

Oklahoma State University | Spears School of Business

Draft Research Proposal

Ph.D. in Business Administration

Impact of Firm Level Bank Consolidation on Mortgage Loan Availability

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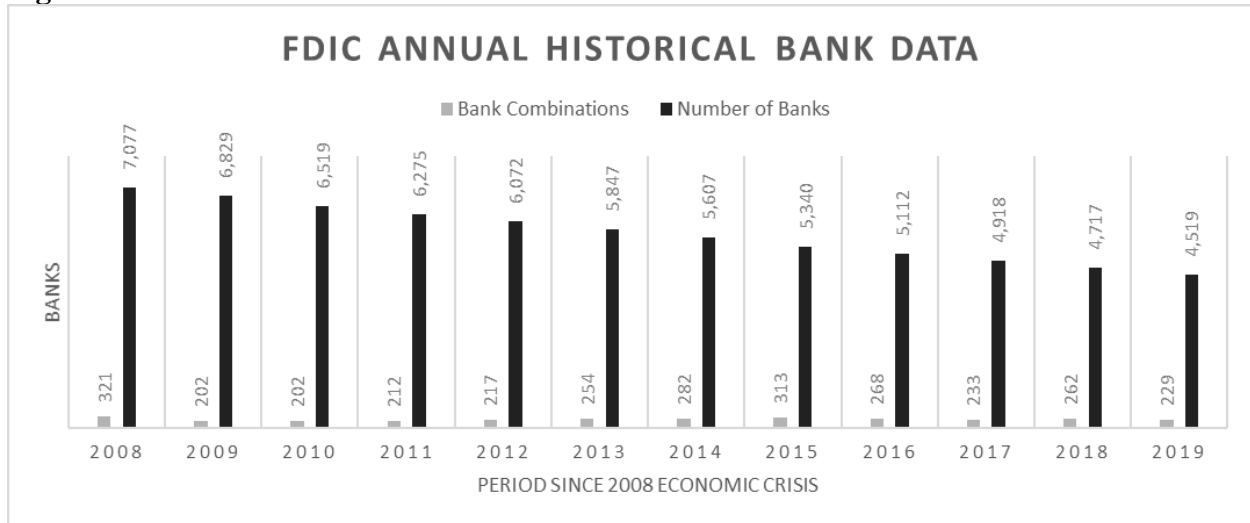
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I. INTRODUCTION AND RESEARCH PROBLEM

Since the economic crisis of 2008, the number of U.S. commercial banks has declined by 36 percent, representing a consolidation of 2,558 banks, with an average of 250 bank mergers a year or 4.45 percent of FDIC insured banks in operation as described in Figure 1¹.

Figure 1



The steady decline in the number of U.S. banks through consolidation is driven by a myriad of factors that include significant industry deregulation prompted in part by bank failures and waning consumer trust stemming from the economic crisis of 2008. Bank consolidations were also facilitated by increased competition from non-bank entities that leveraged technological shifts adapting to changing consumer preferences. While extant literature has examined the impact of consolidations on consolidated bank fundamentals and investor returns, relatively little research has focused on how bank consolidations affect the availability of credit in the markets they service.

¹ FDIC annual historical bank data from 2008 to 2019 includes commercial & industrial banks (national banks, state chartered banks, state chartered banks that are non-members of the Federal Reserve System, FDIC supervised state savings banks, OCC supervised state savings banks, federal & state savings and loans). The dataset excludes non-FDIC Insured Commercial Banks, Thrifts & Credit Unions.

Recently, Jagtiani and Maingi (2018) concluded that bank consolidations have a profoundly negative effect on the availability of small business loans within the counties the banks serve, thus creating small business lending credit gaps. Along with other consolidation literature, the results of the Jagtiani and Maingi (2018) elicit concerns that bank consolidations may create similar lending credit gaps at the consumer level, specifically with regard to mortgage loan availability at the bank firm-level.

The magnitude and implication of mortgage lending on the U.S. economy and communities cannot be overstated. In 2020 for example, \$11.05 trillion in mortgages were outstanding with another \$1.9 trillion mortgages funded in 2020 with² mortgage debt making up approximately 70 percent of all household debt³. However, there continues to be inequality in the extension of mortgage lending by banks in rural areas with the exception of community banks. In an article by the Brookings Institution (2018), mortgage lending in rural communities by community banks and credit unions make up 20 percent of all mortgage loans originated in the U.S. and 33 percent of mortgages in rural areas. The U.S. rural communities in 2016 made up 23.3 percent of the total U.S. population and 20.9 percent of people of color, a market segment that has historically been underserved (Williams et al, 2005). Mortgage lending is also the largest asset class amongst community banks that service rural areas. As banks of various sizes and geographical locations continue to consolidate, the question is raised as to potential changes in their respective mortgage loan portfolios and consequences to the communities they serve. Regulators are also questioning the decline in mortgage lending trend amongst banks and the potential impacts to the people they serve. In the FEDS Notes⁴, data from HMDA for periods of

² [MBA.org/news-research-and-resources](https://www.federalreserve.org/news-research-and-resources)

³ [A Snapshot of Record-High U.S. Household Debt | St. Louis Fed](#)

⁴ FEDS Notes, September 2017, The Decline in Lending to Lower-Income Borrowers by the Biggest Banks, Bhutta et al (2017).

