

Determinants of digital financial inclusion in India: Evidence from the World Bank's global finindex database

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Abstract

The current study explores the determinants of digital financial inclusion (DFI) in India and also examines the influence of demographic characteristics on the accessibility and usage of digital financial inclusion. The data for this study was collected from the World Bank Global Financial Inclusion (Global Findex) database to find the determinants of digital financial inclusion from India's perspective. The study measured the accessibility and usage of digital financial inclusion in relation to selected demographic characteristics such as gender, age, income, education and employment status. The findings of the study revealed that individual's socio-demographic factors such as gender, age, education, income and employment status have found a significant influence on the accessibility of digital financial inclusion. In addition, these factors have significant effect on usage of digital mode of financial transactions such as payments made and receipts through mobile phone or using the internet. The study provides valuable insights to the policymakers and service providers to improve the status of digital financial inclusion.

1. Introduction

The global need of today is social transformation through technological means to overcome the inequality in the accessibility of digital services. As per the UNDP Sustainable Development Goals (SDGs), the status of innovation in technology and digitized services, more than 4 billion people still do not have access to the Internet, and 90 per cent are from the developing world. Hence, bridging the digital divide is crucial to ensure equal access to digitalized services through digital financial inclusion. In order to create an inclusive growth, economic, technological and social transformations are greatly influenced by the advancements in emerging technologies. Specifically, digital technologies have played an ample role in improving the penetration of the banking and financial services in the emerging markets (Al Nahian Riyadh et al. 2009; Asongu & Moulin, 2016; Martins et al. 2014; Parameswar et al. 2017; Salim et al. 2010). Consequently, the digital era is characterized by the technological innovation, which ensures both social and economic transformations with an advantage of knowledge about new technology (Shepherd, 2004). In addition, the application of digital technology tools, for accessing various financial services, influences the quality of life and social inclusion of individuals (Tsatsou, 2020). Therefore, while reaching out to billions of new consumers, the service providers viz., banks and non-banking financial institutions, have been offering digital financial services using a mobile phone or other digital technology devices. This in turn, derives benefits from initiatives of digital financial inclusion (Lyman & Lauer, 2015).

Historically India's financial services industry has been undergoing rapid transformation. The financial institutions have initiated various innovative products and services to be offered to customers using state-of-the-art technological channels (Chaudhuri, 2012; Erumban & Das, 2016; Leeladhar, 2006; Mahajan & Ramola, 1996). Also, a significant development in India's financial services industry is facilitating flexible payment methods and easy access to services offered by digital platforms such as mobile banking, mobile wallets, internet banking, and bank cards etc. (Madan & Yadav, 2016; Priya *et al.*, 2018). Furthermore, the adoption of smartphone-supported mobile payment applications has paved the way for mobile financial services (Laukkanen, 2016; Lee *et al.*, 2012; Klein & Mayer, 2011). This facilitated the customers to involve in comfortable financial transactions at any time using their mobile for money transfer between two parties, bill payments for online shopping, and other services (Chawla & Joshi, 2019; Deb & David, 2014).

However, it has been witnessed that Government of India (GoI) has brought various technology-based initiatives to transform India into a digitally empowered nation. More recently, the outcome of demonetization which enabled the

rapid adoption of digital payment instruments, including banking cards, mobile wallets, mobile banking, internet banking and other digital payment modes (Chaurasia *et al.*, 2019; Goriparthi and Tiwari, 2017; Mohd, 2016; PWC, 2020, Nagdev *et al.*, 2021). With a vision to transform India from traditional 'cash-based economy' into a 'cashless economy' and also as part of the 'Digital India' initiative, Gol has promulgated the digital payments system as a result of promoting cashless transactions (Midthanpally, 2017; Pachare, 2016; Sobti, 2019). Hence, the penetration of cashless transactions is possible through effective initiatives of digital financial inclusion.

"Digital financial inclusion involves the deployment of the cost-saving digital means to reach currently financially excluded and underserved populations with a range of formal financial services suited to their needs that are responsibly delivered at a cost affordable to customers and sustainable for providers."

- Jim Yong Kim President, World Bank Group, October 2014.

The paper is organized as follows: After introduction, second section presents the detailed review of literature in global as well as Indian context. Section three provides the research gap and objectives of the study. The section four presents Research model and hypotheses. Section five describes the research methodology. Section six stipulates the data analysis, results and discussion. Finally, the study concludes with insightful information for the policymakers to achieving the objectives of India's digital economy.

