Branch Expansion of Commercial Banks in Rural America

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Introduction

Alternative distribution channels, such as automated teller machines (ATMs), internet banking and electronic delivery, are now prevalent in the banking industry. Use of these alternative channels has increased substantially.[1] These alternative distribution channels might suggest a lower demand for branch offices and traditional fixed "bricks and mortar" assets. However, the number of branches of U.S. commercial banks has steadily increased from 38,738 in 1980 to 73,275 in 2006, whereas the number of institutions has declined during the same periods. The number of insured commercial banks in the U.S decreased from 14,364 in 1980 to 12,347 in 1990, and to 7,401 in 2006. [2]

The advancement in communication technology has been a driving force in delivering remote banking services at low-cost. These technologies also enable non-bank firms to pose credible threats to the retail bank franchises. From this point of view, it has been argued that branches are relatively expensive channels of delivering retail financial services (Orlow, Radecki and Wenninger, 1996). However, Spieker (2004) report that bank branches are a highly effective and profitable distribution channel for retail services relative to other methods like the internet or call centers.

Despite these arguments, the number of branches has risen steadily since the early 1980s. This study is intended to identify a series of institution-level and market-level

[1] According to ATM Industry Association, the estimated number of ATMs in the world was expected 1.5 million in 2005. Since the first ATM was installed in London in 1967, it took 33 years for the ATM industry to reach the 1 million mark, but it has taken only 6 years to hit 1.5 million.
[2] Source: Federal Deposit Insurance Corporation (FDIC), *Statistics on Banking*.

proxy variables that are correlated with branch expansion decisions in the banking industry. The increase in the number of branches is likely due to three factors: (1) changes in banking branching laws; (2) branching may improve performance when it is well operated; (3) changes in economic and demographic conditions encourage branching in certain markets (Spieker, 2004).

Branching studies in the banking industry often investigate branch cost functions. Multibank holding companies (MBHCs) or branching was thought to have structural advantages because MBHC banks were better able (1) to provide services to larger borrowers, (2) attract managers with better training, and (3) allow specialization within lending functions. Some studies for branching were conducted to examine performance of branches based on all commercial banks in U.S. (Avery et al., 1999; Cyree et al., 2000; Shiers, 2002; Schaffnit et al., 1997). Recent papers have examined the impact of the growth of large banks on bank performance and profitability (Hirtle and Stiroh, 2007; Hirtle, 2007; Spieker, 2004). Few studies have focused on the characteristics of branch expansions in rural or urban area with the trend of the increase the number of branches with an opposite direction to the number of banks in the U.S.

The objective of this paper is to examine the financial and market characteristics of commercial banks which are growing in through branch expansion. The analysis of commercial banks and branching markets provides evidence of potential strategies. These strategies may provide useful guidelines to bank managers and policy makers. This study makes a complementary contribution to prior research by distinguishing the relationship between branch expansion as a means of providing banking services and characteristics

of financial institutions and markets. The results also suggest that there is a meaningful explanation for the role of branches in rural area.

The data used to investigate the characteristics of commercial banks are taken from the Call and Income Report of Federal Reserve. The detailed data on branches and and geographical markets are provided by the Summary of Deposit of FDIC. The changes across three years are applied. A nested Logit model is employed to analyze the characteristics for branch expansion since the decision for branch expansions has a two-level nesting structure; the first decision is branch expansion or not, then banks should make a decision for location, that is, to expand in rural area or urban area.

Review of literature

Most studies analyzing performance and impact of branch and bank consolidation have focused on the banking industry as a whole market (Avery et al., 1999; Shiers, 2002, Demsetz and Strahan, 1997; Eden and Moriah, 1996; Cyree et al., 2000). Shiers (2002) and Demsetz and Strahan (1997) test the effects of geographic and economic diversity and find that economic diversity reduces bank risk and branching reduce bank risk as well. Eden and Moriah (1996) assess the contribution of internal auditing on branch bank performance for organizational effectiveness and performance improve during the half year following the audit in the experimental branches.

