


“What is the future of the bank branch in the midst of the 4.0 industrial revolution? Answers from Vietnam”

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| ARTICLE INFO | Thuy Thu Pham, Hien Thi Thu Hoang and Ha Thi Thu Do (2022). What is the future of the bank branch in the midst of the 4.0 industrial revolution? Answers from Vietnam. <i>Banks and Bank Systems</i> , 17(2), 199-208. doi: 10.21511/bbs.17(2).2022.17 |
| DOI | http://dx.doi.org/10.21511/bbs.17(2).2022.17 |
| RELEASED ON | Friday, 08 July 2022 |
| RECEIVED ON | Tuesday, 28 September 2021 |
| ACCEPTED ON | Thursday, 23 June 2022 |
| LICENSE |  This work is licensed under a Creative Commons Attribution 4.0 International License |
| JOURNAL | "Banks and Bank Systems" |
| ISSN PRINT | 1816-7403 |
| ISSN ONLINE | 1991-7074 |
| PUBLISHER | LLC “Consulting Publishing Company “Business Perspectives” |
| FOUNDER | LLC “Consulting Publishing Company “Business Perspectives” |



NUMBER OF REFERENCES

33



NUMBER OF FIGURES

0



NUMBER OF TABLES

5

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BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine
www.businessperspectives.org

Received on: 28th of September, 2021

Accepted on: 23rd of June, 2022

Published on: 8th of July, 2022

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Conflict of interest statement:

Author(s) reported no conflict of interest

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WHAT IS THE FUTURE OF THE BANK BRANCH IN THE MIDST OF THE 4.0 INDUSTRIAL REVOLUTION? ANSWERS FROM VIETNAM

Abstract

Digital channels (websites, bank apps, mobile banking) are incrementally improving as a result of technology innovation and changing customer behavior. The unprecedented Covid-19 pandemic has just added to this trend by urging people to work and make all financial transaction through the Internet. In this context, the question arises of whether banks should revive their physical branches or take the opportunity to shift to mainly digital platform? This research focuses on the branch network trend of Vietnamese commercial banks during the period 2012–2019 to answer the question, what is the contribution of bank branch networks to the banks' profits. Panel data from 22 largest Vietnamese commercial banks in terms of owners' capital has been analyzed, using Random Effect Model (REM) regression models. The results show that Vietnamese banks are still expanding their branch networks, despite the fact that bank customers are increasingly engaging in digital bank services. The number of branches has a positive correlation with the banks' profits, although there is a disparity between large network banks and the rest. The research suggests some implications that can help optimize the branch network in the context of digitalization in an emerging market.

Keywords

branch network, bank branching, distribution channel, digital banking, profitability, Covid-19

JEL Classification

G21, G41, M31

INTRODUCTION

Brick and mortar branch network used to be an important competitive advantage of commercial banks. A large branch network helps a bank to attract more customers, increase loan volumes, deposits and sales of services (Capgemini, 2012; Berger et al., 1997; Orlow et al., 1996; Blazheski, 2006). Physical branches also increase the bank's identity and creditability, improve customer satisfaction and keep customer loyalty (Kekevi, 2020; Brevoort & Wolken, 2008; Hannan & Prager, 2004, 2006; Park & Pennacchi, 2008). However, the fourth industrial revolution has changed the way in which customers interact with their banks (Mekinjić, 2019). As a result, physical bank branches are gradually replaced by digital distribution channels (Spiegel et al., 1996; Kempson & John, 2000; King, 2012) as most of the daily banking transactions can be done through banking apps and other online channels. The break out of the unprecedented Covid-19 pandemic is another remarkable enabler that makes the go online trend stronger.

While the down trend in a bank branch network is very clear in advanced countries, in an emerging market like Vietnam, the demand for financial services is strongly increasing, which leads to the rocket branch opening in most of banks for the last 10 years (Hanh Phuc,

2014). With the digitalization of the banking sector and the social distancing due to the Covid-19 pandemic recently, more and more customers have shifted to online banking. Therefore, Vietnamese banks should consider carefully their branching strategies. With the aim to add more insight to this issue, this paper reassesses the value of the branch network to the bank's profitability in Vietnam during the period from 2012 to 2019.

1. LITERATURE REVIEW

1.1. The role of bank branches

Traditionally, brick-and-mortar bank branches, characterized by physical locations, have been a symbol of the banking industry. The important role of bank branches to customers, and to a bank itself has been confirmed by various studies. According to Capgemini (2012) and Berger et al. (1997), bank branches have been the place where the client is served, wherein bank services are provided to satisfy all the demands of individual and corporate clientele. Customers prefer going to a bank branch because of the easy accessibility of all transactions and products, convenience and safety. Dick (2002) added another benefit of bank branches, that is, all of the services offered do not involve fees.