2. Literature Review

This study is aimed to measure the digital financial inclusion by examining the accessibility and usage of financial services in relation to select demographic characteristics. The literature pertaining to digital financial inclusion is reviewed and different factors have been identified in the perspective of global and Indian contexts.

2.1 Studies on determinants of digital financial services in global context

Mushtaq and Bruneau (2019) assessed the role of Information and Communication Technologies (ICT) in poverty & inequality reduction by fostering financial inclusion. The study revealed that the ICT dimensions can be used as instruments to stimulate financial inclusion by promoting digital finance. Aziz and Naima (2021) investigated the mismatch between financial inclusion discourse and ideas of access and use of digital technologies. and seeks to move the discourse forward through a comprehensive framework for digital financial inclusion. They concluded that although digital services have eased and bridged the gap of physical access to financial services, such services have not been utilized due to lack of basic connectivity, financial literacy and social awareness. Senyo & Osabutey (2020) studied accessibility of financial services through Fintech innovations for many unbanked in the world. They identified fintech innovations as game changers in deepening financial inclusion, and also found that it is widely accepted but still usage remains limited. Bongomin *et al.*, (2020) asserted that financial digitalization is currently the panacea and game changer in delivering progress towards the sustainable development goals (SDGs) through universal financial inclusion. It was found that transaction tax exemptions on digital financial innovations such as the mobile money services can stimulate economic growth through increased level of financial inclusion.

A study by Hasan *et al.*, (2020) explored the contribution of digital financial services (DFSs) in promoting inclusive finance in China. They focused on DFSs as one of the most influential forces in the development of inclusive finance in the present world. The study also emphasized on the significant contribution of DFS in promoting inclusive finance. Hasan *et al.*, (2020) have systematically carried out a study to demonstrate the present situation of internet

finance in the development of inclusive finance in China. They found that, despite significant development in China's financial system, there is still a development inequality between the most and least developed regions.

Some of the previous studies have used World Bank index data to examine the relationship of demographic characteristics with accessibility and usage of digital financial services (Anson *et al.*, 2013; Borg & Smith, 2018; Demir *et al.*, 2020; Demircuc-Kunt & Klapper, 2012, 2013; Efobi *et al.*, 2014; Zins and Weill, 2016). For instance, Anson *et al.*, (2013) used data from the Global Financial Inclusion Indicators (Global Findex) database and attempted to study account ownership patterns at post offices in comparison to traditional financial institutions such as banks. The results of the study revealed that post offices can play vital role in advancing financial inclusion relatively more likely than banks. Borg and Smith (2018) studied digital inclusion and online behaviour preferences of Australian users. The demographic characteristics most notably age, gender, education level, employment status, disability status, income level, geographic status, are significantly influence on the engaging with the internet more frequently which would help enhancing digital inclusion. Besides, other non-demographic factor such as attitude, access, and digital self-efficacy are also determines how people engage with internet use to address digital inclusion. Demir *et al.* (2020) investigated the interrelationship among financial technology (FinTech), financial inclusion and income inequality for a panel of 140 countries across the globe. The findings of the study show that FinTech and financial inclusion significantly reduces income inequality and these influences are primarily concern with the higher-income countries.

A study by Efobi *et al.* (2014) stated the individual attributes, income level, age and ICT inclination of individuals have great effect on the access to and use of bank services in Nigeria. Zins and Weill (2016) studied the determinants of financial inclusion in Africa based on World Bank's Global Findex database. The authors found that individual demographic factors such as gender, higher income and education showed significant effect on financial inclusion.

Arora (2020), examined access to digital financial services to women including ownership of phones and online access to bank accounts. It examines this across both male and female ownership of phones and examines overall whether digital services are helping in increasing financial access of women. A comparative perspective to access digital financial services by women in South Asia with respect to global trends in digital financial services and included men as well in the analysis.

2.2 Studies on determinants of digital financial services in Indian context

Rana *et al.*, (2020), emphasized that digital financial services (DFS) have substantial prospect to offer a number of reasonable, appropriate and secure banking services to the underprivileged in developing countries through pioneering technologies such as mobile phone-based solutions, digital platforms and electronic money models. Balasubramanian & Kuppusamy (2020) advocated that the role of financial literacy is prominent in determining women's access to sophisticated financial services such as debit card and credit card.