2010 through 2016 show declines from all banks in mortgage lending to low and moderate-income households (LMIs) in the recent years. Another concerning trend described is the decline in originations of loans insured by the Federal Housing Administration (FHA) by banks that averaged 37 percent market share in 2010 falling to a market share of 12 percent by 2016. The implication for borrowers is whether the drop in FHA and LMI household mortgage lending leads to limited access to credit if not offset by other lenders. As noted in the article, “This research raises the possibility that as the largest banks reduce their mortgage lending to lower-income households, these borrowers may be unable to easily obtain loans from other sources (Bhutta et al., 2017). The FDIC’s recent community banking study is also interested in the decline of community banks trending away from residential mortgages and towards commercial real estate loans (CREs), and small business lending. CREs as a proportion of community bank loan portfolio grew from 38 percent in 2011 to 40 percent in 2019. Although on the surface, the change may not appear significant, when contrasted with the growth in market share from 51 to 58 percent over the same period, it is evident that community banks are changing their loan portfolio strategy. Along with the growth in CREs, small business lending originations by community bank is also growing with increases from 38 percent in 2012 to 46 percent in 2019, while non-community banks declined small business lending to 54 from 62 percent in the same period⁵. In contrast, community banks appear to be moving away from mortgage lending as the growth of community bank mortgage originations fell from a high of 6 percent annual growth in 2014 to 3 percent in 2019⁶. The authors of the FDIC 2020 community banking report suggest the

⁵ FDIC Community Banking Study, December 2020. Chapter 4: Notable lending strengths of community banks. (DiChiara, Hanrahan, and Cofer)

⁶ FDIC Community Banking Study, December 2020. Chapter 5: Regulatory change and community banks, chart 5.10. (French)

rationale for the decline in mortgage lending is due in part to increased regulatory costs, changes in financial and information technology, as well as the commoditization of retail lending through increased competition from nonbank entities.

Despite the research investigating the relationship between bank consolidation and small business lending, there appears to be a gap in the literature regarding the impacts of bank consolidation on availability of mortgage loans. As bank mortgage loan portfolios secured by (1-4 family) residential properties constituted 59 percent of total real estate loans in 2010, they now make up 50 percent of total real estate loans originated⁷. The purpose of this proposed research is to test empirically the effects of bank consolidation at the firm-level post 2008 economic crisis, specifically on the availability of mortgage loans (1-4 family) to determine the likelihood of credit gaps in the communities they serve.

My proposed research will apply an event study framework to examine changes in the quantity of mortgage loan originations, average loan origination values, and proportion of mortgage loan to total loans around bank consolidations. In addition, I will also investigate the sensitivity of the above changes to the relative location of the acquiring and target banks. I assert that as banks consolidate, the newly created combined entity originates fewer mortgage loans at higher average origination amounts to the counties in which they operate potentially leading to credit gaps. However, an argument can also be made that some of the catalysts for bank consolidation such as economies of scale, technological efficiencies, and loan portfolio risk mitigation benefit the consumer and thus reduce potential credit gaps. By analyzing the relationship of banking consolidation and mortgage loans over the period of 2011 through 2018,

⁷ FDIC annual historical bank data from 2009 to 2018

I believe my findings will contribute to extant research and fill the apparent literature gap, benefiting academia by testing financial intermediation theory, which is based on transaction and asymmetric information from institutions that take deposits and distribute funds to firms (Allen and Santomero, 1998). Additionally, my findings will provide valuable insight to banking industry policy makers regarding mortgage availability for consumers.

The research proposal is structured into four sections. Section 1 provides an introduction and justification for the proposal. Section 2 presents a review of extant research in bank consolidation as well as bank lending after the 2008 economic crisis. Section 3 describes six hypotheses in the proposed empirical study and respective economic rationale. Lastly, Section 4 includes a description of the dataset, empirical methodologies, and research design.

II. LITERATURE REVIEW

The phenomenon of bank consolidation has been examined through a variety of lenses that include determining factors such as changes in banking regulations, increased competition from non-traditional banks, and technological advancements. So as not to overwhelm the reader with the broader literature on bank consolidation, in this section I confine my review to studies closely related to the research question I seek to address.

Although there is an apparent gap in literature focused on bank consolidations and mortgage lending, parallels of bank consolidation and small business lending research provides insight into mortgage lending as many banks typically hold both forms of credit vehicles in their loan portfolios. Similarities of small business and mortgage lending include a declining portfolio composition of both types of loans to total assets. In a study by the FDIC, over the periods of 1984 through 2011, on a consolidated basis (including community and non-community banks),

the proportion of mortgage lending to total assets fell from 19 percent to 17 percent while business lending fell from 16 percent to 10 percent.⁸ Another similarity of small business and mortgage lending is the increasing competition from nonbanks that leverage technology to expedite and simplify the lending process paramount in customer satisfaction. A McKinsey 2018 retail banking customer experience survey identified three top reasons for choosing a lender: ranked first was exceptional customer service followed by best interest rate, and existing relationship. In conjunction, the three top improvements desired by customers were: getting things right the first time, pre-approval within 24 hours, and quick, clear 24/7 status.⁹ Although small business and mortgage lending similarities deviate in the types of credit users either by consumer or organization, they both draw on common bank infrastructure that contributes to the profitability and viability of a bank.