Avery et al. (1999) find that acquiring banks which have branch networking at the same area as acquired banks reduce offices per capita and changes in the number of bank offices per capita are more negative in low-income neighborhoods than in other neighborhoods. They focus on the relationship between consolidation and changes in

levels of bank branching. They provide the historical statistics that the number of branches masks differences across communities with differing characteristics; an increase in the number of banking office in suburban areas is much higher than an increase both urban and rural areas during 1975 to 1995. They also mention factors which affected branch pattern.

Cerutti et al. (2007) examine the factors influencing international banks' organizational form; branches or subsidiaries. Their research suggests appropriate variables to explain opening branches. Cyree et al. (2000) examine the determinants of bank growth and suggest that larger banks and state-chartered banks are more likely to branch in 1989-1994 time period. They also suggest some variables which affect the growth choice including branch expansions.

Train (2003) interprets generalized extreme value (GEV) models, which were developed by McFadden (1978), and a nested logit model as the most widely used member of the GEV family. He suggests that a nested logit model is appropriate when a decision maker has to choose one from a set of alternatives, and this set can be divided into subsets, called 'nests'.[3] This model has been applied by many researchers in a variety of fields, including transportation, education, household consumption, telecommunication (Montgomery, 2002; Lee, 1999; Ansari, Bawa and Ghosh,1995; Hensher and Greene, 2002). Montgomery (2002) uses a nested logit model of the determinants of choice of a graduate business school. This study employs the structure of the decision model in his study which has two-level nesting structure.

[3] IIA holds within each nest and IIA does not hold in general for alternatives in different nests.

Data

The data employed to analyze the characteristics of commercial banks in the U. S. are taken from the Call and Income Report of Federal Reserve and the Summary of Deposit of Federal Deposit Insurance Corporation (FDIC). For the analysis of the branch expansion, the sample is taken from the Federal Reserve for insured commercial banks and FDIC for branch-level bank data. For the analysis, five-quarter averages from the Call and Income Report of FDIC are used. Since five-quarter average reduces the effects of seasonality on data like deposit, agricultural loans and other loans, this study employs this averaging method (Ellinger and Neff, 1993).

Rural banks in this study are defined as those banks located outside of a metropolitan statistical area (MSA), a city with a population of more than 50,000 people or an urbanized area of at least 50,000 with a total metropolitan population of at least 100,000. In this study, agricultural loans are defined as the sum of loans secured by farm real estate plus loans for agricultural production.

The Economic Research Service (ERS) developed a set of county-level typology codes that captures differences in economic and social characteristics; farming-dependent, mining-dependent, manufacturing-dependent, federal/state government-dependent, services-dependent, and nonspecialized. The classification of metropolitan area and nonmetropolitan area was originally completed in 2002 and results were published in Rural America. Only counties that were classified as nonmetropolitan area by the 1990 census were classified. The classification was updated for this typology by coding the metro counties in 1990 that changed to nonmetropolitan status in 2000. The county-level population growth rates are also taken from the ERS.

In order to obtain the branch expansion data, the number of branches opened in rural and urban areas is estimated using the Call and Income Report of Federal Reserve and Summary of Deposit of FDIC in 2003 and 2006. By investigating the changes in the number of branches from 2003 to 2006, this number can be estimated.[4]

Empirical model

A nested logit model is the most widely used member of the generalized extreme value (GEV). The main attribute of GEV models is that the unobserved portions of utility for all alternatives are jointly distributed as a generalized extreme value. This model is an appropriate model when the set of alternatives faced by a decision maker can be partitioned into subsets, called 'nests'. The nested logit model allows testing the appropriateness of the hierarchical structure and the effects of the explanatory variables on the expansion decision and regional choice. It is attractive because it relaxes the strong assumptions of the multinomial or conditional logit model. In addition, it is computationally straightforward and fast compared to the other discrete choice models due to a closed form expression for the likelihood function (Train, 2003).