A recent study by Dar and Ahmed (2020) used World Bank index database for studying the demographic determinants towards access to and usage of various financial services. The researchers primarily examined the determinants of financial inclusion and its barriers. The results of the study show that gender, age, education and income have a significant impact on the ownership of debit card and also determined the various measures of financial inclusion such as ownership of bank account, credit card and savings.

Ghosh and Chaudhury (2020) examined the determinants and impact of demonetization on access to digital financial services in India. According to the study, the demographics viz., male, high income, more educational background and older age are found to be more favorable to avail digital financial services. Specifically, higher education and higher income level have greatly influenced the usage of digital financial services during post demonetization period.

Some of the previous studies have empirically assessed the influence of demographic characteristics on accessibility and usage of banking services. For instance, Bhanot *et al.* (2012) explored the factors that determine the extent of financial inclusion in the states of Assam and Meghalaya in India. The study concluded that income level, financial literacy, awareness of self-help groups (SHGs) are influential key factors leading to financial inclusion. Nandru *et al.* (2015) observed that the demographic factors have determined the extended usage of banking services which leads to the financial inclusion of people in Pondicherry region. It is found that the factors like higher income, better education, gender and occupation level have a significant influence on usage of banking services. It is also found that the macro level dimensions like ease of accessing bank products, physical distance of bank branch and usage of banking services determine the financial inclusion. Bapat (2010) posited that there is a relationship between selected demographic factors like income, occupation and asset holding pattern with bank account ownership.

3. Research Gap And Study Objectives

Based on prior studies in view of digital financial inclusion with respect to accessibility and usage of digital financial services, the researchers have thoroughly observed that many earlier studies examined determinants of financial inclusion however, there is dearth of previous research works which focused on determinants of digital financial inclusion in Indian and global context by using world bank findex database. It is also identified that limited numbers of studies have examined digital financial inclusion in the context of developing nations. For example in Indian context, a study by Dar and Ahmed 2020 explore the determinants of financial inclusion by measuring ownership of bank account, formal savings, formal credit, debit card ownership and usage of debit card using global findex data base and in global context also very few studies (Efobi *et al.*, 2014; Fungacova and Weill, 2015) examined the determinants of financial inclusion with consideration of ownership of debit card as one of the components of measuring financial inclusion. Therefore, for strengthening the existing literature, the current study examines all the determinants of digital financial inclusion considered in World Bank Findex database (2017) with reference to digital financial services such as ownership of debit card, credit card, mobile money account, digital payments and receipts. Based on the research gap, the study is carried out with the objective of exploring the determinants of digital financial inclusion viz., accessibility (ownership of debit card, credit card, mobile money account) and usage (digital payments made and receipts) in relation to selected demographic characteristics (gender, age, income, education and employment status).

4. Research Model And Hypotheses

The World Bank Findex database 2017 consists of data related to five demographic characteristics pertaining to India, viz., age, gender, income, education and employment status. These demographic characteristics are considered as independent variables. Further, eleven determinants of digital financial inclusion in the same database are identified as: ownership of debit card, ownership of credit card, ownership of mobile money account, usage of debit card, usage of credit card, usage of mobile phone or internet, online bill payments made using the internet,

online utility bill payments made through a mobile phone, received domestic remittances through a mobile phone, received wage payments through a mobile phone, and received government transfers through a mobile phone.

First three determinants of DFI are grouped under the variable 'accessibility'; and remaining eight determinants are grouped under the variable 'usage'. All these eleven determinants are considered as dependent variables in the study. A research model is developed based on literature review, which is shown in *Figure 1*.

In the study, two broader research hypotheses are formulated, viz., influence of demographic characteristics on 'accessibility' (*H1*) and 'usage' (*H2*) of DFI, as mentioned in the proposed research model. Further, based on these two broader research hypotheses. Eleven test hypotheses are framed and tested using probit regression analysis.

The hypotheses are stated as follows:

H1 Demographic characteristics have significant influence on 'accessibility' of DFI.

H2 Demographic characteristics have significant influence on 'usage' of DFI.

5. Research Methodology

As the research is undertaken to analyze the secondary data obtained from World Bank's Findex Database for the three years 2011, 2014, and 2017, the methodology is structured as description of data source, details about measurement variables, and modeling of probit regression equation.