To the banks, branches have been the important selling channels that contribute a great proportion of income for the bank (Orlow et al., 1996; Berger et al., 1997; Blazheski, 2006). Orlow et al. (1996) and Blazheski (2006) show that there is a positive relationship among bank branch networks and deposits, loans outstanding, and service revenues. Berger et al. (2005) show that small and medium-size banks with a small number of branches may be less profitable compared to large banks with huge branch networks. Berger et al. (1997) also give some evidence that large branches may cost more for the head office, but they are more effective in terms of revenue generation. These studies reach the same conclusion as Bikker (2010), who shows that banks with large networks produce a better average profitability.

Besides, branches have contributed to a bank's brand identity and customer attraction and offer a significant competitive advantage for commercial banks. Banks with large branch networks seem to attract more customers for

the reason that they are easier for customers to reach and remember, due to their unique ways of serving the customers (Brevoort & Wolken, 2008; Hannan & Prager, 2004, 2006; Park & Pennacchi, 2008; Spieker, 2014). Banks with large selling networks are often large organizations with tremendous financial power. This helps them to invest in advanced branches, which are able to provide better customer experience (Grzelonska, 2005; Ho & Ishii, 2010). Hannan and Prager (2004, 2006), Park and Pennacchi (2008) reveal that large branches often attract a greater number of corporate customers, who deposit large funds into a bank. This translates into lower costs per dollar transaction for these banks.

To the economy, bank branch network and branch density show the financial accessibility of the population, (especially the low-income person), thus affecting the financial market competitiveness and financial stability of each country (NCRC, 2017). Edmonds (2018) also emphasizes the reduction of bank branch would lead to the reduction of financial accessibility, expenditure and payment. It even leads to the increasing pollution because people have to use traffic more to reach the branches.

Kekevi (2020) insists that despite a huge shift to digital banking, the branch network still plays four important roles, which are:

- serving customers' needs;
- being bastions of customer experience and brand ambassadors in the physical context;
- providing complex service advices, which cannot provide by Internet-based branches; and
- providing guidance until all customers are comfortable using the bank's digital channels.

1.2. The downtrend in bank branches due to the Forth industrial revolution

Spiegel et al. (1996) forecast a downtrend in the bank branch network due to the explosion of ATMs, smartphones, tablets and direct deposits. The authors insist that the operating cost of bank branch is increasing while their importance to the customer decreases. Other studies have shared the same viewpoint. For example, Berger (2015), states that bank branches are important but not under all of the situation. Kempson and John (2000) analyze the ability that customers can satisfy their financial needs without going to bank branches. King (2012) forecasts that in the near future, "banking is no longer somewhere you go, but something you do". Mekinjić (2019) insists the reduction of traditional bank branches and the increase of digital banking is inevitable cause the Digital Revolution has changed the way people live and interact with others, including banks and other suppliers.

Experimental studies have also shown a decrease in the number of bank branches in developed countries. The NCRC Study (2017) on bank branches in the United States showed 6% of branches have been shut down all over the country due to the inefficient revenue cost ratio. Similarly, England also witnessed a significant decline in bank branches during the period from 1997 to 2014 (Edmonds, 2018) for both groups of large and small banks. One of the reason is considered to be the financial crisis, which induces banks to reduce their costs of maintaining branches while enough revenue is not being generated. Another reason was technological development, which allowed customers to be able to making transactions without actually visiting a bank branch.

In Vietnam, currently, Do (2021) finds that banks, especially small and medium size organizations, often see more number of branches as being less effective. This is because more customers nowadays prefer digital services to traditional ones.

Definitely, the spread of Covid-19 has resulted in major impacts on customers' behavior and the way in which the banks provide their services. Kekevi (2020) identified six behavioral changes that have influenced the usage of bank branches, probably

even as the pandemic is abating, which include: the decline of cash transactions, e-commerce adoption, online banking usage, contactless usage, technology adoption, and social distancing. In the UK, the branch network compounded a negative annual growth rate of 12% during the period from 2014 to 2019. Given the impact of Covid-19, it is estimated that the branch closure rate could accelerate from 30% to 70%. Tumay's 2020 survey shows that several bank branches have been either temporarily closed or have reduced their operational hours during the pandemic.