I identified three studies, Berger et al. (1998), Peek and Rosengren (1998), and Jagtiani and Maingi (2018) that empirically tested the relationships of bank consolidation and small business bank lending. Bank consolidation (M&A) and small business loan studies address the concern of policy makers and banking scholars regarding the supply of credit or potential credit gap to small businesses related to bank asset size, location or lending philosophy (relationship or transactional). As postulated by Berger et al. (1998), the body of research on bank consolidation and its effect on small business lending provides a mixed picture, thus prompting the research question as to whether consolidation of U.S. banks substantially reduce the supply of credit to small business. By examining the dynamic net impacts of bank consolidation and small business lending, the authors measure the effects of consolidation on lending by other banks in the same

⁸ FDIC Community Banking Study - Chapter 5

⁹ Competing on customer experience in US mortgage (mckinsey.com)

local markets. The study supplements extant literature that focused solely on static comparisons and conclusions of consolidation and small business lending by measuring the static, restructuring, and direct effects (also defined as dynamic effects) for over 6,000 U.S. bank consolidations from 1970 to 1990. The extant literature includes research by Peek and Rosengren (1996, 1998) that found consolidations between two smaller banking institutions often led to an increase in small business lending. Strahan and Weston (1996, 1998) also tested the relationship of small business lending pre and post consolidation finding that regardless of bank size differences there was no clear effect on small business lending. Lastly, Walraven (1997) finds that after a bank consolidation, the level of small business lending tends to revert to the level of the surviving bank.

The static effect is designed to capture pre-consolidation and post-consolidation balance sheets focused on the quantity of available small business loans. A restructuring effect is defined as the change in firm focus impacted by changes in size, financial condition, or competitive position that occur post consolidation. For example, if a \$500 million bank acquired a \$300 million bank, the restructuring effect might result in a consolidated \$600 million bank rather than a combined \$800 million bank. Lastly, the direct effect reflects the potential change in lending by refocusing firm attention toward or away (due to changes in lending policy) from small business lending net of restructuring and static effects. The results of the study indicate the effect of bank consolidation on small business lending is more complex than previously thought. When isolated, the static effect of bank consolidation is associated with considerable negative impact on small business lending. By including external reactions of other banks, the decline in small business lending is somewhat offset. The restructuring and direct effects appear to have limited effects on small business lending. Another key finding of the analysis is that absolute and

relative asset sizes of consolidating banks impact the level of small business lending.

Consolidation of small and medium asset sized banks appear to increase the level of small business lending. In contrast, larger bank consolidations are associated with decreases in small business lending. Further, the research by Jagtiani and Lemieux, (2016) also identified a relationship between the volume of small business lending and the relative sizes of participating banks. Small business lending research included results of the 2008 economic crisis and its impact on the declining volume of small business lending by banking institutions.

Coupled with bank consolidation and the 2008 economic crisis, one might speculate that the reduced volume of small business lending is a manifestation of the two factors alone. However, the downward trend began at least a decade before the 2008 economic crisis further demonstrating the increasingly dynamic competitive environment and its impact on small business lending. The competitive environment includes the entry of nonbank lenders such as credit unions, independent mortgage companies, and fintech organizations that compete with sophisticated technology that facilitates faster processing times, automated applications, and limited required financial supporting documentation. Small banks, those who have access to better credit information gathered from activities through a customer's deposit account as well as a better lending relationship due to the organizational structure of small banks, were found to perform better than larger banks in the small business lending market while large banks perform better with credit card lending and other standardized loans (Carter and McNulty, 2005).

Peek and Rosengren (1998) investigate the effects of bank consolidation on small business lending. Similar to the research of Berger et al. (1998), the period of rapid bank consolidation raised concerns by researchers and policy makers that such industry consolidation could potentially reduce credit availability to small businesses as banks were a traditional source

of fulfilling credit needs. Further compounding the concerns was that during the years of rapid bank consolidation, large business loans grew faster than small business loans. Additionally, small business lending grew faster at small banks relative to large banks. Lastly, the paper identified that a bank's loan portfolio share of small business loans is often inversely related to the total asset size of the institution. Over a three-year period, 1993 through 1996, the authors documented the business loan growth rate from the respective bank's June call report submitted to the FDIC. In all, the data included 872 consolidation observations with the following breakdown: 261 observations reflected acquirers of less than \$100 million in assets, 196 observations of acquirers with greater than \$100 million but less than \$300 million in assets, and 144 observations of acquirers with greater than \$300 million in assets. The authors find support for their hypothesis that acquirers often recast the target bank small business loan portfolio into the acquirer's pre-consolidation portfolio image. Furthermore, with changes in small business lending subsequent a consolidation is dependent on acquirer's asset size, the allocation of small business loans in the loan portfolio of the acquirer, and the degree in which the acquiring bank's commitment to small business lending as a specialty prevailed, all affected the consolidated bank's willingness to engage in small business lending.