5.1 Data sources

The demographic characteristics and other digital financial inclusion variables have been collected from World Bank's Findex Database for the years 2011, 2014, and 2017. The secondary data pertaining to demographic variables and all the variables related to digital financial inclusion have been collected from the Findex database where the survey was conducted by the Gallup, a renowned US-based analytics company, in 144 countries on 1,50,000 adults across the globe. But data pertaining to India has a sample of 3,000 on all these study variables which have been considered for analysis in the study.

5.2 Measurement of variables

The study variables are broadly grouped into two categories: demographic variables and variables related to digital financial inclusion. According to World Bank Findex database, the demographic variables considered for the study include: 'gender', 'age', 'education', 'income', and 'employment status'. The 'gender' is measured using two categories, viz., 'male' and 'female'; the 'age' is measured parametrically using 'age in number of years'; the 'income' is classified into five categorical variables and each one is measured using two categories; the 'education' is classified into three categorical variables and measured using two categories; and the 'employment status' is measured using two categories, viz., 'in workforce' and 'out of workforce'.

Similarly, eleven variables are considered under digital financial inclusion measures such as, 'ownership of debit card', 'ownership of credit card', 'ownership of mobile money account', 'usage of debit card', 'usage of credit card', 'usage of mobile phone or internet', 'online bill payments made using the internet', 'online utility bill payments made through a mobile phone', 'received domestic remittances through a mobile phone', 'received wage payments through a mobile phone', and 'received government transfers through a mobile phone'. These eleven variables are grouped

into two categories viz., ‘accessibility’ and ‘usage’. First three variables are grouped under ‘accessibility’ and rest of the eight variables is grouped under ‘usage’.

Table 1. Description and measurement of study variables

S. No.	Variable	Measurement
Independent Variables (Demographic Characteristics)		
1.	Gender	Male = 0; Female = 1
2.	Age	Age in number of years
3.	Income=poorest 20%	Income in the first income quintile=1; Otherwise=0
4.	Income= second 20%	Income in the second income quintile=1; Otherwise=0
5.	Income=middle 20%	Income in the middle-income quintile=1; Otherwise=0
6.	Income= fourth 20%	Income in the fourth income quintile=1; Otherwise=0
7.	Income=richest 20%	Income in the richest income quintile=1; Otherwise=0
8.	Primary education	If the individual has completed primary or less=1; Otherwise=0
9.	Secondary education	If the individual has completed secondary education=1; Otherwise=0
10.	Tertiary education	If the individual has completed tertiary education=1; Otherwise=0
11.	Employment status	If the individual is in the workforce=1; Out of workforce=0
Dependent Variables (Digital Financial Inclusion Indicators)		
Accessibility		
1.	ACC1	Ownership of debit card 'Yes' = 1, 'No' = 0
2.	ACC2	Ownership of credit card 'Yes' = 1, 'No' = 0
3.	ACC3	Ownership of mobile money account 'Yes' = 1, 'No' = 0
Usage		
4.	USG1	Usage of debit card 'Yes' = 1, 'No' = 0
5.	USG2	Usage of credit card 'Yes' = 1, 'No' = 0
6.	USG3	Usage of mobile phone or internet 'Yes' = 1, 'No' = 0
7.	USG4	Online bill payments made using the internet 'Yes' = 1, 'No' = 0
8.	USG5	Online utility bill payments made through a mobile phone 'Yes' = 1, 'No' = 0
9.	USG6	Received domestic remittances through a mobile phone 'Yes' = 1, 'No' = 0
10.	USG7	Received wage payments through a mobile phone 'Yes' = 1, 'No' = 0
11.	USG8	Received government transfers through a mobile phone 'Yes' = 1, 'No' = 0
Source: World Bank Findex Database 2017		

The demographic variables included in the study are considered as ‘independent variables’ and the measurement variables deliberated under digital financial inclusion are considered as ‘dependent variables.’ The methodology for measuring all the five independent variables and eleven dependent variables are detailed in the *Table 1*. The

demographic profile of respondents are presented in the *Table 2* and the descriptive statistics related to digital financial inclusion are shown in the *Table 3*.