1.3. Contribution of the branch network to the banks' performance

Previous studies have attempted to examine the impact of the number of branches on the banks' financial performance, and their empirical findings are divergent. Nayatika (2017) used a fixed effect model to quantify the contribution of the network of branches to the financial result of commercial banks in Kenya. The results show that the number of branches has a positive relationship with the bank profitability at a significant level of 5%. Trujillo-Ponce (2013) examined the determinants of banks' profits in Spain, taking the number of branches as the construct of bank size, and found that bank branch number is a determinant of the banks' profitability. These results have confirmed the role of the branch that has been discussed above.

Not surprisingly, there are also other studies, which arrived at the opposite results. The study by Kazumine (2018) uses a fixed effect model, in order to quantify the effects of the number of branches to loan performance of Japanese regional banks. The results indicate that the opening of new branches may lead to a higher loan volume. This is because the regional banks can attract new clients with a greater number of branches. However, the study also shows that too large a branch network can lead to negative effects on the banks' profitability. It can be concluded that a large branch network actually brings negative impacts to the bank's activities. A study by Hirle and Stiroh (2005) on banks in the US shows that banks with mid-size branch networks may be at a competitive disadvantage, compared to either small or large sized branch network banks. Besides, no sys-

tematic correlation between the branch network and bank's profitability has been found. Opening and operating a branch induces costs for the bank and the profitability of the bank may get reduced if the branch network does not generate an effective cost income ratio.

There is no doubt that the importance of the branch network to the bank's performance has led to debates in research studies. However, the digital era and Covid-19 may have induced banks to reduce the size of the bank network to a certain extent. Therefore, it is interesting to examine the role of the bank network to the bank's profitability in the era of digital transformation.

2. METHODOLOGY

2.1. Regression model

A regression model is used to test the relationship between bank profitability and number of bank branches. According to previous studies, the factors determining bank profitability fall into three main categories: the bank's specific factors (including asset structure, asset quality, capitalization, financial structure efficiency, size and revenue diversification), the industry structure (industry concentration and competitiveness), and macroeconomic environment (GDP growth rate, inflation and interest rates) (Trujillo-Ponce, 2013). This study applies the same regression model, but concentrate on the branch variables, wherein, the variables of number of branches, number of branches squared, branch growth and branch per asset are incorporated in order to examine the relationship of branch to the bank profit. The model is specified as:

$$\begin{aligned}
 ROE = & \beta_1 BRANCH + \beta_2 BRANCHsq + \\
 & + \beta_3 BRANCH GROWTH + \\
 & + \beta_4 BRANCH ASSET RATIO + \\
 & + \beta_5 LOAN + \beta_6 DEPOSIT + \beta_7 EQUITY + \\
 & + \beta_8 NPL + \beta_9 HHI + \beta_{10} GDP + e.
 \end{aligned} \tag{1}$$

2.2. Variables

The explanation and constructs of variables are given below.

2.2.1. Dependent variable

ROE (ROE): ROE was used in several studies as a good construct of profitability (Kazumine, 2017; Trujillo-Ponce, 2013). Hence, in this study, ROE is chosen as a dependent variable.

2.2.2. Independent variables

Number of branches (BRANCH): According to Kazumine (2017), Nyatika (2017), Hirtle and Stiroh (2007), the impact of the number of branches on the bank's profitability shows a positive relationship due to the economics of scales. This means that a bank with more branches can attract a higher number of customers, which leads to a higher revenue. If the bank improves its cost ratio at an effective level, the profitability of the bank may improve. The branch number is the number of full-service permanent branches of the bank, including transactions' offices.

Number of branches squared (BRANCHsq): The effect of bank branch number upon profitability could be non-linear or that it has no systematic relationship (Hirtle & Stiroh, 2007). A large number of branches involve higher costs, and over branching may lead to inefficiency. This is more plausible in the context of the industrial revolution and Covid-19, wherein customers can enjoy banking without actually going to meet bank staff. Therefore, both the number of branches and the number of branches squared are used as variables to construct bank branching.

Branch growth (BRANCH GROWTH): measure by the annual growth rate of the bank branches. It represents the bank's branching strategy over the period.

Branch to total assets (BRANCH ASSET RATIO): The chief function of branches is to attract deposits and loans. Therefore, the ratio of branches to total assets can be used to represent the efficiency of the branch (Hirtle, 2007). In this study, the branch to total assets ratio is calculated by the number of branches over VND trillions of assets.

Loan to total assets (LOAN): This is the main source of income and is expected to have a positive impact on the bank's performance (García-

Herrero et al., 2009). In this study, LOAN is represented by the ratio of loan to asset.

