The Bank Competition Index

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Abstract

We develop a Bank Competition Index (BCI) that provides a measure of community bank competition across banking markets more accurate than existing measures. Because banking products are homogeneous, most banks derive market power from borrower and depositor relationships. We argue that competition is more intense in markets where the average bank has relatively few relationships because such banks try to build market power by attracting customers from other banks. Three market factors--the mean nonmaturity deposit ratio, the deposit-share Herfindahl-Hirschman Index (HHI) and per capita offices--form the BCI where the factors are weighted by their long-term impacts on net interest spreads. Our index improves upon HHI and the H-statistic both in-sample and out-of-sample. We find that, on average, community banks operating in more competitive markets exhibit lower profitability and slightly higher risk. In addition, deal prices for merger targets are lower in more competitive markets.

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1. Introduction

Deposits in the Fayetteville-Rogers-Springdale (Fayetteville) metropolitan statistical area (MSA) in northwest Arkansas are highly concentrated because one out of 39 banks in the MSA holds nearly half the market's deposits. According to the deposit-share Herfindahl-Hirschman Index (HHI) —the most widely used measure of bank competition—the Fayetteville MSA ranks in the least competitive (bottom) decile of MSAs nationwide. Bankers in the market, however, would vehemently disagree. They perceive the market as intensely competitive, both for loans and deposits. Indeed, the mean net interest margin in 2017 was 26 basis points less in the market than the margin earned by banks in allegedly more competitive markets. This discrepancy suggests that HHI omits important elements of banking market competition.

The premise of deposit-share HHI is that markets with more concentrated deposit holdings give banks pricing power through the potential for either tacit or explicit collusion. Collusion, however, may not occur even in a highly concentrated market with a small number of banks, and it is even more difficult to establish and maintain in markets with many banks because banks with low market share have incentives to price more competitively to gain market share.

Our objective is to introduce a new measure of banking market competition which we call the Bank Competition Index (BCI) and validate it as a more accurate measure than two commonly used measures of competition in the literature, deposit-share HHI and the H-statistic. The premise of BCI is that the primary determinant of competition is the intensity of the battle for scarce borrower and depositor relationships. Loans and deposits are relatively homogeneous products, so banks derive market power from long-term customer relationships built on trust and switching costs rather than product differentiation. Because relationship intensity at a bank cannot be observed directly, we use nonmaturity deposits (transaction, other savings, and money market deposits), the least rate-sensitive of core liabilities, as a proxy. We assert that banks with higher shares of nonmaturity deposits to

liabilities have deeper community relationships and, hence, more market power than banks with lower percentages of such liabilities.

We hypothesize that banks compete more intensely for customer relationships in markets where the average bank has relatively few relationships. In other words, competition is most fierce in markets where the unweighted mean ratio of nonmaturity liabilities to liabilities is low. In the Fayetteville MSA in 2017, for example, the average bank held 60% of liabilities as nonmaturity deposits, but the ratio for the average market nationwide was 70%. Because the average bank in that MSA relies heavily on maturity funding, it has powerful incentives to woo businesses and depositors from other banks to deepen ties with the community and gain market power. Consequently, we should observe low average profitability of banks in highly competitive markets because the average bank in the market has little pricing power. In addition, even at banks with strong customer relationships, profitability should be lower in more competitive markets than in less competitive markets because competitors in those markets more aggressively bid down loan rates and bid up deposit rates.

The BCI assigns a value to each U.S. market (an MSA or rural county) each year. It is derived from three market structure factors: the mean ratio of nonmaturity deposits to liabilities of all banks with offices in the market, deposit-share HHI, and the per-capita number of offices in the market. The mean nonmaturity deposit to liability ratio proxies for incentives of banks with few customer relationships to entice scarce customer relationships from other banks. Deposit-share HHI proxies for the potential for collusion among banks in more concentrated markets. Finally, a high number of per-capita offices in the market reflects banks' commitments of financial resources to be geographically close to customers to preserve or attract customer relationships. We weight factors in the BCI by their long-term effects on markets' average net interest income to average assets (NII), which provides the BCI with an intuitive interpretation. We construct the index so that higher values

reflect more intense competition. A market with a BCI value of 50, for example, indicates that competition reduces NII an average of 50 basis points for banks in that market relative to the average market over our estimation period from 1997-2015. Of the three market structure factors in the BCI, the mean ratio of nonmaturity deposits to liabilities is the dominant factor explaining 70% of the economic significance, consistent with our premise that the primary determinant of bank competition is the battle for scarce borrower and depositor relationships. Deposit concentration remains a component in our model; however, it accounts for just 6% of the economic significance.

BCI and HHI tell very different stories about which U.S. markets are the most competitive. According to BCI, the Fayetteville MSA ranks as the 11th most competitive MSA in the nation in 2017, a sharp contrast with the 338th ranking by deposit-share HHI. Figure 1 displays two heat maps of the 382 MSAs in the U.S. in 2017 ranked by competition quartile. Darker shades represent MSAs with more intense competition. Panel A ranks MSAs by BCI, and Panel B, by 1-HHI, the complement to deposit-share HHI. We use 1-HHI so that, like BCI, higher values indicate less concentration and more competition. The BCI map in Panel A shows the most competitive MSAs concentrated in the eastern half of the U.S., especially along the Atlantic seaboard. The 1-HHI map in Panel B, however, shows competition more evenly spread across the eastern half of the U.S., and it shows that markets along the West Coast are highly competitive. Table 1 lists the top ten most competitive MSAs in 2017 ranked by BCI (Panel A) and 1-HHI (Panel B). BCI ranks the Pittsburgh and Cincinnati MSAs 2nd and 4th, respectively, but 1-HHI ranks them among the least competitive markets at 340 and 359. In addition, 1-HHI ranks the Oklahoma City and Waco MSAs 4th and 6th, respectively, but BCI ranks them at 141 and 159. Bank net interest spread is more consistent with BCI rankings. Table 1 shows that the average NII across the top-ten BCI-ranked MSAs is 3.12%, 11 basis points lower than the average NII across the top ten HHI-ranked MSAs.

[Insert Table 1 here]

We conduct a series of tests to show that BCI is a more accurate measure of market competition for loans and deposits than HHI and H-statistic. At the market level, we look for an inverse relationship between market competition and mean net interest spread of banks operating in the market. Our in-sample estimate over the 1997-2015 sample period shows that average NII is 18 basis points lower in markets with a one standard deviation increase in BCI. The similar estimate for HHI shows that average NII is lower by 4 basis points, and the H-statistic shows an economically small but unexpectedly higher average NII of one basis point. Indeed, we find that H-statistic performs poorly throughout our testing.

We then look for bank-level evidence that banks with high levels of market power operating in more competitive markets earn lower net spreads than similar banks operating in less competitive markets. We expect to observe this inverse relationship because intense competition from other banks in highly competitive markets should push down loan yields and increase deposits costs even at the banks with the most market power. Holding market power constant, we find that banks operating in a market with a BCI value one quartile higher than another market have NII that is 14 basis points lower. The same test for HHI reduces NII by 6 basis points, and we find no effect on spreads from H-statistic.

We also look for logically consistent relationships at the bank level between market power and profitability. Holding market competition constant, banks with more market power should earn higher spreads. Holding BCI constant, we find that a one quartile increase in market power increases NII by 16 basis points. However, when we measure competition with HHI or H-statistic, we find no effect on net spread.

Finally, we validate BCI by examining deal prices for bank acquisitions. Consistent with expectations, target prices for out-of-market acquisitions are lower in markets with greater

competition as measured by BCI. In contrast, target prices are higher in markets with greater competition as measured by HHI.

In sum, relative to HHI and H-statistic, we find that BCI has the largest adverse effects on profitability both at the market and bank levels, and the index identifies consistent relationships between bank market power, profitability and deal prices.

An ongoing debate in the literature is whether greater competition increases or reduces bank credit risk. At the market level, we find a statistically significant and economically large positive relationship between BCI and credit risk. Bank-level tests, however, show the higher credit risk comes from banks with less market power. In sum, the average bank in a more competitive market has relatively high credit risk because it also has relatively low market power.

Like any index, BCI is not a perfect measure of market competition. First, it focuses exclusively on the competition for loans and deposits without accounting for market power that a bank could derive from other sources such as fee-based services and networks. As such, the index is most relevant for community banks and less relevant for the large regional and national banks. Second, the three factors in BCI are imperfect proxies for competition. BCI does not, for example, have direct proxies for loan competition. Our objective, however, is more modest—to introduce an index that improves upon deposit-share HHI and the H-statistic so that scholars, regulators, bankers, and investors are better informed about differences in competition intensity across banking markets.

Our paper proceeds as follows. Section 2 describes the literature on common measures of bank competition and the relationship between competition and risk. Section 3 explains the construction of BCI, focusing on the three fundamental determinants of market competition. Section 4 examines at the market level the empirical relationship between each of the three competition measures and bank performance. Section 5 reports bank-level analysis of the empirical relationship between each of the three measures of competition and bank performance. Section 6 discusses the

results from tests of the effects of market competition on prices paid for bank targets. Section 7 concludes.

2. Competition Measures and Risk

2.1 Existing Measures of Competition

Researchers have used several approaches to measure bank competition. The most common approach is the structure-conduct-performance (SCP) paradigm, which assumes a causal relationship between market structure and firm conduct and performance. Berger and Hannan (1989) use deposit-share HHI to investigate the relationship between market concentration and profitability using U.S. bank data from 1983-85. They find that firms in concentrated markets have reduced pressures to minimize cost, which results in lower cost efficiency. HHI, however, reflects only the potential for anticompetitive or collusive behavior but it does not account for whether such collusion has been achieved; thus, the measure needs to be augmented with additional information.

A more recent approach is the pricing paradigm, which focuses on direct measures of bank pricing behavior or market power based on the industrial organization literature. These approaches include the Lerner index, H-statistic, and Boone indicator.

The Lerner Index (Lerner, 1934) measures realized outcomes from competition rather than potential outcomes. The Lerner Index is defined as the percentage spread of the output price (P) to estimated marginal cost (MC): (P-MC)/P. In banking industry studies, P is typically the average loan interest rate, and MC includes the average funding cost plus the personnel, overhead, and occupancy costs. MC is estimated from a translog cost function with respect to output. Higher values of the Lerner Index are associated with less bank competition.

Similar to the Lerner index, Panzar and Rosse (1987) develop the H-statistic. The H-statistic measures changes in total revenue to changes in observed input prices. The measure itself is the sum

of factor price elasticities. If the H-statistic is close to 1, output prices rise and fall together implying a competitive market where cost determines price. However, if the H-statistic is close to 0, the input price has little influence on output price indicating that firms can set price independently from input price because of market power.

