Effect of Bank Mergers on the Price and Availability of Mortgage Credit*

Dimuthu Ratnadiwakara† Vijay Yerramilli‡

February 2024

Abstract

Banks which gain large local market shares through acquisitions increase approval rates for conventional mortgage applications but increase rejection rates for the relatively riskier FHA mortgage applications in the post-acquisition period; and the increase in FHA rejection rate is stronger for low-income and minority applicants. Acquiring banks also charge higher interest rates on high-risk non-agency mortgages after the acquisition, but not for conforming mortgages sold to government-sponsored entities. Notably, we find no evidence of a reduction in mortgage rates due to merger efficiency gains. Overall, our results indicate that the effect of bank mergers on the price and availability of mortgage credit vary significantly by borrower risk, income, and race.

(JEL G21, G34)

*We thank Sumit Agarwal, Radha Gopalan, Ali Hortaçsu, Chad Syverson, and seminar participants at Louisiana State University, University of Houston, University of Texas at El Paso, and Wilfrid Laurier University for their helpful comments on issues examined in this paper. All errors are our responsibility.

†E. J. Ourso College of Business, Louisiana State University; email:dratnadiwakara2@lsu.edu

‡C. T.Bauer College of Business, University of Houston; email:vyerramilli@bauer.uh.edu

Introduction

The price and availability of mortgage credit can have significant implications for household wealth because housing accounts for a sizeable portion of household balance sheets.[1] Because bank mergers increase the local market shares of acquiring banks and reduce competition, policymakers and consumer advocates fear that bank mergers will lead to higher mortgage rates for borrowers, and worsening of mortgage credit access for low-income borrowers and borrowers in under-served communities. These fears have recently prompted some bank regulators and members of Congress to call for greater scrutiny of bank mergers.[2] Yet, there is not much empirical evidence on how banks change their mortgage lending policies after gaining market share through acquisitions. This is the question we examine in this paper.

The effects of bank mergers on the price and availability of mortgage credit are not obvious a priori. Mortgage lending mostly occurs through a search and negotiation process between local lenders and individual borrowers. Therefore, the concerns of policymakers and consumer advocates sound plausible because acquiring banks which have significant local market overlap with their target banks may use their enhanced market power to raise mortgage rates after the acquisition. Moreover, if smaller banks specialize in lending to more opaque and risky borrowers (Berger, Miller, Petersen, Rajan, and

[1] Using data from the Federal Reserve Board's Survey of Consumer Finances, Bricker, Moore, and Thompson (2019) show that housing accounted for 60 percent (30 percent) of asset portfolio for the median (average) household in 2016.

[2] In December 2021, there was a public clash between the Democratic and Republican appointed board members at the Federal Deposit Insurance Corporation (FDIC), with the former calling for greater scrutiny of how bank acquisitions could affect the government's efforts to promote financial stability and protect consumers. Moreover, the House Financial Services Committee Chair Maxine Waters requested a moratorium– until the regulatory review is completed– on the approval of mergers that would result in a bank holding above $100 billion of assets. Please visit https://www.americanbanker.com/news/big-bank-mergers-face-new-scrutiny-amid-washington-power-struggle for more details.

Stein (2005)), then bank mergers which swallow up smaller banks may worsen access to mortgage credit for low-income borrowers and borrowers in under-served communities. Indeed, D'Acunto and Rossi (2022) document that larger US banks have been restricting access to mortgage credit disproportionately for lower-income US households after the passage of the Dodd-Frank Act. On the other hand, the increase in scale through mergers may also lead to improvements in operating efficiency. Most banks still rely on brick-and-mortar branch networks for mortgage lending, which may lead to economies of scale for the merged entity. Large banks may also be able to invest in digital technology to compete more effectively with fintech lenders.[3] If the acquiring bank faces competition in the local market, it may pass on some of these efficiency gains to borrowers in the form of lower mortgage interest rates. Hence, the overall effect of bank mergers on the price and availability of mortgage credit are theoretically ambiguous. Indeed, the literature finds mixed evidence on whether bank mergers hurt or benefit other bank customers, such as depositors and borrowers of commercial loans (see Section 1 for details).

We examine these questions empirically using a large sample of mergers involving lenders that are active in the US residential mortgage market. Most of the lenders are banks but there are a few non-banks that were acquired by banks in the sample; we collectively refer to these as banks for convenience. We focus on bank mergers that occurred after 1995 because the coverage of our interest rate data begins in 2000. We define local market at the level of the core-based statistical area (CBSA), which comprises one or more counties that are anchored by and socioeconomically linked to an urban center. To ensure that we are focusing on multi-market mergers that are not driven by demand conditions

[3]See the article titled "5 ways mortgages will shape the BB&T and SunTrust merger" at https://www.nationalmortgagenews.com/list/5-ways-mortgages-will-shape-the-bb-t-and-suntrust-merger.

in any individual local market, we restrict attention to mergers in which the target bank was active (i.e., had at least a 1% market share) in at least 5 CBSAs in the year prior to the merger. For each merger, we compute the market share gained by the acquiring bank in each CBSA using data on approved mortgages from the Home Mortgage Disclosure Act (HMDA) database, which records the vast majority of home mortgage applications and approved loans in the United States. This serves as our measure of increase in local market power. On the other hand, we hypothesize that efficiency gains from mergers operate at the bank level, and depend on the nationwide gain in market share from acquisitions.

For each merger, there is substantial variation across CBSAs in the market share gained by the acquiring bank, due to the variation in the target's market shares across CBSAs prior to the merger. We exploit this variation to conduct an event study to examine how the mortgage lending policies of banks in any given local market change in response to the local market shares they gain through acquisitions, all else equal. The key identifying assumption is that the variation in local market share gained across CBSAs is not driven by local demand conditions in those CBSAs, which we believe is a reasonable assumption given our focus on multi-CBSA mergers. Apart from the standard set of borrower- and loan-level controls, we include granular fixed effects to control for unobserved heterogeneity in bank lending policies across local markets and over time. We use the nationwide gain in market share to proxy for the effects of efficiency gains or cost synergies from the merger because these are likely to arise at the bank level. We also distinguish between short- and long-run effects because past literature highlights that the effects of mergers vary over time (Kim and Singal (1993) and Focarelli and Panetta (2003)).

We find that the effect of bank mergers on the likelihood of mortgage loan approval varies significantly between conventional mortgages and Federal Housing Administra-

tion (FHA) mortgages, which are more likely to be sought by borrowers with lower incomes and lower credit scores than the borrowers of conventional mortgages. Specifically, banks which gain larger local market shares through acquisitions are ceteris paribus more likely to reject FHA mortgage applications in the post-acquisition period, and this effect is stronger for low-income applicants and minority (i.e., Black and Hispanic) applicants. On the other hand, they are more likely to approve the relatively safer conventional mortgage applications in the post-acquisition period, although this effect is weaker for low-income applicants and minority applicants. These results are consistent with the evidence in D'Acunto and Rossi (2022) that, after 2011, larger US banks have been restricting mortgage credit access disproportionately for lower-income US households. One potential explanation for these results is that lending to low-income borrowers and minorities requires generation of soft information, and these capabilities are lost when smaller targets are integrated into larger acquiring banks (see Berger et al. (2005)). An important caveat is that we are unable to control for differences in credit scores and loan-to-value ratios across borrowers categorized by income and race/ethnicity, because HMDA data do not provide this information during our sample period. However, we note that the adverse effects for minority applicants are present for both high-income and low-income applicants; moreover, quite tellingly, the adverse effects for high-income minority applicants are generally similar in magnitude to those of low-income non-minority applicants.

We have interest rate information only for mortgages that are sold either to Fannie Mae and Freddie Mac ("agency mortgages") or to private securitizers ("non-agency mortgages"); and we focus our analysis on the standard 30-year, fully amortizing. fixed-rate mortgages. We find that banks which gain large local market shares through acquisitions charge significantly higher interest rates on high-risk non-agency mortgages in the

post-acquisition period: the effect is strongest for subprime loans, which are the riskiest category of non-agency loans, followed by Alt-A loans, which are the second riskiest category. The corresponding effect for prime loans sold to private securitizers is relatively modest, whereas the increase in interest rate for conforming mortgages sold to Fannie Mae and Freddie Mac is economically insignificant. The contrasting results for agency and non-agency mortgages suggests that lenders' market power increases with borrower risk. Unlike some previous research from other banking markets (Sapienza (2002); Focarelli and Panetta (2003); Erel (2011)), we do not find any significant evidence of efficiency gains being passed on to borrowers in the form of lower mortgage rates. Indeed, interest rates on non-agency mortgages also increase with the nationwide market share gained by the bank through acquisitions.

The effect of bank mergers on mortgage loan amounts also varies significantly across borrower risk categories. In the non-agency mortgage market, banks which gain large local market shares through acquisitions lend larger amounts to borrowers of prime loans and Alt-A loans, but lend smaller amounts to subprime borrowers in the post-acquisition period. By contrast, the gain in a bank's local market share through acquisitions has no significant effect on the amount it lends to borrowers of conforming mortgages sold to Fannie Mae and Freddie Mac.

To summarize, our results carry important implications for the effect of bank mergers on the price and availability of credit in the residential mortgage market. First, the effects of bank mergers on access to mortgage credit vary based on borrowers' income and race/ethnicity. Second, the effects on the price and amount of mortgage credit vary substantially across borrower risk categories. Borrowers who qualify for agency mortgages face minimal impacts. At the other extreme, subprime borrowers face large increases in

interest rates and decrease in the quantity of mortgage credit. Alt-A borrowers who fall between these two extremes benefit from higher loan amounts but also have to pay higher interest rates. Importantly, we do not find any significant evidence that acquiring banks pass on efficiency gains from mergers to borrowers in the form of lower interest rates.

1. Related Literature

Evidence from the banking industry: The extant literature on bank mergers has found mixed evidence on whether bank mergers benefit or hurt bank customers, i.e., depositors and borrowers. There are several papers which highlight the adverse effects of bank mergers, such as: decrease in deposit rates (Prager and Hannan, 1998; Liebersohn, 2017); increase in interest rates on commercial loans, diminished local construction and higher property crime (Garmaise and Moskowitz, 2006); decline in commercial lending due to termination of bank-borrower relationships (Fraisse, Hombert, and Lé, 2018); and decline in small business lending (Nguyen, 2019).

On the other hand, there are also several papers which highlight that the efficiency gains from bank mergers may benefit bank customers under some conditions. Focarelli and Panetta (2003) show that although in-market bank mergers in Italy lead to a decrease in deposit rates in the short run, they lead to an increase in deposit rates in the long run once the efficiency gains from the merger are realized. Sapienza (2002) shows that in-market bank mergers in Italy lead to a reduction in interest rates (i.e., benefit borrowers) if the acquired bank had a small market share. Similarly, Erel (2011) finds that, on average, US bank mergers reduce loan spreads on commercial and industrial (C&I) loans, which suggests that the efficiency gains effect outweighs the market power effect.

A related literature examines the effects of bank market concentration (e.g., Berger and Hannan, 1989; Bustamante and D'Acunto, 2021; Scharfstein and Sunderam, 2016). More closely related to our focus on the residential mortgage market, Allen, Clark, and Houde (2013) find that increase in mortgage lender concentration in Canada reduces dispersion of mortgage rates but does not lead to rate increases for the average buyer. Similarly, using a post-2018 extract of HMDA which has information on upfront fees charged to borrowers, Buchak and Jørring (2021) find that mortgage lender concentration has no effect on mortgage interest rates (also see Amel, Anenberg, and Jorgensen, 2018) but has a positive effect on upfront fees and mortgage rejection rates.

Our paper differs from these papers in two important respects. First, we examine the effect of local market share gained through acquisitions on the acquiring bank's policies *within* the same local market after controlling for demand conditions through granular fixed effects, whereas Allen et al. (2013) and Buchak and Jørring (2021) examine the relation between concentration and mortgage interest rates (and fees and credit access) *across* markets. Second, our analysis highlights the effects of a series of large bank mergers during the 1995–2010 period, which is arguably the most important period of consolidation in the US banking industry. By contrast, Allen et al. (2013) examine the effects arising from a single large merger in Canada; and we note that their interest rate results are similar to the insignificant interest rate increase we find in case of conforming mortgages in the US. Similarly, given their focus on origination fee, the analysis in Buchak and Jørring (2021) is based on the post-2018 period for which HMDA data provide information on upfront fees charged to borrowers.

Evidence from the non-financial sector: The extant literature generally finds that *horizontal mergers* lead to higher prices for consumers in a variety of non-financial industries, such as the airline industry (Borenstein, 1990; Kim and Singal, 1993; Kwoka and Shumilkina, 2010), consumer products industry (Ashenfelter and Hosken, 2010), and the healthcare sector (Gowrisankaran, Nevo, and Town, 2015). In the healthcare sector, Eliason, Heebsh, McDevitt, and Roberts (2020) also provide evidence of worsening patient care following acquisitions of independent dialysis centers by larger chains.

