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UNIVERSAL FINANCIAL INCLUSION AND ECONOMIC GROWTH LINKAGE – EVIDENCE FROM EMERGING INDIAN ECONOMY*

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This paper examines the linkages of various financial inclusion parameters on economic growth for an emerging economy viz., India to review the policy measures implemented in this sphere. In this context, in addition to standard measures of financial inclusion, this study incorporates auxiliary indicators also like mobile and card statistics, usage of electronic channels, pension and insurance subscribers to obtain a comprehensive assessment of the impact of financial inclusion on economic growth in the Indian economy. Bayesian vector autoregression is applied that is established to provide robust results even in small sample sizes and examines the role played by individual measures of financial inclusion separately on overall growth. It is evidenced that factors like branch network, electronic remittance services, and insurance schemes display a significant role in affecting economic growth in India.

Keywords: Financial Inclusion, Economic Growth, Bayesian Vector Autoregression
JEL Classification: G20, O10, C30

1. INTRODUCTION

Financial Inclusion (FI) is essential for improving the standard of living of poor, disadvantaged and vulnerable groups such as farmers, rural micro and small enterprises, and other weaker sections and low-income groups (Dev, 2006; GoI, 2008). The method of inclusion is to deliver 'timely and adequate credit, when required by the vulnerable group, at an affordable cost' (RBI, 2008). In the United Nation's Sustainable

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Development Goals (SDGs) of 2030, FI is included in the four SDG goals - Goal 2: Zero hunger, Goal 5: Gender equality, Goal 8: Decent work and economic growth, and Goal 9: Industry, innovation, and infrastructure (UN, 2016), demonstrating the benefits of FI in multiple dimensions. Also, digital financial services can provide solutions to challenges faced in achieving all the 17 SDGs worldwide (UN, 2018). This is because FI supports curbing poverty and inequality by delivering access to formal savings and growth (Khaki and Sangmi, 2017; Kuri and Laha, 2011; Pal and Pal, 2012; Park and Mercado, 2015).

FI is the process to ensure universal access not just to open bank accounts, deposits and loans, but also access and usage of other financial services such as insurance and pensions at an affordable price (Prasad et al., 2020). Universal financial inclusion means affordable access to banking, insurance, and pension services. As per CRISIL (2015), financial inclusion is 'the extent of access by all sections of society to formal financial services such as credit, deposit, insurance, and pension services. One of the important initiatives taken by the Government of India is to launch Pradhan Mantri Jan Dhan Yojana (PMJDY) on 28th August 2014 to provide universal access to banking services with a basic banking account, access to need-based credit, remittances facility, insurance and pension to the weaker sections and low-income groups.

FI is a key policy consideration for several countries to reduce financial exclusion in their countries. Park and Marcado (2015) assess the link between financial inclusion, poverty and income inequality for 37 selected developing Asian economies. A study by Vyas and Jain (2021) shows the strong relationship between the digital economy and financial inclusion. Contrary to the common view that financial inclusion is all about access to financial products and services, a study by Kanungo and Gupta (2021) conceptualizes financial inclusion as a composite index based on the generic well-being of society in terms of education, healthcare, income, employment, business and financial transactions. In developing economies, the gender gap across access and usage remains - but has significantly reduced.

Previous studies show that countries with stronger GDP growth rates and lower income inequality have a deeper level of traditional financial inclusion regarding access to affordable, appropriate financial services. Financial exclusion is severe in India and disproportionately higher among relatively poor households compared to their richer counterparts (Pal and Pal, 2012). In the Indian context, there are few studies on the long-run positive connection between financial development and economic growth (Singh, 2008; Sehrawat and Giri, 2015; Iqbal and Sami, 2017; Sethi and Sethy, 2018), but no major study has considered universal financial inclusion to incorporate insurance, finance, digital inclusion in their financial system.

Over the years, a slew of measures has been introduced by the RBI to enhance FI. Among the foremost measures was directing banks to open Basic Savings Bank Deposit (BSBD) account that offers minimum banking facilities at NIL charges. Other steps include: doing away with the prior permission of RBI for branch opening; mandating at least 25 percent of the total number of branches opened by banks during the financial

year to be in unbanked rural Tier 5 and Tier 6 centers; launching inter-regulatory visions of FI and literacy in conjunction with government and financial sector regulators i.e., NSFI: 2019-2024 and NSFE: 2020-2025 to promote economic wellbeing, prosperity and sustainable development (RBI, 2014; RBI, 2020). Over the decades' such policies have been tweaked to efficiently connect the masses with the formal financial system. The efficacy of such policy measures has been examined empirically by researchers. Kumar (2012) specifically scrutinized the impact of varied inclusion policies on branch density, finding that the branch authorization policies led to improvement in accessibility of banking facilities in both rural and urban regions of India.

