Competition in Agricultural Lending Markets:
The Effect of Including the Farm Credit System

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The goal of U.S. antitrust laws is to protect consumers and businesses from anticompetitive behavior. In particular, the antitrust laws prohibit business mergers that substantially lessen competition or create a monopoly. In banking, for example, if a merger of two competing banks results in a combined bank with a substantial share of the market, bank customers may have to pay higher loan rates, have less access to credit, or receive lower rates on deposits.

The Federal banking regulatory agencies are responsible for approving bank mergers. As part of the approval process, they are responsible for ensuring that mergers comply with the antitrust laws. The primary initial screening measure used to assess the competitive effects of proposed mergers is the level and changes in banking market concentration based on the deposit shares of banks operating in the market. For proposed mergers that do not pass the initial screening test, the banking agencies conduct further analysis of the competitive effects.

A shortcoming of deposit-based measures of competition is they do not explicitly account for competition from nondepository financial firms. For example, banks compete with finance companies for business and consumer loans and with money market mutual funds for deposit products. In rural markets where agricultural is a primary business activity, the Farm Credit System's Farm Credit Associations (FCAs) are particularly important nonbank competitors in the loan market. While the banking agencies' screening process accounts for some competition from nondepository financial firms, to our knowledge no studies have assessed the impact of FCAs on banking concentration measures and the implications for banking market competition.

This paper estimates local market shares of agricultural loans using data on bank and FCA loans to assess how FCAs affect competition for agricultural loans in rural markets where agriculture is an important local industry. The analysis suggests that FCAs more often than not

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reduce measures of local market concentration in these markets, which implies that excluding FCAs from market structure analyses may understate the competitiveness of such markets.

The first section of the paper reviews U.S. antitrust laws and the underlying economic theory. The second section outlines the methodology and process for assessing competition in banking markets, with a focus on the Federal Reserve System's process. The third section provides an overview of the Farm Credit System and shows how including FCAs as a competitor in rural agricultural lending markets affects local market concentration measures.

I.   The U.S. Antitrust Framework

For 125 years, the United States has used antitrust laws to reduce social welfare losses from anticompetitive business conduct and practices that restrict output and raise prices above incremental production costs. Some of the laws are specifically aimed at protecting consumers and businesses from abuses of power that can occur when a firm or group of firms controls a substantial share of a market. In general, the Federal antitrust agencies – the U.S. Department of Justice (DOJ) and Federal Trade Commission (FTC) – are responsible for enforcing antitrust laws. In banking, however, the Federal banking agencies – Board of Governors of the Federal Reserve System (Federal Reserve), Office of the Comptroller of the Currency (OCC), and the Federal Deposit Insurance Corporation (FDIC) – have primary responsibility for assessing competitive issues as part of their responsibility to ensure that bank mergers and acquisitions (M&As) comply with antitrust laws.

U.S. antitrust laws

The Sherman Act of 1890 and the Clayton Act of 1914 (as amended in 1936 and 1950) form the basis of U.S. antitrust law. The Sherman Act made contracts, combinations of firms, and conspiracies that restrain trade illegal. It also prohibits monopolies, attempts to monopolize, and combinations and conspiracies to monopolize trade or commerce.

The Clayton Act extended the antitrust law beyond the Sherman Act to prevent anticompetitive practices in their "incipiency." Specifically, Section 7 prohibits M&As that "may be substantially to lessen competition, or to tend to create a monopoly" (15 U.S.C. §18). It also prohibits other anticompetitive practices, such as price discrimination and director interlocks among competing firms.

In banking, M&As are addressed by the Bank Merger Act, Home Owners' Loan Act, and Bank Holding Company Act. These Acts gives the Federal banking agencies specific authority to approve M&As of banks, thrifts, and holding companies that they supervise.[1] As part of this authority, they are required to deny M&As that violate Section 7 of the Clayton Act, unless "the anticompetitive effects of the proposed transaction are clearly outweighed in the public interest by the probable effect of the transaction in meeting the convenience and needs of the community to be served."[2]

The Structure-Conduct-Performance paradigm

To assess the competitiveness of banking markets, the Federal antitrust agencies and bank agencies use the same general paradigm for assessing whether an M&A may substantially lessen competition. This paradigm is known as the Structure-Conduct-Performance (SCP) paradigm. Ultimately, the goal of antitrust policy is "good" performance by firms and industries. Specifically, economic welfare is maximized when market prices equal incremental production costs because resources will be allocated to their most productive uses.

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[1] While the Federal banking agencies have authority to approve bank M&A applications, the Antitrust Division of the DOJ (the Division) conducts a concurrent competitive review of the applications and provides comments to the responsible banking regulator concerning the competitive factors involved in the proposed transactions. If the Division concludes that a transaction raises competitive concerns, it may bring a court action under the antitrust laws to challenge the transaction. For most cases, the commencement of a court action will stay the effectiveness of the banking regulator's approval of the application.

[2] Bank Merger Act: 12 U.S.C. §1828(c)(5)(B) and Bank Holding Company Act: 12 U.S.C. §1842(c)(1)(B). The language in the Home Owners' Loan Act, 12 U.S.C. 1467a(e)(2)(B) , except "transaction" is replaced by "acquisition."

Performance, in turn, depends on the conduct of firms and their customers. Some examples of firm conduct that can cause prices to rise above incremental costs are when businesses that have market power significantly restrict the market output of their products, discriminate in the prices they charge different customer groups, and pursue strategies that prevent new firms from entering their market.

Finally, conduct is often affected by the structure of the market. The clearest example is a monopolist that is able to limit its production output, and therefore market output, to increase the market price and its profits. The monopolist's ability to determine market output and price is in stark contrast to a competitive industry where there are so many firms that no single firm can influence the market price.

More generally, the structure of a market can be described by factors such as the number and size distribution of firms and customers. Conduct is more likely to approach that of a monopolist as an industry gets more concentrated in the sense that the number of firms gets very small or one or a small group of firms becomes much larger than the rest of the firms. For example, a small group of firms may explicitly agree to collude, or do so implicitly, to restrict their collective output and raise market prices above incremental cost to increase their collective profits.

The SCP paradigm provides a highly practical methodology for assessing the potential competitive effects of proposed mergers. Measuring the difference between prices and incremental costs is very difficult if not impossible in many industries. Abusive market practices and conduct also are often difficult to observe and prove. Structure, however, is relatively easy to observe and measure. While an industry that is highly concentrated does not necessarily result in poor conduct and performance, it is more likely to do so than a highly *unconcentrated* industry.

As a result, measuring industry concentration, and the effect of mergers on concentration, provides a good initial screening tool for assessing the competitive effects of mergers.

II.   The Federal Reserve's Implementation of the Structure-Conduct-Performance Paradigm

The Federal antitrust and banking agencies all begin their competitive assessment of mergers by measuring the pre- and post-merger concentration levels. They measure concentration with the Herfindahl-Hirschman Index (HHI). The HHI is the sum of the squared market shares of firms producing the same product in the same market. However, their processes differ slightly in how they measure the products and markets. This section focuses on the process used by the Federal Reserve.[3]

The HHI varies between 0 and 10,000 and increases as the number of firms falls or the distribution of firm sizes becomes more skewed to large firms. For example, if there are five firms in an industry and they all have a 20-percent market share, the HHI is 2,000. If two of the firms were to merge, the HHI would increase to 2,800. Alternatively, if four firms have a 15-percent market share and one has 40 percent, the HHI is 2,500.

The Federal Reserve's and other banking agencies' initial criteria for assessing the competitive effects of a merger or acquisition is whether it would (1) would raise the HHI by 200 points or more to a level of 1,800 or higher in any local banking market that parties jointly operate in, or (2) increase the post-transaction market share for the acquiring firm to more than 35 percent in any of those markets. If the merger does not exceed these thresholds, it will generally be approved. If it does exceed one or both thresholds, further analysis is conducted to determine if the merger would be anticompetitive.

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[3] Much of the general information in this section can be found in the Federal Reserve's "Frequently Asked Questions" document on the competitive analysis for mergers and acquisitions (Board of Governors of the Federal Reserve System).

Before an HHI can be calculated, the relevant market for the antitrust analysis must be defined. Specifically, product and geographic components of a market must be defined. The criteria used by the banking agencies to define banking product and geographic markets are largely based on U.S. Supreme Court antitrust cases.

