Impact of branchless banking on banks performance: Quarterly review of Pakistani banks

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ABSTRACT

Branchless banking has become quite popular everywhere. It has, no doubt, expanded the market of financial institutions. However, its further expansion depends on its impact on the performance of banks. Previous studies have mainly highlighted the impact of branchless banking on the performance of banks using the data for other countries and their results have been mixed. To investigate this, the impact of branchless banking on banks' performance and on core banking in the case of Pakistan is examined. For this purpose, data of 5 commercial banks for pre and post periods of branchless banking and data of banks doing only branch banking with that of doing both has been collected. The univariate and multivariate analyses have been carried out on the collected data. In univariate and multivariate analysis, the performance and core banking indicators have been regressed on branchless banking dummy variables and other control variables such as net interest margin, total deposits to total assets ratio, deposits to equity ratio, advances to total assets ratio and administrative expenses to total earning ratio. The multiple regressions have been estimated both by pooled OLS and fixed effect methods. The findings show that branchless banking has made no significant impact on performance and on the core function of banks but it has somehow changed the volatility of these indicators.

Keywords: Financial Institutions, Deposit to equity ratio, Net interest margin, Fixed effect methods.

INTRODUCTION

Branchless banking started as a result of marvelous growth in telecommunication industry. It has expanded the market of financial institutions by inclusion of many people who previously could not take benefit of traditional branch banking. This financial innovation has received great attention of academia recently. There are two types of branchless banking through which banks are operating without bearing the cost of furnishing bank branches; one is internet banking and the other is agency banking.

Internet banking is done by providing financial services online through websites. Bank customers do not have to visit bank offices to get a financial service; rather they get it sitting in their homes or offices. Such type of banking is beneficial to those people who have easy access to internet. Since internet facility is available to almost everyone around the clock at affordable cost in developed countries, therefore internet banking is more commonly practiced in developed countries such as USA, UK, Germany and Japan.

Agency banking is done through retailers and shopkeepers who have access to mobile telephony. Banks hire the services of retailers and shopkeepers in remote areas and train them to provide financial services to local people in the area. These retailers then provide financial services to people living in remote areas where bank branches are almost non-existent. These people mostly use bank services to transfer funds from one place to another. This type of banking is done mostly in developing countries as internet is not commonly available in these countries. So agency banking is quite popular in developing countries such as Pakistan, Nepal, Columbia, Kenya, South Africa, Brazil and India.

Branchless banking has both positive and negative aspects. Its positive aspect is obvious that it saves time to provide and receive financial services. It also saves transportation cost to receive financial services as customers do not have to visit bank offices personally. Its negative aspect is that some people do not prefer internet and agency banking as they have to provide their personal information on internet which may be hacked and misused and to bank agents who may also misuse such information. In other words, many people may not want to deal with branchless banking due to security reasons.

As we know that the basic function of bank is financial intermediation, channeling of funds from surplus units in the shape of bank deposits to deficit units in the shape of bank loans. That is why commercial banks are also called financial intermediaries and financial intermediation is called the core banking. The other important function of banks is to provide financial services and to supplement the payment system by transferring funds from one place to another and from one person to another. Core banking mostly facilitates investment in the country and is therefore considered a catalyst for its economic growth in future. On the other hand, provision of financial services particularly transferring of funds, no doubt, adds to current economic activity but it has little impact on future growth of the economy.

Mwando (2013) checked the impact of agents based branchless banking on the performance of banks and he concluded that this type of banking made positive impact on the performance of banks in Kenya. Malhotra and Singh (2009) investigated the impact of internet banking on size, operating efficiency and profitability of banks. He concluded that internet banking has made significant positive impact on size and operating efficiency on banks and it has negative relationship with risk. This type of research was missing in the case of Pakistan. Therefore, this study investigates the impact of branchless banking particularly of agency banking on overall performance of banks and on their core function of financial intermediation.

To evaluate the impact of branchless banking on the performance of banks and on core banking, this study compare return on asset, return on equity and operating efficiency, markup margin, total deposits to assets ratio and net advances to assets ratio, interest to non-interest income ratio of banks doing agency banking and those not doing agency banking.

Specifically, objectives of this study are

- To understand the profile of branchless banking in Pakistan.
- To investigate the impact of branchless banking on overall performance of banks.
- To investigate the impact of branchless banking on core banking that is financial intermediation.

LITERATURE REVIEW

Literature on Internet Banking

Sayar and Wolfe (2007) compared performance of banks which were doing internet banking in Turkey and UK. They used descriptive approach using 9 banks from each country by three dimensional models. For this purpose, data was gathered through internet survey. They concluded that Turkish banks were better than British in providing wider range of services despite of better level of smoothness environment and environment for internet banking in UK due to desire for better technology to avoid fraud cases. The key difference which was observed was in terms of security related issues and ease of using these internet related facilities.

Malhotra and Singh (2009) described impact of internet banking on bank performance and risk for Indian banks, they studied 85 scheduled banks in June 2007 using unbalanced panel data from 1998 to 2006. In univariate analysis, he concluded that internet banks were larger than non-internet banks and the operating efficiency and profitability was also better for internet banks than non-internet banks. In multivariate analysis there was no significant effect but there was negative association of internet banking with risk.

Ahmed et al. (2010) mentioned in their paper that UK financial system noticed change in last few years that affected banking sector both positively and negatively. Positive in the sense that e banking advanced technology and reduced cost of providing services but on other hand due to increase in expensive infrastructure usage and employment of more skilled staff for operations of internet banking services, cost increased. Similarly security prospect also affected decision and choices of customers, due to high security risk choices changed for internet banking. Even if few customer were ready, banks could not built desired level of internet banking. Sumra et al. (2011) evaluated impact of E-banking on the performance of Pakistani banks. They used qualitative approach by taking interview from managers of 12 banks from Islamabad, Lahore and Bahawalpur cities and discovered that electronic banking has made positive impact on performance of banks.

Stoica et al. (2013) checked how financial innovation considering internet banking made impact on Romanian banks considering overall efficiency. They used data envelopment analysis to check aggregate efficiency of 24 banks excluding branches in foreign and principle component analysis to compare relative efficiency of banks. It was discovered that banks in Romania adopted two kind of policies Cost reduction strategies and Internet banking oriented. They concluded that only few (Banca, Transylvania and OTP Bank) were efficiently using internet banking and other were using mix of strategies both cost decreasing and internet banking.

