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Report on SBLF Program Impact Evaluation

October 2016

SBLF PROGRAM IMPACT EVALUATION

The Small Business Jobs Act of 2010 directs the Secretary of the Treasury to provide a quarterly report on how institutions participating in the SBLF program have used the funds they received under the program. Each quarter SBLF publishes a report providing information on changes in small business lending by participants relative to baseline levels[1]. These reports have compared SBLF participant lending growth to that of a broad comparison group as well as a representative peer group. The results suggest that the SBLF program is supporting significantly increased business lending by participants, consistent with the program's objectives.

This report describes SBLF program results using a statistical methodology called propensity score analysis which attempts to limit the potential reported effect of selection bias. This analysis of participant lending growth was performed for the quarter ending September 30, 2015. Consistent with the findings in the Report on SBLF Program Impact Evaluation dated January 2015, the results of this analysis suggest that the SBLF program is supporting substantially increased business lending among program participants.

Program Impact Analysis Using Propensity Score Method

Propensity score methods seek to account for observable characteristics that may be predictive of a bank's likelihood of participating in the SBLF, extending beyond the conventional measures of market analysis used in the peer group analysis. In general, propensity score methods use balancing factors ("propensity scores") to offset an unequal distribution of observable characteristics between comparison groups. In this way, they help mitigate selection bias by controlling indirectly for a bank's motivation to participate in the SBLF program.

For this program impact analysis, Treasury implemented a "propensity score matching" approach" . This approach calculates the predicted probability that a given institution would have received SBLF funding given the many variables that may have influenced the institution's ability or decision to participate in the SBLF program. This predicted probability of participation is codified as a "propensity score" for each SBLF bank participant as well as each non-participant (6,028[2] banks). To assess the effect of SBLF participation, the analysis matches each SBLF bank with a non-SBLF bank that has the closest propensity score. This process has the effect of creating a propensity score-matched "control group" of non-SBLF banks that is balanced with SBLF banks across all relevant variables. Assembling the two groups in this manner controls for the influence of these characteristic variables by largely eliminating any imbalances across the distribution of these variables among the two groups of banks. This approach explores whether, when controlling for propensity to participate in SBLF, banks that received SBLF capital increased their business lending balances more than other banks.

Similar to other retrospective statistical techniques, propensity score methodologies carry inherent limitations. For example, propensity score matching techniques presume that all relevant characteristic variables are subject to measurement and inclusion when calculating an institution's propensity to participate in one or more groups. Consequently, it remains possible that unmeasured factors may influence differences in outcomes in a comparison of

[1] As established in the Act, the baseline for measuring the change in small business lending is the average of the amounts that were reported for each of the four calendar quarters ended June 30, 2010.

[2] Of the 6,035 non-SBLF banks, seven institutions were excluded from the matching analysis due to missing values associated with the data used to calculate propensity scores.

SBLF banks and non-participants.[3] The use, however, of a large set of observable variables – a total of 71 in the context of this analysis – helps mitigate this risk.

In addition, the scope of this analysis is limited to an assessment of whether SBLF participants have increased business lending in comparison to similarly situated institutions. This analysis does not seek to evaluate, for example, whether increases in business lending by program participants have been offset by decreases by non-participants or slower growth in non-business lending by participants than may otherwise have occurred. Likewise, this analysis does not seek to capture or calculate potential second-order benefits to a community from increased business lending, such as increased job creation, capital investment, tax revenues, or other effects. As well, this analysis is not intended to address questions of capital access or availability, such as whether banks that participated in SBLF could have raised capital from alternative sources, nor does it seek to address potential limitations on the aggregate amount of capital available to community banks.

Selection of Characteristic Variables

Treasury incorporated a broad set of 71 observable financial and market variables that could potentially affect a bank's likelihood of participating in the SBLF program. These variables include balance sheet measures, financial performance measures, capitalization, loan composition, deposit composition, asset quality, liquidity, yield to cost ratios, corporate organization, and participation in the Capital Purchase Program, as well as characteristics of the institution's lending markets. These variables were measured as of March 31, 2011, which was the quarter before the first SBLF investment.