However, the evidence regarding the effects of *vertical mergers* on consumer prices is mixed. For instance, in the gasoline market, some studies find evidence of significant increases in retail and wholesale prices following vertical mergers (Hastings, 2004; Hastings and Gilbert, 2005), while others find no significant effects (Simpson and Taylor, 2008; Taylor, Kreisle, and Zimmerman, 2010). There is evidence that efficiency gains created by vertical mergers lead to lower consumer prices in the cement industry (Hortaçsu and Syverson, 2007), but other studies find that they lead to both price decreases and prices increases at multi-product firms (Luco and Marshall, 2020) and lead to market foreclosures in the cable television industry (Chipty, 2001).

2. Data

2.1. Mortgages

Mortgage applications: We obtain information on mortgage applications from the Home Mortgage Disclosure Act (HMDA) database which records the vast majority of home mortgage applications in the United States, and includes information on both approved and rejected loans. The extract of HMDA that we use spans the time period from

2000 to 2017. The database provides, among other things, the application outcome (i.e, whether the loan was approved), the loan type and purpose, loan amount, year, originator's identity, the county in which the property is located, and the applicant's self-reported income and race/ ethnicity. HMDA database also records whether the originator retains the loan on its balance sheet or sells the loan within one year to a third party. A significant limitation of this database if that, during our sample period, it does not provide information on interest rate, borrower credit scores, loan-to-value ratio, or documentation status.

As noted above, we define local market at the level of the CBSA, which is a geographic unit made up of one or more counties anchored by an urban center with which they are socioeconomically linked. We map the county reported in HMDA to its corresponding CBSA, and use the approved mortgages in HMDA to compute lender market shares at the CBSA-year level. We are unable to compute segment-specific market shares based on borrower or loan risk characteristics (e.g., prime versus subprime loans) because HMDA database does not provide this information.

We provide descriptive statistics for the HMDA mortgage application data in Table 1, separately for conventional loans (Panel A) and FHA loans (Panel B), and separately for refinancing applications and new purchase applications within each panel. The indicator variable *Approved* identifies applications that are approved. Comparing panels A and B, it is evident that, on average, borrowers of FHA loans have significantly lower incomes and borrow lower amounts than borrowers of conventional loans.

We create the following indicator variables to capture the applicant's self-reported race/ethnicity which is available for the post-2004 period:[4] *White* for applicants who

[4]Applicants may choose to not provide any information on race or ethnicity, or they have to choose among five categories for race (American Indian or Alaska Native, Asian, Black or African American, Na-

identify their race as "White" but do not identify as "Hispanic or Latino" by ethnicity; *Black* for applicants who identify their race as "Black or African American" but do not identify as "Hispanic or Latino" by ethnicity; *Hispanic* for applicants who identify as "Hispanic or Latino" by ethnicity regardless of race; *Asian/Other* to identify Asian and all other race/ethnicity categories; and *Not Provided* to identify applicants that do not provide information on race/ethnicity. In Panels A and B, it is clear that FHA applicants are more likely to be Black and Hispanic compared to applicants of conventional loans.

Mortgage interest rates: We combine and use several data sets for loan-level information on mortgages. We obtain information on mortgage interest rates only for mortgages that are sold either to the two major government-sponsored entities (GSEs), Fannie Mae and Freddie Mac, or to private-label securitizers; but we do not have this information for mortgages held on bank balance sheets. During our sample period, we also do not have interest rate information for FHA mortgages.

Fannie Mae and Freddie Mac single-family loan-level data sets: We use these data sets to obtain origination information on agency mortgages sold to these two government sponsored entities (GSEs). We restrict our sample to 30-year, fully amortizing, full documentation, single-family, conforming fixed-rate mortgages that are the predominant conforming contract type in the US. These loan-level data sets provide detailed information on a rich array of loan, property, and borrower characteristics for loans acquired between January 1, 2000, and the end of 2018. In particular, we observe the interest rate on the loan, loan amount, the combined loan-to-value ratio, the borrower's FICO score and debt-to-income, whether it is a refinance or a new purchase, whether the property is the bor-

tive Hawaiian or Other Pacific Islander) and two categories for ethnicity (Hispanic or Latino, Not Hispanic or Latino).

rower's primary residence, and the CBSA and the 3-digit Zip code (henceforth, "Zip3") in which the property is located.[5] Importantly for our purpose, each data set provides information on the originator's identity for originators with at least a 1% market share (by loan amount) in the data set during the calendar quarter; otherwise, the originator's name is set to "Other sellers". Combining the Fannie Mae and Freddie Mac data sets gives us coverage of the majority of conforming loans issued in the United States during the period of our study.

We provide descriptive statistics separately for the Fannie Mae and Freddie Mac loan-level data sets in Panels A and B of Table 2. As expected, the loans in these two samples are very similar in terms of interest rate, FICO and combined loan-to-value (which is evaluated using all secured loans on a property), because both these GSEs buy 30-year, full documentation, conforming fixed-rate mortgages. Fannie Mae buys mortgages from large retail banks, whereas Freddie Mac buys them from smaller banks and thrifts, which may explain why the debt-to-income and interest rate are marginally higher in the Freddie sample.

Moody's Analytics loan-level data set: We use this data set to obtain origination information on non-agency mortgages that were sold to private securitizers. Non-agency mortgages cannot be sold to Fannie Mae or Freddie Mac because they do not meet the criteria set by these agencies: e.g., jumbo loans do not conform to loan amount thresholds, subprime loans do not conform to FICO requirements, low-doc and no-doc loans do not conform to full documentation requirements, and non-standard products like adjustable rate mortgages, interest-only loans, and 40-year loans. Therefore, these mortgages carry higher

[5]GSE datasets only identify CBSAs that are metropolitan areas (urban areas of 50,000+ population and nearby counties integrated with the core city), while micropolitan areas are represented as '0' or 'null'. Around 89% of the mortgages in GSE datasets are associated with metropolitan areas.

interest rate, on average, because of higher risk and lower liquidity. For our analysis, we only use information on 30-year, fully amortizing, fixed-rate mortgages from the Moody's data. That is, we exclude non-standard products such as adjustable-rate mortgages and interest-only mortgages because the interest rate at origination does not reflect the true price of these products.

The loans in the Moody's data set were originated and sold between January 1, 2000 and the end of 2007, when the private-label securitization market collapsed with the onset of the financial crisis. Apart from the loan, property and borrower characteristics provided by the Fannie Mae and Freddie Mac data sets, the Moody's data set also has identifiers for full documentation, Alt-A and subprime loans. However, unlike the Fannie Mae and Freddie Mac data sets, the Moody's data set provides the 5-digit Zip code but not the CBSA in which the property is located. We use the ZIP-CBSA crosswalk file obtained from the HUD-USPS ZIP Crosswalk files website to match Zip codes to CBSAs. If a Zip code matches with more than one CBSA (6,980 out of 39,491 Zip codes), we use the CBSA with the highest share of the population in that Zip code.

We provide descriptive statistics for the Moody's sample in Table 3. We stratify the Moody's sample into prime (Panel A), Alt-A (Panel B), and subprime (Panel C) loans using the classification provided by the Moody's Analytics Data. As expected, subprime loans have the lowest FICO scores and highest interest rates, followed by Alt-A loans. Moreover, depending on the subsample, only around 40% to 55% of loans in the Moody's sample are full-documentation loans.

2.2. Bank Mergers

We obtain information on bank mergers from the "Transformations" data available on the Federal Reserve System's National Information Center website.[6] For each merger, we use the Summary of Deposits data to identify the top holding companies of both the non-surviving and surviving entities and bank holding companies with branches in at least 3 counties.[7] Following Garmaise and Moskowitz (2006), we select mergers classified as 'Merger or Purchase & Assumption' (TRNSFM_CD=1) and exclude mergers within the same high holding company. To identify acquisitions of non-bank mortgage lenders, we rely on Google searches using the names of the 20 largest banks together with the following keywords: merge, merger, acquisition, and acquired. We focus on mergers that occurred after 1995, i.e., five years before the coverage of our interest rate data begins. We identify 317 mergers, out of which 5 involve a non-bank lender as the target.

We used the HMDA lender file constructed by Robert Avery to match the Federal Reserve Board Entity number (RSSD ID) of the bank holding company in the Transformations data with the unique lender identifier in HMDA data.[8] In the case of non-bank lenders, we use manual name-matching to identify the corresponding lenders in the HMDA data set. To ensure that the acquisition is plausibly exogenous at the level of any individual CBSA, we restrict attention to mergers in which the target had 1% or greater market share in at least 5 CBSAs in the year before the merger. The final restriction eliminates a few single-CBSA acquisitions and other small acquisitions that may have been driven by market conditions in specific CBSAs. After imposing these restrictions, we are

[6] See https://www.ffiec.gov/npw/FinancialReport/DataDownload.
[7] See https://www.fdic.gov/resources/bankers/call-reports/call-summary-of-deposits.html.
[8] See https://sites.google.com/site/neilbhutta/data.

left with a sample of 103 mergers.

We list these 103 mergers in chronological order in Table IA.4 in the internet appendix. For each merger, we list the target bank's nationwide market share, the percentile distribution of CBSA market shares, and the number of CBSAs in which it operated in the year prior to the merger (to conserve space, we do not report this information for the acquiring bank). The percentile distribution of the target's CBSA market shares highlights that, in each merger, there is substantial variation in local market share gained by the acquiring bank across CBSAs. Moreover, the distribution of local market share gained by the acquirer is highly skewed, as evidenced by the fact that the $90^{th}-$percentile market share is often several times larger than the target's nationwide market share. For example, when we examine the first merger in the table, Wells Fargo gained a nationwide market share of only 0.21% when it acquired First Interstate Bank in 1996, but in one-tenth of the CBSAs its local market share gain exceeded 3.45%. As we explain in Section 3 below, we exploit this variation in market share gained across local markets to identify the effects of bank mergers on the likelihood of loan approval (i.e., the extensive margin of credit availability).

In order to examine the effect of bank mergers on mortgage interest rates and loan size (i.e., the intensive margin of mortgage credit availability), we have to rely on a much smaller subset of bank mergers in which the acquiring bank is also identified on the Fannie Mae & Freddie Mac data sets and/or the Moody's data set. Recall that the Fannie Mae & Freddie Mac data sets provide information on the originator's identity only for originators with at least a 1% nationwide market share (by loan amount) in the agency securitization market. When combined with the requirement that the target has 1% or greater market share in at least 5 CBSAs in the year before the merger, we are left with 14

mergers that satisfy these requirements. We identify these in bold font in Table IA.4.

3. Empirical Methodology

3.1. Key Independent Variables

Bank mergers may enhance the local market power of the acquiring bank in the residential mortgage market. We measure this using the banks' gain in local (i.e., CBSA-level) market share in the mortgage market through acquisitions, where the market share is computed based on all approved mortgages in the HMDA data. To differentiate between the short-run and long-run effects of gain in market power (e.g., see Focarelli and Panetta, 2003), we construct two separate variables: (i) $MSAcq_{ikt}^{1-3}$, which denotes the market share gained by bank 'i' in CBSA 'k' through acquisitions conducted in the previous three years, $t-3$ to $t-1$ ("short-run"); and (ii) $MSAcq_{ikt}^{4+}$, which denotes the market share gained by bank 'i' in CBSA 'k' through acquisitions conducted in year $t-4$ or before going back to the year 1995 ("long-run"). We set $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$ equal to zero for banks that did not undertake any in-market acquisitions in CBSA 'k' during the respective time periods. Moreover, we set these variables equal to zero in case of acquisitions in which the acquiring bank had zero market share in the CBSA prior to the acquisition because there is no increase in market power for the bank-CBSA pair in such acquisitions; this is the case with 3% of observations in the HMDA sample, 5.4% of observations in the GSE sample, and 2.1% of observations in the non-agency sample.

To construct $MSAcq_{ikt}^{1-3}$, we identify all acquisitions conducted by bank 'i' in the previous three years, and compute the cumulative market shares of the acquired targets in CBSA 'k' just prior to the acquisition; $MSAcq_{ikt}^{4+}$ is defined along similar lines using ac-

quisitions conducted by the bank 4 years or more before the current year and going back to the year 1995. For example, JPMorgan Chase undertook two acquisitions in our sample: Bank One in 2004 and Washington Mutual in 2008. Therefore, for years 2005 through 2007, JPMorgan Chase's $MSAcq_{ikt}^{1-3}$ in each CBSA will equal Bank One's market share in that CBSA at the time of its acquisition. Similarly, for years 2009 through 2011, JPMorgan Chase's $MSAcq_{ikt}^{1-3}$ in each CBSA will equal Washington Mutual's market share in the CBSA at the time of its acquisition. In all other years, JPMorgan Chase's $MSAcq_{ikt}^{1-3}$ is set to zero because JPMorgan Chase did not undertake an acquisition in the previous 3 years. The $MSAcq_{ikt}^{4+}$ variable is constructed similarly but for a different look-back period.