Kombe and Wafula (2015) mentioned in their study that financial institutions transformation increased significantly. Although scope and nature of internet banking discussed widely but discussion on impact of internet banking on banks was limited so Kombe and Wafula targeted to determine impact of internet banking on performance of financial institutions in Kenya .For this purpose they used descriptive survey design and targeted population of 31 out of 51 members representing operations, marketing, finance and ICT employees of Kenya Central Bank, Treasury square in Mombasa Kenya. They used questionnaires to gather data and statistical tools to analyze it. They concluded that that ICT adoption in banks led to quality improvement and reduction in time rather than decreasing cost of transactions.

Literature on Agency Banking

Srinivasan (2007) mentioned in his article that financial exclusion is major problem for excluded unorganized sectors. Although structural changes were costly but must be continued, side by side banks should take measures to follow those unorganized sectors by designing innovations with help of experiences of traditional lenders of these excluded sectors.Donner and Tellez (2008) mentioned in his study that that mobile banking, m-payments systems, money wallets were now providing financial services at mobile of individuals and those facilities could be used through dynamics within research of information and communication technologies and development by scholars and practitioners. So mobiles might be used in more advance and broader sense considering mobile banking.

Lozano and Mandrile (2010) described in their work that although Columbia was not role model in development of branchless banking but indeed it was growing slowly considering technology, regulations and practical condition. So it was heading to be main engine of microfinance industry. They proposed new agent model of branchless banking for Columbia, they mentioned that through MFI financial services can be provided at cheaper rates and MFIs could increase financial services done through agents in two steps firstly by increasing average number transactions done in certain time period and in second period increasing average amount of credit transacted through agents through microfinance institutions. There might also be obstacles of distrust on earlier creditors when customers will move to another creditor due to lack of information or miscommunication caused by MFIs causing problem of bad image in depositors mind of renowned banks due to any misplacement of credit.

Alexandre et al (2011) commended technology and communications networks which made it possible to provide banking services through retail management these retail shops provided banking services like basic deposits, withdrawals and payments system available in villages and at footsteps of people. Alexandre et al considered it as opportunity for providing banking services to all and cash in low balance savings. Alexandre et al said for banking beyond branches, regulations should be advanced. Five types of regulations should be adopted. Firstly regulations which distinguish between full services branches bank and pure transactional outlets. Secondly, regulations which would allow banks to get third party service for retail banking to minimize financial risks for both customers and banks. Thirdly, regulations which would allow banks to help customer through consumer protection regulations in complex service delivery chain without burdening banks. Fourthly, regulations to allow immediate account opening by tiered know your customer (KYC) regulations to decrease barriers for poor people. Fifthly, regulations for class of non-bank e money issuers by creating space for them. This would be for deposits and payments only.

Diniz et al (2012) suggested in their studies that financial innovation helped poor people to get advantages of financial services through information and communication technology (ICT) based branchless banking. They considered Autazes, an amazon region country, case study where through correspondent model approach social and economic benefits reached at local level and socio economic development was noticed in that country but a same time there were few negatives as well because low income population was over indebted, social exclusion started again and power asymmetries were noticed as well. So they concluded that financial education should also be promoted to make this development of poor people effective.

Mwando (2013) discussed in his paper that in Kenya, agency banking has made positive impact on banks performance. He took primary data from 4 senior managers of each of 9 commercial banks which were doing branchless banking through questionnaires using Likert scale. He got results that agency banking probably by low transaction cost, more accessibility by customers and increase in market share has improved performance of commercial banks significantly.

Maina and Mwangi M. (2014) tried to establish factors which were promoting agency banking among customers in Kenya commercial banks and how security, liquidity, availability, customers and awareness affect promotion of agency banking in Kenya. They used descriptive research design by using stratified sample of 10% from targeted population of 4972 customers of Kenya Commercial Bank Nairobi CBD through questionnaires.so sample size used was 497. Descriptive and inferential statistics were used to estimate quantitative data results and Probit model was also used. Additionally, content analysis was made for qualitative data. The paper recommended that liquidity and security were factors which were up taking agency banks. Failures and errors were concerns for customers and robbery cases in towns should be lessen to increase security.

THEORETICAL FRAMEWORK AND PROFILE OF BRANCHLESS BANKING IN PAKISTAN

Theoretical Background

In literature, the core function of commercial banking is stated to provide financial intermediation from surplus units to deficit units. Surplus units are mostly households which do not have time or do not have expertise to invest their funds directly, therefore they deposit their money in commercial banks. Deficit units are business firms and government agencies which have viable investment/development projects but are short of money, therefore they take loans from banks. For providing this financial intermediation, banks pay lower interest rate/profit to depositors and charge high interest rate/markup to bank borrowers. Financial intermediation definitely adds to economic activity of the country as savings of households are utilized for productive investment in the country. Consequently economic growth is directly related with core banking. In addition to financial intermediation, banks provide other financial services such as payment of salary, payment of utility bills and transfer of funds from one place to another and from one person's account to another person's account. Of course the volume of such services depends upon the rate of employment and economic transactions among economic agents. Therefore an increase in these financial services indicate prosperity in the country.

Commercial banks had been providing financial intermediation and other services from their branch offices until the end of last quarter of last century. However after the telecommunication revolution, internet facility was easily accessible by common people in developed countries. Therefore commercial banks took the benefit of this telecom innovation and started providing financial services through internet as well. The internet banking saves time and transportation

cost to provide and receive financial services. Therefore, it increased the scope of commercial banking among the masses. However, internet banking has a negative aspect too. A bank account may be hacked, personal information provided to bank may be stolen and misused Also provision of bank services becomes depended upon availability of electricity and internet facility. Anyhow, internet banking has been more common among developed countries because internet facility is available at affordable price.

According to Economic Council of Canada, a financial innovation can fall in any of the following three categories. Firstly it is an innovation if it broadens the market by increasing liquidity of market, That is, it increases either the number of bank depositors or it increases the number of bank borrowers or both. Secondly, it is an instrument which facilitates management of risk of businesses in financial market. Thirdly it is an instrument which accelerates arbitraging process and thus bridges up price differences charged on financial services. In this regard, branchless banking has definitely broaden the financial market as it has attracted more people to financial services; it has also enhanced the liquidity in financial markets and it has reduced transaction costs of financial services by accelerating arbitraging process.

Financial inclusion is highly emphasized in policy debates now a day. Policy makers are concerned to bring poor people living in remote areas under the financial network so that they may also enjoy similar facilities provided by financial institutions in urban areas. Micro finance institutions took the lead and played their role for financial inclusion. Subsequently commercial banks followed them and introduced agency banking as a new addition in their operating system. In agency banking, banks hire the services of retailers and shopkeepers who are also agents of mobile telephone companies. Then bank official train such retailers and shopkeepers to provide financial services to people living around at their door steps. It definitely helps all the participants; banks, retailers and shopkeepers, telephone companies and people living in remote areas.