To obtain financial information on each bank, Treasury accessed information from SNL Financial (SNL), a private database that contains publicly-filed regulatory and financial reports. To obtain market population, unemployment, and income information on the bank's lending markets, Treasury accessed U.S. Census information using SNL. For banks located within a Metropolitan Statistical Area (MSA), MSA-level information was used, while county-level data was used for banks outside of an MSA.

The following is a list of the 71 characteristic variables selected, grouped by category. These variables are based on SNL's array of summary financials for each institution.

- ***Balance sheet measures (6 continuous[4] variables)*:** total assets, asset growth rate, loan growth rate, deposit growth rate, gross loans to assets, and loans to deposits.

- ***Performance measures (5 continuous variables):*** return on average assets (ROAA), return on average equity (ROAE), net interest margin, yield to cost spread, and efficiency ratio.

- ***Capitalization (8 continuous variables and 1 categorical[5] variable):*** equity to assets, tangible equity to tangible assets, tangible common equity to tangible assets, risk based capital ratio, tier 1 risk based ratio, tier 1 common risk based ratio, leverage ratio, change in common and preferred stock and capital surplus as a

[3] Randomized experiments are best suited to assessing program effectiveness where it is possible to maintain random assignment to minimize the influence of external factors on program outcomes. The structure of the SBLF program, however, did not permit random assignment, as Treasury considered all applicants for funding and sought to provide consistent decisioning among applicants.

[4] A continuous variable is a numeric variable that can take on an infinite number of values within a certain range.

[5] A categorical variable is a variable that can take on one of a finite number of distinct values that assigns each institution to a particular group or category based on some qualitative property.

percentage of total equity between Q1 2010 and Q1 2011 (0% or less, 0 to 5%, 5 to 10%, over 10%) and common dividends declared to net income.

- ***Loan composition (6 continuous variables):*** construction land development loans to total loans, total 1-4 family loans to total loans, multifamily loans to total loans, total real estate loans to total loans, commercial and industrial loans to total loans, and consumer loans to total loans.

- ***Deposit composition (5 continuous variables):*** non-interest bearing deposits to total deposits, transaction accounts to total deposits, money market deposit account (MMDA) savings to total deposits, retail time deposits to deposits, and jumbo time deposits to total deposits.

- ***Asset quality (11 continuous variables):*** non-current loans to loans, nonperforming loans to loans, non-performing assets to total assets, non-performing assets excluding restructured loans to total assets, non-performing assets to loans plus foreclosed real estate, loan loss reserves to gross loans, net charge-offs to average loans, non-performing assets plus loans 90 days past due to tangible equity plus loan loss reserves, adjusted non-performing assets plus adjusted loans 90 days past due divided by tangible equity plus loan loss reserves, adjusted non-performing assets to total assets, and adjusted non-performing loans to total loans.

- ***Liquidity (4 continuous variables):*** liquidity ratio, interest earning assets to interest bearing liabilities, brokered deposits to deposits, and jumbo deposits to total domestic deposits.

- ***Yield to cost ratios (4 continuous variables):*** yield to loans and leases, cost of interest bearing deposits, cost of interest bearing liabilities, and cost of funds.

- ***Government program participation (3 categorical variables):*** current or former participation in CPP (participant; non-participant), former participation in Transaction Account Guarantee Program (TAGP) (participant; non-participant), former participation in Debt Guarantee Program (TDGP) (participant; non-participant).

- ***Corporate organization (6 categorical variables and 1 continuous variable):*** de novo status (de novo; non-de novo), ownership (private; public), ownership structure (mutual; stock corporation), institution type (savings bank; commercial bank), primary regulator (Federal Reserve Board (FRB); Office of the Comptroller of the Currency (OCC); Federal Deposit Insurance Corporation (FDIC)), Community Reinvestment Act rating (outstanding, needs to improve, satisfactory), and bank age in years.

