PENETRATION AND USAGE OF FINTECH FOR FINANCIAL INCLUSION: EVIDENCE FROM BRICS NATIONS

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ABSTRACT

Considering the reach, cost and efficiency of financial technology, penetration and usage of it becomes crucial for successful financial inclusion in emerging nations. This study explores the penetration and adoption of technology especially mobile and internet according to age, gender, income, education and employment wise. Further, this study explores the purpose for doing digital financial transactions i.e. Receipts / Payments, receiving salary, receiving Government pensions, receiving agricultural receipts or business payments etc. for BRICS nations for the year 2017. Data is sourced from Findex database compiled by World Bank. This study found that higher education and higher income level are important constituents of digital inclusion. For usage of digital mode, people with tertiary education, people in richest strata of income and people in employment are making maximum use.

Keywords: Fintech, Financial inclusion, Emerging nations,BRICS

INTRODUCTION

Every few years, 10-30 percent of the world's poorest slip below the poverty line mostly because of Health- related emergencies, crop failures, livestock deaths, farming-equipment breakdowns or wedding expenses etc. Because of not having access to basic banking services they do not have access to personal savings, insurance, credit or cash transfers from family and friends (Kendall, Jake, and Rodger Voorhies, 2014). Financial inclusion helps in removing poverty by increasing savings but at the same time costly. Burgess, R., & Pande, R. (2005) found that branch expansion into rural unbanked locations in India significantly reduced rural poverty.

Emerging nations, in general have large financially excluded populations and have less developed financial sector compared to developed economies. Use of Technology is win-win as lower cost, scale economies, enhanced reach and efficiency of financial services. Study based on Findex data by Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018) found that 25% of sample population is unbanked or financially excluded because of cost and distance. Increasing penetration of internet and mobile technologies provide fertile landscape to grow for services related to these.

With decreasing mobile cost and increasing network coverage/ infrastructure, mobile phones are powerful tool in policy makers' arsenal for providing greater financial inclusion (Aggarwal, S., & Klapper, L. 2013). Mobile finance offers some advantages over traditional financial model; - One, Digital transactions are free. Second, mobile communications generate good amount of data, which can be used to design more profitable services. Third, mobile platform link banks to clients in real time (Kendall, Jake, and Rodger Voorhies, 2014). Increasing Mobile Penetration and increasing availability of financial services on smartphones reduces cost of delivery and improved effectiveness. M-Pesa in Kenya, UPI (Unified Payment Interface) and Wallet services like PayTM in India, Alipay and Wechat pay

in China have increased access to financial products and reduced marginal cost of delivering financial services.

The current paper attempts to understand the landscape of digital services in terms of penetration and adoption. The study is based on world Bank Global Findex survey and covers BRICS nation in particular. This study first explores on digital inclusion percentage, and later adoption across different groups based on age, gender, Qualification, employment status and financial status. The adoption across group is assessed using Probit analysis, and this study found that out of all other factors for financial inclusion it is education and income level which are playing significant role but in India it is education which is more important than income to be financially included. When it comes to digital inclusion than education and Income both play very significant role in all BRICS nations to be digitally included. In case of adoption of digital services for different purposes than it is bank transfer which is more accepted mode and still people prefer to deal in cash. When it is about factors responsible for different usages than it is found that it is people with higher education level and people in rich strata of income who are more interested in using digital mode.

Our paper contributes to the existing literature on digitalization of financial services in many ways. Firstly, by relating demographic factors to using digital mode for different usages it provides crucial information, that if we want to promote digital mode for different purposes than how that could be done. Secondly, by exploring rich source of data from global findex database, this paper is providing useful insights of BRICS nations regarding digital presence of financial services.

The rest of the paper is organized as follows: - Section 2 discusses the relevant literature in field of digital inclusion; Section 3 describes data and methodology; section 4 reports results and discussion, and section 5 concludes the study.

2 LITERATURE REVIEW AND HYPOTHESIS

Technology interventions, may it be in Financial industry, Education, healthcare and Governance etc. has its own opportunities and challenges. There are few studies which highlights the impact of adoption of technology in different fields like education, finance and governance.

Banerjee, Abhijit, Esther Duflo, Clement Imbert, Santhosh Mathew, and Rohini Pande. (2014) did a field experiment to evaluate an e-governance reform of the fund flow system for the workfare programme in Bihar, India. This study found that with this e-governance reform there was reduction in leakage of public funds. Barnwal, P. (2017) found that direct bank transfer of fuel subsidy to verified beneficiaries reduced subsidy leakage. Gelb, A., Muralidharan, K., Singh, A., & Ganimian, A. J. (2019) study suggested that well designed, technology-aided instruction programmes can sharply improve productivity in delivering education. Wright, R., Tekin, E., Topalli, V., McClellan, C., Dickinson, T., & Rosenfeld, R. (2017) study found that electronic benefit transfer (EBT) program implementation across Missouri counties and counties in the states bordering Missouri had led to decrease in overall crime rate by 9.2 percent.

Da-Silva (2018), summarized some pros and cons of Fintech in emerging markets. On the one hand where Fintech creates efficiency on the other hand it could affect monetary policy transmission and the efficacy of macroprudential policy measures in smoothing financial cycles. When we talk about Financial Technology, it's quite wider in definition, it includes Mobile & Internet, Distributed ledger, Machine learning and big data. Out of all Mobile & internet are more important because of its reach, cost and accessibility. Ghosh, S. (2016),

Using data on Indian states during 2001–2012, observed that mobile technology has positive impact on economic growth and financial inclusion and magnitude of response differs across states with high and low mobile penetration.