For the product market, the goal is to include all products that consumers consider to be close substitutes. The product market for banking services used by all of the Federal banking agencies is the "cluster" of commercial banking products and services, which was determined in a 1963 U.S. Supreme Court case.[4] The cluster is considered to be banking products and services that are provided to most households and small businesses. As a result, the competitors that are included in HHI calculations are depository institutions – commercial banks and thrift institutions – and sometimes credit unions.

For the geographic area, the goal is to encompass all banking service providers that customers would consider as a viable alternative for meeting their banking needs. From a practical implementation perspective, these markets should include any depository institution that a bank's customer would consider switching to when prices or service quality change. As in most service industries, the markets generally are local, economically integrated areas. Most markets are based on Metropolitan Statistical Area (MSA) definitions or rural county lines, but some markets include multiple MSAs, counties, and/or parts of them.[5] Currently, there are more

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[4] *United States v. Philadelphia National Bank*, 374 U.S. 321, 356 (1963). The DOJ, however, does not use the "cluster" definition. Instead, when the DOJ conducts its competitive review, it uses two product markets – retail banking products and services, and small business banking products and services. Other relevant cases include *United States v. Connecticut National Bank*, 418 U.S. 656 (1974) and *United States v. Phillipsburg National Bank & Trust Co.*, 399 U.S. 350 (1970)

[5] The information used most frequently to define geographic banking markets includes commuting patterns, shopping patterns, interviews with local government and business leaders, and surveys of local households or small businesses. When an analysis of more specific product markets, such as credit card or mortgage loans, is required, the geographic markets may be regional or national in scope.

than 1,500 local banking markets in the United States and U.S. territories that the Federal Reserve uses for its competitive analyses.[6]

The market shares and HHI for a local banking market are calculated using the deposits of all depository institutions with a presence in the market. Deposits are the only general and reasonable measure of overall banking activity that is available at the branch level. Indeed, the Federal Reserve Board notes deposits are a "reasonable indicator of the level of activity or output of a depository institution, because deposit accounts are widely held by consumers and small businesses and are held in combination with other commercial banking products. In addition, for smaller institutions, deposits may be considered a measure of a bank's lending capacity." (Board of Governors of the Federal Reserve System, Question 11). For calculating the initial HHI, commercial bank deposits receive a 100-percent weight, while thrift deposits receive a 50-percent weight. Thrifts are considered a less active competitor because they tend to focus on residential real estate lending and do limited commercial and industrial (C&I) lending.

When a proposed merger or acquisition exceeds the initial HHI or market share thresholds, further analysis is generally conducted because the merger or acquisition may not be anticompetitive. For example, thrifts that make a relatively large amount of C&I loans can be more of a competitive factor for banks. Similarly, all or a substantial majority of a market's population may be eligible to be members of a credit union in the market, and the credit union's branches may be easily accessible. In these situations, the thrift deposits could receive a 100-percent weight, and credit unions could be included, with their deposits generally weighted at 50 percent.

The additional competitive analysis also includes research on other market characteristics or factors that could suggest the market is more competitive or that the merger is less

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[6] Up-to-date geographic market definitions are available on the Federal Reserve's CASSIDI™ application, https://cassidi.stlouisfed.org/.

anticompetitive than suggested by the initial HHI and market shares. Examples of such mitigating factors that might suggest the market is more competitive or the mergers less of a competitive concern are the attractiveness of the market to potential entrants, ease of entry into the market by existing out-of-market or new banks, the number of competitors, the number of competitors with significant market shares, the effects of a shrinking market, and whether the target bank is failing or experiencing severe financial difficulties (Board of Governors of the Federal Reserve System).

Of course, banks may face competition in products more specific than the cluster of commercial banking products and services and, therefore, from non-depository financial firms. Examples of such competition include the Farm Credit System in agricultural lending, mortgage and credit card specialty lenders, finance companies in commercial lending, factor companies in receivable financing, and money market mutual funds for deposits. For some of these products and services, the geographic market may be regional or national.

In general, the Federal banking agencies (as well as the DOJ) account for this measurement problem in the initial competitive analysis by using higher threshold levels than the DOJ allows for other industries. Specifically, the 200-point change threshold used for banking mergers is much larger than the 50-point threshold the DOJ uses for mergers in most other industries. The practical implication of this difference between the thresholds for HHI changes is that the increase in market share allowed when two banks merge is about twice that for other industries. For example, the HHI increases by 200 points when two firms with 10-percent market shares merge, while the HHI increases by 50 if the merging firms have 5-percent market shares.[7] Nevertheless, in some cases, the extended competitive analysis will include research on the

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[7] The change in the HHI for a merger is twice the market share of the merging firms.

competitive effects in certain specific product markets and consider unique facts that might mitigate the structural related anticompetitive effects of a merger.

III. How Does Farm Credit System Lending Affect Competition in Agricultural Lending Markets

Rural areas are sparsely populated and therefore have less economic activity than metropolitan areas. As a result, most rural areas can support only a limited number of banks, which often results in high measures of banking market concentration. The dominant industry in many rural areas is agriculture, so not surprisingly, many banks in these areas specialize in lending to farmers and other agribusiness entities. However, several other types of nonbank agricultural lenders also compete with banks, none of which are explicitly included in the market shares and HHIs used in the initial competitive analyses of mergers. This section focuses on competition from the Farm Credit System, which along with commercial banks is the largest agricultural credit provider. Specifically, the section provides estimates of FCS market shares and HHIs that include FCS loans in rural banking markets where agriculture is an important part of local economic activity.

The Farm Credit System: background and national agricultural loan market shares

The FCS was first established as a government-sponsored enterprise in 1916 to provide affordable long-term financing to farmers. The original structure consisted of twelve Federal Land Banks that provided funding to National Farm Loan Associations (NFLAs). The NFLAs were cooperatives owned by member farmers, who were required to buy stock in the associations to be eligible for long-term land loans.

The FCS has undergone several changes since 1916, but the general mission and structure have remained basically the same. The current FCS structure was established by the Farm Credit Act of 1971. To support the FCS's mission, the Farm Credit Act also provided several policy objectives for the Farm Credit System's lending programs. One is that it should improve "the

income and well-being of American farmers and ranchers by furnishing sound, adequate, and

constructive credit and closely related services to them, their cooperatives, and to selected farm-

related businesses" (12 U.S.C. §2001(a)). The Act also requires the FCS to "provide equitable

and competitive interest rates to eligible borrowers …" and "That in no case is any borrower to

be charged a rate of interest that is below competitive market rates for similar loans made by

private lenders to borrowers of equivalent creditworthiness and access to alternative credit." (12

U.S.C. §2001(c)).

The current FCS organizational structure includes four regional wholesale banks that

primarily provide funding to 76 Farm Credit Associations (FCAs), which are the organizations

that make loans to their members.[8] The four wholesale banks are funded by a centralized funding

corporation, the Federal Farm Credit Banks Funding Corporation, which raises funds in national

debt markets. The FCS's funding is insured by the Farm Credit Insurance Corporation. The FCS

is regulated and supervised by the Farm Credit Administration, a Federal agency that was created

in 1933.

Similar to the original NFLAs, the FCAs are cooperatives, owned by its borrower-

members, governed by a board of directors primarily elected from its borrower-owners, and pays

dividends to its borrower-owners. As shown in Figure 1, the FCAs each have specific lending

territories, although many of the territories overlap. The sizes of the territories vary significantly.

For example, Northwest FCS's and FCS of America's territories span multiple states in the

Northwest and Midwest portions of the country, while Legacy Land Bank in eastern Texas spans

just a few counties.

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[8] The wholesale banks include three Farm Credit Banks (AgriBank, AgFirst, and FCB of Texas) and one
Agricultural Credit Bank (CoBank). These banks have specific regions, although there is some overlap, and they
lend to FCAs only in their region. CoBank has a broader lending authority than the Farm Credit Banks – for
example, it can lend to public utility cooperatives, finance U.S. agricultural exports, and provide international
banking services for farmer-owned cooperatives. The FCAs include 74 Agricultural Credit Associations (ACAs) and
two Federal Land Credit Associations (FLCAs). ACAs make short-, intermediate-, and long-term loans, while
FLCAs just make long-term land loans.