The determinants of branch expansion in rural areas are a primary goal of this study. The decision for branch expansion has a two-level nesting structure. First a bank decides whether to open a branch or not. If it decides to open a branch, it chooses among one set of available locations. A nested logit model is used for this study. The tree diagram for the banks' expansion choice is given in Figure 1. The tree consists of two

[4] Because of the limitation of the data, a bank which opened a new branch in certain rural area but close one in other rural area was not counted in this estimation. Unlike to the first data set, the second data set is the changes in the number of branches from 2003 to 2006. If the study sets up a longer period, the changes can be affected by a lot of other aspects, like time, regulation, policy etc which are not included in this study.

branches, labeled “branch expansion” and “no expansion”, and one of the branches contains three twigs for the three alternatives within the subset.

In a nested logit framework the location choice model forms one nest, the branch expansion model forms the other. Though estimated simultaneously, the structures of the nests are quite different and are therefore discussed separately.

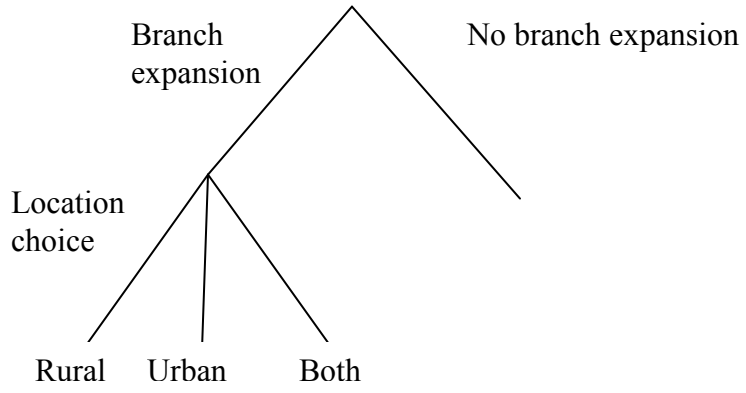

Figure 1. Tree diagram for expansion decision

The location choice model

The location choice is represented by a random utility model estimated by the conditional logit technique introduced by McFadden (1973). The random utility model approach assumes that a bank selects one option, location in this study, from among all of the options in a so-called choice set. It is assumed that the bank chooses the option that yields the highest utility.

The model assumes that if a bank *i* decides to open a branch, then it chooses among *j* alternatives in location choice set. The utility of a bank *i* of expanding *j* location can be expressed as;

$$U_i(\text{location } j) = \beta Z_{ij} + \varepsilon_{ij}, j=1, 2, 3 \tag{1}$$

where *Z* is a vector of characteristics of the location. If a bank *I* decides to open a branch in a location *j*, then it can be inferred that $U_i(\text{location } j) > U_i(\text{location } k),\ \forall j \neq k$. The specific error terms $(\varepsilon_{i1}, \varepsilon_{i2}, \varepsilon_{13})$ are assumed to be random, independently distributed variables with an extreme value distribution. According to McFadden (1973), the probability that a bank *I* chooses location *j* is given by

$$P(i \text{ chooses location } j) = \frac{e^{\beta Z_{ij}}}{\sum_{j=1}^{3} e^{\beta Zij}} \tag{2}$$

A single vector of parameters, β, is provided by estimating above equation. This vector shows the effect of the location characteristics *Z* on the probability that this bank having already decided to open a branch, will choose location *j*.[5]

The branch expansion model

The other nest in the nested logit is the model of the decision whether to open a branch or not. In this model, it is assumed that the utility levels associated with the branch expansion.

$$U_i(\text{branch expansion}) = \gamma X_i + \mu_i \tag{3}$$

[5] Note that any variable that does not vary across locations drops out of the model.

