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Travis R. Davidson
Ohio University - Main Campus

W. Gary Simpson
Oklahoma State University

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Federal Home Loan Bank Advances and Small Business Lending

Travis R. Davidson
Ohio University

W. Gary Simpson
Oklahoma State University

ABSTRACT

Adequate credit availability for small businesses is an important public policy issue because small businesses are essential for employment and economic growth for the economy. The Gramm-Leach-Bliley Act of 1999 includes a provision that could potentially support financial institutions in the provision of credit to small businesses through the use of advances from the Federal Home Loan Bank (FHLB) system that are secured with small business loans. We explore the relation between FHLB advances to financial institutions and the provision of loans to small businesses. We find a positive link between the change in FHLB advances and the change in small business loans and the level of FHLB advances and the level of small business loans. This relation holds for large and small banks and pre- and post-2007 recession. However, we find that the change in the proportion of small business loans to assets is only positively related to the change in the advances to assets ratio prior to the recessionary period. This suggests that banks substitute small business loans for other types of assets during relatively normal economic periods, but FHLB advances are a source of wholesale funds that will be invested in the most attractive financial assets available with no preference for any particular asset during periods of contracting credit.

Keywords: Federal Home Loan Bank, Advances, Small Business Lending, Small Business Credit
JEL Codes: G21, G28

I. Introduction

The Financial Services Modernization Act of 1999, commonly known as the Gramm-Leach-Bliley Act, included a provision that permitted community financial institutions to borrow from the Federal Home Loan Bank (FHLB) system and use small

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business and small agricultural loans as collateral[1] (Craig and Thomson 2003). Prior to the Gramm-Leach-Bliley Act, only mortgage loans and, to some extent, other real estate loans were eligible as collateral for FHLB advances (Craig and Thomson 2003). Historically, FHLB advances were intended to provide funding for housing (Flannery and Frame 2006). Congressional motivation for this tweak of policy is not clear but one reasonable interpretation is that congress intended to provide support for increased lending to small businesses and small farms.

Regardless of the legislation's intent, it is clear from the FHLB website that community lending is now important to the system (www.fhlbanks.com). After more than a decade and a significant recession, the importance of small businesses as creators of jobs remains an important policy consideration[2]. The creators of the Gramm-Leach-Bliley Act did not foresee all of the events of the first decade of the 21st century but the decision to provide funding for small businesses through the FHLB system, a government-sponsored enterprise, is probably more relevant today than ever. The FHLB system is a large financial entity with total assets over one trillion dollars at its peak in 2008 (Office of Finance of the Federal Home Loan Banks 2008) and a significant capacity to provide funding to financial institutions for small business loans. An important policy issue and the focus of this investigation is the nature of the relation between FHLB system advances to financial institutions and the credit extended to small businesses by financial institutions. In other words, do commercial banks use funds borrowed from the FHLB system to make loans to small businesses?

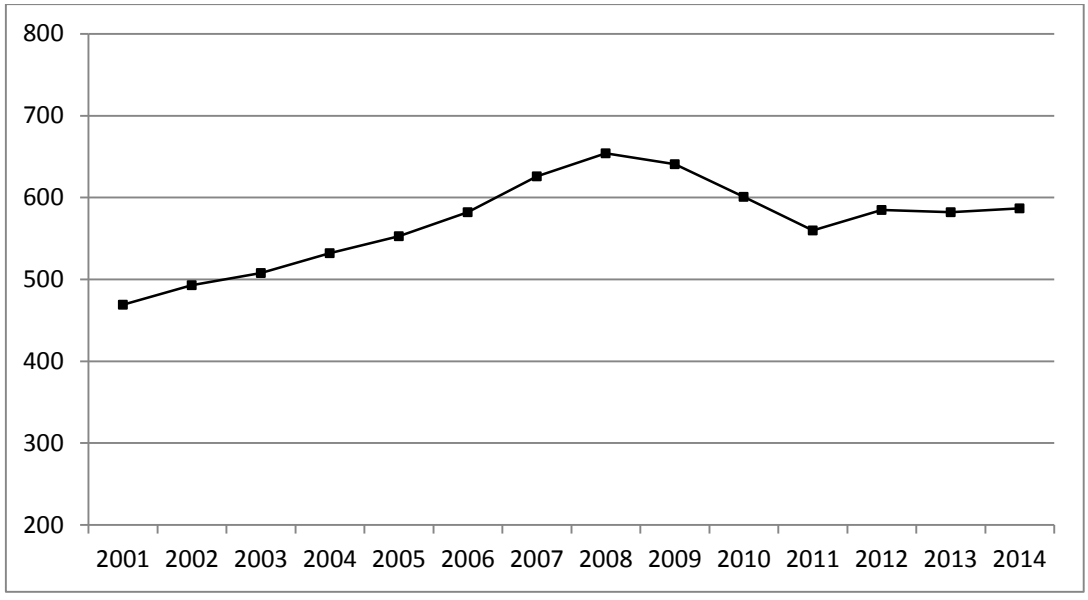
The FHLB system is composed of 12 regional Federal Home Loan Banks. All regional FHLBs sponsor some form of Community Investment Cash Advance (CICA) program. Table 1 displays these and other similar programs. Although the names and specific terms vary by regional FHLB, all CICA programs are meant to provide member institutions with reduced cost advances for the purpose of increasing certain types of

[1] Nearly all commercial banks are permitted to join and subsequently borrow from the FHLB. Only community financial institutions, defined to have assets under $500 million in 1999 dollars, are able to use small business loans as collateral for advances. See Stojanovic et al. (2008) for a more detailed discussion.

[2] Berger and Udell (1998) provide a description of the relationship of small businesses to the economy and the importance of small businesses. They also describe the process and some of the problems associated with financing small businesses.

community lending. At each regional FHLB, small business loans qualify as community lending, meaning members can make use of these programs to obtain lower cost advances if the funds are used for small business loans. Many regional FHLBs have additional programs that promote small business lending. For example, the Dallas and Pittsburg FHLBs administer programs that provide grant funding to small businesses that have borrowed from FHLB member institutions (called the Economic Development Program Plus and the Banking on Business program respectively). The Topeka FHLB operates the Joint Opportunity for Building Success program that provides grant funding to member institutions for the purpose of community job creation. All of these programs, if successful, should decrease the cost of and increase the amount of funding available to small business.

