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Community bank product design within an asymmetric competitive market

An X-efficiency approach

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Abstract

Purpose – The purpose of this paper is to assess product and service arrays of community banks within competitive markets that are impacted by varying sized financial institutions. A cost efficiency model is used to understand the relationship of product offerings and business cycle response upon bank performance.

Design/methodology/approach – A cost efficiency model is used to understand the relationship of product offerings and business cycle response upon bank performance. Markets comprised of alternate size and type of financial institutions are compared.

Findings – Greater values of X_EFF_i when institutions compete are observed in this analysis. Cost efficiency is lowest when community banks are the only institution in the market, and second lowest when credit unions are the only competing institutions. Call report data are analyzed from 1994 to 2013. The number of big banks increases community bank efficiency and efficiency of large banks. Also, the number of community banks does affect big bank cost efficiency. The magnitude of the effect pertaining to the number of community banks upon big bank efficiency is much smaller than that of the number of big banks on community bank efficiency.

Originality/value – This study considers cost efficiency and profitability as measures of institution on the performance of a competing institutional type. The modeling approach uses cost efficiency as a method of observing the performance of financial institutions and an explanation of how firms persist, grow, and respond to changes in technology or regulation. The effects of the presence of each type of financial institution on the performance of another type are compared. Situations in which any number of one or more institutional types is present in a market are considered for analysis purposes.

Keywords X-efficiency, Competition, Product positioning, Community banks, Call reports

Paper type Research paper

1. Introduction

Competitive interaction of community banks and credit unions in non-metro financial markets is of interest. Given that relatively fewer deposits are available in these regions, comparatively lesser numbers of financial institutions are likely to be present. As a result, entry and exit by financial institutions into a non-metro area may signal extraction of monopoly rents after eliminating other competitors (Berger *et al.*, 2005). In particular, research suggests large banks could affect relationship banking in non-metro locations.

Overlooked in these studies is the role of institutional type. Banks, regardless of size, and credit unions may operate with different objectives. Bank investors seek financial returns in proportion to their equity ownership. A credit union is a cooperative financial

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institution owned by depositors. The objective of credit unions has been modeled variously as profit maximization (Flannery, 1974; Keating and Keating, 1975; Hempel and Yawitz, 1977) value maximization (Keating and Keating, 1989; Rubin *et al.*, 2013), cost minimization, and service maximization-whether for savers or borrowers (Smith, 1981, 1984, 1988; Smith *et al.*, 1981). These are likely to be prominent in certain non-metro markets where they operate. For purposes of this study, a community bank is a commercial bank that is a locally owned and managed financial institution. Community banks typically do business as independent organizations that are unaffiliated with larger bank holding companies. Community banks obtain the majority of their base deposits locally and are viewed as relationship banks.

Despite differences in product mix and costs, it is unclear how cost efficiencies of credit unions (Glass and McKillop, 2006; Wilcox, 2006; Wheelock and Wilson, 2011, 2013) and banks affect one another when competing in the same market. Researchers indicate credit unions and community banks compete with each other or are experiencing asset growth and institutional changes in number of entities (Anderson and Liu, 2013; McKee and Kagan, 2015). The combination of institutional types within a market affects the type and magnitude of determinants of cost efficiency.

The combination of institutional types within a market is related to consolidation. To perceive the effect of consolidation consider the following over the 21-year period 1994-2014. In 1994, there were 2,893 banks in 1,071 non-metro (rural) counties served only by banks; there were 2,015 banks in 1,020 counties at year-end 2014, a 5 percent decline in counties served and a 30 percent decline in the number of banks present. At the same time, 84 counties were served by 151 credit unions in 1994 while 285 credit unions were serving 175 counties at year-end 2014, a 108 percent increase in counties served. Total loan volume and deposits in non-metro counties grew significantly for both banks and credit unions during this period.

The trend of exiting from non-metro counties by one type of institution or another may depend on the effect of their mutual presence in these markets. This study observes 1,216 counties served by both banks and credit unions in 1994 in non-metro locations. During 2014, 743 non-metro counties were served by these types of financial institutions, a 39 percent decline. The number of banks declined from 6,044 to 2,929 (51 percent) while credit unions declined from 2,361 to 1,277 (46 percent).

Banks and credit unions compete and may provide a pro-competitive influence on the market (Tokle and Tokle, 2000; Feinberg, 2001, 2002, 2008) based on a specified product mix. Deller and Sundaram-Stukel (2012) conclude credit unions fill voids in spatial financial markets, but their selection of filling gaps in financial service supply reduces their pro-competitive effect. Although community banks offer a superior product mix when the credit union is small, not-for-profit credit unions offer subsidies for deposits or other products that may be attractive to potential members (customers). Credit unions may compete for consumer loans; when competing in terms of price, studies have historically observed credit union deposit or loan rates are related to those of banks (Tokle and Tokle, 2000; Feinberg, 2001; Feinberg and Rahman, 2001; Hannan, 2002; Jackson, 2006). Credit unions tend to pay higher returns on saving accounts, charge lower loan costs for borrowers (Jackson, 2006) and control for the incremental costs of either lending or rewarding deposits (Keating and Keating, 1989). When competing in terms of service quality, recent research suggests credit union customers, on average, perceive credit union service quality to be greater than bank customers from banks, including increased attempts to retain customers or to regain defectors (Allred and Addams, 2000; Burke, 2014).

Input cost differences exist, however, among community banks and credit unions. Between 2011 and 2014 non-metro credit union input costs were nearly 1 percent greater than competing community bank costs, on average. Fixed asset and employee compensation costs per dollar of loans were 3.7 percent for both categories for non-metro credit unions, and 2.9 percent for both categories for community banks. Non-metro credit unions may earn more income per dollar of loans than their for-profit competitors but tend to sustain greater costs. This suggests a limited effect of non-metro credit unions on community bank cost efficiency when competing in the same market.