Despite their adherence to economic theory, the Lerner Index and H-statistic do not account for important aspects of competition. Bolt and Humphrey (2015) show that interpretation of the Lerner index is clouded by the influence of scale economies, productivity, and risk differences among banks. The H-statistic faces much the same problem as it relates changes in total revenues to changes in observed input prices, holding output constant. In addition, a lack of detailed price and input and output data limit the application of these two methods.

The Boone Index (Boone, 2008) analyzes the impact of increased competition on firms' output, prices, profit, and market shares. The author defines the measure of Relative Profit Distance (RPD) as follows: let $\pi(n)$ denote the variable profit level of a firm with efficiency level n, where higher n denotes higher efficiency. Consider three firms with different efficiency levels, $n_2 > n_1 > n$, and calculate the following variable, $[\pi(n_2) - \pi(n)]/[\pi(n_1) - \pi(n)]$. An increase in RPD signals an increase in competition because as the industry becomes more competitive, the most efficient firm n_2 gains more relative to a less efficient firm n than firm n_1. The intuition for the relative profits measure is that in a more competitive industry, firms are punished more harshly for being inefficient. This index, however, is firm specific and is difficult to aggregate to the market level.

Our approach to constructing BCI uses the SCP paradigm and identifies three market structure factors: the mean ratio of nonmaturity deposits to liabilities, the deposit-share HHI, and the per-capita number of offices of all banks in the market. We use interest spread decomposition to weight the index factors. We compute the unweighted mean net interest income to average assets (NII) of all community banks operating in a given market (county or MSA) over a rolling three-year

period from 1997 to 2015. We then regress the market NII on the factors and use the coefficients as weights to construct the index.

In our validity tests, we compare BCI with the stand-alone deposit-share HHI and market-level H-statistic. We use the H-statistic, developed by Rosse and Panzar (1977) and Panzar and Rosse (1982, 1987), as our third competition measure. We compute our market level H-statistic following Yildrim and Mohanty (2010). The authors estimate reduced form bank revenue equations using an "intermediation approach" to bank modeling (e.g., Claessens and Laeven, 2004). We estimate the reduced form revenue equations for each market over rolling three-year windows, similar to those used in the construction of our BCI index, to get the coefficient estimates needed to compute the H-statistic. Like Yildrim and Mohanty, our H-statistic is constructed as the sum of three coefficient estimates used in describing the relation between bank revenues and input prices, i.e., estimates on the ratio of interest expenses to total deposits, the ratio of personnel expense to the number of full time equivalent employees, and the ratio of physical capital expenditure to fixed assets.

2.2 Competition and Risk

The effects of bank competition on bank risk-taking, profitability, and financial stability remain hotly debated issues within the academic literature. The conventional theory, the competition-fragility hypothesis, posits that increased competition erodes market power leading to a reduction in charter values (Marcus, 1984; Chan, Greenbaum, and Thakor, 1986; and Keeley, 1990). To preserve or increase charter values, bank owners increase the riskiness of asset portfolios, which shifts risk to liability holders. In a more competitive environment with greater downward pressures on bank profitability and, by extension, charter values, banks have greater incentives to take increased asset risks, resulting in greater fragility. Keeley (1990) finds that banks failures surged following increases in competition resulting from geographical deregulation restrictions in the 1970s and 1980s. Hellmann,

Murdock, and Stiglitz (2000) find a similar increase in bank risk-taking following the removal of interest rate ceilings on deposits.

More recent literature posits a competition-stability view of bank competition. Boyd and De Nicolo (2005) construct a model in which a less competitive environment provides banks the ability to exploit market power by charging higher interest rates on assets. Higher interest rates, however, increase the difficulty faced by customers in servicing debt, which exacerbates problems of asset substitution among borrowers. Less competitive banking systems may also increase risk-taking if institutions believe they will receive larger subsidies through implicit "too-big-to-fail" policies (Mishkin, 1999). Empirical studies provide some support for the competition-stability view. Schaeck, Cihak, and Wolfe, (2009) find that more competitive banking systems have lower likelihoods of bank failure and longer times between crises. Boyd, De Nicolo, and Jalal (2006) and De Nicolo and Loukoianova (2006) find that bank risk is inversely related to market concentration.

Berger, Klapper, and Turk-Ariss (2009) argue that the competition-fragility and competition-stability hypotheses need not yield contradictory predictions regarding the relationship between competition and stability in banking. Increases in the riskiness of loan portfolios resulting from increases in market power may be counteracted by banks through actions to protect higher charter values generated through concentrated banking systems. Specifically, banks can offset increased loan risk by holding more equity capital to protect charter values. Berger et al. (2009) examine bank risk across 23 nations and provide evidence for their argument by finding that: 1) in general, banks with greater market power exhibit less overall risk; and, 2) loan risk does increase with concentration, but the increased risk is somewhat offset by higher equity capital ratios.

Our evidence is most consistent with the competition-fragility hypothesis. Risk increases at banks operating in more competitive markets, but the risk increase comes from banks with relatively low market power.

3. Construction of the Index

Construction of BCI begins with the intuitive assumption that more competition should depress the average net interest income of banks in the local market. The local market for urban areas includes all banks with deposits in the MSA, and the local market for rural areas includes all banks with deposits in the county. We use MSA and county boundaries from the 2010 Census so that geographic markets are consistent across years.

Our bank sample includes all commercial banks between 1995 and 2015 obtained from the Federal Financial Institutions Examination Council (FFIEC) Call Reports. Thrifts are included beginning in 2012. From this database, we compute several quarterly bank ratios that are trimmed at the top and bottom 1% to remove outliers and then annualized.

The FDIC Summary of Deposit database provides annually (as of June 30) the geographic location and amount of deposits in each bank office (branches plus headquarters). We aggregate deposits and offices by bank and geographic market to compute deposit share and number of offices of each bank in each market. We merge the aggregated Summary of Deposits data with the annualized Call Report ratios and retain the geography from the offices so that each bank observation in the merged database is at the market (MSA or county) level where the bank's deposits reside. For example, a bank with deposits in three different markets in a year will have three observations that year. For each market and year, we compute the unweighted means of bank performance ratios to derive the average performance of all banks with deposits in a market.

We estimate the long-term effects of competitive factors on bank net spreads by regressing at the market level mean net interest income to average assets (NII) on explanatory variables using a rolling three-year window between end-of-periods 1997 and 2015. The three-year window reduces potential idiosyncratic effects from annual variations in a market's NII, and the long sample period

ensures that competitive factors have persistent effects on NII over time. The first three-year period in the sample is 1995-1997, which coincides with the implementation of the Riegle-Neal Interstate Banking and Branching Law that permitted full interstate banking by bank holding companies and banks across the U.S. Consequently, a wave of interstate acquisitions and mergers began around that time.

The OLS regression in Equation (1) estimates the effect of competition on NII:

$$NII_{it} = \alpha + \boldsymbol{\beta_1}\, \boldsymbol{Competition_{it}} + \boldsymbol{\beta_2}\, \boldsymbol{Controls_{it}} + \varepsilon_{it} \quad (1)$$

where *NII* is the equally-weighted average net interest income to average assets of all banks with deposits in market *i* for the rolling three-year period *t*. *Competition* is a vector of three factors, and all are defined such that higher values reflect an increase in market competition so that each $\boldsymbol{\beta_1}$ coefficient is negative.

The first factor is the unweighted mean of the ratio of *maturity* liabilities to total liabilities, or equivalently, one minus the ratio of *nonmaturity* deposits to liabilities, expressed as $1 - (DD + MMDA + SAV)/LIAB$. For each bank with deposits in the market, we sum its nonmaturity deposits: demand deposits (*DD*), money market deposit accounts (*MMDA*), and other savings deposits (*SAV*).[1] We divide the sum by total liabilities (*LIAB*) and subtract the resulting value from one. The bank ratios are then averaged across all banks with deposits in market *i* during the three-year rolling window *t*. To understand why we do not weight maturity liability ratios by deposit (or asset) share, consider a highly competitive market where most banks hold high levels of maturity liabilities (or few nonmaturity deposits). These banks have strong incentives to build customer relationships and gather core deposits by wooing loan and deposit customers from other banks with generous terms. If these

[1] We also compute the nonmaturity deposit to liability ratio using only headquarters banks rather than banks with deposits in the market; our results are qualitatively unchanged regardless of the specific approach used.

homogeneous products are priced at the margin, the aggressive banks will influence prices for all banks in the market regardless of their market share.

The second competition factor is deposit-share HHI, the most commonly used competition measure in the literature. We use the complement to HHI by subtracting HHI from one (*1–HHI*) so that higher values signal more competition. In general, we expect markets with more equally distributed deposits to have lower profitability because the potential for pricing collusion among banks is lower.

The third competition factor is the number of offices per 1000 people in the market. The rationale is straightforward. Bank offices are resources that banks use to attract and retain customer relationships. Greater density of offices represents more intense competition for core deposits and loan customers. We correct for scale bias that leads to high per-capita office ratios in counties with very small populations. The bias arises because offices in counties with small populations serve relatively few people, yet those offices are weighted the same as those that serve many people. For example, in 2015 Jones County, Texas had a population of 956, and Garfield County, Utah had a population of 5000. Each county had 3 offices, but the number of offices per 1000 people was 5.2 times higher in Jones County. To correct for this bias, we add 8000 to each market's population.[2] This adjustment significantly reduces the per-capita office ratio in lightly populated banking markets but has little effect in heavily populated markets.

Equation (1) includes several control variables, defined in Appendix 1, to account for other factors that affect average net interest income. *Controls* include nonperforming loans to assets and net chargeoffs to loans, the loan to asset ratio, the share of real estate loans, and the log of (real) assets. We also control for market characteristics, which include the share of deposits held by community

[2] The addition of 8000 to population minimizes the variance of per-capita office means across markets. We experimented with several other values, and the effects on BCI are small.

banks (less than $10 billion in real assets), a rural indicator that equals one if the market is in a rural area and zero otherwise, and the log of the market's population. Finally, we include national economic and financial data to control for business cycle changes over time.[3] These variables include the one-year Treasury yield, the spread between one- and ten-year Treasury yields, and a recession variable that equals one for the recession years of 2001, 2008, and 2009, and zero otherwise. Because we run the regression on averages over three-year rolling windows, the variable *Recession Indicator* ranges between 0 and 1.