Table 2. Demographic profile of respondents

Variable	No. of observations	Mean
Female	3000	0.52
Age	3000	37.44
Income=poorest 20%	3000	0.18
Income= second 20%	3000	0.20
Income=middle 20%	3000	0.20
Income= fourth 20%	3000	0.20
Income=richest 20%	3000	0.22
Primary education	2991	0.66
Secondary education	2991	0.28
Tertiary education	2991	0.06
Employment	3000	56.2

Source: World Bank Global Findex data base 2017

Table 3. Descriptive statistics for the dependent variables

Code	Variable	No. of observations	Mean
<i>Accessibility</i>			
ACC1	Ownership of debit card	2980	0.316
ACC2	Ownership of credit card	2918	0.030
ACC3	Ownership of mobile money account	3000	0.022
<i>Usage</i>			
USG1	Used debit card in past 12 months	844	0.391
USG2	Used credit card in past 12 months	88	0.739
USG3	Used mobile phone or the internet in past 12 months to make payment	2224	0.065
USG4	Made bill payments online using the internet	2942	0.027
USG5	Paid utility bills through a mobile phone	1288	0.036
USG6	Received domestic remittances through a mobile phone	463	0.026
USG7	Received wage payments through a mobile phone	628	0.025
USG8	Received government transfers through a mobile phone	385	0.031

Source: World Bank Global Findex data base 2017

5.3 Modeling of Probit Regression Equation

The prediction variable for the study is the dependent variable which is dichotomous in nature. Therefore, the probit regression model is developed and employed to predict the eleven determinants of digital financial inclusion.

$$Y = \alpha + \beta_1 \text{Gender} + \beta_2 \text{Age} + \beta_3 \text{Income} + \beta_4 \text{Education} + \beta_5 \text{Employment} + \varepsilon$$

where Y denotes the digital financial inclusion and there are eleven indicators considered for measuring digital financial inclusion as described in **Table 1**. Therefore, eleven probit regression equations are developed and tested using Eviews 11 software of student version.

6. Data Analysis, Results And Discussion

The analysis is made based on the World Bank index database through probit regression model and the discussion is made on two dimensions viz., accessibility and usage of digital financial inclusion.

6.1 The influence of demographic characteristics on 'accessibility' of digital financial inclusion

The probit regression estimation for the influence of demographic characteristics on accessibility component of digital financial inclusion is presented in **Table 4**. The accessibility is considered as dependent variable, where it has been measured by the three variables: ownership of debit card, credit card and mobile money account. The demographic characteristics such as age and dummy variable (aged), third- and fourth-income quintile, secondary and tertiary education and employment status have significant effect on ownership of debit and credit cards. Further, gender specifically, female respondents and aged have significant effect on the ownership of mobile money account. Individuals' income level is also having influence on ownership of mobile money account. The dummy variables for the four income quintiles have significant effect on possession of mobile money account. The dummy variable second quintile is major significant determinants of ownership of mobile money account, which is evident from its highest coefficient value. Further, individual's education background also has significant effect on ownership of mobile money account. Dummy variables for secondary education and tertiary education are also positively influenced ownership of mobile money account. It was observed that value of coefficients increases with the increase in education. Having tertiary educational background is more likely who won mobile money account than secondary education. The similar findings reported by Dar and Ahmed (2020) stated that higher educational background have significantly influenced with the increasing the usage of digital payment methods and which enable to higher financial inclusion. Therefore, it implies that, being educated may have chance of increasing the use of digital payment services for their day-to-day financial transactions.

Table 4. Determinants of accessibility of digital financial inclusion in India

Variables	Ownership of debit card	Ownership of credit card	Ownership of mobile money account
Female	0.021 (0.08)	-0.005 (0.219)	-0.817*** (0.278)
Age			
Age	-0.004*** (0.052)	-0.205*** (0.126)	0.124 (0.145)
Age ²	0.045*** (0.095)	-0.480*** (0.299)	0.320** (0.335)
Income			
Income-poorest 20%	-0.156 (0.127)	0.539 (0.351)	2.124*** (0.531)
Income-second 20%	-0.140 (0.123)	0.385 (0.354)	2.155*** (0.532)
Income-third 20%	-0.168** (0.122)	0.417** (0.349)	1.723*** (0.416)
Income- fourth 20%	0.016** (0.112)	0.045** (0.377)	1.581*** (0.393)
Education			
Secondary education	-0.016* (0.170)	0.464 (0.601)	1.224*** (0.353)
Tertiary education	-0.289** (0.176)	0.694* (0.616)	1.392*** (0.390)
Employment	-0.047** (0.523)	-0.048** (0.102)	-0.016 (0.124)
Observations	2980	2918	2991
Pseudo R ²	0.004	0.002	0.021
Log likelihood	-3709.431	-784.053	-556.237
Note: The dependent variable is shown at the top of each column. The independent variables are gender, age, income, education and employment status. The estimated marginal effects and standard errors are shown in parentheses. *** denotes significant level at the 1%, ** denotes significance at the 5% level, *denotes significance at the 10 % level.			