Deposit to total liabilities (DEPOSIT): According to Claeys and Vennet (2008) and García-Herrero et al. (2009), a higher proportion of customer deposits on bank liabilities should increase the bank's profitability, considering that deposits are relatively cheaper, and a more stable source of financing, compared to other funding alternatives. In this study, this variable is constructed as the ratio of total deposits to total liabilities.

Equity (EQUITY): According to Kazumine (2017), Nyatika (2017), Hirtle and Stiroh (2007), Trujillo-Ponce (2013), banks with higher owner capital can invest in more advanced technology, which allows banks to better manage their risks, and develop a better services base. In this study, this variable is measured as the ratio of equity capital to total assets.

Non-performing loan (NPL): Non-performing loan is used as a construct for the quality of assets, as NPL is a factor that influences the bank's profitability (Trujillo-Ponce, 2013).

Control variables

Market competition (HHI): To capture market competition, this study uses an asset-based Herfindahl Hirschmann Index (HHI). A higher HHI is seen in a more competitive market, wherein banks face stronger competition. The relationship between HHI and bank's profitability is expected to be negative (Kazumine, 2017; Hirtle and Stiroh, 2007; Trujillo-Ponce, 2013).

GDP (GDP): Rapid economic growth increases profitability whereas slow economic growth can worsen the quality of bank assets, thus reducing the bank's profitability (Demirguc-Kunt & Huizinga, 1999). Therefore, GDP is expected to have a positive relationship with bank profitability. Economic growth is expected to be higher when the economy is boosted through the development of technological forces. However, the unprecedented Covid-19 pandemic has just negatively impacted that trend.

The variables are summarized in Table 1.

Table 1. Summary of variables

| Variables (Type) | Explanation | Literature review |
|-------------------------------|---|--|
| Dependent variable | | |
| ROE | Bank profit, calculated by Net profit over Equity | Kazumine (2017), Trujillo-Ponce (2013) |
| Independent variable | | |
| BRANCH | Number of branches, represented by bank's network size, converted into a natural logarithm | Kazumine (2017), Nyatika (2017), Hirtle and Stiroh (2007) |
| BRANCHsq | Square of natural logarithm of branch, to test whether the relationship of branch and ROE is non-linear | Hirtle and Stiroh (2007) |
| BRANCH GROWTH | Branch growth rate per annum | |
| BRANCH ASSET RATIO | Ratio of branch numbers over a VND trillion of assets, represented for branch efficiency | Hirtle and Stiroh (2007) |
| DEPOSIT | Ratio of customer deposit over total liabilities | Kazumine (2017), Trujillo-Ponce (2013) |
| LOAN | Ratio of customer lending over total assets | Hirtle and Stiroh (2007), Trujillo-Ponce (2013) |
| EQUITY | Ratio of owners' equity over total assets | Kazumine (2017), Nyatika (2017), Hirtle and Stiroh (2007), Trujillo-Ponce (2013) |
| NPL | Asset quality, represented by ratio of non-performing loan over total loan | |
| Controllable variables | | |
| HHI_Asset | Herfindahl-Hirschmann Index, represents market competition | Kazumine (2017), Hirtle and Stiroh (2007), Trujillo-Ponce (2013). |
| GDP | GDP growth rate | Demirguc-Kunt and Huizinga (1999) |

2.3. Data

The study uses a dataset which covers a period of 7 years with a sample of 22 largest banks in Vietnam in terms of owners' capital. These banks account for 80% of the assets of the entire banking system (2019 calculation). The sample is then divided into 4 sub samples:

- sample of all banks;
- sample of large network banks, with banks that have more than 500 branches;
- sample of medium network banks with banks that have from 250 up to 500 branches; and
- sample of small network banks, with the rest of the selected banks.

The estimation is done for all the four samples to draw the difference of the result. Data have been obtained from several sources: bank characteristics data were obtained from the banks' 2012 to 2019 annual reports, HHI data were collected from State Bank of Vietnam, General Statistics Office of Vietnam, and GDP from the World Bank. The financial data is nominated in term of Vietnamese Dong (millions).

3. RESULTS

Based on all observations in the data sample, a bank has 399 branches on an average. The largest bank in terms of network has 2,272 branches, while the smallest bank has just 30 brick-and-mortar spots. The mean branch growth is 5.97% annually, with the highest growth rate of 70.6% and the lowest growth rate of -2%. That means that during the study period, most of the banks have established more branches, whereas some have closed down several of their branches. The most impressive average branch growth rate belongs to the group of

medium banks (7.57% per year), whereas the group of large banks has a modest branch growth, which is 2.41% per year on average. The market shares of the largest banks, medium banks and small banks are 58.6%, 26.6% and 16.5%, respectively. Branch per 1 VND trillion of assets (branch asset ratio) has a mean value of 1.51, indicating that on an average, banks need 1.5 branches to create and manage VND 1 trillion worth of assets. The most efficient banks need only 0.4 branches, while the most inefficient banks need 3.8 branches to manage the same amount of assets.

