Post-Crisis Residential Mortgage Lending by Community Banks

William F. Bassett and John C. Driscoll*

September 18, 2015

Abstract

In the aftermath of the financial crisis, policymakers have made a number of changes to the supervision and regulation of banks' origination of mortgage loans with the intent of selling and securitizing them. Some banks and researchers have argued that these changes have resulted in a reduction in smaller (community) banks' activities in this market. Using a schedule on banks' quarterly regulatory filings that we believe has not previously been used in research, we examine the profitability of, and community bank participation in, these activities post-crisis. We find that returns on sales and securitization have been higher for community banks than for larger banks; community banks engaged in such activities have higher returns on assets and equity than larger banks who engage in them. In addition, the share of community banks engaged in these activities has been rising, as has the total number of banks with income from sales and securitization. Regression analysis confirms that asset size has become less important of a determinant of participation in these actives in recent years. All told, these data suggest that smaller banks have not been, on net, deterred from engaging in sales and securitization of mortgages, have become a more important part of the market, and have profited from their activities.

JEL Classification: G21, G28, L25
Keywords: Financial Institutions, Bank Supervision and Regulation, Qualified Mortgage Rule, Mortgage Banking.

This manuscript is PRELIMINARY and circulated for discussion and constructive feedback. Please do not quote or cite without permission of the authors.

[0]The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of anyone else associated with the Federal Reserve System. Mike Massare and Steve Baillio provided excellent research assistance.

*Division of Monetary Affairs, Federal Reserve Board, 20th Street and Constitution Avenue, NW, Washington, DC 20551. E-mail:william.f.bassett@frb.gov and John.C.Driscoll@frb.gov.

1 Introduction

Lax mortgage lending policies in the United States during the mid-2000s helped sow the seeds of the financial crisis that started in August 2007 and continued well into 2009. Because mortgage originators believed that they retained little of the risk associated with loans that they sold or securitized, this "originate-to-distribute" model could have been rife with moral hazard. Indeed, many authors have concluded that the greatest irregularities were concentrated in loans that were securitized [Mian and Sufi, 2009; Keys, Mukherjee, Seru, and Vig, 2010; Keys, Seru, and Vig, 2012]. However, other authors demonstrate that the link between securitization and subsequent defaults is less clear. Jaffee, Lynch, Richardson, and Van Nieuwerburgh [2009] show that institutions that simultaneously originated subprime mortgages for securitization and held mortgage-backed securities and retained servicing rights did not transfer all of the risk of the origination business. Bubb and Kaufman [2014] provide evidence that securitizers responded to signals from the GSEs about loan quality at certain credit score thresholds, and those signals, rather than moral hazard, led to lower monitoring near those thresholds. Foote, Gerardi, and Willen [2012] argue that the primary cause of the crisis was that all players in the mortgage market had faulty expectations about future house prices, and conditional on those expectations, mortgage originators did not systematically deceive mortgage investors.

In the aftermath of the crisis, mortgage guarantors such as Fannie Mae and Freddie Mac, the housing-related federal government sponsored enterprises (GSEs), became more aggressive in requiring mortgage originators to repurchase loans that had gone delinquent and were not fully compliant with required representations and warranties, a practice commonly referred to as "put-backs."[1] In addition, foreclosure practices of banks became the subject of intense scrutiny and led to substantial penalties.[2] Portions of the Dodd-Frank Act and other regulatory actions have been aimed at tightening mortgage underwriting standards and preventing a recurrence of the type of lending practices that characterized the mid 2000s. Two of the most prominent reforms were the Ability to Repay (ATR) and Qualified Mortgage (QM) rules, which were finalized by the newly formed Consumer Financial Protection Bureau (CFPB) in April 2013.[3] The ATR rule requires all financial institutions regardless of size or type to verify and reliably document the credit history, income, assets, and debt payments of every borrower and make a good faith assessment that

[1] See, for instance, http://www.bloomberg.com/news/2014-05-13/fannie-freddie-overseer-easing-loan-buybacks-mortgages.html

[2] For details, see the press release, "Federal Government and State Attorneys General Reach $25 Billion Agreement with Five Largest Mortgage Servicers to Address Mortgage Loan Servicing and Foreclosure Abuses" at http://www.justice.gov/opa/pr/2012/February/12-ag-186.html.

[3] Further information is available on the Consumer Financial Protection Bureau's website at www.consumerfinance.gov/regulations/ability-to-repay-and-qualified-mortgage-standards-under-the-truth-in-lending-act-regulation-z.

the borrower has the ability to repay the loan. The QM rule provides for a presumption of having met the ATR requirements for mortgages that meet certain criteria. Mortgages that contain features associated with the lax lending practices of the mid-2000s, such as negative amortization or balloon payments, do not qualify for QM status, nor do those to borrowers with a total debt to income ratio of greater than 43 percent or those that charge fees greater than the price caps set by the rule.[4] If the financial institution fails to comply with the ATR/QM rules, the CFPB can assess penalties and damages, and borrowers can file a lawsuit to recover certain charges as well as to forestall foreclosure on the property.

Some banks, particularly smaller ones, have indicated that the higher risks of litigation and put-backs, combined with stringent documentation requirements to obtain safe-harbor status, make mortgage banking increasingly unprofitable. As a result, some researchers have warned that the rules and their interaction with other regulations could make credit less available for otherwise creditworthy borrowers [Goodman, Ashworth, Landy, and Yang, 2012].[5] Other research shows that the new regulations could have a disparate impact on lower income households and minorities [Apgar, 2012; Quercia, Ding, and Reid, 2012]. Gete [2014] constructs a general equilibrium model in which increased costs of loan origination can cause an endogenous tightening in bank lending standards. In addition to a reduction in credit availability, a decrease in competition in the market might lead to higher equilibrium interest rates and fees for all consumers.

Recent responses to the Federal Reserve's Senior Loan Officer Opinion Survey (SLOOS) provide evidence of a decline in mortgage credit availability relative to pre-crisis norms even as the housing market continues to recover. In the April 2013 survey, more than three-fourths of the respondents indicated that the "Risk-adjusted profitability of residential mortgage business relative to other possible uses of funds" was at least a somewhat important factor "restraining their bank's willingness or ability to approve" such loans. Moreover, about 40 percent of those respondents indicated that the importance of this factor had increased between 2012 and 2013.[6] A year later, in the July 2014 SLOOS, a majority of banks indicated that–all else equal–they were less likely to approve even prime jumbo mortgages, which typically are made to high income households with strong credit histories, as a result of the ATR/QM rules.[7]

This paper attempts to provide more systematic answers to several questions related to

[4]In addition, until 2021 or when the federal government housing enterprises (GSEs) exit conservatorship, whichever happens first, loans that meet the GSE automated underwriting criteria will be given QM status and retain that status for the life of the loan.

[5]For instance, self-employed individuals who previously qualified for mortgage products based on reduced documentation requirements (e.g., "stated income" loans) may be unable to obtain loans under the new rules.

[6]For specific information see the results of questions 18i and 19i on the domestic questionnaire for the April 2013 SLOOS, available at http://www.federalreserve.gov/boarddocs/snloansurvey/201305/table1.htm.