The null choice in this logit model will be "no branch expansion". In the branch expansion model, the vector X contains characteristics of banks. With no branch expansion as the null choice, the probability of expansion with a branch is

$$P(\text{a bank } i \text{ chooses branch expansion}) = \frac{e^{\gamma X_t}}{1+e^{\gamma X_t}} \tag{4}$$

Combining the location choice and branch expansion decisions

To estimate the location-choice model and branch expansion model jointly the nested logit combines two probabilities, (2) and (4). The unconditional probability that a bank i will choose to open a branch in location j is

$$P(i \text{ chooses location } j) = \\ P(i \text{ chooses location } j \,|\, i \text{ chooses branch expansion}) \times P(i \text{ chooses branch expansion})$$

That is, using (2) and (4),

$$P(i \text{ chooses location } j) = \left[\frac{e^{\beta Z_{ij}}}{\sum_{j=1}^{3} e^{\beta Zij}}\right] \times \left[\frac{e^{\gamma X_t + \sigma I_i}}{1+e^{\gamma X_t + \sigma I_i}}\right] \tag{5}$$

where $I_i = \log\left(\sum_{j=1}^{3} e^{\beta Z_{ij}}\right)$. This new variable, called the inclusive value, represents the utility associated with having available all of the locations in branch expansion choice set. If the coefficient of the inclusive value, σ, is zero, then equation (5) will reduce to the unconditional probability of choosing location j times the probability of the branch expansion. In this case, the choice of whether or not to expand through opening a branch is independent of the utility value of the options in the location choice set. With the probability of observed choices from (5), a likelihood function can be constructed.

Estimation of the parameters

The parameters, β, γ, σ, of a nested model can be estimated by standard maximum likelihood techniques. An explicit function of the parameters of this model can be derived by substituting the choice probabilities of a nested logit formula into the log-likelihood function. However, instead of using a maximum likelihood function, a nested logit model can be estimated consistently in a sequential estimation, that is, estimated two separated models. This sequential estimation is performed from "lower level", that is, the lower models for the choice of alternative within a nest are estimated first. Then the upper model for choice of nest is estimated with the inclusive value entering as explanatory variables. The inclusive value is calculated for each lower model using the estimated coefficients.

Variables

The Location Choice Model

A discussion of the variables and the expected impact of each of the variables on the probability a bank will choose a particular expansion strategy is shown below. The location choice model includes characteristics of specific location as explanatory variables; Herfindahl and Hirschman Index (HHI), Location of head office, Population growth rate (county), Deposit growth rate (county), county typology code.

HHI is used for a proxy for the bank competition.[6] Since there is a negative relationship between competition and concentration, this study uses HHI as a measure of competition, even though HHI is used as a measure of concentration. Based on previous studies (Berger et al. 1993, Berger 1995), HHI has a positive relationship with inefficiency and does not necessarily predict the ability to overcome operating inefficiency. Thus banks that have high concentration, that is, banks with low competition are less likely to open a branch due to inefficiency of those banks. In addition, since the banking industry in rural areas is often less competitive and very concentrated (Collender, 1996), it is less likely to open a branch in rural area than in urban area.

Deposit growth rate for each county reflects the changes in an availability of loanable funds, and population growth rate can be used as proxy for the changes in the expected demand and supply for the funds in each county. Cheng et al. (1989) find acquiring banks pay significantly higher premiums for banks with higher deposit growth rate. It is inferred that more banks want to expand at the higher deposit growth rate area. Thus, financial institutions are expected to open branches in rural area since rural area has higher county-level population growth rate and county-level deposit growth rate a given period.

The location of a head office affects the decision for the location choice. It is easy to understand the local financial market and provide more specific services for rural

[6] Herfindahl- Hirschmann Index (HHI) shows a degree of concentration of banking market *m*. $HHI = \sum_{i=1}^{n} A_i^2$, where A_i represents the percentage of deposit share of *i*-th bank in a banking market in which total of n banks are operating. Higher HHI means that there are few banks in a certain area and they are in less competitive market while lower HHI means that there are a lot of banks and the market is more competitive.

based bank (Lee, 2002). Thus, if the head office of a bank is in rural area, then it is more likely to open a branch to obtain profits in rural area rather than in urban area due to those advantages for local financial market.

Characteristics of a county in which a head office is located affect the location choice model. In order to analyze the relationship between a property in rural area and the branch expansion, this study use a binary variable equal to one if a county is specialized and depends on farming rather than other characteristics like manufacturing, services, mining, etc. A bank in a farming-specified county has advantages for local market and farm business because it has more information for the farm businesses and agricultural lending, and therefore it is more likely to open a branch in same characterized county.