We plot the distribution of nonzero values of $MSAcq_{ikt}^{1-3}$ in the form of a histogram in Figure 1, where the $Y-$axis denotes the number of observations at the bank-CBSA-year level. The distribution of $MSAcq_{ikt}^{1-3}$ is highly skewed because even in case of lenders that undertook acquisitions, the average target has a low market share in most CBSAs (as shown in Table IA.4). For example, even a prominent target like Washington Mutual with a nationwide market share of 3% had less than 1% market share in a quarter of the CBSAs.

We also define $Nationwide\ MSAcq_{it}^{1-3}$ and $Nationwide\ MSAcq_{it}^{4+}$ to denote the nationwide market share gained through acquisitions by bank 'i' in the previous three years (short-run) and in four years or more before the current year and going back to the year 1995 (long-run), respectively. We set these variables equal to zero for banks that did not undertake any acquisitions during the respective time periods. Intuitively, efficiency gains or cost synergies from acquisitions arise at the bank level, and depend on the nationwide gain in market share from the acquisitions. Hence, we will use $Nationwide\ MSAcq_{it}^{1-3}$ and $Nationwide\ MSAcq_{it}^{4+}$ as proxies for potential efficiency gains

in the short- and long-run period following the acquisitions. By contrast, $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$ serve as proxies for the bank's increase in local market power.

3.2. Regression Specification

We estimate variants of the following fixed effects regression to examine the short-run and long-run effects of gain in banks' market power through acquisitions on their mortgage lending policies:

$$\begin{aligned} y_{l,ikct} =& \alpha + \mu_t + \mu_i \times \mu_c + \beta \cdot MSAcq_{ikt}^{1-3} + \psi \cdot MSAcq_{ikt}^{4+} \\ &+ b \cdot Nationwide\ MSAcq_{it}^{1-3} + c \cdot Nationwide\ MSAcq_{it}^{4+} + \Gamma \cdot X_l + \varepsilon_{l,ikt} \end{aligned} \quad (1)$$

We first estimate the regression on mortgage application-level data from the HMDA, where the dependent variable y is a dummy to denote that the loan application was approved ($Approved$). The subscript 'l' denotes the loan application; subscripts 'k' and 'c' denote the corresponding CBSA and county, respectively; subscript 'i' denotes the bank; and subscript 't' denotes the year.

Note that regression (1) is effectively an event study in which the coefficient β captures the *within bank-county* effect of local market share gained through acquisitions by bank 'i' in CBSA 'k' on its likelihood of loan approval in the 3-year period following the acquisition, all else equal; ψ has a similar interpretation but for effects in the 4 years or more following the acquisition. The key identifying assumption is that the variation in $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$ across CBSAs is not driven by local demand conditions in those CBSAs. We believe that this is a reasonable assumption because our analysis is based on multi-market bank mergers (i.e, mergers in which the target was active in at least 5 CB-

SAs prior to the merger), and excludes single-market mergers. Although bank mergers are endogenous, in each merger, there is substantial $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$ across CBSAs due to the variation in the pre-merger local market shares of the target across CBSAs (see Table IA.4), which we exploit in our analysis.

Apart from a host of borrower and loan characteristics (X_l), we also control for $Nationwide\ MSAcq_{it}^{1-3}$ and $Nationwide\ MSAcq_{it}^{4+}$ because any efficiency gains or cost synergies from the mergers are likely to arise at the bank level and depend on the nationwide gain in market share for the acquiring bank. We include year fixed effects (μ_t) to control for the effect of common macroeconomic factors that may affect the mortgage market, and bank×county fixed effects ($\mu_i \times \mu_c$) to control for unobserved heterogeneity across bank-county pairs which may arise due to differences in the location-specific strategies of banks.[9]

We showed in Figure 1 that the distribution of gain in local market share is highly skewed. To test for the possibility that the effects of gain in local market share may be concentrated in the right tail of its distribution, we define the dummy variables $MSAcq_{ikt}^{1-3} > 75p$ and $MSAcq_{ikt}^{4+} > 75p$ to identify observations where $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$, respectively, exceed their $75^{th}-$percentile values conditional on being positive. We then estimate a variant of regression (1) after replacing $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$ with $MSAcq_{ikt}^{1-3} > 75p$ and $MSAcq_{ikt}^{4+} > 75p$, so that the omitted categories in this regression are low or zero values of $MSAcq_{ikt}^{1-3}$ and $MSAcq_{ikt}^{4+}$, respectively.

The other dependent variables we examine are: interest rate, and the natural logarithm of the loan amount ($Log(Amount)$). We employ the loan-level data sets from Fannie, Freddie, and Moody's Analytics for the interest rate regression because, unlike HMDA

[9]We obtain qualitatively similar results if we include bank×CBSA fixed effects instead of bank×county fixed effects.

data, these data sets provide interest rates for the subset of securitized mortgages. We also use the loan-level data sets for the loan amount analysis because they include information on loan-to-value ratio which allows us to control for the value of the residential property against which the mortgage is being issued. As we noted above, a drawback of these loan-level data sets is that they provide information on the originator's identity only for large securitizers. Hence, for the analyses of interest rate and loan amount, we have to rely on a smaller subset of bank mergers where the acquiring bank is identified in these loan-level data sets. Also, we use the 3-digit zipcode area instead of county for these tests because the loan-level data sets do not provide the county in which the property is located.

4. Empirical Results

4.1. Effect of mergers on mortgage application approval

We begin our analysis by examining the effect of bank mergers on the likelihood of loan approval for mortgage applications. Accordingly, we estimate regression (1) with $Approved$ as the dependent variable on mortgage application-level data from HMDA. The loan characteristics (X_l) we control for are: natural logarithm of the loan amount; natural logarithm of the applicant's income; and the $Refinance$ indicator. We also control for the acquiring bank's local market share. The results are presented in Table 4.

We present the baseline results in Panel A separately for conventional mortgage applications and FHA mortgage applications because the borrower profiles of these loan are very different; as we noted above, FHA loans are designed for low-to-moderate-income borrowers with lower credit scores and require a lower minimum down payment than

conventional loans. The positive and significant coefficients on $MSAcq^{1-3}$ and $MSAcq^{4+}$ in column (1) indicate that banks which gain larger local market shares through acquisitions are significantly more likely to approve conventional mortgage applications in both the short- and long-run period following the acquisition, all else equal. The coefficients on $MSAcq^{1-3} > 75p$ and $MSAcq^{4+} > 75p$ in column (2) indicate that the likelihood of approval for conventional mortgages increases by 1.2% (3.6%) when $MSAcq^{1-3}$ ($MSAcq^{4+}$) is in its top quartile, which is significant in comparison to the average approval probability of 69% for conventional loans.

In stark contrast, the negative and significant coefficients on $MSAcq^{1-3}$ and $MSAcq^{4+}$ in column (3) indicate that banks which gain larger local market shares through acquisitions are significantly less likely to approve FHA mortgage applications in both the short- and long-run period following the acquisition. The coefficients on $MSAcq^{1-3} > 75p$ and $MSAcq^{4+} > 75p$ in column (4) indicate that the likelihood of rejection for FHA mortgage applications increases by 1.4% (0.5%) when $MSAcq^{1-3}$ ($MSAcq^{4+}$) is in its top quartile, which is significant in comparison to the average rejection probability of 67% for FHA loans.

One potential concern could be that these results are driven by high-profile acquisitions of failed banks in the aftermath of the financial crisis; e.g., acquisition of Countrywide by Bank of America in 2009. To assuage this concern, we repeat our analysis after excluding the market share gains on account of mergers that happened during the 2008–09 period. That is, for example, we exclude the local market shares of Countrywide while computing $MSAcq^{1-3}$ for Bank of America in the years 2010 through 2012. As can be seen, the results in columns (5) and (6) are qualitatively similar to the baseline results in columns (1) and (3), respectively, but, as expected, the coefficients estimates are smaller

in magnitude.

Because FHA loans are designed for low-to-moderate-income borrowers, the contrasting results in columns (1) and (2) of Panel A suggest that banks which gain a large local market share through acquisitions are more likely to reduce lending to low-income borrowers. To test this hypothesis more directly, we define the indicator variable *Low Income* to identify applicants whose income is below the median income within the CBSA-year. We then repeat the regression after interacting $MSAcq^{1-3}$ and $MSAcq^{4+}$ with the *Low Income* indicator. The coefficients on these interaction terms represent the incremental effects of $MSAcq^{1-3}$ and $MSAcq^{4+}$ for low-income applicants relative to high-income applicants. The results are presented in columns (1) and (2) of Panel B for the conventional loan sample and the FHA loan sample, respectively.

The negative and significant coefficients on $MSAcq^{1-3} \times Low\ Income$ and $MSAcq^{4+} \times Low\ Income$ in column (1) indicate that the increase in approval rates for conventional mortgage applications by acquiring banks in both the short-run and long-run is weaker for low-income applicants. Interestingly, for the FHA sample in column (2), we find that the coefficients on $MSAcq^{1-3}$ and $MSAcq^{4+}$ are now positive (in contrast to the findings in column (2) of Panel A), whereas the coefficients on $MSAcq^{1-3} \times Low\ Income$ and $MSAcq^{4+} \times Low\ Income$ are large and negative. That is, both the short-run and long-run increase in rejection rates for FHA mortgage applications by acquiring banks which we documented in Panel A is entirely driven by low-income applicants, but is not present among high-income applicants.

Past literature has highlighted racial discrimination in mortgage lending (see Holmes and Horvitz (1994), Tootell (1996), Ladd (1998), and Charles and Hurst (2002)). To examine the incremental effect for borrowers from under-represented racial/ethnic minori-

ties, we repeat the baseline regression after interacting $MSAcq^{1-3}$ and $MSAcq^{4+}$ with the *Minority* dummy which identifies Black and Hispanic borrowers. The coefficients on these interaction terms represent the incremental effects of $MSAcq^{1-3}$ and $MSAcq^{4+}$ for Black and Hispanic applicants relative to those in the omitted category, which is mostly White applicants but also includes some Asian/other applicants. We present the results of these tests in columns (3) and (4) for the conventional and FHA loan applications, respectively. The sample sizes in these columns is lower than those in columns (1) and (2) because we estimate this test only for the post-2004 HMDA sample for which ethnicity information is available, and drop applications in which the borrower does not provide any race/ethnicity information.

We find that the coefficients on $MSAcq^{1-3} \times Minority$ and $MSAcq^{4+} \times Minority$ are negative and significant in both columns (3) and (4). The results in column (3) indicate that the increase in approval rates for conventional mortgage applications by acquiring banks in both the short and long run following the acquisition are significantly weaker for Black and Hispanic applicants compared to White and Asian applicants. The results in column (4) indicate that the increase in rejection rates for FHA applications by acquiring banks in both the short and long run following the acquisition are significantly stronger for Black and Hispanic applicants compared to White and Asian applicants. The negative coefficients on $MSAcq^{1-3}$ and $MSAcq^{4+}$ in column (4) indicate that even White/Asian applicants of FHA mortgages experience an increase in rejection rates from acquiring banks, which may be driven by the presence of low-income non-minority applicants.

Next, we examine the joint effects of income and minority status. We do this by creating three dummy variables: *Low income and minority* to identify Black or Hispanic applicants who are also in the low-income category; *Low income and not minority* to identify

non-minority applicants who are also in the low-income category; and *High income and minority* to identify Black or Hispanic applicants in the high-income category. We then repeat the baseline regression after including these three dummies and their interaction terms with $MSAcq^{1-3}$ and $MSAcq^{4+}$. Note that the omitted category in this regression is the subset of high-income and non-minority applicants. We present the results of these tests in columns (5) and (6) for the conventional and FHA loan applications, respectively.

We note a few important takeaways from the results in columns (5) and (6). First, the effects of $MSAcq^{1-3}$ and $MSAcq^{4+}$ are worse for minority applicants compared to non-minority applicants in both the low-income and high-income categories. Specifically, the coefficient on $MSAcq^{1-3} \times$*Low income and minority* is more negative than the coefficient on $MSAcq^{1-3} \times$*Low income and not minority*; and the coefficient on $MSAcq^{1-3} \times$*High income and minority* is negative (similarly for interactions with $MSAcq^{4+}$).[10] Second, and more interestingly, the short-run effects of gain in market power seem to be as bad, or even worse, for high-income minority applicants compared to low-income non-minority applicants. Specifically, the coefficient on $MSAcq^{1-3} \times$*High income and minority* is as negative as (more negative than) that on $MSAcq^{1-3} \times$*Low income and not minority* for the FHA loan sample in column (6) (conventional loan sample in column (5)). Finally, the positive coefficient on $MSAcq^{1-3}$ in column (6) indicates that acquiring banks actually increase approval rates for FHA loans sought by high-income and non-minority applicants, even as they increases rejection rates for all other categories.