The FCAs make four general types of loans (Federal Farm Credit Banks Funding Corporation). The first major category is real estate loans, which has maturities from five to 40 years.[9] The second category is production and intermediate-term loans for farm operating purposes, which typically match the borrower's production and marketing cycle of 12 months or less. Third, they make agribusiness loans, which include loans to farmers to market or process their product or to businesses that provide farm-related services to farmers. Finally, they can make rural single-family residential real estate loans that will be the primary residence in rural areas, defined as cities with fewer than 2,500 residents, as long as the total of all such rural housing loans does not exceed 15 percent of the FCA's total loans.

The FCS and commercial banks are the largest lenders to the agricultural sector (Chart 1), with the FCS holding its largest market share since the beginning of the data series in 1960. The data are aggregated farm sector balance information from the U.S. Department of Agriculture's (USDA's) Economic Research Service. The FCS's market share of lending overtook the banking industry's market share in 2009 for the first time since the mid-1980s. Since then, both of their market shares have been about 40 percent of all loans to agriculture.[10]

The growth in the FCS market share relative to banks in recent years has been due to increases in both FCA real estate and production loans (Chart 2). These data are aggregated from individual FCA and bank balance sheets, and begin in 2005 because that is the first year

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[9] The real estate loans are generally used to purchase farm real estate, refinance existing mortgages, construct various facilities used in agricultural operations, or purchase other rural residential/lifestyle real estate.
[10] U.S. Department of Agriculture, Economic Research Service, Farm Income and Wealth Statistics, Farm Sector Balance Sheet and Selected Financial Ratios: http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics/balance-sheet.aspx. The composition of the data used to measure debt owed to commercial banks changes in 2012. Specifically, farm sector debt owed to savings associations moved to the Commercial Bank category from the Individuals and Others category, which can be seen by the increase in the Commercial Bank share and the corresponding decrease in the share of Individuals and Others. The compositional change does not affect the overall trends in Chart 1, and while the commercial bank market share would have been slightly lower from 2012–2014, the FCS and bank market shares would still be roughly the same as each other.

individual FCA data are available.[11] Panel A shows that the FCAs' share of agricultural real estate loans is larger than the bank share and that the gap has widened between 2005 and 2014. The FCAs' share has risen from 52 to 55 percent, which has increased the gap over the banks' share from four to 10 percentage points. For production loans, the commercial bank share is larger than the FCAs' share, but the gap has narrowed since 2005. The FCA share has risen from 33 to 40 percentage points, which has narrowed the gap from 34 percentage points in 2005 to 20 percentage points in 2014.

The effect of FCS lending on competition measures in local agricultural loan markets

In this section, agricultural loan shares for banks and FCAs are estimated to calculate HHIs for local rural banking markets, which are generally rural counties, where agriculture is economically important. The effect of FCA lending on market competition is assessed by comparing HHIs calculated with and without FCA loan shares. Whether adding a competitor to a market increases or decreases concentration is an empirical question. In particular, if the additional competitor is large relative to other competitors, market concentration can increase.[12]

Estimation of local market agricultural loan shares and HHIs

Local market shares of agricultural loans from individual banks and FCAs are needed to calculate HHIs. Agricultural loan data, however, are available only at the bank and FCA level, which may span more than one market for banks with multiple branches and for all FCAs. As a result, local market agricultural loans must be estimated for both banks and FCAs. Estimates of agricultural loans are made at the county level, which are then aggregated if the local market

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[11] The FCA agricultural real estate and production loan data are aggregated from FCA balance sheets and were obtained from a Freedom of Information Act request to the Farm Credit Administration, which is the normal procedure for receiving this data. The bank lending data are from the Reports of Condition and Income (Call Reports).

[12] For example, a market with five competitors, each making $100 in loans would have an HHI of 2,000. Adding a new competitor that makes $500 in loans would increase the HHI to 3,000.

includes multiple counties. The estimates of FCA loans and bank loans in each market are then used to calculate market shares for FCAs and individual banks and market HHIs.

For banks, agricultural loans are reported only at their headquarters locations. The loans are allocated to counties based on the degree to which a county is rural and on the level of the bank's activity in the county using the following procedure. First, the percentage of each county that is rural is obtained from Census Bureau, whose calculations are based on population densities for Census tracks. Second, a bank's activity in each county is measured by its branch deposits in the county. Third, the bank's "rural deposits" are estimated for each county by multiplying its deposits in the county by the county's rural percentage. Fourth, the bank's rural deposits are summed and used to calculate the share of rural deposits for each county in which it operates. Finally, assuming that a bank's agricultural loans are proportional to its rural deposits, its agricultural loans are allocated to each county by multiplying the bank's agricultural loans by the county's share of rural deposits.[13] For multiple-county markets, the county loans are summed up to the market level.

For FCAs, the agricultural loans are allocated to individual counties based on the level of agricultural activity in each county. Agricultural activity is measured by aggregate marketing proceeds from crops and livestock in the county. For each FCA, marketing proceeds in its territory's counties were summed and used to calculate each county's share of agricultural activity. Each ACA's agricultural loans are then allocated to each county by multiplying the county's share of agricultural activity by the FCA's agricultural loans. As with bank loans, county loans are summed for multiple-county markets.

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[13] For some bank merger applications submitted to the Federal Reserve, an analysis of competition for small business loans is prepared. Under certain circumstances, the estimate of market level small business loans also relies on the assumption that local market loans are proportional to local market deposits.

Selection of agricultural lending markets

Rural banking markets are the starting point for determining the market areas. Typically, these markets correspond with rural county boundaries. However, for Federal Reserve local banking markets, Federal Reserve Bank staff may adjust market boundaries when appropriate to reflect local business patterns.

The choice of markets was affected by several factors, including the importance of agricultural activity and the characteristics of the FCA in which the market is located. Given the focus on agricultural lending, markets are included only if agricultural activity is economically important. The criteria used to define whether agriculture is economically important are based on the USDA's definition of a "farm dependent" county.[14] The USDA defines a county as farm dependent if farm earnings are 15 percent or more of total county earnings or farm occupations account for 15 percent or more of all occupations of employed county residents. The occupation option is included to account for highly farming-oriented economies that may not meet the earnings threshold, most often due to negative farm earnings for a given year.[15]

Following the USDA's general methodology, an index of agriculture importance is calculated using a 3-year average of the maximum of a county's farm earnings and farm employment shares. A market is considered *agriculture-important* if the index is at least five percent, and the market is considered *agriculture-dependent* if the index meets or exceeds the USDA threshold of 15 percent. All markets in the analysis meet the agriculture-important threshold.

The characteristics of FCAs are important because the allocation process assumes a proportional relationship between FCA lending and agricultural activity measured by crop and

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[14] U.S. Department of Agriculture, Economic Research Service, County Typology Codes: http://www.ers.usda.gov/data-products/county-typology-codes/documentation.aspx
[15] The USDA's most recent data for farm-dependent counties are for 2004, which are based on average earnings from 1998-2000 and farm employment in 2000.

livestock marketing proceeds. This assumption is less likely to hold for FCAs that cover very large geographic areas, have non-contiguous territories, or are "overchartered," that is, an area is included in more than one FCA's territories. The selected rural banking markets were completely within smaller FCAs with contiguous territories and in areas that were not overchartered.

Using county earnings and employment data for 2011-2013, 86 agriculture-important markets were selected from the local banking markets that the Federal Reserve uses for antitrust analysis (Figure 2).[16] All but 8 of the markets are a single county, with the largest market consisting of 11 counties. Among the 86 markets, 48 meet the agriculture-dependent criteria.

The effect of FCAs on competition in agricultural lending markets

Summary statistics on the 86 markets and their HHIs are shown in Table 1. Statistics are provided for 2005 and 2014 for three sets of markets – Agriculture-Important, Agriculture-Dependent, and "Agricultural Bank". Agricultural banks are banks with a ratio of agricultural loans to total loans of 25 percent or more. An "Agricultural-Bank" market is used here to denote a market in which 20 percent or more of the banks are agricultural banks. Agricultural activity is likely to be very important in rural markets that have a relatively large number of banks with highly concentrated agricultural loan portfolios, so an Agricultural-Bank market as defined here is used as an alternative proxy for identifying markets that are highly dependent on agriculture. As would be expected for markets that are relatively more dependent on agriculture, there are significantly fewer Agriculture-Dependent (48) and Agricultural Bank (56 in 2005 and 62 in 2014) markets than Agriculture-Important markets.

