percent of respondents report financing as the biggest problem (NFIB, 2011).

### *Factors affecting supply of small business lending*

In the recent recession, policymakers implemented several policies to increase the supply of small business lending. Two of the strategies employed were raising bank capital and reducing problem assets in banks.

*Bank capital* is a source of funding for new loans. But more importantly, banks hold capital to absorb unexpected losses. Following prudent business practices and regulatory requirements, banks hold capital in proportion to their assets. If a bank’s ratio of capital to assets falls to or below regulatory minimums, the bank must raise additional capital or reduce its assets. Growth in capital should be positively correlated with lending since it provides banks funds and the capacity to make additional small business loans. Banks typically leverage new capital by increasing deposits. Thus, when banks raise new capital, new lending should increase by more than the increase in capital.

In the last few years, two programs have directly targeted the level of capital at banks. The first program was the Troubled Asset Relief Program (TARP), created at the height of the financial crisis in October 2008 and originally designed to purchase “toxic assets” from banks. Its focus was quickly changed to provide new capital in the form of preferred stock for large and then smaller banking organizations. The

purpose of the TARP's Capital Purchase Program (CPP) was "to stabilize the financial system by providing capital to viable financial institutions of all sizes throughout the nation. With a strengthened capital base, financial institutions have an increased capacity to lend to U.S. businesses and consumers and to support the U.S. economy."<sup>7</sup>

The second program was the Small Business Jobs Act, passed by Congress in September 2010. The Act includes a new Small Business Lending Fund (SBLF), which provides up to \$30 billion in new capital to community banks to support small business lending.

*Problem assets*, which include past-due and nonaccrual loans and foreclosed properties, may reduce bank lending in two ways.<sup>8</sup> First, problem loans and foreclosed property require substantial management time and attention, and they generate additional monitoring, collection, and legal costs. This makes banks more risk averse, leading to tighter lending standards and reducing the supply of new loans.

Second, problem assets reduce bank earnings and slow capital accumulation. Because problem loans are non-earning assets, they reduce net interest income. Income is reduced further when banks make provisions for expected loan losses. Loan loss provisions are expense payments that go into the bank's allowance for loan losses. When loans are charged off, the bank writes down its loan balances and the loan loss allowance by the amount of the charged-off loan. Although the charge-off recognizes the loan loss, the actual loss or reduction in income occurs when the loan loss provision is made. The reduction in net interest income and the increase in provision expense reduces income and lowers the bank's retained earnings, an important part of the bank's capital. As discussed above, reducing a bank's capital lowers its capacity to make new loans.

Several programs have tried to remove problem assets from bank balance sheets, but their success has been limited. In March 2009, the Treasury turned its attention back to the TARP's original purpose of buying problem assets. The Treasury, the Federal Reserve, and the Federal Deposit Insurance Corporation (FDIC) jointly announced the Legacy Asset Program. This program consisted of two parts: the Legacy Securities Public-Private Investment Program (PPIP) and the Legacy Loan Program. The purpose of the PPIP was to increase liquidity in the market for toxic securities, thus making it easier for banks to sell

problem securities, free up capital, and increase lending. The Legacy Loan Program was similar in nature.<sup>9</sup> The FDIC would provide funding and debt guarantees for investment funds formed by outside investors. These investment funds would purchase problem assets from banks.

As a program to remove problem assets, the Legacy Loan Program was ineffective. Banks did not offer problem assets for sale under the program, in part, because they would have had to realize losses on the assets if the sale occurred. Furthermore, valuations on sold assets (especially securities) could serve as benchmarks for writing down other similar assets retained by the banks. Because banks did not participate, no problem assets were removed from bank balance sheets. The program is no longer in use.

### *Supporting evidence*

Changes in both bank capital and problem assets appeared to play a role in the decline in bank lending during the recent recession. This relationship can be seen in Chart 1, which shows the levels of business loans, bank capital, problem assets, and loan loss provision for all U.S. community banks from the start of the recession at year-end 2007 through 2010. During the recession and unfolding financial crisis, business lending by community banks declined 15.6 percent. Capital in community banks declined, while problem loans and loan loss provisions increased substantially. Over the period, there appeared to be a clear correlation between these supply factors and small business lending.