[7]For specific information see the results of questions 17 and 18 on the domestic questionnaire for the July 2014 SLOOS, available at http://www.federalreserve.gov/boarddocs/snloansurvey/201408/table1.htm.

those concerns. First, how have the returns to the originate-to-distribute business model changed since before the crisis, particularly for smaller banks? Second, how has community bank participation in the mortgage market changed since before the crisis? And, to what extent can we identify new mortgage lending regulations or other key events affecting the outlook for the profitability of mortgages as one of the factors affecting community bank participation in the market?[8]

To answer these questions, we primarily use information from the quarterly FR Y-9C Reports of Condition and Income from bank holding companies–equivalents to the more commonly used "Call Reports" for commercial banks. We look in particular at information that has been reported since 2007 on Schedule 'P,' which details the activity and income from banks' participation in the sale, securitization, and servicing of residential mortgages. Despite the great interest in this topic, to our knowledge our paper is the first to use this data.

We find that the gross return to sales and securitization has been higher for smaller banks than for larger ones, and has been increasing over the post-crisis period. In addition, because the gross returns may reflect higher fixed costs per unit of business borne by smaller banks, we also look at broader measures of bank profitability, such as returns on assets and equity. Those have also been higher for banks with income from sales and securitization, again particularly for smaller ones. Perhaps as a result, we observe that smaller banks have been originating a growing share of mortgages to sale or securitize, and sales from such banks have comprised a bigger fraction of the total. The total number of bank holding companies engaged in these activities has risen substantially, on net, since 2007, although the number of BHCs with income from securitization has fallen from an already-low level. Subsequent regression analysis indicates that these trends are robust to controlling for the characteristics of the banks' long-term business model, recent financial performance, and the evolution of the economy in markets where the bank operates branches.

All told, these data suggest that rather than smaller banks having been deterred from engaging in the "originate-to-distribute" business model, they have instead become a more important part of the market and have apparently profited from having done so. An important caveat to this finding is that, as our data start just before the financial crisis, we are not able to examine the status of this business model prior to, and during, the housing boom of the mid-2000s. Another caveat is that the data does impose some limitations on our analysis; only banks with at least $1 billion in assets, or at least $10 million of origination volume in this area over the past quarter are required to report their activity. Moreover,

[8]Some previous researchers have looked at the effects of regulation on profitability, for example Fuster, Goodman, Lucca, Madar, Molloy, and Willen [2013], who document the rise in gross profitability of mortgage origination for sale into GSE pools from 2009 to 2012, and find that it can only be partly explained by higher costs of origination after the crisis or greater market power among mortgage originators.

during our sample period, only bank holding companies with more than $500 million of total assets filed the Y9-C. If the scale economies required to make the originate-to-distribute model profitable dissipate below those asset size thresholds, then our analysis would not capture the effect. Finally, our analysis only considers the behavior of commercial banks. A rising number of nonbank financial institutions are participants in the mortgage market, putting competitive pressure on banks of all sizes.

The paper proceeds as follows: Section 2 describes the data sources and methodology used. Section 3 describes the results of the analysis of small bank participation in the mortgage market. Section 4 describes the results of the analysis of delinquency rates and charge-offs of mortgage loans by small banks. Section 5 concludes.

2 Data and Sample

This paper uses data from the FR Y-9C Report of Condition and Income for commercial bank holding companies, and from comparable reports for the commercial bank subsidiaries of such BHCs (the Call Reports); the FDIC's Summary of Deposits (SOD); and four state-level variables: income and population from the Census, unemployment from the Department of Labor, and house prices from CoreLogic. The Call Report provides quarterly, bank-level income and balance sheet data, including items necessary to construct a picture of banks' exposures to residential real estate and income earned from residential mortgage operations.[9] The SOD provides annual observations on the location of, and amount of deposits held in, each branch of a bank, which is then used to construct deposit-weighted averages of a number of state-level economic indicators–drawn from the Census Bureau and other common sources of macroeconomic data–in order to account for factors affecting the supply of, and demand for, bank credit in those markets.

Although the Call Reports and FR Y-9C filings lack information on most types of loan originations, since 2007:Q1 they have recorded originations of 1-4 family residential mortgage loans that the bank intends to sell or securitize. Both filings also report the volume of sales of these loans, and the combined net income generated from sales, securitization, and servicing of such loans.[10] The Call Report data also allow the construction of weighted-

[9]The data for banks within the same bank holding company are aggregated. Those data are adjusted for mergers between commercial banks and between commercial banks and thrifts and then trimmed to eliminate outliers and banks with highly nontraditional business models. For details on the merger-adjustment procedures see English and Nelson [1998].

[10]Note that banks also receive origination fees for mortgage loans. In the case of loans held for sale or securitization, such fees are deferred and counted as part of the net income for sale of the loan. For loans held for investment, origination fees are counted as interest income by amortizing the amount over the life of the loan.

average effective interest rates (AER) earned on residential mortgage loans since DATE.[11] The weighted-average effective rate is the total amount of interest income earned on residential mortgage loans during the quarter divided by the average outstanding amount of residential mortgage loans over the quarter in which the interest expense was accrued.[12] In addition, the Call Reports have provided the outstanding amount of residential mortgages carrying adjustable interest rates since 1990, and the outstanding amount of mortgages with negative amortization features since DATE.

We obtain information on originations to sell or securitize from Schedules 'P' of both the Call Reports and FR Y-9C filings, available since 2007:Q1.[13] Those schedules have also recorded the volume of sales of mortgage loans and the combined net income generated from the sales, securitization, and servicing of such loans. For simplicity, from here on we will refer to the "sales, securitization, or servicing of mortgage loans" as "mortgage banking."

In the FDIC's annual Summary of Deposits data collection, commercial banks report the amount of deposits held at each of their bank branches. This information may provide a glimpse into the intensity of that bank's operations within a given state, under the assumption that banks are engaging in more widespread activities such as lending and cash management in rough approximation to where they are bringing in their deposits.[14] Using the share of a bank's deposits held in a particular state as a weight, we construct bank-specific estimates of growth of personal income, the change in the unemployment rate, and the change in home prices in markets where a bank operates its branches.

Given the focus on the behavior of full-service community banks, the sample was trimmed to eliminate banks that had highly concentrated funding sources or asset portfolios that suggested specialized business models. For banks with less than $50 billion in total assets, we excluded those that had less than 40 percent of their funding from core deposits or less than 25 percent of their assets invested in core loans.[15] For banks with more than $50 billion in total assets, we excluded those that had less than 25 percent of their assets in core loans, but did not limit the large banks in the sample based on the

[11] Admittedly, the weighted-average-effective rate has a number of drawbacks, principally that it may not represent the marginal or most recent interest rate charged by the bank, but it also reflects the actual income stream earned on mortgages, which posted rates for new mortgages may not.

[12] The interest income is available on schedule RI-B of the Call Report and the average amount outstanding during the quarter is available from schedule RC-K.

[13] Some information on those schedules is available back to 2006:Q3.

[14] This assumption is justified by regulations requiring banks to reinvest in the communities in which they serve. However, over time, more banks have begun to centrally book their deposits at one or a few main branches. This makes the data less useful from this regard. As a robustness check, the equations are re-estimated using variables that are weighted by the ratio of the number of branches a bank has in a particular state to its total number of branches. [The results are ...]

[15] Core deposits are defined as transactions, savings, and small time deposits. Core loans are defined as loans to nonfarm, nonfinancial businesses and households—commercial and industrial (C&I) loans, commercial and residential real estate loans, and consumer loans—as well as lease financing arrangements.