This study finds institutional profitability depends on the combination of institutions present in a market. Non-metro credit union ROA is greater when competing in a market with large banks (institutions of $1 billion in assets) and community banks; limited cases were observed of large banks and credit unions competing together for purposes of analysis. Cost efficiency also increases when compared with the case of credit unions operating in a market exclusively. Non-metro credit union ROA is also greater, accompanied with greater cost efficiency, when competing with community banks. The same results of increased profitability and efficiency hold for community banks when competing with credit unions in the same market. A market with all three institutional types has the greatest profitability however maximum efficiency is not attained. Results also indicate that the presence of large banks is likely to affect the viability of competition from credit unions when only these two institutional types compete within a market, also the practicality of competition from community banks when only these two financial firms compete appears plausible, as well as the feasibility of credit unions and community banks when all three entity types again compete in the same market.

2. Literature

The purpose of this study is to examine the effect of institutional type on competition within non-metro financial markets. Investor owned and cooperative financial institutions operate in the same competitive environment but under distinct business/economic objectives. These differences suggest that the ability of a financial institution to react to changes in the supply or demand of financial products may be altered by the presence of competitors with varying capacities to accurately interpret this information (Bauer *et al.*, 2009; Dopico and Wilcox, 2009, 2010; Wilcox and Dopico, 2011). Prior studies have discussed the effect of information technology on the ability of large banks to operate successfully in local markets, but repeated transactions between a financial institution and its local customers may translate into performance gains for the institution. Evidence exists to show the presence of a competitor within a geographic market may affect the distribution and size of the rewards from these advantages (Kagan and Conklin, 2001; Acharya *et al.*, 2008).

To date limited research has been done to study the nature of competitive interactions between banks and credit unions using industrial organization concepts (Schmid, 2005; Feinberg, 2009; Deller and Sundaram-Stukel, 2012). Some studies describe the competitive interaction between credit unions and banks (Cyree and Spurlin, 2012). Bauer *et al.* (2009) observes commercial banks tend to merge with other banks in response to favorable changes in current market value relative to pre-merger conditions. Competitive pressures among financial institutions are likely to cause banks and credit unions to increase the scale of product offerings of the cooperative institution (Wheelock and Wilson, 2011; Wilcox and Dopico, 2011).

Credit union and bank interaction affects product pricing. Tokle and Tokle (2000) and Tokle (2005) show a statistically significant, direct, relationship between changes in certificate of deposit interest rates in credit unions and banks. The number of credit union members per adult in the relevant geographic market, and the proportion of bank deposits within the same market as the credit union matter (Hannan, 2002). Credit unions are less sensitive, in terms of loan default risk, than banks to macroeconomic shocks (Smith and Woodbury, 2010). Credit unions, by virtue of the diffuse nature of financial benefits and its representative governance structure, are exposed to reduced risk tendencies as compared to banks, thereby enabling credit unions to charge lower consumer loan rates (Becker, 2004; Heinrich and Kashian, 2008; Smith and Woodbury, 2010; Goddard *et al.*, 2015).

Evidence of a pro-competitive effect of credit unions on banks is not universal (Deller and Sundaram-Stukel, 2012). Credit unions have little market power in non-metro markets but the presence of other financial institutions in the market signals prospects for positive performance when credit unions consider entering non-metro markets. Market size affects credit union entry decisions or the ability to preserve their market power (Feinberg, 2008, 2009).

Other studies simply compare the dynamics of participation in markets by credit unions and banks. Smith (2012) concludes that credit union business loan growth rates are less sensitive to change than for banks. Smith (2012) further observes that business loan growth persisted for credit unions during two successive business cycles while loan growth became negative during the recession phase of the same business cycles. Wilcox and Dopico (2011) report the same phenomenon and estimates that for each dollar of business loan volume reduction from banks, credit unions increased business loans by $0.07. Wilcox (2011) also estimates that credit union business loans have displaced $19 million in bank business loans, while increasing total business loan volume in the economy by $81 million. Credit unions face regulatory constraints in this market environment. Conversely, evolutions in lending technologies are a key determinant of how credit unions and community banks may compete for business lending (Berger *et al.*, 2011). Business loans result in initial reductions in profitability that lessen over time and do not change loan portfolio quality. Credit unions face regulatory constraints in this market.

A variety of studies examine the effect of large bank and community bank interaction on their respective performance, ignoring the influence of cooperative financial institutions. These studies consider either the role of size or geographic dispersion on performance. Others observe that community banks can successfully compete with the largest banking organizations when well-managed institutions address the niche banking demand of non-metro markets (Gilbert and Wheelock, 2013) or by adopting new technologies to predict loan repayment or to increase credit access (Berger *et al.*, 2007). Hannan and Prager (2009) find the profitability of small, single-market banks is significantly ($p < 0.001$) affected by the presence of banks operating primarily in other markets, regardless of size, within non-metro markets. In particular, a single-market bank's profitability is increased in non-metro markets, comprised of average deposit concentration, when a bank operating primarily in other markets participates in the same market as the observed small, single-market bank. Filbeck *et al.*, 2010 find that within select MSAs during 2001-2007 small community banks have increased relative share in markets that contain both larger community banks and regional banks. The smaller banks tend to focus on customer relationships that sustain market share expansion in certain locations.

3. Hypotheses

This study considers the effect of competition between differing types of financial institutions on the cost efficiency of each. Large banks may be likely to participate in non-metro markets wherein they can enjoy greater profits; these banks are unlikely to exert market power in the costs of employees and fixed assets. Large banks may, however, exert market power in the acquisition cost of funds, with this category of banks being less inclined to reward deposits when compared with credit unions. Hence, an initial proposition is that the presence of different institutions types in the same market will be associated with increased cost efficiency when compared with markets in which credit unions or community banks operate alone. To test this hypothesis, consider the following:

H1. When a large bank is present in a non-metro market with only a community bank as the "other" competitor, community bank cost efficiency is increased by the number of community banks and large banks when compared with situations where they operate alone.