Figure 1. Aggregate Small Business Lending
The sum of all small business loans outstanding is graphed for each year. The sample consists of an unbalanced panel of 106,062 firm year observations taken from the June 30th bank level Reports of Condition and Income from 2001 to 2014. Dollar amounts on the horizontal axis are in billions of dollars.



Our research is unique and adds to the evolving literature on the FHLB system in the following ways. First, we are the only investigation that uses a large panel of data to investigate the link between FHLB advances and small business loans provided by commercial and savings banks. Only one other study by Tuccillo, Flick, and Ranville (2005) investigates this relation and they use cross-sectional data for 2003. Second, our

Table 1. Regional Federal Home Loan Bank Small Business Lending Programs
Each of the individual regional Federal Home Loan Banks is permitted to develop their own programs to promote community lending. Below is a list of programs that are partially or solely used to promote small business loans.

Regional FHLB	Program Name	Details of Program
Atlanta	Economic Development Plan	Advances are priced 10 basis points below normal advance rates to provide funding for projects and business in moderate income communities.
Boston	Community Development Advance	Provides discounted funding for small business or personal lending for borrowers in locations at or below 115% (100%) of area median income for rural (urban) areas.
Chicago	Community Investment Cash Advance	Provides discounted lending for a variety of loans, including small business loans.
Cincinnati	Community Investment Cash Advance	Provides discounted advances for low income housing or economic development, including small business loans.
Dallas	Economic Development Program	Provides favorably prices advances to fund economic development.
	Economic Development Program Plus (EDP^{Plus})	Provides grants of up to $25,000 to qualifying small businesses that have borrowed from FHLB member institutions.
Des Moines	Community Investment Cash Advance	Provides funding to members at cost to fund projects, including small business loans.
	Community Lending Advance	Provides low cost funding for commercial and agricultural lending.
Indianapolis	Community Investment Program	Provides favorably-priced funds for community economic development in low- and moderate-income neighborhoods.
New York	Community Lending Program for Small Business Lending	Provides less expensive advances for small business lending.
	Rural Development Advance	Provides low priced advances for individuals with less than 115% of area median income in areas with a population less than 25,000.
	Urban Development Advance	Provides low priced advances for individuals with less than 100% of area median income in areas with a population greater than 25,000.
Pittsburgh	Community Lending Program	Provides advances 20 – 40 basis points below normal advances rates for community and economic development.
	Banking on Business (BOB)	Provides recoverable grants for startup funding to small businesses that must be combined with small business loans. BOB funding recovery is made based on the health of the small business and has the following repayment terms: 0% interest and no principal repayment in year 1, 3% interest (retained by the member) and principal repayment begin in year 2, and 6% interest (with 3% retained by the member and 3% by the FHLB) in year 3 forward.
San Francisco	Advances for Community Enterprise	Provides low priced advances for the purpose of community lending.
Seattle	Economic Development Fund	Provides reduced rate advances to support economic development.
Topeka	Community Development Program	Provides low cost funding for community development.
	Joint Opportunity for Building Success	Provides grants to promote economic initiatives that promote community employment growth.

data set is recent and covers the time period 2001-2014. This allows us to examine the effect of advances during the financial crisis in which small business lending was reduced, as documented by Cole (2012) and shown in Figure 1. The reduced lending that resulted from the 2007 recession made support for small business lending imperative. If advances from the FHLB are indeed being used by banks for small business loans, it is particularly important that this relation holds during times of reduced liquidity and contracting credit. We find that FHLB advances are being used to fund small business loans by both large and small banks and both pre- and post-2007 recession, but banks only shift their asset portfolios to more heavily favor small business loans before the 2007 recession.

The paper is organized as follows. Section II describes previous research that is relevant to the present investigation and Section III presents the hypotheses tested. Section IV explains the sample, data, and statistical method. Section V presents the results of the statistical tests of the hypotheses, and the last section develops the implications of the results.

II. Literature Review

Very few empirical investigations have explored the effects of FHLB advances on commercial bank performance. This is somewhat surprising given the size, scope, and potential influence of the FHLB system. Ashcraft, Bech, and Frame (2009) refer to the FHLB system as "a large, complex, and understudied U. S. Government-sponsored enterprise (GSE) that was created in the midst of the Great Depression." The FHLB system consists of twelve cooperatively owned "banks" which provide secured loans called advances to over 8,000 member institutions, including commercial banks, thrifts, credit unions, and insurance companies (Ashcraft, Bech, and Frame 2009). The ability to inject approximately one trillion dollars in funding into the banking system offers the possibility for a major impact on the economy.

Ashcraft, Bech, and Frame (2009) investigate the relationship between changes in FHLB advances at the institution level and changes in other balance sheet changes during the second half of 2007. For a period of six quarters before 2007 that they considered normal, they find there is a strong correlation between changes in FHLB advances and changes in both mortgage loans and non-mortgage loans for small institutions but a much weaker relationship for large institutions (Ashcraft, Bech, and Frame 2009). Ashcraft, Bech, and Frame (2009) find that small banks and thrifts probably use FHLB advances to smooth out changes in funding during the normal period while larger institutions are less dependent on FHLB advances to meet funding

needs. However, in the third quarter of 2007 many of the relationships changed. Larger institutions began to use FHLB advances more. The correlation between FHLB advances and mortgage loans for small institutions increased some during the third quarter of 2007, but the relation for large institutions increased significantly. The positive correlation between changes in FHLB advances and changes in non-mortgage loans became larger in the third quarter of 2007 for small institutions but became much weaker to the point of turning negative for larger institutions. The aforementioned relationships in the Ashcraft, Bech, and Frame (2009) investigation returned to the pre-crisis baseline in the fourth quarter of 2007. Ashcraft, Bech, and Frame (2009) conclude that FHLB advances are used to smooth one time liquidity imbalances but the willingness of institutions to lend, not funding pressure, normally is the binding constraint on the origination of new loans.