Table 1: Means and Standard Deviations of Key Variables, by Mortgage Banking Operations

	Full Sample		Participants		Nonparticipants	
Observations	5,958		3,490		2,468	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Participant	0.586	0.493	1		0	
Total assets ($billions)	16.40	142.59	26.92	185.54	1.53	5.65
Δ personal inc.	1.663	2.926	1.648	2.904	1.685	2.957
Δ house price	-0.512	6.127	-0.310	5.773	-0.797	6.584
Δ employment	0.249	1.787	0.244	1.753	0.257	1.833
Average personal inc.	39,795	4,588	39,596	4,586	40,076	4,579
Core loans / assets	62.672	12.258	63.822	11.384	61.045	13.231
Core deposits / assets	64.176	9.173	63.755	9.326	64.773	8.919
Noninterest income / assets	1.096	0.856	1.279	0.971	0.837	0.568
Net interest income / assets	3.32	0.508	3.273	0.509	3.386	0.5
Delinquency rate	3.399	2.496	3.231	2.233	3.638	2.81
Leverage ratio	7.83	2.338	7.594	2.133	8.165	2.564
Assets mat. $<$ 1 year	35.89	11.812	37.025	11.672	34.285	11.826
Liab. mat. $<$ 1 year	31.904	15.173	31.679	14.919	32.222	15.523

amount of core deposit funding.

Outlier quarters among the dependent variables and various explanatory variables were also removed. Observations in which a bank's market area could not be mapped to the employment are excluded. Observations where the bank had less than the $500 million minimum reporting threshold were also excluded. These firms represent banks that had to continue to file for a time as they were shrinking below the threshold and therefore are unrepresentative of the population of banks with fewer than $500 million assets. Bank-quarter observations with tier 1 leverage ratios less than 2 percent (the threshold below which a bank must be closed) or greater than 33 percent are also removed. Observations on net interest income less than 0 or more than 6 percent of assets or noninterest income greater than 12 percent of assets are also excluded.

The paper includes data from 2007:Q1 to 2014:Q4, with the start date chosen to coincide with the availability of key information about income from residential mortgage banking operations. After removal of specialty banks and outliers, that time period allows for about [5,958] bank-year observations encompassing around [1,055] unique institutions with an average tenure in the sample of [5] years.

Table 1 shows the means and standard deviations of the key variables used in the analysis for the full sample, and broken down by participants in mortgage banking. Almost

60 percent of the firm-years in the sample represent BHCs that participated in mortgage banking activity, and the average size of participants was about $24 billion larger than nonparticipants. Not surprisingly, the group of participants has significantly higher ratios of noninterest income to assets; however, the two groups had about equal ratios of net interest income to assets. Nonparticipants had slightly higher delinquency rates but also slightly higher capital ratios. All of the variables controlling for the economic conditions in the bank's market are about equal, on average over the sample period, between participants and nonparticipants

Table 2 breaks down those variables by time period. The first column repeats the full sample average, the second column the average for 2007 (the only year we have pre-crisis) and the third column shows averages for 2014 (the most recent data). By 2014, the fraction of banks participating in mortgage banking operations had increased relative to the end of 2007, and the average size of banks participating had increased only a little in nominal terms. The most glaring difference was the change in the average economic environment from 2007 to 2014, with house prices moving from sharp declines registered in 2007 to a rapid increase in 2014, employment growth accelerating from about 0.6 percent to 1.6 percent, and personal income growth running at over 3 percent, about 1 percentage point higher than in 2007. The changes in market discipline and regulation over the past half decade, which required banks to boost capital and liquidity, are evident: the leverage ratio increased noticeably and the share of liabilities that matured within a year declined materially. The decline in short-term liabilities, however, was about matched by a decline in short-term assets. Income variables are fairly similar from the beginning to the end of the sample.

3 Methodology

We use these data to estimate the returns associated with the "originate-to-distribute" model. Unfortunately, income from sales and securitization is not separately broken out of income from servicing; since these two sources of income arise from different activities (the flow of sales and securitizations and the stock of assets for which servicing rights have been retained, respectively), we cannot compute exact returns on both activities. We approximate servicing income on residential mortgage loans by assuming that the fraction of total servicing income from all types of loans that is derived from mortgage loans is equal to the fraction of outstanding mortgage loans sold or securitized (with recourse or servicing rights retained) in total loans sold or securitized (with recourse or servicing rights retained).[16] We

[16]Total servicing income is reported on schedule HI and RI, and outstanding balance on loans that have been sold or securitized with recourse or servicing rights retained on schedules HC-S and RC-S, for banks

Table 2: Means and Standard Deviations of Key Variables, by Year

	Full Sample		2007		2014	
Observations	5,958		702		785	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Participation rate	0.586	0.493	0.531	0.499	0.589	0.492
Total assets ($billions)	16.40	142.60	15.64	128.02	17.40	150.65
Δ personal inc.	1.663	2.926	2.077	1.677	3.185	1.044
Δ house prices	-0.512	6.127	-3.705	4.477	4.545	2.138
Δ employment	0.249	1.787	0.59	0.835	1.553	0.943
Average personal inc.	39,795	4,588	39,698	4,487	40,032	4,771
Core loans / Assets	62.672	12.258	64.451	11.672	61.237	12.899
Core deposits / Assets	64.176	9.173	63.261	9.407	65.087	9.216
Noninterest Income /Assets	1.096	0.856	1.086	0.847	1.116	0.887
Net interest income / Assets	3.32	0.508	3.294	0.524	3.333	0.509
Delinquency Rate	3.399	2.496	3.573	2.542	3.102	2.255
Leverage Ratio	7.83	2.338	7.514	2.302	8.165	2.33
Asset mat. $<$ 1 year	35.89	11.812	38.225	12.577	34.291	11.551
Liab. mat. $<$ 1 year	31.904	15.173	33.321	15.424	30.558	15.201

can then subtract this estimate from total net income on sales, securitization and servicing of mortgages to get an estimate for the amount attributable to just sales and securitization. These two estimated income streams are then used to compute the returns on these activities, as described above, and add them together to get total returns.

While some of our analysis is descriptive–presenting summary statistics by bank size and intensity of mortgage banking business from this relatively little-used dataset in order to chart the evolution of the industry over time–we also attempt to more formally examine the determinants of bank participation in this segment of the mortgage market.

Specifically, we a estimate probit model for whether a bank is engaged in the origination of mortgages for sale or securitization in any given calendar year.[17] The controls include quarterly fixed effects, δ_t, the asset size of the bank, $A_{i,t}$, an interaction of δ_t and $A_{i,t}$, key bank characteristics that proxy for its general business model, $z_{i,t}$. additional variables that proxy for the current condition of the bank and economic conditions in the market that it serves, $x_{i,t}$. The parameter μ_i denotes the bank-specific effect for bank i. The errors, $\eta_{i,t}$ are disturbances that are independent across banks and across time.

and BHCs, respectively.

[17]For reasons that are unclear to us at this time, the quarterly data are quite volatile and seem to show banks entering and exiting the business on a quarter-by-quarter basis. This volatility seems counterintuitive in a business line that has material start up costs, and we continue to investigate. For now, smoothing through that volatility by assuming a bank that had originations for sale or securitization during any calendar quarter of the year seems prudent.

$$Y^*_{i,t} = x_{i,t}\beta_1 + z_{i,t}\beta_2 + A_{i,t}\beta_3 + \delta_t + (A_{i,t} * \delta_t)\beta_4 + \mu_i + \eta_{i,t}. \quad (1)$$

and

$$participate_{i,t} = \begin{cases} 1 & if \quad Y^*_{i,t} > c_1 \\ 0 & otherwise \end{cases} \quad (2)$$

The parameters of equation 1 and 2, and the cut-off point c_1 is estimated using maximum likelihood, assuming that b_i and $\eta_{i,t}$ are normally distributed.