It is proposed that large banks are unmotivated to adjust their interest expense when competing against community banks and are unmotivated to increase interest expense or reduce loan rates to draw a marginal loan from a community bank. Their cost efficiency will be unchanged by the number of community banks. Community banks, on the other hand, must attract consumers who might otherwise seek financial services with large banks by providing relatively attractive deposit rates and/or comparatively low loan rates. This increases expenses and decreases output, increasing the expense to output ratio:

H2. When a credit union is present in a non-metro market with only a community bank as a market competitor, community bank cost efficiency is increased by the number of community banks and credit unions.

Community banks regard credit unions as direct competitors in consumer loan and savings product offerings and are motivated to adjust their interest expense when competing against credit unions, thereby increasing their efficiency. Credit unions are motivated to increase interest expense or reduce loan rates to draw a marginal loan from a community bank. The cost efficiency of the credit union is increased by the number of community banks present within the market space:

H3. When one or more large banks, community banks, and credit unions are present in a non-metro market, community banks, and credit unions operating in that market have higher levels of cost efficiency.

The number of any type of institution increases when each is the only institution type present in the market. The business-at-cost approach of credit unions vs banking; together with consumer loans comprising a substantial fraction of community banks loan volume, impose a pro-competitive response by banks to price loans and deposits similarly. Community banks and credit unions are compelled to act efficiently to retain and attract customers and will have greater cost efficiency than when compared with markets where they do not compete with other types of financial institutions. Large banks are unmotivated to adjust their interest expense when competing against credit unions since consumer loans are a smaller fraction of the large bank's portfolio than for credit unions. Credit unions, on the other hand, must attract consumers who might otherwise use banking services with large banks by providing relatively attractive deposit rates and comparatively low loan rates. This increases expenses and decreases output, subsequently increasing the expense to output ratio.

4. Data and method

Using a panel of finance and macroeconomic data spanning 1994-2014, this study examines the effect competition among large banks, community banks, and credit unions in non-metro markets. Credit union financial data are compiled from the December versions of the "5300 Call Reports" available at the National Credit Union Administration (NCUA) website. 5300 Call Reports contain year-to-date financial statement and operational data from each credit union. Annual data are available from Q1 1994 through Q4 2014. Only credit unions headquartered in a county outside a non-metropolitan statistical area are considered. These data are not provided at the branch level. Call Reports contain information about the location of the main branch of each credit union. In 2011 it is observed that, over 90 percent of all credit unions have six or fewer branches; while 50.2 percent operate as single branch entities; 64.4 percent of credit unions conduct business operations with one or two branch locations.

Financial data for individual bank branches that operate in any number of non-metro counties were collected. These are compiled from Call Reports available from the Federal Financial Institutions Examination Council website. The sample period begins in Q1 1994 and ends in Q4 2014. Only bank branch locations headquartered in a county outside a non-metropolitan statistical area are considered.

Since loan demand and deposit supply are functions of population and income, macroeconomic data are obtained. Total personal per capita income was obtained from the Bureau of Economic Analysis (series CA1-3) for each year between 2008 and 2011. Annual total county population was obtained from the US Census Bureau between 2008 and 2011. Using the Federal Information Processing Standards to identify the county and state in which the main branch of each credit union and community bank are located, macroeconomic data are linked with the credit union and community bank. An assumption implicit in this analysis is that persons (or members) living near other branches will encounter the macroeconomic conditions present in the county where the main branch of the financial institution is located.

A subset of the data based on which types, and how many types, of institutions compete in the same county was developed. The following six cases were considered: credit unions as the only type of financial institution, community banks as the only type financial institution, large banks and community banks competing, large banks and credit unions competing, credit unions and community banks competing, and all three types of financial institutions competing. No cases of large banks being the only type of institution in a county were considered or observed. The predominant competitive situation is to have a community bank as the sole institution headquartered in a county, comprising 37 percent of all cases in 1995 increasing to 55 percent of all cases in 2013. The second most common competitive arrangement is a community bank and credit union competing in the same market. This scenario accounted for approximately 30 percent of cases during the study period. Large banks are involved in a minority of competitive cases, comprising 27 percent of cases in 1995 declining to seven percent in 2013. At year-end 2013, credit unions are present as the only financial institution in 8 percent of cases. An increasing number of counties with only a credit union or a community bank appear to spread during the sample period; the incidence of competing institutional types is declined during the study period (Table I).

Several published studies describe methods for measuring efficiency. Research measuring X-efficiency (XE), based on a cost minimization approach, applies data envelopment analysis (DEA) (Majumdar, 1995; Garden and Ralston, 1999; Sathye, 2001; Neal, 2004), or stochastic frontier analysis (Gardner and Grace, 1993;

Year	Community banks	Credit unions	Large banks and community banks	Large banks and credit unions	Community banks and credit unions	All three types
1995	2,309	171	36	7	2,031	1,718
1996	2,455	171	24	7	1,998	1,495
1997	2,400	184	36	4	1,934	1,291
1998	2,301	194	21	4	1,833	1,224
1999	2,278	219	15	4	1,918	953
2000	2,265	225	8	0	1,875	780
2001	2,234	252	4	0	1,877	627
2002	2,199	246	4	0	1,826	533
2003	2,183	245	4	0	1,740	535
2004	2,192	251	4	0	1,668	479
2005	2,207	247	4	0	1,598	426
2006	2,127	250	0	5	1,523	419
2007	2,099	260	0	5	1,407	417
2008	2,076	261	0	5	1,314	385
2009	2,036	270	5	5	1,277	354
2010	2,024	270	5	5	1,266	298
2011	2,013	268	5	4	1,186	275
2012	1,996	268	5	4	1,132	255
2013	1,952	280	5	4	1,060	244

Table I. Number counties with selected combinations of financial institution types 1995-2013

DeYoung, 1997; Clark and Siems, 2002; Miller and Parkhe, 2002; Lieu *et al.*, 2005; Kwan, 2006). While the former requires no assumption of a production function, the later requires a specification and provides error terms. DEA is used in this study.

