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https://www.emerald.com/insight/0972-9968.htm

Received 12 January 2022
Revised 8 March 2022
Accepted 29 April 2022

Bank branch outreach and access to banking services toward financial inclusion: an experimental evidence

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Abstract

Purpose – Both branch and automated teller machine (ATM) are playing a crucial role in banking coverage expansion in India. People prefer to go to an ATM for withdrawal of money rather waiting in a queue for hours at a branch. Without the existence of a full-fledged brick-and-mortar branch, ATM also plays an important role by providing basic banking services. In India, a significant part of the population is excluded from banking access. The present study aims to investigate how the branch and ATM penetration influence financial inclusion.

Design/methodology/approach – The study covers the period from 2008–2009 to 2019–2020. With the application of Welch's *t*-test, a comparative study is being conducted between branch and ATM. Further, with the application of regression analysis, the study analyses how the branch and ATM network expansion influence financial inclusion.

Findings – Though in recent times customers prefers to visit an ATM and its growth rate is higher than branches, the study found no significant differences between the growth of branch and ATM. Further, results of regression show both branches and ATMs have significant impacts on financial inclusion.

Originality/value – In micro concept both have a common role in respect of service provided to customers. While in macro concept a list of specific services can be provided through branch level only. This study has a significant role, considering the importance of branches or ATMs and cost of installing a physical branch.

Keywords Financial inclusion, Commercial bank, Automated teller machine, Bank branch

Paper type Research paper

1. Introduction

Access to finance is essential not only for maintaining and improving social-economic status but also is essential for meeting all needs (Dangi, 2013; Maity and Sahu, 2018a). A significant share of population is excluded from available banking services (Rafiq and Adewale, 2019). As such regulators have taken many initiatives both from demand side and from supply side. Without having an account people do not save for future purchases, child education and to invest for retirement, or avoid high-interest payments and fees. A formal account in a bank or in a post office can stimulate saving and open access to credit. It makes it easier to transfer wages, remittances and government payments. The public sector, private sector, regional

JEL Classification — G11, G23

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Rajagiri Management Journal
Vol. 17 No. 2, 2023
pp. 170-182
Emerald Publishing Limited
e-ISSN: 2633-0091
p-ISSN: 0972-9968
DOI 10.1108/RAMJ-01-2022-0004

rural and cooperative banks, etc. have the responsibility to spread their services in metropolitan, urban, semi-urban and rural areas to strengthen the economy of households thereby the nation.

Banks started the journey of financial inclusion since 1969 and 1980 through bank nationalization. Rest of the banks that are not nationalized were termed as private sector banks (PVBs). From 1993 again Reserve Bank of India (RBI) has started granting license to PVBs for expansion of branches and minimization of population per branch. Other than public sector banks (PSBs) and PVBs, regional and cooperative banks have also expanded their networks in semi-urban and rural areas to expand banking services.

Regulators have considered automated teller machine (ATM) and branch networks as the most important indicators of penetration of banking services. Today, the world is suffering from Covid-19 pandemic and the Indian Government has imposed rigorous lockdown regulations. The present Covid-19 pandemic is continued for over one and half year that encourages business organizations and financial institutions to work from home (WFH). The WFH reduces staff at bank branches which ultimately limits the banking transactions by the customers. The people getting social benefits under direct benefit transfer (DBT) during pandemic are waiting for hours outside the bank's branches for withdrawing a small amount. In the present study, researchers have analyzed financial inclusion status through banking coverage expansion by way of branch and ATM.

2. Review of literature

The Indian banking sectors expanded their banking coverage at a great extent throughout the country. With nationalization in 1969 and 1980, banking services were extended to the neglected areas. Mobilization of deposits from the vast public and extension of funds to the priority sector was identified as the major objectives (Maity and Sahu, 2018a; Sahu *et al.*, 2021). It also ensures access to credit for people who depend on informal means (Chakravarty and Pal, 2013). The regulators have found that coverage of banking services to be expanded rapidly either in branch mode or ATM mode. Further, to minimize load on a branch or due to cost control initiative banks are more interested to open an ATM. This also helps the customers by providing services at real time basis. The present situation of Covid-19 is also drastic with coronavirus cases as third in the world. The present lockdown due to Covid-19 pandemic is continued for over one and half year and many of us have no idea when we all will escape from this situation. To maintain the social distancing to stop spreading the virus among the communities we should not visit the bank branches regularly . Further, bank branches have changed their working schedule with restrictions of customers in entering the branches. So it may safe to visit an ATM for banking services or access to other electronic modes of banking rather than visiting a bank branch.