Agency banking can further be divided into two types; one is through agents who are also agents of mobile companies and the other is through agents who also own point of sale terminals. The first type of agency banking has shown less penetration level of banking system because of poor state of banking technology. It has been mostly adopted in Africa. The second type of agency banking is based on bank based projects which consist of cards and point of sale terminals and this has been mostly adopted in Latin America. This type of agency banking became popular particularly in Kenya and Brazil. In Brazil, larger banks played their role by establishing cards and point of sale terminals in almost all municipalities of the country. They authorized 39000 agents to provide banking services to general public living in rural areas. In Kenya, mobile phone-based banking-network is known as Safaricom. It works through menu based applications on mobile phones of their customers. The number of users of this network expanded to six million with more than 8000 agents nationwide in a span of few years.

According to Mas (2009), branchless banking framework consists of two main networks; payment network and account platform. Payment network basically manages transfer of funds. Customers report their desired transactions to agents and then the corresponding banks complete them to relevant users. Account platform manages the service logic by maintaining the value of accounts and authorizing individual transactions to account holders. In payment network there is a tradeoff between interoperability (work together for unique purpose) and competitive advantage, where in start banks work to extend market for industry which give benefits to whole industry then banks work for their maximum transactions and stop other banks to become competitive in branchless banking. In accounts networks banks tradeoff between complexity and

scale for increasing scale they adopt one size fit all policy to give services to all people and other policy is that they give different service of quality and different products just like in core banking.

Payment account performs mainly three kinds of services through agents. The first kind is public to public (P2P) transactions. People use this agency banking for sending money to their relatives as domestic remittances in their villages by sending money at their Computerized National Identity Card (CNIC). The second kind is public to bank (P2B) transactions. It deals with payment of utility bills, credit card bills and taxes. People transfer payments to banks through agents and then banks make payments to indicated beneficiaries. The third kind is from government to public (G2P) transactions. It is mostly used for transfer and welfare payments. Governments transfer funds to banks and then banks pay these funds to designated individuals through their agents like Benazir Income Support Program and payment to IDPs in North Waziristan etc.

Branchless Banking in Pakistan

Pakistan is a developing country where majority of people live in rural areas. Bank branches in many villages are either nonexistent or they are fewer in numbers than that in urban areas. So agents based branchless banking also called agency banking was adopted to substitute and supplement branch banking to provide services to those people who have to spend a lot of time and transportation cost to reach bank branches located far away from their houses. Branchless banking in Pakistan is serving both purposes; core banking and financial services, it means that people can open their accounts and deposits money and can get loans through agents.

However in Pakistan it seems that agency banking has been mostly used to transfer funds as the volume of transactions, done through this agency banking, has reached millions of rupees. Although agency banking started in 2009 that is 20 years after it started in England where it started, probably first time in the world, in 1989 with the name of "First Direct", yet its growth is remarkable as shown in table 3.1 below. In Pakistan, branchless banking was first time started by Tameer Bank, a microfinance bank, with collaboration of Telenor, a mobile telephone company. It was given the name of EasyPaisa. Subsequently Askari Bank started agency banking with the name of Timepey, United Bank started with the name of UBL Omni, Muslim Commercial Bank started with the name of MCB Lite, Bank Alfalah started with the name of Mobile Paisa and Habib Bank Limited started with the name of HBL Express. Two other microfinance banks also started agency banking; U Microfinance Bank with the name of U-paisa and Waseela Bank with the name of MobiCash. All these banks are playing their role for branchless banking with the help of mobile telephone companies under the supervision of State Bank of Pakistan.

Table 3.1 shows the number of agents, the number of accounts, accumulated deposits, the number of transactions, the value of transactions, the average transactions size and the number of average transactions daily. The data has been taken from quarterly reports of State Bank of Pakistan (SBP). Although agency banking started in 2009 by most of the banks, yet SBP started reporting such data quarterly from the first quarter of 2012.

Table 3.1 Branchless Banking in Pakistan 2012-2015

Period	Agents	Accounts (numbers)	Accumulated deposits (million Rs.) (as per date)	Number of transactions (in 000)	Value of transactions (million Rs.)	Average transaction (Rs.)	Average number of transactions per day
Q1 2012	26,792	1,059,519	594	25,300	85,092	3,367	280,798
Q2 2012	29,525	1,447,381	753	28,400	115,304	4,065	315,178
Q3 2012	31,637	1,815,611	839	31,500	139,011	4,420	349,411
Q4 2012	41,567	2,112,052	1,055	35,319	151,108	4,279	392,378
Q1 2013	64,716	2,398,888	1,391	41,130	170,796	4,153	457,005
Q2 2013	93,862	2,642,941	2,391	44,760	173,231	3,870	497,333
Q3 2013	110,214	2,966,306	2,320	51,914	224,024	4,315	576,822
Q4 2013	125,027	3,475,458	2,639	54,100	234,646	4,337	601,113
Q1 2014	148,324	3,831,868	4,911	68,535	278,348	4,061	761,501
Q2 2014	168,615	4,238,178	6,219	71,194	326,131	4,581	791,041
Q3 2014	186,618	4,713,145	5,652	66,806	375,945	5,627	742,293
Q4 2014	204,073	5,414,655	6,668	71,818	372,093	5,181	797,980
Q1 2015	229,645	7,538,025	6,890	72,520	354,135	4,883	805,774
Q2 2015	251,865	10,881,378	8,553	99,523	505,879	5,083	1,105,815

Source: State Bank of Pakistan/Publications/acd/Branchless.htm, accessed on (2015. December 23)

The above table shows an increase in number of agents by more than four times, increase in number of accounts, massive increase in accumulated deposits, increase in number of transactions done through agency banking, increase in average size and number of transactions. To sum up, table 3.1 shows that all indicators have increased significantly in these three years due to agency banking. So, looking at these numbers, it shows that agency banking is promoting both accounts network and transfer of payments.

Descriptive Analysis

For easy comparison and better understanding, table 3.2 shows growth rates of number of agents and accounts, accumulated deposits, number of transactions, value of transactions and average size of transactions from the first quarter of 2012 to the second quarter of 2015.