Branch expansion model

Bank variables are characteristics of banks, not location.[7] The branch expansion model includes the set of a bank's characteristics; Assets, loan to deposit ratio, equity to asset ratio, agricultural loan rate, ROA, MBHC, the number of branches.

Total assets of a bank reflect a size of the bank. Larger banks are more likely to expand by opening branches since they have a lower expenditure as a proportion of assets (Cyree et al. 2000). Thus, total assets can be expected to positively affect the expansion decision. Deposits are used in the x-efficiency literature (Berger and Humphrey, 1992). They find that deposits have positive relation with total efficiency.[8] Thus, the coefficient of deposit to asset ratio for the branch expansion model is expected to be positive.

[7] Location attributes affect the branch expansion decision through the inclusive value, as described in previous section.
[8] Cyree et al. (2000) assume that there is positive relationship between efficiency and bank growth.

Equity to asset ratio can be a measure of the capital position of the bank. Equity capital can be another source of funds (Berger et al., 1996).[9] In addition, as the proportion of a bank's equity capital increases the risk position of the bank declines and may increase the impact of the bank to expand its portfolio and business. If equity to asset is a source of liquidity for a bank anticipating growth activity, it is expected to have a positive impact on the branch expansion.

As mentioned by Berger (1995), ROA, as a profit measure is standard in bank research. Poor ROA leads a bank to enter into higher margin product expansion (Liang and Savage, 1990) instead of opening a new branch. Thus ROA may have positive relation with a branch expansion. Agricultural loan can be a factor to affect branch expansion, especially in rural area. Agricultural loan rate is negatively correlated with bank size and banks specialized in agricultural loans may experience higher profit inefficiency (Neff et al. 1994). Since bank size positively affects bank expansion and inefficiency has negative impact on bank expansion, it is expected to have a negative impact on expansion decision.

MBHC is a binary variable that equals one if the bank is in a multi-bank holding company and zero if the bank is a one-bank holding company. Multi-bank holding companies have typically acquired banks in the past and maintain the acquired bank in the holding company structure (Cyree, et al., 2000). Since MHBCs have more competitive behavior and more flexible funds (Barry and Pepper, 1985), they are easier to analyze local financial market and open a branch. Thus, it is expected to have a positive impact on the branch expansion decision.

[9] They use securities as a measure of 'other assets'.

The number of branches for a bank affects the decision for a branch expansion. Since banks with branches have experience to operate a branch, it has fewer problems to open and manage a new branch than banks with no branch. Thus, it is less likely for banks to expand, while it is more likely to open other branches for a bank with more than a branch. Thus it would have a positive impact on the branch expansion decision.

Descriptive statistics for these variables are reported in Table 1. The average number of branches in 2003 was 5.97 and the average log of asset was 11.59. The mean of the county-level deposit growth rate was 36.07% and the average loan to deposit ratio, equity to asset ratio, agricultural loan rate were 1.26%, 0.11%, 0.12%, respectively. Table 2 shows the number of the bank which opens branches from 2003 to 2006. 31.44% of commercial banks opened branches given period. 65.79% of expanded banks open a branch in the urban area while 26.11% in rural area and 8.10% in both areas.

Table 1 independent variables for the nested logit model

Variable	Mean	Std. dev
HHI	4337.20	2637.35
Deposit growth rate (county) (%)	36.07	974.67
Location of head office (binary, rural =1)	0.48	0.50
Farm county (binary, farm =1)	0.08	0.27
Asset (log)	11.59	1.20
Loan to deposit (%)	1.26	31.58
Equity to asset ratio (%)	0.11	0.06
Agricultural loan rate (%)	0.12	0.16
ROA	0.02	0.01
MBHC (binary, MBHC=1)	0.61	0.49
The number of braches (2003)	5.97	17.68

Table 2 Observations for the branch expansion by location.