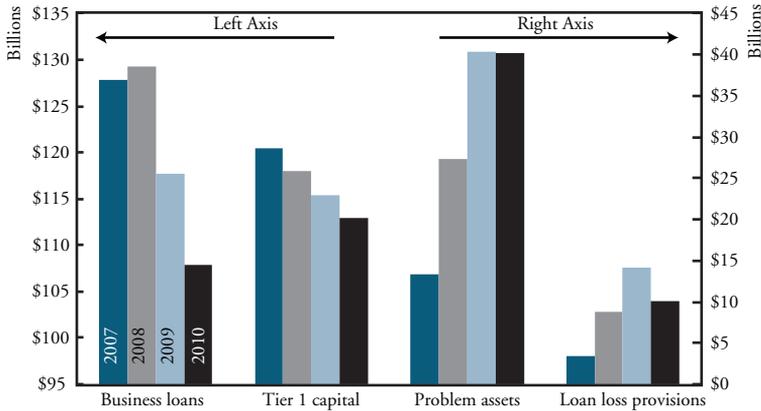
## **III. STATISTICAL MODEL AND DATA**

Regression analysis is used to estimate the effect of changes in bank capital, problem assets, and other variables on small business lending. The regression equation includes supply variables, demand variables, and other control variables. The selection of variables to include in the regression equation is based on a simple model of supply and demand for small business loans.

The supply variables are factors that affect a bank's production function. These include capital, core deposits, asset quality of the current loan portfolio (problem assets and loan loss provisions), and measures of liquid assets and lending strategies.

Chart 1

## COMMUNITY BANK BUSINESS LENDING, CAPITAL, PROBLEM ASSET, AND LOAN LOSS PROVISIONS, 2007-10



Source: Reports of Condition and Income

The demand for loans by small businesses is a “derived demand,” that is, businesses need bank credit as an input for producing their final goods and services. Rather than assessing demand for individual goods and services, broader business conditions in each market and the general business outlook are examined. Both local and national business conditions may be important and are measured by local employment and national real gross domestic product (GDP), respectively.<sup>10</sup> Also the outlook for future business is important and is measured using responses from surveys of small business owners.

Control variables account for differences in local markets that are related to the type of market (rural vs. urban) and the degree of local competition. Additional information about the supply and demand model, the regression variables, and how they are measured is provided in the Appendix.

The analysis focuses on community banks in the Tenth Federal Reserve District and the conditions in their local markets over time.<sup>11</sup> Community banks are generally smaller banks that rely heavily on relationships with individuals and businesses in their local geographical market. For example, in the Tenth District, on average, 80 percent of a community bank’s deposits are in branches located in the market where the bank is headquartered.<sup>12</sup>

In this analysis, community banks are defined as having less than \$1 billion in total assets. Virtually all business loans by banks of this size are made to small borrowers. Community banks cannot effectively meet the borrowing and other financial needs of large businesses. Regulatory limits on loan size and the need to maintain a diversified loan portfolio keep community bank loans at a size appropriate for small businesses.<sup>13</sup> In contrast, determining the proportion of small business loans at larger banks is difficult. Though large banks report the amount of their small balance loans, they do not identify the proportions of small balance loans made to small versus large business customers.

Community banks have wide coverage across the Tenth District. They make up 96 percent of all district banks and operate in almost every county and metropolitan area in the district.<sup>14</sup> Because community banks conduct most of their activities in local markets, which are defined in this article as metropolitan areas or as counties in rural areas, it is relatively easy to identify the local business conditions that affect their lending.<sup>15</sup>

Focusing on community banks has some limitations. One limitation results from excluding large banks, which account for a large percentage of small business loans.<sup>16</sup> Larger banks may use different lending technologies, such as greater reliance on FICO credit scores as opposed to personal information to make lending decisions. As a result, the analysis may not apply to a major source of small business lending. Another limitation is some loans used for small business purposes are not classified as small business loans. For example, many small business owners use personal credit cards or home equity lines of credit to help fund their businesses.<sup>17</sup> These loans would not be included in this study.

Data on Tenth District community banks and their local market conditions are available on a quarterly basis over an extended period. The analysis uses data from the first quarter of 2001 through the fourth quarter of 2009. This period includes the recessions of 2001 and 2008-2009 and includes small business lending through more than a full business cycle. Data for the banks' small business loans and other bank characteristics are obtained from the Reports of Condition and Income (call reports) that banks file with regulators each quarter.

The call reports contain detailed financial information about a bank's income statement and balance sheet.

In the regression, new business loans are measured using the quarterly growth rate (percentage change) in business (commercial and industrial) loans as the dependent variable.<sup>18</sup> Bank capital is measured as the quarterly growth rate of Tier 1 capital. Tier 1 capital is a regulatory capital measure that includes equity and retained earnings while excluding most intangible assets. Problem assets are measured as a percentage of total loans. The regressions include four lags of the dependent variable and of most of the explanatory variables. Information on how all variables are measured is in the Appendix.

#### IV. REGRESSION ANALYSIS AND RESULTS

The results of the analysis show that business lending is affected by the supply variables but not the demand variables. In particular, the two variables associated with recent government programs to increase small business lending—capital and problem loans—are statistically significant.<sup>19</sup> Thus, both of these variables are potentially useful policy targets for increasing small business lending.