Kochar, A. (2018) find that branchless banking through local agents increases both total and financial savings. Further, savings are more for poor households than non-poor households in India. Demirgüç-Kunt, Asli, Leora Klapper, Saniya Ansar, and Aditya Jagati. (2017) based on individual-level survey data from India found that India's flagship financial inclusion program, the Jan Dhan Yojana scheme, has made it easier to get an account, through lower costs and greater ease of applying. However, despite the scheme's initial successes, people who wish to apply for an account continue to incur a range of costs.

Muralidharan, Karthik, Paul Niehaus, and Sandip Sukhtankar. (2016) evaluated the impact of biometrically authenticated payments infrastructure ("Smartcards") on beneficiaries of employment (NREGS) and pension (SSP) programs in the Indian state of Andhra Pradesh. The study found that, while incompletely implemented, the new system delivered a faster, more predictable, and less corrupt NREGS payments process without adversely affecting program access.

It has been found that investing in secure payments infrastructure can significantly improve 'state capacity' to deliver welfare programs in developing countries. Ghosh, S. (2017) found that PMJDY, Aadhaar cards and mobile phones are complementary, with each tending to reinforce the other. This complementarity is reflected primarily in respect of PMJDY and Aadhaar, but much less so with regard to mobile telephony. With the government making the JAM trinity a fulcrum for less distortive and targeted delivery of subsidies, it becomes important that each leg of the triad to perform its mandated role. Second, the levels of account inactivity would appear to suggest that consumers still face significant transactions costs in operating accounts. Third, the JAM trinity appears to be much more effective in the rural areas.

Dupas, P., Karlan, D., Robinson, J., & Ubfal, D. (2018) experimentally tested the impact of expanding access to basic bank accounts in Uganda, Malawi, and Chile. Over two years, 17, 10, and 3 percent of treatment individuals made five or more deposits, respectively. Results suggest that policies merely focused on expanding access to basic accounts are unlikely to improve welfare noticeably on average. Svitlana Naumenkova, Svitlana Mishchenko, Dmytro Dorofeiev. 2019, examines the influence of the current stage of economy digitalization on the financial inclusion in Ukraine. The research findings stress the need to adhere to the basic principles of digital financial inclusion in order to regulate activities of financial institutions and their agents in the digital provision of financial services, strengthen regulatory control over the use of innovative financial products and service systems, and protect the rights of consumers of financial services in Ukraine.

Klapper, L., & Singer, D. (2017) found that digitizing G2P payments has the potential to dramatically reduce costs, increase efficiency and transparency, and help recipients build familiarity with digital payments. These studies hint that digital technology can significantly mprove efficiency and reduce cost, specially mobile technology.

3 DATA AND RESEARCH METHODOLOGY

The study is based on Findex database compiled by the world Banks. Study covers 5 nations commonly named as BRICS i.e. Brazil, Russia, India, China and South Africa. Table 1 compiles the detail of sample.

Table 1: Description of Sample used in the study

No.	Country	Sample size	Income group	Data Collection period	Design effect*	Margin of error**	Mode of Interview
1	India	3000	Lower middle	April 21-june 2, 2017	1.48	2.2	Face to Face
2	Brazil	1000	Upper middle	May 11- June 15, 2017	1.39	3.7	Face to Face
3	Russia	2000	Upper middle	Jun9-August 20, 2017	1.35	2.5	Face to Face
4	China	3627	Upper middle	May 14- July 7, 2017	1.53	2	Face to Face
5	South Africa	1000	Upper middle	Jun 20-Jul 5, 2017	1.41	3.7	Face to Face

* Design effect calculation: n*(sum of squared weights)/[(sum of weights)*(sum of weights)].

** Margin of error calculation: $\sqrt{(0.25/N)}*1.96*\sqrt{(DE)}$.

To evaluate factors affecting digital penetration our estimation equation is as follows:

$$X_i = \alpha + \beta Gender_i + \gamma Age_i + \eta Age^2 + \delta Education_i + \lambda Income_i + \omega Employment_i + \varepsilon_i \qquad (1)$$

Here, X is a variable which represent different levels of digital penetration and i represent different individuals. This X will take different value depending on the regression equation we are estimating and are described as follows

For measuring;

Financial Inclusion; take value 1, if a person has bank account, otherwise 0.

Digital Inclusion; take value 1, if a person has ATM card, debit card, otherwise 0.

Digital Transfer of money; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

Digital Receipt of money; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

Digital Payment of Bill; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

Digital Receipt of salary; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

Digital Receipt of Govt.support; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

Digital Agriculture Receipt; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

Digital Business Receipt; take value1, if a person has used card, mobile money or bank transfer, otherwise 0.

As our dependent variable is dichotomous, ordinary least square can give misleading results. So we will be estimating the equation by using probit model.

Gender in our equation will take value 1 if male and 0 if female. Age represent actual age of the person surveyed. To identify non-linear relationship with age we also used age^2 in our equation. We have three levels of education primary, secondary and tertiary in the data. We created dummy variable for secondary and tertiary variables and primary education is treated as omitted dummy variable. There are five income levels in the data we have taken poorest20% as omitted dummy variable and created four dummy variables for other four levels of income i.e second20%, middle20%, fourth20% and richest20%. Employment is also taken as one of the factors affecting digital penetration and take value 1 if the person is part of workforce and 0 if the person is out of workforce.