Frame, Hancock, and Passmore (2007) find that FHLB advances are just as likely to be used for non-mortgage loans as mortgage loans for single-family housing. They also find that FHLB advances are used to meet unexpected credit requests due to changes in loan demand but mortgages are not unique in this respect (Frame, Hancock, and Passmore 2007). Furthermore, Frame, Hancock, and Passmore (2007) conclude that FHLB advances are probably not stabilizing financing for housing, and financial institutions appear to be using FHLB advances as a wholesale funding source to fund all types of commercial bank assets, not just mortgages. Frame, Hancock, and Passmore (2007) refer to the idea that FHLB advances are just part of a pool of funds that are not linked to any particular type of assets as the "wholesale funding view" of FHLB advance usage. According to this view, we would not expect to see FHLB advances tied to a particular type of loan such as small business loans.

Tuccillo, Flick, and Ranville (2005) find that single-family mortgage loans and multifamily mortgage loans are positively correlated with the amount of FHLB advances. However, they do not find a positive correlation between FHLB advances and other loans, which includes agricultural loans, small business loans, construction loans, and land development loans, unless the size of the financial institution is considered. Their results indicate a positive relationship between FHLB advances and other loans for institutions with assets less than $1 billion but no relationship for larger institutions (Tuccillo, Flick, and Ranville 2005). Institution size does not affect the relationship between FHLB advances and either single-family mortgage loans or multifamily mortgage loans (Tuccillo, Flick, and Ranville 2005). Tuccillo, Flick, and Ranville (2005) conclude that FHLB advances translate into more credit for housing, small businesses, and agriculture in the economy and the communities served by financial institutions.

Craig and Thomson (2003) explore the relationship between bank deposits and small business loans with a panel of data from 1993 through 1999. Their analysis addresses the existence of funding constraints in small loan markets prior to the Gramm-Leach-Bliley Act that were hypothesized to be the source of a market failure causing the need for the subsidy of FHLB advances. Craig and Thomson (2003) find that community banks in rural areas have more funds available than they can loan to their relationship borrowers, which argues against a funding constraint. Furthermore, Craig and Thomson (2003) find that increases in the demand for small business loans and agricultural loans are easily met by the community banks shifting more liquid assets into these types of loans. They conclude that the extension of FHLB advances secured with small business and small farm loans is unlikely to increase the amount of loans to small businesses and small farms.

The relationship of primary interest for this analysis is the link between FHLB advances and loans to small businesses. Ashcraft, Bech, and Frame (2009) report some evidence of a positive link between FHLB advances and small business loans that is strongly influenced by the size of the financial institution and general economic conditions. However, Ashcraft, Bech, and Frame (2009) ultimately conclude that the willingness of institutions to lend is the binding constraint on new loans, not lack of funding. Frame, Hancock, and Passmore (2007) conclude that financial institutions view FHLB advances as fungible and simply include advances in a general pool of funds that is not directed to any one type of asset. This view suggests that FHLB advances do not necessarily produce increased loans to small businesses. Craig and Thomson (2003) come to a similar conclusion because they find no evidence of a funding constraint on financial institutions and banks seem to simply liquidate more liquid assets when loan demand increases. Tuccillo, Flick, and Ranville (2005) provide evidence of a link between FHLB advances and small business loans. They conclude that FHLB advances increase loans to small businesses for small financial institutions with assets less than one billion dollars but there is no evidence of a link for larger financial institutions.

III. Hypotheses

Craig and Thomson (2003) argue that small businesses rely heavily on small community banks to provide the financing for their operations. They base their argument on the work of Peterson and Ranjan (1994) and Berger and Udell (1995) that suggests the importance of relationship lending by small community banks for small business financing. Craig and Thomson (2003) further argue that if community banks

are constrained for funds in their local markets, then the availability of additional funding through FHLB advances will result in increased funding for small businesses because small business loans can be used as the required collateral for FHLB advances. However, if financial institutions are not funding constrained, Craig and Thomson (2003) argue that it is not certain if financial institutions will direct advances into loans to small businesses or not. Financial institutions may simply view FHLB advances as another source of funding and direct the funds to the best available asset that may not be a small business loan. Based on their evidence that community banks are not funding constrained, Craig and Thomson (2003) conclude that there is no reason to believe that FHLB advances will be used specifically to generate small business loans.

However, Craig and Thomson (2003) argue that since small business loans may be used as collateral towards advances, community financial institutions may increase their issuance of these types of loans even if they are not funding constrained. The reason for a bank to specifically direct advances towards these asset types is to increase the types of assets that may be used as collateral against new advances. Stojanovic et al. (2008) describe issuing qualified loans to permit increased access to advances as maintaining an option on advances. A bank wishing to grow could use advances to make mortgage loans, small business loans, or agricultural production loans and then secure additional advances by posting the newly made loans as collateral. In this case, advances would alter the portfolio make-up of banks by changing the amount of mortgage or community lending. Assuming that neither bank asset size nor asset composition is fixed, Craig and Thomson (2003) contend that the collateralization option is likely to induce community financial institutions to increase their holdings of all types of assets, with an increasing share of total assets invested in small business loans.

Given the FHLB's focus on community economic development and the associated reduced-cost advances, we posit that this line of reasoning suggested by Craig and Thomson (2003) is the correct description of reality. We predict that the ability of financial institutions to use small business loans as collateral for FHLB advances will cause financial institutions to increase the volume of small business loans, an asset growth effect in the terminology of Craig and Thomson (2003), and the proportion of small business loans in an institution's portfolio of assets, a portfolio substitution effect in the terminology of Craig and Thomson (2003). Our hypotheses in the alternative form are:

> *Asset Growth Hypothesis* ($H1_a$): The volume of FHLB advances is positively related to the volume of small business loans for a financial institution.

Portfolio Substitution Hypothesis ($H2_a$): The proportion of FHLB advances to total assets is positively related to the proportion of small business loans to total assets for a financial institution.