As expected, an increase in bank capital was associated with higher lending (Table 1). The long-run effect of a one-percentage-point increase in a bank's capital growth is estimated to increase its lending growth rate by 0.11 percentage points, other things equal.<sup>20</sup> The problem-assets variable showed a negative relationship with small business lending. That is, a one-percentage-point increase in a bank's ratio of problem loans to total loans is estimated to decrease lending growth by 0.39 percentage point in the long run.

Although these results are statistically significant, the economic effect on lending not only depends on the coefficient size, but also on the change in the policy variable. Comparing the effects of changes in the capital and problem-asset variables on bank lending requires looking at equal changes in the two policy variables, which depends on how "equal" is defined.

One sense of an equal change is the standard deviation of the variables because it represents historical variations in the data that are equally likely to occur. The standard deviation of capital growth is 3.7 percent. Based on Tier 1 capital in district community banks at year–

Table 1

## SUPPLY FACTOR'S LONG-RUN IMPACT ON LENDING

Variable Name	Long-run Effect on Lending (percent)
Tier 1 capital growth	0.11
Deposit and other borrowings growth	0.15
Problem assets to total loans	-0.39
Loan loss provisions to total loans	-5.87

Note: The table shows the estimated long-run percentage change in lending due to a 1-percentage-point increase in each of the listed supply variables.

end 2010, a one standard-deviation increase is \$502 million in Tier 1 capital. The regression results indicate that a one-time increase of capital by \$502 million is estimated to raise small business lending over four quarters by only \$59 million, an increase of 0.5 percent over the year-end 2010 level.<sup>21</sup> A one-standard-deviation reduction in the problem asset ratio (2 percent) implies a drop in problem assets of \$1.8 billion or almost 46 percent of the problem loans at the end of 2010.<sup>22</sup> This is estimated to increase small business lending by \$111 million four quarters after the decrease in problem assets.

An alternative to a one-standard-deviation change is to use equal dollar changes in the policy variables. Such a comparison is useful for evaluating the effectiveness of the policy options for a given cost to the government. Four quarters after increasing capital by \$100, small business lending is estimated to increase by \$12. Similarly, four quarters after reducing problem assets by \$100, small business lending is estimated to increase by \$6. Although the effect of a reduction in problem assets is smaller in the first year, it is more persistent in later years. In the long run, both a \$100 increase in capital and a \$100 reduction in problem assets would increase small business lending by about \$13.

The small estimated sizes of the policy effects makes these lending supply policy variables an inefficient option for increasing small business lending. For example, it would be more effective for policymakers to give money directly to small businesses in the form of grants or loans rather than putting funds into banks' capital accounts. Of course, giving money directly to businesses raises many other potential issues, such as the potential for favoritism, fraud, and abuse and the difficulty in choosing winners and losers.

These results, however, may underestimate the effects that increased capital could have on small business lending. The regression is based only on business lending, which accounts for just 14 percent of community bank lending. If policies are designed specifically to encourage small business lending relative to other types of lending, the proportion of new small business loans could be much more than 14 percent of new lending. For example, the dividend rate banks pay to the U.S. Treasury on capital from the SBLF declines as banks increase small business lending. Thus, if banks that obtain capital from the SBLF use the capital to make only business loans, each dollar of new capital could result in a much greater impact on new business loans.

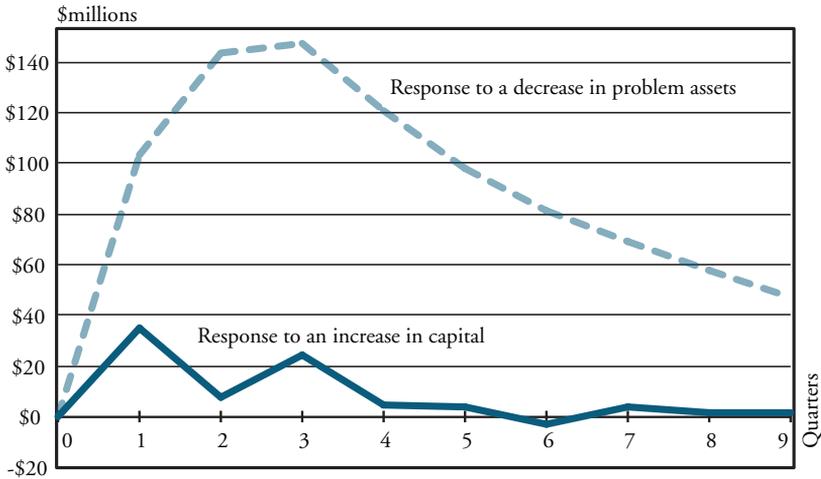
The regression also assumes that other variables remain unchanged. Policy changes, however, may cause feedback effects on other variables that impact small business lending. For example, banks that receive new capital may leverage the capital by raising new deposits. Banks that reduce problem assets also may be able to reduce loan loss provisions. Both of these changes should increase small business lending. The regression coefficients indicate that a one-standard-deviation increase in the level of core deposits (\$6.3 billion) would increase small business lending by \$104 million after four quarters, while a one standard-deviation decline in the level of loan loss provisions (\$205 million) would increase small business lending by \$198 million in four quarters.