Table 2 reports the regression results from Equation (1). As expected, each of the competition factors is negative and statistically significant showing that markets with more intense competition have lower NII. Maturity liabilities have the largest economic significance. A one standard deviation increase in the maturity liabilities to total liabilities ratio reduces market NII by 22 basis points. One standard deviation increases in per-capita offices and 1-HHI, respectively, reduce NII by 7 and 2 basis points. Most control variables are statistically significant and have expected signs. Markets where the average bank is larger, has higher nonperforming loans, and has fewer loans to assets have lower profitability. The coefficient on net chargeoffs, however, is positive, possibly because higher net chargeoffs reflect riskier loan portfolios on average, which generate higher margins.

[Insert Table 2 here]

We compute BCI for each market and end-of-year three-year window by multiplying the competition coefficients from Table 2 by the difference of each competition variable from its sample period mean (1997 through 2015), as shown in Equation (2). This methodology gives the index an intuitive interpretation. For a market where the competition variables are at their means, BCI is zero. For a more competitive market where each variable is one standard deviation above the mean, BCI is

[3] Running the regression separately on MSAs and counties yields similar results as well as replacing business cycle variables with year fixed effects.

0.31 (0.22+0.07+0.02), indicating that competition in that market leads to net interest income 31 basis points lower than the mean.

$$CBI_{it} = 2.34 * (MATLIAB_{it} - \overline{MATLIAB}) + 0.66 * (PCOFF_{it} - \overline{PCOFF}) + 0.10 * (\overline{HHI} - HHI_{it}) \quad (2)$$

Table 3 reports descriptive statistics for BCI over the 1997-2015 estimation period. Panel A presents the results for the entire sample. The mean BCI is essentially zero by construction, has a standard deviation of 0.24, and ranges from -0.98 to 0.70, reflecting significant variability across markets and years. The mean values of *Maturity Liabilities*, *Per Capita Offices*, and *1-HHI* are 0.48, 0.49, and 0.71, respectively.

[Insert Table 3 here]

Summary statistics of market-level bank financial characteristics are presented in Panel B. During the sample period, the average annual *ROA* is 1.05%, nonperforming loans to total assets (*Nonperforming*) is 0.95%, and the average net chargeoffs is 0.46%. The mean bank has $951.7 million in real assets using 2009 dollars. Panel C of Table 3 reports descriptive statistics of BCI by Federal Reserve district. The competition index by Federal Reserve district ranges from -0.21 in San Francisco to 0.10 in St. Louis.

Finally, Panel D reports BCI values for each ending year of the three-year rolling windows. The results show that BCI fell from a mean value of 0.09 in 1997 to -0.35 in 2015. The decline is especially pronounced after the financial crisis and is due to the extraordinary actions by the Federal Reserve to expand the money supply post-crisis, which increased the supply of maturity liabilities in the banking system. The downward trend suggests that banking markets are less competitive post-crisis than they were pre-crisis because competition for core deposits has eased. All our tests, however, contain year fixed effects so our focus is on differences in BCI across markets in a given year.

4. Market-Level Validation of BCI

In this section, we compare the relationship between each of the three measures of market competition and bank performance at the market level. Banks in the market include all banks with deposits in the market so that banks with deposits spread across markets are included in each market. We expect to find an inverse relationship between market competition and banking market profitability. We also examine the relationship between market competition and risk, though we have no a priori expectation of the coefficient signs given the mixed evidence in the literature. Section 4.1 presents in-sample results for the full sample period, and section 4.2 presents out-of-sample results for BCI.

4.1 In-Sample Results

We run panel regressions at the market level to examine the relationship between bank profitability and each of the three competition measures—BCI, 1-HHI, and H-statistic. Equation (2) displays the regression specification:

$$BP_{it} = \alpha + \beta_1 Competition_{i,t-1} + \boldsymbol{\beta_2}\, \boldsymbol{Controls_{i,t-1}} + District_i + Year_t + \varepsilon_{it} \qquad (2)$$

where BP_{it} is the market-level bank profitability or risk variable for market i in year t; $Competition_{i,t-1}$ is one of the three competition measures lagged one year; $Controls_{i,t-1}$ is a vector of lagged control variables; $District_i$ is a vector of Federal Reserve district dummies; and $Year_t$ controls for year fixed effects.

Equation (2) differs from Equation (1) in several ways. First, competition and control variables are lagged one year to reduce endogeneity because we are interested in assessing causation rather than correlation. Second, all bank and control variables are computed on an annual basis rather than three-year rolling averages. Competition measures, however, are constructed with the rolling windows. Third, we weight the dependent variables by each bank's market power to control for the

differing effects that competition has on banks with different degrees of market power.[4] For BCI, market power is measured by the ratio of nonmaturity deposits to liabilities; for HHI, it is the bank's deposit share; and for H-statistic, it is the inverse of the bank-level H-statistic (because lower values of H-statistic imply more market power). Finally, because the descriptive statistics in Table 3 show considerable variation in BCI through time and by Federal Reserve district, regressions include year fixed effects and district dummies. Consequently, controls variables differ slightly between the specifications. For all specifications, we compute robust standard errors clustered by district. Despite these differences, we expect lagged BCI to be strongly correlated with NII because BCI was constructed precisely to capture NII sensitivity over the same sample period. We present out-of-sample tests in the next section to address this concern.

[Insert Table 4 here]

Table 4 presents results from regressing market-level bank performance variables on the three competition measures. Each of the two panels reports three regression results for each competition measure. Columns 1, 4 and 7 report results with BCI as the competition measure, columns 2, 5, and 8 use 1-HHI, and columns 3, 6, and 9 use the H-statistic.

Panel A of Table 4 measures the effect of competition on net spread. Dependent variables are net interest income to average assets (*NII*), interest income to average assets (*Interest Income*), and interest expense to average assets (*Interest Expense*). The statistically significant -0.74 coefficient estimate on BCI in column 1 shows that the average bank in a market with a one standard deviation higher BCI has lower NII of 18 basis points, or 4.9% of the average NII over the sample period. Results in columns (4) and (7) show that the lower NII is driven almost entirely by higher interest expense. With 1-HHI as the competition measure, column 2 shows that one standard deviation higher market competition results in lower market NII of just 4 basis points. Interestingly, 3 of the 4 basis

[4] We also equally weight the dependent variables, and the regression results are essentially unchanged.

point reduction comes from a decline in interest income. In fact, the coefficient on interest expense is statistically insignificant, suggesting that the pricing power for banks in markets with more deposit concentration comes from loans rather than deposits. With H-statistic as the competition measure, column 3 shows that one standard deviation higher competition leads to an unexpected *increase* in average bank NII of 1 basis point, and column 9 shows that the change results from lower interest expense.

Panel B of Table 4 assesses the effects of competition on ROA and credit risk as measured by nonperforming loans to assets (*Nonperforming*) and net chargeoffs to loans (*Net Chargeoffs*). Column 1 shows that one standard deviation higher BCI is associated with lower ROA of 7 basis points, or 6.2% of the average ROA. Column 2 for 1-HHI shows lower market ROA of 3 basis points, and column 3 for H-statistic shows an unexpectedly higher ROA of 1basis point.

Panel B also shows that markets with higher competition as measured by BCI results in higher credit risk while the other competition measures show lower risk. Specifically, columns 4 and 7 show that average nonperforming loans and chargeoffs are 5 basis points and 4 basis points higher, respectively, given one standard deviation higher BCI. In contrast, columns 5 and 8 show that a one standard deviation increase in 1-HHI results in lower average nonperforming loans and chargeoffs of 2 basis points each. The same results for H-statistic in columns 6 and 8 show a reduction in nonperforming loans and chargeoffs of 1 basis point each.

In sum, Table 4 shows that the average bank in a market with greater competition as measured with BCI has lower NII due to higher interest expense, lower ROA, and higher credit risk. The average bank in a market with greater competition as measured by 1-HHI also has lower NII, but the economic significance is less than one-fourth of the effect from BCI. In addition, more competition measured with 1-HHI results in lower credit risk. Results for H-statistic are economically small, and the profitability ratios have unexpected signs.

As robustness, we evaluate the relationship between BCI and market-level bank performance by focusing on markets with high growth in the number of banking offices. We compute the year-over-year difference in the number of bank offices operating within a given market. We then identify by year those markets in the highest quintile of percentage growth and rerun the regressions assessing the relationship between competition and bank profitability and risk over our sample period.[5] We expect an even stronger correlation between lagged competition measures and bank profitability and risk because markets with expanding offices imply more banks battling to establish customer relationships. Unreported results using BCI as the measure of competition show the coefficient for NII roughly 9% larger in absolute value. In contrast, for 1-HHI the coefficient for NII falls in absolute value by 61% and is statistically insignificant. The same coefficient for H-statistic remains at 1 basis point but is no longer statistically significant.

4.2 Out-of-Sample Results

Thus far, our regressions have been run over the same 1997-2015 sample period as computation of BCI. A potential critique is that the in-sample results are sample-specific and not robust to other time periods. To address this criticism, we conduct a series of tests where BCI is estimated using the three-year rolling window between 1995 and 2000, and the testing period is 2001-2015.[6] We re-estimate the coefficient estimates needed to construct the BCI and then use those values in out-of-sample regressions run on the sample period from 2001 to 2015.

[Insert Table 5 here]

Table 5 reports regression results of out-of-sample market-level bank performance on estimates of BCI. Net spread coefficient estimates are smaller than coefficients from in-sample

[5] In unreported results, we construct terciles as well as quartiles. Our results remain qualitatively unchanged regardless of the categorization strategy.

[6] In unreported results, we vary the year-end estimation period from 2000 and 2005. Our results are qualitatively unchanged regardless of the year used to separate the estimation and testing periods.

estimates, but they continue to show a strong statistically significant and negative relationship between BCI and NII. Markets with one standard deviation higher BCI values have lower NII and ROA of 14 and 5 basis points, respectively. Further, a one standard deviation higher BCI is associated with higher nonperforming loans and net chargeoffs of 5 and 4 basis points, respectively.

5. Bank-Level Validation of BCI

In this section, we examine the relationship between market competition, market power, and bank performance at the bank level. This perspective allows us to show that competition is more intense in markets where the average bank has relatively low market power.

Our main result thus far is that the average bank operating in a more competitive market with a higher BCI value has relatively low profitability. It is possible, however, that this result is a mechanical outcome of our methodology. Because the maturity liability ratio is the dominant factor in BCI, markets that have many banks with high maturity liabilities will also tend to have low average profitability because of the high interest expense.

We argue that the primary determinant of market competition is the battle for scarce customer relationships because banks with few relationships compete aggressively for these relationships to generate market power, which leads to higher profitability. Competition, then, depends upon the distribution of market power within the market. From this theory, we state three hypotheses. First, controlling for market power, banks in more competitive markets are less profitable than banks in less competitive markets. Second, controlling for market competition, banks with high market power are more profitable than banks with low market power. Third, the difference in profitability between banks with high and low market power is smaller in more competitive markets than in less competitive markets. Indeed, these hypotheses should hold for any measure of competition because more intense market competition should erode the profitability advantage of the market leaders.