Overall, the results in Table 4 indicate that the effects of gain in market power on mortgage approval rates vary significantly by borrower income and race/ethnicity. Of course, as we noted in the introduction, an important caveat is that we are unable to control for

[10] In unreported tests, we verify that these differences between coefficients are statistically significant with $p-$values close to zero.

differences in credit scores and loan-to-value ratios across borrowers categorized by income and race/ethnicity, because HMDA data do not provide this information during our sample period.

Robustness: Reverse causality is unlikely in our setting because our sample includes multi-CBSA bank mergers that are unlikely to be driven by mortgage lending activity in any single CBSA. Nonetheless, we conduct the following falsification test to rule out this possibility. We construct a *Pre-merger* dummy to identify CBSAs which experience an increase in market concentration due to an acquisition in the *next* 3 years. We then estimate equation (1) with *Pre-merger* as the independent variable of interest instead of $MSAcq^{1-3}$ and $MSAcq^{4+}$. We present the results of this falsification test in Table IA.1 in the appendix, separately for conventional loans (column (1)) and FHA loans (column (2)). If banks strategically acquire market shares through acquisitions in CBSAs with growing conventional lending and/or declining FHA lending, we expect the coefficient on *Pre-merger* to be positive in column (1) and/or negative in column (2). Instead, we find that the coefficient on *Pre-merger* has the opposite sign in both columns and is economically insignificant.

Recall that we use a small sample of large bank mergers for the tests examining the effect of bank mergers on mortgage interest rates and loan size. We reexamine the effect of bank mergers on the likelihood of loan approval using this smaller sample of large bank mergers. The results are presented in Table IA.2 in the internet appendix. Similar to the baseline results in Table 4, we find that banks which gain large local market shares through acquisitions are more likely to approve conventional loan applications but less likely to approve FHA loan applications in the post-acquisition period.

4.2. Effect of mergers on mortgage interest rate

We present the results of regression (1) with interest rate as the dependent variable in Table 5, where interest rate is expressed as a percentage number (i.e., 100 times the fractional rate). We estimate the regression separately on the GSE sample (i.e, Freddie and Fannie samples jointly) and the non-agency sample.[11] The results for the agency sample are presented in Panel A. The loan characteristics (X_l) we control for are: logarithm of the loan amount; combined loan-to-value ratio and its square term; borrower's FICO score and its square term; borrower's debt-to-income; a dummy identifying whether the mortgage is financing a new purchase (versus a refinancing); a dummy identifying whether the property is the borrower's primary residence; and a *Freddie* dummy to identify loans sold to Freddie Mac. We also control for the acquiring bank's local market share.

The positive and significant coefficients on $MSAcq^{1-3}$ and $MSAcq^{4+}$ in column (1) indicate that banks which gain larger local market shares through acquisitions increase the interest rate they charge on agency mortgages in both the short- and long-run period following the acquisitions. However, despite the statistical significance, the interest rate increase is not economically significant: the coefficients on $MSAcq^{1-3} > 75p$ and $MSAcq^{4+} > 75p$ in column (2) indicate that the interest rate is higher by 1.6bp (3.6bp) when $MSAcq^{1-3}$ ($MSAcq^{4+}$) is in its top quartile, which is insignificant compared to the average interest rate of 5.7% for Freddie Mac loans and 5.5% for Fannie Mae loans.

Interestingly, the negative coefficient on *Nationwide* $MSAcq^{1-3}$ in column (1) indicates that banks which gain larger nationwide market shares through acquisitions

[11] We obtain very similar results if we estimate the regression separately for the Freddie Mac sample and the Fannie Mae sample. Hence, to conserve space, we report one set of results estimated over the combined GSE sample, but include a *Freddie* dummy to capture minor differences between the Freddie and Fannie samples.

modestly decrease the interest rate they charge on agency mortgages in the 3-year period following the acquisition, which is consistent with efficiency gains from the merger being passed on to mortgage borrowers. However, the positive coefficient on *Nationwide* $MSAcq^{4+}$ indicates that this modest short-run decrease in the mortgage interest rate is reversed in the long run. These patterns are opposite of those in Focarelli and Panetta (2003), who find that bank mergers hurt depositors in the short run but benefit them in the long run as merger synergies are realized.

To assuage concerns that the results in column (1) may be driven by acquisitions of failed banks in the aftermath of the financial crisis, we repeat our analysis after excluding the local market share gains from acquisitions during the 2008–09 period from the computation of $MSAcq^{1-3}$ and $MSAcq^{4+}$. As can be seen from column (3), the relation between mortgage interest rate and $MSAcq^{1-3}$ becomes statistically insignificant, but there is no change in the relation between interest rate and $MSAcq^{4+}$.

We present the results for the non-agency sample in Panel B of Table 5. We estimate regression (1) separately for prime loans (columns (1) and (2)), Alt-A loans (columns (3) and (4)), and subprime loans (columns (5) and (6)) because borrower risk characteristics vary significantly across these three categories. In addition to all the loan-level controls from Panel A, we also include the *FullDocumentation* dummy to differentiate between full-documentation loans and no-doc/low-doc loans. As noted above, the non-agency sample ends in 2007 because the private-label securitization market collapsed with the advent of the financial crisis. Therefore, for the non-agency sample, we are unable to include $MSAcq^{4+}$ as independent variable given the short time frame of this data. For the same reason, we note that the results reported in Panel B cannot be driven by mergers that occurred during 2008–09.

The positive coefficients on $MSAcq^{1-3}$ in columns (1), (3) and (5) indicate that acquiring banks which gain larger local market shares increase the interest rate on all three categories of non-agency mortgages, but the magnitude of this effect varies significantly across borrower risk categories. The effect is the smallest for prime mortgages which are the safest category of non-agency mortgages, and is the largest for subprime mortgages which are the riskiest category of non-agency mortgages. In terms of economic significance, the coefficients on $MSAcq^{1-3} > 75p$ indicate that interest rate increases by 12.3bp for prime mortgages (column (2)), 34.7bp for Alt-A mortgages (column (4)), and 85.3bp for submprime mortgages (column (6)) when $MSAcq^{1-3}$ is in its top quartile. In comparison, the median interest rate for prime, Alt-A, and subprime mortgages is 6.5%, 6.75%, and 7.65%, respectively.

Interestingly, and in contrast to the findings with the GSE sample in Panel A, the coefficient on *Nationwide* $MSAcq^{1-3}$ is also positive and significant. That is, interest rates on non-agency mortgages also increase with the nationwide market share gained by the acquiring bank. Thus, unlike in case of GSE mortgages, there is no evidence of efficiency gains from the acquisition being passed on to borrowers in the non-agency market.

Although we believe that reverse causality is unlikely in our setting, we undertake the following falsification test to rule out the possibility that the acquisition itself was driven by interest rate increases in the local market preceding the acquisition. We estimate equation (1) with the *Pre-merger* dummy as the independent variable of interest instead of $MSAcq^{1-3}$ and $MSAcq^{4+}$. Recall that the *Pre-merger* dummy identifies CBSAs which experience an increase in market concentration due to an acquisition in the *next* 3 years. If banks strategically acquire market shares through acquisitions in CBSAs with high mortgage interest rates, then we should detect a positive coefficient on the *pre-merger*

dummy. The results of the falsification test presented in Table IA.3 indicate otherwise: the coefficient on *Pre-merger* is positive but economically insignificant for the agency loan sample (column (1)), and is insignificant for all three categories of the non-agency sample (columns (2) through (4)).

The main takeaway from Table 5 is that the effect of bank mergers on mortgage interest rates vary significantly by borrower risk. Borrowers of subprime mortgages and Alt-A mortgages are charged significantly higher interest rates by acquiring banks which gain large local market shares. The corresponding effect for the relatively safer prime loans and conforming mortgages sold to Fannie and Freddie Mac is economically insignificant. The results of the falsification test rule out the possibility that banks are strategically acquiring market share through acquisitions in CBSAs with high mortgage interest rates.

4.3. Effect of mergers on loan amount

To examine the effect of mergers on the quantity of mortgage credit to borrowers, we estimate regression (1) with the natural logarithm of the loan amount as dependent variable. We use the agency and non-agency loan-level data sets instead of the HMDA data for these tests so that we are able to control for the borrower's credit score and use the loan-to-value ratio to compute the value of the residential property against which the mortgage is being issued. The empirical specification and control variables are similar to those in the interest rate regression above, except that we drop loan-to-value as a control variable and instead control for the underlying property value. The results are presented in Table 6.

We present the results for the GSE sample in Panel A. The positive coefficient on $MSAcq^{1-3}$ in column (1) indicates that banks which gained larger local market shares

through acquisitions increase loan amounts on GSE mortgages in the following three years, although the increase is economically insignificant. The coefficient estimate indicates that a 1% increase in $MSAcq^{1-3}$ is associated with a 0.08% increase in the loan amount. Moreover, this effect dissipates in the log run as evidenced by the negative but insignificant coefficient on $MSAcq^{4+}$.

In column (2) we repeat the regression after replacing $MSAcq^{1-3}$ and $MSAcq^{4+}$ with indicator variables identifying top-quartile values of these variables. The insignificant coefficients on $MSAcq^{1-3} > 75p$ and $MSAcq^{4+} > 75p$ indicate that banks which gain large local market shares through acquisitions do not change their loan amounts significantly on GSE mortgages. In column (3) we repeat the regression after excluding local market share gains from acquisitions during the 2008–09 period from the computation of $MSAcq^{1-3}$ and $MSAcq^{4+}$. We find that the relation between loan amount on GSE mortgages and both $MSAcq^{1-3}$ and $MSAcq^{4+}$ becomes statistically insignificant.

We present the results for the non-agency sample in Panel B, separately for prime loans (columns (1) and (2)), Alt-A loans (columns (3) and (4)), and subprime loans (columns (5) and (6)). In contrast to the GSE sample, we find that bank mergers do affect loan amounts in the non-agency mortgage market, and that the effects vary by both sign and magnitude across the loan risk categories. Specifically, the positive coefficients on $MSAcq^{1-3} > 75p$ in columns (2) and (4) indicate that banks which gain large local market shares through acquisitions increase their lending to prime and Alt-A borrowers by 6.5% and 10.6%, respectively, all else equal. On the other hand, the negative coefficient on $MSAcq^{1-3} > 75p$ in column (6) indicates that banks which gain large local market shares through acquisitions decrease their lending to subprime borrowers by 5.4%, all else equal. The coefficients on $MSAcq^{1-3}$ in columns (1), (3), and (5) tell a similar story, except that the coefficients in

columns (3) and (5) are not statistically significant.

Overall, the results in Table 6 indicate that the effects of gain in market power on mortgage loan amounts vary significantly across borrower risk categories. In the non-agency mortgage market, borrowers of subprime loans receive smaller amounts whereas borrowers of prime loans and Alt-A loans receive larger amounts from banks which gain large local market shares through acquisitions. There is no significant effect of gain in market power on loan amounts for GSE mortgages.

5. Conclusion

In this paper, we examine the effect of bank mergers on the price and availability of credit in the residential mortgage market. Our empirical strategy exploits variation in local market share gained by acquiring banks across CBSAs to identify the effect of mergers on the likelihood of mortgage approval, interest rate, and loan amount.

Banks which gain large local market shares through acquisitions increase approval rates for conventional mortgage applications but increase rejection rates for the relatively riskier FHA mortgage applications in the post-acquisition period. The increase in rejection rate for FHA mortgage applications is stronger for low-income applicants compared to high-income applicants, and for minority applicants compared to non-minority applicants. On the other hand, the increase in approval rate for conventional mortgage applications is weaker for low-income applicants and minority applicants.

Acquiring banks also charge higher interest rates on high-risk non-agency mortgages (i.e., subprime loans and Alt-A loans) after the acquisition, but not for the safer prime loans and conforming mortgages sold to GSEs. Notably, we find no evidence of a reduc-

tion in mortgage rates due to merger efficiency gains. In the non-agency market, acquiring banks also reduce loan amounts on subprime loans while increasing loan amounts on prime and Alt-A loans. There is no significant effect of bank mergers on loan amounts of conforming mortgages sold to GSEs.

Overall, our results indicate that the effect of bank mergers on the price and availability of mortgage credit vary significantly by borrower risk, income, and race. In general, riskier borrowers, low-income borrowers, and minority borrowers seem to be most adversely affected by bank mergers.