Jagtiani and Maingi (2018) in a study that aligns with both Berger et al. (1998) and Peek and Rosengren (1998) investigate the impact on local small business lending as a result of the shrinking banking sector by focusing solely on community banks. Small business lending in their study is measured from the perspective of both the acquirers' and targets' operation before and after consolidation. The study's motivation is to better "understand the interplay among community banks' comparative advantages in small business lending, their local presence, and their involvement in mergers and acquisitions". Specifically, the authors use bank mergers as a

shock to the community banking sector in an attempt to identify firm-level and county level responses in local small business lending markets. The analysis is based on data of all bank mergers during 2002 through 2014 that include U.S. community bank targets. Along with the merger data set, data on the quantity of small business loan originations by bank in each county by year for the periods, 2001 through 2015 was derived from quarterly call reports submitted to the FDIC. The resulting data is bifurcated by two different target community bank definitions: \$1 billion and \$10 billion asset thresholds for both pre- and post-consolidation with merger observations of 477 and 511 respectively. By looking deeper into the geographic location of changes in small business lending, the authors find a decrease in small business loan funding when a consolidation occurred in an acquisition target's county. The result is even stronger when the acquiring bank is a large bank. However, when a consolidation occurred in an acquirer's county, small business loans increased suggesting that the impact of community banks mergers are dependent on bank operations prior to consolidation.

As addressed in the preceding literature review, there appears to be a gap in literature regarding bank consolidation post 2008 economic crisis and its effect on bank mortgage loan portfolios. The studies of Berger et al. (1998), Peek and Rosengren (1998), and Jagtiani and Maingi (2018) provide a paradigm for both bank consolidation and small business lending. My proposed hypotheses described in part 3 of my study builds on similar analytical logic of previous research on bank consolidation but substitutes small business lending with mortgage lending to determine any potential consumer mortgage loan credit gaps.

III. HYPOTHESIS FORMULATION

The proposed research will test the relationship between bank consolidation and number and value of mortgage loans originated by firm in aggregate and on a per loan mortgage amount. In addition, the effects of bank target location, and bank target loan specialization will also be tested to determine their significance on the availability of mortgage loan credit.

The rationale to pursue consolidation with another bank is typically to sell more services and products to customers as well as to improve the credit management of the combined firm. Focarelli et al. (2002) describe the justification of bank consolidations as prompted by cost reductions and growth opportunities. The authors conclude that bank consolidations aimed at increasing enterprise value are often achieved by improving the loan quality of the combined loan portfolio. One such strategy described is to improve loan quality is by reducing the level of small business lending or limiting the ratio of bad loans to total loans. Research by Wheelock (2000) on the determinants of U.S. bank failures and acquisitions also point to a higher probability of failure and potential for acquisition for banks maintaining relatively illiquid low-quality assets.

Ntiamoah et al., (2014) investigated loan default rates and firm profitability concluding that defaults arose from poor management procedures and improper appraisal by credit officers. The authors also reference the 5Cs, (Character, Capacity, Capital, Conditions, and Collateral), that are core to loan optimization. Some of the bad credit policies described include lenders trying to ignore conditions such as high loan to value ratios as well as historically low loan loss reserves that function as contingencies for loan exposure. Loan exposure is increased if banks ignore the borrower's capacity by following the competitive lending behaviors of competitors that erode credit standards to maintain profitability.

Increased bank risk and subsequent reduction in profitability due to loan exposure may also drive further bank consolidation and affect future lending practices post-consolidation. Research by Li, (2005) described an increasing mortgage loan to value ratio (LTV), a metric that affects the underwriting standards for the majority of mortgage purchasers such as Fannie Mae and Freddie Mac, who are instrumental in both the underwriting and securitizations of mortgage loans. The study indicated that the average LTV in 1984 was 26 percent and by 2001, it had increased to 35 percent, where today the average LTV was 84.1 percent¹⁰. Another indicator of bank loan exposure is derived by estimating the level of anticipated losses on loans due to defaults and nonpayment established by appropriate loan loss reserves subject to market conditions. The economic research data from the federal reserve bank of St. Louis on loan loss reserves to total loans for all U.S. banks indicates a downward slide from a high of 3.7 percent in Q1 of 2010 to a low of 1.15 percent in Q4 of 2019. The lower levels of loan loss reserves to total loans present an optimistic view of loan defaults and nonpayment. By limiting loan loss reserves, a bank benefits with improved firm profitability in the short run but may later be required to expense loan defaults and nonpayment as they occur in the future potentially decreasing firm profitability.