5.1 Market Power, Competition and Profitability

Our first and second hypotheses that test the relationship between market power, competition, and profitability are closely related, and we test them using the same methodology. From the 1997-2015 bank sample used to construct the annual market-level dataset, we construct an annual bank-level dataset. Unlike the market-level dataset where an observation existed for each bank operating in each market, each bank has only one observation in the bank-level dataset. Because many banks operate across markets with different levels of competition, we compute weighted average competition indices for each bank each year where the weight is the bank's own deposit share in each market taken from the FDIC Summary of Deposits database. We then compute quartiles by year for each of the three (weighted) competition measures where higher quartiles represent greater competition.

We use a similar procedure to place banks into quartiles by market power. The premise of BCI is that banks derive market power from customer relationships, so our proxy for market power is the bank's ratio of nonmaturity deposits to liabilities. The premise of deposit-share HHI is that banks in more concentrated markets derive market power from price collusion. Consequently, banks with higher market share should have more market power, so our proxy for market power is the bank's deposit share in the market. If a bank operates in more than one market, we compute the weighted average deposit share across all markets where the weight is the bank's own deposit share in each market each year. Finally, the market power proxy for market-level H-statistic is the inverse of the bank-level H-statistic.

Table 6 presents summary statistics of our bank-level dataset. The table reports means for banks in the first and fourth quartiles of market competition and market power, respectively, between 1997 and 2015. In each panel, market competition is measured, respectively, by BCI, 1-HHI, and market-level H-statistic. Each competition measure is paired with its source of bank market power,

which is measured, respectively, with the bank's nonmaturity deposits to liabilities ratio, (weighted) deposit share in the market, and bank-level H-statistic.

[Insert Table 6 here]

Panel A presents mean ratios and differences by market competition quartile. Banks in the first (fourth) competition quartile are in the least (most) competitive markets. Consistent with expectations, results show that banks in more competitive markets as measured by BCI and 1-HHI are less profitable with higher credit risk. H-statistic, in contrast, shows that banks in more competitive markets are more profitable with lower credit risk. We also observe from the right-hand column that banks in more competitive markets have less market power on average, which likely contributes to the reduced profitability and higher risk.

Panel B of Table 6 presents mean ratios and differences by market power quartile. Banks in the first (fourth) quartile have the least (most) market power. Again as expected, banks with more market power as measured by the nonmaturity deposit ratio and deposit share, respectively, generally have higher profitability and lower credit risk. The two exceptions are that banks with more nonmaturity deposits have lower loan yields, and banks with more deposit share have lower NII. Bank-level H-statistic results unexpectedly show that banks with more market power have lower profitability and credit risk. The right-hand column in Panel B shows that banks with more market power also operate in less competitive markets on average, which likely contributes to the higher profitability and lower risk.

We use OLS regression analysis to disentangle the effects of competition and market power on bank performance measures. Panel regressions take the following form:

$$BP_{it} = \alpha_t + \beta \cdot Comp_{it} + \gamma \cdot MktPower_{it} + \delta \cdot Controls_{it} + Year_t + \varepsilon_{it} \quad (3)$$

where BP_{it} is the bank performance ratio for bank *i* in year *t*. $Comp_{it}$ is one of the three (weighted) competition measure quartiles, and $MktPower_{it}$ is the bank's (weighted) market power quartile.

$Controls_{it}$ is a vector of bank-level controls variables. Finally, $Year_t$ controls for year fixed effects. From hypotheses 1 and 2, respectively, we expect β to have a negative sign, and γ to have a positive sign for regressions where bank profitability is the dependent variable.

Table 7 displays the regression results. In each of the two panels, regressions in columns 1, 4, and 7 use BCI as the competition measure, and the bank's ratio of nonmaturity deposits to liabilities as the market power measure. Regressions in columns 2, 5, and 8 use 1-HHI as the competition measure, and the bank's (weighted) deposit share in the market as the market power measure. Regressions in columns 3, 6, and 9 use the market H-statistic as the competition measure, and the inverse of the bank-level H-statistic as the market power measure.

Results in Panel A of Table 7 show that competition as measured with BCI has the economically largest adverse effects on net interest income among the three competition measures. Columns 1, 4, and 7 across each of the three dependent variables in the panel show lower NII of 14 basis points given a one quartile higher BCI value because interest income falls by 8 basis points while interest expense increases by 6 basis points. 1-HHI gives a similar but economically smaller result. Columns 2, 5, and 8 show lower NII of 6 basis points given a one quartile higher 1-HHI value because interest income declines 5 basis points while interest expense increases 2 basis points. In contrast, the market-level H-statistic in columns 3, 6, and 9 shows no difference in net interest income from more intense competition because both interest income and interest expense rise by one basis point.

[Insert Table 7 here]

Panel A also displays the effects of market power on bank profitability, and the results provide support for the importance of nonmaturity liabilities. As shown in columns 1, 4, and 7, a one quartile higher nonmaturity deposit ratio is associated with higher NII of 16 basis points because interest income is lower by 9 basis points and interest expense is lower by 25 basis points. In contrast, a one quartile higher deposit market share in columns 2, 5 and 8 shows no effect on NII because both

interest income and interest expense rise by 4 basis points. The positive and statistically significant coefficient on market power when interest expense is the dependent variable is especially troubling because one would expect a bank with greater deposit market share to pay lower interest expense. If banks with more market power pay higher interest expense, it is difficult to understand how banks with low market share would benefit from collusion. Finally, a one quartile higher bank-level H-statistic shown in columns 3, 6, and 9 has essentially no economic effect on NII.

The first three columns of Panel B of Table 7 display regressions results with loan yield as the dependent variable. Consistent with expectations, greater competition as measured with BCI and 1-HHI is associated with lower loan yields of 16 and 11 basis points, respectively, as shown in columns 1 and 2. However, greater competition as measured with the market-level H-statistic in column 3 is unexpectedly correlated with an increase in loan yields of 2 basis points. We also expect to observe higher loan yields for banks with greater market power. Column 1, however, shows unexpectedly that banks with one quartile higher values of nonmaturity liabilities have lower yields of 7 basis points. One possibility for this result is that banks with more market power make safer loans on average. As expected, column 2 shows that banks with one quartile higher deposit market share have higher loan yields of 3 basis points. Bank-level H-statistic shows no economic effect on yields.

Finally, columns 4-9 in Panel B of Table 7 display regression results for the credit risk dependent variables. The results show that each of the three measures of market competition has little effect on bank credit risk. A one quartile higher BCI value is correlated with higher nonperforming loans of 2 basis points and there is no effect on net chargeoffs. For higher quartiles of 1-HHI and market-level H-statistic, nonperforming loans and net chargeoffs are lower by 2 and 1 basis points, respectively. In contrast, banks with greater market power as measured by the nonmaturity deposit ratio have lower credit risk. Nonperforming loans and net chargeoffs are lower by 8 and 5 basis points, respectively.

In sum, results in Table 7 for BCI and 1-HHI support the first hypothesis that controlling for market power, banks in more competitive markets are less profitable than banks in less competitive markets. We find larger adverse effects on profitability when measuring competition with BCI. Only results using the nonmaturity deposit ratio as the source of market power support the second hypothesis that controlling for market competition, banks with more market power have higher profitability. Even this result comes with a caveat because we find that banks with more market power have lower loan yields. Even more troubling is the result that NII at banks with more market power as measured by deposit market share is no different from NII at banks with less market power. Indeed, we show that banks with more deposit market share pay *higher* interest expense, which casts doubt on the notion that deposit market share is a strong source of market power. Finally, both the market-level and bank-level H-statistics show essentially no impact on bank profitability or risk, leading us to conclude that these competition and market power measures are the least reliable.

5.2 Difference in Difference

We use a difference-in-difference approach to test the third hypothesis that more intense market competition reduces the profitability gap between banks with high and low levels of market power. From the same bank-level dataset, we use the yearly quartiles for market power and market competition to compute difference-in-difference summary statistics as shown in Equation (3). We identify the sample of banks each year located in markets in the top (*C4)* and bottom (*C1*) competition quartiles. For each market *i* and year *t* in sample *C4*, and again for market *j* and year *t* in sample *C1*, we compute the difference in the mean market performance ratios of banks in the top (BP_{it}^{MP4}) and bottom (BP_{it}^{MP1}) market power quartiles. Markets are excluded from the sample if they do not have at least one bank in each market power quartile. We then average the ratio differences across all markets and years in the competition top quartile (N^{C4}) and the competition bottom quartile (N^{C1}). Finally, we subtract the resulting mean bank performance ratio of banks in the low competition

quartile from the mean value of banks in the highest competition quartile. The resulting value (ΔBP^{C4-C1}) is the mean difference in bank performance between the most and least competitive markets of the mean performance gap by market power. We expect the market-power-driven profitability gap to be smaller for banks operating in more competitive markets.

$$\Delta BP^{C4-C1} = \frac{\sum\left(BP_{it}^{MP4} - BP_{it}^{MP1}\right)^{C4}}{N^{C4}} - \frac{\sum\left(BP_{jt}^{MP4} - BP_{jt}^{MP1}\right)^{C1}}{N^{C1}} \quad (3)$$

Table 8 presents the difference-in-difference analysis. The first two rows of each panel display the mean performance difference between the high and low market power quartiles for banks in low and high competition quartiles, respectively. The bottom row shows the difference between high and low competition quartiles.

Panel A displays results for BCI quartiles using the nonmaturity deposit ratio as the measure of market power. As our third hypothesis states, the mean market power profitability gap is smaller in more competitive markets. Difference-in-difference NII is lower by 17 basis points largely because interest income is 24 basis points lower. In addition, ROA is lower by 9 basis points, and loan yields by 28 basis points. The differences in credit risk variables are economically small with weak statistical significance. Nonperforming loans are just 4 basis points lower in the most competitive quartile, statistically significant at the 10 percent level. The 2 basis point difference in chargeoffs is statistically insignificant.

[Insert Table 8 here]

Panel B of Table 8 displays results for 1-HHI competition quartiles using deposit market share as the measure of market power. The results also show that the market power profitability gap narrows with competition. Difference-in-difference NII is 17 basis points lower, driven by lower interest income of 13 basis points. Loan yields are 32 basis points lower, but ROA is unexpectedly 4 basis points higher. In addition, differences in risk measures are small. Nonperforming loans are 6 basis

points lower, statistically significant at the 10 percent level, but net chargeoffs are 2 basis points higher and statistically insignificant.