- ***Local market indicators (1 categorical variable and 10 continuous variables):*** region (Mid-Atlantic, Midwest, Northeast, Southeast, Southwest, West), unemployment rate, change in unemployment rate from prior year, 2011 compound annual growth rate (CAGR) of households, 2011 CAGR of population, 2010 CAGR of median household income, 2010 CAGR of per capita income), projected 2017 CAGR of households, projected 2017 CAGR of median household income, projected 2017 CAGR of per capita income, and projected 2017 CAGR of population.

Propensity Score Matching Analysis Methodology

Propensity score matching follows five primary steps: (1) evaluation of the balance of characteristic variables between SBLF participants and non-participants, (2) calculation of a propensity score for each institution, (3) selection of a control group of banks using propensity scores, and (4) testing of the control group to assess its effectiveness in mitigating selection bias, and (5) estimation of net effect of SBLF participation.

Step 1: Evaluation of the Balance of Characteristic Variables Between SBLF Participants and Non-Participants

Treasury measured the statistical differences between the SBLF banks and the broader market of community banks across each of the 71 characteristic variables listed above to identify which characteristics were equally distributed (i.e., balanced) among SBLF participants and non-participants. To evaluate balance, the statistical differences in each variable between the two groups of banks were calculated using chi-squared tests for categorical variables and Kolmogorov–Smirnov tests (K-S tests) for continuous variables. The analysis found statistically significant imbalances (p-values < 0.05) between SBLF and non-SBLF banks for 53 of the 71 characteristic variables. This result suggests that SBLF banks have observable characteristics that differ significantly from the broader market of community banks.

Step 2: Calculation of a Propensity Score for Each SBLF Participant and Non-Participant

Treasury calculated a "propensity score" ranging between 0 and 1 for each SBLF bank participant and each non-participant based on the 71 characteristic variables described above. The calculation of the propensity score for each bank follows a standard logistic regression. The dependent variable is defined as program status (non-participant = 0, SBLF participant = 1) and the independent variables are the 71 characteristic variables. A backward selection process was used to iteratively eliminate highly insignificant variables (i.e., p-values > 0.60).[6] Through the backward variable selection process, 17 variables were eliminated. The initial test of propensity score's ability to balance across SBLF and the control group (see Step 5) indicated remaining imbalances for the asset growth rate, loan growth rate, and ROAA variables, possibly suggesting a non-linear relationship for these variables not captured in the initial model. To correct for this imbalance, Treasury added squared terms for each of these factors (a common approach in propensity score modeling) and cubed variables for the loan growth rate and ROAA variables, which yielded five additional coefficients for the logistic regression.

Step 3: Selection of a Control Group of Non-Participants Using Propensity Scores

Treasury selected a control group of non-participants for comparison to SBLF institutions by matching each SBLF participant with the non-participant that had the next closest propensity score (propensity score-matched "control group"). For example, if an SBLF participant had a propensity score of 0.30, the institution selected for inclusion in the control group was the non-participant that received a propensity score closest to 0.30.

[6] The variables eliminated were found to be insignificant in the presence of other correlated variables; individually, however, they may be correlated with lending growth. The eliminated variables included: deposit growth rate, ownership = private, regulator = OCC or FRB, ROAE, projected CAGR households, tier 1 common risk based capital ratio, NPAs to total assets, cost of interest bearing deposits, yield on loans and leases, jumbo time deposits to total deposits, CAGR per capita income, MMDA savings to total deposits, leverage ratio, projected CAGR per capita income, institution type = savings bank, and ownership structure = mutual.

Step 4: Evaluation of the Balance of Characteristic Variables Between SBLF Participants and the Control Group

Treasury performed statistical tests to assess whether the control group and the SBLF participants had comparable distributions with respect to each of the 71 characteristic variables. The statistical differences in each variable between the two groups of banks were calculated using chi-squared tests for categorical variables and Kolmogorov-Smirnov tests (K-S tests) for continuous variables (see Table A for detailed test results). These tests found no statistically significant imbalances (p-values < 0.05) between the group of SBLF banks and the control group across any of the 71 characteristic variables (see Table A for additional detail). This suggests that the propensity score matching analysis reduced the possibility of selection bias by selecting a statistically balanced control group.

