



Construction and Interpretation of the Bank Competition Intensity Index

February 1, 2018

Fundamental Characteristics of Competitive Markets

Construction of the Bank Competition Intensity index (BCI) begins with the intuitive assumption that more competition should depress the average net interest income of banks in the local market. For urban banks headquartered in a metropolitan statistical area (MSA), the local market is the MSA. For rural banks outside an MSA, the local market is the county.

Three fundamental characteristics determine the competition intensity of a banking market, and they are defined such that higher values reflect greater competition.

The first characteristic is the number of offices (main offices, full-service branches, and loan production offices) per 1,000 people in the market. The rationale is straightforward: more bank offices reflect more intense competition for deposits and loans. Markets with more branches per capital have lower interest income and higher interest expense.

The second characteristic is the concentration of deposits among banks in the market. The deposit-share Herfindahl Hirschman Index (HHI) ranges between 0 and 1, and higher values indicate less competition. (See the boxed insert on pg. 3 for an explanation of how to compute HHI.) We use instead the complement of the deposit-share HHI, or $1 - \text{HHI}$ so that higher values signal more equal allocation of deposits across banks in the market, which reflects greater competition.

Markets with more equally distributed deposits have higher interest expense because banks lack the market power to keep deposit costs low. The deposit-share HHI also serves as a measure of loan concentration, which is not directly observable from the call reports because loan data are collected at the headquarters level instead of the county or MSA level. However, average interest income is lower in markets with more equal deposit share allocations because banks lack the market power to impose above-market loan rates.

Although deposit-share HHI is the most commonly used measure of bank competition, it is the least important of our three market characteristics. The third and most important characteristic is the average ratio of maturity deposits (with explicit maturities) to liabilities of all banks operating in the market.

Maturity liabilities proxy for noncore funding. The ratio is computed as one minus the ratio of *nonmaturity* liabilities to liabilities, expressed as $1 - (DD + MMDA + SAV)/LIAB$. For each bank with deposits in the market, the sum of demand deposits (*DD*), money market deposit accounts (*MMDA*), and other savings deposits (*SAV*), is divided by total liabilities (*LIAB*), and the resulting value is subtracted from one. The ratios for each bank are then averaged across all the banks.

The influence of this measure on bank competition is subtle and requires more explanation. Maturity deposits are mostly noncore funds, and nonmaturity deposits as mostly core funds. Each banking market has a natural demand for core deposit accounts because customers need transaction accounts to access the payments system, and they prefer to hold at least a portion of their funds at nearby banks they know and trust.

The average amount of core deposits among banks in a market affects the competition intensity because banks with few core deposits aggressively compete to deepen their community relationships. Consider two markets, A and B, that have identical numbers of banks and deposit-share concentrations (HHI). On average, banks in Market A have relatively few core deposits, perhaps because the supply of core deposits is spread thinly across the banks, or because one bank for historical reasons holds a dominant share of core deposits leaving the others to rely on noncore funding. In Market B, the average ratio of core deposits across banks is high.

Because most banks in Market A hold few core deposits, they have strong incentives to build customer relationships by wooing loan customers from other banks with generous terms and attracting local depositors with generous rates. They also have incentives to make loans to risky borrowers at relatively high interest rates to offset the high funding costs. Because banks in Market B have higher percentages of core deposits and, presumably, deeper community relationships, their incentives to woo customers and make high-risk loans are more muted.

Banks in Market A also have more powerful risk-taking incentives. On the one hand, they have incentives to underprice competitors to capture existing business. On the other hand, they have incentives to lend to relatively risky borrowers. Either way, they have powerful incentives to take additional credit risk. Empirically, markets with greater reliance on noncore funds experience higher nonperforming loans and chargeoffs.

In sum, banking markets are more competitive if they have more offices per capita, more equal deposit market shares, and higher average ratios of maturity liabilities to total liabilities.

Index Construction

The three competition measures in each banking market are averaged over a rolling three-year period between end-years 1997 and 2015 to derive the BCI index value for each market in each year. For example, the BCI in 2015 is computed from the average competition ratios between 2013 and 2015.

The BCI for each banking market i in year t is computed from the following equation:

$$BCI_{it} = 2.35 \times (MATLIAB_{it} - \overline{MATLIAB}) + 0.19 \times (OFFICES_{it} - \overline{OFFICES}) + 0.19 \times ((1 - HHI_{it}) - (1 - \overline{HHI}))$$

In the equation, each competition value in year t is differenced from its mean value (indicated by the horizontal bar over the measure) over the entire 1995-2015 period. Table 1 displays hypothetical BCI values for three banking markets. In the “more competitive” market, each competition measure is 0.10 above the 1995-2015 mean for all markets, leading to a BCI value of 0.27. The BCI in the “average” market is zero because each competition ratio is at its long-term average. Finally, the BCI in the “less competitive” market is -0.27 because each competition ratio is 0.10 below its long-term average.