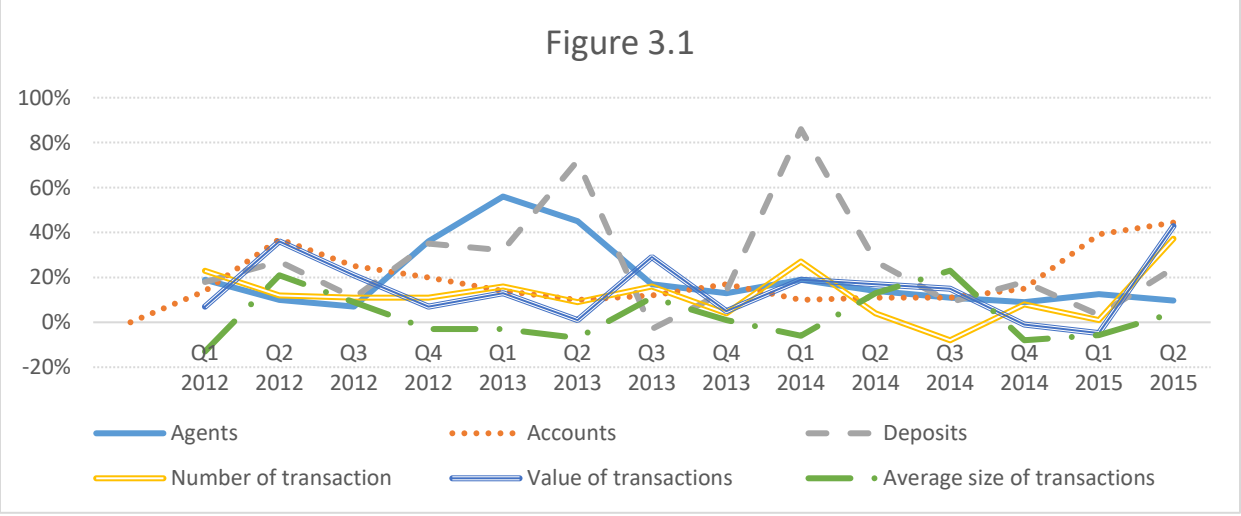
Growth of all measures of branchless banking can be shown graphically as in figure 3.1. This figure 3.1 shows trend lines of growth rates of number of agents, number of accounts, accumulated deposits, number of transactions, value of transactions and average size of transactions.

It can be inferred from the descriptive analysis of different indicators of agency banking that most of them had been positive during the period. Only few indicators showed less or negative growth rates. Accumulated deposits have highest growth rate with average quarterly growth rate of 21%. Number of accounts has second highest average quarterly growth rate of 18%.Number of agents has average quarterly growth rate of 17%. After that value of transactions has average quarterly growth rate of 14% and then number of transactions average quarterly growth rate is 10% Average size of transactions has lowest average quarterly growth rate of 3% only.

Table 3.2. Growth Rate of Branchless Banking in Pakistan 2012-2015

Period	Agents	Accounts (number)	Accumulated deposits (millions Rs.) (as per date)	Number of transaction (in 000)	Value of transactions (millions Rs.)	Average size of transactions (Rs.)	Average number of transactions per day
Q1 2012	-	-	-	-	-	-	-
Q2 2012	10%	37%	27%	12%	36%	21%	12%
Q3 2012	7%	25%	11%	11%	21%	9%	11%
Q4 2012	36%	20%	35%	11%	7%	-3%	11%
Q1 2013	56%	14%	32%	16%	13%	-3%	16%
Q2 2013	45%	10%	72%	9%	1%	-7%	9%
Q3 2013	17%	12%	-3%	16%	29%	11%	16%
Q4 2013	13%	17%	14%	4%	5%	1%	4%
Q1 2014	19%	10%	86%	27%	19%	-6%	27%
Q2 2014	14%	11%	27%	4%	17%	13%	4%
Q3 2014	11%	11%	9%	-8%	15%	23%	-8%
Q4 2014	9%	15%	18%	8%	-1%	-8%	8%
Q1 2015	12%	39%	3%	1.0%	-5%	-6%	1.0%
Q2 2015	10%	44%	24%	37%	43%	4%	37%
Avg	17%	18%	21%	10%	14%	3%	10%

Source: State Bank of Pakistan/Publications/acd/Branchless., accessed on (2015, December 23)



METHODOLOGY

To check performance of banks, both univariate and multivariate analyses have been used in this research. In univariate analysis, significance of difference between means of two categories of banks has been tested by t-test and significance of variance ratio has been tested by F-test statistic. The null and alternative hypotheses in both cases are: -

Ho; there is no significant difference between means/variances of ratios.
Ha; there is significant difference between means/variance of ratios.

In multivariate analysis, to check the impact of branchless banking on banks' performance and on core banking, the following multiple regression has been estimated: -

$$Y_{it} = c + \alpha D_{it} + \sum \beta_i X_{it} + e_{it}$$

Here, Y_{it} is the dependent variable, D_{it} is the dummy variable for branchless banking, X_{it} are other variables and e_{it} is the error term.

For performance purposes, we used two regressions; in one the dependent variable is RoA and in the other, it is RoE. For core banking, the dependent variable is the ratio of interest to non-interest income of banks. In these three regressions, the control variables are net interest margin, advances to assets ratio, total deposits to assets ratio, and administrative expenses to total earning ratio and total deposits to equity ratio.

Construction of Variables

a. **Bank performance:** It is measured by three parameters; return on assets (RoA), return on equity (RoE), and operating efficiency. RoA is calculated as net profit after tax divided by total assets. Total assets of a bank comprise of cash balances, balances with other banks, lending to other banks and financial institutions, portfolio investment in government and corporate securities, advances to general public and physical assets. RoE is calculated as net profit after tax divided by total shareholders' equity. Operating efficiency is calculated as administrative expenses divided by total earning before tax.

b. Core Banking: It is measured by four parameters in univariate analysis; markup margin, total deposits to total assets, advances to total assets and interest to non-interest income ratio. Markup margin is obtained by taking the difference of average markup charged to bank borrowers and average markup paid to depositors. Total deposits in total assets, it is calculated by dividing total deposits by total assets. Similarly advances to total assets ratio is measured by dividing advances to total number of assets. Interest to non-interest income is ratio of total interest income to total non-interest income ratio.

In multivariate analysis RoA, RoE has been used as measure of performance and interest to non-interest income has been used for financial intermediation to check core banking. Then each of these indicators has been regressed on the dummy variable for branchless banking and other control variables such as net interest margin, total deposits to total assets ratio, total deposits to total equity ratio, administrative expenses to total earning ratio and advances to total assets . Each of these regression equations has been estimated by both pooled OLS and fixed effect methods.