IV. Implications

A. Data and Sample

Data from bank level Reports of Condition and Income (Call Reports) available from the Federal Reserve Bank of Chicago from 2001 to 2010 and from FFIEC Central Data Repository's Public Data Distribution site from 2011 to 2014 is employed in the statistical analysis. The sample is composed of yearly data from 2001 to 2014 because FHLB advances were not recorded on Call Reports until 2001, and small business loans are only available once per year in the June 30 Call Report until 2010. All sample banks have a minimum of $1 million in assets, $500,000 in core deposits, and $750,000 in loans. These restrictions are imposed to remove data reporting errors and banks that are no longer able to operate. Adding these restrictions reduces the number of bank-year observations from 107,924 to 106,062.

Table 2 contains summary statistics. The number of banks in the sample decreases from 8,595 in 2001 to 6,598 in 2014. Panel A displays statistics for the entire sample. Construction of all variables is detailed in Table A1. Banks have $75 million small business loans outstanding and have $43 million in advances from the FHLB on average. We follow Cole (2012) and define small business loans as the sum of commercial and industrial loans (C&I) and commercial real estate loans (CRE) with original amounts less than $1 million unless substantially all of C&I and CRE have original amounts less than $100,000. In this case, we define small business loans to be the sum of C&I and CRE. Average bank size is $1.43 billion while $424 million of assets are liquid. Liquid assets are composed of the sum of cash and balances due from depository institutions, Federal funds sold and securities purchased under agreements to resell, securities held until maturity, and securities available for sale. Assets are funded with an average of $149 million in equity and $246 million in core deposits which are the sum of deposits from transaction accounts and time deposits less than $100,000. Non-performing loans and leases (sum of loans and leases 90 days past due, nonaccrual loans and leases, and other real estate owned) average almost $15 million compared to $265 million in outstanding mortgage loans, business loan commitments of $287 million, and total credit of $2.3 billion. Mortgage loans are the sum of all loans backed

by residential property and total credit is the sum of total assets and total commitments. Average bank net income in the sample is $6.8 million. We winsorize the percent change in small business loans and the percent change in FHLB advances at -1 and +1.

Table 2. Summary Statistics

The sample consists of an unbalanced panel of 106,062 firm year observations taken from the June 30th bank level Reports of Condition and Income from 2001 to 2014. All dollar amounts are in thousands. *SBL* is small business loans. *FHLB* is Federal Home Loan Bank advances. *TA* is total assets. *Equity* is total equity capital. *NPL* is non-performing loans and leases. *B Commitments* is business commitments and *T Commitments* is total commitments. *TC* is total credit. *Mortgages* is mortgage loans. The construction of all variables is defined in Table A1. *PC(·)* is the percentage change from year t-1 to year t. *Δ(·)* is the change from year t-1 to year t. *Ln(·)* is the natural logarithm. Panels B and C contain mean values, standard errors, and the test statistic of the difference in means for large vs. small banks and banks with above vs. below average FHLB advances to total assets respectively. Small Banks are defined to have less than or equal to $1 billion in total assets. Asterisks indicate statistical significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels.

Panel A: Full Sample

Variable	Mean	Standard Deviation	Minimum	Maximum
Dollar Amounts				
SBL	75,391	583,306	0	36,700,000
FHLB	43,460	667,970	0	87,700,000
TA	1,428,825	27,100,000	2,298	2,000,000,000
Equity	149,208	2,644,789	-161,976	183,000,000
NPL	14,764	502,605	0	65,500,000
Net Income	6,810	132,579	-3,238,426	10,200,000
Liquid Assets	423,941	8,820,556	0	788,000,000
Core Deposits	246,239	3,159,663	520	237,000,000
B Commitments	287,466	6,400,287	0	660,000,000
T Commitments	854,420	18,900,000	0	1,510,000,000
TC	2,283,237	41,300,000	2,298	2,880,000,000
Mortgages	265,338	5,214,978	0	386,000,000
Variables of Primary Interest				
PC(SBL)	0.0479	0.2555	-1	1
Δ(SBL/TA)	-0.0011	0.0468	-0.6307	0.7633
Ln(SBL)	9.7238	1.6916	0	17.4188
PC(FHLB)	-0.1050	0.4288	-1	1
Δ(FHLB/TA)	0.0002	0.0273	-0.4286	0.4200
Ln(FHLB)	9.0656	1.7370	0	18.2896
Control Variables				
SBL/TA	0.1559	0.1051	0	0.9784
FHLB/TA	0.0372	0.0539	0	0.6413
Equity/TA	0.1107	0.0500	-0.1175	0.9580
NPL/TA	0.0140	0.0236	0	0.4889
Net Income/TA	0.0040	0.0074	-0.3858	0.2340
Liquid Assets/TA	0.3212	0.1609	0	0.9911
Core Deposits/TA	0.4434	0.1421	0.00004	0.9294
B Commitments/TC	0.0723	0.0549	0	0.9638
Mortgages/TA	0.1963	0.1344	0	0.9776

Panel B: Large vs. Small Banks					
Variable		Large		Small	
	Mean	S.E.	Mean	S.E.	Difference
Dollar Amounts					
SBL	675,516	24,162	29,496	110	646,020***
FHLB	497,295	28,181	8,522	62	488,772***
TA	17,500,000	1,141,023	183,028	600	17,300,000***
Equity	1,830,808	111,197	18,968	68	1,811,840***
NPL	169,515	21,519	2,850	25	166,664***
Net Income	84,825	5,586	768	7	84,057***
Liquid Assets	5,198,387	372,498	54,161	204	5,144,226***
Core Deposits	2,487,628	132,294	72,644	212	2,414,984***
B Commitments	3,781,950	270,272	16,855	97	3,765,096***
T Commitments	11,400,000	797,211	35,485	3821	11,400,000***
TC	28,900,000	1,735,277	218,512	3888	28,700,000***
Mortgages	3,212,588	221,343	38,449	173	3,174,139***
Variables of Primary Interest					
PC(SBL)	11.2682	10.6111	0.3906	0.0351	10.8776
Δ(SBL/TA)	-0.0047	0.0003	-0.0008	0.0002	-0.0039***
Ln(SBL)	12.3269	0.0174	9.5268	0.0049	2.8001***
PC(FHLB)	4.1346	1.0023	0.8439	0.2416	3.2906***
Δ(FHLB/TA)	-0.0013	0.0004	0.0003	0.0001	-0.0016***
Ln(FHLB)	11.7300	0.0239	8.7719	0.0062	2.9581***
Control Variables					
SBL/TA	0.0988	0.0008	0.1602	0.0003	-0.0615***
FHLB/TA	0.0565	0.0008	0.0357	0.0002	0.0208***
Equity/TA	0.1076	0.0006	0.1109	0.0002	-0.0033***
NPL/TA	0.0152	0.0003	0.0139	0.0001	0.0013***
Net Income/TA	0.0046	0.0001	0.0039	0.00002	0.0007***
Liquid Assets/TA	0.2827	0.0018	0.3242	0.0005	-0.0415***
Core Deposits/TA	0.2413	0.0014	0.4591	0.0004	-0.2178***
B Commitments/TC	0.1053	0.0008	0.0698	0.0002	0.0356***
Mortgages/TA	0.2017	0.0016	0.1959	0.0004	0.0058***