6.2 The influence of demographic characteristics on 'usage' of digital financial inclusion

The usage of digital financial inclusion differs based on the demographic characteristics of the respondents. **Table 5** presents individuals characteristics are associated with the usage of digital mode of financial services such as usage of debit card, credit card and mobile or internet based accessing financial services. Individuals income significantly influence on the usage of debit card, the dummy variable for the first and third income quintile are significant determinants for the usage of debit card. It reveals that, as income increases, the usage of debit card also increases. Furthermore, education also influences on usage of debit card, individuals secondary education and tertiary education is significantly influences on usage of debit card. It shows that, as education increases, the usage of debit card also increase. And also find that employment status also significant effect on the usage of debit card. With respect to usage of credit card first income and fourth income quintile have significant effect and no other individual's characters have effect and employment status also having significant effect. In case of usage of mobile or internet, individual's characteristics such as third income quintile, tertiary education and employment status have significant influence on it. This result is in the line with (Bhanot *et al.*, 2012; Dar & Ahmed, 2020; Demirguc-Kunt & Klapper, 2013; Efobi *et al.*, 2014; Zins & Weil, 2016; Fungacova & Weill, 2015). This results in, being higher income people, and having higher secondary educational background are significantly associated with the usage of debit card and credit to avail digital financial services. In fact, respondents having higher educational background may

associate with specific brands and they do frequently buy products through online mode without making a personal visit to shopping malls. Thus, it may tend to improve the usage level of digital financial services.

Payment made in online is determined by the demographic characteristics of the users. **Table 5** present the determinants of digital payments made with relates to digital payments made through usage of mobile phone or internet. The individual demographic characteristics such as age, third and fourth income quintile and employment status have significant influence on payment made through mobile or internet. In case of payment made through mobile phone, being aged and higher income respondents are more likely to make digital payments and remaining all other individuals' characteristics are insignificant. This finding is similar with (Bapat, 2010; Dar & Ahmed, 2020). It implies that being an older people and higher income groups are more likely to use mobile phones for making the utility bills. Regarding the digital payment made through internet, individual's educational background and employment status have shown significant effect. This finding is consistent with (Nandru *et al.*, 2016 and Saunders *et al.*, 2007) suggested that individual's income levels and employment status positively significant impact on access to and usage of financial services. It implies that being an employer, earning money, willing to spend and comfort in online shopping leads to increase in online bill payment.

The individual's characteristics in relation with different digital receipts such as received domestic remittances, wage payments and receiving government transfers through mobile phone is presented in **Table 5**. Regarding receiving wage payment through mobile phone, individual's income is significantly related. The second income quintile and third income quintile are significantly positive in receiving wage payments through mobile phone. Also found that education is also significant in relation to receipts of wage payments through mobile phone. Dummy variable for secondary education and employment status have significant effect with the receipts of wage payment through mobile phone. In case of receiving government transfers through mobile phone, aged is found significant. Regarding domestic remittances receipts through mobile phone, all individuals' characteristics are found insignificant. This finding is in the line with (Dar and Ahmed, 2020; Zins and Weil, 2016; Fungacova and Weill, 2015). This shows that, being aged, having higher income and higher secondary educational background is significantly associated with various modes of digital receipts. In fact, aged may have eligible to receive older age government benefits such as pension and other social security advantages. And being higher income holders and secondary education people may receive wage receipts through mobile phone. Thus, it may improve the usage of mobile phone for receiving the various benefits through digital mode.

7. Policy Implications And Recommendations

The findings of the study provide valuable insights to the service providers and policy makers for achieving the digital India objective of 'Faceless, Paperless, and Cashless'.

7.1 Recommendations to service providers

The service providers have to enhance the accessibility in terms of owning the debit card, credit card, and mobile money account by the users; and usage in terms of payments and receipts of services by the users through card-based and mobile-based financial transactions. This can be improved through effective support mechanism, adequate technological infrastructure and affordable user charges.