Table 2 of summary statistics provides details of variables used in the study. Important thing to note in data for BRICS nation is, data is collected for upper middle class except for India, where it is collected for lower middle class. It is noted that 60-80% of the people are financially included for BRICS nation, but only 31-60% of financially included population is digitally included. More than 80% of sample population have mobile phones except India, where it is approximately 68% (may be because data is collected from lower middle class). Use of cash transfer and bank transfer are considered to be preferred mode of payment than use of mobile phone and card in BRICS nation. Use of cash transfer and bank transfer are considered to be preferred mode for receiving money than use of mobile phone and card in BRICS nation. For India and Brazil use of mobile phone is even lesser than 5% of times. Use of Card for receiving money is less in all BRICS nation (less than 18%) except for South Africa where it is to the extent of 46%. For Bills payment, receiving salary and wages still the preferred mode of payment is cash. More than 80 % of the respondent payed bills in cash and received salary in cash (except in case of Russia where in 70% of cases money is received in cash). For receiving Government pensions etc. transfers are through banks, cash and card except mobile money. For receiving Agricultural crop and live stocks majority of transactions are happening in cash (70-95%) in addition to bank transfers (14-35%). In case of South Africa 21% of transactions happened through card. For business receipts and payments majority of payments are made through cash (79-95%) and banks (18-40%).

Table 2: Summary statistics of variables used in the study (Dependent Variables)

Descriptive Statistics	Obs.	India		China		Russia		Brazil		South Africa
Total people in the sample		3000		3627		2000		1000		1000
Financially included	**3000**	**2379(79.30%)**	**3627**	**2666(73.5)**	**2000**	**1545(77.25)**	**1000**	**708(70.80)**	**1000**	**683(68.30)**
Digitally included	**943**	**943(31.43%)**	**3627**	**2121(58.48)**	**2000**	**1117(55.85)**	**1000**	**594(59.40)**	**1000**	**367(36.70)**
used ATM	845	330(39.05%)	1955	978(50.03)	848	695(81.96)	564	309(54.79)	342	254(74.27)

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	Obs	India		China		Russia		Brazil		South Africa
used mob/internet to make payment	2256	144(6.38%)	2242	974(43.44)	1114	566(50.81)	628	105(16.72)	580	203(35)
used mob/inter to check bal	2256	193(8.55%)	2242	975(43.49)	1114	725(65.08)	628	140(22.29)	580	285(49.14)
mobile owner	3000	2063(68.77%)	3627	3272(90.21)	2000	1924(96.20)	1000	819(81.90)	1000	800(80)
Transfer /Paid money	**3000**	**315(10.50%)**	**3627**	**514(14.17)**	**2000**	**540(27)**	**1000**	**79(7.90)**	**1000**	**331(33.10)**
By banks	315	165(52.38%)	514	275(53.50)	540	293(54.26)	79	47(59.49)	331	211(63.75)
By mobile phone	315	24(7.62%)	514	243(47.28)	540	201(37.22)	79	2(2.53)	331	117(35.35)
By cash	148	80(54.05%)	179	133(74.30)	140	81(57.86)	32	16(50)	93	74(79.57)
By card	148	5(3.38%)	179	15(8.38)	140	31(22.14)	32	3(9.38)	93	40(43.01)
Received money	**3000**	**467(15.57%)**	**3627**	**568(15.66)**	**2000**	**413(20.65)**	**1000**	**72(7.20)**	**1000**	**390(39)**
By banks	467	142(30.41%)	568	269(47.36)	412	213(51.70)	72	43(59.72)	390	226(57.95)
By mobile phone	467	12(2.57%)	568	247(43.49)	413	149(36.08)	72	3(4.17)	390	175(44.87)
By cash	322	242(75.61%)	209	165(78.95)	110	61(55.45)	28	22(78.57)	121	98(80.99)
By card	322	14(4.35)	209	18(8.61)	110	20(18.18)	28	3(10.71)	121	56(46.28)

Table 2: Continue… Summary statistics of variables used in the study (Dependent Variables)

Descriptive	Obs.	India		China		Russia		Brazil		South Africa

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Statistics											
Bill payment	**3000**	**1298(43.27%)**	**3627**	**2544(70.14)**	**2000**	**1614(80.70)**	**1000**	**679(67.90)**	**1000**	**459(45.9)**	
By banks	1298	185(14.25%)	2544	819(32.19)	1614	601(37.24)	679	209(30.78)	459	146(31.81)	
By mobile phone	1298	47(3.62%)	2544	433(17.02)	1614	213(13.20)	679	33(4.86)	459	86(18.74)	
By cash	1090	885(81.19%)	1586	1538(96.97)	918	869(94.66)	466	456(97.85)	284	267(94.01)	
Received salary wages	**3000**	**634(21.13%)**	**3627**	**1010(27.85)**	**2000**	**970(48.50)**	**1000**	**316(31.60)**	**1000**	**349(34.90)**	
By banks	634	160(25.24%)	1003	585(58.33)	970	608(62.68)	316	192(60.76)	349	228(65.33)	
By mobile phone	634	16(2.52%)	1000	276(27.60)	970	49(5.05)	316	1(0.32)	349	116(33.24)	
By cash	473	405(85.62%)	365	305(83.56)	348	247(70.98)	124	116(93.55)	107	85(79.44)	
By card	482	24(4.98%)	361	27(7.48)	350	107(30.57)	124	6(4.84)	107	15(14.02)	
Financial support from govt.or pension	**3000**	**452(15.06%)**	**3627**	**861(23.73)**	**2000**	**518(25.90)**	**1000**	**190(19)**	**1000**	**225(22.50)**	
By banks	390	214(54.87%)	668	423(63.32)	976	497(50.92)	257	173(67.32)	278	135(48.56)	
By mobile phone	390	12(3.08%)	668	36(5.39)	976	23(2.36)	257	0	278	42(15.11)	
By cash	169	86(50.89%)	236	118(50)	473	306(64.69)	84	36(42.86)	126	63(50)	
By card	169	5(2.96%)	236	67(28.39)	473	112(23.68)	84	39(46.43)	126	57(45.24)	

Table 2: Continue… Summary statistics of variables used in the study (Dependent Variables)