The average percent change in small business loans is nearly 5%, the average change in the small business loans to total assets ratio is -0.0011, and the natural logarithm of small business loans averages 9.7. The percent change in FHLB advances averages -0.105, the average change in the advances to total assets ratio is 0.0002, and the natural logarithm of advances averages 9. Not shown in Table 2, the sample includes 6,484 bank-year observations of De Novo banks defined to have been in operation for less than five years.

Table 2 Panel B displays summary statistics for large vs. small banks. Large banks are defined to have greater than $1 billion in total assets. The large bank sample has a larger natural logarithm of small business loans, but has a smaller change in the small business loans to total assets ratio, and there is no difference between the average percent

Panel C: Banks with Above vs. Below Average Advances to Assets					
Variable	Above Average		Below Average		
	Mean	S.E.	Mean	S.E.	Difference
Dollar Amounts					
SBL	85,091	1,993	70,087	2,551	15,004***
FHLB	95,507	4,634	15,051	1,906	80,456***
TA	1,046,266	64,222	1,638,134	123,762	-591,869***
Equity	109,421	6,047	170,976	12,120	-61,555***
NPL	11,045	483	16,793	2,372	-5,748**
Net Income	4,252	270	8,210	612	-3,958***
Liquid Assets	254,970	16,423	516,390	40,924	-16,423***
Core Deposits	226,466	6,525	257,057	14,579	-30,592*
B Commitments	173,774	18,738	349,669	28,622	-175,895***
T Commitments	337,303	48,532	1,137,344	85,876	- 800,041***
TC	1,383,559	101,340	2,775,478	188,221	-1,391,919***
Mortgages	256,489	12,929	270,168	23,737	- 13,679
Variables of Primary Interest					
PC(SBL)	0.2735	0.0344	1.6919	1.2052	-1.4184
Δ(SBL/TA)	-0.0020	0.0002	-0.0006	0.0002	-0.0015***
Ln(SBL)	10.2165	0.0075	9.4518	0.0067	0.7647***
PC(FHLB)	1.0417	0.2206	1.3850	0.4949	-0.3432
Δ(FHLB/TA)	0.0070	0.0002	-0.0036	0.0001	0.0106***
Ln(FHLB)	9.7613	0.0073	7.9261	0.0106	1.8352***
Control Variables					
SBL/TA	0.1643	0.0005	0.1512	0.0004	0.0131***
FHLB/TA	0.0942	0.0003	0.0061	0.00004	0.0881***
Equity/TA	0.0997	0.0002	0.1167	0.0002	-0.0170***
NPL/TA	0.0152	0.0001	0.0133	0.0001	0.0019***
Net Income/TA	0.0039	0.00003	0.0040	0.00003	-0.00002
Liquid Assets/TA	0.2663	0.0007	0.3513	0.0006	-0.0850***
Core Deposits/TA	0.4052	0.0007	0.4644	0.0006	-0.0592***
B Commitments/TC	0.0774	0.0003	0.0695	0.0002	0.0078***
Mortgages/TA	0.2308	0.0007	0.1775	0.0005	0.0532***

change in small business loans for large vs. small banks. The large bank sample has a larger average natural logarithm of FHLB advances and a larger average percent change of advances. The average change in the advances to asset ratio is negative for the large bank sample, but positive for the small bank sample implying large banks are becoming less reliant on advances as a source of funding while small banks are becoming more reliant on advances during the sample period.

Summary statistics for banks with above vs. below average FHLB advances to total assets are display in Panel C of Table 2. Banks that fund a higher percent of assets with advances lend more to small businesses (SBL and Ln(SBL)) and small business loans compose a larger percent of assets at these banks which preliminarily suggests a positive relation between advances and small business loans. However, the sample of banks with

above average advances to assets has a more negative change in small business loans to assets ratio and there is no difference between the percent change in small business loans between banks with above and below average advances to assets, on average.

B. Statistical Method

We investigate the effect of FHLB advances on small business lending with a series of regressions that contain year and bank fixed-effects and standard errors clustered at the bank level that take the following form:

$$SBL_{i,t}=\beta_0+\beta_1 FHLB_{i,t}+\sum\beta_k Control_{k,i,t-1}+\sum\beta_t Year_t+\sum\beta_i Bank_i+\varepsilon_{i,t} \quad (1)$$

where SBL is one of three measures of small business loans following Cole (2012). The first measure is the percent change in the dollar value of small business loans (PC(SBL)) at bank i from year t-1 to year t as measured by Berger and Udell (2004). The second measure is the change in the ratio of small business loans to total assets (Δ(SBL/TA)) at bank i from year t-1 to year t as measured by Peek and Rosengren (1998). The final measure is the natural logarithm of small business loans (Ln(SBL)) at bank i in year t.

The independent variable of primary interest is FHLB advances which is measured in the same manner as small business loans in each regression (PC(FHLB), Δ(FHLB/TA), and Ln(FHLB)). Other independent variables include a vector of control variables (control) and time (year) and bank (bank) fixed-effects. All control variables are lagged one year relative to SBL. We follow Cole (2012) and control for capital adequacy with total equity (Equity/TA), asset quality with nonperforming loans and leases (NPL/TA), earnings with net income (Net Income/TA), and liquidity with liquid assets (Liquid Assets/TA), each scaled by total assets. Also following Cole (2012), we include the core deposits to total assets ratio (Core Deposits/TA), the ratio of business loan commitments to total credit (B Commitments/TC), bank size measured by the natural logarithm of total assets (Ln(TA)), and a dummy variable equal to one if a bank has been in operation for less than five years (De Novo). Finally, we include the ratio of mortgage loans to total assets (Mortgages/TA). FHLB advances have traditionally been given to financial institutions to promote mortgage lending so it is important to control for the amount of mortgage lending to prevent a spurious correlation in the regressions.