Bank decision		Frequency	Percent
Branch expansion	Rural area	654	8.21
	Urban area	1648	20.68
	both	203	2.55
No expansion		5463	68.56

Empirical Results

Table 3 presents the results of the branch expansion choice and for the location decision. This study estimates the model step by step; first using a simple logit for expansion decision, then a multinomial logit for location selection. Coefficients estimated by 2 step-model have same signs and consistency comparing with the nested logit model. (Liao 1994, Lee et al. 2005)

In the branch expansion model, HHI has a significant and negative impact on the expansion decision, that is, a bank in high concentrated area is less likely to open a branch. Since the coefficient of location of head office is significant and positive, the probability that a bank whose head office is located in rural area chooses a branch expansion is higher than that of urban banks' decision. Log of assets have a significant and negative impact on the expansion decision which is an opposite result of this study's expectation. Loan to deposit ratio, agricultural loan rate, and profitability (ROA) positively affect a bank's expansion decision. A bank with higher ratios mentioned above is more likely to choose a branch expansion. The coefficient of MBHC is significant and negative. This means that the probability that a multibank holding company chooses a branch expansion is higher than that of a non-MBHC. The county-level deposit growth rate, farm-specified county, equity to asset ratio, and the number of branch are not significant for the branch expansion model.

Table 3 Estimation results for the branch expansion and the location choice model

Variables	Branch expansion model		Location Choice model			
			Rural vs both		Urban vs both	
	coefficient	Wald χ^2	coefficient	Wald χ^2	Coefficient	Wald χ^2
HHI	-0.0005**	20.91	-0.0007	3.36	-0.00015	22.75
Deposit growth rate	0.0002	0.61	-0.00128*	1.31	-0.0001***	0.53
Location of head office	0.2790***	19.99	2.2717***	88.79	-2.1027***	118.03
Farm county	0.1345	0.99	-0.3588	2.40	0.1840	0.16
Asset (log)	-0.6032***	356.86	-1.0382***	52.84	-0.4659***	26.00
Loan to deposit	0.0680**	4.88	-1.3223***	7.16	-0.7417***	3.84
Equity to asset ratio	-0.7118	1.78	3.7265	1.32	1.6105	0.28
Agricultural loan rate	1.4525***	33.43	1.0167	1.17	-2.0978*	4.53
ROA	0.3125***	68.32	0.2356	1.29	-0.3180*	2.93
MBHC	-0.3396***	36.29	0.1673	0.58	0.2503	1.73
The number of braches	0.0022	1.16	-0.0308**	3.90	-0.0020	0.74
Intercept	7.7922***	406.52	13.1675***	55.60	9.9732***	64.85
Obs	7968		2505		2505	

***p<0.01, **p<0.05, *p<0.10

The coefficients of the location choice model are the odds ratios from the multinomial logit model. The third column in Table 3 reports odds ratios comparing opening a branch in rural area with opening branches in both areas, and the fifth column reports on opening a branch in urban area as compared to opening branches in both areas. Values above one indicate that higher values of the explanatory increase the first relative to the second outcome. For example, the ratio of 2.2717 for the location of head office in

the third column indicates that the relative probability that a bank whose head office is located in rural area opens a branch in rural area is 127% higher than the probability which that bank opens branches in both areas.

The county-level deposit growth rate, location of head office, log of assets, loan to deposit ratio are significant determinants of location choice model. The impacts of agricultural loan rate and ROA on the relative odds for branch expansion in urban area and that in both areas are significant and negative. The number of branches also has a negative impact on the relative odds for a location choice decision between rural area and both areas. HHI, farm-specified county, equity to asset ratio, MBHC and the number of branch are not significant for the location choice model.

The coefficients of the location of head office have different signs in two relative odds (the third column and the fifth column). This indicates that a bank whose head office is located in rural area is more like to open a branch in rural area while an urban bank is more like to open branches in both areas rather than in urban area. Since the coefficients of deposit growth rate, log of asset and loan to deposit ratio are negative, banks with higher deposit growth rate or higher loan to deposit ratio or larger assets are more likely to open branches in both areas rather than in a rural or in urban area. Since agricultural loan rate and ROA have negative coefficients in relative odds for urban expansion versus urban and rural expansion, the probability of banks that banks with higher profit or larger agricultural loan rate open branches in urban area is smaller than the probability to open a branch in urban area. The number of branches has a negative impact and thus banks with many branches are more likely to open branches in both areas rather than in rural area.