Although a nonlinear fixed-effects regression might be considered in order to account for the bank-specific effect μ_i, given the large cross-sectional sample and a comparatively limited time series, that model would likely be hampered by the well known "incidental parameters problem." A standard random effects model also would not produce consistent estimates, because it requires the strong assumption that the random effect μ_i would need to be uncorrelated with all of the other explanatory variables, including those proxying for its business model.

Instead, we consider a modified random-effects framework, described in Wooldridge [2010]. This approach accounts for likely correlation between the random effect and the control variables by assuming that it can be modeled as a function of both the average values of the bank-specific variables and the deviations from those averages. Specifically, the expected value of the bank-specific disturbance term is modeled as a linear combination of time-averages of the financial ratios derived from a bank's balance sheet and income items, $\overline{z}_i$, or

$$E[a_i|x_{i,t}, A_{i,t}, \delta_t, \epsilon_{i,t}] = \psi\overline{z}_i.$$

If valid, that assumption removes the correlation between the bank-specific effects, μ_i in equation 1 and banks' financial ratios. Then substituting $\mu_i = \psi\overline{F}_i + b_i$, where b_i is now the bank-specific random effect not correlated with $\overline{z}_i$ (and adding and subtracting $\beta_2\overline{z}_i$, implies

$$P(y_{i,t} = 1) = x_{i,t}\beta_1 + (z_{i,t} - \overline{z}_i)\beta_2 + (\beta_2 + \psi)\overline{z}_i + A_{i,t}\beta_3 + \delta_t + (A_{i,t} * \delta_t)\beta_4 + b_i + \epsilon_{i,t} \quad (3)$$

where b_i is a bank-specific disturbance term not correlated with the explanatory variables. One added benefit of this framework is that the coefficients on the deviations from the average financial ratios can be interpreted as short-run effects on a bank's rating and condition, while the coefficients on the average values can be considered the long-run effects of that ratio as in Afonso, Gomes, and Rother [2011].

The quarterly fixed effects control for important determinants of mortgage banking business like overall loan demand, the average level of risk aversion in the economy, and the general level of interest rates. However, particularly for smaller banks ,local conditions may be substantially different from national trends. Their markets may also differ in size and affluence, which might lead to differential access to high net worth customers that would affect mortgage demand. Therefore, the vector $x_{i,t}$ includes bank-specific contemporaneous levels of per capita personal income in the states they serve, as well as contemporaneous and one lag of yearly growth rates of per capita personal income, employment, and house prices.

The log of total assets, $A_{i,t}$ is included due to the likelihood that participation in this business line has significant fixed costs, and those fixed costs are more easily absorbed by larger institutions. Indeed, as detailed in the introduction, groups representing the banking industry have argued that, due at least in part to additional regulation, these costs have increased substantially since the onset of the financial crisis. If that were the case, then ceteris paribus, we should see a decrease in participation by smaller banks. In order to formally test whether smaller banks are increasingly likely to shun mortgage banking, we interact asset size with the time fixed effects. If smaller banks are retreating from the market, then those interaction terms should become larger over time.

Regressors in $z_{i,t}$ include controls for liquidity, capital adequacy, and credit quality of the bank. The lag of the bank's regulatory tier 1 leverage ratio account and the lagged ratio of core loans to total assets and delinquent loans to total loans account for the current financial strength and riskiness of the bank's assets.[18] The ratios to total assets of noninterest income and net interest income account for the profitability of the bank, as well as the mix of revenue between traditional lending operations and fee-based businesses that generate noninterest income. In addition, a one-quarter lag of the share of interest-earning assets and interest-paying liabilities that mature within one year and one-quarter lagged share of assets funded by core deposits (transactions, savings, and small time deposits) account for the bank's liquidity position.[19] The variables in $z_{i,t}$ are averaged over the sample period in order to construct $\overline{z}_1$.

[18]The results are robust to the use of various combinations of delinquency and charge-off rates to control for current asset quality and to the choice of capital ratio to control for capital adequacy. For definitions of tier 1 and total capital and risk-based and leverage ratios, please see Lee and Rose [2010].

[19]A large fraction of core deposits tend to be operational balances of the banks' business customers and checking account balances of their retail customers. This feature makes the quantity quite stable over time and relatively insensitive to changes in interest rates (Driscoll and Judson [2013].

4 Discussion and Analysis

Returns to Sales and Securitization

Figure 1 plots our estimates of the gross returns from the originate and distribute business.

The top panel plots the total gross return from mortgage banking activities and the breakdown into the sales and securitization and the servicing portions. Returns on the former drive most of the time series variation in the total. Not surprisingly, returns on this business line turned sharply negative during the recession of 2007-9 before rebounding and becoming consistently positive by early 2011. Returns on servicing have been relatively flat at a low level throughout the period, though they had moved toward the lower end of their post-crisis range at the end of 2014.

The bottom panel of the figure plots returns broken up by bank holding company size. Gross returns on these activities at small bank holding companies (those with less than $20 billion in assets) have been consistently positive; the losses during the recession were entirely concentrated at larger banks. Since the end of the recession, gross returns at small banks have remained noticeably above those for large bank holding companies. Moreover, for most of the period since 2011, they also have been mostly above the level observed in 2007.

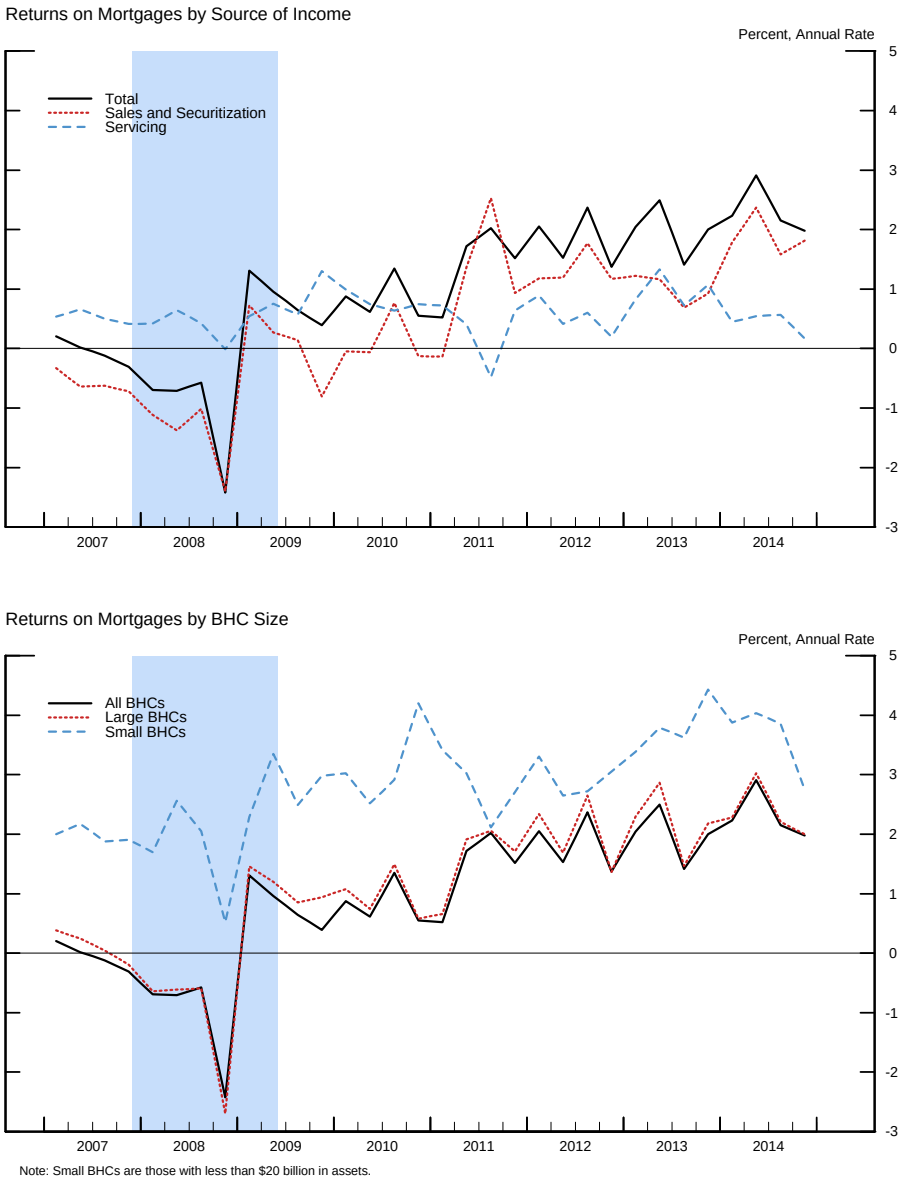
There is no clear break in this data that might be attributable to changes in regulatory or supervisory policy such as the history of the Dodd-Frank Act from the Obama administration's proposal in June 2009 to its passage in July 2010 or the announcement of the QM rules for comment in June 2013.