We use the percentage change in small business loans (PC(SBL)) and the natural logarithm of small business loans (Ln(SBL)) to investigate the relation between the amount of advances outstanding and the amount of small business loans to addresses

whether banks are using FHLB advances to increase small business lending (Asset Growth Hypothesis). The change in the small business loans to assets ratio ((Δ(SBL/TA)) is used to examine whether banks are changing the proportion of these assets in their asset portfolio (Portfolio Substitution Hypothesis). In all specifications, a positive coefficient on the FHLB advances variable is interpreted as support for the respective hypothesis.

V. Results

The results of estimating Eq. (1) are presented in Table 3. Column (1) shows that the percentage change in FHLB advances is positively related to the percentage change in small business lending. This supports the asset growth hypothesis that the ability of financial institutions to use small business loans as collateral for FHLB advances causes an increase in small business loans. The percentage change in small business lending is positively related to net income, business commitments to total credit, and the indicator variable for De Novo banks and is negatively related to the proportion of assets composed of small business loans, nonperforming loans, liquid assets, and bank size.

Column (2) displays the results of using the change in the small business loans to assets ratio. Contrary to the portfolio substitution effect hypothesis, the change in the proportion of assets funded with FHLB advances is not related to the change in the proportion of small business loans in the asset portfolio. We do not find evidence that banks are using advances to increase small business lending relative to other assets. The change in the proportion of assets composed of small business loans is positively related to the business commitments to total credit ratio and the indicator for De Novo banks and is negatively related to the small business loans to assets ratio, nonperforming loans, net income, liquid assets, bank size, and mortgage loans.

Table 3 Column (3) shows that the natural logarithm of small business loans is positively related to the natural logarithm of FHLB advances which supports the asset growth hypothesis. Banks that borrow more from the FHLB, lend more to small businesses. We also find that the natural logarithm of small business loans is positively related to the small business loans to assets ratio, equity capital, the business commitments to total credit ratio, bank size, and the De Novo indicator variable and is negatively related to nonperforming loans, net income, liquid assets, and mortgage loans. We split the sample by size and re-estimate Eq. (1) because previous work by Craig and Thomson (2003), Peterson and Ranjan (1994), and Berger and Udell (1995) suggests the relation between advances and small business lending should be stronger for small banks and because of the documented difference in the operations of small and large

Table 3. FHLB Advances and Small Business Lending

The sample consists of an unbalanced panel of 106,062 firm year observations taken from the June 30th bank level Reports of Condition and Income from 2001 to 2014. All estimates are obtained from fixed-effects regressions of Eq. (1) with standard errors clustered at the bank level. The dependent variable is the percent change in small business loans (*PCSBL*), the change in the small business loans to total assets ratio (*Δ(SBL/TA)*), and the natural logarithm of small business loans (*Ln(SBL)*) in columns (1), (2), and (3) respectively. The primary independent variable of interest is the percent change in FHLB advances (*PC(FHLB)*), the change in the advances to total assets ratio (*Δ(FHLB/TA)*), and the natural logarithm of advances (*Ln(FHLB)*) in columns (1), (2), and (3) respectively. All control variables are lagged one year. Control variables scaled by total assets include: total equity (*Equity/TA*), nonperforming loans and leases (*NPL/TA)*, net income (*Net Income/TA*), liquid assets (*Liquid Assets/TA*), core deposits (*Core Deposits/TA*), and mortgage loans (*Mortgages/TA*). Other control variables include: the ratio of business loan commitments to total credit (*B Commitments/TC*), the natural logarithm of total assets (*Ln(TA)*), and a dummy variable equal to one if a bank has been in operation for less than five years (*De Novo*). The construction of all variables is defined in Table A1. Coefficients for the constant term and year and bank dummy variables are not displayed to conserve space. P-values are displayed in brackets below the coefficients. Asterisks indicate statistical significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. An F-Test confirms the overall validity of the model at better than the 1% level in each specification.

Explanatory Variables	Dependent Variable		
	(1)	(2)	(3)
	PC(SBL)	Δ(SBL/TA)	Ln(SBL)
PC(FHLB)	0.0386***		
	[<0.001]		
Δ(FHLB/TA)		0.0055	
		[0.382]	
Ln(FHLB)			0.0290***
			[<0.001]
SBL/TA	-1.6950***	-0.4811***	3.1159***
	[<0.001]	[<0.001]	[<0.001]
Equity/TA	-0.0469	-0.0138	0.4307***
	[0.636]	[0.102]	[<0.001]
NPL/TA	-1.6827***	-0.1449***	-2.4338***
	[<0.001]	[<0.001]	[<0.001]
Net Income/TA	1.0719***	-0.2495***	-2.0212***
	[0.002]	[<0.001]	[0.004]
Liquid Assets/TA	-0.1263***	-0.0185***	-0.4754***
	[<0.001]	[<0.001]	[<0.001]
Core Deposits/TA	-0.0169	-0.0018	0.0226
	[0.397]	[0.565]	[0.516]
B Commitments/TC	0.3427***	0.0133*	0.4419***
	[<0.001]	[0.065]	[<0.001]
Ln(TA)	-0.1650***	-0.0142***	0.6434***
	[<0.001]	[<0.001]	[<0.001]
Mortgages/TA	-0.0081	-0.0247***	-0.1830**
	[0.849]	[<0.001]	[0.049]
De Novo	0.0843***	0.0095***	0.0234*
	[<0.001]	[<0.001]	[0.055]

banks (Berger et al., 2005). Large banks are defined to have greater than $1 billion in total assets, and small banks have less than or equal to $1 billion in assets. Table 4 shows that the relation between FHLB advances and small business lending is qualitatively the same for both large and small institutions. The positive relation between advances and small business loans in columns (1), (3), (4), and (6) support the asset growth hypothesis. The change in the proportion of advances to assets is not significantly related to the change in the proportion of small business loans to assets in columns (2) and (5). We find no evidence for the portfolio substitution effect hypothesis for large or small banks.