Table 3 shows the correlation matrix, wherein all the correlation coefficients between different regressors are low. The highest correlation is between LOAN and BRANCH (0.583), still smaller than 0.7, which means that the data are suitable for regression (Rekha, 2019).

Table 4 reports the multicollinearity test, which shows that all VIF is smaller than 2.00 and the mean VIF is 1.54, indicating that the data has no multicollinearity issues.

Table 2. Summary statistics

| Variable | Obs. | Mean | Std. dev | Min | Max |
|--------------------|------|---------|----------|----------|----------|
| ROE | 155 | 9,9823 | 7,0034 | .3 | 27.73 |
| BRANCH | 175 | 399.4 | 481.3949 | 30 | 2272 |
| BRANCH GROWTH | 153 | 0.05971 | .1111 | -.02222 | .7061 |
| BRANCH ASSET RATIO | 175 | 1.511 | .6742 | .4234 | 3.8780 |
| NPL | 173 | .0247 | .0198 | .0019 | .1600 |
| LOAN | 175 | .5647 | .1221 | .2223 | .8217 |
| DEPOSIT | 175 | .7535 | .1129 | .4525 | .9654 |
| EQUITY | 175 | .0783 | .0285 | .0158 | .2994 |
| HHI | 176 | 888.90 | 18.2026 | 862.7938 | 909.4194 |
| GDP | 175 | .0630 | .0066 | .0525 | .0708 |

Table 3. Correlation

| Variable | ROE | BRANCH | BRANCH GROWTH | BRANCH ASSET RATIO | NPL | LOAN | DEPOSIT | EQUITY | HHI | GDP |
|--------------------|---------|---------|---------------|--------------------|---------|---------|---------|---------|--------|--------|
| ROE | 1.0000 | – | – | – | – | – | – | – | – | – |
| BRANCH | 0.0665 | 1.0000 | – | – | – | – | – | – | – | – |
| BRANCH GROWTH | 0.0520 | –0.1306 | 1.0000 | – | – | – | – | – | – | – |
| BRANCH ASSET RATIO | –0.3685 | 0.2269 | –0.0654 | 1.0000 | – | – | – | – | – | – |
| NPL | –0.2469 | 0.2025 | –0.1173 | 0.3511 | 1.0000 | – | – | – | – | – |
| LOAN | 0.2945 | 0.5833 | –0.0431 | –0.0187 | –0.1250 | 1.0000 | – | – | – | – |
| DEPOSIT | –0.1450 | 0.3895 | –0.0495 | 0.1324 | 0.0675 | 0.4603 | 1.0000 | – | – | – |
| EQUITY | –0.1408 | –0.3168 | –0.1320 | 0.3204 | 0.0670 | –0.4251 | –0.1673 | 1.0000 | – | – |
| HHI | 0.1916 | 0.0573 | 0.0435 | –0.1775 | –0.2542 | 0.1900 | 0.0992 | –0.1749 | 1.0000 | – |
| GDP | 0.3544 | 0.1089 | 0.0606 | –0.3175 | –0.1888 | 0.3046 | 0.0051 | –0.2025 | 0.5204 | 1.0000 |

Table 4. Multicollinearity test

| Variable | VIF | 1/VIF |
|--------------------|------|----------|
| LOAN | 2.19 | 0.456294 |
| BRANCH | 1.91 | 0.523099 |
| GDP | 1.65 | 0.607811 |
| BRANCH ASSET RATIO | 1.55 | 0.646657 |
| EQUITY | 1.53 | 0.652107 |
| HHI | 1.46 | 0.683539 |
| DEPOSIT | 1.37 | 0.729935 |
| NPL | 1.33 | 0.753614 |
| BRANCH GROWTH | 1.07 | 0.934692 |
| Mean VIF | 1.56 | – |

The results from F test, Breusch-Pagan Lagrange multiplier (LM) and Hausman test indicate that the Random Effect Model (REM) is most appropriate for this regression. The REM with option robust standard errors is selected to control heteroskedasticity and serial correlation. Four estimations have been done for the four sub-samples: all banks in the sample (Panel A), group of large network (Panel B) group of medium network banks (Panel C) and group of small network bank (Panel D). The results are presented in Table 5.