4.1 Returns on Assets and Equity

Our estimates above of the gross returns to sales, securitization, and servicing of mortgages are imperfect. An alternative way of looking at how the profitability of this business line has changed over time is to examine broader measures of profitability for banks that engage in it. Figure 2 plots returns on assets for BHCs with income from the sales, securitization, and servicing of mortgages, broken up by bank size.

All measures show sharp falls during the recession of 2007-9, followed by a rebound. Over the past several years, the ROA for banks with assets between $50 billion and $100 billion that originate mortgage loans for sale or securitization but do not retain servicing rights have been consistently above those of banks with the same business configuration in the other size categories. Patterns are similar for returns on equity (not shown).

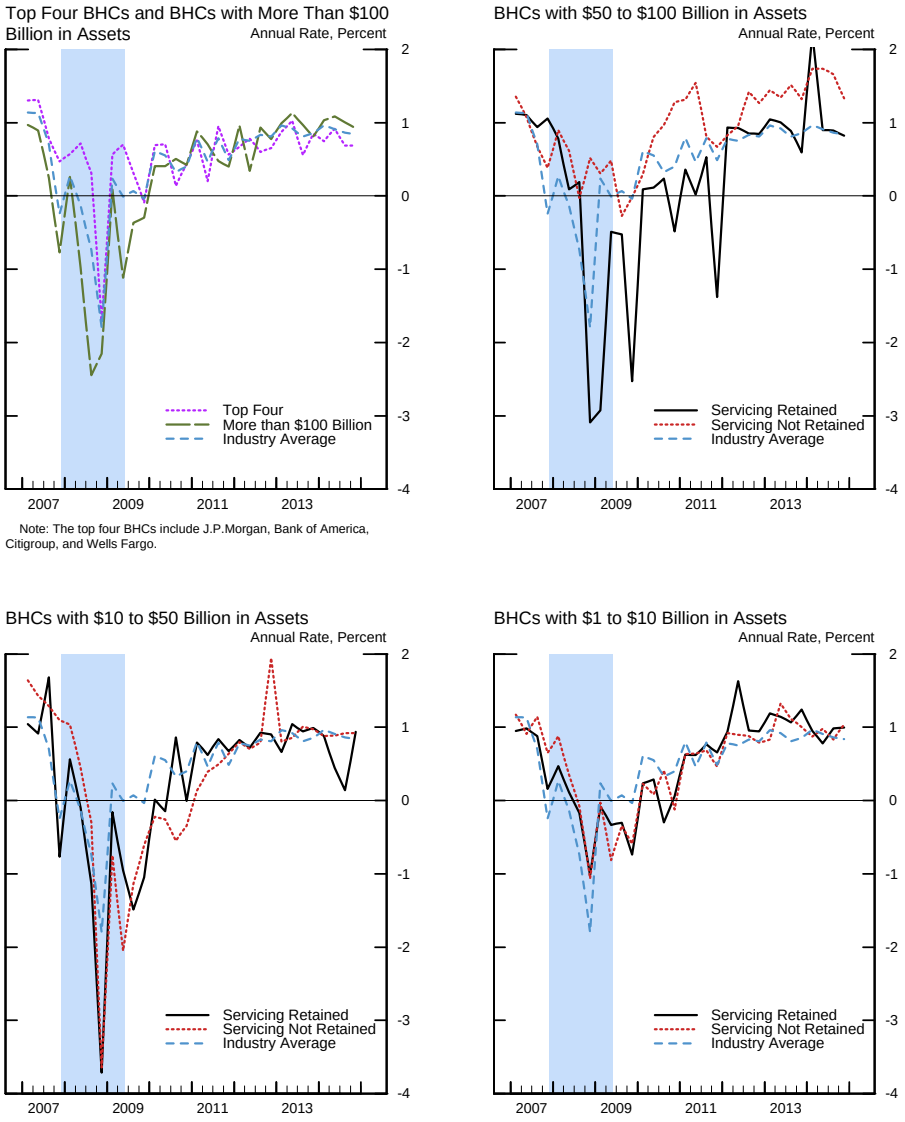
Figure 1



Note: Small BHCs are those with less than $20 billion in assets.

Figure 2

Returns on Assets for BHCs with Income from the Sale, Securitization, and Servicing of Mortgages



Note: The top four BHCs include J.P.Morgan, Bank of America, Citigroup, and Wells Fargo.

4.2 Participation in the Originate to Distribute Business

Figure 3 plots sales of mortgages and originations with the intent of selling and securitizing, also by bank size.

As one might expect by the skewness in the distribution of bank sizes, for much of the period the vast majorities of both sales and originations have been accounted for by large banks. These activities saw large declines among all bank sizes starting in 2013 as refinancing activity plunged in the wake of steep rises in mortgage interest rates around mid-year. However, the decline was much more pronounced at large banks, for whom refinancing is evidently a larger share of their mortgage banking activity. Nonetheless, as shown by the red dashed line, the ratio of small to total in both series has been rising over time, even during the 2011-2013 period when refinancing activity was relatively strong.

Despite the drop in the total volume of sales and originations with the intent of selling and securitizing, the number of banks in the industry participating in these activities has risen on net since the end of the financial crisis. As shown in the top panel of Figure 4, about 350 banks had income from any of these activities at the beginning of 2007, and the number peaked at about 525 in the middle of 2013. Over the second half of 2013, however, the number of banks active in these markets declined noticeably. The timing of this drop is curious, as it corresponds to the announcement of the final QM rules on May 29, 2013.[20] After that initial decline, participation remained stable at just under 500 banks over the final quarters of 2014.

As shown in the bottom panel, the number of securitizers has dropped from an already low figure of about 18 at the beginning of the financial crisis to about 10 in the most recent data. This decline and the lack of any evidence of a recovery reflects the still moribund markets for privately issued mortgage-backed securities.