Indian policy makers have continually adopted several measures to institutionalize the financial framework. Accordingly, large numbers of research studies have been conducted among policy makers, researchers and other stake holders. By introduction of ATMs, banks have enabled its customers to have more independent access to their bank accounts (Chatterjee, 2020). It made customers less dependent on the working schedule of branches or their location. Similar to banking branches' network, bank's ATM network increases with size (Golubić, 2019). Bhat and Bhat (2013) have investigated comparative growth of ATMs (onsite and offsite) of different bank groups. They used an exponential growth model (2005–2011) and concluded that ATM network is expanding at a rapid pace and will continue to grow in the days to come, as this mode of delivery channel is becoming widely accepted for accessing banking services. Thus, ATMs would be the "future of banking' and traditional branches may not grow as fast as the ATM networks grow. Their result indicates that a day may come when traditional branches would be a thing of past. Further, Pathania *et al.* (2016)

have found that new ATMs provide access to financial services. Alama and Ausina (2012) concentrate on the socio-economic variables that may have influenced the decisions to expand geographically. Their analysis may help develop further insights into relevant topics like access to finance. Evanoff (1988) indicates accessibility improved in branching.

According to Burgess and Pande (2005) banks favor branches in urban areas, while state-led bank target of opening branches in rural areas. Further, access to bank is associated with improved access to mortgages loan in low-income areas (Ergungor, 2010). Mahadeva (2009) has stated that most banks in rural areas only exist to fulfill the government's or the RBI's norms, rather than to actually engage in promoting rural business. According to Burgstaller (2013), more banks are located in regions with a higher population and therefore higher demand for banking services. Banks are significantly more represented where income per capita is higher. Further, Jalaludeen (2014) has identified districts having existing branches with more business targeted to more new branches. The analysis reveals initiatives of financial inclusion influenced more branch expansion.

Maity and Sahu (2018b) also found existence of financial inclusion disparity between the regions and states in India. Further, Maity (2019), Maity and Sahu (2021) and Ghosh and Sahu (2021) have also found existence of disparity in financial inclusion. Sharma (2016) in her study suggested positive nexus between geographic/demographic outreach of ATMs/branches and growth of Indian economy. Also, Ghosh (2011) has supported the constructive effect of financial outreach on economic development. The branch and ATM drive the wheels of an economy by providing easy financial access to borrowers and savers. According to Maity and Sahu (2019) expansion of branches is essential for the sustainability of and to reach the excluded population.

The previous studies notice that even developed countries with well-developed financial systems like in the USA and the UK have not succeeded to provide formal financial services to all population. A major percentage of populations in these developed countries remain outside of financial systems (Maity and Sahu, 2020a). Apart from institutional support, modern technologies play an important role for including the unbanked and financially excluded population into the mainstream by introducing ATM services. Besides the above literature studies of Liao *et al.* (1999), Wan *et al.* (2005), Kadir *et al.* (2011), Dangi (2013), Okafor and Ezeani (2012), Mwatsika (2014), Rahman and Akhtar (2018), and Vennila and Rathnaraj (2018) also highlighted that ATM was the most frequently adopted channel compared to branch banking and other technology driven services.

The research on financial inclusion has been popular since last two decades. Due to change of technology, people are now not only dependent on bank branches for various banking services but also several electronic modes of banking. The previous studies mostly considered branches as an indicator of it. However, ATM also plays a role in banking coverage expansion. Limited studies have been undertaken with national level data, rather with only a few selected regions. So, it fills the gaps that existed in the earlier studies and provide a more generalized opinion.