Descriptive Statistics	Obs.	India		China		Russia		Brazil		South Africa
Sale of Agriclt crops/live stocks	3000	421(14.03%)	3627	549(15.14)	2000	109(5.45)	1000	27(2.7)	1000	32(3.20)
By banks	421	77(18.29)	545	106(19.45)	109	15(13.76)	27	8(29.63)	32	11(34.38)
By mobile phone	421	7(1.66%)	547	47(8.59)	109	6(5.50)	27	1(3.70)	32	9(28.13)
By cash	343	257(74.93%)	427	405(94.85)	90	85(94.44)	19	18(94.74)	19	16(84.21)
By card	343	9(2.62%)	424	8(1.89)	90	1(1.11)	19	0	19	4(21.05)
Business/selling goods	2059	122(5.93%)	2234	167(7.48)	969	55(5.68)	669	146(21.82)	632	125(19.78)
By banks	122	23(18.85%)	167	66(39.52)	55	22(40)	146	26(17.81)	125	47(37.60)
By mobile phone	122	2(1.64)	167	66(39.52)	55	9(16.36)	146	0	125	35(28)
By cash	99	78(78.79)	81	68(83.95)	30	27(90)	120	113(94.17)	66	58(87.88)
By card	99	4(4.04)	81	8(9.88)	30	6(20)	120	7(5.83)	66	7(10.61)

Table 3: Summary statistics of variables used in the study (Independent Variables)

Variable	Gender	Age	Primary	Edu_Secondary	Tertiary	Poorest20	second20	middle20	fourth20	Richest20	emp_i0rout
India											
Obs	3,000	3,000	2,991	2,991	2,991	3,000	3,000	3,000	3,000	3,000	3,000
Mean	0.48	37.43	0.66	0.28	0.06	0.18	0.20	0.20	0.20	0.22	0.56
Std. Dev.	0.50	15.44	0.47	0.45	0.24	0.39	0.40	0.40	0.40	0.41	0.50
China											
Obs	3,627	3,608	3,606	3,606	3,606	3,627	3,627	3,627	3,627	3,627	3,627
Mean	0.46	48.48	0.72	0.25	0.04	0.25	0.19	0.18	0.19	0.19	0.68
Std. Dev.	0.50	16.09	0.45	0.43	0.19	0.43	0.39	0.39	0.39	0.39	0.47
Russia											
Obs	2,000	2,000	1,999	1,999	1,999	2,000	2,000	2,000	2,000	2,000	2,000
Mean	0.34	48.45	0.12	0.58	0.30	0.15	0.20	0.21	0.21	0.22	0.55
Std. Dev.	0.47	19.04	0.32	0.49	0.46	0.36	0.40	0.41	0.41	0.42	0.50
SouthAfrica											
Obs	1,000	999	989	989	989	1,000	1,000	1,000	1,000	1,000	1,000
Mean	0.51	34.38	0.17	0.75	0.08	0.16	0.17	0.19	0.22	0.27	0.68
Std. Dev.	0.50	14.29	0.38	0.43	0.27	0.36	0.37	0.39	0.41	0.44	0.47

Brazil											
Obs	1,000	1,000	990	990	990	1,000	1,000	1,000	1,000	1,000	1,000
Mean	0.39	44.83	0.42	0.53	0.05	0.19	0.18	0.18	0.23	0.23	0.62
Std Dev.	0.39	18.13	0.49	0.50	0.22	0.39	0.39	0.38	0.42	0.42	0.49

4 RESULTS AND DISCUSSIONS

Table 4 shows the results of probit estimation for factors affecting financial inclusion and digital inclusion of BRICS nations. It shows marginal effects and for financial inclusion gender shows significant results for china and it has been observed that male has more probability (0.079) of being financial included than female. Gender is not found to have any significant relation with financial inclusion in any other BRICS nation. Our results are similar to (Allen, 2012) where at world level also gender is not playing any role in use of formal accounts. When it comes to digital inclusion results for India, China and Russia shows that male in these countries has more probability of being digitally included than females, which shows that gender has significant relation with digital inclusion. Age is found to be significantly positively related to financial and digital inclusion, except in china, showing that older people has more probability of being financially and digitally included. In China age is showing negative relation implying that older people has less probability of being financially included. Non-linear relation of age shows significant negative relation for financial inclusion and digital inclusion showing that after some age there is less probability of financial and digital inclusion, but in China after some age there is more probability (0.0001), even though coefficient value is very small, of being part of financial inclusion.

Education is found to be significantly and positively related to financial inclusion and shows that as compare to primary education if a person has secondary or tertiary education there is significant positive probability of financial and digital inclusion and this relationship is true for all BRICS nation. The coefficient for tertiary education is more than secondary education in all the countries, implying that person having tertiary education, even have more probability of financial and digital inclusion than secondary education. It may be because tertiary education makes you more techno-savvy and better in managing digital mode.

Income level in India is found to be not significantly related to probability of financially included even though it is found to be significantly positively related to digital inclusion. In all other countries income level is found to be significant and positively related to financial as well as digital inclusion and it has also been found that coefficient is increasing with income level. Higher the income level is more is the probability of financial and digital inclusion in majority of BRICS nation. These results are in line with Demirgüc-Kunt and Klapper (2013). Being a part of workforce significantly increases the probability of digital and financial inclusion, coefficient is highest (0.131) for South Africa implying that having employment has more probability of being financially included.

Table 5 present factors affecting usage of digital finance for different purposes in India. When it is about transfer of money results shows that as age grows there is less probability of transferring money digitally. If a person has tertiary education there is more probability of transferring money through digital mode. Income level is also found to have significant positive relation with probability of transferring money and richest 20 percent represent highest coefficient of 0.603. Being employed also increases the probability of transferring money through digital mode. When it is about receiving salary through digital mode gender is found to be significantly negatively related implying that male has less probability of

receiving salary through digital mode. In case of payment of bill through digital mode and doing business through digital mode it is found that age is significantly positively related. Tertiary education is found to be significantly positively related to usage of digital services for different purposes whether it is receiving money, paying bills etc. when it comes to how income level effect digital usage of finance, it is found that richest 20 percent has the highest probability of using digital mode for transferring and receiving money. Having employment also increases the probability of transferring money through digital mode.