Bank firm profitability is derived from a number of loan revenue streams that include conventional conforming mortgage loan originations. The recent research on the trends in mortgage originations and servicing by FDIC find that post-economic crisis, banks lost approximately 32 percent market share in conventional conforming mortgage loan originations

¹⁰ Federal Housing Finance Agency, Table 3 – January to September, 2019, www.fhfa.gov: national statistics for new fixed-rate, fully-amortizing residential mortgages on owner-occupied, site-build properties in the United States

down from 80 percent market share¹¹. The research also finds that nonbank mortgage originations grew steadily and now exceed the volume and market share of bank mortgage originations. The drop in market share origination by banks is due in part to the increasing cost to originate and service mortgage loans as a result of post-crisis litigation for crisis-era legacy portfolios.¹² The post-crisis litigation associated fines and legal fees assessed on large banks reduced profitability on their mortgage loan portfolios with the unintended consequence of potentially deterring post-crisis mortgage originations. The study also notes that most nonbanks focus on mortgage lending as their core competence placing banks at a disadvantage when developing application technologies aimed at streamlining and automating the origination process that contributes to the profit of a mortgage loan. Large banks in particular are at a disadvantage in mortgage loan origination expenses as cost for corporate administration is on average three times as high as nonbanks. The greater overhead administrative expenses include providing efficient technology support for mortgage loan originations along with system costs not germane to mortgage lending but necessary for other elements to support their business. The trend of lower revenues and higher expenses handicap banks as they compete with nonbanks not burdened by higher infrastructure costs (Shoemaker, 2019). Further, a review by the Stratmor Group¹³ found that large banks since 2016 lost on average \$850 per mortgage loan increasing to an average loss per mortgage loan of \$4,803 in 2018. However, nonbanks or mortgage loan specialist also realized lower profit from \$975 per loan in 2016 to \$376 in 2018 but remained profitable. The critical driver in lower profitability is the high cost to originate a retail mortgage

¹¹ *FDIC Quarterly - TRENDS IN MORTGAGE ORIGINATION AND SERVICING: Nonbanks in the Post-Crisis Period

¹² *FDIC Quarterly - TRENDS IN MORTGAGE ORIGINATION AND SERVICING: Nonbanks in the Post-Crisis Period

¹³ Stratmor Group, June 2019, https://www.stratmorgroup.com/insights_article/the-large-bank-mortgage-banking-profitability-conundrum/.

loan. In 2018, the average bank total per-loan expense was \$13,628 compared to nonbank total per-loan expense of \$10,097 or roughly 25 percent lower.

Mortgage loan costs include not only origination expense but also loan servicing expenses. The mortgage origination and servicing trends identified by the 2019 FDIC quarterly report echo the expense trajectory of mortgage originations with the cost of loan servicing growing from \$541 per loan in 2008 to \$2,631 per loan in 2018 for both performing and nonperforming loans. In isolation, performing loans service costs increased nearly threefold and nonperforming loans saw an increase of more than fivefold.¹⁴ Although banks continue to lose market share in conventional conforming and government loans to nonbanks, they have maintained and grown their market share of jumbo loans to over 80 percent. Jumbo loans values typically exceed \$726,525 but vary from state to state. Unlike a conventional loan, jumbo loans cannot be purchased, guaranteed, or securitized by Fannie Mae or Freddie Mac and undergo more rigorous credit requirements compared to a conventional loan. Approval of jumbo loans require high credit scores, very low debt-to-income ratios and down payments of roughly 10 to 15 percent of the total purchase price. Often the consumers of jumbo loans are a smaller segment than conventional loan consumers that tend earn between \$250 to \$500 thousand per year.¹⁵

In the process of loan optimization to maintain or improve a bank's risk return loan portfolio balance intended to enhance consolidated bank profitability, I contend that consolidated banks either through better alignment of lending policies or loan allocation redundancies of the target firm may inadvertently create a credit gap in mortgage lending by supplying fewer

¹⁴ *FDIC Quarterly - TRENDS IN MORTGAGE ORIGINATION AND SERVICING: Nonbanks in the Post-Crisis Period

¹⁵ Conforming Loan Limits For 2021 – Forbes Advisor

mortgage loan originations (in number and dollar volume) and cater more toward larger loans.

Thus, I propose:

Hypothesis 1: There will be fewer number of mortgage loans originated by the bank post-consolidation as compared to mortgage loans originated by “combined banks” pre-consolidation.

Hypothesis 2: There will be lower aggregate mortgage loan amounts originated by the bank post-consolidation as compared to aggregate mortgage loan amounts originated by “combined banks” pre-consolidation.

Hypothesis 3: There will be higher per mortgage loan amounts originated by the bank post-consolidation as compared to per mortgage loan amounts originated by “combined banks” pre-consolidation.

In the instances above, I will be comparing the post consolidation mortgage numbers (amounts) with the pre-consolidation values assuming the acquirer and target were combined.

Along with the consolidating banking industry over the last twenty-five years, the allocation of small business lending in bank loan portfolios has also changed significantly. Peek and Rosengren (1998) measured the effects of small business loan growth relative to total assets for periods preceding and post bank consolidation. The change in small business loan growth either up or down was most significant when the acquirer and target maintained different specialization in small business lending that reflected sizable impacts to the acquirer’s total assets. As a result, acquiring banks tend to recast the target bank in the acquirer’s image such that the small business loan portfolio converges toward the pre-consolidation loan portfolio share of the acquirer.