Recent noteworthy policies initiated by RBI towards improving FI that may be underlined are guidelines for licensing of Small Finance Banks (SFBs) and Payment Banks (PBs). On one hand, the SFBs banking model has been instituted to improve FI through efficient deployment of deposits and extension of credit facilities to micro, small and unorganized entities at low processing costs. On the other hand, PBS has been set up to further FI by providing small savings accounts and payments/remittance services for retail customers (RBI, 2014; RBI, 2015). Recent analytical evidence suggests that SFBs have not only forwarded the goal of fulfilling the FI objectives by serving the under-served and marginalized section of society but are also catering to the priority sector along with healthy operating performance (Kumar and Sharma, 2021).

Both FI and economic progress have effects on each other. FI is strongly associated positively with levels of output (Sarma and Pais, 2011). Previous studies have generally used per capita GDP as a measure of income growth (Roubini and Sala-i-Martin, 1992; King and Levine, 1993). Sehrawat and Giri (2015) found a long-run connection between financial development and economic growth in India. Iqbal and Sami (2017) observed a positive and significant relationship between FI and the GDP growth of the country.

The objective of the study is to analyze the linkage of GDP growth with universal FI in India, covering traditional insurance initiatives as part of FI. Using the quarterly data from 2015 to 2022, we applied the Bayesian vector auto-regression (BVAR) model to investigate the association between economic prosperity and universal FI and its different dimensions. The main results indicate that branch networks, electronic remittances and insurance service schemes are playing a vital role in India's GDP growth, especially at longer horizons.

The paper is organized as follows. Section 2 narrates the various FI initiatives that have been taken in recent past in India. After briefly describing the literature on universal FI in India and identifying gaps in the existing literature in Section 3, we cover the data source and methodology adopted in this study in Section 4. Empirical results are then presented in Section 5 with summary and policy suggestions based on this research discussed in Section 6.

2. FINANCIAL INCLUSION STATUS IN INDIA

India's journey toward FI has a long history. It began with the nationalization of Life Insurance companies in 1956 and afterward the nationalization of commercial banks in 1969 and 1980, and the nationalization of general insurance companies in 1972 (RBI, 2020). Given that the large majority of India's poor live in rural areas,[1] rural India has been traditionally housing three-fourths to four-fifths of India's poor (Niti Aayog, 2012), the drive toward FI in India is primarily pitched toward the expansion of rural banking (Basu, 2006). Later, the agenda of FI has drawn the concerted attention of the government led to the formation of the Committee of Financial Inclusion to undertake the agenda of FI in a holistic and organized manner (Rangarajan Committee, 2008). The report not only defined FI but also advocated setting up National Mission on Financial Inclusion (NMFI), National Rural Financial Inclusion Plan (NRFIP), Business Correspondent Model (BCM) and procedural simplification, among other things. More recently, numerous measures were suggested by the Mohanty Committee (2015), prominent among them being the Sukanya Shiksha Scheme, Aadhaar-linked accounts, mobile-linked technology, digitization of land records, leveraging on the foundations of government direct benefit schemes, increased usage of digital mediums for financial transactions and laying the foundation of the JAM (Jan Dhan, Aadhaar and Mobile) trinity for facilitating FI. One of the important initiatives taken by the Government of India is to launch Pradhan Mantri Jan Dhan Yojana (PMJDY) on 28 August 2014 to provide universal access to banking services with a basic banking account, access to need-based credit, remittances facility, insurance and pension to the weaker sections and low-income groups.

To create a universal social security system for all Indians, especially the poor and the under-privileged, three social security schemes namely, Pradhan Mantri Suraksha Bima Yojana (PMSBY), Pradhan Mantri Jeevan Jyoti Yojana (PMJJBY) and Atal Pension Yojana (APY) were initiated by the Government of India from May 2015. The PMSBY scheme is available to cover insurance in case of death or disability by accident, whereas PMJJBY covers life insurance in case of death due to any cause. APY is a pension scheme to provide social security for unorganized sector workers not covered under any organized pension scheme. On 23 September 2018, the Government of India launched the largest health insurance scheme in the world, Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (PM-JAY), to meet sustainable development goals (SDGs).