4.3 Regression Analysis of Participation Decision

Table 3: Regression for BHC Participation in Mortgage Banking

	Regression Specification					
	1		2		3	
Variable	Participation		Marginal Effects		Participation	
Explanatory Variable	*Est.*	*S.E.*	*Est.*	*S.E.*	*Est.*	*S.E.*
lnlag_4_assets	3.4386***	(0.3708)	0.4683***	(0.0315)	3.4993***	(0.5105)

Continued on next page

[20] These rules were modifications, clarifications, and exemptions to a proposed rule issued along with interim final rules on January 10, 2013. Further amendments were made on July 10, 2013 and September 13, 2013. Previously, the Federal Reserve Board had proposed rules for comment on April 19, 2011.

Table 3 – *Continued from previous page*

Variable	1 Participation		2 Marginal Effects		3 Participation	
Explanatory Variable	*Est.*	*S.E.*	*Est.*	*S.E.*	*Est.*	*S.E.*
y08	1.8217	(1.8085)	0.1310	(0.0797)	0.9563	(1.8821)
y09	12.4442***	(2.7732)	0.2393	(0.0142)	10.5516***	(2.8957)
y10	13.0217***	(2.6612)	0.2504	(0.0208)	11.2648***	(2.7513)
y11	13.0185***	(2.7119)	0.2511	(0.0198)	12.0704***	(2.9485)
y12	19.5151***	(3.1519)	0.3577	(0.0475)	18.3644***	(3.2720)
y13	19.7994***	(3.4480)	0.3628	(0.0463)	18.7089***	(3.4885)
y14	20.9682***	(3.7831)	0.3518	(0.0163)	20.0396***	(3.9013)
laglnassetsXy08	-0.1329	(0.1280)	-0.0164	(0.0146)	-0.0694	(0.1337)
laglnassetsXy09	-0.8555***	(0.1958)	-0.0015	(0.0036)	-0.7129***	(0.2063)
laglnassetsXy10	-0.8800***	(0.1888)	-0.0156	(0.0034)	-0.7629***	(0.1959)
laglnassetsXy11	-0.8751***	(0.1920)	-0.0153	(0.0035)	-0.8152***	(0.2098)
laglnassetsXy12	-1.3079***	(0.2252)	-0.0253	(0.0046)	-1.2336***	(0.2332)
laglnassetsXy13	-1.3205***	(0.2468)	-0.0258	(0.0051)	-1.2622***	(0.2496)
laglnassetsXy14	-1.4238***	(0.2731)	-0.0278	(0.0061)	-1.3810***	(0.2794)
change_pinc	-0.0013	(0.0248)	-0.0002	(0.0034)		
change_house	0.0189	(0.0183)	0.0026	(0.0025)		
change_emp	-0.0269	(0.0500)	-0.0037	(0.0068)		
lag_change_pinc	-0.0178	(0.0253)	-0.0024	(0.0035)		
lag_change_house	-0.0220	(0.0173)	-0.0030	(0.0023)		
lag_change_emp	0.0431	(0.0473)	0.0059	(0.0065)		
avg_pinc	-0.0001***	(0.00003)	-0.00002	(0.000004)		
avg_share_core_lns	0.0719***	(0.0186)	0.0098***	(0.0023)		
avg_share_core_depos	0.0623*	(0.0248)	0.0085*	(0.0034)		
avg_ratio_nonintINCM_assets	1.3604***	(0.3423)	0.1853***	(0.0410)		
avg_ratio_netintINCM_assets	-1.3980**	(0.4336)	-0.1904***	(0.0552)		
avg_ratio_delinqs_totloans	-0.2136**	(0.0649)	-0.0291***	(0.0084)		
avg_ratio_tier1_lev	-0.1707*	(0.0676)	-0.0232*	(0.0092)		
avg_share_assets_matur1yr	0.0004	(0.0167)	0.0001	(0.0023)		
avg_share_liab1yr	0.0131	(0.0132)	0.0018	(0.0018)		
lag_share_core_lns	0.0115	(0.0106)	0.0016	(0.0014)		
lag_share_core_depos	-0.0001	(0.0097)	-0.0000	(0.0013)		
lag_ratio_nonintINCM_assets	0.1812*	(0.0919)	0.0247*	(0.0125)		

Continued on next page

Table 3 – *Continued from previous page*

Variable	1 Participation		2 Marginal Effects		3 Participation	
Explanatory Variable	*Est.*	*S.E.*	*Est.*	*S.E.*	*Est.*	*S.E.*
lag_ratio_netintINCM_assets	0.5206***	(0.1376)	0.0709***	(0.0184)		
lag_ratio_delinqs_totloans	0.0444	(0.0272)	0.0061	(0.0037)		
lag_ratio_tier1_lev	0.0368	(0.0384)	0.0050	(0.0052)		
lag_share_assets_matur1yr	-0.0044	(0.0080)	-0.0006	(0.0011)		
lag_share_liab1yr	0.0077	(0.0067)	0.0010	(0.0009)		
_cons	-49.4554***	(5.8459)			-49.2750***	(7.2178)
lnsig2u	2.4658***	(0.2088)			2.5704***	(0.2646)
N	5958		5958		5958	
(2012-2011)*Assets	0.4328**	(0.1498)				

NOTE: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$** Robust asymptotic standard errors are clustered at the bank holding company level and are reported under the column headings "*S.E.*".

The results of the probit regression discussed in section 3 are shown in Table 3. As expected the coefficient on asset size is economically large and highly statistically significant. The marginal effect on the probability of participating, when evaluated at the means of all the variables, is about [47] percent per additional log point compared with an overall fraction of banks that participate in the mortgage banking business of 58.6 percent. A one-log-point decrease from the mean of about $16 billion is equivalent to an asset size of about $6 billion, so that is a meaningful difference in asset size generating such a large marginal effect.

However, contrary to the fears expressed by many analysts and market participants, the results suggest that asset size has become less important of a determinant of participation in recent years. The coefficients on the interaction terms between year and asset size have declined since 2008, suggesting that smaller BHC's have become more likely to participate in the originate-to-distribute business. Indeed, a discrete drop in the coefficient is noticeable from 2011 to 2012, and that decrease is statistically significant with a p-value of 0.004. The values continue to decline gradually in 2013 and 2014. The marginal effects shown in the second panel indicate that relative to the base year of 2007, a $16 billion bank is is 2.8 percent less likely to participate relative to a $6 billion bank compared with 2007.