Table 4: Probit Analysis for Financial inclusion and Digital inclusion

VARIABLES	India		China		Russia		Brazil		South Africa	
	FinIncld	DgtlIncld	FinIncld	DgtlIncld	FinIncld	DgtlIncld	FinIncld	DgtlIncld	FinIncld	DgtlIncld
Gender	0.0194	0.0769***	0.0799***	0.0629***	-0.0226	-0.0249	0.0327	0.0636**	-0.0436	0.0399
	-0.0158	-0.0161	-0.0137	-0.015	-0.0196	-0.0224	-0.0291	-0.0309	-0.0294	-0.0307
Age	0.0158***	0.0190***	0.0157***	-0.00680***	0.00489*	0.005	0.0180***	0.0169**	0.0048	0.0169***
	-0.0022	-0.00268	-0.00253	-0.00263	-0.00267	-0.00318	-0.00378	-0.00417	-0.00478	-0.00539
Age Square	-0.00014***	-0.00021***	0.00012***	2.91E-05	-5.25e-05*	-9.71e-05***	-0.00015***	0.00013***	-1.17E-05	0.00017***
	-2.52E-05	-3.15E-05	-2.49E-05	-2.65E-05	-2.71E-05	-3.25E-05	-4.08E-05	-4.50E-05	-5.69E-05	-6.54E-05
Edu_Secondary	0.118***	0.230***	0.172***	0.210***	0.133***	0.178***	0.147***	0.153***	0.0987**	0.120**
	-0.0182	-0.0166	-0.0204	-0.0198	-0.027	-0.0345	-0.0314	-0.0336	-0.0428	-0.0468
Tertiary	0.318***	0.414***	0.284***	0.315***	0.206***	0.283***	0.285***	0.294***	0.245***	0.281***
	-0.0474	-0.0304	-0.0804	-0.0609	-0.031	-0.0374	-0.0902	-0.0842	-0.071	-0.0663
second20	0.0157	0.0520*	0.0370*	0.0404*	0.000146	0.0134	0.0315	0.0652	0.0674	0.111**
	-0.0224	-0.0268	-0.0186	-0.0216	-0.0293	-0.0347	-0.0418	-0.0464	-0.0491	-0.055
middle20	0.0262	0.125***	0.0762***	0.127***	0.0686**	0.0738**	0.0505	0.101**	0.0735	0.104**
	-0.0227	-0.0257	-0.0196	-0.0219	-0.03	-0.0346	-0.0433	-0.0476	-0.0476	-0.053
fourth20	-0.0143	0.166***	0.178***	0.236***	0.0898**	0.0683**	0.0957**	0.133**	0.0691	0.118**
	-0.0228	-0.0253	-0.021	-0.0222	-0.0303	-0.0345	-0.0421	-0.0458	-0.0467	-0.0524
Richest20	0.034	0.257***	0.200***	0.212***	0.0707**	0.150***	0.228***	0.285**	0.148***	0.234***
	-0.0237	-0.0243	-0.0241	-0.0245	-0.0303	-0.0348	-0.0472	-0.0487	-0.0459	-0.0494
emp_i0rout	0.0619***	0.0582***	0.0905***	0.0920***	0.0903**	0.122***	0.0525*	0.0815*	0.131***	0.0689**

	-0.0158	-0.0167	-0.0143	-0.0161	-0.0206	-0.0229	-0.0301	-0.0326	-0.0308	-0.034
Observations	2,991	2,972	3,593	3,497	1,999	1,965	990	984	988	959
Pseudo-R^2	0.061	0.189	0.152	0.164	0.063	0.113	0.101	0.109	0.0469	0.062
Log Likelihood	-1430.24	-1503.72	-1757.45	-1962.79	-1003.99	-1190.76	-534.49	-589.48	-587.27	-596.012
Predicted Prob (at mean values)	0.793	0.317	0.735	0.599	0.772	0.568	0.71	0.6	0.684	0.378

Probit results for use of digital mode for different purposes in case of China are shown in table 6. It shows that male has more probability of using digital mode for receiving and transferring money. Age is found to be significantly negatively related to probability of digital receipt of money, digital payment of bills and digital business dealings. Like the case of India, in China having tertiary education increases the probability of using digital mode for different purposes. In China when it comes to digital payment of bills, digital receipt of salary, digital receipt for agricultural dealings and business dealings people with in middle income to richest 20 percent has significantly positive coefficient, showing that these people have more adoption of digital mode. Being in employment has significant positive relation with probability of receiving money digitally, for payment of bills and for receiving government support.

In case of Russia (table 7) gender has similar results as in India, male has less probability of receiving money digitally and receiving money through digital mode. In probability of receiving salary through digital mode age is playing significantly positive role but in case of probability of paying bills digitally age is significantly negatively related. Here in Russia like other countries India and China, tertiary education has significant positive relation with probability of using digital method for all different purposes. Increasing income level increases the probability of using money digitally for different purposes. In Russia people who are employed has more probability of using digital method for different purposes.

In Brazil (table 8) male has less probability of receiving money through digital mode or receiving any agriculture purpose but has more probability of using digital mode for payment of bills. But older age people have less probability of using digital mode for making payments. Tertiary education also increases the probability of using digital method for making bill payments and receiving salary. In case of income level it is the richest 20 percent who has more probability of using digital mode for making payments and for business dealings. When a person is part of workforce it increases the probability of receiving money through digital mode. In case of South Africa (table 9) if a person has received tertiary education it increases the probability of making digital payment of bills and receiving salary through digital mode. In case of income groups richest 20 percent has more probability of using digital mode of transferring money, payment of bills and receiving salary. Being a part of labour force also increases the probability of receiving money through digital mode and receiving government support.