2.1 Objectives and hypotheses of the study

The prime objective of the study is to explore how the branch and ATM penetration influence financial inclusion. The study considers the following:

(1) To examine the trend of supply side dimensions of financial inclusion.

(2) To analyze the impact of branch and ATM network expansion on financial inclusion.

Based on the previous discussion and research objective, the first null hypothesis (H_{01}) is that there is no significant difference between branch and ATM in banking coverage expansion and the second null hypothesis (H_{02}) is that branch and ATM network expansion do not have any significant impact on financial inclusion.

3. Data and research methodology

3.1 Data

The required information sources are secondary in nature from the database on Indian Economy, RBI. The present study covers 12 years from 2008–2009 to 2019–2020 and it is desired to work on the basis of sufficient data so that the results become reliable. The study considers this period to be long enough to assure the adequacy of data.

3.2 Description of variables

A bank account is a primary requirement that enables access to any banking service or product (Mahadeva, 2008; Fungacova and Weill, 2014; Maity and Sahu, 2018b) and branch and ATM are the indicators of the outreach of banking services (Chakravarty and Pal, 2013). According to Shafi and Medabesh (2012) all households/adults should have a bank account for making and receiving payments and parking savings through deposits and insurance. Around the world, people having an account at financial institutions' serve as an entry point into financial sector (Kodan and Chhikara, 2011; Kunt and Klapper, 2013).

Higher penetration of branch (Kumar, 2013) and ATM (Bhat and Bhat, 2013) reflects easier access to financial services (Beck *et al.*, 2007). To reduce the overload at branches it is easier to set up an ATM either in the same premises to minimize the overload of the branch or in different places to cover the excluded areas. The study considers three parameters to measure trend of branch and ATMs and significant difference between them. These are number of branches and ATMs, geographic penetration per 1,000 km^2 and further demographic penetration per million population. Following these researchers have measured trend equations with branch and ATM as dependent variables separately and time (T) as an independent variable.

In the second part, with respect to the objectives, researchers have considered two dependent variables, viz. deposit and credit account per capita. In line with Kodan and Chhikara (2011), Shafi and Medabesh (2012), Kumar (2013), Sharma (2016), Maity and Sahu (2018b), Maity (2019), and Ghosh and Sahu (2020) deposit accounts and credit accounts considered as endogenous variables. How these two accounts are distributed among population, i.e. deposit account per capita ($Deposit_{a/c\text{-}pc}$) and credit account per capita ($Credit_{a/c\text{-}pc}$) have been considered as dependent variables. The study considers two independent variables, viz. branch per km^2 ($Branch_{sqkm}$) and ATM per km^2 (ATM_{sqkm}). How branch and ATM are distributed throughout the region in India, these two explanatory variables are measured in terms of $Branch_{sqkm}$ and ATM_{sqkm}.

3.3 Statistical tests used

A two-sample test is used to check the difference between means of branch and ATMs. The Welch's t-test (or unequal variances t-test) and Levene's test for equality of variance have been tested to check the homogeneity assuming the following unequal variances:

$$W = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

To check the critical value, Degree of freedom (d.f.) is calculated as follows:

$$\text{d.f.} \approx \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\left[\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}\right]}$$

where $\overline{X_1}$ = Mean of first sample; $\overline{X_2}$ = Mean of second sample; s_1^2 = Variance of first sample; s_2^2 = Variance of second sample; n_1 = First sample size; n_2 = Second sample size; and W = Welch's t-test. To capture the growth rate, researchers have also applied trend equations. To find out the impact on number of accounts per capita, researchers have conducted regression analysis. Regression is a method for examining relationships between dependent and independent variables and for hypotheses testing. Both bivariate and multiple regression are used depending upon the number of explanatory variables. The problem of multicollinearity, if any, among the explanatory variables, is checked in terms of Variance Inflation Factor (VIF). The technique of regression is used to find the equation that represents relationship between variables. The regression equations are as follows:

$$\mathrm{D} = \mathrm{a} + \mathrm{A} + \mathrm{B} + \mathrm{u} \tag{1}$$

where, D represent deposit account per capita, a = intercept, A = ATM per km^2, B = branch per km^2, and u = error term.

$$\mathrm{C} = \mathrm{a} + \mathrm{A} + \mathrm{B} + \mathrm{u} \tag{2}$$

where, C represent credit account per capita, a = intercept, A = ATM per km^2, B = branch per km^2, and u = error term.