The timing of the jump in participation by small banks, *ceteris paribus*, in 2012 and further increase in 2013 and 2014 coincides with a series of events that reduced uncertainty in mortgage markets. An expansion of the Home Affordable Refinance Program (HARP 2.0) to include significantly more underwater borrowers was announced in December, 2011, and

Figure 3

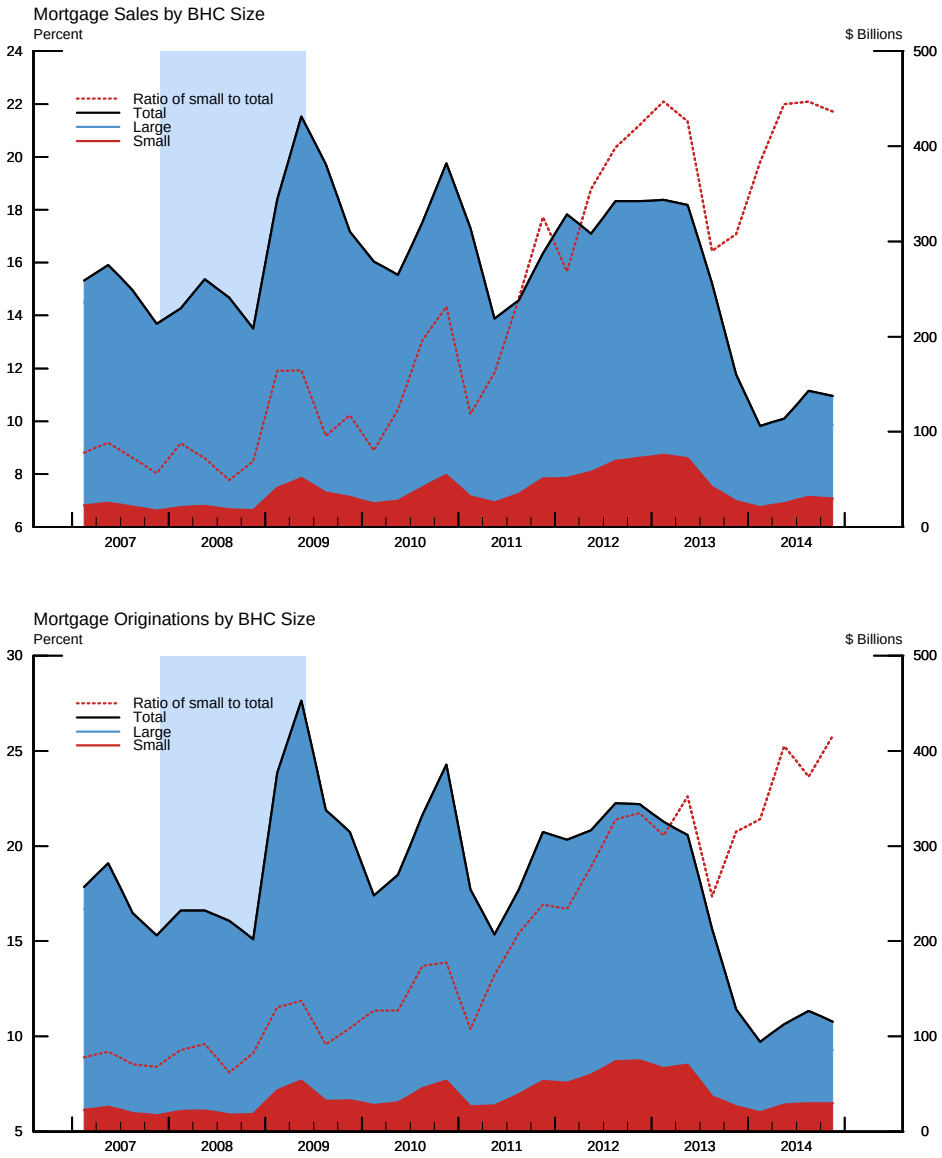
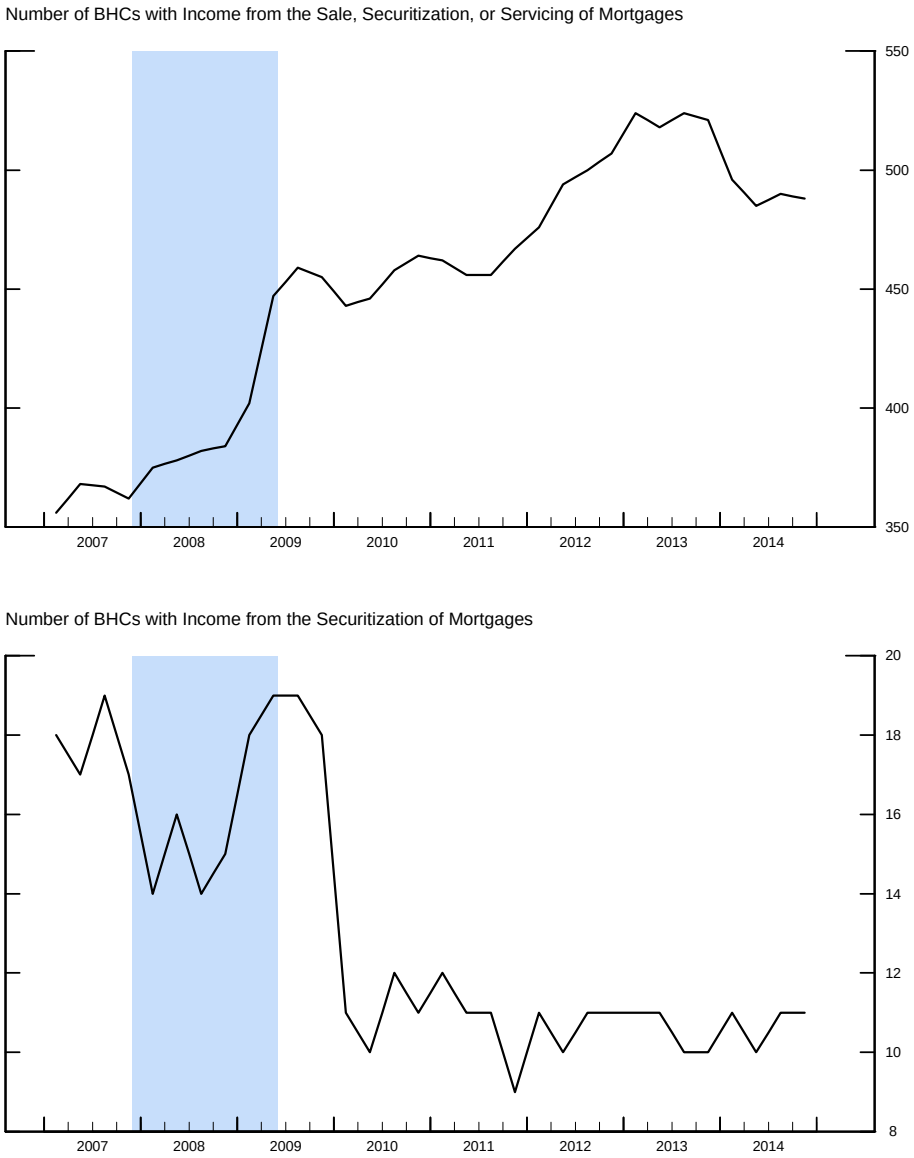

Mortgage Sales by BHC Size
Percent
$ Billions
Ratio of small to total
Total
Large
Small
24
22
20
18
16
14
12
10
8
6
500
400
300
200
100
0
2007
2008
2009
2010
2011
2012
2013
2014
Mortgage Originations by BHC Size
Percent
$ Billions
Ratio of small to total
Total
Large
Small
30
25
20
15
10
5
500
400
300
200
100
0
2007
2008
2009
2010
2011
2012
2013
2014

Figure 4


Number of BHCs with Income from the Sale, Securitization, or Servicing of Mortgages
550
500
450
400
350
2007
2008
2009
2010
2011
2012
2013
2014
Number of BHCs with Income from the Securitization of Mortgages
20
18
16
14
12
10
8
2007
2008
2009
2010
2011
2012
2013
2014

the States' Attorney General Foreclosure Settlement mentioned earlier occurred in February 2012. Those events, along with the improvement in the economy that we attempted to account for in the regression, may have made mortgage banking more attractive relative to 2009 and 2010. Likewise, finalization of the Ability-to-Repay and Qualified Mortgage rule in January 2013 also could have reduced uncertainty to an extent leading to further entry by smaller banks, ceteris paribus, through 2014.