We see a similar phenomenon in a study by the FDIC (FDIC Community Banking Study, 2012), where residential mortgage loans represented over 61 and 35 percent of all loans for community and non-community banks respectively in 1984 compared to 36 and 54 percent of all loans today. The study also revealed an increase in a community bank's emphasis in real estate lending with the focus on commercial real estate loans rather than residential mortgage loans. One measure of bank loan specialization is the degree to which loans make up total assets. For example, in 1984, 29 and 13 percent of mortgage loans contributed to the total assets of community and non-community banks, respectively. However, 27 years later, the percentage of mortgage loans held by community banks decreased by 8.7 percent while non-community banks percentage of mortgage loans increased by 4.3 percent. Although the FDIC community banking study separates U.S. banking organizations into either community or non-community, it acknowledges the difficulty of defining a community bank based on asset size alone and thus uses a multi-step process in distinguishing between community or non-community banks. I contend the significant change that occurred in both bank consolidation and mortgage loan portfolio allocation in both community and non-community banks in the extant research limits potential insight into the loan specialization effect of bank consolidation on mortgage loan activity. By analyzing all bank consolidations regardless of size of either community or non-community banks and the changes in mortgage loan portfolio specialization, as measured by mortgage loan growth to total assets, current FDIC data supports the declining specialization trend of 1-4 family residential mortgages to total loans across various bank sizes. With the inclusion of 6,519 reporting institutions in 2010 compared to 4,518 in 2019¹⁶, the proportion of 1-4 family residential mortgages to total loans declined from 33.2 to 23.5 percent across all sizes

¹⁶ <https://banks.data.fdic.gov>

of U.S. banks. As reflected in the aforementioned Peek and Rosengren (1998) study on proportions of small business lending to total asset variations pre- and post-consolidation, the authors observed a strong negative correlation between the size of a bank's total assets and its portfolio specialization of business loans. The shift toward greater loan specialization may reflect the utilization of common merger related theories such as the efficiency and focusing hypotheses designed to increase the combined value of merging banks. Berger and Humphrey (1992) found that large bank acquirers are likely to be more efficient than their target and thus motivated to improve the target's efficiency to increase a bank's combined value. In addition, focusing hypothesis suggests that banks with similar focus would create more value by concentrating on a narrow area of expertise or specialization as concluded by DeLong (2003).

I contend that as banks consolidate thus creating a larger asset-based entity, the acquiring bank will recast the target's portfolio share of mortgage loans to total assets in the acquirer's image potentially creating a credit lending gap. The implication of this from a credit gap perspective is that if the acquiring banks maintain a lower mortgage loan allocation or specialization as compared to the targets, a decrease in mortgage originations post consolidation will likely result as found in the Peek and Rosengren (1998) small business loan study. Thus, I propose:

Hypothesis 4: If the acquirer has a greater (lower) percentage of mortgage loans than the target pre-consolidation, the percentage of mortgage loans will be greater (lower) than the post-consolidation combined bank average.

Geographic expansion of bank assets is thought to improve cost-efficiencies and reduce risk through the economic diversity of metropolitan statistical areas (MSA) or local market risks. MSAs are defined by the Office of Management and Budget and include geographical areas that

contain a core urban area of 50,000 or more inhabitants. In particular, Goetz et al. (2014) found that bank holding companies that incorporate a geographical diversity leveraged MSAs with different industrial structures and business cycles lowered corporate risk while maintaining consistent loan quality as measured by increased loan loss provisions, nonperforming loans, or loan charge-offs which are indicators of bank fragility. In contrast, research by Berger and De Young (2001) suggested that there were both positive and negative links with bank geographical scope. Banks that expanded into nearby states and regions benefited from higher levels of efficiency especially with small banks with less than \$100 million in assets. In both studies the focus was on operational efficiency and not the underlying impact to credit availability. Yet, a study by Rosen (2011) examined how lender competition affects the profile of bank loans made by using denial rate as a proxy for aggregate riskiness of loans with lower denial rate in various counties potentially indicating higher loan or borrower risk. The findings supported an increasing denial rate amongst local banks from a rate of 12 percent of applicants to 19 percent prior to the 2008 economic crisis in comparison to other mortgage lenders, non-local banks (banks that do not have branches in the local market) and independent mortgage banks (IMB), that saw their denial rates drop from 40 percent to slightly above 25 percent. Stated another way, non-local banks and IMBs change in approval of mortgage application increased while local banks decreased mortgage loan approvals over the same period. The caveat to the denial rates across lenders is potential differences in applicant quality and variation in the types of mortgages. While mortgage loan denial rates increased for the local banks and decreased for non-local banks, the denial rate for mortgage applications remains higher for non-local banks, suggesting that fewer local banks, as a product of consolidation may make access to mortgage loans more difficult for the consumer.