The top panel of Table 1 summarizes trends in the number of banks and FCAs' presence in the markets. The median number of banks is essentially the same across all market groups –

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[16] The earnings and employment data are from the U.S. Bureau of Economic Analysis. See the Appendix for the specific data used. The most recent county-level earnings and employment data are from 2013, so the agriculture-importance index is calculated using data from 2011-2013. The index is used to determine the agriculture-important and agriculture-dependent counties for 2005 and 2014.

five banks in every year except for six in the Agricultural-Bank markets in 2005. The FCAs' median share of agricultural loans increases from 2005 to 2014 in all three market groups, which is consistent with the national trends shown in Charts 1 and 2. Among the 86 Agriculture-Important markets, the FCS share of loans decreased in only 21 markets, with the decline more than 2 percentage points in only 12 markets.

The bottom panel of the table provides summary statistics for HHIs based on three measures of market activity and market participants – the traditional deposit measure for bank market shares, estimated agricultural loan market shares for banks only, and estimated agricultural loan market shares for banks and FCAs. The deposit-based HHIs for banks are used as a benchmark for comparing bank-only agricultural-loan HHIs. The FCA-and-bank HHIs are then compared to bank-only HHIs to assess how FCAs affect competition in agricultural lending markets. As expected given the relatively small number of banks in each of the three types of agricultural markets, the median HHIs for all market categories in 2005 and 2014 are very high.

For HHIs based on deposits, the medians are about 3,000 for Agriculture-Important and Agriculture-Dependent markets in both years and Agricultural-Bank markets in 2014. The Agricultural-Bank market median in 2005 is significantly lower at about 2,500. These results are consistent with the median number of banks shown in the top panel for all three market groups in each year. Very few markets have HHIs below the 1,800 threshold that would be needed post-merger for a merger to be approved without an extended competitive analysis.

The middle section of the bottom panel shows statistics for HHIs calculated with agricultural loan shares assuming only banks are competing in the market. The medians of these HHIs are much larger than the median deposit HHIs. For the Agriculture-Important and Agriculture-Dependent market groups, the median HHIs are about 3,500 in 2005 and rise in 2014 to about 3,700 in Agriculture-Important and 3,800 in Agriculture-Dependent markets. For

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Agricultural-Bank markets, the median HHI is much lower at about 2,800 in 2005, but increases to 3,500 in 2014.

An alternative way to look at the difference between agricultural-loan and deposit HHIs is a market-by-market comparison of the difference between the HHIs. For all market groups, the median difference in the HHIs is highly positive, ranging from a low of 254 in Agricultural-Bank markets in 2005 to a high of 672 in Agriculture-Important markets in 2014. Finally, for every market group and in both years, the number of markets below the 1,800 threshold is lower than or equal to the number of markets based on deposits, which is consistent with the larger agricultural-loan HHIs.

The bottom section of Table 1 suggests that markets are more competitive when FCAs are included as market competitors with banks. Including FCAs reduces the median HHIs for the Agriculture-Dependent and Agricultural-Bank markets in both years and for the Agriculture-Important market in 2005. For the Agriculture-Important and Agriculture-Dependent markets, the median HHIs are about 3,300 in 2005 and somewhat higher in 2014 – about 3,700 for the Agriculture-Important markets and 3,600 for the Agriculture-Dependent markets. For the Agricultural-Bank market, median HHIs are much lower in both years at about 2,700 in 2005 and 3,100 in 2014. At the individual market level, the median difference between the FCA-and-bank HHIs and the bank-only HHIs is negative and very large. The differences range from -413 in Agriculture-Important and Agricultural-Bank markets in 2005 to -653 in Agricultural-Bank markets in 2014.

Overall, the summary statistics suggest that including FCAs in a market structure analysis tends to lower HHIs. Charts 3–5 provide a more detailed assessment of the individual markets by plotting the FCA-and-bank HHIs against the bank-only HHIs for each of the 3 market groups in 2014. For the Agriculture-Important markets (Chart 3), including FCAs tends to lower HHIs in

51, or 59 percent, of the 86 markets. In Chart 3, these are the points below the 45 degree line. In addition, the HHI declines are relatively large – they decline 26 percentage points or more in 22 (25 percent) of the markets and 13 percentage points or more in 43 (50 percent) of the markets.

Interestingly, the relationship between the FCA-and-bank HHI and bank-only HHI for the markets in which the HHI increases is very different from the markets in which the HHI declines. For the markets in which the HHI increases, the relationship is highly scattered – the correlation is 63 percent. In seven of the markets, adding FCAs increased the HHI from less than 5,000 to more than 8,500.[17] In these markets, bank lending was relatively low, and the average FCA market share was 95 percent.

In contrast, the relationship between the FCA-and-bank HHI and bank-only HHI for the markets in which the HHI decreases, the decline appears very systematic. The correlation between the FCA-and-bank HHI and bank-only HHI for declining markets is 88 percent. The estimated slope coefficient from a linear regression of the FCA-and-bank HHI on the bank-only HHI is 0.57.[18] In markets where including FCA reduces concentration, the reduction is larger in markets that have a higher initial concentration.

The results are similar for the Agriculture-Dependent markets (Chart 4). Including FCAs increases HHIs in 17 (35 percent) of the 48 markets. In these markets, the relationship between the HHIs is also scattered – the correlation is 64 percent and the HHI increased from less than 5,000 to more than 8,500 in four markets. Again, these markets are markets where bank lending was relatively low and the FCA had a very high market share. The number of markets in which the HHI declines is 31, or 65 percent of the 48 markets. The correlation coefficient (0.86) and regression slope coefficient (0.57) are essentially the same as for the Agriculture-Important

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[17] These markets are in California, North Carolina (3), South Carolina (2), and Virginia.
[18] The estimated coefficient is statistically significant with a t-statistic of 12.9, and the regression's adjusted R^2 is 0.77.

results. [19] The distribution of declines is similar to that of the Agriculture-Important markets – they decline 28 percentage points or more in 12 (25 percent) of the markets and 15 percentage points or more in 24 (50 percent) markets.

Finally, the results for the Agricultural-Bank markets provide the strongest support for the view that omitting FCAs make banking markets in agricultural areas appear less competitive than they might be (Chart 5). The relationship among markets in which the HHI increases is much more systematic than in the other two market groups. None of the markets in the top-left quadrant of the scatter plot are in this group. The correlation among the markets in which FCAs lead to an increase in the HHI is 87 percent. [20]

However, the percentage of markets in which FCAs reduce concentration is the highest among the three market groups – HHIs decline in 41, or 66 percent, of the 62 markets. Moreover, they decline 28 percentage points or more in 16 (25 percent) of the markets and 19 percentage points or more in 31 (50 percent) of the markets. Among the declining HHI markets, the correlation is 96 percent, and the regression-slope coefficient is 0.45. [21] The results indicate that including FCA lending reduces HHIs more in markets that have higher initial concentration, and this effect is stronger here than in the other two market groups. Thus, to the extent Agricultural-Bank markets are a good proxy for a market's dependence on agriculture, these results suggest that the degree to which FCAs increase the competitiveness of markets increases with economic importance of agriculture to the local economy.

IV.   Conclusion

The Federal banking regulatory agencies are responsible for ensuring that bank mergers are not anticompetitive. The initial competitive assessment of proposed mergers is based on the

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[19] The estimated slope coefficient is statistically significant with a t-statistic of 9.2, and the regression's adjusted R^2 is 0.74.
[20] The slope coefficient of the HHI regression is 1.22. The t-statistic is 7.5, and the adjusted R^2 is 0.74.
[21] The estimated coefficient is statistically significant with a t-statistic of 21.2, and the regression's adjusted R^2 is 0.92.

level and changes in banking market concentration based on the deposit shares of banks operating in the market. A shortcoming of deposit-based measures of competition is they do not explicitly account for competition from nondepository financial firms. In particular, for banks in rural markets that make agricultural loans, FCAs are important competitors.