Suppose financial institutions face input prices $w = (w_1, \ldots, w_N) \epsilon R^N_{++}$ and seek to minimize cost (Fried *et al.*, 2008). Then, a minimum cost function, or a cost frontier, is defined as:

$$c(y, w) = Min_x[T_x : D_1(y, x) \geqslant 1].$$

If the input sets $L(y)$ are closed and convex, and if inputs are freely disposable, the cost frontier is dual to the input distance function in the sense of (1.1) and:

$$D_1(y, x) = Min_w[wT_x : c(y, w) \geqslant 1].$$

A measure of *XE* is provided by the ratio of minimum cost to actual cost:

$$XE(x, y, w) = c(y, w)/wT_x$$

XE is calculated by dividing the minimum cost under variable returns to scale by the actual cost:

$$XE_i = C_i(w, y, S_v)/w_i x_i$$

The minimum cost under the VRS technology is solved by the following LP:

$$C_i(w, y, S_v) = Min\ w_i x_i$$

st:

$$\sum_{k=1}^{K} x_{nk} z_k \leqslant x_{in};$$

$$\sum_{k=1}^{K} y_{mk} z_k - y_{im} \geqslant 0;$$

$$\sum_{k=1}^{K} z_k = 1;$$

$$z_k \geqslant 0$$

4.1 DEA bootstrapping method

The DEA efficiency score is not an absolute efficiency index; rather it is a relative efficiency index (Xue and Harker, 1999; Colbert *et al.*, 2000; Wang and Luo, 2006; Wang and Huang, 2007). Hence, if efficiency scores are regressed on environmental variables in the second stage, this violates the assumption of independence within the sample frame. When the data generating process (DGP) for each DMU is not identified or little is known about the sample distribution, applying the bootstrapping method the DGP can be predicted and the bootstrapped sample may be capable of providing parameters of interest (Odeck, 2009). Simar and Wilson (1998) suggest the primary difficulty lies in simulating DGP in the case of non-parametric frontier estimation. They suggest clearly defining the DGP first, which allows for a smoothed bootstrapping method to address this issue. This study's analysis process uses a smoothed bootstrapping method; a naïve bootstrapping procedure was followed in case of computational difficulties with the former method.

4.2 Probability of large bank in market

Large banks are assumed to respond principally to the profit motive for operating in a given market. Since a large bank's presence in a non-metro county could be related to the inherent amount of profits available, a two-stage (Heckman, 1979) error correction model is estimated. In the first stage the probability a large bank will operate in a market as a function of macroeconomic and market conditions is applied as follows:

$$\text{PRESENT} = f(\text{MKT\_ROA, Ln(POP), POPGROWTH, HHIADJ, MBB, MCU,}$$
$$\text{NUMBERINSTITUTIONS})$$

where PRESENT is a binary variable with a value of one when a large bank has a branch operating in a non-metro county; its value is 0 otherwise. MKT_ROA is the average return on assets in the county the large bank operates in. LnPOP is the natural log of the estimated county population the large bank branch is in. POPGROWTH is the percentage change in estimated county population from one year to the next. HHIADJ is the Herfindahl-Hirschman index based on deposit market share in the county. In order to preserve the magnitude of this value when compared with other variables, for purposes of estimating the coefficients, it is necessary to adjust the HHI by dividing by 1,000. MBB is the number of large banks in the county and MCU is the number of credit unions in the county. NUMBERINSTITUTIONS is the total number financial institutions (large banks, community banks, and credit unions) in the county. Dummy variables for each year in the sample; 1994 is used as the omitted year in the specification.

4.3 Institution performance

The second stage of the Heckman (1979) model is estimated using a pooled OLS regression:

$$X\_\text{EFF}_i = f(\text{BIG, Ln(POP), POPGROWTH, HHIADJ, LNASSETS, LOANAST,}$$
$$\text{MBB, MCU, NUMBERINSTITUTIONS, LAMBDA})$$

where the dependent variable X_EFF is the bootstrapped DEA estimate of cost efficiency for a large bank, community bank, or credit union depending on the case i. LNASSETS is the natural log of the assets of the given financial institution. LOANAST is the ratio of total loans to total assets for the institution. LAMBDA is the inverse Mills ratio of the first-stage Probit model when a large bank is present in the market. The other variables are as defined above. Dummy variables are included for each year and 1994 is the omitted year. When the performance of a large bank is the dependent variable, the number of large banks and credit unions is considered. When the performance of a community bank is the dependent variable the number of credit unions and community banks is considered. When the performance of a credit union is the dependent variable, the number of credit unions and community banks is considered. The model is estimated using a heteroskedasticity consistent pooled OLS estimator.

5. Empirical results

Summary performance statistics, by institutional type, are presented in Table II. There are six combinations of institutions considered. Observed ROA is greatest when all three institutions compete in the same market. The average ROA is greater when institutions compete.

Year	Avg. total asset	Avg. county population	County population growth rate	Avg. institution market share	Loan-to-asset ratio	LAMBDA
1995	237,347,043	647,162	0.007	0.632	0.612	0.37
1996	258,524,475	644,171	0.006	0.658	0.623	0.371
1997	289,450,619	647,279	0.006	0.675	0.628	0.353
1998	321,437,120	648,116	0.005	0.696	0.607	0.354
1999	348,758,666	648,199	0.005	0.713	0.622	0.343
2000	287,630,429	670,978	0.03	0.73	0.648	0.334
2001	300,475,137	671,178	0.005	0.75	0.614	0.326
2002	324,494,400	671,562	0.005	0.775	0.596	0.323
2003	354,866,528	666,039	0.005	0.796	0.587	0.322
2004	379,124,998	666,171	0.005	0.828	0.603	0.321
2005	402,033,117	669,880	0.005	0.859	0.625	0.321
2006	405,804,364	669,241	0.005	0.883	0.641	0.324
2007	420,719,544	672,616	0.007	0.909	0.644	0.324
2008	427,251,733	680,952	0.007	0.934	0.637	0.322
2009	438,525,099	671,888	0.006	0.962	0.609	0.322
2010	442,635,993	672,810	0.006	0.986	0.589	0.318
2011	468,961,629	668,411	0.004	1.018	0.567	0.316
2012	501,969,146	655,776	0.052	1.05	0.557	0.314
2013	518,463,223	636,466	0.004	1.057	0.567	0.313

Table II.
Summary statistics, US bank and credit unions dataset, 1995-2013

Greater values of X_EFF_i when institutions compete are observed in this analysis. Cost efficiency is lowest when community banks are the only institution in the market, and second lowest when credit unions are the only institution. The loan-to-asset (LTA) ratio is greatest when credit unions and large banks compete in a market.