The financial crisis that began in 2007 created a liquidity shock that negatively affected the supply of credit. Figure 1 displays aggregate small business lending by year. Small business lending steadily increased prior to the crisis and then declined sharply after the onset before leveling off in the final years of our sample. The contraction in lending to small businesses during the recession made funding for these loans even more critical. We therefore split the sample into two time periods, 2001-2007 and 2008-2014, and re-estimate Eq. (1) to examine the effects of FHLB advances on small business lending pre- and post-recession. Columns (1), (3), (4), and (6) of Table 5 show support for the asset growth hypothesis in both time periods because advances are positively related to the amount of small business lending.

However, evidence of the portfolio substitution effect hypothesis differs by time period. As shown in column (2), prior to the recession there is a positive relation (p-value of 0.08) between the change in the proportion of advances to assets and small business loans to assets suggesting that as banks funded more assets with advances they increased small business lending more than other types of assets. We find no such support for the portfolio substitution effect hypothesis after the onset of the recession. Column (5) of Table 5 shows an insignificant relation between the change in the advances to assets ratio and the change in the small business loans to assets ratio during 2008-2014. Combined with the results in Columns (4) and (5), this suggests that after the beginning of the recession banks still used advances to fund small business loans, but they did not show a preference to fund small business loans proportionately more than other types of assets.

Table 4. FHLB Advances and Small Business Lending for Large and Small Banks

The sample consists of an unbalanced panel of 106,062 firm year observations taken from the June 30th bank level Reports of Condition and Income from 2001 to 2014. All estimates are obtained from fixed-effects regressions of Eq. (1) with standard errors clustered at the bank level. Large banks are defined to have greater than $1 billion in total assets. The dependent variable is the percent change in small business loans (*PCSBL*), the change in the small business loans to total assets ratio (*Δ(SBL/TA)*), and the natural logarithm of small business loans (*Ln(SBL)*) in columns (1) and (4), (2) and (5), and (3) and (6) respectively. The primary independent variable of interest is the percent change in FHLB advances (*PC(FHLB)*), the change in the advances to total assets ratio (*Δ(FHLB/TA)*), and the natural logarithm of advances (*Ln(FHLB)*) in columns (1) and (4), (2) and (5), and (3) and (6) respectively. All control variables are lagged one year. Control variables scaled by total assets include: total equity (*Equity/TA*), nonperforming loans and leases (*NPL/TA)*, net income (*Net Income/TA*), liquid assets (*Liquid Assets/TA*), core deposits (*Core Deposits/TA*), and mortgage loans (*Mortgages/TA*). Other control variables include: the ratio of business loan commitments to total credit (*B Commitments/TC*), the natural logarithm of total assets (*Ln(TA)*), and a dummy variable equal to one if a bank has been in operation for less than five years (*De Novo*). The construction of all variables is defined in Table A1. Coefficients for the constant term and year and bank dummy variables are not displayed to conserve space. P-values are displayed in brackets below the coefficients. Asterisks indicate statistical significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. An F-Test confirms the overall validity of the model at better than the 1% level in each specification.

Explanatory Variables	Dependent Variable					
	Large Banks			Small Banks		
	(1)	(2)	(3)	(4)	(5)	(6)
	PC(SBL)	Δ(SBL/TA)	Ln(SBL)	PC(SBL)	Δ(SBL/TA)	Ln(SBL)
PC(FHLB)	0.0451***			0.0372***		
	[<0.001]			[<0.001]		
Δ(FHLB/TA)		-0.0162			0.0075	
		[0.137]			[0.275]	
Ln(FHLB)			0.0398***			0.0248***
			[0.002]			[<0.001]
SBL/TA	-2.2937***	-0.5506***	4.3683***	-1.7030***	-0.4857***	3.0383***
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Equity/TA	-0.1540	0.0707	-0.8503	-0.1388	-0.0232**	0.5272***
	[0.565]	[0.168]	[0.364]	[0.210]	[0.011]	[<0.001]
NPL/TA	-1.7252***	0.0663	-1.8448***	-1.7186***	-0.1574***	-2.5535***
	[<0.001]	[0.238]	[0.002]	[<0.001]	[<0.001]	[<0.001]
Net Income/TA	1.3066*	0.0535	0.4789	1.0751***	-0.2793***	-2.3585***
	[0.075]	[0.504]	[0.783]	[0.006]	[<0.001]	[0.001]
Liquid Assets/TA	-0.1579*	-0.0254**	-0.6428**	-0.1297***	-0.0198***	-.4724***
	[0.065]	[0.017]	[0.032]	[<0.001]	[<0.001]	[<0.001]
Core Deposits/TA	-0.0070	-0.0117	-0.1000	-0.0208	-0.0031	0.0487
	[0.924]	[0.467]	[0.601]	[0.325]	[0.327]	[0.148]
B	0.3431*	-0.0251**	-0.4075	0.3597***	0.0172**	0.5074***
Commitments/TC	[0.063]	[0.033]	[0.348]	[<0.001]	[0.034]	[<0.001]
Ln(TA)	-0.1505***	-0.0016	0.5316***	-0.1930***	-0.0157***	0.6570***
	[<0.001]	[0.542]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Mortgages/TA	0.0620	-0.0009	0.1768	-0.0395	-0.0288***	-0.2441***
	[0.654]	[0.937]	[0.700]	[0.400]	[<0.001]	[0.003]
De Novo	0.0578	-0.0080	-0.0054	0.0762***	0.0094***	0.0272**
	[0.340]	[0.188]	[0.964]	[<0.001]	[<0.001]	[0.024]