Index Interpretation Within Years

The difference in competition intensity across any two markets *within* a given year is the difference between the index values in that year. Assume that the three markets described in Table 1 are for the same year. Table 1 shows that the BCI in the more competitive banking market is 0.27, but it is 0 for the average market. The difference of 0.27 suggests that the more intense competition in the first market reduces the long-term NII of banks in that market by an average of 27bp relative to the second market. Similarly, the NII of banks in the more competitive market is reduced an average of 54bp (0.27 – (-0.27)) relative to the less competitive market.

Table 1. Bank Competition Intensity Index for Three Banking Market in the Same Year

MARKET TYPE	MATURITY LIAB		OFFICES		1-HHI		BCI
	Ratio	Mean	Ratio	Mean	Ratio	Mean	
1. More Competitive	0.59	0.49	0.96	0.86	0.80	0.70	0.27
2. Average	0.49	0.49	0.86	0.86	0.70	0.70	0.00
3. Less Competitive	0.39	0.49	0.76	0.86	0.60	0.70	-0.27

Index Interpretation Across Years

The change in competition intensity for a given market across any two years is the difference in the BCI across those years. Assume that the three markets listed in Table 1 are for the same banking market but in the years 2005, 2010, and 2015. In this case, the BCI in 2005 is 0.27, and it is 0 in 2010. We conclude that the competition intensity has fallen by 27bp between 2005 and 2010. Similarly, the competition intensity for that market falls by an additional 27bp between 2010 and 2015.

Interpretation of the Index Values

BCI index values are interpreted relative to their long-term average rather than to the average in any particular year. Consider Market Y whose BCI is 0.06 in 1997 and -0.10 in 2015. We correctly conclude, as shown in the first row of Table 2, that competition intensity has fallen by 16bp in this market over time.

Now consider Market Z where the BCI is -0.05 in 1997 and -0.21 in 2015. As the second row of Table 2 shows, competition intensity has also fallen by 16bp in this market over time. In addition, the difference in competition intensity between Markets Y and Z is 0.11 in both years. That is, competition intensity has fallen in both markets by 16bp between 1997 and 2015, but the relative difference in competition intensity between the markets is unchanged.

Table 2. Markets Y and Z

Banking Market	BCI in 1997	BCI in 2015	Difference across years
Y	0.06	-0.10	-0.16
Z	-0.05	-0.21	-0.16
Difference within year	-0.11	-0.11	

We might also be tempted to conclude that Market Y is 6bp more competitive than peers in 1997, but 10bp less competitive than peers in 2015. That interpretation, however, is incorrect because the BCI index values are computed such that the average index value of all markets between 1995 and 2015 is zero, but the average value of the BCI across all markets in a given year is not necessarily zero.

Herfindahl-Hirschman Index

The FDIC Summary of Deposits data lists each bank's deposits by branch each year as of June 30. From that data, we compute each bank's deposit market share. The HHI is the sum of the squares of those market shares.

HHI ranges from 0 to 1, where 0 is the most competitive. If each bank in a market holds a small portion of the deposits, the sum of the squares of those market shares will be close to zero. On the other hand, if one bank holds all the deposits, HHI equals one.

Consider a county with three banks: A, B, and C. Each has one-third of the deposits in the county. HHI is computed as:

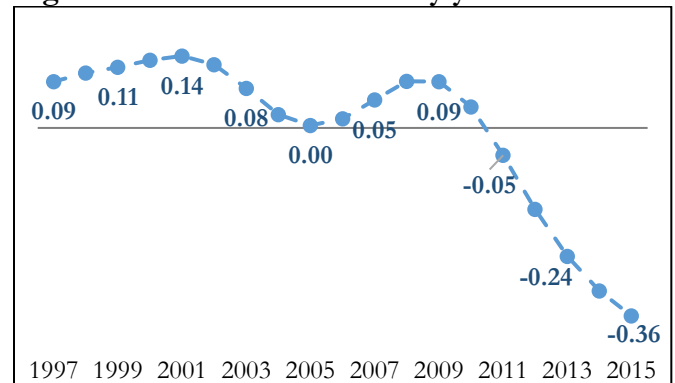
$$(1/3)^2 + (1/3)^2 + (1/3)^2 = 0.33$$

Instead, suppose that that Bank A has 70% of the market share, B has 20%, and C has 10%. HHI in this case equals 0.54.

The Bank Competition Intensity Index uses the complement of HHI, or 1-HHI, so 1-HHI equals 0.67 for the first example above, and 0.46 for the latter example. Higher values indicate more equal distribution of deposits across banks and a more competitive market.

Figure 1 plots the mean value of the BCI index by year, which declines from 0.09 in 1997 to -0.36 in 2015. The primary reason for the decline in competition intensity is the surge in nonmaturity deposits following the massive monetary expansion

Figure 1. Mean value of BCI by year



by the Federal Reserve.¹

The correct interpretation of the BCI for Market Y is that in 1997, it was 6bp more competitive than the average of all markets between 1995 and 2015; in 2015, it was 10bp less competitive than the average of all markets between 1995 and 2015. In other words, the index value is interpreted relative to its long-term average.

Timothy J. Yeager is Professor of Finance and holds the Arkansas Bankers Association Chair in Banking at the University of Arkansas. Garrett McBrayer is Assistant Professor of Finance at Boise State University.

¹ For an explanation, see our article titled “A Post-Crisis Reduction in Competition Intensity.”