Differences in means tests for all unique combinations of institutional combinations, under assumption of different variances, were conducted. The means of variables POP, NUMBERINSTITUTIONS, and HHIADJ were different from each other in all possible cases. The mean of the variable POPGROWTH was indistinguishable across almost all cases. The null of no difference in mean MKT_ROA in six cases could not be rejected.

Table III presents results from a first-stage Probit regression that estimates the probability one or more large banks are present in a given county in any year. Contrary to the a priori hypothesis, the estimated coefficient for MKT_ROA indicates a large bank is less likely to be present in relatively profitable counties. This puzzling result occurs in the context of a statistically significant positive correlation between MKT_ROA and the presence of a large bank. This finding appears to be related to the macroeconomic fluctuations during the sample period. When performing the same regression using data between 1995 and 2007, the coefficient for MKT_ROA becomes statistically insignificant. It is positive when considering only data between 1995 and 2005.

Larger populations (within a market) alone do not increase the probability that large banks will be present, all else equal. The presence of other types of financial institutions, however, does increase the probability of a large bank presence; the estimated coefficient for the variables MCB and MCU are positive and significant at

Parameter	Estimate	*p*-value
Intercept	5.0635*	< 0.0001
d97	0.1758*	0.0001
d98	0.1725*	0.0002
d99	0.2439*	< 0.0001
d00	0.3550*	< 0.0001
d01	0.4621*	< 0.0001
d02	0.5206*	< 0.0001
d03	0.5356*	< 0.0001
d04	0.5392*	< 0.0001
d05	0.5540*	< 0.0001
d06	0.4992*	< 0.0001
d07	0.5160*	< 0.0001
d08	0.5708*	< 0.0001
d09	0.5966*	< 0.0001
d10	0.6216*	< 0.0001
d11	0.6525*	< 0.0001
d12	0.6717*	< 0.0001
d13	0.7027*	< 0.0001
MKT_ROA	−0.0479*	0.0017
LnPOP	−0.4874*	< 0.0001
POPGROWTH	0.0770	0.2587
HHIADJ	0.1025*	< 0.0001
MCB	0.1223*	< 0.0001
MCU	0.0092**	0.1088

Note: *,**Significant at 1, 10 percent levels, respectively, two-tail test

Table III.
Parameter estimates for first-stage regression

the 10 percent level. The magnitude of the effect of community banks being present with a large bank presence is over ten times greater than for credit unions. The estimated coefficient for HHIADJ indicates large banks are more likely to participate in markets with greater concentration of deposits. These results provide mixed support for the underlying hypotheses.

5.1 Determinants of performance

Table IV provides estimated coefficients for the second stage of the Heckman (1979) model. This step of the modeling process controls for the probability a large bank is present using the inverse Mills ratio from the first-stage regression as an independent variable. Cost efficiency is the dependent variable.

Estimated coefficients for all independent variables are presented in the penultimate column of Table IV. These estimates use the entire set of financial institutions in all counties over time. The cost efficiency of all institutions in general is higher when more community banks are present, but lower when more large banks and credit unions are present. LAMBDA is positive and significant ($p < 0.001$). This suggests that as the probability of a large bank entering the market increases it is associated with greater average cost efficiency. When combined with the results of the first-stage regression, this suggests a tradeoff between profitability and efficiency. Since the probability of a large bank entering a market is inversely related to market ROA, large banks, on average, will tend to be most efficient when market ROA is relatively low. Together, these results suggest greater cost efficiency is linked with having more community banks in the market or fewer credit unions in a market with relatively low ROA.

These findings also indicate mixed results of efficiency by population. Larger county population is associated with greater cost efficiency. A typical financial institution becomes more cost efficient as the population growth rate decreases. In these results larger banks, in terms of assets, tend to be less efficient. This creates an interesting complementarity to the negative coefficients on MCU and MBB. This suggests that, if institutions grow to adequately serve consumer or business financial demand within a specific market, competitive conditions may be created wherein cost efficiency is reduced. On the other hand, the positive coefficient on MCB suggests that reduced cost efficiency by growth in any one institution can be offset, in part, by the market entry of a community bank. The loan-to-asset ratio and cost efficiency have a direct relationship. The effect of the loan-to-asset ratio is the largest in terms of magnitude and underscores the role of risk management in motivating cost control in a financial institution. Finally it is noted that cost efficiency decreases with increased concentration in the market, suggesting a tradeoff between the number of large institutions of any type and subsequent efficiency.

Cost efficiency of large banks and credit unions is less when more credit unions or community banks are present within the market. Cost efficiency is greater with more large banks in a market. Community bank efficiency is reduced when more community banks enter a market where all three financial institution types are present, but increase as more credit unions enter and decline as large banks enter said market. The probability of a large bank in the market, LAMBDA, has a negative and significant ($p = 0.625$) effect on the efficiency of community banks, but no effect on credit union and large bank cost efficiency. These findings indicate mixed results of efficiency by population. Higher county population is associated with greater cost efficiency for all institutional types. Only community banks are affected by the population growth rate, becoming less cost efficient as the county (market) population increases. The results