Step 5: Estimation of Net Effect of SBLF Participation

To estimate the net effect of the SBLF participation using this methodology, Treasury compared the median increases in lending growth at SBLF banks to the median increases in lending growth and the control group over baseline and since investment. Consistent with the findings from the peer and comparison group analysis published in the quarterly SBLF Lending Growth Reports, the results of the propensity score matching analysis suggest that the SBLF program is supporting increased business lending among program participants. By convention, the output of these methodologies reflects differentials between groups and are not directly comparable with the results of the peer and comparison group analyses presented in the quarterly SBLF Lending Growth Reports.

As of September 30, 2015, SBLF banks have increased business loans outstanding by a median 91.6 percent over baseline levels, versus a 56.4 percent median increase for the propensity score-matched control group, for an estimated net effect associated with SBLF participation of 35.2 percentage points. The following table shows changes in business lending and other lending by SBLF banks and the propensity score matched control group.

Results of Propensity Score Matching Analysis

	Median Lending of SBLF Participants	Median Lending of Control Group	Estimated Net Effect of SBLF Participation
Number of institutions	184	184	
Median Change in Lending Over Baseline			
Business lending	91.6%	56.4%	**35.2%**
Other lending	74.3%	51.8%	**22.5%**
Median Change in Lending Since Investment			
Business lending	59.0%	34.1%	**24.8%**
Other lending	55.9%	39.6%	**16.3%**

Table A: Summary Statistics of Characteristic Variables: Propensity Score Matching

The following tables includes additional detail of the chi-square test results for the 11 categorical variables and the K-S test results for the 60 continuous variables used in the propensity score matching analysis. All variables were measured at March 31, 2011, the quarter before the initial SBLF investment.

Summary of Chi-Square Test Results for Continuous Variables and KS-Test Results for Categorical Variables

	p-value Before PS Correction	p-value After PS Correction
Corporate organization		
Banks Age in Yrs.	< 0.01	0.11
Balance sheet measures		
Total Assets	< 0.01	0.07
Asset Growth Rate	< 0.01	0.11
Loan Growth Rate	< 0.01	0.09
Deposit Growth Rate	< 0.01	0.09
Gross Loans to Assets	< 0.01	0.34
Loans to Deposits	< 0.01	0.41
Performance measures		
ROAA	< 0.01	0.14
ROAE	< 0.01	0.34
Net Interest Margin	0.05	0.23
Yield to Cost Spread	0.02	0.14
Efficiency Ratio	0.44	0.28
Capitalization		
Equity to Assets	0.04	0.75
Tangible Equity to Tangible Assets	0.01	0.90
Tang Common Eqty to Tang Assts	< 0.01	0.98
Risk Based Capital Ratio	< 0.01	0.95
Tier 1 Risk-based Ratio	< 0.01	0.95
Tier 1 Common Risk-Based Ratio	< 0.01	0.98
Leverage Ratio	0.09	0.49
Com Div Decl to Net Income	< 0.01	0.14
Loan composition		
Const Land Dev Lns to Loans	< 0.01	0.34
Tot 1-4 Fam Loans to Loans	< 0.01	0.57
Multifamily Loans to Loans	< 0.01	0.57
Total Real Est Lns to Tot Loans	0.06	0.66
CI Loans to Loans	< 0.01	0.41
Consumer Loans to Loans	< 0.01	0.07
Deposit composition		
Non Int Bear Dep to Total Deposits	0.15	0.49
Trans Accts to Total Deposits	< 0.01	0.14
MMDA Savings to Total Deposits	< 0.01	0.49
Retail Time Deposits to Dep	< 0.01	0.83
Jumbo Time Deposit to Total Dep	0.02	0.41
Liquidity		
Liquidity Ratio	< 0.01	0.66
Int Earn Assets to Int Bear Liab	0.18	0.66
Brokered Deposits to Deposits	< 0.01	0.49
Jumbo Deposit to Total Dom Dep	0.02	0.41
Yield to cost ratios		
Yield on Loans and Leases	<0.01	0.90
Cost of Int Bearing Deposits	0.07	0.15
Cost of Interest Bearing Liab	0.19	0.83
Cost of Funds	0.07	0.41