Thus, to take account of these feedback effects, it is necessary to estimate a more general model that allows more interaction among the variables. One such approach is a vector autoregression (VAR). A VAR is a set of regressions, one for small business lending and one for each of the other variables that may have feedback effects.<sup>23</sup> The regressions use the same data for Tenth District community banks and their markets. The VAR results can be used to calculate the response of small business lending to a one-time change in capital or problem assets, accounting for feedback interactions.<sup>24</sup>

Chart 2 shows the change in small business lending in each quarter (for nine quarters) after capital growth increases and the problem asset ratio decreases by one-standard-deviation. A one-standard-deviation increase in capital of \$502 million is estimated to cause lending to rise initially, but the effect is short lived. Four quarters after the shock, there are no more quarterly changes in small business lending and the

Chart 2

RESPONSE OF SMALL BUSINESS LENDING TO CHANGES IN CAPITAL AND PROBLEM ASSETS



Note: The chart shows the responses of lending each quarter after a one-time, one-standard-deviation change in capital (\$502 million) and problem assets (-\$1.8 billion).

estimated cumulative increase is \$72 million. Even though the VAR allows for variable interactions, these results are comparable to the results found in the regression analysis above, suggesting that there is little feedback effect among capital and other endogenous variables. In particular, the results show that banks did not use additional borrowings to leverage their capital and increase small business loans.

The reduction in problem assets has a larger and more prolonged effect on small business lending when feedback effects are considered. Four quarters after the shock, a one standard-deviation reduction in problem assets is estimated to increase small business lending by a cumulative \$515 million, which is almost five times larger than in the regression analysis.

Allowing for feedback also indicates that a given dollar decrease in problem assets increases small business lending much more than an equal increase in capital. In the VAR estimation, four quarters after a \$100 increase in capital, small business lending increases by \$14, whereas a \$100 reduction in problem assets leads to an increase of \$29. Thus, for the same cost to the government, reducing problem assets is estimated to be twice as effective as increasing capital in increasing small business lending.<sup>25</sup>

## VI. CONCLUSIONS

Policymakers have looked to new and small businesses to create new jobs as the U.S. economy slowly recovers from the 2008-09 recession. However, small businesses have struggled. One reason may be a decline in bank lending to small businesses. This article examined two policy tools to increase the supply of small business lending: increasing bank capital and reducing problem assets.

The results show that both strategies have a statistically significant effect on the supply of small business loans and thus are potentially useful policy tools for expanding the supply of small business loans. However, the economic effect of the two policies is different. Policies that provide additional capital to community banks are likely to generate only a small amount of new business lending. Although banks would be expected to leverage new capital and thereby generate new lending greater than the amount of new capital, both single-equation and VAR techniques show new business lending increases by only a fraction of the additional capital. Although it is possible that these results underestimate the policy impact, small business lending is unlikely to increase by the amount of capital provided to banks.

The statistical results indicate that policies that can reduce the amount of problem loans are likely to lead to a larger increase in small business lending than would an equal increase in capital, although the increase in lending is still much smaller than the decrease in problem assets. The effect was more pronounced in the VAR analysis, which incorporated feedback effects among the variables. Unfortunately, recent policies designed to remove problem assets from bank balance sheets have been difficult to implement. For example, the FDIC's Legacy Loan Program did not attract any problem assets from banks and was discontinued. Therefore, policymakers face a choice between ineffective capital policies that are easy to implement and potentially more effective problem-asset policies that are difficult to implement successfully.

## APPENDIX

The Appendix provides additional information about the statistical analysis used in the article. It includes a simple model of supply and demand for small business loans that helps guide the selection of variables used in the analysis. The Appendix also describes how the theoretical variables are measured and the data sources that were used. The technical specifications for the regressions and a more complete table of regression results also are shown.

### *Quantity demanded*

The quantity of loans demanded ( $Q^d$ ) is a function of the loan rate, local and national business conditions, and the future business outlook:

$$Q^d = d(\text{loan rate, business conditions, business outlook}). \quad (1)$$

Local business conditions in each market are measured by the growth rate of local employment from the *Quarterly Census of Employment and Wages* (QCEW) from the Bureau of Labor Statistics. National economic conditions are measured using the quarterly growth rate of real GDP from the Bureau of Economic Analysis (BEA). The business outlook variable, measured at a national level, is created using survey information from the National Federation of Independent Business (NFIB). The business outlook variable is the percentage of respondents that believe that the next three months will be a good time to expand. This measure should be associated with a higher probability of the business taking out a loan.