Lastly, research by Jagtiani and Maingi (2018) investigating the geographic expansion of locations as a result of a bank consolidation and the effect on small business lending finds the “overall impact of community bank mergers depends significantly on where the acquirers and the targets had operations in before consolidation. It supports the conventional belief that there would be an adverse impact on credit availability to the local small businesses in counties where community banks are acquired by large banks”, in particular, target banks that operated outside an acquirer’s county. The results indicate that small business loan activity increased in counties that acquirers operated in prior to consolidation, however offset by a decline in loan activity in counties of the target bank. Based on the aforementioned research, it appears that there is a location effect related to bank consolidation that could potentially impact the availability of loans post-consolidation. I speculate that target consolidated banks that were not located in the same county as the acquiring bank will reduce the availability of mortgage loans post-consolidation similar to the phenomenon encountered by small business loans described by Jagtiani and Maingi (2018). Thus, I propose:

Hypothesis 5: There will be greater number of mortgage loan originations post-consolidation in counties where the acquirer has headquartered operations pre-consolidation while there will be fewer mortgage loan originations in counties where the target but not the acquirer had headquartered operations pre-consolidation.

Hypothesis 6: There will be greater aggregate mortgage origination amounts post-consolidation in counties where the acquirer has headquartered operations pre-consolidation while there will be lower aggregate mortgage origination amounts in counties where the target but not the acquirer had headquartered operations pre-consolidation.

IV. EMPIRICAL METHODOLOGIES AND RESEARCH DESIGN

IV.1 Data sources

The data sample will be extracted from three datasets: FDIC organizational structural changes, quarterly bank call reports, and HMDA data on home mortgage loan originations for the period **beginning 2011 and ending 2018**. The size of the three datasets varies significantly providing for the breadth and depth of a robust event analysis. For example, over the eight-year period of study, 3,494 instances of bank consolidations occurred, while in a typical year, 6,876 banks disclose call report data associated with 6,177,475 home mortgage loans. Further, my research on mortgage lending relies on (1-4 family) residential property data, which differs from the research of Peek and Rosengren (1998) and Jagtiani and Maingi (2018) that focused on small business lending. The use of (1-4 family) residential data, a homogeneous category of credit, helps to circumvent the problems associated with shifts in demand across different credit lending described by Dagher and Kazimov (2012).

The first dataset is extracted from the FDIC historical bank archive that includes organizational structural changes of banks. The structural changes reflect the creation of new institutions, business combinations (consolidations), interim mergers, reorganizations, conversions, title changes, main office relocations, and branch office openings and closings. The focus of the research will be on the FDIC bank archival data specific to business combinations (consolidations). Thus, for the purpose of my study, the analysis will exclude the structural data containing the creation of new institutions, interim mergers, reorganizations, conversions, title changes, main office relocations, and branch office openings and closings.

The second data source is also from the FDIC which provides quarterly bank call reports containing financial documentation required by regulatory bodies that includes data such as total assets, loan portfolios, number of branches, and bank locations similar to the small business lending data collected by Jagtiani and Maingi (2018).

The third data set pertains to mortgage loan data that is maintained by the federal financial institutions examination council (FFIEC). The council is an interagency body that includes the federal reserve board (FRB), federal deposit insurance corporation (FDIC), national credit union administration (NCUA), office of the comptroller of the currency (OCC), and the consumer financial protection bureau (CFPB). The FFIEC archives data are populated through the home mortgage disclosure act (HMDA) of 1975 which contains loan amounts by individual by year by institution and by county. The HMDA data for the period of 2011 through 2018 contains over one million records for each period. The data set includes fifty-five data fields, and of interest to my study are the following nine data fields: `As_of_year` (year of mortgage origination), `respondent_id` (unique bank id), `property_type_name` (one-to-four family dwelling), `property_type` (code of 1 representing one-to-four family dwelling), `loan_amount_000` (loan origination amount in thousands), `action_take_name` (loan originated), `action_taken` (loan originated code of 1). The three datasets will be merged using three criteria in common that include: acquirer and target name, address, and zip code for banks that were consolidated. Banks not consolidated, will rely solely on HMDA data that contains bank name, address, zip code, and relevant loan data. Since there is not a common bank id across the three data sets, there is a potential of excluding an observation due to misspellings. To mitigate the potential loss of observations, a three criteria approach that includes name, address, and zip code will be applied

to merged data sets. Thus, the combination of the three datasets provides a robust sample size of public data to test the relationships between bank consolidations and mortgage originations.

IV.2 Empirical Design

To test each of the hypotheses, I will be using an event-panel regression framework with the dependent variable expressed as the change in the variable of interest from the post-consolidation calendar year $t+1$ to pre-consolidation calendar year $t-1$. The regression will be estimated over all consolidated banks and non-consolidated banks. Consolidating banks will be included only if they were not involved in another consolidation in years $t-3$ to $t-1$ or subsequently in years $t+1$ to $t+3$ where t is the calendar year of consolidation. A similar restriction will be imposed on non-consolidating banks. These restrictions are imposed to ensure that the effects being measured are for the consolidation event in question. The dependent variable will be regressed on a dummy variable indicating whether the bank was subject to consolidation and a number of control variables. For the first three hypotheses, I will be using the same basic regression model though the dependent variable will be different:

$$(1) \Delta y_{i,(t+1)-(t-1)} = \beta_0 + \beta_1 \text{consol}_{i,t} + \beta_2 \text{prof}_{i,t-1} + \beta_3 \text{banksiz}_{i,t-1} + \text{calendar year fixed effect} + \varepsilon_{i,t}$$