Data Sources

In total, data of 10 large commercial banks have been selected. These banks are selected with respect to their assets as reported in the annual reports of State Bank of Pakistan for commercial banks of 2013. Out of these 10 banks, 5 banks such as. Faysal Bank, Allied Bank, Al Habib Bank, Standard Chartered Bank, Meezan Bank are doing exclusively branch banking and the other 5 banks such as Askari Commercial Bank, Bank Alfalah, Muslim Commercial bank, United Bank, Habib Bank are doing both branch and branchless banking. Data for individual banks is taken from their respective balance sheets given in quarterly reports on their websites.

In univariate analysis, at first the data of 5 banks such as Askari Commercial Bank, Bank Alfalah, Muslim Commercial bank, United Bank, Habib Bank doing currently both branch and branchless banking has been compared for pre and post period of branchless banking. Their pre branchless banking period is from 2005Q1 to period they have been doing branch banking exclusively and post branchless banking period is from period they first started branchless banking to 2015Q3. HBL started in 2012Q2, UBL started in 2010Q2, MCB started in 2014Q1 Askari bank started in 2013Q1 and similarly Bank Alfalah started in 2014Q1. Then the data for 5 banks such as Faysal Bank, Allied Bank, Al Habib Bank, Standard Chartered Bank, Meezan Bank doing branch banking only has been taken from 2009Q1 to 2015Q3 and has been compared with that of banks mentioned above doing both branch and branchless banking over the same period.

In multivariate analysis, to check the impact of branchless banking on banks' performance and on core banking, Data of first type of banks has been taken since 2015Q1 to 2015Q3. These banks had been doing only branch banking and period when they have been doing both branch and branchless banking since 2009. But to check impact of branchless banking on all 10 banks, doing branch banking only and banks also doing branchless banking, data from 2009Q1 to 2015Q3 has been taken. In multivariate analysis data has been taken since 2009Q1 to 2015Q3.

Estimation Techniques

Firstly the performance of those banks which are currently doing both branch and branchless banking has been analyzed. So the performance during the pre and post periods has been compared to find out whether it changed due to branchless banking or not. These banks had been doing only branch banking from 2005Q1 till they started to do branchless banking and when they have been doing both branch and branchless banking from quarter they started branchless banking to 2015Q3. The data of these particular banks has been taken from 2005Q1 to 2015Q3. These banks may be called as category A banks.

Secondly, the performance of category A banks which had been doing both branch and branchless banking from 2009Q1 to 2015Q3 has been compared with other 5 banks which had been doing only branch banking over the same period. This latter type of banks may be called category B banks. The quarterly data has been collected from quarterly reports of concerned banks. To check the difference between performances of 5 banks of category A and 5 banks of Category B, different ratios are calculated for all 10 banks. There is also one assumption of data normality is taken while making all these comparison based analysis. Then difference between means and variances were tested for two categories A and B.

Univariate Analysis:

In univariate analysis, at first difference between means of selected measures has been checked through t-test statistic. Similarly F test or variance ratio test is carried out to check

difference between means' significance with equal or unequal variances and to investigate spread of ratios from mean. Additionally, normality is checked by Wilk-Shapiro test and Skewness Kurtosis test (Jarque Bera test with small sample size).

Multivariate Analysis:

Panel data multivariate analysis of these variables has been carried out to check, whether by considering all these explanatory variables and dummy variable of branchless banking at same time, effect significantly on markup margin, return on equity and return on asset.

$$Y_{it} = c + \alpha D_{it} + \sum \beta_i X_{it} + e_{it}$$

Pool data is used for time series cross section observations, one can simply use ordinary least square regression for pool data. In pool data there is a simple assumption that there is no correlation between independent variables and error terms within cross-section terms. Fixed effect model and random effect model estimation has also been carried out considering this limitation of ordinary least square regression. Multivariate analysis is done in two ways, firstly over the time period analysis on 5 banks doing both branch and branchless banking since 2005Q1 to 2015Q3, secondly, for all 10 selected banks, to check impact of branchless banking on different performance indicators and core banking. Wald or F test, Breusch Pagan LM test and Hausman test are used to check which type of regression is more appropriate either fixed effect model or random effect model. Link test has been also used to check appropriate functional form. In multivariate analysis for branchless banking dummy variable is used, 1 is assign number if bank is doing branchless banking in that period. 0 is assigned if bank is not doing branchless banking in that period. Robust standard errors are used to make correct estimation considering heteroskedastic errors in different clusters regarding banks. Different control variables of profitability measures ratios are used like total deposits to total assets, net interest margin, advances to total assets ratio, administrative expenses to total earning before tax ratio and total deposits to total equity ratio are used.

Total Deposits to Assets Ratio this ratio is obtained by dividing total deposits to total assets. It is an indirect measure to check core banking as it shows the first part of financial intermediation.

Net Interest Margin net interest margin can also be used as a control variable for multivariate regression. It shows difference of interest income earned from bank borrowers minus interest paid to depositors divided by total earning from interest.

Advances to Total Assets Ratio advances divided by total assets shows share of advances in total assets ratio this is also indirect measure of core banking.

Administrative Expenses to Total Earning before Tax this ratio was used as control variable as it is used as measure of operating efficiency as it represents non-interest expenses.

Total Deposits to Equity ratio Total deposits to total equity ratio is used as control variable for return on equity it is obtained by dividing total deposits to total equity.

RESULTS AND DISCUSSION

Results of Univariate Analysis

Table 5.1 Results of F-Test Statistic

Measure	Variance for pre-post period				Variance for branch and branchless banks			
	Pre branchless	Post branchless	F value	P value	Branch banks	Branchless banks	F value	P value
RoA	0.0089	0.0072	1.5313	0.0292**	0.0052	0.0072	2.3610	.0030***
RoE	0.1116	0.0994	2.3421	.0064***	0.0123	0.0994	8.3636	.0000***
Admin. exp. to total earning ratio	4.65000	0.8720	28.270	0.0000***	1.1232	0.8720	1.1848	0.3500
Markup margin	0.0153	0.0114	1.8061	0.0099***	0.1010	0.0114	1.2660	0.1900
Deposits to asset ratio	0.1057	0.0416	6.6812	0.0000***	0.0678	0.0416	0.6008	.0064***
Advances to asset ratio	0.0816	0.0574	2.0432	0.0020***	0.0974	0.0574	0.5941	.0000***
Interest to non-interest income ratio	2.0076	1.3273	2.9000	0.0043***	2.8443	1.3273	0.1236	0.4800

***significant at **1%** significance level, **significant at **5%** significance level,*significant at **10%** significance level

a. Performance

As it can be seen from the above table that the variances for RoA, variances of RoE, variances for administrative expenses to total earning ratio, variances for markup margin , variances for total deposits to total assets ratio, variances for total assets ratio for pre and post periods of 5 banks doing currently both branch and branchless banking are significantly unequal. It means that introduction of branchless banking in banks has changed variance of RoA much for the banks which had been doing only branch banking before. Variance of RoA for the post branchless banking period of banks falling in category A is greater than that for banks doing only branch banking. Similarly, introduction of branchless banking for banks has changed RoE for the banks which had been doing only branch banking before. So branchless banking has made significant impact on variances of RoE. In case of administrative expenses to total earning ratio, variance of administrative expenses to total earning ratio of this category is statistically equal to that for banks doing only branch banking . So branchless banking has not made significant impact on variances of administrative expenses to total earning ratio. However, variance of markup margin of this category is statistically not different so branchless banking has not made significant impact on variances of markup margin.