Table 5. Multiple regression results

| Dependent variables: ROE year t+1 | Panel A | Panel B | Panel C | Panel D |
|--------------------------------------|----------------------|-----------------------|-----------------------|---------------------|
| | All banks | Large network banks | Medium network banks | Small network banks |
| Constant | -43.91*** [25.17] | 582.01*** [177.27] | -219.85*** [81.69] | 21.45 [69.5] |
| BRANCH | 18.416** [8.01] | -145.81** [62.3] | 91.98*** [31.36] | -14.20 [30.41] |
| BRANCHsq | -1.602** [0.67] | 10.14** [4.24] | -8.53*** [3.02] | 1.29 [2.98] |
| BRANCH GROWTH | -5.61* [2.99] | -11.26** [4.97] | -5.22** [2.28] | -1.28 [5.82] |
| BRANCH ASSET RATIO | -4.47** [1.75] | 1.84 [2.83] | -7.61*** [1.32] | -4.73* [2.63] |
| NPL | -7.17 [13.26] | -13.14 [15.34] | -4.84 [46.61] | 29.82 [53.77] |
| LOAN | 32.98*** [9.56] | 1.50 [18.26] | 36.62*** [12.48] | -15.43** [7.17] |
| DEPOSIT | -20.36*** [6.41] | -56.89** [22.74] | -23.97*** [8.25] | 40.09*** [11.87] |
| EQUITY | -16.69 [26.19] | -187.29*** [62.44] | -5.33 [42.00] | -34.29 [34.34] |
| HHI | 0.005 [0.17] | -0.013 [0.053] | -0.0002 [0.05] | 0.03 [0.03] |
| GDP | 42.75 [83.02] | 249.27 [259.45] | -18.01 [148.32] | 3.47 [113.8] |
| Observation | 132 | 30 | 42 | 60 |
| R square | 57.98 | 38.10 | 69.42 | 63.20 |
| Adj R square | 28.04 | – | – | – |

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results in Table 5 show that for all banks in the sample, the coefficient of BRANCH is positive and significant at 5% level, indicating that a greater number of branches positively affects the banks' ROE for the next year. This result is consistent with Trujillo-Ponce (2013) and Nayatika (2017). Estimations for three sub-groups – large, medium and small branch networks – show that the coefficient of BRANCH is negative and significant at 5% level for the group of large network banks, but positive and significant at 1% level for the group of medium network banks. This indicates that a greater number of branches does not correlate with higher ROE for larger network banks, but for medium network banks, branch network is really a competitive advantage. This finding is contrary to Zadkoohi and Kolari (1994) who found that for savings banks in Finland, large branch banks are more efficient than smaller branch banks.

BRANCHsq is negative and significant at 5% level, suggesting that the relationship between branch and ROE is non-linear. ROE increases if the number of branches reaches a certain level. Over and above that optimum number, ROE would fall if the bank keeps opening more branches.

BRANCH GROWTH is negative and significant at 10% level, which indicates that the growth of branches does not bring more profit to the banks. For sub-group estimation, Branch growth is also negative and significant at 5% level for the groups of large network banks and medium network banks, which shows that for large network banks and medium network banks, increase in the branch growth rate decreases the banks' profits. This may be because the increase of branch may lead to higher costs which are not compensated by the revenue generated. This is especially true when customers nowadays are less and less interested in branches due to the convenience of online banking (Spiegel et al., 1996). However, as the estimation shows, the number of branches still a positive factor contributed to the bank ROE, so it is likely that, branch opening may be a long-term investment, in which branches need more than one year to break even.

BRANCH ASSET RATIO is negatively correlated with the bank's ROE, for all banks in the sample, at 5% level of significance. This means a higher branch asset ratio (more branches to generate the same asset volume) is correlated with a

lower profitability. This suggests that branch efficiency is an important determinant of the banks' profits. A larger branch network can help a bank acquire more loans and deposits, but also increases the cost. Therefore, a bank with better effective branches will have higher profitability. This result is consistent with Hirtle and Stiroh (2007).

The coefficient of LOAN is positive and of DEPOSIT is negative, both significant at 1% level, which meet the expectations. This is because loan volume relates to revenue, so the higher proportion of LOAN, the higher ROE, and deposits increase the cost of the banks, so the higher DEPOSIT, the lower ROE.