References

Allen, J., R. Clark, and J.-F. Houde (2013). The effect of mergers in search markets: Evidence from the Canadian mortgage industry. *American Economic Review 104*, 3365–96.

Amel, D. F., E. Anenberg, and R. Jorgensen (2018). On the geographic scope of retail mortgage markets. Board of Governors of the Federal Reserve System, FEDS Note, June 15.

Ashenfelter, O. and D. Hosken (2010). The effect of mergers on consumer prices: Evidence from five mergers on the enforcement margin. *Journal of Law and Economics 53*, 417–466.

Berger, A. N. and T. H. Hannan (1989). The price-concentration relationship in banking. *Review of Economics and Statistics 71*, 291–299.

Berger, A. N., N. Miller, M. Petersen, R. Rajan, and J. Stein (2005). Does function follow organizational form? Evidence from the lending practices of large and small banks. *Journal of Financial Economics 76*, 237–269.

Borenstein, S. (1990). Airline mergers, airport dominance, and market power. *American Economic Review 80*, 400–404.

Bricker, J., K. B. Moore, and J. Thompson (2019). Trends in household portfolio composition. In *Handbook of US Consumer Economics*, pp. 53–96. Elsevier.

Buchak, G. and A. Jørring (2021). Do mortgage lenders compete locally? Evidence beyond interest rates. SSRN working paper.

Bustamante, M. C. and F. D'Acunto (2021). Banks' market power, access to finance, and leverage. SSRN working paper.

Charles, K. K. and E. Hurst (2002). The transition to home ownership and the black-white wealth gap. *Review of Economics and Statistics 84*, 281–297.

Chipty, T. (2001). Vertical integration, market foreclosure, and consumer welfare in the cable television industry. *American Economic Review 91*, 428–453.

D'Acunto, F. and A. G. Rossi (2022). Regressive mortgage credit redistribution in the post-crisis era. *Review of Financial Studies 35*, 482–525.

Eliason, P. J., B. Heebsh, R. C. McDevitt, and J. W. Roberts (2020). How acquisitions affect firm behavior and performance: Evidence from the dialysis industry. *Quarterly Journal of Economics 135*, 221–267.

Erel, I. (2011). The effect of bank mergers on loan prices: Evidence from the United States. *Review of Financial Studies 24*, 1068–1101.

Focarelli, D. and F. Panetta (2003). Are mergers beneficial to consumers? Evidence from the market for bank deposits. *American Economic Review 93*, 1152–1172.

Fraisse, H., J. Hombert, and M. Lé (2018). The competitive effect of a bank megamerger on credit supply. *Journal of Banking & Finance 93*, 151–161.

Garmaise, M. J. and T. J. Moskowitz (2006). Bank mergers and crime: The real and social effects of credit market competition. *Journal of Finance 61*, 495–538.

Gowrisankaran, G., A. Nevo, and R. Town (2015). Mergers when prices are negotiated: Evidence from the hospital industry. *American Economic Review 105*, 172–203.

Hastings, J. S. (2004). Vertical relationships and competition in retail gasoline markets: Empirical evidence from contract changes in Southern California. *American Economic Review 94*, 317–328.

Hastings, J. S. and R. J. Gilbert (2005). Market power, vertical integration and the wholesale price of gasoline. *Journal of Industrial Economics 53*, 469–492.

Holmes, A. and P. Horvitz (1994). Mortgage redlining: Race, risk, and demand. *Journal of Finance 49*, 81–99.

Hortaçsu, A. and C. Syverson (2007). Cementing relationships: Vertical integration, foreclosure, productivity, and prices. *Journal of Political Economy 115*, 250–301.

Kim, E. H. and V. Singal (1993). Mergers and market power: Evidence from the airline industry. *American Economic Review 83*, 549.

Kwoka, J. and E. Shumilkina (2010). The price effect of eliminating potential competition: Evidence from an airline merger. *Journal of Industrial Economics 58*, 767–793.

Ladd, H. F. (1998). Evidence on discrimination in mortgage lending. *Journal of Economic Perspectives 12*, 41–62.

Liebersohn, J. (2017). How does competition affect bank lending? Quasi-experimental evidence from bank mergers. *Working Paper. Massachusetts Institute of Technology*.

Luco, F. and G. Marshall (2020). The competitive impact of vertical integration by multiproduct firms. *American Economic Review 110*, 2041–2064.

Nguyen, H.-L. Q. (2019). Are credit markets still local? evidence from bank branch closings. *American Economic Journal: Applied Economics 11*, 1–32.

Prager, R. A. and T. H. Hannan (1998). Do substantial horizontal mergers generate significant price effects? Evidence from the banking industry. *Journal of Industrial Economics 46*, 433–452.

Sapienza, P. (2002). The effects of banking mergers on loan contracts. *Journal of Finance 57*, 329–367.

Scharfstein, D. and A. Sunderam (2016). Market power in mortgage lending and the transmission of monetary policy. Harvard University working paper.

Simpson, J. and C. Taylor (2008). Do gasoline mergers affect consumer prices? The Marathon Ashland petroleum and Ultramar Diamond Shamrock transaction. *Journal of Law and Economics 51*, 135–152.

Taylor, C. T., N. M. Kreisle, and P. R. Zimmerman (2010). Vertical relationships and competition in retail gasoline markets: Empirical evidence from contract changes in Southern California: Comment. *American Economic Review 100*, 1269–76.

Tootell, G. M. (1996). Redlining in Boston: Do mortgage lenders discriminate against neighborhoods? *Quarterly Journal of Economics 111*, 1049–1079.

Figure 1: Distribution of $MSAcq^{1-3}$

This figure plots the distribution of non-zero values of $MSAcq^{1-3}$ in the form of a histogram, where the Y-axis denotes the number of observations at the bank-CBSA-year level. The figure uses the full set of mergers listed in the Table IA.4.

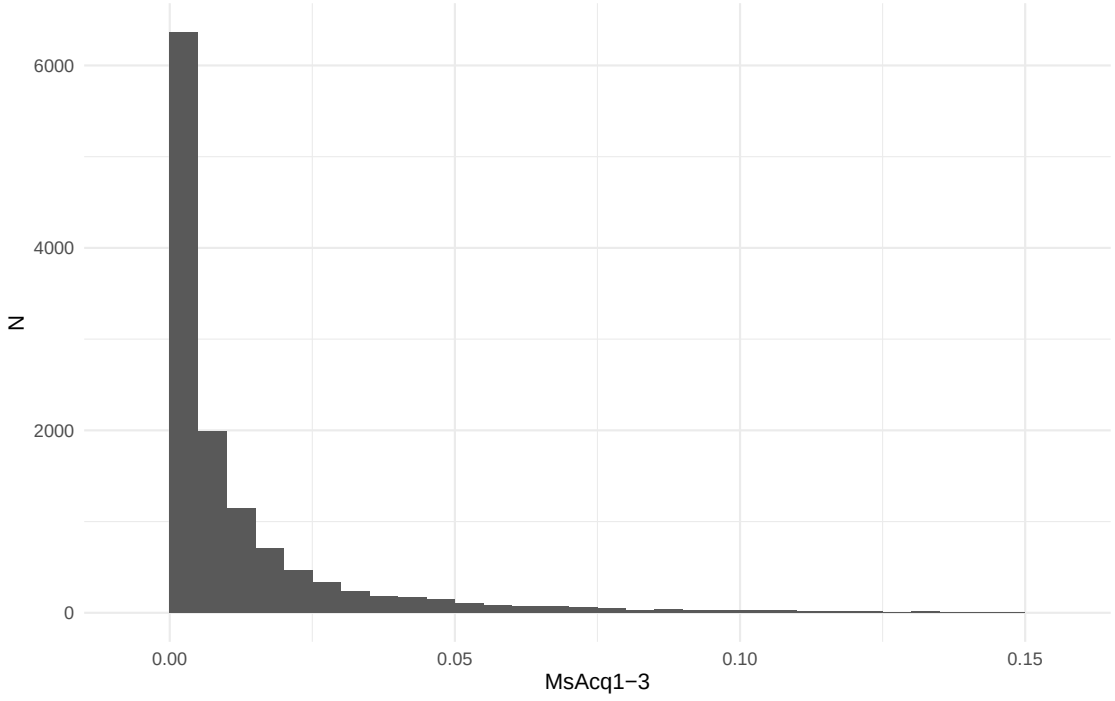

Table 1: Descriptive Statistics: HMDA sample

This table provides descriptive statistics for the HMDA sample used in our analysis: Conventional mortgages used for new purchases in Panel A.1, Conventional mortgages used for refinances in Panel A.2, FHA mortgages used for new purchases in Panel B.1, and FHA mortgages used for refinances in Panel B.2.

Panel A.1: Conventional Mortgages - New purchases

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Approved	59,335,517	0.728	0.445	0	1	1
Applicant income (000s)	59,335,517	105.61	171.83	48	75	119
Loan amount (000s)	59,335,517	189.49	217.67	74	142	246
Black	41,945,548	0.077	0.266	0	0	0
Hispanic	41,945,548	0.118	0.322	0	0	0
Low income	59,335,517	0.453	0.498	0	0	1

Panel A.2: Conventional Mortgages - Refinances

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Approved	108,308,545	0.635	0.481	0	1	1
Applicant income (000)	108,308,545	98.37	146.55	48	72	111
Loan amount (000)	108,308,545	186.20	203.91	84	144	239
Black	70,618,156	0.071	0.256	0	0	0
Hispanic	70,618,156	0.089	0.284	0	0	0
Low income	108,308,545	0.485	0.500	0	0	1

Panel B.1: FHA Mortgages - New purchases

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
F Approved	11,570,897	0.810	0.392	1	1	1
Applicant income (000s)	11,570,897	61.323	85.675	37	52	73
Loan amount (000s)	11,570,897	158.530	150.260	98	137	193
Black	8,753,096	0.118	0.322	0	0	0
Hispanic	8,753,096	0.175	0.380	0	0	0
Low income	11,570,897	0.729	0.444	0	1	1

Panel B.2: FHA Mortgages - Refinances

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
Approved	5,010,808	0.545	0.498	0	1	1
Applicant income (000s)	5,010,808	68.702	64.416	41	59	84
Loan amount (000s)	5,010,808	174.457	154.992	108	151	215
Black	4,506,641	0.112	0.315	0	0	0
Hispanic	4,506,641	0.087	0.282	0	0	0
Low income	5,010,808	0.651	0.477	0	1	1

Table 2: Descriptive Statistics: Agency sample

This table provides descriptive statistics for the agency sample used in our analysis: Freddie Mac sample in Panel A and Fannie Mae sample in Panel B.

Panel A: Freddie Mac Sample

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
FICO Score	7,709,443	731.72	54.11	694	741	776
Combined loan-to-value	7,709,443	75.199	15.453	68	80	85
Debt-to-income	7,709,443	47.489	114.518	26	34	42
Loan amount (000s)	7,709,443	174.30	91.52	107	154	222
Interest rate (%)	7,709,443	5.742	1.198	4.875	5.875	6.500
New purchase	7,709,443	0.409	0.492	0	0	1
Primary residence	7,709,443	0.916	0.278	1	1	1

Panel B: Fannie Mae Sample

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
FICO Score	14,961,717	735.20	55.03	698	746	780
Combined loan-to-value	14,961,717	73.492	16.193	65	78	82
Debt-to-income	14,609,166	34.198	11.625	26	34	42
Loan amount (000s)	14,961,717	196.31	107.32	118	174	252
Interest rate (%)	14,961,715	5.634	1.229	4.625	5.750	6.500
New purchase	14,961,717	0.386	0.487	0	0	1
Primary residence	14,961,717	0.900	0.301	1	1	1

Table 3: Descriptive Statistics: Non-agency sample

This table provides descriptive statistics for the non-agency sample, separately for prime loans (Panel A), Alt-A loans (Panel B), and subprime loans (Panel C).