Table IV. Parameter estimates for second-stage regression

Variable	Credit union, comm. bank, large bank						Credit union, comm. bank			
	Large bank		Credit union		Comm. bank		Credit union		Comm. bank	
	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	0.2953*	0.0027	0.369*	0.0000	0.7562*	0.0000	0*	0.0000	0*	0.0000
MCU	−0.0079*	0.0000	−0.0023*	0.0183	0.0014***	0.1071	−0.0021*	0.0017	−0.0012*	0.0198
MBB	0.038*	0.0000	0.0079*	0.0104	0.0065*	0.0083				
MCB	0.0113*	0.0000	0.0037*	0.0118	0.0029*	0.0091	0.0000	0.9582	0.0037*	0.0000
LnPOP	−0.0971*	0.0000	−0.0284*	0.0672	−0.0402*	0.0002	0.0254*	0.0000	0.0309*	0.0000
POPGROWTH	0.3659*	0.0106	0.2378*	0.0008	−0.2071*	0.0084	−0.0068	0.2567	−0.0125*	0.0016
HHIADJ	0.0288*	0.0037	0.0317*	0.0000	0.0059	0.1616	−0.0879*	0.0503	−0.0503*	0.0027
LNASSETS	0.0242*	0.0000	0.0282*	0.0000	0.0013	0.4995	0.033*	0.0000	0.0258*	0.0000
LTA	−0.1338*	0.0000	−0.0756*	0.0000	0.1156*	0.0000	0.0151	0.1949	0.2263*	0.0000
LAMBDA	1.9289*	0.0000	0.2513	0.3108	0.3474*	0.0625	−0.4412*	0.0012	−0.2759*	0.0023
d97	0.2226*	0.0000	0.0299*	0.0068	0.0317*	0.0001	0.023*	0.0124	−0.0693*	0.0000
d98	0.2653*	0.0000	0.0173	0.1292	0.0635*	0.0000	0.0014	0.8817	−0.0605*	0.0000
d99	0.1755*	0.0000	0.0348*	0.0227	0.1028*	0.0000	−0.0132	0.1960	−0.17*	0.0000
d00	0.3629*	0.0000	0.0425*	0.0233	0.1*	0.0000	−0.0163	0.1492	−0.0138*	0.0450
d01	0.3272*	0.0000	0.049*	0.0243	0.1056*	0.0000	−0.0219*	0.0781	−0.0519*	0.0000
d02	0.279*	0.0000	−0.0258	0.2737	0.0934*	0.0000	−0.0908*	0.0000	−0.0328*	0.0000
d03	0.3816*	0.0000	−0.0839*	0.0005	0.0951*	0.0000	−0.1782*	0.0000	−0.0564*	0.0000
d04	0.5069*	0.0000	−0.1185*	0.0000	0.0886*	0.0000	−0.1973*	0.0000	−0.0576*	0.0000
d05	0.4455*	0.0000	−0.1016*	0.0001	0.1416*	0.0000	−0.1849*	0.0000	−0.0562*	0.0000
d06	0.3941*	0.0000	−0.0974*	0.0001	0.137*	0.0000	−0.1584*	0.0000	−0.0487*	0.0000
d07	0.4145*	0.0000	−0.0647*	0.0083	0.11*	0.0000	−0.1328*	0.0000	−0.0172*	0.0323
d08	0.5195*	0.0000	−0.0644*	0.0115	0.1479*	0.0000	−0.1385*	0.0000	−0.0343*	0.0000
d09	0.5509*	0.0000	−0.0845*	0.0014	0.1951*	0.0000	−0.1623*	0.0000	−0.0012	0.8870
d10	0.5828*	0.0000	−0.151*	0.0000	0.2099*	0.0000	−0.221*	0.0000	−0.0265*	0.0029
d11	0.6237*	0.0000	−0.1994*	0.0000	0.1952*	0.0000	−0.2834*	0.0000	−0.0603*	0.0000
d12	0.5324*	0.0000	−0.0467	0.1568	0.2893*	0.0000	−0.3041*	0.0000	−0.0593*	0.0000
d13	0.5857*	0.0000	−0.0563	0.1122	0.2862*	0.0000	−0.253*	0.0000	−0.0536*	0.0000

(*continued*)

Table IV.

	Comm. bank, large bank									
	Large bank		Comm. bank		Credit union		Comm. bank		All data	
Variable	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	0.2953*	0.0027	1.0573*	0.0925	0.4009*	0.0000	0.2215*	0.0000	0.4714*	0.0000
MCU					0.0038*	0.0279			−0.0006**	0.0360
MBB	0.038*	0.0000	0.1031	0.1784					−0.0018*	0.0727
MCB	−0.0079*	0.0000	0.0086	0.5388			0.0099*	0.0000	0.002*	0.0000
LnPOP	0.0113*	0.0000	−0.2051	0.2087	−0.0114*	0.0415	−0.026*	0.0000	0.0014	0.2672
POPGROWTH	−0.0971*	0.0000	−0.3287	0.7314	0.0110	0.5315	0.0008	0.2571	−0.0017*	0.0815
HHIADJ	0.3659*	0.0106	0.0313	0.1456	0.0000*	0.0000	0.0013*	0.0001	−0.003*	0.0000
LNASSETS	0.0288*	0.0037	0.0103	0.3998	0.0368*	0.0000	0.0281*	0.0000	−0.0046*	0.0000
LTA	0.0242*	0.0000	0.1747*	0.0281	−0.0317*	0.1474	0.2845*	0.0000	0.2094*	0.0000
LAMBDA	−0.1338*	0.0000	3.8726	0.1618	−0.4899*	0.0087	0.3645*	0.0000	0.0875**	0.0126
d97	1.9289*	0.0000	0.0639	0.2524	0.0342	0.1454	−0.0703*	0.0000	−0.0205*	0.0000
d98	0.2226*	0.0000	0.0660	0.3364	0.0336	0.1467	−0.0475*	0.0000	−0.0027	0.3135
d99	0.2653*	0.0000	0.1145	0.1996	0.0008	0.9727	−0.043*	0.0000	−0.0217*	0.0000
d00	0.1755*	0.0000	0.2679*	0.0355	−0.0425**	0.0590	−0.0329*	0.0000	0.0152*	0.0000
d01	0.3629*	0.0000	0.3054*	0.0876	−0.0181	0.4219	0.0073**	0.0387	0.0356*	0.0000
d02	0.3272*	0.0000	0.3264*	0.0876	−0.0847*	0.0002	−0.0418*	0.0000	0.0015	0.6441
d03	0.279*	0.0000	0.3198*	0.0923	−0.1546*	0.0000	−0.0806*	0.0000	−0.0361*	0.0000
d04	0.3816*	0.0000	0.2997	0.1138	−0.1756*	0.0000	−0.1222*	0.0000	−0.0594*	0.0000
d05	0.5069*	0.0000	0.3006	0.1123	−0.1413*	0.0000	−0.0669*	0.0000	−0.0258*	0.0000
d06	0.4455*	0.0000	0*	0.0000	−0.1161*	0.0000	−0.0637*	0.0000	−0.0176*	0.0000
d07	0.3941*	0.0000	0*	0.0000	−0.157*	0.0000	−0.0184*	0.0000	0.0162*	0.0000
d08	0.4145*	0.0000	0*	0.0000	−0.1429*	0.0000	−0.0403*	0.0000	0.0084**	0.0139
d09	0.5195*	0.0000	0.3002*	0.0490	−0.1954*	0.0000	−0.0469*	0.0000	0.0143*	0.0001
d10	0.5509*	0.0000	0.3079*	0.0576	−0.2372*	0.0000	−0.0213*	0.0000	0.0154*	0.0000
d11	0.5828*	0.0000	0.2987*	0.0795	−0.3125*	0.0000	−0.0342*	0.0000	−0.0127*	0.0006
d12	0.6237*	0.0000	0.2838	0.1327	−0.3111*	0.0000	−0.08*	0.0000	−0.0403*	0.0000
d13	0.5324*	0.0000	0.3080	0.1126	−0.3662*	0.0000	−0.059*	0.0000	−0.0304*	0.0000