### *Quantity supplied*

The quantity of loans supplied ( $Q^s$ ) by a bank is a function of the loan rate and characteristics of the bank's production function for loans.

$$Q^s = s(\text{loan rate, funding, capital, loan quality, liquidity, strategy, market characteristics}) \quad (2)$$

The bank-specific variables for the supply equation are calculated using data from Reports of Condition and Income (call reports). Capital is measured using the quarterly percentage change in Tier 1 capital. The funding mix is measured using the quarterly growth rate of core deposits, which include transaction accounts (including demand

deposits), money market deposit accounts, other savings deposits, and time deposits under \$100,000.<sup>26</sup> There are two measures for loan quality. The first is the ratio of problem assets divided by total loans and leases less unearned income on loans. Problem assets are defined as the sum of nonaccrual loans, loans and leases more than 90 days past due, and other real estate owned (OREO). The second variable is the ratio of loan loss provisions to total loans and leases less unearned income on loans. Liquidity is measured by the sum of available-for-sale securities and excess reserves to total assets. Bank lending strategies are measured using three binary variables that take on the value 1 if the bank is classified as a business lender, agricultural lender, or real-estate lender. A bank is classified, for example, as a business lender if commercial and industrial lending is its largest loan category.

A number of control variables also are included. The level of competition is measured using the Herfindahl-Hirschman Index (HHI). The HHI is calculated as the sum of the squared market shares of each bank in the market. Shares are based on deposits as reported in the Summary of Deposits data set, which is collected by the Federal Deposit Insurance Corporation and the Office of Thrift Supervision.<sup>27</sup> In addition, differences in metropolitan and rural markets are controlled for by using a binary variable equal to one for metropolitan markets. A variable for the interaction of the HHI and metropolitan binary variables also is included.

Descriptive statistics for the variables used in the analysis are provided in Table A1. It shows the mean, standard deviation, minimum value, and maximum value for each variable.

Instead of estimating equations (1) and (2) simultaneously, a reduced form approach is used to eliminate the endogenous loan rate and estimate the quantity of loans in a market as a function of the demand variables and supply variables.

$$Q = q(\text{business conditions, business outlook, funding, capital, loan quality, liquidity, strategy, market characteristics}) \quad (3)$$

Equation (3) is estimated using the following equation:

Table A1  
DESCRIPTIVE STATISTICS

Variable Name	Mean	Std. Dev.	Min	Max
<b>Dependent variable</b>				
Commercial and industrial loan growth <sup>1</sup>	0.020	0.155	-0.407	0.742
<b>Independent variables:</b>				
<i>Demand:</i>				
Private employment growth <sup>1,2</sup>	0.004	0.119	-0.758	3.082
Real GDP growth	0.004	0.007	-0.017	0.017
NFIB survey question – “Good time to expand”	0.146	0.064	0.010	0.280
<i>Supply:</i>				
Tier 1 capital growth <sup>1</sup>	0.013	0.037	-0.134	0.222
Core deposit growth <sup>1</sup>	0.007	0.049	-0.128	0.257
Loan loss provisions to total loans <sup>1</sup>	0.001	0.002	-0.001	0.016
Problem assets to total loans <sup>1</sup>	0.016	0.020	0.000	0.113
Excess reserves and securities to total assets <sup>1</sup>	0.254	0.157	0.017	0.667
<i>Controls:</i>				
HHI <sup>2</sup>	0.209	0.149	0.038	1.000
Metro <sup>2</sup>	0.357	0.479	0.000	1.000
HHI*Metro <sup>2</sup>	0.033	0.050	0.000	0.474
Business bank strategy	0.022	0.147	0.000	1.000
Agricultural bank strategy	0.362	0.481	0.000	1.000
Real-estate bank strategy	0.600	0.490	0.000	1.000

Note: All growth rates are quarterly. Private employment growth and real GDP growth are seasonally adjusted.

1. Winsorized at 1 percent and 99 percent level.

2. The descriptive statistics are calculated across banks, so the mean and standard deviation are affected by the number of banks in each period.