Panel A: Prime Loans

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
FICO Score	1,350,034	728.47	42.01	692	727	764
Combined loan-to-value	1,350,034	75.522	15.736	68.590	80.000	87.720
Loan amount (000s)	1,350,034	314.18	247.90	131	257	457
Interest rate (%)	1,349,751	6.624	1.365	6.000	6.500	7.000
New purchase	1,350,034	0.442	0.497	0	0	1
Primary residence	1,350,034	0.788	0.409	1	1	1
Full documentation	1,350,034	0.405	0.491	0	0	1

Panel B: Alt-A Loans

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
FICO Score	486,098	661.26	42.90	634	647	667
Combined loan-to-value	486,098	77.721	15.325	71.280	80.000	90.000
Loan amount (000s)	486,098	209.48	159.36	102	166	272
Interest rate (%)	485,849	7.011	1.757	6.125	6.750	7.750
New purchase	486,098	0.321	0.467	0	0	1
Primary residence	486,098	0.819	0.385	1	1	1
Full documentation	486,098	0.390	0.488	0	0	1

Panel C: Subprime Loans

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
FICO Score	570,784	593.13	49.30	560	592	614
Combined loan-to-value	570,784	77.178	14.726	70.060	80.000	87.620
Loan amount (000s)	570,784	163.09	112.47	85	133	207
Interest rate (%)	570,378	7.620	2.079	6.625	7.650	8.850
New purchase	570,784	0.215	0.411	0	0	0
Primary residence	570,784	0.893	0.309	1	1	1
Full documentation	570,784	0.544	0.498	0	1	1

Table 4: Effect of Mergers on Probability of Loan Approval

This table reports the results of regressions examining the effect of bank mergers on the likelihood of loan approval. We estimate variants of regression (1) with *Approved* as the dependent variable on mortgage application-level data from HMDA. Panel A presents the baseline results separately for conventional loans (columns (1), (2) and (5)) and FHA loans (columns (3), (4), and (6)). In Panel B we examine how this effect varies with the following applicant characteristics: income using the *Low Income* dummy to identify applicants whose income is below the median income within the CBSA-year (columns (1) and (2)); race/ethnicity using the *Minority* dummy to identify applicants who are either Black or Hispanic (columns (3) and (4)); and the joint effects of income and race/ethnicity using the *Low income-Minority*, *Low income- Not Minority*, and *High income-Minority* dummies (columns (5) and (6)). We include Bank×County fixed effects and year fixed effects in all specifications. Standard errors (in parentheses) are clustered at the CBSA level. Significance levels are denoted as *, **, and *** for the 10%, 5%, and 1% levels, respectively.

Panel A

	All Mergers				Excluding 08-09 Mergers	
	Conventional		FHA		Conventional	FHA
	(1)	(2)	(3)	(4)	(5)	(6)
$MSAcq^{1-3}$	0.427***		−0.270***		0.252***	−0.157***
	(0.006)		(0.027)		(0.011)	(0.052)
$MSAcq^{4+}$	0.985***		−0.130***		0.434***	0.065
	(0.006)		(0.026)		(0.020)	(0.073)
$MSAcq^{1-3} > 75p$		0.012***		−0.014***		
		(0.0003)		(0.001)		
$MSAcq^{4+} > 75p$		0.036***		−0.005***		
		(0.0003)		(0.001)		
Acquirer Share	−0.141***	−0.073***	0.092***	0.112***	0.040***	−0.148***
	(0.003)	(0.003)	(0.008)	(0.008)	(0.003)	(0.012)
Nationwide $MSAcq^{1-3}$	0.0002***	0.0001***	0.002***	0.002***	0.002***	0.003***
	(0.00001)	(0.00001)	(0.00003)	(0.00003)	(0.00003)	(0.0002)
Nationwide $MSAcq^{4+}$	0.190***	0.192***	−0.011	−0.009	0.091***	−0.053***
	(0.004)	(0.004)	(0.014)	(0.014)	(0.001)	(0.006)
log(Income)	0.077***	0.077***	0.077***	0.077***	0.077***	0.076***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
log(Loan amount)	0.020***	0.020***	0.016***	0.015***	0.020***	0.015***
	(0.0001)	(0.0001)	(0.0003)	(0.0003)	(0.0001)	(0.0003)
Refinance	−0.100***	−0.100***	−0.249***	−0.249***	−0.100***	−0.249***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
Bank×County	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Year	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
N	167,644,062	167,644,062	16,581,705	16,581,705	167,498,544	16,581,705
Adjusted R^2	0.176	0.178	0.116	0.116	0.169	0.114

Panel B

	Conventional	FHA	Conventional	FHA	Conventional	FHA
	(1)	(2)	(3)	(4)	(5)	(6)
$MSAcq^{1-3}$	0.548***	0.250***	0.586***	−0.127***	0.586***	0.393***
	(0.008)	(0.046)	(0.009)	(0.038)	(0.010)	(0.062)
$MSAcq^{4+}$	1.049***	0.237***	1.103***	−0.928***	1.197***	−0.557***
	(0.008)	(0.046)	(0.014)	(0.058)	(0.017)	(0.092)
$MSAcq^{1-3}$ × Low income	−0.267***	−0.738***				
	(0.011)	(0.052)				
$MSAcq^{4+}$ × Low income	−0.171***	−0.495***				
	(0.011)	(0.052)				
$MSAcq^{1-3}$ × Minority			−0.179***	−0.705***		
			(0.016)	(0.062)		
$MSAcq^{4+}$ × Minority			−0.292***	−0.696***		
			(0.028)	(0.100)		
$MSAcq^{1-3}$ × Low income-Minority					−0.222***	−1.390***
					(0.020)	(0.084)
$MSAcq^{1-3}$ × Low income-Not Minority					−0.003	−0.780***
					(0.015)	(0.073)
$MSAcq^{1-3}$ × High income-Minority					−0.103***	−0.707***
					(0.024)	(0.125)
$MSAcq^{4+}$ × Low income-Minority					−0.644***	−1.210***
					(0.036)	(0.131)
$MSAcq^{4+}$ × Low income-Not Minority					−0.261***	−0.548***
					(0.024)	(0.107))
$MSAcq^{4+}$ × High income-Minority					0.011	−0.549***
					(0.043)	(0.205)
Low income	−0.025***	0.022***				
	(0.0001)	(0.0003)				
Minority			−0.121***	−0.062***		
			(0.0001)	(0.0003)		
Low income-Minority					−0.131***	−0.035***
					(0.0002)	(0.0005)
Low income-Not Minority					−0.015***	0.026***
					(0.0001)	(0.0004)
High income-Minority					−0.127***	−0.064***
					(0.0002)	(0.001)
Acquirer Share	−0.142***	0.092***	0.020***	0.149***	0.020***	0.149***
	(0.003)	(0.008)	(0.004)	(0.009)	(0.004)	(0.009)
Nationwide $MSAcq^{1-3}$	0.0002***	0.002***	−0.001***	0.001***	−0.001***	0.001***
	(0.00001)	(0.00003)	(0.00002)	(0.00005)	(0.00002)	(0.00005)
Nationwide $MSAcq^{4+}$	0.188***	−0.010	0.211***	−0.123***	0.209***	−0.122***
	(0.004)	(0.014)	(0.004)	(0.016)	(0.004)	(0.016)
log(Income)	0.063***	0.090***	0.061***	0.076***	0.054***	0.093***
	(0.0001)	(0.0003)	(0.0001)	(0.0003)	(0.0001)	(0.0004)
log(Loan amount)	0.020***	0.016***	0.004***	0.006***	0.004***	0.007***
	(0.0001)	(0.0003)	(0.0001)	(0.0004)	(0.0001)	(0.0004)
Refinance	−0.100***	−0.249***	−0.094***	−0.262***	−0.094***	−0.262***
	(0.0001)	(0.0002)	(0.0001)	(0.0003)	(0.0001)	(0.0003)
Bank×County	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Year	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
N	167,644,062	16,581,705	97,491,164	11,998,325	97,491,164	11,998,325
Adjusted R^2	0.174	0.115	0.177	0.116	0.177	0.116

Table 5: Effect of Mergers on Interest Rate

This table reports the results of regression (1) with interest rate as the dependent variable. Panel A presents the results for conforming mortgages sold to the GSEs. Panel B presents the results for the non-agency sample, separately for prime loans (columns (1) and (2)), Alt-A loans (columns (3) and (4)), and subprime loans (columns (5) and (6)). We include Bank×Zip3 fixed effects and Year fixed effects in all specifications. Standard errors (reported in parentheses) are clustered at the CBSA level. We use *,**, and *** to denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A - Agency Sample

	All Mergers		Excluding 08-09 Mergers
	(1)	(2)	(3)
$MSAcq^{1-3}$	0.415***		−0.100
	(0.073)		(0.111)
$MSAcq^{4+}$	0.729***		0.721***
	(0.053)		(0.097)
$MSAcq^{1-3} > 75p$		0.016***	
		(0.003)	
$MSAcq^{4+} > 75p$		0.036***	
		(0.003)	
Acquirer Share	0.002	−0.126***	−0.294***
	(0.013)	(0.016)	(0.013)
Nationwide $MSAcq^{1-3}$	−0.762***	−1.015***	0.284**
	(0.041)	(0.060)	(0.125)
Nationwide $MSAcq^{4+}$	0.807***	0.234***	1.573***
	(0.083)	(0.071)	(0.162)
FICO Score/100	−0.452***	−0.451***	−0.448***
	(0.015)	(0.015)	(0.015)
(FICO Score/100)^2	0.021***	0.020***	0.020***
	(0.001)	(0.001)	(0.001)
Combined loan-to-value	−0.002***	−0.002***	−0.002***
	(0.0001)	(0.0001)	(0.0001)
Combined loan-to-value^2	0.00004***	0.00004***	0.00004***
	(0.00000)	(0.00000)	(0.00000)
Debt-to-income	0.0001***	0.0001***	0.0001***
	(0.00000)	(0.00000)	(0.00000)
log(Loan amount)	−0.163***	−0.163***	−0.164***
	(0.002)	(0.002)	(0.002)
Freddie Mac	0.048***	0.052***	0.050***
	(0.001)	(0.001)	(0.001)
New purchase	0.022***	0.020***	0.020***
	(0.001)	(0.001)	(0.001)
Primary residence	−0.341***	−0.341***	−0.341***
	(0.004)	(0.004)	(0.004)
Bank×Zip3	Y	Y	Y
Year	Y	Y	Y
N	21,345,165	21,345,165	21,280,042
Adjusted R^2	0.890	0.890	0.890

Panel B - Non-Agency Sample

	Prime		Alt-A		Subprime	
	(1)	(2)	(3)	(4)	(5)	(6)
$MSAcq^{1-3}$	2.413***		9.741***		17.184***	
	(0.298)		(0.769)		(0.984)	
$MSAcq^{1-3} > 75p$		0.123***		0.347***		0.853***
		(0.011)		(0.031)		(0.055)
Acquirer Share	0.785***	0.914***	1.788***	1.717***	−0.680***	0.515***
	(0.046)	(0.047)	(0.155)	(0.157)	(0.253)	(0.254)
$Nationwide\ MSAcq^{1-3}$	5.657***	5.997***	4.886***	3.676	14.451***	5.454***
	(0.773)	(0.776)	(2.191)	(2.330)	(2.094)	(1.488)
FICO Score/100	−2.327***	−2.322***	−1.776***	−1.785***	−1.906***	−1.899***
	(0.086)	(0.086)	(0.117)	(0.117)	(0.076)	(0.076)
(FICO Score/100)^2	0.145***	0.145***	0.096***	0.097***	0.107***	0.107***
	(0.006)	(0.006)	(0.008)	(0.008)	(0.006)	(0.006)
Combined loan-to-value	−0.040***	−0.040***	−0.087***	−0.088***	−0.080***	−0.080***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Combined loan-to-value^2	0.0004***	0.0004***	0.001***	0.001***	0.001***	0.001***
	(0.00000)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
log(Loan amount)	−0.607***	−0.607***	−1.015***	−1.015***	−1.216***	−1.216***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.008)	(0.008)
New purchase	−0.003	−0.002	−0.032***	−0.033***	0.004	0.005
	(0.002)	(0.002)	(0.005)	(0.005)	(0.007)	(0.007)
Primary residence	−0.305***	−0.304***	−0.248***	−0.250***	−0.181***	−0.184***
	(0.003)	(0.003)	(0.006)	(0.006)	(0.010)	(0.010)
Full documentation	−0.155***	−0.154***	−0.306***	−0.307***	−0.473***	−0.474***
	(0.002)	(0.002)	(0.005)	(0.005)	(0.006)	(0.006)
Bank×Zip3	Y	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y	Y
N	1,334,349	1,334,349	480,235	480,235	561,374	561,374
Adjusted R^2	0.469	0.469	0.403	0.403	0.291	0.292

Table 6: Effect of Mergers on Loan Amount

This table reports the results of regression (1) with $Log(LoanAmount)$ as the dependent variable. Panel A presents the results for conforming mortgages sold to the GSEs. Panel B presents the results for the non-agency sample, separately for prime loans (columns (1) and (2)), Alt-A loans (columns (3) and (4)), and subprime loans (columns (5) and (6)). We include Bank×Zip3 fixed effects and Year fixed effects in all specifications. Standard errors (reported in parentheses) are clustered at the CBSA level. We use *,**, and *** to denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Agency Sample