Our results for usage of digital mode for various purposes points out some important findings for BRICS nation showing that it is more educated and people with more income who are using digital mode for various purposes. It may be due to the reason that when it comes to

usage of digital mode many alternatives are there like mobile banking, electronic transfer and ATM usage and out of all this mobile banking is most cost effective and user friendly mode.

Digitizing government-to-person (G2P) payments has the potential to dramatically reduce costs, increase efficiency and transparency, and help recipients build familiarity with digital payments. However, digitizing G2P may require significant up-front investments in building an adequate physical payment infrastructure that is able to process such payments, as well as a financial identification system and a consumer protection and education framework to ensure that recipients have safe, reliable, and affordable access to the digital payment system (Klapper, L., & Singer, D. (2017). At the same time mobile banking on the other hand is penetrating very fast and giving good results in many countries. So it is required that in order to increase the usage of digital mode, mobile banking alternative should be promoted that can lead to more usage by poor and less educated people. For example, in Kenya, Safaricom introduced "M-Shwari" accounts, which can be set up instantly and accessed from any mobile phone. The account is operated jointly with Commercial Bank of Africa, but no branch facilities are offered. It requires no minimum balance and offers a small overdraft. In its first four months, 2.3 million subscribers opened M-Shwari accounts, holding about $47 million in deposits as of March, 2013. (The Economist, "Is it a phone, is it a bank?", March 30, 2013). Appointment of bank agent, point of transaction machine, M-Money is highly successful in Africa (Aggarwal, S., & Klapper, L. (2013). Considering the success of mobile money in many countries may be efforts should be made to increase the use of this mode of digital inclusion which is also supposed to be in the reach of poor and less educated people.

Table 5: Probit Analysis for Marginal effects for parameters for Digital inclusion in India

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	DgTrMny	DgRecMny	DgPyBill	DgRecSlry	DgGvtSpt	DgAgRec	DgBusRec
Gender	-0.0558	-0.0434	-0.0264	-0.0807**	0.0384	0.0197	-0.0320
	(0.0577)	(0.0458)	(0.0268)	(0.0360)	(0.0549)	(0.0406)	(0.0716)
Age	-0.0169**	-0.00867	0.00778*	0.00423	-0.00156	-0.00136	0.0407***
	(0.00847)	(0.00689)	(0.00463)	(0.00695)	(0.00787)	(0.00623)	(0.0149)
Age Square	0.000134	9.58e-05	-6.96e-05	2.19e-06	4.24e-05	3.02e-05	-0.000371**
	(9.54e-05)	(7.98e-05)	(5.37e-05)	(8.30e-05)	(8.24e-05)	(6.60e-05)	(0.000162)
Edu_Secondary	0.0926	0.0807*	0.0769***	0.174***	0.0870	0.114**	0.240***
	(0.0595)	(0.0483)	(0.0297)	(0.0371)	(0.0764)	(0.0489)	(0.0854)
Tertiary	0.287***	0.288***	0.109**	0.275***	0.0625	0.207**	0.333***
	(0.0842)	(0.0770)	(0.0461)	(0.0591)	(0.104)	(0.0857)	(0.120)
second20	0.428***	0.215**	0.0175	0.0266	-0.0963	-0.0612	0.216*
	(0.112)	(0.0862)	(0.0476)	(0.0652)	(0.0798)	(0.0611)	(0.128)
middle20	0.506***	0.317***	-0.00408	-0.00875	-0.0280	0.00564	0.309***
	(0.112)	(0.0858)	(0.0471)	(0.0648)	(0.0802)	(0.0605)	(0.120)
fourth20	0.419***	0.316***	0.00263	0.0758	-0.0183	-0.0318	0.228*
	(0.107)	(0.0837)	(0.0460)	(0.0591)	(0.0830)	(0.0639)	(0.125)
Richest20	0.603***	0.474***	0.0406	0.219***	0.000729	0.133**	-0.0785
	(0.0968)	(0.0765)	(0.0452)	(0.0532)	(0.0806)	(0.0589)	(0.154)
emp_i0rout	0.210***	0.0537	0.0210	0.0275	0.0130	0.103**	-0.0829
	(0.0585)	(0.0477)	(0.0281)	(0.0559)	(0.0550)	(0.0482)	(0.0848)

Observations	312	462	916	626	383	418	122
Pseudo-R^2	0.212	0.146	0.023	0.134	0.015	0.102	0.263
Log Likelihood	-169.24	-252.24	-400.51	-317.69	-257.45	-191.59	-47.499
Predicted Probabilities (at mean values)	0.448	0.309	0.154	0.237	0.555	0.206	0.239

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6: Probit Analysis for Marginal effects for parameters for Digital inclusion in China