Similarly, branchless banking is significant for variances for advances on total deposits. Finally, there is no significant difference between variance of interest income to non-interest income ratio for banks doing both branchless and branch banking, and 5 banks doing exclusively branch banking as variances are significantly different for banks doing agency banking and banks which are not doing agency banking. Variance for interest income to non-interest income for banks doing both kind of banking has been significantly different for pre and post branchless banking but just on the basis of over the time basis we cannot say that branchless banking has

changed interest to non-interest income ratio as interest to non-interest income is not significantly different from banks doing branch banks only.

Table 5.2 Results of t-Test Statistic

Measure	Means of pre-post branchless banking				Means of branch banks and branchless banking			
	Pre mean	Post mean	t value	P value	Branch banks mean	Branchless bank mean	t value	P value
RoA	0.0103	0.0095	-1.2153	0.2261	0.0085	0.0098	1.4763	0.1400
RoE	0.1485	0.1158	-3.7821	0.0480**	0.1348	0.1146	1.3961	0.1600
Admn. exp. to total earning ratio	2.2316	1.0610	2.9700	.0034***	2.0844	1.7105	-1.2268	0.2234
Markup margin	0.0285	0.0238	-2.6203	.0097***	0.4588	0.4828	1.7634	0.0812*
Deposits to asset ratio	0.7960	0.7930	-0.2289	0.3865	0.7915	0.8002	0.2621	0.1245
Advances to asset ratio	0.5123	0.4756	0.2156	0.1347	0.5654	0.4112	-19.734	.0000***
Interest to non-interest income ratio	6.1900	5.9600	-1.5442	0.1532	6.1400	5.5200	1.0800	0.1500

***significant at **1%** significance level, **significant at **5%** significance level,*significant at **10**% significance level

a. Performance

The above table shows that. RoA for 5 banks doing both branch and branchless banking has not changed significantly for post branchless banking period from quarter they started branchless banking to 2015Q3 compared to pre branchless banking period from 2005Q1 to quarter they were doing branch banking only. It concludes that branchless banking has not changed RoA significantly as means for both comparisons are not significantly different. Results for RoE has been significantly different for banks over time but no significant difference exists for banks doing branch banking only compared to those banks which are doing branchless banking. So considering both results branchless banking has not made any significant impact. Likewise, there is significant difference between means of administrative expenses to total earning before tax ratio for branchless banks pre and post period means as means are statistically unequal. Results for comparison of category show that category of branchless banks mean is insignificantly different from exclusively branch based banks. By considering these earlier mention results we can conclude that administration expense to total earning before tax ratio has not been significantly different which show that branchless banking has no significant effect on non-interest expenses of banks doing such kind of banking. Additionally, there is significant difference between means of markup margin of pre branchless banking period and post branchless banking period for 5 banks doing both branchless and branch banking with 90 percent confidence level with unequal variances. Results show that there is significant difference between means at 10 % significance level so markup margin has changed for banks due to branchless banking.

The t test statistic show that there is no significant difference between means of total deposits to total assets ratio for pre and post branchless banking period for banks doing branchless banking with unequal spreads. So there is insignificant difference between means of deposits ratio due to branchless banking.

The differences between means table results show that advances to total assets ratio for 5 banks doing both branch and branchless banking has not been significantly different for post branchless banking period compared to pre branchless banking period with unequal variances. However, advances to total assets ratio for 5 banks doing both branch and branchless banking for period they started branchless banking to 2015Q3 is significantly different or unequal to mean of advances to total assets ratio of banks doing branch banking only for period 2009Q1 to 2015Q3 with significantly unequal spreads. So considering both results one may conclude that branchless banking has not changed advances to total assets ratio significantly although it has changed its variances. In last row of above table for differences between means table, results show that there is significance between differences of variances of interest to non-interest income ratio for agents based branchless banking for pre and post branchless banking period at 90 percent level of confidence. There is no significance for difference between variances of relative income ratio of banks doing branchless banking from period they firstly started it to 2015Q3 and those banks which are not doing branchless banking from period 2009Q1 to 2015Q3, interest to non-interest income has not changed significantly. So results show that there is insignificant difference for interest to non-interest income ratio due to branchless banking.

Results of Multivariate Analysis

In multivariate analysis, 3 equations were estimated with two different methods; one is the pooled OLS regression and the other is the fixed effect method.

Panel data results for pooled least square regression for pre and post branchless banking suggest that net interest margin has affected RoA as coefficient of net interest margin is highly significant at 99 percent level of confidence and coefficient of net interest margin is 7.0867 for 5 banks doing currently both branch and branchless banking. Deposits to assets ratio has also made significant impact on RoA with coefficient 0.2065 at 95 percent confidence level. But other variables like deposits to equity ratio, advances to assets ratio and administrative expenses to total earning ratio have not affected RoA which is against the theory. Moreover dummy variable showing branchless banking has not made significant impact of RoA of banks which have been doing branchless banking.