	All Mergers		Excluding 08-09 Mergers
	(1)	(2)	(3)
$MSAcq^{1-3}$	0.080*		0.036
	(0.046)		(0.060)
$MSAcq^{4+}$	−0.021		−0.028
	(0.031)		(0.036)
$MSAcq^{1-3} > 75p$		0.002	
		(0.002)	
$MSAcq^{4+} > 75p$		0.002	
		(0.001)	
Acquirer Share	0.081***	0.093***	0.059***
	(0.019)	(0.021)	(0.014)
$Nationwide\ MSAcq^{1-3}$	−0.045*	−0.116***	0.077
	(0.025)	(0.023)	(0.072)
$Nationwide\ MSAcq^{4+}$	0.061	0.102**	−0.400***
	(0.051)	(0.041)	(0.083)
FICO Score/100	0.962***	0.962***	0.957***
	(0.009)	(0.009)	(0.009)
(FICO Score/100)^2	−0.071***	−0.071***	−0.070***
	(0.001)	(0.001)	(0.001)
log(Home value)	0.840***	0.840***	0.840***
	(0.004)	(0.004)	(0.004)
Debt-to-income	0.00003***	0.00003***	0.00003***
	(0.00000)	(0.00000)	(0.00000)
Freddie Mac	−0.017***	−0.017***	−0.016***
	(0.001)	(0.001)	(0.001)
New purchase	0.137***	0.137***	0.137***
	(0.001)	(0.001)	(0.001)
Primary residence	0.074***	0.074***	0.075***
	(0.002)	(0.002)	(0.002)
Bank×Zip3	Y	Y	Y
Year	Y	Y	Y
N	21,345,167	21,345,167	21,280,044
Adjusted R^2	0.819	0.819	0.819

Panel B: Non-Agency Sample

	Prime		Alt-A		Subprime	
	(1)	(2)	(3)	(4)	(5)	(6)
$MSAcq^{1-3}$	1.170***		1.494		−0.335	
	(0.196)		(0.919)		(0.678)	
$MSAcq^{1-3} > 75p$		0.065***		0.106***		−0.054**
		(0.006)		(0.028)		(0.022)
Acquirer Share	−0.089***	−0.103***	−0.075	−0.041	−0.248***	−0.219***
	(0.017)	(0.017)	(0.060)	(0.060)	(0.085)	(0.085)
$Nationwide\ MSAcq^{1-3}$	0.628***	0.400*	3.321***	4.243***	−0.203	−0.393
	(0.217)	(0.218)	(0.979)	(1.033)	(0.602)	(0.599)
FICO Score/100	0.810***	0.809***	0.666***	0.666***	0.028*	0.028*
	(0.032)	(0.032)	(0.039)	(0.039)	(0.017)	(0.017)
(FICO Score/100)^2	−0.058***	−0.058***	−0.048***	−0.048***	0.002	0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)
log(Home value)	0.896***	0.896***	0.891***	0.891***	0.903***	0.903***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
New purchase	0.098***	0.098***	0.011***	0.011***	−0.033***	−0.033***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Primary residence	0.030***	0.030***	−0.010***	−0.010***	−0.015***	−0.015***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Full documentation	0.024***	0.024***	0.064***	0.064***	−0.007***	−0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Bank×Zip3	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Year	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
N	1,334,349	1,334,349	480,235	480,235	561,374	561,374
Adjusted R^2	0.835	0.835	0.745	0.745	0.781	0.781

Internet Appendix

Table IA.1: Falsification Test - Loan Approval

This table reports the results of regressions examining how the likelihood of loan approval changed in CBSAs before they experienced increase in market concentration. *Pre-merger* is a dummy to identify CBSAs which experience an increase in market concentration due to an acquisition in the next 3 years. We estimate regression (1) with *Pre-merger* as the independent variable of interest, separately for conventional loan applications (column (1)) and FHA loan applications (column (2)). We include Bank×County fixed effects and Year fixed effects in all specifications. Standard errors (reported in parentheses) are clustered at the CBSA level. We use *,**, and *** to denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Conventional	FHA
	(1)	(2)
Pre-merger	-0.0005^{***}	0.004^{***}
	(0.0001)	(0.0004)
Acquirer share	-0.099^{***}	0.349^{***}
	(0.002)	(0.006)
log(Income)	0.077^{***}	0.077^{***}
	(0.0001)	(0.0002)
log(Loan Amount)	0.020^{***}	0.016^{***}
	(0.0001)	(0.0003)
Refinance	-0.100^{***}	-0.249^{***}
	(0.0001)	(0.0002)
Bank×County	Y	Y
Year	Y	Y
N	167,644,062	16,581,705
Adjusted R^2	0.167	0.12

Table IA.2: Effect of Mergers on Probability of Loan Approval - Large Mergers

In this table we reexamine the effect of bank mergers on the likelihood of loan approval using the smaller set of large bank mergers in which the acquiring bank is also identified on the Fannie Mae & Freddie Mac data sets and/or the Moody's data set. We estimate regression (1) with *Approved* as the dependent variable separately for conventional loan applications (column (1)) and FHA loan applications (column (2)). We include Bank×County fixed effects and Year fixed effects in all specifications. Standard errors (reported in parentheses) are clustered at the CBSA level. We use *,**, and *** to denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Conventional	FHA
	(1)	(2)
$MSAcq^{1-3}$	0.637^{***}	-0.379^{***}
	(0.007)	(0.029)
$MSAcq^{4+}$	1.369^{***}	0.021
	(0.007)	(0.029)
Acquirer Share	-0.239^{***}	-0.091^{***}
	(0.003)	(0.006)
Nationwide $MSAcq^{1-3}$	-0.001^{***}	0.001^{***}
	(0.00001)	(0.00004)
Nationwide $MSAcq^{4+}$	0.558^{***}	-0.924^{***}
	(0.010)	(0.038)
log(Income)	0.081^{***}	0.075^{***}
	(0.0001)	(0.0003)
log(Loan amount)	0.016^{***}	0.017^{***}
	(0.0001)	(0.0003)
Refinance	-0.101^{***}	-0.259^{***}
	(0.0001)	(0.0002)
Bank×County	*Y*	*Y*
Year	*Y*	*Y*
N	167,644,062	16,581,705
Adjusted R^2	0.192	0.155

Table IA.3: Falsification Test - Interest Rate

This table reports the results of regressions examining whether the interest rate on mortgages changed in CBSAs before they experienced increase in market concentration. *Pre-merger* is a dummy to identify CBSAs which experience an increase in market concentration due to an acquisition in the next 3 years. We estimate regression (1) with interest rate as dependent variable and *Pre-merger* as the independent variable of interest. We do this separately for agency mortgages (column (1)) and the three categories of non-agency mortgages (columns (2) through (4)). we include Bank×Zip3 and Year fixed effects in all specifications. Standard errors (reported in parentheses) are clustered at the CBSA level. We use *,**, and *** to denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Agency	Prime	Alt-A	Subprime
	(1)	(2)	(3)	(4)
Pre-merger	0.007*	0.005	−0.008	−0.033
	(0.004)	(0.008)	(0.020)	(0.021)
Acquirer Share	−0.014	0.793***	1.960***	−0.673***
	(0.014)	(0.046)	(0.155)	(0.253)
FICO Score/100	−0.454***	−2.328***	−1.773***	−1.883***
	(0.015)	(0.086)	(0.117)	(0.076)
(FICO Score/100)^2	0.021***	0.145***	0.096***	0.106***
	(0.001)	(0.006)	(0.008)	(0.006)
Combined Loan-to-Value	−0.002***	−0.040***	−0.087***	−0.080***
	(0.0001)	(0.001)	(0.001)	(0.001)
Combined Loan-to-Value^2	0.00004***	0.0004***	0.001***	0.001***
	(0.00000)	(0.00000)	(0.00001)	(0.00001)
log(Loan amount)	−0.163***	−0.607***	−1.014***	−1.217***
	(0.002)	(0.005)	(0.007)	(0.008)
New-purchase	0.021***	−0.003	−0.032***	0.004
	(0.001)	(0.002)	(0.005)	(0.007)
Primary residence	−0.341***	−0.305***	−0.246***	−0.179***
	(0.004)	(0.003)	(0.006)	(0.010)
Debt-to-income	0.0001***			
	(0.00000)			
Freddie Mac	0.052***			
	(0.001)			
Full documentation		−0.155***	−0.306***	−0.473***
		(0.002)	(0.005)	(0.006)
Bank×Zip3	Y	Y	Y	Y
Year	Y	Y	Y	Y
Observations	21,345,165	1,334,349	482,175	563,278
Adjusted R^2	0.890	0.469	0.403	0.291

Table IA.4: List of Bank Mergers

This table lists the bank mergers used in our analysis in chronological order. For each merger, we show the nationwide market share, the percentile distribution of CBSA market shares, and the number of CBSAs and states/territories in which the target banks operate in. entity.

Index	Acquirer	Target	Event Year	Target						
				No of CBSA	Mean market share	Q1 market share	Median market share	Q3 market share	P90 market share	Nationwide market share
1*	**WELLS FARGO BANK, N.A.**	**FIRST INTERSTATE BK CA**	**1996**	52	0.89	0.04	0.63	1.25	3.45	0
2	CITIZENS BANKING CORPORATION	CB FINANCIAL CORPORATION	1997	8	1.17	0.02	0.54	1.60	2.06	0
3	FIRST BANK SYSTEM, INC.	U.S. BANCORP	1997	23	1.71	0.28	0.89	1.87	3.40	0
4	FIRST UNION CORPORATION	SIGNET BANKING CORPORATION	1997	16	0.80	0.02	0.21	0.97	2.61	0
5	FIRST WACHOVIA CORPORATION	CENTRAL FIDELITY BANKS, INC.	1997	15	5.79	0.63	4.05	9.50	13.97	0
6	MARSHALL $ ILSLEY CORPORATION	Security Capital Corp	1997	36	3.02	0.04	0.28	4.08	8.59	0
7	NCNB CORPORATION	BOATMEN'S BANCSHARES, INC.	1997	83	1.48	0.02	0.07	0.62	4.63	0
8	SOUTHERN NATIONAL CORPORATION	UNITED CAROLINA BANCSHARES CORPORATION	1997	32	2.76	0.14	0.90	2.93	6.59	0
9	BANC ONE CORPORATION	FIRST COMMERCE CORPORATION	1998	9	2.54	0.12	1.87	4.07	5.37	0
10	BANC ONE CORPORATION,NBD BANCORP	INC.	1998	149	1.88	0.04	0.29	1.52	7.00	0
11	BANKNORTH GROUP, INC.	EVERGREEN BANCORP, INC.	1998	8	1.99	0.33	0.91	1.03	6.29	0
12	FIRST ALABAMA BANCSHARES, INC.	FIRST STATE CORPORATION	1998	12	1.51	0.05	0.18	0.82	5.49	0
13	FIRST ALABAMA BANCSHARES, INC.	FIRST COMMERCIAL CORPORATION	1998	42	1.41	0.02	0.14	0.98	3.17	0
14	FIRST AMERICAN CORPORATION	DEPOSIT GUARANTY CORP.	1998	48	0.58	0.02	0.06	0.40	1.48	0
15	FIRST NATIONAL CINCINNATI CORP.	TRANS FINANCIAL BANCORP, INC.	1998	67	0.50	0.04	0.18	0.47	0.92	0
16	FIRST UNION CORPORATION	CORESTATES FINANCIAL CORP	1998	37	3.06	0.05	0.82	3.93	8.94	0
17	FIRST WISCONSIN CORPORATION	FIRST NATIONAL CINCINNATI CORP.	1998	74	1.08	0.03	0.19	0.60	1.79	0
18	NATIONAL CITY CORPORATION	FIRST OF AMERICA BANK CORPORATION	1998	114	2.25	0.07	0.41	1.77	5.01	0
19	NATIONAL CITY CORPORATION	FORT WAYNE NATIONAL CORPORATION	1998	16	2.00	0.02	0.17	2.99	6.82	0
20	NCNB CORPORATION	BANKAMERICA CORPORATION	1998	387	3.60	1.35	2.71	5.16	7.83	6
21	NCNB CORPORATION	BARNETT BANKS, INC.	1998	112	1.00	0.03	0.07	0.20	2.58	0
22	PEOPLES HERITAGE FINANCIAL GROUP, INC.	CHESHIRE FINANCIAL CORPORATION	1998	18	3.45	0.28	1.04	3.53	6.89	0
23	AMSOUTH BANCORPORATION	FIRST AMERICAN CORPORATION	1999	39	1.87	0.01	0.09	0.99	6.48	0
24	CHITTENDEN CORPORATION	VERMONT FINANCIAL SERVICES CORP	1999	13	5.04	0.14	0.81	9.51	16.49	0
25	FIFTH THIRD BANCORP	CNB BANCSHARES, INC.	1999	19	1.38	0.01	0.10	0.54	3.45	0