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	DgTrMny	DgRecMny	DgPyBill	DgRecSlry	DgGvtSpt	DgAgRec	DgBusRec
Gender	0.0774**	0.0775**	0.0292	0.0165	0.0334	-0.00147	0.0850
	(0.0360)	(0.0362)	(0.0178)	(0.0278)	(0.0346)	(0.0358)	(0.0675)
Age	-0.00553	-0.0103*	-0.0174***	-0.00506	0.00193	-0.0120	-0.0262*
	(0.00746)	(0.00620)	(0.00353)	(0.00534)	(0.00610)	(0.00756)	(0.0143)
Age Square	-6.16e-05	1.27e-05	0.000133***	1.47e-05	-1.07e-05	9.98e-05	0.000190
	(8.07e-05)	(6.43e-05)	(3.51e-05)	(5.82e-05)	(5.78e-05)	(7.55e-05)	(0.000157)
Edu_Secondary	0.0816**	0.0553	0.165***	0.183***	-0.0234	0.112**	0.187**
	(0.0394)	(0.0439)	(0.0207)	(0.0288)	(0.0471)	(0.0438)	(0.0757)
tertiary	0.230**	0.158*	0.372***	0.300***	0.296*	0.202	-
	(0.0908)	(0.0929)	(0.0599)	(0.0646)	(0.159)	(0.157)	
Second	-0.0635	-0.0780	0.00693	0.0981*	-0.0117	-0.0492	0.327**
	(0.0715)	(0.0581)	(0.0281)	(0.0543)	(0.0449)	(0.0529)	(0.142)
middle	-0.00386	-0.0636	0.0642**	0.197***	0.0659	0.112**	0.481***
	(0.0634)	(0.0578)	(0.0280)	(0.0503)	(0.0531)	(0.0506)	(0.145)
fourth	0.0679	0.0539	0.161***	0.310***	0.0530	0.170***	0.355***
	(0.0623)	(0.0613)	(0.0269)	(0.0468)	(0.0541)	(0.0533)	(0.137)
richest	0.0822	0.0252	0.205***	0.277***	0.123*	0.175***	0.481***
	(0.0630)	(0.0602)	(0.0284)	(0.0490)	(0.0670)	(0.0576)	(0.137)
emp_inout	0.00464	0.0826**	0.0568***	-0.00525	0.0649*	0.0108	-0.00802
	(0.0482)	(0.0414)	(0.0206)	(0.0507)	(0.0372)	(0.0503)	(0.127)
Observations	504	551	2,510	989	659	550	163
Pseudo-R^2	0.251	0.189	0.151	0.161	0.023	0.094	0.239
Log Likelihood	-238.05	-287.67	-0.1412	-531.77	-366.34	-271.41	-85.28
Predicted Prob (at mean values)	0.506	0.577	0.381	0.512	0.746	0.287	0.419

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7: Probit Analysis for Marginal effects for parameters for Digital inclusion in Russia

VARIABLES	DgTrMny	DgRecMny	DgPyBill	DgRecSlry	DgGvtSpt	DgAgRec	DgBusRec
Gender	-0.0304	-0.117***	-0.00651	-0.0657**	0.0273	0.0549	0.388***
	(0.0357)	(0.0445)	(0.0262)	(0.0282)	(0.0322)	(0.0871)	(0.0996)
Age	-0.00226	-0.00584	-0.00896**	0.0138***	-0.000975	-0.00645	-0.00501
	(0.00543)	(0.00614)	(0.00391)	(0.00466)	(0.00458)	(0.0133)	(0.0239)
agrSqr	-2.20e-05	4.63e-05	4.27e-05	-0.000166***	-3.58e-05	3.93e-05	-3.27e-05
	(5.60e-05)	(6.74e-05)	(3.89e-05)	(5.17e-05)	(4.33e-05)	(0.000144)	(0.000272)
Edu_Secondary	0.0895	0.110*	0.0813*	0.186***	0.158***	0.0295	0.277
	(0.0583)	(0.0649)	(0.0442)	(0.0539)	(0.0431)	(0.145)	(0.309)
tertiary	0.130**	0.145*	0.210***	0.292***	0.217***	0.0834	0.464
	(0.0642)	(0.0748)	(0.0469)	(0.0559)	(0.0492)	(0.155)	(0.313)
second20	-0.0246	0.0908	0.0176	0.0981**	-0.00826	0.0862	-0.264
	(0.0580)	(0.0621)	(0.0404)	(0.0477)	(0.0490)	(0.118)	(0.205)
middle20	0.0288	0.135**	0.0517	0.139***	0.0280	-	0.218
	(0.0586)	(0.0644)	(0.0402)	(0.0464)	(0.0490)		(0.191)
fourth20	0.0575	0.0874	0.103***	0.113***	0.0671	0.0817	-0.181
	(0.0596)	(0.0655)	(0.0395)	(0.0429)	(0.0514)	(0.124)	(0.216)
Richest20	0.0668	0.112*	0.160***	0.147***	0.101*	0.177	0.141
	(0.0590)	(0.0645)	(0.0403)	(0.0429)	(0.0532)	(0.119)	(0.178)
T	0.0780**	0.0841*	0.0610**	-0.0579	0.164***	0.255**	-0.321*
	(0.0370)	(0.0443)	(0.0273)	(0.0393)	(0.0322)	(0.126)	(0.168)
Observations Pseudo-R^2 Log Likelihood Predicted Prob (at mean values)	537 0.092 -244.59 0.763	410 0.0502 -204.94 0.759	1,600 0.074 -1013.91 0.445	967 0.065 -507.34 0.706	972 0.112 -568.0 0.709	92 0.141 -41.35 0.210	54 0.3413 -24.26 0.475

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: Probit Analysis for Marginal effects for parameters for Digital inclusion in Brazil

VARIABLES	DgTrMny	DgRecMny	DgPyBill	DgRecSlry	DgGvtSpt	DgAgRec	DgBusRec
Gender	-0.0889	-0.196*	0.0581*	-0.0239	-0.0881	-0.353*	-0.0172
	(0.103)	(0.117)	(0.0347)	(0.0521)	(0.0562)	(0.204)	(0.0658)
Age	0.0132	0.0128	-0.00917*	0.0109	-0.0103	0.000286	8.71e-05
	(0.0177)	(0.0235)	(0.00557)	(0.0116)	(0.00853)	(0.0444)	(0.0107)
Age Square	-9.88e-05	-6.26e-05	8.32e-05	-0.000109	0.000136	-0.000148	-2.75e-05