Table 5. Determinants of usage of digital financial inclusion in India

Variables	Usage of debit card	Usage of credit card	Usage of mobile phone or internet	Online bill payments made using the internet	Online utility bill payments made through a mobile phone	Received domestic remittances through a mobile phone	Received wage payments through a mobile phone	Received government transfers through a mobile phone
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	0.032 (0.145)	0.102 (0.576)	-0.128 (0.175)	-0.304 (0.230)	-0.138 (0.304)	-0.204 (0.613)	0.228 (0.529)	0.732 (0.636)
Age								
Age	-0.063 (0.112)	-0.215 (0.541)	0.050 (0.997)	0.064 (0.113)	0.337 (0.147)	0.406 (0.287)	-0.061 (0.270)	0.507 (0.288)
Age ²	-0.108 (0.182)	-0.434 (0.879)	0.100 (0.207)	0.153 (0.263)	0.822*** (0.317)	0.924 (0.626)	-0.187 (0.613)	1.048* (0.614)
Income								
Income-poorest 20%	-0.664 (0.262)	-2.073 (0.849)	-0.095 (0.293)	-0.391 (0.384)	-0.501 (0.624)	0.952 (1.248)	1.230 (1.249)	0.842 (0.841)
Income-second 20%	-0.147 (0.227)	-1.341 (0.854)	0.034 (0.281)	-0.025 (0.339)	0.243 (0.489)	0.009 (1.143)	2.156** (1.118)	0.486 (0.870)
Income-third 20%	-0.385* (0.205)	-1.265** (0.800)	0.203** (0.264)	-0.018** (0.348)	0.348** (0.487)	1.160 (1.177)	2.093* (1.096)	-0.778 (1.187)
Income-fourth 20%	-0.284** (0.196)	-1.188** (0.845)	0.273** (0.262)	0.013** (0.331)	0.682** (0.450)	1.668 (1.109)	1.023 (1.241)	-0.950 (1.181)
Education								
Secondary education	-0.433* (0.261)	-1.275 (1.202)	-0.042 (0.366)	-0.279 (0.447)	-0.233 (0.509)	-0.814 (0.882)	-2.204*** (0.702)	18.791 (13.880)
Tertiary education	-0.169* (0.264)	-0.261 (1.278)	-0.038* (0.384)	0.001 (0.461)	-0.713 (0.569)	-1.043 (0.996)	-1.324 (0.693)	19.617 (13.881)
Employment	-0.040** (0.098)	-0.633* (0.401)	-0.068** (0.901)	0.174 (0.104)*	-0.027 (0.145)	0.342 (0.301)	0.077* (0.250)	-0.419 (0.325)
Observations	841	88	2224	2942	1288	463	628	385
Pseudo R ²	0.013	0.149	0.011	0.001	0.005	0.007	0.016	0.015
Log likelihood	-1113.562	-86.956	-1065.810	-737.569	-396.581	-108.229	-138.684	-101.010
Note: The dependent variable is shown at the top of each column. The independent variables are gender, age, income, education and employment status. The estimated marginal effects and standard errors are shown in parentheses. *** denotes significant level at the 1%, ** denotes significance at the 5% level, *denotes significance at the 10 % level.								

7.2 Recommendations to policymakers

The policymakers can frame effective strategies which strives to digital literacy (d-literacy) campaign. This can be made by creating awareness through adoption of digital payments by the financial institutions or service providers. This initiative will lead to enhance capacity building of both the service providers and users. These efforts of policymakers will transform India's economy from traditional cash-based system into digitally empowered (cashless) economy.

8. Conclusion

Recently, the government of India has emphasized digital financial inclusion as a result of demonetization for promoting cashless transactions with a vision to transform India from a traditional cash-based economy into a cashless economy. The digital based money payment tools are facilitated in greater access to e-government

services and improving the speed, efficiency, accuracy, and effectiveness of delivering public services. Additionally, this system employs the technology-based payments to bring government closer to citizen's specifically unorganized sector workers, farmers and other underprivileged people. The current study investigated the demand side determinants of accessibility of digital financial services, which is measured by three variables such as ownership of debit card, credit card, and mobile money account based on 2017 World Bank's global finindex database. The individual's characteristics such as female, age, income, education and employment status are significantly determining accessibility of digital financial inclusion in India. In case of usage of digital financial services, education, income, and employment status are found to be significant. Finally, individual characteristics such as being aged, income, education and employment status have significant effect on digital payments made and receipts.