The signs and significance of the coefficients in the branch expansion model have standard interpretation, while the magnitudes of the coefficients can not be explained. The marginal effect will provide interpretation for the effect of a unit change in independent variable on the dependent variable. The marginal effect which is an elasticity of probability of choosing location of a bank with respect to variables is shown Table 4. The marginal effects are calculated by following equations.

$$\frac{\partial \Pr(y=j)}{\partial x_k} = \frac{\partial}{\partial x_k}\left(\frac{\exp\left(\sum_{k=1}^{K}\beta_{jk}x_k\right)}{1+\sum_{j=1}^{J-1}\exp\left(\sum_{k=1}^{K}\beta_{jk}x_k\right)}\right)$$

Let $\Lambda = \exp\left(\sum_{k=1}^{K}\beta_{jk}x_k\right)$, then $\Pr(y=j) = P_j = \dfrac{\Lambda}{1+\sum_{j=1}^{J-1}\Lambda}$

$$\begin{aligned}\frac{\partial \Pr(y=j)}{\partial x_k} &= \frac{\partial}{\partial x_k}\left(\frac{\Lambda}{1+\sum_{j=1}^{J-1}\Lambda}\right) \\ &= P_j\left(\beta_{jk} - \sum_{j=1}^{j-1}P_j\beta_{jk}\right)\end{aligned} \tag{6}$$

Table 4 Marginal effects of the model

Variables	Branch expansion model	Location Choice model	
		Rural vs both	Urban vs both
HHI	0.0000	0.0000	0.0000
Deposit growth rate	0.0000	-0.0002	0.0001
Location of head office	0.0696	0.5810	-0.6901
Farm county	0.0336	-0.1154	0.1177
Asset (log)	-0.1505	-0.0877	0.0392
Loan to deposit	0.0170	-0.0932	0.0212
Equity to asset ratio	-0.1776	0.3225	-0.1527
Agricultural loan rate	0.3624	0.4042	-0.5327
ROA	0.0780	0.0727	-0.0909
MBHC	-0.0847	-0.0077	0.0276
The number of braches	0.0005	-0.0041	0.0034

Conclusion

The main objective of this study is to identify the financial and market characteristics of commercial banks' branch expansion decision. The nested logit model is used to analyze the characteristics to affect the expansion decision and location choice of commercial banks due to a two-level nesting structure for branch expansion decision. Using the Call and Income Report of Federal Reserve and the Summary of Deposit of FDIC, the changes in the number of branches and independent variables are estimated for this analysis.

The results indicate that most of characteristics chosen for this study are significant for the branch expansion model except county-level deposit growth rate, farm-specified county, equity to asset ratio and the number of branches in 2003. Location of head office, loan to deposit ratio, agricultural loan rate, and profitability have positive impact on the decision for the branch expansion while HHI, log of asset, and MBHC affect negatively.

For the location choice model comparing banks opening a branch in rural area and that in both areas, a bank whose head office is located in rural area is more likely to open a branch in rural area instead of in both areas. The probability that banks with high deposit growth rate, assets, loan to deposit ratio or more branches open branches in rural area is less than the probability that those open branches in both areas. However, banks with high deposit growth rate, asset, loan to deposit ratio, agricultural loan rate, ROA and rural head office are more likely to open branches in both areas rather than in urban area.

These results suggest that bank size, structure and market characteristics are affecting bank expansion choice since the assets of commercial banks, financial ratios,

MBHC and market concentration rate are determinants of the branch expansion decision model. The importance of bank expansion decision and location choice models is more likely to increase recently because commercial banks are globalizing, and adopting improved technologies including internet banking, and markets are competitive. As banks are more easily to open a branch across state lines due to the Reigle-Neal Act of 1994, branch expansion becomes important. The further study should be provided to develop more specific reasons why the number of branches in the US keeps increasing while that in other countries declining.

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