In order to calculate growth rate of branch, ATM, geographic penetration and demographic penetration, the compound annual growth rate (CAGR) has been calculated.

4. Analysis and findings

4.1 Trend of branch and ATM

In this section, a comparative statistics of branch and ATM has been measured. Further, separately geographic penetration and demographic penetration between branch and ATM have been presented to draw a suitable comparison between the modes of banking. The strong positive upward direction is an indication of improvement of financial inclusion from supply side dimension. As availability of banking service within the coverage area or easy to access help to decide for opening of bank accounts, the number of branches have been grown from 79,887 in 2008–2009, to 149,977 in 2019–2020 and ATMs grew from 42,597 in 2008–2009, to 210,760 in 2019–2020. The CAGR of branch is 5.89% and CAGR of ATM is 15.65%. Table 1 also shows the positive trend of both geographic and demographic penetration of these two banking modes. Branches per 1,000 km^2 has increased from 24 in 2008–2009 to around 46 in 2019–2020, i.e. total branches increased to 149,977 and ATMs per 1,000 km^2 has increased from 13 in 2008–2009 to around 64 in 2019–2020, i.e. total ATMs reached to 210,760. In respect of demographic penetration, branches per million of population has increased from 68 in 2008–2009 to around 107 in 2019–2020 and ATMs has increased from 36 to around 150 during the period. A closer look at Figure 1 reveals a remarkable increase of branches and ATMs in certain years. For instance between 2012 and 2013 to 2015–2016, number of branches increased by 27.27%, representing almost 29,065 additional branches and ATMs increased by 74.6%, representing almost 85,085 additional ATMs. Now banks are very much interested to open ATMs instead of a new branch due to cost cutting in their balance sheet. Given the fact that banks are in process of introduction of ATMs and this would help them to facilitate improved customer service.

The study uses Welch's t-test to determine differences if any between the parameters of banking coverage from supply side dimensions. This test is more appropriate than t-test in the situation of unequal variances. The Levene's test clarifies that the requirement of homogeneity is not met and rejects that the variances of the data sets are equal. According to Welch's t-test in Table 2, there is no significant difference in respect of total, geographic and demographic penetration of branch and ATM. Accordingly, null hypothesis is accepted ($p > 0.05$) and the alternative hypothesis is rejected. This concludes that both branch and

Year	Number		Geographic penetration per 1,000 km2		Demographic penetration per million population	
	Branch	ATM	Branch	ATM	Branch	ATM
2008–2009	79,887	42,597	24.3	13.0	68.2	36.4
2009–2010	85,160	59,127	25.9	18.0	71.5	49.7
2010–2011	90,909	73,138	27.7	22.2	75.1	60.4
2011–2012	98,620	95,686	30.0	28.7	80.2	76.6
2012–2013	106,578	114,014	32.4	34.3	85.3	90.2
2013–2014	118,006	160,055	35.9	48.3	92.9	125.0
2014–2015	126,691	181,398	38.5	54.8	98.1	139.5
2015–2016	135,643	199,099	41.3	60.2	103.3	150.8
2016–2017	140,685	208,354	42.8	63.4	105.5	156.2
2017–2018	143,191	207,052	43.6	63.0	105.6	152.7
2018–2019	146,028	202,196	44.4	61.5	106.0	146.7
2019–2020	149,977	210,760	45.6	64.1	107.1	150.5
Mean	118447.9	146123.0	36.0	44.3	91.6	111.2
S.D.	25428.6	64905.3	7.7	19.7	14.8	45.4
Kurtosis	−1.6	−1.6	−1.6	−1.6	−1.6	−1.5
Skewness	−0.3	−0.5	−0.3	−0.5	−0.4	−0.6
Minimum	79887.0	42,597.0	24.3	13.0	68.2	36.4
Maximum	149977.0	210760.0	45.6	64.1	107.1	156.2
Count	12	12	12	12	12	12

Source(s): Calculated by Researchers

Table 1. Descriptive statistics

ATM have played a significant role in the expansion of banking coverage. Further, the mean values of branch are significantly lower than ATM. This accomplishes that now banks are going to opening more ATMs than branches to expand banking coverage.