Among the other control variables, many of the sample average values are statistically significant and have the expected sign. Banks that have a one-percentage point higher average share of core loans are about 1 percent more likely to participate, which should not be surprising given the likely synergies between portfolio lending and origination for sale. Banks with higher net interest income are less likely to participate, after netting the effects of the long-run average and previous year the marginal effect of a 0.5 percentage point increase in that metric amounts to about a 5 percent decrease in the likelihood of participation, The relationship perhaps exists because the high returns to portfolio lending dominate the returns they could earn by selling mortgage loans. Banks with higher average leverage ratios are also a little less likely to participate, a correlation that highlights the role that balance sheet capacity plays in the decision to hold a loan as opposed to selling it.

Of note, the coefficient on the average delinquency rate is negative, and the marginal effect a fairly large 3 percent per 1 percentage point change in the delinquency rate. Hence, banks with generally poorer asset quality over the sample period are less likely to participate in mortgage banking. Analogously, participants in the market for sales or securitization of mortgages tended to have lower delinquency rates for loans held on their books. This is consistent with those banks selectively selling riskier loans or with banks that participate in loan sales being more selective overall.

In contrast, most of the one-year lagged values of the control variables are statistically insignificant, as are the values of the contemporaneous and one-year lag values of the bank-specific state-level economic variables. This result suggests that the decision to engage in the originate-to-distribute model is based on long-term strategic goals to a much greater degree than near-term fluctuations in bank or economic performance. Consequently, if smaller banks were to withdraw from the market, it may not be the case that potential new entrants would necessarily respond quickly enough to the reduction in competition to avoid a decline in credit supply.

Column 3 of the table repeats the regression with only size, the year dummies, and the year-size interaction terms. The coefficients on all of these variables remain statistically significant and are slightly smaller than the values reported in column (1). This result means that adding the control variables reinforces the conclusion that small banks are not less likely to participate in mortgage banking post-crisis than they were pre-crisis. Another

conclusion is that the additional controls reported in the regression in the first two columns, though adding some explanatory power towards explaining participation, do not alter the results on the time pattern of participation by bank size.

5 Conclusion

Mortgage loan underwriting policies during the mid 2000s, revealed *ex post* to have been excessively easy, contributed to the financial crisis that began later that decade. Policies may have been especially lax for loans that were originated by banks that had the intention of selling or securitizing them–thus retaining little, if any, of the risks on their books. Regulatory changes since the crisis have tightened mortgage underwriting standards, but may have also made the "originate to distribute" approach unprofitable for banks to engage in. These changes in regulations may have had the unintended consequence of reducing the availability of credit to potential mortgage borrowers.

In this paper, we have attempted to more systematically evaluate these concerns through using quarterly data from commercial bank and bank holding company regulatory reports. Since 2007, Schedule 'P' of the Call Reports for these institutions has detailed the activity and income from banks' participation in the sale, securitization, and servicing of residential mortgages. To our knowledge, our paper is the first to use this data.

We find that gross returns to sales and securitization has been higher for smaller banks than for larger ones, and has been increasing over the post-crisis period. Broader measures of returns to all types of bank activities have also been higher for banks with income from mortgage sales and securitizations. The total number of banks engaged in these activities has also risen over time. In regression analysis controlling for changes in the health of banks' balance sheets, their business models, and the improvement in the economy, we find that while asset size is strongly positively correlated with participation in mortgage banking, it has become significantly less important of a determinant of participation in this market over the past three years.

Our analysis has some limitations. We do not (generally) have data before 2007 on these activities, and the relevant regulatory reports have lower bounds for reporting on the size of the activities and the asset size of the institutions.

Another limitation, and one possible reason for the discrepancy between our findings and the views of some bankers and researchers, is that we are only able to consider the behavior of commercial banks. Involvement of nonbank lenders in the residential mortgage business has grown substantially over time. The resulting increase in competitive pressures is likely a factor weighing on bankers' perceptions of the profitability of this market. In addition, as these nonbank financial institutions are generally subject to fewer regulations than their

commercial bank counterparts, the growth of these institutions may be a consequence of the post-crisis bank regulatory changes. Thus, it is possible that while regulatory changes have not evidently disadvantaged community banks relative to larger banks, these changes may have disadvantaged both banks relative to these new "shadow banks."

References

Afonso, A., P. Gomes, and P. Rother (2011): "Short-and Long-Run Determinants of Sovereign Debt Credit Ratings," *International Journal of Finance and Economics*, 16, 1–15.

Apgar, W. C. (2012): "Getting on the Right Track: Improving Low-Income and Minority Access to Mortgage Credit after the Housing Bust," Discussion paper, Joint Center for Housing Studies, Harvard University.

Bubb, R., and A. Kaufman (2014): "Securitization and moral hazard: Evidence from credit score cutoff rules," *Journal of Monetary Economics*, 63, 1–18.

Driscoll, J. C., and R. A. Judson (2013): "Sticky deposit rates," Finance and Economics Discussion Series 2013-80, Board of Governors of the Federal Reserve System.

English, W. B., and W. R. Nelson (1998): "Profits and Balance Sheet Developments at U.S. Commercial Banks in 1997," *Federal Reserve Bulletin*, 84(6), 391–419.

Foote, C. L., K. S. Gerardi, and P. S. Willen (2012): "Why did so many people make so many ex post bad decisions? the causes of the foreclosure crisis," Working Paper 2012-07, Federal Reserve Bank of Atlanta.

Fuster, A., L. Goodman, D. Lucca, L. Madar, L. Molloy, and P. Willen (2013): "The Rising Gap Between Primary and Secondary Mortgage Rates," *Economic Policy Review, Federal Reserve Bank of New York*, 19(2), 17–39.

Gete, P. (2014): "The Extensive Margin of Credit, Housing Markets and the Tradeoff between Financial Stability and Homeownership," unpublished manuscript, Georgetown University.

Goodman, L. S., R. Ashworth, B. Landy, and L. Yang (2012): "The Coming Crisis in Credit Availability," *Journal of Structured Finance*, 18(3), 37–49.

Jaffee, D., A. W. Lynch, M. Richardson, and S. Van Nieuwerburgh (2009): "Mortgage origination and securitization in the financial crisis," *Restoring Financial Stability: How to Repair a Failed System*, 542, 61.

Keys, B. J., T. Mukherjee, A. Seru, and V. Vig (2010): "Did Securitization Lead to Lax Screening? Evidence from Subprime Loans," *The Quarterly Journal of Economics*, 125(1), 307–362.

Keys, B. J., A. Seru, and V. Vig (2012): "Lender Screening and the Role of Securitization: Evidence from Prime and Subprime Mortgage Markets," *Review of Financial Studies*, 25(7), 2071–2108.

Lee, S., and J. Rose (2010): "Profits and Balance Sheet Developments at US Commercial Banks in 2009," *Federal Reserve Bulletin*, 96(May).

Mian, A., and A. Sufi (2009): "The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis," *The Quarterly Journal of Economics*, 124(4), 1449–1496.

Quercia, R., L. Ding, and C. Reid (2012): "Balancing Risk and Access: Underwriting Standards for Qualified Residential Mortgages," Research report, Center for Community Capital.

Wooldridge, J. M. (2010): *Econometric Analysis of Cross Section and Panel Data*. MIT Press.