This paper uses data on bank and FCA loans to estimate local market shares of agricultural loans in rural markets where agriculture is an important local industry. The loan-based market shares are used to estimate agricultural-loan HHIs to assess how FCAs affect competition for agricultural loans. The results show that including FCAs as a competitor can significantly affect the measurement of market concentration. In particular, when market concentration is measured using loan shares (instead of deposit shares), including FCA lending can significantly reduce measures of concentration. In addition, the effect tends to be larger in markets that are more concentrated and in markets that are more dependent on agriculture.

These results imply that excluding FCAs from market structure analyses may understate market competitiveness in rural markets where agriculture is an important part of the local economy and are suggestive that similar results may apply to other significant product lines for certain banks. Moreover, because including FCAs will always reduce the market shares of banks, a merger that would otherwise increase the HHIs by more than 200 points may not cross that threshold and, therefore, would be less of a competitive concern.

The results, of course, are dependent on the assumptions that are used to disaggregate FCA and banks loans to local market levels. Future research would greatly benefit from more granular location-based agricultural loan data.

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Appendix

Data Sources

The data used in the HHI analysis encompass a variety of sources and span the years from 2005 to 2014. The data sources include: financial data provided by the Farm Credit Administration (FCAdm) for Farm Credit entities, Report of Condition and Income (Call Report) data for banks, U.S. Census Bureau (Census) data for county demographics, Bureau of Economic Analysis (BEA) data on cash receipts for farm income and employment data, and the Federal Deposit Insurance Corporation's Summary of Deposit (FDIC SOD) survey for branch level deposit data. In addition, supplemental data sets were created using merger information from the FCAdm as well as Farm Credit entity county coverage information based on their website. Because the analysis occurs at the county level, datasets were merged using GeoFips codes or a combination of County and State name when applicable. In a few circumstances, it was necessary to make modifications to the original data sets to accommodate unique location values and to provide consistency across the data.

Farm Credit Associations – Merger Adjustments

The data provided by the FCAdm contain agriculture loans originated and held by the various Farm Credit Associations (FCAs), which include Agricultural Credit Associations (ACAs) and Federal Land Credit Associations (FLCAs). Because there have been numerous mergers among various ACAs and FLCAs, institutions are merger adjusted and treated as one institution over time. For example, as of 2005, the current Texas Farm Credit Services (Texas FCS) was three separate entities: AgCredit of South Texas ACA (AgCredit), Texas AgFinance, and AgriLand FCS. For purposes of this analysis, the initial three institutions were combined into a pro-forma Texas FCS when calculating total agriculture lending in 2005. In addition to merger adjusting FCA loan volumes, the FCA coverage areas were also merger adjusted.

Geographic Market Definitions and Allocations

Geographic market areas were based on local banking markets used by the Federal Reserve. These markets can be found in the Federal Reserve's CASSIDI™ application at https://cassidi.stlouisfed.org/. Not all counties were in defined markets. In these cases, the counties were treated as a market, which is the initial or default assumption for competitive analysis of banking mergers.

The analysis used data for 86 markets. Eight markets included more than one county, three of which included whole counties and portions of counties. Allocations of bank deposits and loans were based only on branches located within the market. Branch locations were identified using CASSIDI. FCA loans were assigned to the entire county, a portion of the county, or none at all, depending on the market characteristics. Once all counties in a market were allocated their appropriate FCA agricultural loans, they were aggregated up to the market level, with FCA loans treated as coming from a single entity.

- Minot Market in North Dakota covers the entire counties of Burke, Mountrail, Pierce, Renville, and Ward, almost all of McHenry county, and approximately one-third of Bottineau County. For purposes of assigning FCA loans in the Minot market, all of McHenry County was included in the market while no FCA loans were assigned to Bottineau County.

- Bottineau Market (adjacent to Minot) covers all of Rolette County, two-thirds of Bottineau County, and a very small portion of McHenry. This market was assigned two-thirds of the Bottineau County FCA agricultural loans and none from McHenry County.[22]

- The Bismark/Mandan Market in North Dakota encompassed the entire counties of Burleigh, Emmons, Grant, Kidder, Logan, McIntosh, McLean, Mercer, Oliver, and

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[22] One-third of Bottineau County FCA loans that should have been assigned to the Minot market were inadvertently dropped from the analysis. The impact of the error on market shares was very small.

Sioux, but only half of Sheridan County. In addition, two FCAs cover McLean and Sheridan – Farm Credit Services of Mandan (FCS Mandan) and Farm Credit Services of North Dakota (FCS North Dakota). Based on the FCA coverage of the counties, 25 percent of FCS Mandan's McLean County agricultural loans and 75 percent of FCS North Dakota's McLean County agricultural loans were assigned to the Bismakr/Mandan market. In addition, 80 percent of FCS Mandan's Sheridan County agricultural loans and 20 percent of FCS North Dakota's Sheridan County agricultural loans were assigned to this market. Because the Bismark/Mandan Market includes only half of Sheridan County, only half of the Sheridan County FCA allocations were included in the final market calculations. (Bank loans in Sheridan County were included for those branches that were in the Bismark/Mandan half of the county.)

Deposit HHIs

Deposit HHIs were calculated using bank branch deposit data. Branch data for each bank were aggregated up to the local market level. The deposit HHIs differ from the standard CASSIDI HHIs in two respects. Unlike CASSIDI HHIs, the deposit HHIs used in the paper do not include thrift deposits because data on agricultural lending by thrifts was not available in 2005. In addition, the deposit HHIs are aggregated to the bank level while CASSIDI aggregates to the BHC level. Bank deposits in each market are used to calculate each bank's market share, which is then used to calculate the market's deposit HHI.

Data Adjustments

A number of adjustments were made to raw data to correct for irregularities and anomalies in the data. For example, some adjustments were needed to address cities and counties with the same name in the same (for example, St. Louis City vs. St. Louis County) which are not

distinguished in the U.S. Census Bureau data. Adjustments were made to handle cities within

counties that have separate GeoFips codes.