Table 5.3 Results of Pooled OLS Regression Model

Variable	Pre -Post branchless banking			Branch and Branchless banking		
	ROA	ROE	II/NII	ROA	ROE	II/NII
Intercept	6.2214 (0.000)***	8.6439 (0.001)***	15.8619 (0.070)*	29.29973 (0.000)***	5.60777 (0.444)	13.2674 (0.014)**
Net interest margin	7.0867 (0.000)***	4.1131 (0.000)***	16.4300 (0.059)*	4.8476 (0.067)*	2.1210 (0.006)***	19.3426 (0.042)**
Deposits to asset ratio	0.2065 (0.044)**	0.1593 (0.510)	0.5735 (0.234)	0.8792 (0.001)***	0.1960 (0.039)**	0.4623 (0.018)**
Deposit to equity ratio	0.4482 (0.643)	0.3038 (0.011)**	5.9119 (0.000)***	0.3326 (0.552)	0.5496 (0.006)***	4.6450 (0.065)*

Advances to asset Ratio	5.0178 (0.113)	0.0614 (0.335)	1.2484 (0.294)	6.2881 (0.181)	0.0657 (0.487)	1.0499 (0.038)**
Admin exp to total earning	-0.0144 (0.694)	-0.2038 (0.017)**	-0.0097 (0.741)	-0.0239 (0.0488)**	-0.1960 (0.867)	-0.0705 (0.337)
Dummy variable	0.0004 (0.548)	0.0849 (0.597)	-1.8425 (0.005)***	0.0003 (0.530)	0.0104 (0.325)	-1.7757 (0.000)***
F-Test	83 (0.0000)***	53 (0.0002)***	39 (0.005)***	47 (0.0000)***	33 0.0004)***	69 (0.000)***
R-Square	0.66	0.68	0.73	0.74	0.43	0.56

*******significant at **1%** significance level, **significant at **5%** significance level,*significant at **10**% significance level

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Similarly for regression for RoE as dependent variable for banks doing both branch and branchless we have results that net interest margin has affected RoE as coefficient of net interest margin is highly significant at 99 percent level of confidence and coefficient of net interest margin is 4.1131 for 5 banks doing currently both branch and branchless banking. Deposits to equity ratio has also made significant impact on RoE with coefficient 0.3038 at 95 percent confidence level and administrative expense to total earning ratio has made negative impact on RoE with coefficient of -0.2038 . But other variables like deposits to assets ratio and advances to assets ratio have not made impact on RoE which is against the theory. Dummy variable showing branchless banking has not made significant impact of RoE of banks which have been doing branchless banking.

Pooled regression results for interest to non-interest income ratio as dependent variable results show that net interest margin, deposits to equity ratio and dummy variable showing branchless banking has made significant impact on interest to non-interest income ratio. Net interest margin and deposits to equity ratio has made positive affect with coefficients of 16.43 and 5.9119 at 90 and 95 percent confidence interval whereas branchless banking has made significant negative impact on interest to non-interest income and its coefficient is -1.8425.In this regression other control variable like deposits to assets ratio and administrative expenses to total earning ratio have not affected relative income ratio.

In pooled OLS regression model by considering both types of banks together we have almost same results as we can see from table that considering RoA as dependent variable there are net interest margin and deposits to assets ratio which have made significant positive impact on RoA whereas administrative expenses to total earning ratio which has significant negative impact on RoA with coefficients of 4.8476, 0.8792 and -0.0239 respectively.

Similarly for same category data, taking RoE as dependent variable we have results that net interest margin, deposits to assets ratio and deposits to equity ratio have made significant positive impact with coefficients of 2.1210, 1.1960 and 0.5496 respectively. Whereas other independent variables have not made any significant impact on RoE. Results for Interest to non-interest income ratio as dependent variable for pooled OLS regression model results for banks with only branch banking and banks doing agency banking, show that net interest margin, deposits to assets ratio, deposits to equity ratio, advances to assets ratio and dummy variable which shows branchless banking have significant impact on interest to non-interest income ratio.Net interest margin has positive impact with 19.3426 coefficient, deposits to total assets ratio has coefficient of 0.4623, deposits to equity coefficient is 4.6450 and advances to assets ratio coefficient is 1.0499.Branchless banking has made significant negative impact on interest to non-interest income ratio and its coefficient is -1.7757.

Table 5.4 Results of Fixed Effect Model

Variable	Pre -Post branchless banking			Branch and Branchless banking		
	ROA	ROE	II/NII	ROA	ROE	II/NII
Intercept	1.0200 (0.000)***	0.0110 (0.031)**	7.3979 (0.000)***	2.3461 (0.003)*	2.0003 (0.369)	16.75 (0.003)***
Net interest margin	0.4086 (0.000)***	2.0767 (0.000)***	10.4513 (0.067)*	3.3618 (0.04)**	3.4994 (0.073)*	19.0305 (0.000)***
Deposits to asset ratio	0.0015 (0.038)**	0.0743 (0.630)	6.5735 (0.234)	0.0902 (0.015)**	0.8653 (0.031)**	0.3189 (0.073)*
Deposit to equity ratio	0.0437 (0.532)	0.0038 (0.011)**	4.6665 (0.004)***	0.0073 (0.605)	0.0128 (0.000)***	0.0772 (0.024)**
Advances to assets ratio	0.0217 (0.448)	0.0161 (0.889)	0.9882 (0.197)	0.0128 (0.432)	0.0962 (0.167)	0.6502 (0.547)
Admn exp. to total earning	-0.0543 (0.199)	-0.3091 (0.054)*	-0.0065 (0.432)	-0.0152 (0.053)*	-0.1533 (0.312)	-3.2023 (0.532)
Dummy variable	0.0008 (0.277)	0.0173 (0.347)	-0.5332 (0.004)***	0.0007 (0.293)	0.0016 (0.899)	-0.7449 (0.001)***
F-Test	78 (0.0000)***	104 (0.0000)***	54 (0.0003)***	112 (0.0000)***	48 (0.0036)***	56 (0.0000)***
R-Square	0.67	0.71	0.74	0.64	0.59	0.43

***significant at **1%** significance level, **significant at **5%** significance level,*significant at **10**% significance level

Results for fixed effect model for panel data are similar to results of pooled OLS regression results as coefficient of branchless banking for return on assets and return on equity are insignificant but significantly negative for interest to non-interest income ratio considering possible problems of heterogeneity in errors and autocorrelation among independent variables and error terms.

Panel data results for fixed effect regression for pre and post branchless banking suggest that suggest that net interest margin has affected RoA and its coefficient is highly significant at 99 percent level of confidence and coefficient of net interest margin is 0.4086 for 5 banks doing currently both branch and branchless banking. Deposits to assets ratio has also made significant impact on RoA with coefficient 0.0015 at 95 percent confidence level. But other variables like deposits to equity ratio, advances to assets ratio and administrative expenses to total earning ratio have not affected RoA which is against the theory. Moreover dummy variable showing branchless banking has not made significant impact of RoA of banks which have been doing branchless banking as pooled OLS results suggest. Similarly for fixed effect regression for RoE as dependent variable for banks doing both branch and branchless we have results that net interest margin has affected RoE as coefficient of net interest margin is highly significant at 99 percent level of confidence and coefficient of net interest margin is 2.0767 for 5 banks doing currently both branch and branchless banking. Deposits to equity ratio has also made significant impact on RoE with coefficient 0.0038 and administrative expense to total earning ratio has made negative impact on RoE with coefficient of -0.3091 . But other variables like deposits to assets ratio and advances to assets ratio have not made impact on RoE which is against the

theory. Dummy variable showing branchless banking has not made significant impact of RoE of banks which have been doing branchless banking. These results regarding significance identical to pooled regression results.