	(0.000198)	(0.000296)	(5.84e-05)	(0.000143)	(9.10e-05)	(0.000516)	(0.000114)
Edu_Secondary	0.340***	0.172	0.152***	0.294***	0.0429	-0.245	0.115
	(0.119)	(0.121)	(0.0398)	(0.0579)	(0.0525)	(0.341)	(0.0742)
tertiary	0.305		0.296***	0.569***	-0.0662		0.312***
	(0.199)		(0.0683)	(0.124)	(0.138)		(0.113)
second20	0.139	0.00852	0.0847	0.0488	-0.0858	-0.346	0.0390
	(0.221)	(0.170)	(0.0682)	(0.0950)	(0.0613)	(0.262)	(0.144)
middle20	-0.0472	-0.0919	0.178***	-0.0770	-0.0238	-0.158	0.170
	(0.206)	(0.160)	(0.0638)	(0.0924)	(0.0763)	(0.297)	(0.127)
fourth20	0.157	-0.157	0.196***	0.0214	0.0993		0.326***
	(0.216)	(0.223)	(0.0612)	(0.0918)	(0.0910)		(0.118)
richest20	-0.0631	-0.00241	0.345***	0.111	0.0408	0.245	0.317**
	(0.193)	(0.186)	(0.0584)	(0.0900)	(0.0838)	(0.430)	(0.123)
emp_inout	0.000742	0.295**	0.00101	0.124	0.00267	0.349	-0.114
	(0.135)	(0.120)	(0.0395)	(0.0924)	(0.0508)	(0.242)	(0.112)
Observations	79	65	674	313	254	23	144
Pseudo-R^2	-11.06	0.138	0.1184	0.119	0.059	0.307	0.204
Log Likelihood	-46.18	-37.32	-370.66	-181.27	-111.56	-10.28	-60.69
Predicted Prob (at mean values)	0.639	0.625	0.305	0.520	0.821	0.401	0.256

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 9: Probit Analysis for Marginal effects for parameters for Digital inclusion in South Africa

For South Africa							
VARIABLES	DgTrMny	DgRecMny	DgPyBill	DgRecSlry	DgGvtSpt	DgAgRec	DgBusRec
Gender	0.00184	-0.0180	0.0388	-0.0336	-0.00999	-0.0191	0.0561
	(0.0405)	(0.0409)	(0.0440)	(0.0472)	(0.0563)	(0.215)	(0.0870)
Age	-0.00795	0.00552	0.00329	-0.00312	-0.0137*	0.0112	0.0203
	(0.00722)	(0.00626)	(0.00713)	(0.00960)	(0.00813)	(0.0510)	(0.0155)
Age Square	9.45e-05	-9.52e-05	-5.50e-05	5.29e-05	0.000172*	1.97e-06	-0.000148
	(8.92e-05)	(7.40e-05)	(8.34e-05)	(0.000120)	(9.23e-05)	(0.000766)	(0.000205)
Edu_Secondary	0.0308	-0.00201	0.0775	0.121*	0.0794	0.188	0.251
	(0.0644)	(0.0669)	(0.0669)	(0.0631)	(0.0727)	(0.258)	(0.155)
Edu_Tertiary	0.0332	-	0.228***	0.447***	0.131	-0.257	0.455**
	(0.0891)		(0.0870)	(0.141)	(0.119)	(0.368)	(0.197)
Income_second20	0.0480	-0.0874	0.0270	0.110	-0.0552	-0.0544	-0.452**
	(0.0693)	(0.0743)	(0.0814)	(0.0845)	(0.0821)	(0.322)	(0.191)
Income_middle20	0.0872	-0.128*	0.106	0.0866	-0.0138	-	-0.0440

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	(0.0676)	(0.0758)	(0.0787)	(0.0817)	(0.0843)		(0.128)
Income_Fourth20	0.0534	-0.0106	0.244***	0.104	0.0376	0.0708	0.282**
	(0.0632)	(0.0773)	(0.0735)	(0.0772)	(0.0839)	(0.282)	(0.132)
Income_Richest20	0.228***	-0.0454	0.321***	0.210***	-0.0286	0.210	0.153
	(0.0670)	(0.0719)	(0.0668)	(0.0752)	(0.0859)	(0.236)	(0.124)
Employed	0.0605	0.106**	0.0180	-0.0914	0.130**	0.244	-0.0707
	(0.0479)	(0.0440)	(0.0513)	(0.0716)	(0.0547)	(0.287)	(0.101)
Observations Pseudo-R^2 Log Likelihood Predicted Prob (at mean values)	327 0.071 -133.02 0.820	357 0.054 -158.66 0.81	452 0.104 -269.26 0.375	342 0.083 -177.77 0.748	274 0.034 -148.09 0.752	30 0.107 -18.31 0.526	125 0.181 -70.75 0.49

Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

5 CONCLUSION

In this paper we investigated the landscape of landscape of digital services in terms of penetration and adoption based on World Bank Global Findex survey covering BRICS nations. We explored what is the percentage of financial as well as digital inclusion, and adoption across different groups based on age, gender, Qualification, employment status and financial status. The results of probit analysis found that out of all other factors for financial inclusion it is education and income level which are playing significant role but in India it is education which is more important than income to be financially included. For digital inclusion education and Income both play very significant role in all BRICS nations in the probability of to be digitally included. In adoption of digital services for different purposes, out of all three digital mode bank transfer is most accepted mode but majority of people still prefer to deal in cash. When it is about factors responsible for different usages than it is found that it is people with higher education level and people in rich strata of income who are more interested in using digital mode.

Our findings have some important policy implications, as it has been seen that technology reduces cost and enhance efficiency in delivery of financial services but if only few are able to use it than whole purpose get defeated. Our study provided that it is only educated and rich people who are able to use fintech for different purposes, providing the evidence that something needs to be done in this regard so that it becomes within the reach of poor and less educated people otherwise digitalization of financial services will be of no use.

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