CONCLUSION

The branch network size of Vietnamese banks was steadily increasing during the period from 2012–2019, despite the expansion of mobile banking and digital banking. This result may come from the fact that in a developing country like Vietnam, there is still a high proportion of people who lack access to mainstream banking services, and who are less capable of financial literacy, still prefer going to a physical branch to be served and assisted by a bank staff, especially for some services that need consulting or seem digitally risky. The number of branches of the medium network bank group is positively correlated with banks' profitability, whereas the opposite is true for large network banks, indicating that branch network is a competitive advantage for medium banks, but not for already larger network banks.

The relationship between the number of branches and ROE has a convex parabolic shape. Opening more branches when the network meets the optimal number would lead to a lower ROE. Branch growth is also negatively correlated with profitability which suggests that if a bank follows an aggressive branching strategy then it may not reach its optimal profitability.

Evaluating the contribution of branch networks to the bank's profitability provides important information, which guides the banks to decide whether they should be opening more branches or downsizing their network. Banks also have to consider the cost income structure of their branches, which may be improved by transforming branches from a purely transaction factory to advisory centers, or combining face-to-face advice and better digital interactions. Branches should also manage customer relationship better, enhance customer loyalty and increase cross-selling. By doing so, they can be more-than-just-a-branch, which generate higher revenue at a certain cost level.

Although this study suffers from some limitations, such as the small number of observations and the unavailability of a construct that captures of the then mentioned Covid-19 pandemic, still it is hopefully a foundation for further studies on the same topic.

AUTHOR CONTRIBUTIONS

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REFERENCES

1. Berger, A. N., Dick, A. A., Goldberg L. G., & White, L. (2005). The Effects of Competition from Large, Multimarket Firms on the Performance of Small, Single-Market Firms: Evidence from the Banking Industry. *Finance and Economics Discussion Series*, 15, 1-36. <http://dx.doi.org/10.17016/FEDS.2005.15>
2. Berger, A. N., Leusner, J. H., & Mingo, J. J. (1997). The Efficiency of Bank Branches. *Journal of Monetary Economics*, 40(1), 141-162. [https://doi.org/10.1016/S0304-3932\(97\)00035-4](https://doi.org/10.1016/S0304-3932(97)00035-4)
3. Berger, R. (2015). *Digital Revolution in retail banking*. Interview with Egbert Wege.
4. Bikker, J. A. (2010). Measuring Performance of Banks: An Assessment. *Journal of Applied Business and Economics*, 11(4), 141-159. Retrieved from <http://digitalcommons.www.na-businesspress.com/JABE/BikkerWeb.pdf>
5. Brevoort, K., & Wolken, J. (2008). *Does Distance Matter in Banking?* Retrieved from <https://www.federalreserve.gov/pubs/feds/2008/200834/200834pap.pdf>
6. Capgemini. (2012). *World Retail Banking Report 2012*. Retrieved from https://www.capgemini.com/wp-content/uploads/2017/07/World_Retail_Banking_Report_2012.pdf
7. Demircuc-Kunt, A., & Huizinga, H. (1998). Determinants of commercial bank interest margin and profitability: some international evidence. *World Bank Economic Review*, 13(2), 379-408. <http://dx.doi.org/10.1093/wber/13.2.379>
8. Dick, A. A. (2002). Demand Estimation and Consumer Welfare in the Banking Industry. Board of Governors of the Federal Reserve System. *Finance and Economics Discussion Series*, 14. <http://dx.doi.org/10.17016/FEDS.2002.58>
9. Do, T. H. (2021). *Research impact of E-banking services on operation results of Vietnam commercial bankers* (Unpublished Doctoral Dissertation). Thuong Mai University.
10. Edmonds, T. (2018). *Bank Branch Closures* (Briefing Paper No. 385).
11. García-Herrero, A., Gavilá, S., & Santabábara, D. (2009). What explains the low profitability of Chinese banks? *Journal of Banking and Finance* 33(11), 2080-2092. <https://doi.org/10.1016/j.jbankfin.2009.05.005>
12. Grzelonska, P. (2005). *Benefits from Branch Networks: Theory and Evidence from the Summary of Deposits Data*. University of Minnesota. Retrieved from <http://qed.econ.queensu.ca/pub/students/allenj/bookmark/papers/grzelonska.pdf>
13. Hanh Phuc. (2014). *Ngan hang du nhau "banh truong" mang luoi hoat dong. Nhip song doanh nghiep*. Retrieved from <https://nhipsong-doanhnghiep.cuocsongantoan.vn/ngan-hang-dua-nhau-banh-truong-mang-luoi-hoat-dong-post50634.html>
14. Hannan, T. H., & Prager, R. A. (2004). The Competitive Implications of Multimarket Bank Branching. *Journal of Banking and Finance*, 28(8), 1889-1914. <https://doi.org/10.1016/j.jbankfin.2003.06.006>
15. Hannan, T. H., & Prager, R. A. (2006). Multimarket Bank Pricing: An Empirical Investigation of Deposit Interest Rates. *Journal of Economics and Business*, 58(3), 256-272. <https://doi.org/10.1016/j.jeconbus.2005.07.004>
16. Hirtle, B. (2007). The impact of network size on bank branch performance. *Journal of Banking and Finance*, 31(12), 3782-3805. <https://doi.org/10.1016/j.jbankfin.2007.01.020>
17. Hirtle, B., & Metli, C. (2005). The evolution of US bank branch Networks: Growth, Consolidation and Strategy. *Current Issues in Economics and Finance*, 10(8), 1-7. Retrieved from https://www.newyorkfed.org/medialibrary/media/research/current_issues/ci10-8.pdf
18. Ho, K., & Ishii, J. (2010). Location and Competition in Retail Banking. *International Journal of Industrial Organization*, 29(5), 537-546. <http://dx.doi.org/10.1016/j.ijindorg.2010.11.004>
19. Kekevi, C. (2020). *How the Covid-19 crisis is impacting branch banking*. Accenture Banking, Guest Blogger Series [Online]. Retrieved from <https://banking-blog.accenture.com/how-covid-19-crisis-is-impacting-branch-banking>
20. Kempson, E., & Jones, T. (2000). *Banking without branches: a study of how people conduct their banking business without a local branch*. University of Bristol.
21. King, B. (2012). *Bank 3.0. Why banking is no longer somewhere you go, but something you do* (1st ed.). Wiley.
22. King, B. (2014). *Breaking banks: the innovators, rogues, and strategist rebooting banking* (1st ed.). Wiley.
23. Mekinjić, B. (2019). The impact of industry 4.0 on the transformation of the banking sector. *Journal of Contemporary Economic*, 1, 7-28. <http://dx.doi.org/10.7251/JO-CE1901006M>
24. NCRC. (2017). *Research Memo. Bank Branch closures from 2008–2016: Unequal impact in America's Heartland*. Retrieved from https://ncrc.org/wp-content/uploads/2017/05/NCRC_Branch_Deserts_Research_Memo_050517_2.pdf
25. Nyatika, S. (2017). *Spread in branch network and financial performance of commercial banks in Kenya* (Master's Thesis). University of Nairobi. Retrieved from http://erepository.uonbi.ac.ke/bitstream/handle/11295/103083/Nyatika,Simeon_Spread%20in%20Branch%20Network%20and%20Financial%20Performance%20of%20Commercial%20Banks%20in%20Kenya.pdf
26. Orlow, D. K., Radecki, L. J., & Wenninger, J. (1996). *Ongoing*