Finally, Panel C of Table 8 displays results from market-level H-statistic competition quartiles using bank-level H-statistic as the proxy for market power. Most results are economically small and have unexpected signs. Difference-in-difference NII is 3 basis points higher and ROA is 19 basis points higher in the most competitive markets. Differences in loan yields and credit risk are small and statistically insignificant.

6. Bank Acquisition Prices

We provide one more piece of bank-level evidence supporting BCI as a valid measure of market competition by examining prices paid for bank acquisitions. We hypothesize that, all else equal, acquisition prices are lower in markets with more intense competition because the expected stream of future earnings from the assets is lower. Although this relationship should be true for in-market and out-of-market acquisitions, we focus on out-of-market acquisitions because the market shares of banks in the market do not change endogenously.

We collect data from SNL Financial on 567 acquisitions by publicly traded U.S. banks between 1997 and 2015. We match Call Report data to targets and acquirers at the quarter of the announcement to use as control variables. Acquisition price is computed as the deal value scaled by the target's book equity.

We run OLS regressions of deal value to equity on the market competition measure, an in-market indicator variable, and their interaction. Market competition is measured, alternatively, with BCI and 1-HHI. *In-market* equals one if the acquirer has deposits in the target's market at the time of acquisition, and zero otherwise. We control for a host of target and acquirer variables including target

market power. We expect the market competition coefficient to be negative, and the market power coefficient to be positive.

Table 9 reports the regression results. Column (1) present results using BCI as the market competition variable, and market power is measured with the target's nonmaturity deposit to liability ratio. The coefficient of -0.63 on BCI is negative and statistically significant at the 10 percent level. It is also economically large. The mean deal value to equity is 1.90 so a one standard deviation higher BCI value of 21 basis points represents a lower deal value of 0.13, or 7% of the sample mean. In addition, the target market power coefficient is positive and statistically significant as expected, even though we include controls for target ROA and net interest income. A one standard deviation increase in target market power represents an increase in deal value of 0.10, or 5.4% of the mean.

[Insert Table 9 here]

Column (2) of Table 9 presents results using 1-HHI as the market competition variable, and market power is measured with the target's deposit market share. The market competition coefficient is an unexpectedly positive value of 2.43, which indicates that a one standard deviation increase in 1-HHI translates into an *increase* in deal value of 14.3%. In addition, the coefficient on market power is unexpectedly negative but statistically insignificant.

In sum, out-of-market acquisition premiums are lower in more competitive markets as measured by BCI, and higher in more competitive markets as measured by 1-HHI. These results are consistent with the premise that BCI is a more accurate measure of market competition.

7. Conclusion

We introduce the Bank Competition Index (BCI) and provide evidence that it is a more accurate measure of community bank competition than the deposit-share Hirschman -Herfindahl Index (HHI) and the H-statistic. BCI is derived from three market factors—the unweighted average

maturity liability ratio, the complement to deposit-share HHI (1-HHI), and per capita offices—because they are shown over the 1997-2015 sample period to reduce average net interest income (NII) of banks with deposits in the market. Higher BCI values signify more competitive markets.

The premise of BCI is that the primary determinant of banking market competition is the battle for scarce customer relationships because those relationships generate bank market power. We argue that markets where the average bank has few relationships, which we proxy by the ratio of nonmaturity deposits to liabilities, are more competitive because banks with few relationships compete aggressively to attract customers from other banks with generous interest rates and terms. We validate BCI at the market level over the 1997-2015 sample period by showing that the average bank has 18 basis points lower NII in markets with one standard deviation higher BCI values.

We then conduct bank-level analysis to further validate BCI by showing consistent relationships between profitability, competition, and market power. Controlling for market power, we show that banks operating in more competitive markets have lower profitability. We also show that, controlling for market competition, banks with higher nonmaturity deposit ratios have higher profitability. In addition, we conduct a difference-in-difference within-market analysis to show that the profitability gap between banks with high and low levels of market power narrows with greater market competition. This result is consistent with our story that banks in more competitive markets battle intensely for customer relationships. Our final bank-level validation test shows that, all else equal, out-of-market acquisition prices of publicly traded banks are lower in markets with more competition.

We add to the evidence supporting the competition-fragility hypothesis by showing that average credit risk is greater in more competitive markets as measured by BCI. However, the higher risk comes from banks with low market power, and the credit risk gap between banks in the lowest and highest market power quartiles is wider in more competitive markets.

We run these same tests on H-statistic and deposit-share 1-HHI. We find no support for H-statistic as a reliable measure of market competition because the results are economically small, and coefficients often have unexpected signs. Deposit-share 1-HHI, however, generally shows results similar to, but economically smaller than BCI results. This result is reassuring because 1-HHI is a factor in the BCI. However, in addition to the lower economic significance, we argue that 1-HHI is not as reliable as BCI as a stand-alone measure of market competition for two reasons. First, the theory of deposit-share HHI is that market power is derived from market share, but we find no increase in NII for banks with more market power. Second, the evidence shows that banks pay higher prices for out-of-market acquisitions in markets with less deposit concentration.

Measuring competition accurately matters for bankers, investors, and regulators. We show that BCI provides a better alternative than current measures.

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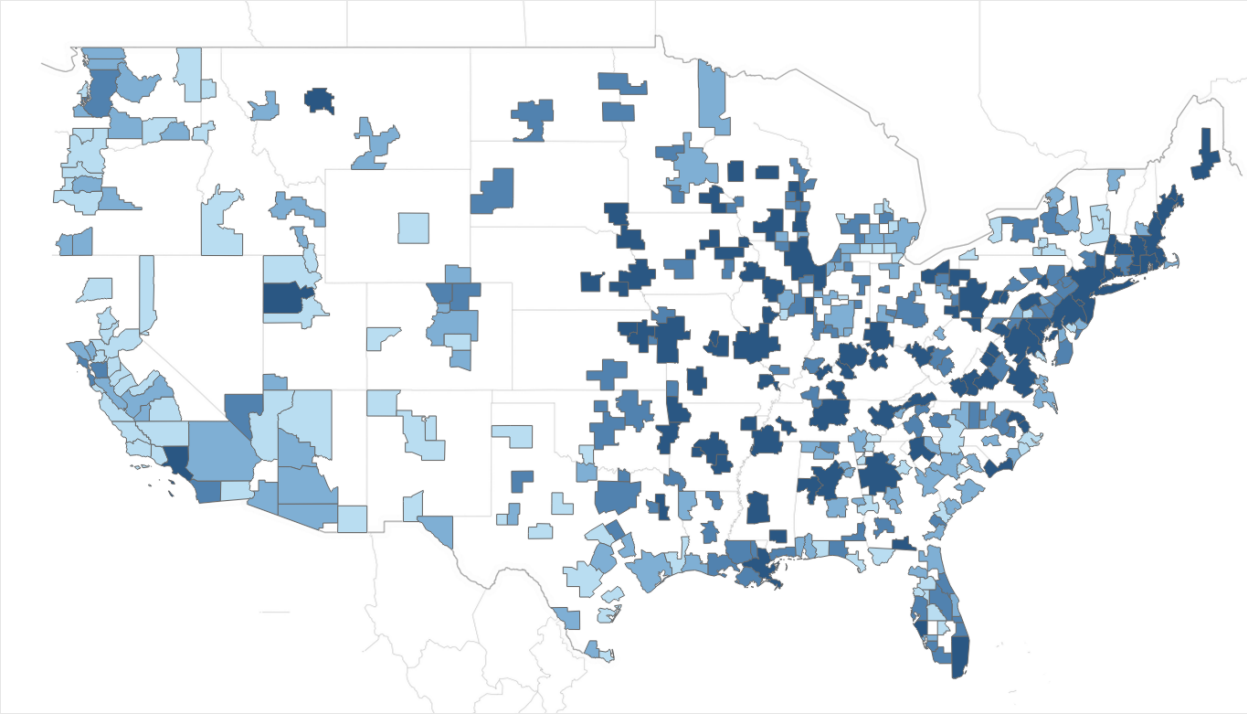
Figure 1. Most Competitive MSAs in 2017 by BCI and 1-HHI

Heat maps separate banking markets into evenly distributed quartiles by their competition intensity in 2017 as measured by BCI (Panel A) and 1-HHI (Panel B). Darker shading reflects higher levels of competition.

Panel A. Most Competitive MSAs Ranked by BCI



Panel B. Most Competitive MSAs Ranked by 1-HHI

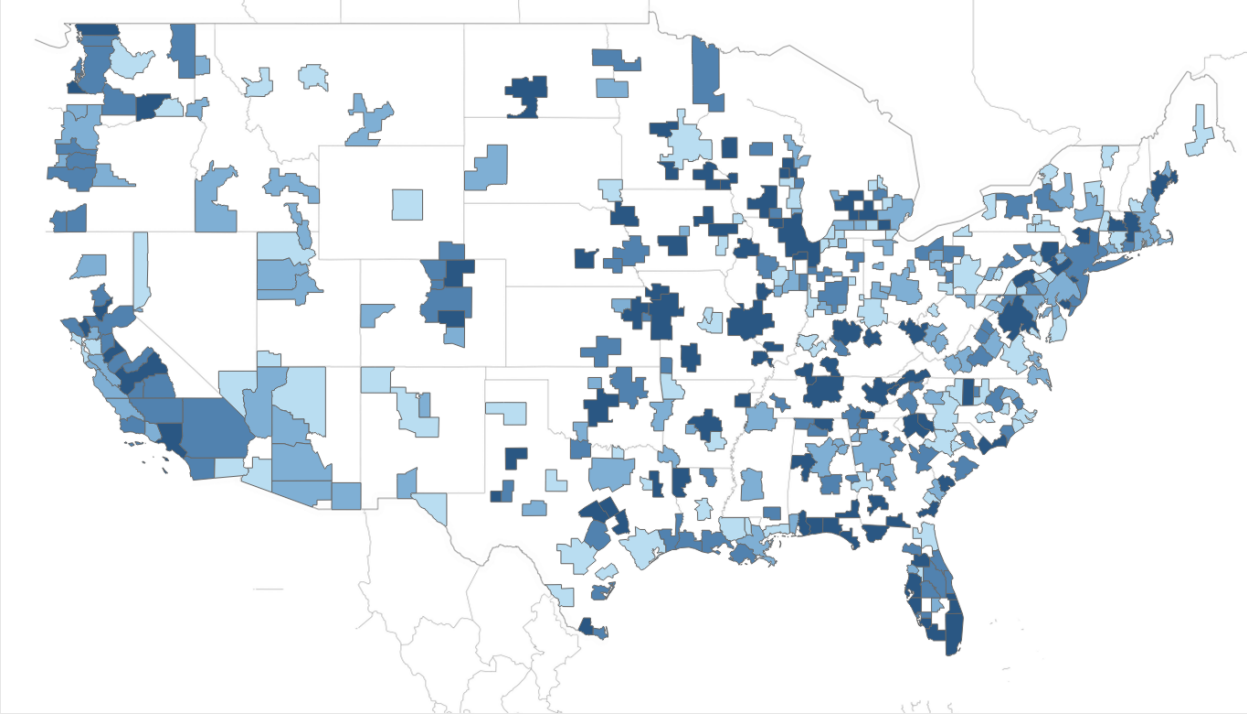


Table 1. Most Competitive MSAs in 2017 by BCI and HHI

Table lists the top ten most competitive metropolitan statistical areas (MSAs) in 2017 as ranked by BCI (Panel A) and the complement to deposit-share HHI, or 1-HHI (Panel B). Each panel also lists the MSA rank and value of the alternative market competition measure.