$$\begin{aligned}
 SBL_{i,t} = & \alpha_i + \sum_{j=1}^4 \beta_{1,j} SBL_{i,t-j} + \sum_{j=1}^4 \beta_{2,j} Cap_{i,t-j} + \sum_{j=1}^4 \beta_{3,j} Dep_{i,t-j} + \sum_{j=1}^4 \beta_{4,j} PA_{i,t-j} \\
 & + \sum_{j=1}^4 \beta_{5,j} LLP_{i,t-j} + \beta_6 Liq_{i,t-1} + \sum_{j=1}^4 \beta_{7,j} Empl_{i,t-j} + \sum_{j=1}^4 \beta_{8,j} GDP_{t-j} \\
 & + \sum_{j=1}^4 \beta_{9,j} Surv_{t-j} + \beta_{10} HHI_{i,t} + \beta_{11} Metro_{i,t} + \beta_{12} Metro * HHI_{i,t} \\
 & + \beta_{13} BusBk_{i,t} + \beta_{14} AgBk_{i,t} + \beta_{15} ReBk_{i,t} + \sum_{j=2}^4 \beta_{16,j} Seas_j + \epsilon_{i,t},
 \end{aligned}$$

where *SBL* is small business lending; *Cap* is Tier 1 capital; *Dep* is core deposits; *PA* is problem assets; *LLP* is loan loss provisions; *Liq* is liquidity; *Empl* is local employment; *GDP* is real gross domestic product; *Surv* is the business outlook from the NFIB survey; *HHI* is the Herfindahl-Hirschman Index; *Metro* is a binary variable that equals 1 if the bank is located in a metro area; *Metro\*HHI* is the interaction between the Metro and HHI binary variables; *BusBk* is a binary variable that equals

1 if the bank is a business lender;  $AgBk$  is a binary variable that equals 1 if the bank is an agricultural lender;  $ReBk$  is a binary variable that equals 1 if the bank is a real-estate lender, and  $Seas_j$  is a seasonal binary variable for the  $j^{th}$  quarter of the year.  $j=2, 3,$  and  $4$ .

The analysis focuses on two policy variables, bank capital ( $Cap$ ) and problem assets ( $PA$ ). Lagged values of certain variables are included because there may be delayed effects on lending. For example, even though capital increases today, it may take time to make a new loan. Thus, previous changes in capital may have an effect on lending today. Similarly, previous levels of problem assets may have long-term impact on management's risk tolerance and subsequently affect lending decisions today.

The data are an unbalanced panel data set, which includes an average of 1,265 banks per quarter over the 31 quarters.<sup>28</sup> The analysis also controls for various econometric issues. Bank-fixed effects are used to capture differences among banks. To control for possible heteroskedasticity, standard errors are clustered at the bank level. To mitigate autocorrelation issues, four lags of the dependent variable are included. The regression includes seasonal binary variables to control for potential seasonal effects. To reduce the influence of extreme values, the following variables are winsorized at the upper and lower 1 percent levels: small business lending, employment, capital, core deposits, loan loss provisions, problem assets, and liquidity. In the same spirit, data are excluded for all de novo banks and any observation where a bank's assets increased more than 10 percent in a quarter.<sup>29</sup> This excludes mergers and acquisitions where the increase in small business loans is not the result of organic growth.

The results of the regressions are shown in Table A2. For convenience, the table shows the sum of coefficients where there are lagged variables. The significance is based on an F-test of joint significance.

Several other specifications were run to check the robustness of the results. Although these results are not shown here, the results were not substantially different across the various specifications. These included using quarterly time binary variables to control for factors that vary across time, different specifications of the employment variable, different survey measures, and the Tier 1 capital ratio.

Table A2

## REGRESSION RESULTS

Variable Name	Regression Coefficients
<i>Demand:</i>	
Employment growth	0.029
Real GDP	0.599
NFIB survey question – “Good time to expand”	0.061
<i>Supply:</i>	
Tier 1 capital growth	0.135†
Core deposit growth	0.181***
Loan loss provisions to total loans	-7.261***
Problem assets to total loans	-0.483***
Excess reserves and securities to total assets	0.089***
<i>Controls:</i>	
Commercial and industrial loan growth (lag)	-0.237***
HHI	0.063
Metro	-0.033
HHI*Metro	-0.006
Business bank strategy	0.073***
Agricultural bank strategy	-0.014
Real-estate bank strategy	-0.001
R <sup>2</sup>	3.65%
F-stat	15.63***
Observations	32,859
Banks	1265

Notes: For variables with lags, the table shows the sum of the lagged coefficients. For summed coefficients, significance is measured using an F-test of joint significance.

\*\*\* indicates statistical significance at the 1 percent level.

† indicates statistical significance at the 11 percent level.

*Panel vector autoregression (VAR)*

The previous regressions measure the effect of individual variables while holding values of other variables constant. However, changes in the policy variables may cause changes in other supply and demand variables in the equation. To account for this endogeneity of the supply and demand variables, a panel VAR is estimated.