Figure 1
Farm Credit Wholesale Bank and Association Territories

Source: Farm Credit Administration, http://www.fca.gov/Download/Maps/InstitutionTerritoryMap01-2013.pdf
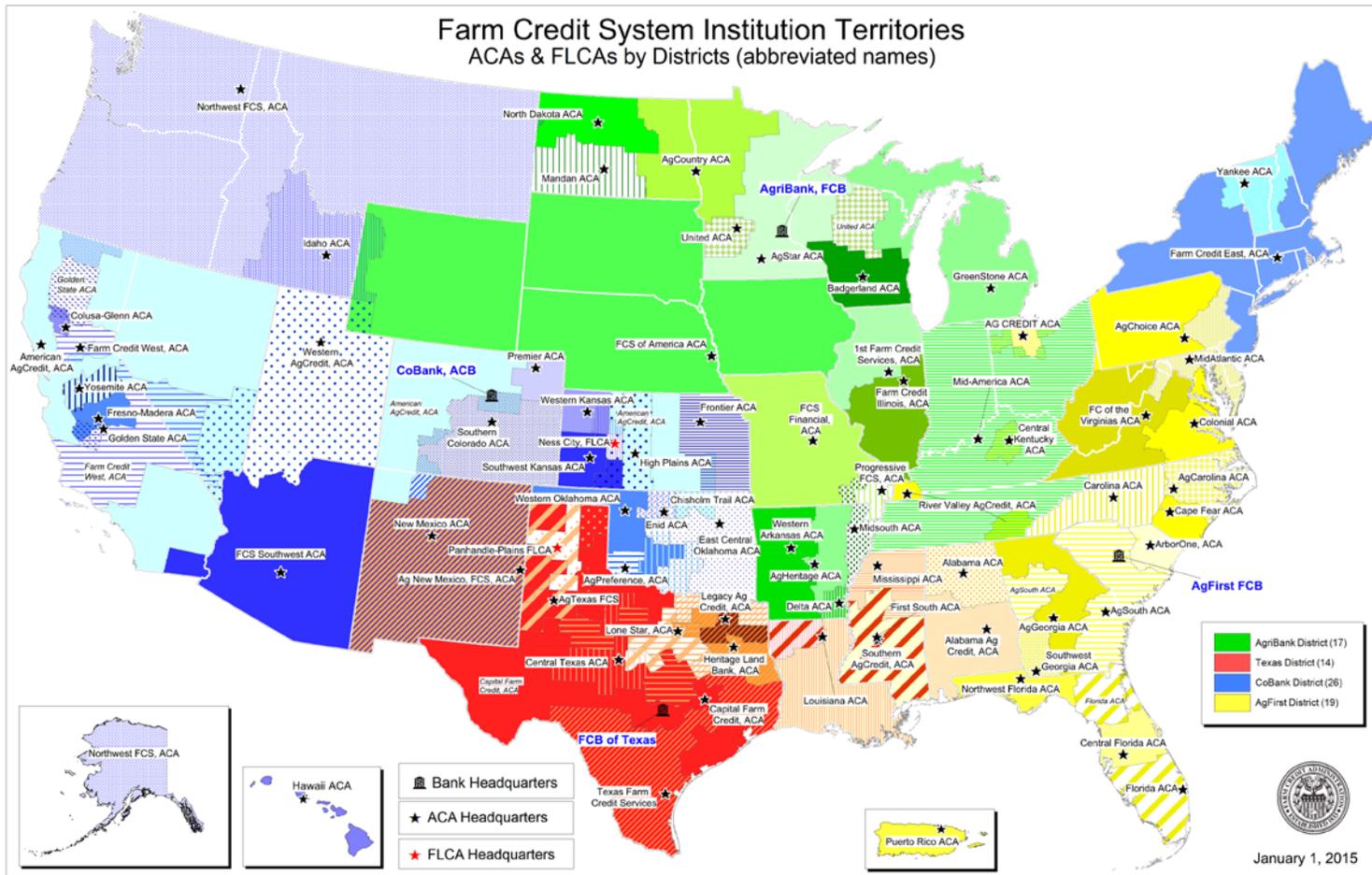
Figure 2
Agriculture-Important Banking Markets
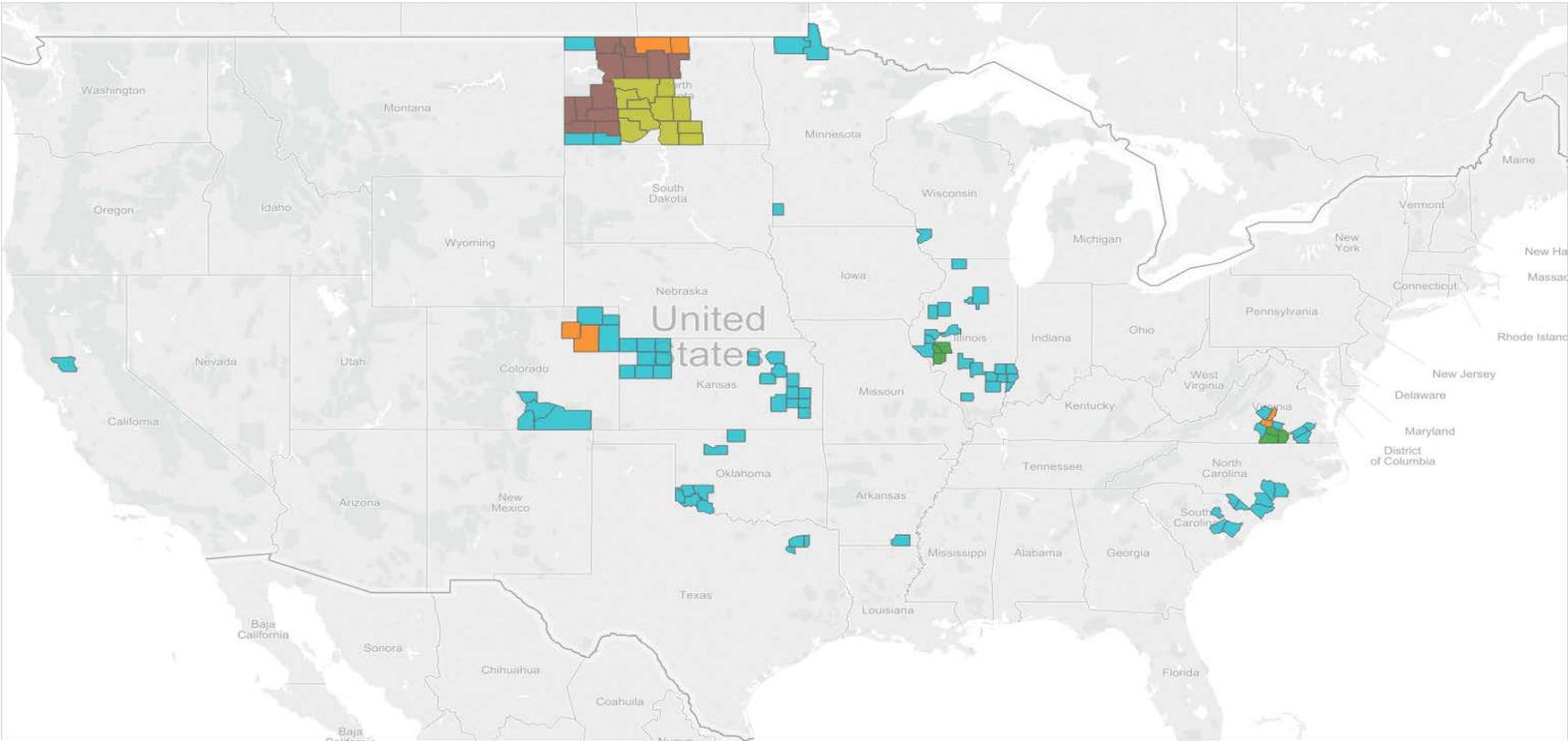
Number of Counties in Markets
- 1
- 2
- 3
- 6
- 11
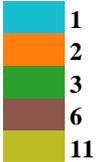
Source: See Appendix for authors' calculations.

Chart 1
Major Farm Credit Providers
(Market Shares)
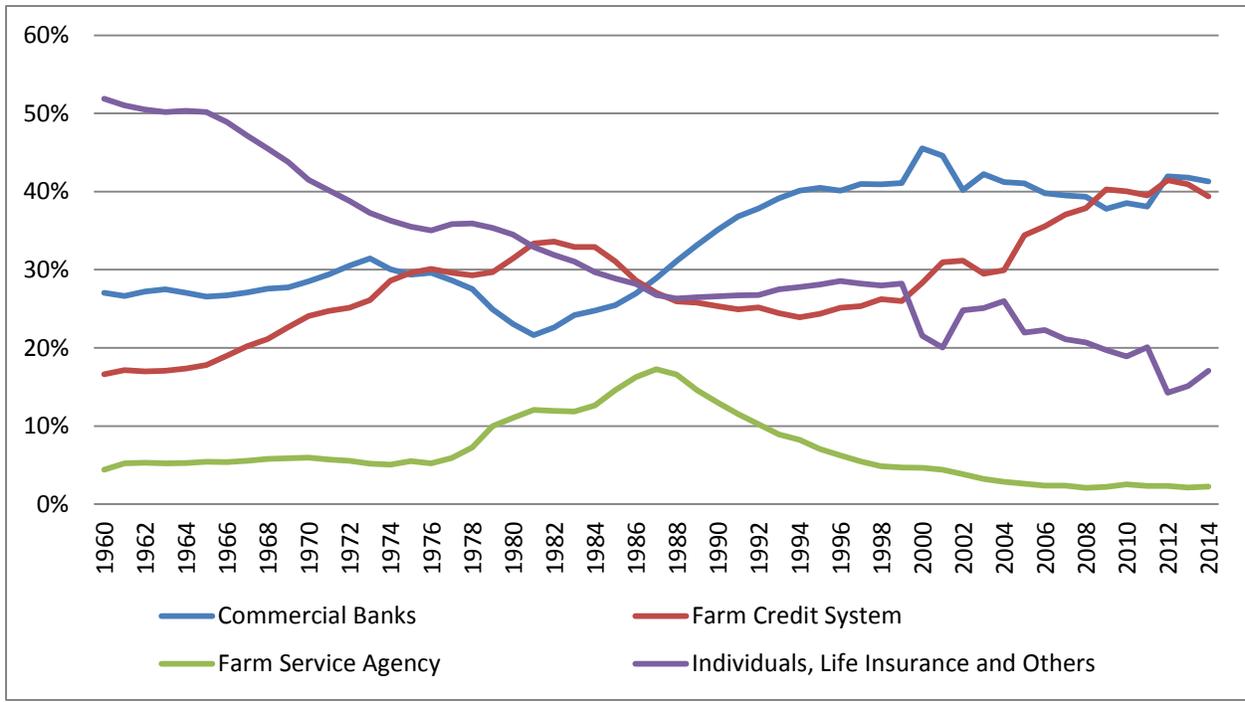
Source: U.S. Department of Agriculture, Economic Research Service, Farm Income and Wealth Statistics, U.S. Farm Sector Financial Indicators