Panel A. Most Competitive MSAs by BCI

	Rank		Value	
MSA	BCI	1-HHI	BCI	1-HHI
Bowling Green, KY	1	21	-0.19	0.91
Pittsburgh, PA	2	340	-0.20	0.75
Grand Island, NE	3	54	-0.21	0.90
Cincinnati, OH-KY-IN	4	359	-0.21	0.69
Baltimore-Columbia-Towson, MD	5	223	-0.22	0.85
New York-Newark-Jersey City, NY-NJ-PA	6	178	-0.23	0.86
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	7	247	-0.23	0.84
Bridgeport-Stamford-Norwalk, CT	8	107	-0.24	0.88
Waterloo-Cedar Falls, IA	9	18	-0.24	0.92
Little Rock-North Little Rock-Conway, AR	10	88	-0.25	0.89

Panel B. Most Competitive MSAs by 1-HHI

	Rank		Value	
MSA	1-HHI	BCI	1-HHI	BCI
Worcester, MA-CT	1	41	0.94	-0.34
Madison, WI	2	50	0.94	-0.35
Huntington-Ashland, WV-KY-OH	3	38	0.94	-0.33
Oklahoma City, OK	4	141	0.93	-0.45
Springfield, MO	5	31	0.93	-0.31
Waco, TX	6	159	0.93	-0.47
St. Louis, MO-IL	7	39	0.92	-0.34
Cedar Rapids, IA	8	32	0.92	-0.31
Springfield, IL	9	91	0.92	-0.41
Davenport-Moline-Rock Island, IA-IL	10	20	0.92	-0.27

Table 2. Estimation of the Bank Competition Index

Table reports coefficient estimates from an ordinary-least-squares regression run at the market level over rolling three-year windows between year-end 1997 and 2015. We regress the equally weighted, average net interest income scaled by average assets (*NII*) of all banks with deposits in the market on three market competitiveness factors. *Maturity Liabilities* is the equally weighted average maturity liabilities to total liabilities ratio, *Per-capita Offices* is the number of offices in the market per 1000 people, and *1-HHI Deposit Share* is the complement to the deposit-share Herfindahl index by market. The remaining control variable definitions are provided in Appendix A. *t*-statistics are presented in parentheses below the coefficient estimates. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable = NII	
Maturity Liabilities	-2.34***
	(-115.8)
Per-Capita Offices	-0.66***
	(-43.81)
1-HHI Deposit Share	-0.10***
	(-7.69)
Rural Area Indicator	0.02***
	(4.05)
Community Bank Share	0.02**
	(2.28)
Nonperforming	-0.03***
	(-9.17)
Net Chargeoffs	0.17***
	(24.14)
Total Loans to TA	0.02***
	(116.65)
Real Estate Loans to TA	0.00***
	(-15.72)
Ln(Real Assets)	-0.11***
	(-85.21)
Ln(Population)	-0.01***
	(-2.77)
One-Year Treasury	0.30***
	(152.44)
U.S. Treasury Spread	0.36***
	(91.01)
Recession Indicator	-0.11***
	(-16.24)
Intercept	3.90***
	(120.9)
Observations	41,698
Adjusted R^2	0.66

Table 3. Descriptive Statistics by Banking Market

Table presents descriptive statistics for banking markets over the sample period 1997-2015. Panel A presents descriptive statistics of the bank competition index (BCI), its component parts, and alternative measures of competition. Panel B reports annual banking market financial characteristics. Panel C presents BCI by Federal Reserve District, and Panel D presents BCI values by year. Variable definitions are provided in Appendix A.

	Obs.	Mean	Median	Std. Dev.	Min	25th Percentile	75th Percentile	Max
Panel A: Competition Indices								
BCI	41,679	-0.0011	0.0300	0.2418	-0.9846	-0.1631	0.1763	0.6989
Maturity Liabilities	41,679	0.4782	0.4944	0.1010	0.1123	0.4064	0.5545	0.7995
Per Capita Offices	41,679	0.4854	0.4017	0.2974	0.0559	0.3049	0.5610	3.3250
(1-HHI of Deposits)	41,679	0.7063	0.7440	0.1502	0.0524	0.6224	0.8206	0.9557
H-statistic	41,181	1.0777	1.0217	0.7993	-15.3701	0.7657	1.3425	11.9661
Panel B: Financial Characteristics								
NII	41,679	3.6923	3.6521	0.4648	1.9433	3.3534	3.9898	6.0857
Interest Income	41,679	5.5942	5.4880	1.4289	2.6418	4.3329	6.9017	9.4202
Interest Expense	41,679	1.8932	1.7708	1.1602	0.1058	0.8040	2.9589	4.5825
ROA	41,679	1.0464	1.0863	0.4052	-2.2886	0.8585	1.2895	2.7978
Nonperforming	41,679	0.9463	0.7198	0.6994	0.0000	0.4806	1.1825	6.6930
Net Chargeoffs	41,679	0.4606	0.3306	0.4173	-0.4113	0.1948	0.5762	3.4627
Total Loans to TA	41,679	63.2692	64.1997	7.6360	21.6014	59.2318	68.4690	88.5153
Ln(Real Assets)	41,679	13.7662	13.6985	1.8130	9.5657	12.3266	15.0134	21.1144
Ln(Population)	41,679	10.2470	10.0526	1.4174	6.4135	9.2956	10.8871	16.8171
Home Price Growth	41,679	0.0419	0.0085	0.3513	-0.9370	-0.1466	0.1639	12.0000
Rural Area Indicator	41,679	0.8268	1.0000	0.3784	0.0000	1.0000	1.0000	1.0000
Panel C: Bank Competition Index by District								
District 1 - Boston	886	-0.0543	-0.0552	0.1855	-0.7713	-0.1784	0.0691	0.4440
District 2 - New York	703	-0.0537	0.0078	0.2207	-0.8089	-0.1547	0.0997	0.3979
District 3 - Philadelphia	779	0.0499	0.0989	0.2054	-0.5312	-0.0850	0.2121	0.3971
District 4 - Cleveland	2,160	0.0635	0.1043	0.2042	-0.6063	-0.0609	0.2114	0.4883
District 5 - Richmond	3,754	0.0162	0.0558	0.2039	-0.7723	-0.0964	0.1633	0.5806
District 6 - Atlanta	5,175	0.0315	0.0668	0.2292	-0.9402	-0.1004	0.1910	0.6437
District 7 - Chicago	4,765	0.0681	0.0999	0.2228	-0.7131	-0.0595	0.2237	0.5536
District 8 - St. Louis	5,083	0.1006	0.1342	0.2065	-0.7730	-0.0102	0.2366	0.6989
District 9 - Minneapolis	4,488	0.0009	0.0281	0.2397	-0.7973	-0.1641	0.1724	0.6963
District 10 - Kansas City	6,193	0.0320	0.0494	0.2519	-0.7864	-0.1462	0.2203	0.6613
District 11 - Dallas	3,918	-0.1623	-0.1468	0.2284	-0.9846	-0.3081	-0.0019	0.4316
District 12 - San Francisco	3,642	-0.2060	-0.1913	0.2014	-0.9767	-0.3414	-0.0642	0.3543

Table 3. Descriptive Statistics (cont.)

	Obs.	Mean	Median	Std. Dev.	Min	25th Percentile	75th Percentile	Max
Panel D: Bank Competition Index by Ending Year								
1997	2,177	0.0869	0.1061	0.2069	-0.7713	-0.0366	0.2317	0.6288
1998	2,182	0.1029	0.1241	0.1998	-0.7864	-0.0152	0.2388	0.6453
1999	2,181	0.1137	0.1347	0.1955	-0.7763	0.0026	0.2438	0.6481
2000	2,182	0.1272	0.1498	0.1958	-0.7652	0.0118	0.2603	0.6732
2001	2,183	0.1353	0.1597	0.1947	-0.7453	0.0213	0.2668	0.6989
2002	2,187	0.1193	0.1412	0.1947	-0.7128	0.0008	0.2523	0.6899
2003	2,193	0.0750	0.0936	0.1987	-0.6925	-0.0469	0.2121	0.6613
2004	2,195	0.0257	0.0450	0.1999	-0.7044	-0.0971	0.1641	0.6294
2005	2,195	0.0054	0.0261	0.2002	-0.7810	-0.1200	0.1440	0.5884
2006	2,198	0.0181	0.0394	0.2000	-0.8226	-0.1092	0.1574	0.6204
2007	2,202	0.0534	0.0786	0.1976	-0.8111	-0.0652	0.1879	0.6639
2008	2,205	0.0883	0.1112	0.1902	-0.7193	-0.0241	0.2151	0.6963
2009	2,204	0.0879	0.1080	0.1832	-0.6799	-0.0191	0.2115	0.6573
2010	2,205	0.0405	0.0561	0.1798	-0.6961	-0.0689	0.1581	0.5904
2011	2,204	-0.0509	-0.0452	0.1828	-0.7396	-0.1607	0.0677	0.4990
2012	2,203	-0.1511	-0.1478	0.1853	-0.8290	-0.2714	-0.0259	0.4323
2013	2,199	-0.2393	-0.2375	0.1871	-0.9163	-0.3645	-0.1093	0.3674
2014	2,195	-0.3031	-0.3034	0.1857	-0.9767	-0.4289	-0.1738	0.2961
2015	2,189	-0.3519	-0.3556	0.1828	-0.9846	-0.4779	-0.2263	0.2277