- Restructuring of Retail Banking* (Research Paper No. 9634). Federal Reserve Bank of New York. Retrieved from https://www.newyorkfed.org/medialibrary/media/research/staff_reports/research_papers/9634.pdf
27. Park, K., & Pennacchi, G. (2008). Harming Depositors and Helping Borrowers: The Disparate Impact of Bank Consolidation. *The Review of Financial Studies*, 22(1), 1-40. <https://doi.org/10.1093/rfs/hhn051>
28. Rekha, M. (2019). *MLmuse: Correlation and Collinearity – How they can make or break a model*. Clairvoyant blog. Retrieved from <https://blog.clairvoyantsoft.com/correlation-and-collinearity-how-they-can-make-or-break-a-model-9135fbe6936a>
29. Spieker, R. L. (2004). Bank Branch Growth Has Been Steady – Will it Continue? *FDIC Future of Banking Study*.
30. Trujillo-Ponce, A. (2013). What determines the profitability of banks? Evidence from Spain. *Accounting & Finance*, 53(2), 561-586. <https://doi.org/10.1111/j.1467-629X.2011.00466.x>
31. Tumay, K. (2020). *Realigning the Bank branch for the new normal with analytics*. [Online]. Retrieved from <https://community.verint.com/b/customer-engagement/posts/realigning-the-bank-branch-for-the-new-normal-with-analytics>
32. WEF. (2016). *Fourth Industrial Revolution: what it means, how to respond*. World Economic Forum. Retrieved from <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>
33. Zardkoohi, A., & Kolari, J. (1994). Branch office economies of scale and scope: evidence from savings banks in Finland. *Journal of Banking and Finance*, 18(3), 421-432. [https://doi.org/10.1016/0378-4266\(94\)90001-9](https://doi.org/10.1016/0378-4266(94)90001-9)