The VAR consists of regression equations for small business lending growth and each of the demand and supply variables except for the national demand variables (GDP and the NFIB survey measure). The effects of these variables are captured using quarterly time dummies. Thus, the VAR is a seven-equation system with the national demand and control variables considered exogenous.<sup>30</sup>

The Cholesky decomposition of the VAR error variance-covariance matrix creates a lower triangular contemporary coefficient matrix for the seven endogenous variables, which implies the estimates are not

Table A3

## PANEL VAR ORDERING

Order:	Variable name:
1.	Employment growth
2.	Deposit growth
3.	Excess reserves and securities to total assets
4.	Small business lending growth
5.	Problem assets to total loans
6.	Loan loss provisions to total loans
7.	Capital growth

biased if the endogenous variables are temporally exogenous with respect to each other. Specifically, the estimates are not biased if the ordering of the endogenous variables is such that any given variable is contemporaneously exogenous with respect to each variable below it in the column vector of endogenous variables.

The ordering of variables shown in Table A3 is based on the following reasoning. Economic conditions (in this case employment) are assumed to affect bank-specific variables immediately. Of course bank-specific variables, such as loans, to a certain extent drive economic conditions, but this effect is less immediate than the other way around. Thus, a change in employment would change workers' income, which should cause an immediate change in deposits. As deposits change, cash and safe short-term securities would change at banks. The changes in employment, deposits, and cash at banks will influence lending. Even though lending does not necessarily have an immediate impact on problem assets (other than changing the denominator of our problem-asset ratio), lending is more responsive to employment, deposits, and cash than the problem-asset measure.

The next three steps fall naturally in place. As problem assets change, loan loss provisions will also change and this change would be immediate. Further, loan loss provisions directly impact net income, and, thus, retained earnings which is a part of capital. Hence, loan loss provisions would immediately impact the capital base.

## ENDNOTES

<sup>1</sup>The Business Cycle Dating Committee of the National Bureau of Economic Research, the “official” arbiter of recessions and expansions, determined that the recent recession ran from December 2007 through June 2009. (See their press release at <http://www.nber.org/cycles/sept2010.html>.) Although economic output started growing in June 2009, employment continued to fall through February 2010.

<sup>2</sup>Haltiwanger, Jarmin, and Miranda (2010) show that new firms are responsible for new job creation. After adjusting for firm age, they find that small firms do not create more new jobs, on net, than large, established firms.

<sup>3</sup>Data are from the Bureau of Labor Statistics’ *Quarterly Census of Employment and Wages* and *Business Employment Dynamics*. Establishments are business locations, so these numbers also include smaller establishments or business locations of large businesses. Census Department data on employment by firm size are available only with a substantial lag.

<sup>4</sup>See Robb and Robinson (2010) and Berger and Udell (1998).

<sup>5</sup>Data are from the Reports of Condition and Income. Commercial and industrial loans outstanding declined from almost \$1.4 trillion to \$1.1 trillion. Outstanding small loans to businesses declined from \$286 billion to \$262 billion. These loans have historically only been reported in June of each year. In 2010, banks were required to report this on a quarterly basis.

<sup>6</sup>Smaller banks do not have the same ability as larger banks to access capital markets, which makes it harder for smaller banks to raise additional capital. Instead, smaller banks rely to a larger extent on retained earnings for capital accumulation, a factor that is very procyclical.

<sup>7</sup>TARP was also used to provide capital to automobile manufacturers General Motors and Chrysler.

<sup>8</sup>When a borrower misses one or more payments, the loan is considered past due. Depending on the type of loan, banks will begin various efforts to collect the past due payments. Loans that are past due more than 90 days are listed as nonaccrual loans. The bank stops accruing interest due on the nonaccrual loans, and any payments received are applied first to past due principal. Property acquired through foreclosure is known as Other Real Estate Owned (OREO). The bank will try to sell its OREO to recover principal and interest owed on the foreclosed loan.

Traditionally, loans have made up the bulk of problem assets. However, in the recent recession, bank-owned securities, such as “private-labeled” or non-Agency, mortgage-backed securities and securitized trust preferred securities, became impaired due to credit problems with the collateral underlying these securities. Securities impaired due to credit problems are known as “other than temporary impairments” (OTTI) and must be written down as a loss against income. Problems in the securities portfolio are not included in our measure of problem assets.

<sup>9</sup>The press release describing the program can be found at <http://www.fdic.gov/news/news/press/2009/pr09121.html>

<sup>10</sup>Including measures for nationwide economic conditions captures loan demand from small businesses that sell over a broader area.

<sup>11</sup>The Tenth District includes Colorado, Kansas, Nebraska, Oklahoma, Wyoming, western Missouri and northern New Mexico.

<sup>12</sup>Local market deposits are calculated from the FDIC's June 2009 Survey of Deposits.

<sup>13</sup>For example, federal banking regulations limit the maximum aggregate loan amount to any one borrower to 15 percent of a bank's capital for national banks (similar limits apply to state chartered banks in most states). For a national bank with \$1 billion in assets and a 10 percent capital-to-asset ratio, the maximum loan size would be \$15 million.