Table 4. BCI and Banking Market Performance

Table reports market level results from ordinary-least-squares regression analyses of banking market performance on the Bank Competition Index (BCI). The sample includes annual data from all U.S. banks between 1997 and 2015. Regression results in columns (1,4,7) use the *BCI* as the measure of competition and compute the dependent variable as the weighted average by market using the share of maturity liabilities a bank holds in a given market as weights. Regression results in columns (2,5,8) use the complement to deposit HHI (*1-HHI*) as the measure of competition and compute the dependent variable as the weighted average by market using the share of deposits a bank holds in a given market as weights. If a bank operates in more than one market, we compute the weighted mean deposit share across all its markets where the weight is the bank's own deposit share in each market each year. Finally, regression results in columns (3,6,9) use the market H-statistic as the measure of competition and compute the dependent variable as the weighted average by market using bank-level H-statistics as weights. All specifications include fixed effects for year and Federal Reserve district. Robust standard errors are clustered by district. *t*-statistics are presented in parentheses below the coefficient estimates. The remaining variable definitions are provided in Appendix A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Net Interest Income and Components

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	NII			Interest Income			Interest Expense		
Competition Measure$_{t-1}$	-0.7431***	-0.2414***	0.0100***	-0.0451*	-0.2301***	0.0037	0.7140***	0.0389	-0.0080***
	(-30.301)	(-4.645)	(3.313)	(-1.902)	(-4.102)	(1.318)	(47.205)	(0.958)	(-4.107)
Total Loans to TA$_{t-1}$	0.0242***	0.0213***	0.0205***	0.0325***	0.0324***	0.0322***	0.0080***	0.0110***	0.0115***
	(35.741)	(24.729)	(26.421)	(49.947)	(43.154)	(49.462)	(20.164)	(16.693)	(20.500)
Ln(Real Assets)$_{t-1}$	-0.1022***	-0.0601***	-0.0795***	-0.1137***	-0.0908***	-0.1109***	-0.0107***	-0.0298***	-0.0312***
	(-34.874)	(-15.208)	(-23.513)	(-38.013)	(-23.649)	(-38.257)	(-5.951)	(-10.757)	(-12.663)
Ln(Population)$_{t-1}$	0.0055	-0.0244***	0.0034	-0.0171***	-0.0490***	-0.0179***	-0.0213***	-0.0285***	-0.0199***
	(1.337)	(-3.089)	(0.695)	(-4.001)	(-5.833)	(-4.120)	(-7.869)	(-5.561)	(-5.478)
Home Price Growth$_{t-1}$	-0.0242***	-0.0300***	-0.0306***	-0.0225***	-0.0226***	-0.0230***	-0.0013	0.0049	0.0046
	(-4.940)	(-5.649)	(-6.572)	(-4.796)	(-4.127)	(-4.892)	(-0.303)	(1.137)	(1.165)
Rural Area Indicator$_{t-1}$	0.0491***	0.1036***	0.0368**	0.0199	0.1109***	0.0181	-0.0195**	0.0108	-0.0079
	(3.958)	(5.523)	(2.411)	(1.556)	(5.967)	(1.406)	(-2.329)	(0.776)	(-0.665)
Constant	3.1269***	3.0675***	3.6959***	4.9721***	5.0436***	6.9448***	1.8352***	2.0006***	3.2556***
	(38.482)	(27.317)	(38.829)	(62.444)	(49.076)	(90.040)	(36.480)	(24.129)	(46.210)
Observations	39,329	39,329	38,883	39,329	39,329	38,883	39,329	39,329	38,883
Adjusted R^2	0.648	0.496	0.573	0.965	0.945	0.965	0.972	0.952	0.961

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Table 4. BCI and Banking Market Performance (cont.)

Panel B: ROA and Risk Measures									
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
		ROA			**Nonperforming**			**Chargeoffs**	
Competition Measure$_{t-1}$	-0.2700***	-0.1862***	0.0068**	0.2232***	-0.1341**	-0.0177***	0.1774***	-0.1586***	-0.0124***
	(-10.588)	(-3.609)	(2.337)	(6.426)	(-2.210)	(-3.739)	(11.216)	(-3.591)	(-4.393)
Total Loans to TA$_{t-1}$	0.0058***	0.0044***	0.0045***	0.0064***	0.0080***	0.0074***	-0.0001	0.0010*	0.0007
	(8.020)	(5.500)	(6.179)	(7.506)	(9.122)	(8.711)	(-0.203)	(1.762)	(1.376)
Ln(Real Assets)$_{t-1}$	0.0089***	0.0015	0.0162***	0.0683***	0.0522***	0.0613***	0.0770***	0.0538***	0.0713***
	(2.825)	(0.447)	(5.096)	(16.146)	(11.746)	(14.698)	(35.472)	(19.560)	(34.920)
Ln(Population)$_{t-1}$	-0.0414***	0.0001	-0.0413***	0.0094*	0.0384***	0.0102*	0.0046	0.0491***	0.0058**
	(-8.789)	(0.015)	(-8.553)	(1.702)	(5.170)	(1.882)	(1.536)	(7.966)	(2.029)
Home Price Growth$_{t-1}$	0.0037	0.0042	0.0010	-0.0220*	-0.0184	-0.0207*	-0.0167***	-0.0131**	-0.0153***
	(0.642)	(0.692)	(0.174)	(-1.761)	(-1.347)	(-1.653)	(-3.163)	(-2.321)	(-2.904)
Rural Area Indicator$_{t-1}$	-0.0014	-0.0044	-0.0057	0.0446***	-0.0112	0.0522***	0.0065	-0.0346***	0.0131
	(-0.104)	(-0.287)	(-0.408)	(2.706)	(-0.570)	(3.231)	(0.740)	(-2.734)	(1.527)
Constant	0.4998***	0.3930***	0.9527***	-0.7279***	-0.7353***	-1.0421***	-0.6652***	-0.6384***	-0.8453***
	(5.627)	(4.020)	(11.103)	(-7.354)	(-6.981)	(-11.123)	(-11.414)	(-8.750)	(-15.507)
Observations	39,329	39,329	38,883	39,329	39,329	38,883	39,329	39,329	38,883
Adjusted R^2	0.367	0.333	0.354	0.531	0.493	0.526	0.576	0.512	0.569

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Table 5. Out of Sample BCI and Banking Market Performance

Table reports market level results from ordinary-least-squares regression analyses of banking market performance on BCI. We perform out of sample analyses by estimating the regression used to compute the BCI over the period 1995 through 2000. We then test the relation between the BCI and banking market performance over the period 2001 through 2015. The dependent variables in this series of tests are: net interest income scaled by average assets (*NII*), interest income scaled average assets (*Interest Income*), interest expense scaled by average assets (*Interest Expense*), return on average assets (*ROA*), nonperforming loans to total loans (*Nonperforming*), and net chargeoffs to loans (*Chargeoffs*). All specifications include fixed effects for year and Federal Reserve district. Robust standard errors are clustered by district. *t*-statistics are presented in parentheses below the coefficient estimates. The remaining variable definitions are provided in Appendix A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	NII	**Interest Income**	**Interest Expense**	**ROA**	**Nonperforming**	**Chargeoffs**
BCI_{t-1}	-0.5709***	-0.0252	0.5579***	-0.2116***	0.1878***	0.1450***
	(-30.490)	(-1.390)	(49.811)	(-10.865)	(7.014)	(11.908)
Total Loans to TA $_{t-1}$	0.0242***	0.0324***	0.0079***	0.0059***	0.0063***	-0.0002
	(35.796)	(49.905)	(20.361)	(8.051)	(7.384)	(-0.321)
Ln(Real Assets) $_{t-1}$	-0.1019***	-0.1133***	-0.0106***	0.0089***	0.0688***	0.0773***
	(-34.935)	(-37.976)	(-6.082)	(2.819)	(16.285)	(35.627)
Ln(Population) $_{t-1}$	0.0054	-0.0172***	-0.0212***	-0.0415***	0.0094*	0.0046
	(1.306)	(-4.004)	(-8.029)	(-8.808)	(1.702)	(1.542)
Home Price Growth $_{t-1}$	-0.0245***	-0.0226***	-0.0011	0.0037	-0.0221*	-0.0167***
	(-4.977)	(-4.817)	(-0.269)	(0.633)	(-1.770)	(-3.173)
Rural Area Indicator $_{t-1}$	0.0471***	0.0196	-0.0176**	-0.0021	0.0450***	0.0068
	(3.810)	(1.534)	(-2.171)	(-0.154)	(2.727)	(0.781)
Constant	3.6745***	6.9556***	3.2883***	0.9426***	-1.0507***	-0.8414***
	(47.172)	(91.300)	(69.634)	(11.032)	(-11.012)	(-15.071)
Observations	39,329	39,329	39,329	39,329	39,329	39,329
Adjusted R^2	0.648	0.965	0.972	0.368	0.531	0.576

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Table 6. Bank-Level Summary Statistics by Competition and Market Power Quartiles

Table reports bank-level summary statistics for banks in the first and fourth quartiles of market competition and market power, respectively, between 1997 and 2015. In each panel, *Competition* is measured, respectively, by the Bank Competition Index (BCI), 1-HHI, and market H-statistic; and bank *Market Power* is measured, respectively, by the bank's nonmaturity deposits to liabilities ratio, deposit share in the market, and bank-level H-statistic. Panel A presents mean ratios and differences by market competition quartile. Banks in the first (fourth) competition quartile are in the least (most) competitive markets. Panel B presents mean ratios and differences by market power. Banks in the first (fourth) quartile have the least (most) market power. Bank ratios are expressed in percent and defined in Appendix A.