Agricultural Real Estate Loan Market Share
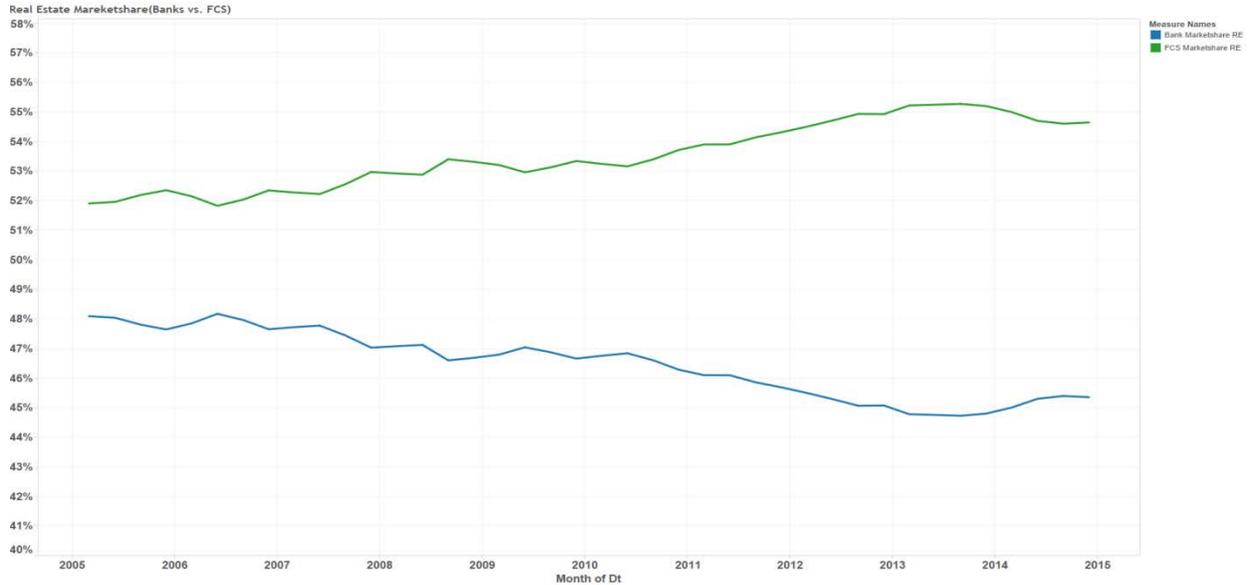
Real Estate Mareketshare(Banks vs. FCS)

Measure Names
- Bank Marketshare RE
- FCS Marketshare RE

Source: Farm Credit Administration for Farm Credit System loans and Reports of Condition and Income (Call Reports) for banks.

Chart 2B
Agricultural Production Loan Market Share
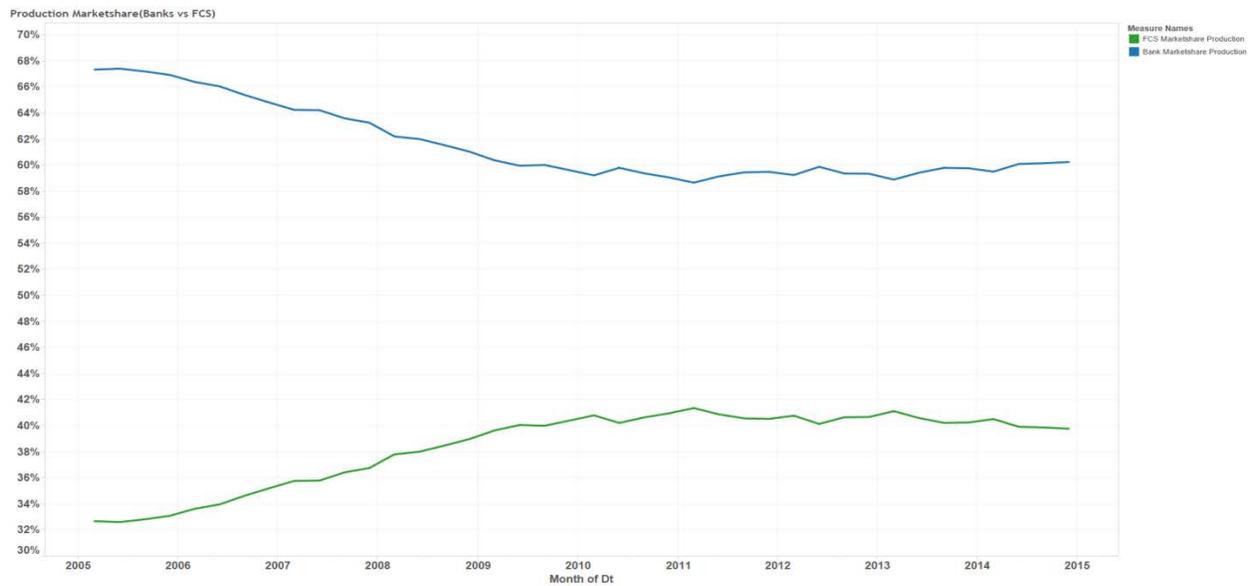
Production Marketshare(Banks vs FCS)

Measure Names
- FCS Marketshare Production
- Bank Marketshare Production

Source: Farm Credit Administration for Farm Credit System loans and Reports of Condition and Income (Call Reports) for banks.

Chart 3
Agricultural Loan HHIs: Banks and FCAs vs. Banks
**(Agriculture-Important Markets)**
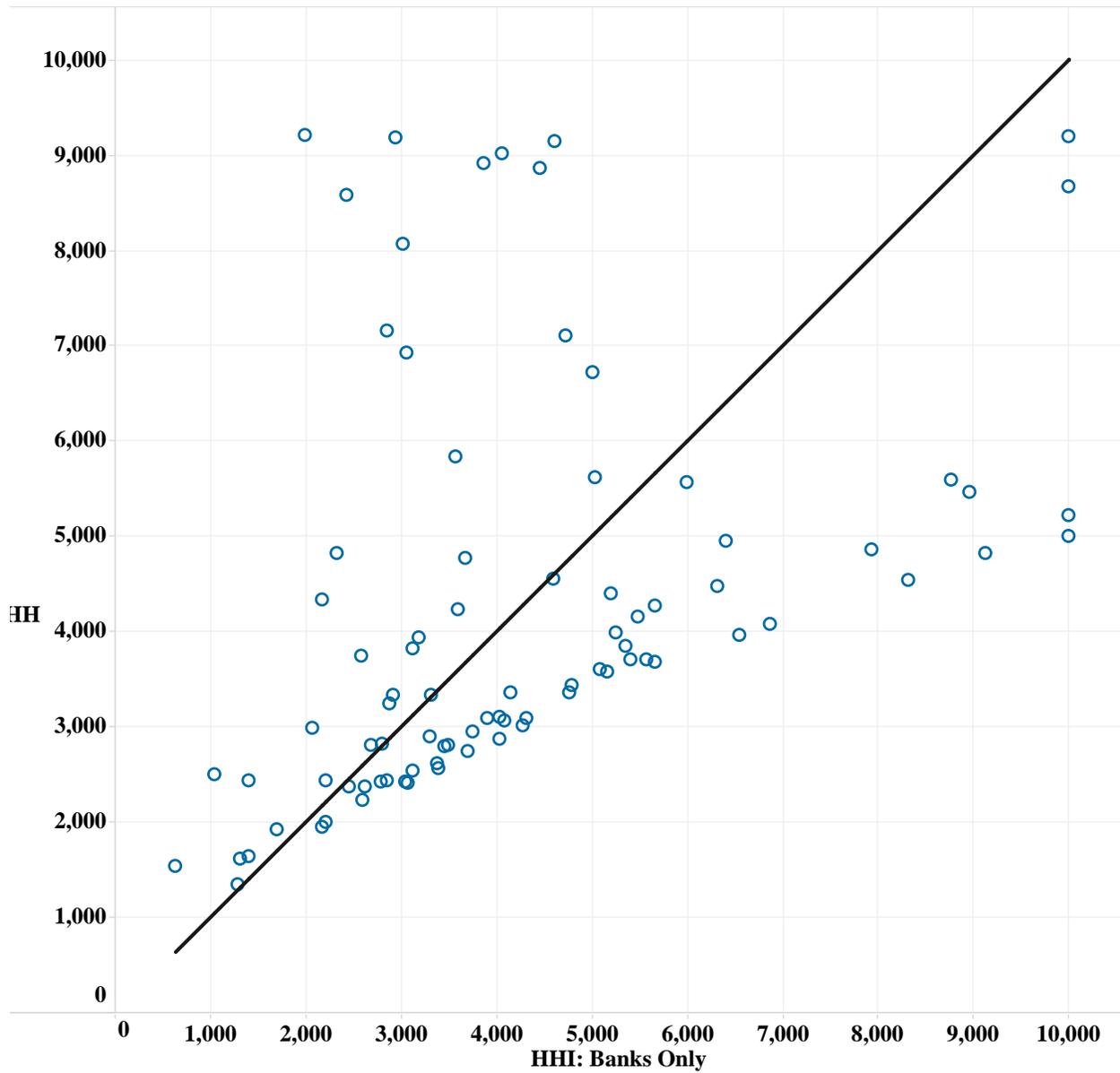
[1] Based on earnings and employment criteria as of 2013