Table 5. FHLB Advances and Small Business Lending Pre- and Post- 2007 Recession

The sample consists of an unbalanced panel of 106,062 firm year observations taken from the June 30th bank level Reports of Condition and Income from 2001 to 2014. All estimates are obtained from fixed-effects regressions of Eq. (1) with standard errors clustered at the bank level. The dependent variable is the percent change in small business loans (*PCSBL*), the change in the small business loans to total assets ratio (*Δ(SBL/TA)*), and the natural logarithm of small business loans (*Ln(SBL)*) in columns (1) and (4), (2) and (5), and (3) and (6) respectively. The primary independent variable of interest is the percent change in FHLB advances (*PC(FHLB)*), the change in the advances to total assets ratio (*Δ(FHLB/TA)*), and the natural logarithm of advances (*Ln(FHLB)*) in columns (1) and (4), (2) and (5), and (3) and (6) respectively. All control variables are lagged one year. Control variables scaled by total assets include: total equity (*Equity/TA*), nonperforming loans and leases (*NPL/TA)*, net income (*Net Income/TA*), liquid assets (*Liquid Assets/TA*), core deposits (*Core Deposits/TA*), and mortgage loans (*Mortgages/TA*). Other control variables include: the ratio of business loan commitments to total credit (*B Commitments/TC*), the natural logarithm of total assets (*Ln(TA)*), and a dummy variable equal to one if a bank has been in operation for less than five years (*De Novo*). The construction of all variables is defined in Table A1. Coefficients for the constant term and year and bank dummy variables are not displayed to conserve space. P-values are displayed in brackets below the coefficients. Asterisks indicate statistical significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels. An F-Test confirms the overall validity of the model at better than the 1% level in each specification.

Explanatory Variables	Dependent Variable					
	2001-2007			2008-2014		
	(1)	(2)	(3	(4)	(5)	(6)
	PC(SBL)	Δ(SBL/TA)	Ln(SBL)	PC(SBL)	Δ(SBL/TA)	Ln(SBL)
PC(FHLB)	0.0380***			0.0342***		
	[<0.001]			[<0.001]		
Δ(FHLB/TA)		0.0158*			0.0108	
		[0.080]			[0.167]	
Ln(FHLB)			0.0367***			0.0245***
			[<0.001]			[<0.001]
SBL/TA	-2.5330***	-0.6866***	1.7650***	-2.6356***	-0.6612***	1.8146***
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Equity/TA	-.2986	-0.0355**	-0.0289	0.3940***	-0.0151	0.4437***
	[0.103]	[0.023]	[0.891]	[0.008]	[0.167]	[0.004]
NPL/TA	-2.4342***	-0.1856***	-1.9707***	-1.0302***	-0.0434***	-1.5768***
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[0.003]	[<0.001]
Net Income/TA	-1.1591	-0.2979***	-3.1348*	1.2262***	-0.1122**	-0.5042
	[0.249]	[0.004]	[0.074]	[0.001]	[0.014]	[0.413]
Liquid Assets/TA	-0.0869	-0.0163**	-0.4638***	-0.2308***	-0.0357***	-0.6977***
	[0.111]	[0.016]	[<0.001]	[<0.001]	[<0.001]	[<0.001]
Core Deposits/TA	0.0010	0.0038	0.1367***	-0.0663**	-0.0140***	-0.0685
	[0.981]	[0.513]	[0.007]	[0.038]	[0.001]	[0.116]
B	0.2160**	-0.0096	0.2764**	0.4168***	0.0292***	0.3012
Commitments/TC	[0.023]	[0.469]	[0.030]	[<0.001]	[0.004]	[0.189]
Ln(TA)	-0.3108***	-0.0278***	0.4265***	-0.1844***	-0.0048***	0.6148***
	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[0.006]	[<0.001]
Mortgages/TA	-0.0239	-0.0233**	-0.3673***	-0.2033***	-0.0552***	-0.5335***
	[0.747]	[0.017]	[0.003]	[0.001]	[<0.001]	[<0.001]
De Novo	0.0624***	0.0161***	0.0108	0.0188	0.0001	-0.0460***
	[<0.001]	[<0.001]	[0.552]	[0.144]	[0.972]	[0.003]

VI. Conclusion

Adequate credit for small businesses is an important public policy issue because small businesses are important sources of employment and economic growth for the economy (Board of Governors of the Federal Reserve System 2007). It is generally recognized that depository financial institutions are important providers of credit to small businesses and several federal programs exist to support financial institutions in their role as lenders to small businesses (for example, the Small Business Administration). The Gramm-Leach-Bliley Act of 1999 includes a somewhat obscure provision that could potentially support commercial banks in the provision of credit to small businesses through the use of advances from the Federal Home Loan Bank system secured by small business loans. The exact intent of this legislation is not clear, but the dramatic increase in the size and importance of the FHLB system offers the possibility that FHLB advances to depository institutions might be an important source of credit for small businesses. Furthermore, given the recent state of the U. S. economy, the need to provide financing to small businesses seems an even larger public policy issue. The original intent of FHLB advances was to support housing finance but the Gramm- Leach-Bliley Act provided the pathway for FHLB financing of small businesses through the banking system. Our analysis explores the relation between FHLB advances to financial institutions and the provision of loans to small businesses.

We find evidence of a positive link between the change in FHLB advances and the change in small business loans and the amount of FHLB advances and the amount of small business loans. This relation holds for large and small banks and pre- and post-2007 recession. We interpret our results to support the asset growth hypothesis of Craig and Thomson (2003).

We also investigate the possibility that the higher the proportion of FHLB advances in the total funding of a financial institution, the higher the proportion of small business loans in the institution's asset portfolio. In other words, do financial institutions rearrange their asset portfolios to include more loans to small businesses as a result of using a greater proportion of FHLB advances? In most specifications, we find no evidence for this portfolio substitution effect, consistent with the proposition of Frame, Hancock, and Passmore (2007) that FHLB advances are one of many sources of wholesale funds available to financial institutions, and they will be invested in the most attractive financial assets available with no preference for any particular asset. However, when we split the sample by time we find a positive relation between the change in the

advances to assets ratio and the change in the small business loans to assets ratio in the years 2001-2007.

We know that FHLB advances to depository financial institutions have increased in recent time periods. However, it was not clear if this funding was being directed towards the new mission of funding small businesses. We conclude that funding from advances is being used to support small business lending. Our evidence suggests that if the FHLB wishes to increase its support of small business lending, focusing on providing funds to banks during periods of contracting credit is especially important.

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