Panel A. Bank ratios by competition quartile

Competition Quartile	Obs.	NII	Interest Income	Interest Expense	Loan Yields	ROA	Non-performing	Charge-offs	Market Power
				BCI					
1	36,210	4.01	5.67	1.66	7.54	0.92	0.75	0.31	0.60
4	35,755	3.59	5.76	2.17	7.30	0.85	0.93	0.36	0.44
Q4-Q1		-0.42	0.09	0.51	-0.24	-0.06	0.19	0.05	-0.16
				1-HHI					
1	35,894	3.81	5.76	1.95	7.56	1.03	0.83	0.33	0.28
4	35,563	3.69	5.61	1.91	7.17	0.73	0.90	0.36	0.02
Q4-Q1		-0.12	-0.16	-0.04	-0.39	-0.30	0.07	0.03	-0.26
				Market H-statistic					
1	36,660	3.77	5.68	1.89	7.30	0.73	0.88	0.37	1.00
4	35,703	3.81	5.75	1.93	7.47	0.99	0.80	0.30	1.00
Q4-Q1		0.04	0.07	0.04	0.17	0.25	-0.08	-0.07	0.00

Panel B. Bank ratios by market power quartile

Mkt Power Quartile	Obs.	NII	Interest Income	Interest Expense	Loan Yields	ROA	Non-performing	Charge-offs	Compe-tition
				Nonmaturity Deposit to Liability Ratio					
1	37,534	3.55	5.91	2.35	7.40	0.70	1.06	0.45	0.11
4	35,242	3.98	5.48	1.49	7.36	0.93	0.69	0.28	-0.09
Q4-Q1		0.43	-0.42	-0.86	-0.05	0.23	-0.37	-0.17	-0.20
				Deposit Share					
1	35,881	3.78	5.66	1.88	7.31	0.53	0.94	0.37	0.87
4	35,792	3.76	5.73	1.96	7.45	1.14	0.80	0.33	0.70
Q4-Q1		-0.02	0.06	0.08	0.14	0.61	-0.13	-0.04	-0.18
				Bank-level H-statistic					
1	32,942	3.80	5.85	2.05	7.47	0.84	0.94	0.38	0.88
4	44,427	3.77	5.67	1.90	7.43	0.74	0.84	0.34	0.88
Q4-Q1		-0.03	-0.18	-0.15	-0.04	-0.10	-0.11	-0.04	0.00

Table 7. Effects of Competition and Market Power on Bank Performance

Table reports bank-level regressions of bank performance metrics on banking market competition quartile, market power quartile, and controls. The sample includes annual data from all U.S. banks between 1997 and 2015. Each profitability dependent variable is scaled by average assets. Regressions in column (1) use the Bank Competition Index (BCI) as the competition measure, and the bank's ratio of nonmaturity deposits to liabilities as the measure of market power. Regressions in column (2) use the complement to deposit HHI (1-HHI) as the competition measure, and the bank's deposit share in the market as the measure of market power. If a bank operates in more than one market, we compute the weighted mean deposit share across all its markets where the weight is the bank's own deposit share in each market each year. Finally, regressions in column (3) use the market H-statistic as the competition measure, and the bank-level H-statistic as the proxy for market power. The regression specifications include several control variables (not reported). Variables are defined in Appendix A and include *Rural Area Indicator*, *Nonperforming*, *Chargeoffs*, *Loans to assets*, *Real estate loan share*, *Loans to assets*, and *Ln(Real assets)*. All regressions include year fixed effects. *t*-statistics are presented in parentheses below the coefficient estimates. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Net interest income and components

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	NII			Interest Income			Interest Expense		
Intercept	4.13***	4.57***	4.31***	7.25***	7.05***	6.76***	3.09***	2.42***	2.42***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Competition quartile	-0.14***	-0.06***	0.00***	-0.08***	-0.05***	0.01***	0.06***	0.02***	0.01***
	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Market power quartile	0.16***	0.00	0.00***	-0.09***	0.04***	0.00***	-0.25***	0.04***	-0.01***
	(0.00)	(0.91)	(0.04)	(0.00)	(0.00)	(0.47)	(0.00)	(0.00)	(0.00)
Observations	137,251	137,251	137,251	137,165	137,165	137,165	136,990	136,990	136,990
Adjusted R^2	0.44	0.31	0.30	0.89	0.88	0.88	0.91	0.85	0.85

Panel B. Loan yield and credit risk

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Loan Yield to Loans			Nonperforming			Net Chargeoffs		
Intercept	12.63***	12.49***	12.02***	0.08**	-0.16***	-0.05**	-0.13***	-0.25***	-0.22***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.09)	(0.00)	(0.00)	(0.00)
Competition quartile	-0.16***	-0.11***	0.02***	0.02***	-0.02***	-0.02***	0.00***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Market power quartile	-0.07***	0.03***	0.00***	-0.08***	-0.04***	-0.01***	-0.05***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	136,862	136,862	136,862	138,207	138,207	138,207	138,572	138,572	138,572
Adjusted R^2	0.79	0.79	0.78	0.17	0.16	0.16	0.14	0.13	0.13

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Table 8. Difference in Difference Analysis by Competition and Market Power Quartiles

Table presents differences between markets with high and low competition of within-market differences in performance ratios between banks with high and low market power. The first two rows of each panel display the mean ratios of within-market differences between banks in low and high market power quartiles for banks in low and high market competition quartiles, respectively. The bottom row displays the ratios differences between the high and low market competition quartiles. Quartiles are computed yearly, and higher quartiles indicate greater market power and greater competition. Panel A presents results for Bank Competition Index (BCI) competition quartiles and bank nonmaturity deposit ratio market power quartiles. Panel B presents results for deposit-share 1-HHI competition quartiles and bank deposit market share market power quartiles. Panel C presents results for market-level H-statistic competition quartiles and bank-level H-statistic market power quartiles. *Obs* is the number of markets across all years in each competition quartile. Bank performance ratios are defined in Appendix A. *t*-statistics are presented in parentheses below the coefficient estimates. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A:		**Nonmaturity Deposits Quartile: High - Low**						
BCI Quartile	**Obs.**	**NII**	**Interest Income**	**Interest Expense**	**ROA**	**Loan Yields**	**Non-performing**	**Chargeoffs**
Low	10,372	0.27	-0.13	-0.42	0.17	0.08	-0.15	-0.06
High	3,286	0.10	-0.37	-0.45	0.07	-0.20	-0.19	-0.08
High-Low		-0.17***	-0.24***	-0.03**	-0.09***	-0.28***	-0.04*	-0.02
Panel B:		**Deposits Market Share Quartile: High - Low**						
1-HHI Quartile	**Obs.**	**NII**	**Interest Income**	**Interest Expense**	**ROA**	**Loan Yields**	**Non-performing**	**Chargeoffs**
Low	20,834	0.02	0.03	0.01	0.07	0.06	0.00	0.00
High	1,988	-0.15	-0.10	0.05	0.11	-0.26	-0.06	0.01
High-Low		-0.17***	-0.13***	0.04***	0.04**	-0.32***	-0.06**	0.02
Panel C:		**Bank-Level H-statistic Quartile: High - Low**						
H-statistic Quartile	**Obs.**	**NII**	**Interest Income**	**Interest Expense**	**ROA**	**Loan Yields**	**Non-performing**	**Chargeoffs**
Low	5,388	-0.03	-0.05	-0.03	-0.15	-0.01	-0.04	-0.02
High	7,155	0.00	-0.01	0.00	0.04	0.02	-0.02	-0.02
High-Low		0.03***	0.05***	0.03**	0.19***	0.02	0.02	0.00

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Table 9. Effect of Market Competition on Acquisition Prices

Table regresses at announcement quarter the deal value to target book equity on market competition for acquisitions of publicly traded banks between 1997 and 2015. All explanatory variable are lagged one quarter. In column (1), Competition is measured with the Bank Competition Index (BCI) and target Market Power is the ratio of the target's nonmaturity deposits to liabilities. The same variables in column (2) are the complement to deposit-share HHI (1-HHI) and the target's deposit market share. *In Market* is an indicator variable that equals one if acquirer and target have any markets that overlap, and zero otherwise. *Relative Asset Size* is the ratio of target to acquirer assets, and *Net Federal Funds* is federal funds sold minus federal funds purchased, all scaled by assets. Remaining variable definitions are provided in Appendix A. *t*-statistics are presented in parentheses below the coefficient estimates. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Deal Value to Equity	
	(1)	**(2)**
Market Competition	-0.63*	2.43**
	(-1.70)	(2.19)
In Market	0.04	3.92***
	(0.51)	(3.24)
In Market x Market Competition	0.47	-4.49***
	(1.19)	(-3.27)
Target Controls		
Market Power	0.69***	-0.84
	(3.25)	(-0.26)
ROA	0.08***	0.03**
	(2.69)	(2.27)
NII	0.08***	0.12***
	(2.88)	(4.18)
Nonperforming Loans	-1.95	-4.02
	(-0.62)	(-1.38)
Relative Asset Size	-0.16**	-0.19***
	(-2.40)	(-2.78)
Net Federal Funds	1.44***	1.44***
	(3.66)	(3.60)
Acquirer Controls		
ROA	-0.01	-0.01
	(-0.95)	(-0.45)
Ln(Total Assets)	0.09***	0.09***
	(5.41)	(5.09)
Constant	0.78***	-1.71*
	(2.55)	(-1.69)
Observations	567	499
Adjusted R^2	0.20	0.21

Appendix A. Variable Definitions

Variable	Definition
Bank Competition Index Components	
Maturity Liabilities	Unweighted mean of the ratio of maturity liabilities to total liabilities, or equivalently, one minus the ratio of nonmaturity liabilities to liabilities expressed as 1-(DD+MMDA+SAV)/LIAB. For each bank with deposits in the market, we sum the nonmaturity deposits: demand deposits (DD), money market deposit accounts (MMDA), and other savings deposits (SAV). We divide that sum by total liabilities (LIAB) and subtract the resulting value from one. The resulting values are then averaged across all banks with deposits in the market in the year.
Per Capita Office	Number of bank offices (branches plus headquarters) in a given market per 1000 people.
(1-HHI) Deposit-share	Complement to the deposit-share Hirschman Herfindahl Index computed for each market. Higher values indicate a more evenly distributed deposit base.
Performance Measures	
NII	Annual average of quarterly annualized net interest income scaled by average assets.
Interest income	Annual average of quarterly annualized total interest income scaled by average assets.
Interest expense	Annual average of quarterly annualized total interest expense scaled by average assets.
ROA	Annual average of quarterly annualized net income scaled by average assets.
Nonperforming	Annual average of quarterly nonperforming loans scaled by total assets. Nonperforming loans are loans 90 days or more past due or in nonaccrual status.
Chargeoffs	Annual average of quarterly annualized net chargeoffs scaled by average loans. Net chargeoffs are total chargeoffs less total recoveries.
Control Variables	
Loans to assets	Annual average of quarterly total loans scaled by total assets.
Ln(Real assets)	Natural log of inflation-adjusted total assets in 2009 dollars.
Ln(Population)	Natural log of market population.
Home Price Growth	Year-over-year percentage change in the Federal Housing Finance Association home price index in a given market.
Rural Area Indicator	An indicator variable equal to one if the banking market is outside of an MSA, and zero otherwise.
Community Bank Share	The share of bank deposits held by community banks in a market where community banks are defined as those with less than $10 billion in real total assets.
Real estate loan share	Annual average of quarterly real estate loans scaled by total loans.

One-Year Treasury	Annual average interest rate on one-year U.S. Treasury bonds.
U.S. Treasury Spread	Annual average spread between the one-year Treasury bond and ten-year Treasury bond.
Recession Indicator	An indicator variable equal to one if the U.S. economy was in a recession more than half the year, and zero otherwise.