Note: *,**,***Significant at 1, 5 and 10 percent levels, respectively, two-tail test

further indicate that large banks and credit unions become more cost efficient as assets increase, whereas increasing firm-level assets appear to have no effect on community bank efficiency. As the loan-to-asset ratio increases large banks and credit unions become less cost efficient but community banks become more efficient. Finally the findings show that cost efficiency is unaffected by market concentration when any number of all three types of financial institutions are present.

These results are different from those obtained when all institutional types compete in a market. Pooled analysis of 1,751 large bank observation, credit union observations, and 4,860 community bank observations of community banks compose the dataset for this analysis. Community bank cost efficiency is increased by the number of credit unions and large banks and reduced by conditions increasing the probability of large bank presence. Large bank cost efficiency is increased by the number of large banks and assets; cost efficiency subsequently is reduced by the number of credit unions within a market and the overall loan-to-asset ratio. Credit union cost efficiency is decreased by the number of community banks and loan-to-asset ratio in a situation when any number of all three financial institutional types is present in the market, but increased by asset growth. Hence, the effect of competition, asset growth, and risk have on cost efficiency is distinct when all three institutional types are present when compared with an average of all markets.

Changes in results when only community banks and large banks compete in the same market are observed. These are assumed to be motivated by profit maximization. In the study's sample of 109 community bank observations, this model does little to explain the determinants of community bank cost efficiency. The only variable with a statistically significant relationship on cost efficiency is the loan-to-asset ratio, whose sign corresponds with the pooled case.

When only community banks and credit unions compete in the same market the following patterns occur. This case contains 9,773 credit union and 13,297 community bank observations. The cost efficiency of both institutions decreased when more credit unions are present. The cost efficiency from the presence of more community banks is unchanged for credit unions but increased for community banks. The probability of a large bank entering in the market, LAMBDA, has a negative and significant effect on the efficiency of community banks and credit unions ($p = 0.001$ and $p = 0.002$, respectively). These findings again indicate mixed results of efficiency by population size. Higher county-level population is associated with greater cost efficiency for community banks and credit unions. Only community banks are affected by the population growth rate, becoming less cost efficient as the growth rate increases. Both types of financial institutions become more cost efficient as assets increase. As the loan-to-asset ratio increases community banks become more cost efficient but credit unions are unaffected. Also, cost efficiency is decreased by market concentration in community banks and credit unions. When comparing these results with the results using all observations community banks are affected differently from the average in that the number of other community banks matter, but the effect of the number of credit unions is the same. The effect of asset growth on efficiency is reversed for both types of institutions, as is the effect of the probability of market entry by a large bank.

Finally, cases where credit unions or community banks operate as the only type of financial institution in the market are observed. Larger community bank populations increased cost efficiency. The probability of a large bank entering in the market, LAMBDA, has a positive and significant ($p < 0.001$) effect on community bank efficiency. Study findings indicate mixed results of efficiency by population. A higher

population level is associated with lower cost efficiency for community banks and the population growth rate has no effect. Community banks become more cost efficient as assets increase and as the loan-to-asset ratio increases. Alternatively cost efficiency is increased by market concentration in community banks and credit unions. These findings are different from the average case in that the population level, concentration, and asset amount have the opposite effect on cost efficiency when compared with the average case. The magnitude of the variables is also larger for the case when the banks operate singularly when compared with the average case.

When credit unions operate alone in a market, relatively fewer variables have a significant relationship with cost efficiency when compared with community banks operating alone or with the average case. In this case an increasing number of credit unions improve cost efficiency. The probability of a large bank entering a local market, LAMBDA, has a negative and significant ($p = 0.009$) effect on the efficiency of credit unions. Study results indicate mixed results of efficiency by population. Higher population is associated with lower cost efficiency for community banks and the population growth rate has no effect. Community banks become more cost efficient as assets increase while decreasing as the loan-to-asset ratio increases. Additionally, cost efficiency is increased by market concentration in community banks and credit unions. These findings are different from the average case in that each significant variable has the opposite effect from the average case when credit unions operate as the only financial institution present in the market.