In this part, researchers have examined the trend of growth of branch and ATM of commercial banks. Based on the objectives of the study, trend equations have been obtained with branch and ATM as dependent variables separately and time (T) as an independent variable. In Table 3, it observed that coefficient of determination is 97.43% and 91.13% for branch and ATM respectively. The independent variable, i.e. time has explained up to 97.43% and 91.13% of variation. The F – values are 379.42 and 102.72 which is significant at 1% level ($p < 0.005$). Hence, the overall regression model is fitting properly in deciding the branch and ATM of commercial banks. Further, a trend equation has been obtained which is a linear growth curve, i.e. BRANCH = 6.9615xT + 73.198 with growth rate of 6.13% and ATM = 17.184xT + 34.424 with growth rate of 14.55% which is very high, considering the yearly growth from 2008–2009 to 2019–2020. The study finds favorable growth of different banking penetration including geographic and demographic. The expansion of ATM finds a higher growth than expansion of branch.

4.2 Impact of branch and ATMs expansion on financial inclusion

The literature review, various RBI reports and individual bank annual reports reveal that the banks, RBI and Government have taken many initiatives to cover regions with branches or ATMs and by any other mode. Branch and ATMs are principal interfaces between banks and public and support the economic activities of the state or region. As more the supply more will be the demand. People will open a savings or credit account if the access is easier within a short distance with minimum time period. To check, whether branch and ATMs expansion significantly impact on financial inclusion and to measure how branches and ATMs significantly impact on it, the researchers have run bivariate and multiple regression with