<sup>14</sup>Due to their small size, these banks accounted for only 51 percent of Tenth District banking assets as of December 31, 2010.

<sup>15</sup>This definition of local markets is the standard approach followed in most banking studies. See for example Berger, Rosen, and Udell (2007).

<sup>16</sup>In a study by Prager and Wolken (2008), 66 percent of the small businesses in their sample obtained credit only from banks with assets more than \$1 billion. In addition, Montoriol-Garriga and Wang (2010) note that banks with more than \$50 billion in assets now account for more than 50 percent of small business loans.

<sup>17</sup>The February 2010 National Federation of Independent Businesses survey on small business credit found that small business owners rely to a large extent on both their homes and their business real estate for equity. Seventeen percent of small business owners with a mortgage obtained the mortgage to help finance their business, and 16 percent of business owners with a mortgage on their firm's real estate took out the mortgage to finance other business activities. Also see Schweitzer and Shane (2010).

<sup>18</sup>Bernanke and Lown (1991) and Berrospide and Edge (2010) both examine the effects of capital on bank lending using the growth rate of lending as the dependent variable. The growth in loans is used to measure new loans. It actually measures the net change in loans, which may differ from actual new loans. For example, "new" loans would be higher than "net" loans if some existing loans are not renewed.

<sup>19</sup>Tier 1 capital is significant only at the 11 percent level, but other specifications find it significant at a lower level. The finding that the demand variables are not statistically significant could mean that demand factors were not appropriately accounted for in the regression equation, which means the estimated coefficients on the supply factors could be biased. However, the bias would not alter the general conclusion of the article that the impact on small business lending of changes in the two policy variables of interest—capital and problem assets—are not very large. Because capital and problem assets tend to be procyclical, i.e., as economic activ-

ity and aggregate demand expand, capital tends to increase and problem assets tend to decrease, the omission of demand effects would cause the coefficients on capital and problem assets to be larger than their true values. Thus, if anything, the impact of changes in capital and problem assets are even smaller than reported in the article.

<sup>20</sup>The long-run effect of a shock to the specific variable is

$$\sum_{j=1}^4 \beta_{k,j} / (1 - \sum_{j=1}^4 \gamma_j)$$
 where  $\beta_{k,j}$  is the coefficient of variable  $k$  at lag  $j$  and  $\gamma_j$  is the coefficient of the  $j^{\text{th}}$ -lag of the dependent variable. See Table A2 in the appendix for actual point estimates of all variables in the regression equation.

<sup>21</sup>The four-quarter-ahead prediction of the cumulative change in lending is based on a one-time change in capital growth, which impacts lending beyond the next quarter because the regression includes four lags of lending growth and of other explanatory variables (see equation 3 in the Appendix). The regression results in Table A2 in the Appendix show the sum of the lagged coefficients on lending growth and each of the lagged explanatory variables. The calculation of the four-quarter-ahead prediction of the change in lending requires the individual coefficients on each lag of lending growth and the explanatory variables, which are available from the authors upon request.

<sup>22</sup>Total loans are assumed to stay constant.

<sup>23</sup>The variables that are believed to have feedback effects are often called endogenous variables, or variables that are determined within the model. The endogenous variables in the VAR are the growth in employment, deposits, small business lending, and capital, and the ratios of excess reserves and securities to total assets, problem assets to total loans, and loan loss provisions to total loans.

<sup>24</sup>The VAR results are used to calculate impulse response functions, shown in Chart 2, that show how lending changes in response to changes in capital and problem assets, while also allowing other variables to adjust to these changes. The VAR analysis and impulse response functions are described in the Appendix.

<sup>25</sup>As noted in previous discussion in the text, this assumes the capital program does not provide special incentives to use the capital for small business lending relative to other types of lending or debt reduction.

<sup>26</sup>Deposits over the limit for insured deposits are considered to be less stable. For most of the period included in the analysis, deposit insurance coverage was limited to \$100,000. Although the coverage was raised in 2008 to \$250,000 for time deposits, bank call reports continued to collect data by size of deposits using a \$100,000 break point.

<sup>27</sup>The Summary of Deposits data are deposit balances for each bank branch in the country. Branches of a bank are aggregated within each market to measure the bank's market share.

<sup>28</sup>Some banks were not present in all quarters. The data include a total of 1,214 different banks. Banks were in the study an average of 26 of the 31

quarters. Only 31 quarters of the data are available because five quarters are used to calculate the lagged annual growth rates and lagged four-quarter average values.

<sup>29</sup>This is a standard approach. See for example Cornett, McNutt, Strahan, and Tehranian (2010). Also, banks were excluded if they did not have any loans or if they did not have any business, real estate, agricultural or consumer loans.

<sup>30</sup>Standard statistical tests found the endogenous variables were stationary.

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