It is concluded that, increasing accessibility and usage of digital financial services that enables the society, free from cash related robbery and corruption, thereby reducing the risk of carrying cash, vanish the block money and finally persuading accountability and transparency for each financial transaction.

Declarations

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Authors' contributions

Notable studies used World Bank data to examine determinants of financial inclusion in general. However, no prior studies have made attempt in particular to measure the digital financial inclusion in India as well as the global aspect. This study is the first attempt to analyze the determinants of digital financial inclusion in India based on the Global Finindex Database 2017. Thus, this study has added value to the existing literatures on digital financial inclusion in India.

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Availability of data and materials

We provide detail summary of our data, its source and version. Further information may be provided upon request.

Competing interests

The authors declare that they have no competing interests.

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Figures

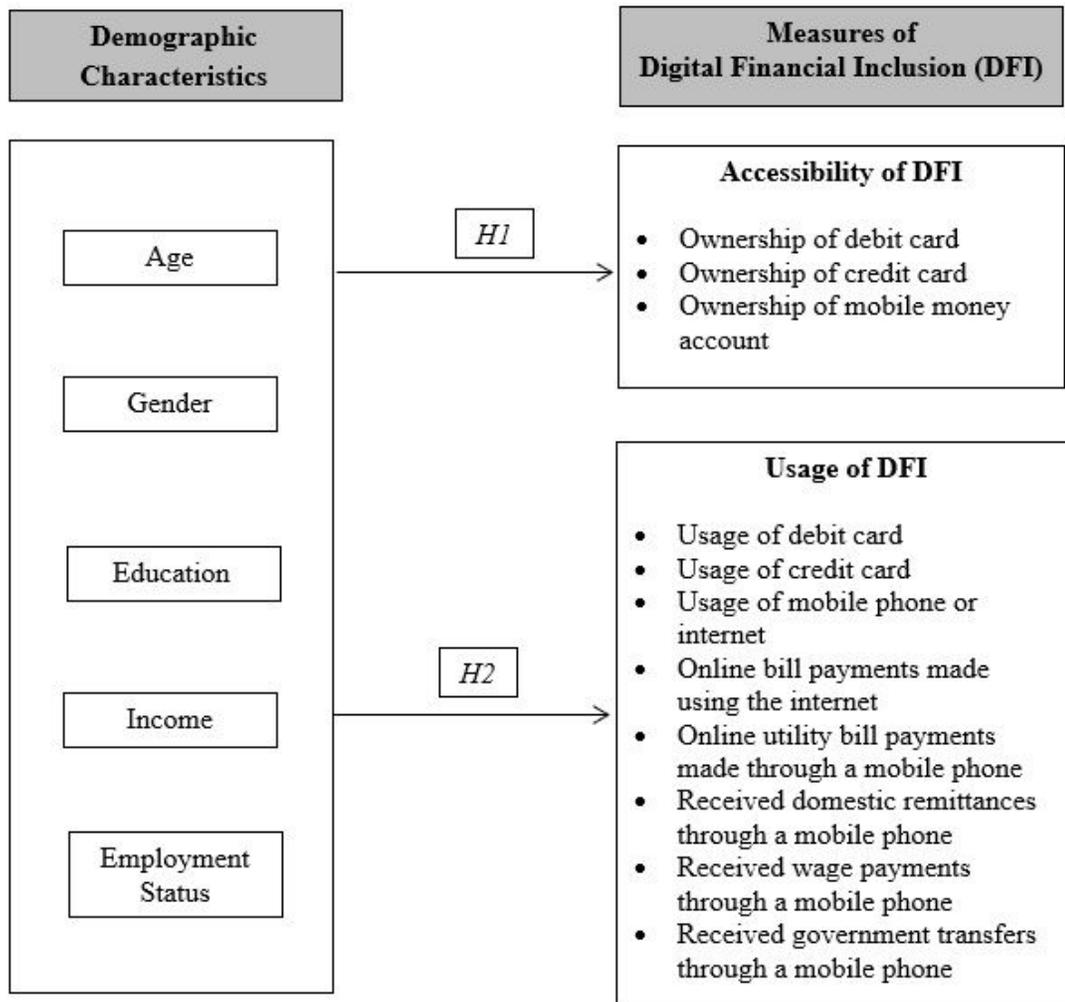


Figure 1

The proposed research model