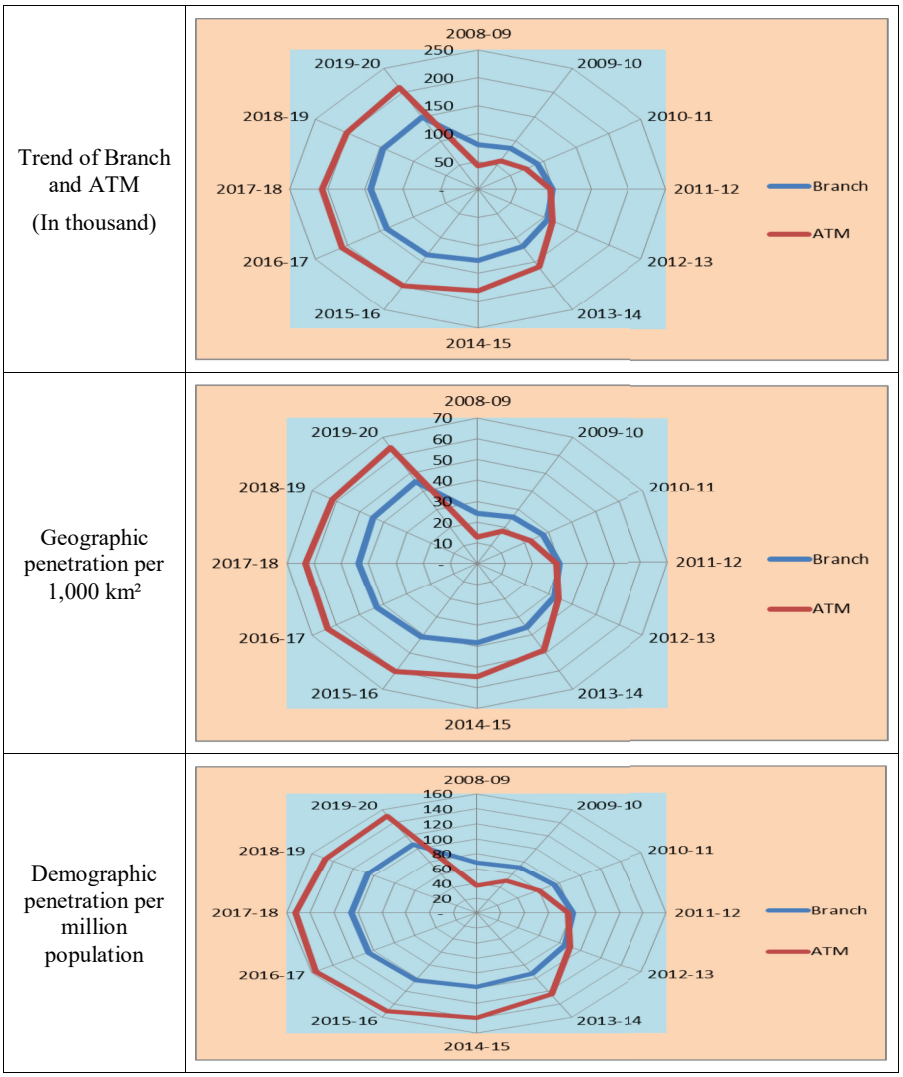

Figure 1.
Trend of branch and ATM of commercial banks

Source(s): Prepared by Researchers

endogenous variables of $Deposit_{a/c\text{-}pc}$ and $Credit_{a/c\text{-}pc}$ separately with common explanatory variables of $Branch_{sqkm}$ and ATM_{sqkm}. Now banks are very much interested to open ATMs instead of a branch due to cost-effectiveness. And as a result number of ATMs increases at a higher growth rate than number of branches. So, ATM_{sqkm} is one another explanatory variable. To find, whether branch and ATM affect the opening of $Deposit_{a/c\text{-}pc}$ and $Credit_{a/c\text{-}pc}$, two sets of regression have been applied separately considering $Deposit_{a/c\text{-}pc}$ and $Credit_{a/c\text{-}pc}$ as dependent variables.

Table 4 reveals the regression results considering $Deposit_{a/c\text{-}pc}$ as a dependent variable and $Branch_{sqkm}$ and ATM_{sqkm} as independent variables. The analysis expresses that,

Variables	Leven's test	Result of Welch' *t*-test	Null hypothesis (H_0)
Total Branch and ATM	9.340 (0.003)	1.375 (0.190)	There is no significant difference between branch and ATM in banking coverage expansion
Geographic penetration of Branch and ATM per 1,000 km^2	21.810 (0.000)	1.350 (0.198)	
Demographic penetration of Branch and ATM per million population	28.952 (0.000)	1.426 (0.177)	Result: H_0 cannot be rejected

Note(s): The values in parenthesis represent the *p*-values
Source(s): Calculated by Researchers

Table 2. Result of Welch' *t*-test

	Branch	ATM
Trend Equation	BRANCH = 6.9615xT + 73.198	ATM = 17.184xT + 34.424
Growth Rate (%)	6.13	14.55
R^2	0.9743	0.9113
Adjusted R^2	0.9718	0.9024
F (Significance)	379.4179 (0.000)	102.7196 (0.000)

Source(s): Calculated by Researchers

Table 3. Trend equation of branch and ATM of commercial banks

Variables	Model I (*t*-value)	Model II (*t*-value)	Model III (*t*-value)
Intercept	−0.426** (−2.810)	0.323* (3.795)	−0.170 (−2.235)
BRPSK	37.600* (9.298)	–	21.849* (7.141)
ATMPSK	–	15.307* (8.112)	7.813* (6.191)
R^2	0.915	0.892	0.987
Adjusted R^2	0.905	0.878	0.983
Mean VIF	1.000	1.000	3.243
F	86.445	65.811	264.029
Prob > *F*	0.000*	0.000*	0.000*

Note(s): * Significant at 1 per cent level, ** Significant at 5 per cent level
Source(s): Calculated by Researchers

Table 4. Regression analysis (dependent variable: Deposit account per capita)