Index	Acquirer	Target	Event Year	Target						
				No of CBSA	Mean market share	Q1 market share	Median market share	Q3 market share	P90 market share	Nationwide market share
26	FIRST BANCORPORATION OF OHIO	SIGNAL CORP	1999	357	0.38	0.07	0.17	0.37	0.74	0
27	FIRST NATIONAL CINCINNATI CORP.	FIRST WISCONSIN CORPORATION	1999	92	1.55	0.03	0.23	1.58	4.43	0
28	FIRSTAR CORPORATION	MERCANTILE BANCORPORATION INC.	1999	77	2.58	0.01	0.17	2.82	9.64	0
29	FLEET FINANCIAL GROUP, INC.	BANK OF BOSTON CORPORATION	1999	220	0.18	0.04	0.09	0.17	0.32	0
30	BANCORP OF MISSISSIPPI, INC.	FIRST UNITED BANCSHARES, INC.	2000	15	1.00	0.01	0.16	0.50	2.25	0
31	CENTURA BANKS, INC.	TRIANGLE BANCORP, INC.	2000	19	0.45	0.01	0.09	0.46	1.15	0
32	NATIONAL COMMERCE BANCORPORATION	CCB FINANCIAL CORPORATION	2000	30	0.94	0.03	0.18	1.58	2.40	0
33	NORWEST CORPORATION	FIRST SECURITY CORPORATION	2000	470	1.03	0.08	0.20	0.75	2.50	0
34	PEOPLES HERITAGE FINANCIAL GROUP, INC.	BANKNORTH GROUP, INC.	2000	22	2.27	0.05	0.72	1.97	9.21	0
35	SOUTHERN NATIONAL CORPORATION	ONE VALLEY BANCORP OF WEST VIRGINIA, INC.	2000	25	1.63	0.02	0.12	0.96	5.07	0
36	SOUTHERN NATIONAL CORPORATION	COMMEX FINANCIAL CORPORATION	2000	44	0.28	0.02	0.06	0.30	0.76	0
37	CITIGROUP INC.	STICHTING PRIORITEIT ABN AMRO HOLDING	2001	714	0.88	0.16	0.37	1.05	1.97	1
38	FIRST BANK SYSTEM, INC.	FIRSTAR CORPORATION	2001	398	1.32	0.05	0.14	0.68	4.44	0
39	FIRST UNION CORPORATION	FIRST WACHOVIA CORPORATION	2001	92	0.94	0.06	0.52	1.41	2.35	0
40	FIRSTAR CORPORATION	FIRST BANK SYSTEM, INC.	2001	271	1.69	0.07	0.50	2.09	4.70	0
41	FLEET FINANCIAL GROUP, INC.	UNITED JERSEY BANKS	2001	14	0.65	0.01	0.03	0.31	2.05	0
42	NBT BANCORP INC.	CNB FINANCIAL CORP.	2001	31	1.31	0.04	0.72	2.03	2.99	0
43	SOUTHERN NATIONAL CORPORATION	FIRST VIRGINIA BANKS, INC.	2003	20	1.51	0.07	0.80	2.13	3.19	0
44	CHEMICAL NEW YORK CORPORATION	BANC ONE CORPORATION	2004	893	1.95	0.52	0.85	2.17	4.68	1
45	CITIZENS BANCSHARES INC.	SECOND BANCORP, INCORPORATED	2004	46	0.39	0.01	0.05	0.23	1.28	0
46	FIRST UNION CORPORATION	SOUTHTRUST CORPORATION	2004	220	0.84	0.03	0.26	0.79	2.20	0
47	INTERNATIONAL BANCSHARES CORPORATION	LOCAL FINANCIAL CORPORATION	2004	13	1.67	0.07	0.32	2.41	6.26	0
48*	**JPMORGAN CHASE**	**BANK ONE**	**2004**	915	2.68	0.85	1.61	3.83	4.84	2
49	NATIONAL CITY CORPORATION	PROVIDENT BANCORP, INC.	2004	241	0.11	0.04	0.07	0.14	0.24	0
50	NCNB CORPORATION	FLEET FINANCIAL GROUP, INC.	2004	125	0.64	0.02	0.04	0.10	0.11	0
51	NORWEST CORPORATION	INTERWEST BCORP	2004	17	1.06	0.09	0.22	1.17	3.25	0
52*	**REGIONS FINANCIAL CORP**	**UNION PLANTERS BANK**	**2004**	744	0.97	0.07	0.21	0.57	1.07	0
53	SUNTRUST BANKS, INC.	NATIONAL COMMERCE BANCORPORATION	2004	103	0.35	0.01	0.05	0.18	0.99	0
54*	**U.S. BANK N.A.**	**The Leader Mtg Co**	**2004**	268	0.35	0.06	0.18	0.40	0.83	0
55*	**WELLS FARGO BANK, N.A.**	**PACIFIC NORTHWEST**	**2004**	19	0.92	0.09	0.23	1.22	4.91	0

Index	Acquirer	Target	Event Year	Target						
				No of CBSA	Mean market share	Q1 market share	Median market share	Q3 market share	P90 market share	Nationwide market share
56*	**BANK OF AMERICA**	**FLEET NA**	**2005**	731	0.35	0.04	0.07	0.13	0.94	0
57	CAPITAL ONE FC	NORTH FORK BANCORPORATION, INC.	2006	619	0.39	0.11	0.23	0.48	0.97	0
58	CITIZENS BANKING CORPORATION	REPUBLIC BANCORP INC.	2006	45	0.48	0.01	0.04	0.26	1.51	0
59	HUNTINGTON BANCSHARES INCORPORATED	UNB CORP.	2006	13	0.57	0.03	0.11	0.35	1.03	0
60*	**REGIONS FINANCIAL CORPORATION**	**AMSOUTH BANCORPORATION**	2006	114	1.70	0.04	0.53	2.72	4.90	0
61*	**CITI BANK**	**ABN AMRO MTG GROUP**	**2007**	886	1.42	0.52	0.93	1.79	3.76	1
62	HUNTINGTON BANCSHARES INCORPORATED	CITIZENS BANCSHARES INC.	2007	59	1.08	0.01	0.04	0.34	4.01	0
63	SUSQUEHANNA BANCSHARES, INC.	COMMUNITY BANKS, INC.	2007	12	0.47	0.01	0.12	0.68	1.41	0
64*	**WELLS FARGO BANK, N.A.**	**Greater Bay Bank**	**2007**	14	0.01	0.01	0.02	0.02	0.18	0
65*	**BANK OF AMERICA**	**LASALLE BK**	**2008**	139	0.45	0.02	0.07	0.43	1.28	0
66	F.N.B. CORPORATION	OMEGA FINANCIAL CORPORATION	2008	13	1.93	0.01	0.21	3.43	5.19	0
67*	**JPMORGAN CHASE**	**Washington Mutual**	**2008**	916	2.24	0.97	1.65	2.85		3
68	NCNB CORPORATION	ABN AMRO HOLDING N.V.	2008	853	0.87	0.30	0.55	1.00	1.86	0
69	NORWEST CORPORATION	FIRST UNION CORPORATION	2008	883	1.91	0.47	0.79	1.96	5.51	3
70	PNC FINANCIAL CORP.	NATIONAL CITY CORPORATION	2008	916	2.62	1.30	2.06	3.24	5.07	2
71*	**U.S. BANK N.A.**	**PFF BANK & TRUST**	**2008**	18	0.01	0.00	0.01	0.01	0.09	0
72*	**BANK OF AMERICA**	**COUNTRYWIDE**	**2009**	918	6.88	4.59	6.39	8.48	16.58	8
73*	**WELLS FARGO BANK, N.A.**	**WACHOVIA BK NA**	**2009**	872	1.01	0.17	0.28	0.58	1.49	1
74*	**WELLS FARGO BANK, N.A.**	**MERIDIAN MOME MORTGAGE, LP**	**2010**	14	0.00	0.00	0.00	0.01	0.07	0
75	FIRST NIAGARA FINANCIAL GROUP, INC.	NEWALLIANCE BANCSHARES, INC.	2011	7	1.27	0.06	0.57	2.08	3.75	0
76	HANCOCK HOLDING COMPANY	WHITNEY HOLDING CORPORATION	2011	24	0.52	0.01	0.02	0.43	1.76	0
77	NORTH AMERICAN FINANCIAL HOLDINGS, INC.	GREENE COUNTY BANCSHARES, INC.	2012	10	0.62	0.01	0.05	0.61	2.30	0
78	PROSPERITY BANCSHARES, INC.	AMERICAN STATE FINANCIAL CORPORATION	2012	26	3.47	0.02	0.19	1.09	9.82	0
79	SUSQUEHANNA BANCSHARES, INC.	TOWER BANCORP INC.	2012	98	0.25	0.02	0.06	0.18	0.58	0
80	FIRST BANCORPORATION OF OHIO	CITIZENS BANKING CORPORATION	2013	49	0.91	0.02	0.10	0.69	3.56	0
81	PEOPLES HOLDING COMPANY, THE	FIRST M & F CORPORATION	2013	19	1.00	0.03	0.20	0.56	2.99	0
82	FIRST CITIZENS BANCSHARES, INC.	FIRST CITIZENS BANCORPORATION OF SOUTH CAROLINA, INC.	2014	30	3.46	0.07	0.27	3.95	10.32	0
83	FIRST INTERSTATE BANCSYSTEM OF MONTANA, INC.	MOUNTAIN WEST FC	2014	6	0.96	0.00	0.01	0.05	2.99	0
84	HUNTINGTON BANCSHARES INCORPORATED	CAMCO FINANCIAL CORPORATION	2014	17	2.25	0.05	0.18	0.72	9.33	0
85	ISB FNCL CORP	TECHE HOLDING COMPANY	2014	9	3.33	0.07	0.59	3.92	9.56	0

Index	Acquirer	Target	Event Year	Target						
				No of CBSA	Mean market share	Q1 market share	Median market share	Q3 market share	P90 market share	Nationwide market share
86	OLD NATIONAL BANCORP	UNITED BANCORP, INC.	2014	9	0.70	0.00	0.02	0.09	1.00	0
87	UMPQUA HOLDINGS CORPORATION	STERLING FINANCIAL CORPORATION	2014	74	1.78	0.07	0.32	2.44	6.77	0
88	UNION BANCORP, INC.	VIRGINIA FC	2014	12	0.61	0.01	0.04	0.17	2.04	0
89	SIMMONS FIRST NATIONAL CORPORATION	SHARON BANCSHARES, INC.	2015	14	1.98	0.01	0.07	0.24	3.61	0
90	SOUTHERN NATIONAL CORPORATION	SUSQUEHANNA BANCSHARES, INC.	2015	30	1.40	0.03	0.23	1.51	3.95	0
91	CHEMICAL FINANCIAL CORPORATION	FIRST MICHIGAN BANCORP, INC.	2016	62	0.20	0.01	0.05	0.20	0.68	0
92	HUNTINGTON BANCSHARES INCORPORATED	FIRST BANCORPORATION OF OHIO	2016	72	0.91	0.03	0.17	0.60	2.78	0
93	NORTH AMERICAN FINANCIAL HOLDINGS, INC.	FNB CORP.	2016	16	0.65	0.05	0.17	1.12	1.94	0
94	SOCIETY CORPORATION	FIRST NIAGARA FINANCIAL GROUP, INC.	2016	50	1.14	0.04	0.22	1.49	3.47	0
95	SOUTHERN NATIONAL CORPORATION	NATIONAL PENN BANCSHARES, INC.	2016	17	0.69	0.08	0.20	0.54	2.17	0
96	CAROLINA FC	NEWSOUTH BCORP	2017	16	1.14	0.10	0.54	1.19	2.72	0
97	COMMUNITY BANK SYSTEM, INC.	MERCHANTS BANCSHARES, INC.	2017	7	0.89	0.08	0.18	2.02	2.31	0
98	F.N.B. CORPORATION	YADKIN VALLEY FINANCIAL CORPORATION	2017	35	0.70	0.06	0.23	0.58	2.07	0
99	FIRST BANCORP	CAROLINA BANK HOLDINGS, INC.	2017	27	0.55	0.03	0.08	0.30	1.10	0
100	FIRST INTERSTATE BANCSYSTEM OF MONTANA, INC.	CASCADE BANCORP	2017	14	0.64	0.02	0.07	0.34	1.56	0
101	FIRST TENNESSEE NATIONAL CORPORATION	NORTH AMERICAN FINANCIAL HOLDINGS, INC.	2017	33	0.37	0.05	0.10	0.25	0.60	0
102	HANDI-BANCSHARES, INC.	STRATEGIC GROWTH BANKING INCORPORATED	2017	38	0.24	0.03	0.11	0.21	0.42	0
103	PINNACLE FINANCIAL PARTNERS, INC.	BNC BANCORP	2017	24	0.35	0.03	0.10	0.33	0.88	0