Fixed effect regression results for interest to non-interest income ratio as dependent variable results show that net interest margin, deposits to equity ratio and dummy variable showing branchless banking has made significant impact on interest to non-interest income ratio. Net interest margin and deposits to equity ratio has made positive affect with coefficients of 10.4513 and 4.6665 whereas branchless banking has made significant negative impact on interest to non-interest income and its coefficient is -0.5332.In this regression other control variable like deposits to assets ratio and administrative expenses to total earning ratio have not affected relative income ratio.

In fixed effect regression model by considering both types of banks together we have almost same results as we can see from table that considering RoA as dependent variable there are net interest margin and deposits to assets ratio which have made significant positive impact on RoA whereas administrative expenses to total earning ratio which has significant negative impact on RoA with coefficients of 3.3618, 0.0902 and -0.0152 respectively. Similarly for same category data, taking RoE as dependent variable we have results that net interest margin, deposits to assets ratio and deposits to equity ratio have made significant positive impact with coefficients of 3.4994, 0.8653 and 0.0128 respectively. Whereas other independent variables have not made any significant impact on RoE.

Results for Interest to non-interest income ratio as dependent variable for pooled OLS regression model results for banks with only branch banking and banks doing agency banking, show that net interest margin, deposits to assets ratio, deposits to equity ratio, advances to assets ratio and dummy variable which shows branchless banking have significant impact on interest to non-interest income ratio.Net interest margin has positive impact with 19.0305 coefficient, deposits to total assets ratio has coefficient of 0.3189, deposits to equity coefficient is 0.0772.Branchless banking has made significant negative impact on interest to non-interest income ratio and its coefficient is -0.7449

Considering fixed effect model for both kind of regressions whether over the time period or considering all 10 banks results that those banks which are doing branchless banking have no significant impact on performance but it has negative affect on core banking or more precisely we can say that branchless banking adversely affected core function relative to other banks which have not started banking because banks with agency banking are focusing more toward agency banking for diversification and this change of focus has affected basic function of banks adversely. So core banking which is financial intermediation has been adversely affected due to branchless banking.

Discussion

In univariate analysis results from F test statistic for pre and post banking suggests that branchless banking has significantly affected the variances of performances indicators RoE and administration expenses to total earning and similarly variances of core banking indicators have also been affected significantly as variances are not equal for markup ratio, deposits to assets ratio, advances to assets ratio and interest to non-interest income ratio.

In univariate analysis variance ratio test, to check significance of differences between variances of banks doing branch banking only and those banks which are doing agency banking, show that RoA and RoE variance are significantly different as performance measures. And variances of deposits to assets ratio and variances of advances to assets ratio are significant unequal for

different comparisons of variances for core banking measures. In univariate analysis for difference of means for pre and post branchless period analysis, our results indicate that RoE and administrative expenses to total earning ratio means are significantly from performance indicators and markup margin means are different from core banking measures. And other measures means of performance and core banking has not been significantly different for pre and post branchless banking period. In univariate analysis for differences between means of different category banks comparison, our results show that performance measures RoA, RoE and administrative expenditures to total earning ratio are statistically equal and core banking measures results show that markup margin means and advances to assets ratio means are significantly different.

In multivariate analysis, considering pooled ordinary least square regression and focusing on performance indicators like RoA and RoE, our results show that branchless banking has not significantly affected performance of banks as coefficients of dummy variable has insignificant coefficient for both type of regressions either we take pre and post branchless banking period data or we consider all 10 banks data.

In multivariate analysis, results for fixed effect model are identical to pooled OLS regression for performance indicators as dummy variable coefficient is statistically insignificant considering RoA and RoE as dependent variable for both kind of data sets. So on the basis of insignificance of coefficient of dummy variable we can say that branchless banking has not made impact on performance. Results for pooled OLS in multivariate analysis, show that interest to non-interest income ratio (a measure of core banking) has been significantly affected by branchless banking. In pooled OLS coefficient of dummy variable is significant and with negative sign. It means that branchless banking has adversely affected interest to non-interest income ratio which indirectly means that core banking has been affected negatively by agency banking considering both over the time and across categories comparison..

Fixed effect regression model for core banking results identical outcome for branchless banking if we take interest to non-interest income ratio as dependent variable. Coefficient of dummy variable is significant and showing negative sign for both over the time period data set and across categories both regressions suggest that branchless banking is negatively affecting branchless banking.

Now considering all these results together for univariate analysis and multivariate analysis we can say on the basis of univariate analysis that although branchless banking has significantly changed variability or variances of performance and core banking ratios but it has not made significant impact on performance and on core banking either we consider pre and post branchless banking period or we compare it with other banks doing branch banking only. In multivariate analysis we may conclude that branchless banking has not made significant impact on performance of banks but it has definitely negative impact on interest to non-interest income of banks can be considered as financial intermediation which is core function of banking.

CONCLUSION

The data of 5 commercial banks for pre and post periods of branchless banking and data of banks doing only branch banking till to date with that of doing both has been collected. The univariate and multivariate analyses have been carried out on the collected data. In univariate analysis, the difference between means and variances of 3 indicators of performance such as return on assets, return on equity and administrative expenses to total earning ratio and 4 indicators of core banking such as markup margin, total deposits to total assets ratio, advances to total assets ratio and interest to non-interest income ratio have been compared. In multivariate

analysis, the performance and core banking indicators have been regressed on branchless banking and other control variables such as net interest margin, total deposits to total assets ratio, deposits to equity ratio, and advances to total assets ratio and administrative expenses to total earning ratio. The multiple regressions have been estimated both by pooled OLS and fixed effect methods.

In univariate analysis our results have shown that branchless banking has not made any significant effect on performance of banks as differences between for RoA, RoE and administrative expenses to total earning ratio but it has changed significantly variances of performance ratios for both pre and post branchless banking period and also relative to other banks doing branch banking only. Similarly univariate analysis shows that branchless banking has not made any significant on core banking function but it has changed spreads from mean of financial ratios.

In multivariate analysis we have identical results to univariate analysis for performance measures that branchless banking has not made significant on performance, which have been derived from both pooled ordinary least square regressions model and fixed effect model. But our multivariate analysis results for core banking measure, which is interest to non-interest income ratio, show that branchless banking has made negative impact on core function of banks which is contradictory result to univariate analysis.

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