$Branch_{sqkm}$ solely can explain about 91.5% of $Deposit_{a/c\text{-}pc}$. The value of *F* statistics is 86.445 and *p*-value of *F* statistics is 0.000 i.e. <0.01. It indicates Model-I is fit for the study. The study shows $Branch_{sqkm}$ has significant positive impact on $Deposit_{a/c\text{-}pc}$ (i.e. 37.600). Further, individually ATM_{sqkm} can explain about 89.2% of $Deposit_{a/c\text{-}pc}$. The value of *F* statistics is 65.811 and *p*-value of *F* statistics is 0.000 i.e. <0.01. It indicates Model-II is fit for the study and ATM_{sqkm} has a significant positive impact on $Deposit_{a/c\text{-}pc}$ (i.e. 15.307). Both $Branch_{sqkm}$ and ATM_{sqkm} jointly can explain about 98.7% of $Deposit_{a/c\text{-}pc}$. The value of *F* statistics is 264.029 and *p*-value of *F* statistics is 0.000 i.e. <0.01. It indicates the Model-III is also fit for the study. The result reveals that jointly both $Branch_{sqkm}$ and ATM_{sqkm} have a positive effect on $Deposit_{a/c\text{-}pc}$ (i.e. 21.849 and 7.813 respectively).

Table 5 reveals the regression results considering $Credit_{a/c\text{-}pc}$ as a dependent variable and $Branch_{sqkm}$ and ATM_{sqkm} as independent variables. The analysis expresses that, $Branch_{sqkm}$ individually explains about 82.0% of $Credit_{a/c\text{-}pc}$. The value of *F* statistics is 36.511 and *p*-value of *F* statistics is 0.000 which is below 0.01. It indicates that Model-I is fit for the study. It reveals that $Branch_{sqkm}$ has positive and significant impact on $Credit_{a/c\text{-}pc}$ (i.e. 1.976).

*F*urther, individually ATM_{sqkm} explains about 59% of $Credit_{a/c\text{-}pc}$. The value of *F* statistics is 11.505 in this model and *p*-value of *F* statistics is 0.009 which is below 0.01. It indicates that Model-II is fit for the study. This Model indicates that ATM_{sqkm} has a significant positive impact on $Credit_{a/c\text{-}pc}$ (i.e. 0.691). Moreover, jointly $Branch_{sqkm}$ and ATM_{sqkm} can explain about 82.1% of $Credit_{a/c\text{-}pc}$. The Model-III is also fit because value of *F* statistics is 16.051 and *p*-value of *F* statistics is 0.002 i.e. <0.01. And jointly both $Branch_{sqkm}$ and ATM_{sqkm} have a significant positive impact on $Credit_{a/c\text{-}pc}$ (i.e. 1.888 and 0.043 respectively).

5. Results and discussion

The Welch's *t*-test finds that results are not significant at 5% level. In this context, researchers conclude that there is no significant difference between branch and ATM in banking coverage expansion including geographic and demographic penetration. Further, CAGR and trend equation show that expansion of ATM finds a significantly higher growth rate than expansion of branch. The trend equations also find positive growth of branch and ATM due to change of time. Further, it is evident that deposit and credit accounts are positively related with branch network expansion. Thus, financial inclusion and branch expansion in the form of physical branch and ATMs are interlinked. Hence, results in both Table 4 and Table 5 reveal that null hypothesis "expansion of branch and ATM network do not have any significant impact on financial inclusion' is rejected and it can be said that both will ultimately fulfill the target of financial inclusion.

This finding is consistent with previous study of Ansong *et al.* (2015) in the Ghana context; Burgess *et al.* (2005), Mahadeva (2008), Kumar (2013), Kundu (2015), Pathania *et al.* (2016) and Maity and Sahu (2018b) in Indian context; Collard (2007) in UK context; Evanoff (1988) in US context; Alama and Ausina (2012) in the Spanish context; Beck *et al.* (2007) and Ergungor (2010) in different countries, that opening of new branch and or new ATM provide access to financial services.