$\Delta y_{i,(t+1)-(t-1)}$ is the dependent variable of interest and varies with the hypothesis. It is the change in the variable of interest, e.g., in hypothesis 1 it is the number of mortgage loans in the post-consolidation calendar year $(t+1)$ minus the corresponding number of mortgage loans originated in the pre-consolidation calendar year $(t-1)$ on a “consolidated” basis. Banks that did not consolidate serve as the treatment firms. The consol_i independent variable is defined as a dummy variable coded as 1 for “yes” and 0 for “no” in the event a bank consolidation occurred

in year t . In line with the research of Jagtiani and Maingi (2018), my regression models include control variables: prof_{it-1} , bank profitability measured by net income/ total assets and banksiz_{it-1} measured by total assets, both measured as of $t-1$. In addition, I include a calendar year fixed effect, $\text{calendaryearfixedeffect}$, to control for any time trend changes in the dependent variable.

As noted, the dependent variable differs depending on the hypothesis being tested.

For Hypothesis 1 the dependent variable is:

$$\Delta y_{n,i} = (y_{n,t+1} - y_{n,t-1})_i$$

defined as the change in the quantity of home mortgage loans originated post-consolidation $y_{n,t+1}$ period less the quantity of home mortgage loans at origination pre-consolidation $y_{n,t-1}$ by bank $_i$ where y_n equals the quantity of home mortgage loans.

For Hypothesis 2 the dependent variable is:

$\Delta y_a = (\sum y_{a,t+1} - \sum y_{a,t-1})_i$ describes the change in the aggregate home mortgage loan amount at origination post-consolidation period $\sum y_{a,t+1}$ less the aggregate home mortgage loan amount pre-consolidation period $\sum y_{a,t-1}$ by bank $_i$ where y_a equals mortgage loan amount.

For Hypothesis 3 the dependent variable is:

$\Delta y_{a/n} = ((\sum y_{a,t+1} / y_{n,t+1}) - (\sum y_{a,t-1} / y_{n,t-1}))_i$ describes the change in the per mortgage loan amount at origination post-consolidation period less the per mortgage loan amount at origination pre-consolidation where y_a equals mortgage loan amount and y_n equals the quantity of home mortgage loans.

To test hypothesis 4, I estimate the following regression equation (2) that is similar to equation (1) with the exception of a different dependent variable, $\Delta y_i \text{ percent}_{(t+1)-(t-1)}$. Also included is an additional interactive dummy variable between *consol* and *special*. Where *special* is a dummy variable that indicates 1 or “Yes” if the ratio of mortgage loans to total loans pre-consolidation is greater for the acquiring bank compared to the ratio of the target bank, otherwise the dummy variable indicates 0 or “No”.

$$(2) \Delta y_i \text{percent}_{(t+1)-(t-1)} = \beta_0 + \beta_1 \text{consol}_{i,t} + \beta_2 \text{prof}_{i,t-1} + \beta_3 \text{banksiz}_{i,t-1} + \beta_4 (\text{special}_i * \text{consol}_i) + \text{calendaryearfixedeffect} + \varepsilon_{i,t}$$

The dependent variable for hypothesis 4 is defined as: $\Delta y_i \text{ percent} = (\sum \text{Consolidated bank's mortgage loan amount} / \text{Total assets})_{i,t+1} - (\sum \text{combined banks mortgage loan amount} / \text{Total assets})_{i,t-1}$. The dependent variable describes the proportion of a bank's aggregate mortgage loan amount originated to its total loan portfolio post-consolidation and pre-consolidation.

Regression model (3) will be applied to hypotheses 5 and 6 but will differ in the use of the following two dependent variables in addition to an interaction dummy variable between *consol* and *bankcounty* to address the potential effects of locations of both acquiring and target banks during a consolidating event. If the target and acquiring banks are headquartered in the same county prior to consolidation, 1 indicates “yes” and 0 indicates “no”.

$$(3) \Delta y_{i,(t+1)-(t-1)} = \beta_0 + \beta_1 \text{consol}_{it} + \beta_2 \text{prof}_{i,t-1} + \beta_3 \text{banksiz}_{i,t-1} + \beta_4 (\text{bankcounty}_i * \text{consol}_i) + \text{calendaryearfixedeffect} + \varepsilon_{it}$$

For Hypothesis 5 the dependent variable is:

$$\Delta y_{n,i,(t+1)-(t-1)} = (y_{n,t+1} - y_{n,t-1})_i$$

defined as the change in the quantity of home mortgage loans originated post-consolidation $y_{n_{t+1}}$ period less the quantity of home mortgage loans at origination pre-consolidation $y_{n_{t-1}}$ by bank_i where y_n equals the quantity of home mortgage loans.

For Hypothesis 6 the dependent variable is:

$\Delta y_a = (\sum y_{a_{t+1}} - \sum y_{a_{t-1}})_i$ describes the change in the aggregate home mortgage loan amount at origination post-consolidation period $\sum y_{a_{t+1}}$ less the aggregate home mortgage loan amount pre-consolidation period $\sum y_{a_{t-1}}$ by bank_i where y_a equals mortgage loan amount.

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