	p-value Before PS Correction	p-value After PS Correction
Asset quality		
Noncurrent Loans to Loans	< 0.01	0.49
NPLs to Loans	< 0.01	0.34
NPAs to Total Assets	< 0.01	0.57
NPA Excl. Restruct. Lns to Total Assets	< 0.01	0.95
NPAs to Loans+Frclsd RE	< 0.01	0.49
Loan Loss Reserves to Gross Loans	0.05	0.90
NCOs to Avg Loans	0.23	0.66
NPA+ Loans 90PD to Tang Equity + LLR	< 0.01	0.57
Adj NPA + Adj Lns 90PD / Tang Equity + LL	< 0.01	0.57
Adjusted NPA to Total Assets	< 0.01	0.49
Adjusted NPL to Total Loans	< 0.01	0.34
Local market indicators		
Unemployment Rate	0.06	0.95
Change in Unempl Rate from Prior Year	0.12	0.57
CAGR Population	< 0.01	0.83
CAGR Households	<0.01	0.75
CAGR Per Capita Income	< 0.01	0.75
CAGR Median Household Income	< 0.01	0.95
Proj CAGR Population	< 0.01	0.95
Proj CAGR Households	< 0.01	0.95
Proj CAGR Per Capita Income	< 0.01	0.57
Proj CAGR Median Household Income	< 0.01	0.75
Government Program Participation		
TARP	< 0.01	0.40
TAGP Participant	< 0.01	0.45
TDGP Participant	< 0.01	0.07
Ownership		
Private	< 0.01	0.83
Ownership Structure	< 0.01	0.70
Company Type	0.16	0.85
Regulatory		
Primary Regulator	0.15	0.48
CRA Rating	0.23	0.60
De Novo Status		
De Novo Status	< 0.01	0.09
Region		
Region	< 0.01	0.70
Capital Raising Activity		
Capital Raise Observed	< 0.01	0.88

References

This program impact analysis follows a methodology drawn from prior research on program evaluation. To complete this analysis, Treasury worked with a third-party contractor with expertise in statistical methods. In addition, the following publications include information used in developing the methodological approach.

1. Augurzky, B., and C. Schmidt (2000): “The Propensity Score: A Means to An End," Working Paper, University of Heidelberg.

2. Caliendo, M., Kopeinig, S. (2005): “Some practical guidance for the implementation of propensity score matching”. Paper 1588. Institute for the Study of Labor, IZA.

3. Dehejia, R. H., and S. Wahba (1999): “Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs," Journal of the American Statistical Association, 94(448), 1053-1062.

4. Dehejia, R. H., and S. Wahba (2002): “Propensity Score Matching Methods for Nonexperimental Causal Studies," The Review of Economics and Statistics, 84(1), 151-161.

5. Rossman, S.B., Rempel, M., Roman, J.K., Zweig, J.M., Lindquist, C.H., Green, M., Downey, P.M., Bhati, A.S., & Farole, D.J., Jr. (2011): The multi-site adult drug court evaluation: The impact of drug courts. Washington, D.C.: The Urban Institute.

6. Spreeuwenberg, M., Bartak, A., Croon, M., Hagenaars, J., Busschbach, J., Andrea, H., Twisk, J, and Stijnen, T. (2010): “The Multiple Propensity Score as Control for Bias in the Comparison of More Than Two Treatment Arms: An Introduction From a Case Study in Mental Health”. Medical Care, 48 (2), 166-174.

7. Imbens, G.W. (2000): “The Role of the Propensity Score in Estimating Dose-Response Functions.” Biometrika, 87(3), 706-710.

8. Rosenbaum, P. and Rubin, D. (1983): “The Central Role of the Propensity Score in Observational Studies for Causal Effects.” Biometrika, 70 (1), 41-55.