6. Conclusion and recommendations

The fundamental challenges of any developing country is to ensure a satisfactory level of economic growth which ensures the capabilities of citizens to fulfill their basic necessities, sponsors their educational and social developments, permits them to cultivate and nurture their skills and abilities and provide them sufficient economic freedom to survive and flourish. So, sound economic health and steady growth rate no doubt becomes first priority for any emerging economy. To develop the economic status every citizen needs to keep their savings at safe custody with fixed or regular interest income from their savings. And on the

Table 5. Regression analysis (dependent variable: Credit account per capita)

Variables	Model I (*t*-value)	Model II (*t*-value)	Model III (*t*-value)
Intercept	0.039** (3.223)	0.084* (9.082)	0.041** (2.624)
BRPSK	1.976* (6.042)	–	1.888** (3.006)
ATMPSK	–	0.691* (3.392)	0.043 (0.167)
R^2	0.820	0.590	0.821
Adjusted R^2	0.798	0.539	0.770
Mean VIF	1.000	1.000	3.243
F	36.511	11.505	16.051
Prob > *F*	0.000*	0.009*	0.002*

Note(s): * Significant at 1 per cent level ** Significant at 5 per cent level
Source(s): Calculated by Researchers

other side business entities and entrepreneurs require credit at a nominal interest rate as per the government norms (Maity and Sahu, 2020b; Sahu *et al.*, 2021). The government also wants to transfer various subsidies directly to bank account. All these can be fulfilled by having a formal account in a financial institution.

Branch and ATM are the prime intermediation between banks and public (Beck *et al.*, 2007). Thus both are playing an important role in the expansion of banking services. The present study shows ATMs increase at a higher rate than number of branches. The reason may be due to low office space, no requirement of operational bank staff, operation can start in very short while, etc. which ultimately leads to low cost. Though, the results of Welch's *t*-test show that these two modes of banking have no significant difference in banking coverage expansion. The trend equations also find positive growth of banking coverage due to change in time. Following this, the study further finds that both the physical branch and ATM have a significant role in financial inclusion. Both demand and supply sides are expanding at a large scale and further building a financially inclusive society (Ansong *et al.*, 2015). But this branch based banking may change due to technological innovations (Bhat and Bhat, 2013; Sahu and Maity, 2021). New technology has made it easier for clients to access financial services and cheaper for providers to develop and deliver them (Imboden, 2005; Singh and Singh, 2016). Still people prefer to visit physical branch or ATM rather than banking services through various technology innovative devices. People living in urban or metropolitan areas may have no problem in accessing banking services due to high penetration of banks offices or branches (Maity and Sahu, 2017). In a developing country like India, where there are more than 0.6 villages with various infrastructure problems, it is a big challenge.

The world is toiling through an enormous challenge posing threat to life and economy as an outcome of Covid-19 pandemic (Maity *et al.*, 2020). Intending to prevent the spread of Covid-19 through ensuring social distancing, the Government has announced phase-wise lockdown. Due to prolong lockdown, business organizations and financial institutions are looking for work from home for their employees. So the share of bank employees reduces significantly compared to the pre-lockdown situation. As a result customers' services in a branch get significantly hampered. As per government norms to maintain social distancing, customers are restricted to enter the branch together, in this situation, ATM and other electronic modes are more suitable than a bank branch. From the banks' point of view, it also saves costs. So banks may take initiative to open more ATMs to improve banking services and improve their financial conditions. The regulators may direct a minimum number of ATMs with each branch to be opened in non-banking areas to cover a particular radius. The establishment of new branches or ATMs should be in a proper location and more accessible to unbanked people.

The infectious Corona disease impacts all the people around the globe. In this Covid-19 pandemic situation, people are very much afraid to visit either a branch or ATM, and rather choose online banking transactions. The present study considers only branch and ATM as supply side dimensions of financial inclusion. Other than branch and ATM, people are using Internet banking and mobile banking either through computers or smartphones. Indeed, more research is needed to be undertaken in the field of technology-based banking services. Further, the study may be conducted using primary data for the effectiveness of various technology-based banking rather than physical branch mode.

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