Sources: Farm Credit Administration, Reports of Condition and Income (Call Reports), FDIC Summary of Deposits, www.bea.gov, and www.census.gov.

Chart 4
Agricultural Loan HHIs: Banks and FCAs vs. Banks
(Agriculture-Dependent Markets)

Chart 5
Agricultural Loan HHIs: Banks and FCAs vs. Banks
(Agricultural-Bank Markets)
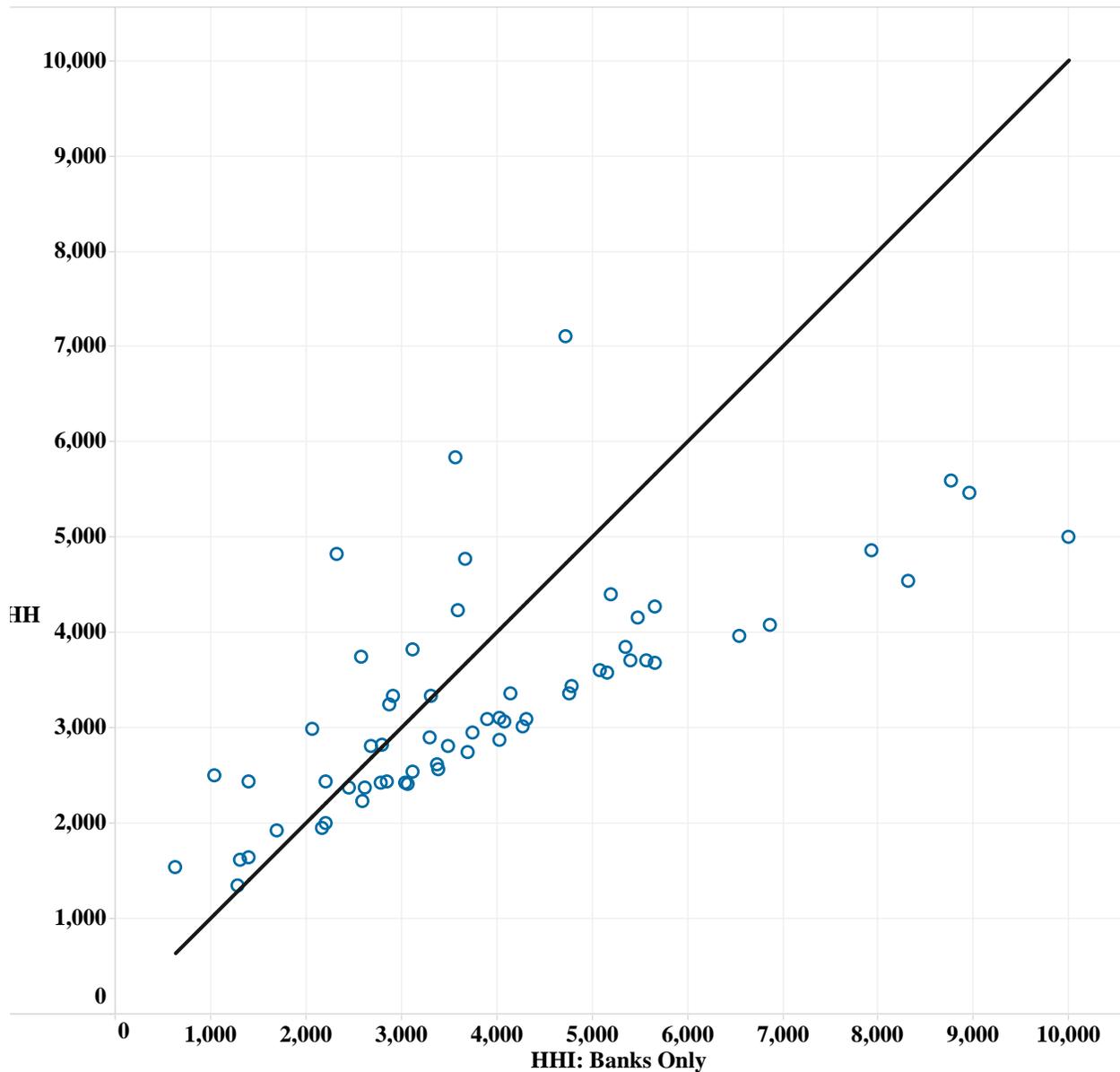
[1] Based on earnings and employment criteria as of 2013
[2] Agricultural banks are banks with a ratio of agricultural loans to total loans of 25 percent or more. An "Agricultural-Bank" market denotes a market in which 20 percent or more of the banks are agricultural banks.

Sources: Farm Credit Administration, Reports of Condition and Income (Call Reports), FDIC Summary of Deposits, www.bea.gov, and www.census.gov.

Table 1
Local Banking Market Summary Statistics

	Agriculture-Important Markets[1]		Agriculture-Dependent Markets[1]		"Agricultural-Bank" Markets[2]	
	2005	**2014**	**2005**	**2014**	**2005**	**2014**
Number of Markets	86	86	48	48	56	62
Number of Banks (median)	5	5	5	5	6	5
FCA Market Share of Agricultural Loans (median)	37%	45%	39%	44%	34%	39%
HHI: Deposits, Banks (median)	2,934	2,970	3,050	2,976	2,515	2,948
Markets <1800	14 (16%)	11 (13%)	5 (10%)	5 (10%)	12 (21%)	10 (16%)
HHI: Agricultural Loans, Banks (median)	3,457	3,690	3,549	3,807	2,833	3,534
ΔHHI: Agr. Loans - Dep., Banks (median)	434	672	265	639	254	639
Markets <1800	11 (13%)	7 (8%)	5 (10%)	2 (4%)	11 (20%)	7 (11%)
HHI: Agricultural Loans, Banks & FCAs (median)	3,343	3,688	3,343	3,634	2,684	3,082
ΔHHI: Agr. Loans, Banks & FCAs - Banks (median)	-413	-419	-554	-612	-413	-653
Markets <1800	9 (10%)	4 (5%)	3 (6%)	1 (2%)	9 (16%)	4 (6%)

[1] Based on earnings and employment criteria as of 2013.

[2] Agricultural banks are banks with a ratio of agricultural loans to total loans of 25 percent or more. An "Agricultural-Bank" market denotes a market in which 20 percent or more of the banks are agricultural banks.

Sources: Farm Credit Administration, Reports of Condition and Income (Call Reports), FDIC Summary of Deposits, www.bea.gov, and www.census.gov.