The effect of competition on cost efficiency determinants can be observed by comparing the effect of introducing one or two different financial institutional types to markets serviced by community banks or credit unions. We omit the large bank case since there were too few cases of non-metro counties having only large banks available over time to consider as a benchmark. Comparisons between a market served only by community banks with a market served by at least one community bank and at least one large bank show many variables in the model become statistically insignificant for the community bank specification. The only variable remaining significant, the ratio of loan-to-assets ($p = 0.028$), retains its sign and becomes smaller in magnitude. When any number of all three financial institution types is present, many variables become significant again in explaining community bank efficiency. The results indicate that the number of other large banks and credit unions increase efficiency, the effect of population and loan-to-asset ratio retain their negative sign, and the probability of a large bank presence has a positive, but statistically weak ($p = 0.063$), effect on community bank efficiency. Comparing a market served by credit unions alone with one served by credit unions and community banks, the estimated coefficient on the number of credit unions and population-level change sign; assets retains its positive sign, and the probability of large bank entry reduces efficiency.

6. Conclusions

The number of large banks increases community bank efficiency and efficiency of large banks, the opposite of the a priori expectation. Also, contrary to expectations, the number of community banks does affect large bank cost efficiency. The magnitude of the effect pertaining to the number of community banks upon large bank efficiency is much smaller than that of the number of large banks on community bank efficiency. This provides weak support for the hypothesis of no effect of community banks on large bank efficiency. The direction of the effect also depends on institutional type; an increased number of community banks decreases large bank cost efficiency whereas

this increases community bank cost efficiency. Concentration, loan-to-assets and population size all increase large bank and community bank efficiency.

An increase in the number of credit unions decreases community bank and credit union efficiency. Perhaps these two institutions regard each other as capturing different segments of the market, making it unnecessary to adjust costs when competing. In support of this view is that the number of community banks has no effect on credit union cost efficiency but does increase community bank efficiency and with a larger magnitude than the effect of credit unions on community bank efficiency. This provides no support for the hypothesis of community banks affecting credit union efficiency. Loan-to-assets and population size all increase credit union and community bank efficiency. These, however, receive no cost efficiency benefit from concentration. It appears, again, that these two competing institutional types may prefer to retain relatively small fractions of the market, thereby preserving the relationship lending practices unique to both types of institutions.

An increase in the number of large banks increases large bank, community bank and credit union efficiency. These two institutions regard each other as capturing overlapping segments of the market and must adjust costs when competing. A number of changes happen when considering the interaction of all three types relative to the situations in which credit unions and community banks or large banks and community banks interact. The direction of the effect of the number community banks now no longer depends on institutional type; an increased number of community banks increase credit union and community bank cost efficiency.

The number of community banks has a positive effect on credit union and community cost efficiency, distinct from the case when these two types operate alone. The relative effect of the number of large banks vs community banks remains the same: the number of large banks has a larger effect than the number of community banks on cost efficiency. The direction of the effect of the number community banks continues to now depend on institutional type; an increased number of community banks or large banks increases large and community bank cost efficiencies.

These results support the third hypothesis. Concentration and scale benefit all three types. Increased loan-to-asset ratios only benefit community banks. This suggests credit unions and large banks may principally be savings institutions in these markets. The findings also provide an interpretation for the negative relationship between population growth rate and community bank efficiency: relationships are important to these institutions, whereas population growth has a positive effect on large banks and credit unions, suggesting economies of scale in membership size or by growth in assets.

These results have implications for antitrust policy. When community banks and credit unions compete their customers may not easily switch from one institutional type to another. Customers of each may bear nontransitory price increases for similar products while in the same county. On the other hand, only when all three institutional types compete in the same market does competition enforce cost responses from all three types. An interesting extension of this research, therefore, would be to know the nature of competitive responses by these institutions in terms of product offerings.

7. Managerial implications

Managers in non-metro financial institutions need to be cognizant of the competitive alignment within the local market sphere. The presence financial organization

types will impact the firm's responsiveness to market forces, product mixes and operating efficiencies.

As financial service markets within the non-metro sector shift with other competitive entrants managerial awareness to alter consumer offerings is necessitated. The ability of the non-metro financial institution to improve efficiencies while adapting to competition is a critical to firm performance. Given that many non-metro financial markets have a varying set of competitive organizations market awareness is a key to the successful service array delivery and consumer product identification.

Credit unions that compete within non-metro markets oftentimes were able to structure member (customer) relationships that may be obviated by other competing firms. As non-metro markets experience varying market entrants from multiple community banks to large bank presence a credit union must shift product availability, cost structures and customer preferences prior to other market player reactions. Credit union efficiencies within a market of this type must be highly adaptive.

Non-metro financial institutions have begun to offer services and products that would address market shifts as well as customer needs. Credit unions in underserved markets offer a wide array of real estate products from conventional mortgage originations, home equity lines of credit, as well as more complex rural real estate mortgages that require a second level of compliance (Dodd Frank). These types of products increase market risk and exposure due to liquidity concerns. Credit unions in these markets have also begun to offer a limited number of "business" loan products to address specific market needs. Business loans are scrutinized by the regulator (NCUA or state) to conform to total portfolio limits.

Community banks located within non-metro markets oftentimes become a more "full" service lender. These firms have expanded product offerings beyond the traditional comfort zone of small business products and a limited number of real estate options. As consolidation has occurred across the community bank sector firms tend to offer a wider array of business products that include lines of credit, new business financing as well as participation packaging with larger lenders to serve specific market requirements that may exceed firm (local) lending limits. Also community banks are using on line applications to address younger and more technologically familiar customers. The use of the online banking options is an attempt to sustain spatial market presence as well continuing relationship options. The objective is to limit large bank presence (and entry) within their market space.

Within the context of community bank's designing products for the asymmetric competitive market the overall approach is to adapt to market conditions via services and products that retain existing customer relationships while limiting large bank entry. This strategic approach is noted when community banks use the concepts of product refinement such as new types of business offerings to support exiting as well as new firm operations. A more detailed approach to offering on line banking services, which augments customer access with a changing technological affinity of the client base, is needed. In essence the ability of bank managers to understand the internal firm resources with a conceptual view of XE would facilitate service offerings that support market stability and continuity.

Given that XE within a competitive environment encourages financial institutions to optimize the overall cost function in an effort to achieve optimum outputs, in this case banking products and services. Both community banks and credit unions use the XE approach to develop market-based products based on the firms' existing cost structure.

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