The postal department is another cog in the wheel for facilitating financial inclusion, especially for rural and poor masses through its vast network of offices. India Post provides services like basic savings accounts, remittance services, long-term savings products and likewise. Examining the role of India Post, Kumar (2011) found notable progress in postal savings penetration and its usage as reflected by accounts per capita

[1] Rural India has been traditionally housing three-fourths to four-fifths of India's poor (Niti Aayog, 2012).

and savings per capita trend, respectively across the major states of India. However, certain developed states were found to be low in terms of postal department service usage where large scope exists for further improvements.

The role of microfinance institutions (MFIs) in delivering financial services to the poor, marginalized sections and rural regions is undeniable with nearly 31 percent share in the overall loan portfolio, next only to banks who occupy a share of 41 percent as of 30 September 2020. In terms of active loans, the share of MFIs is 35 percent, which is marginally below the banks at 36 percent during the same period (RBI, 2021). In a major move, RBI introduced a comprehensive regulatory structure for NBFI-MFIs in December 2011 based on the committee report headed by Shri Y.H. Malegam for orderly development, transparency and accountability in the operations of NFBI-MFIs. The main provisions of the regulations stress protection of borrowers and fair practices in lending, non-coercive methods of recovery, restrictions related to over-indebtedness especially experienced due to fallout of the MFI crisis in 2010 due to irrational exuberance and likewise. Research shows that MFIs have recorded sufficient improvement in operating efficiency with profitability, size and leverage having a beneficial impact on them (Kumar and Sensarma, 2017).

Based on Financial Access Survey, a spatial comparison of traditional, digital and auxiliary measures of FI is summarized in Table 1. Among the traditional FI measures, the density of commercial bank branches per 1000 square km is noted to be highest for India at 50 branches in 2020 within emerging nations. This is next only to Japan's figure of 103 branches for the same period among advanced nations. Moving on to the number of branches per 0.1 million of adults, which is a more apposite indicator of bank accessibility, it is found that most advanced nations are better herein. Japan has the highest number of bank branches per 0.1 million of adults at 33 in 2020 which is closely followed by France. China is evidenced to have the least number at approximately 9 branches. A similar finding is revealed in the case of the number of ATMs per 0.1 million of adults with Japan spearheading at 121 ATMs and India lagging with a paltry 22 ATMs per 0.1 million adults in 2020. Turning to the usage of financial services, we focus on deposits and credit data. Nations like China, Japan and the United Kingdom show high deposits usage at 158, 153 and 77 percent of GDP in 2020. Healthy card usage statistics is observed for countries like Japan and China at 2659 credit cards per thousand adults and 7087 debit cards per thousand adults in 2020 with India lagging significantly in both spheres. Digital FI penetration has been considerably facilitated by the spread of mobile and internet technologies. A glance at number and value of banking transactions based on mobile and internet platforms exhibits Malaysia to be the frontrunner based on both digital parameters. Further, supplementary FI insurance measures show Indonesia and Thailand to be ahead with 19929 number of life insurance and 1224 number of non-life insurance policies per thousand adults respectively. It is found that in most of the nations, both traditional and digital means of FI have improved particularly in the last few years. However, the contribution of traditional and digital platforms has been varied and demands independent analysis (Khera et al., 2021).

Table 1. Cross Country Comparison of Universal Financial Inclusion Indicators

Indicator	Emerging nations					Advanced nations				
	China: Mainland	India	Indonesia	Malaysia	Thailand	France	Germany	Japan	United Kingdom	United States
Number of commercial bank branches per 1,000 sq. km	10.81	50.53	17.03	6.77	12.07	33.65	19.21	102.51		8.73
Number of commercial bank branches per 100,000 adults	8.79	14.74	15.22	8.97	10.59	33.2	9.37	33.92		29.69
Number of ATMs per 1,000 sq. km	108	73.67	57.77	41.9	127.49	94.78		367.8	225.58	
Number of ATMs per 100,000 adults	87.88	21.5	51.66	55.56	111.82	93.52		121.71	98.63	
Outstanding deposits with commercial banks (% of GDP)	157.71	71.63	43.19	103.9	86.8	50.74	34.21	152.81	151.04	76.79
Outstanding loans from commercial banks (% of GDP)	119.42	53.71	35.52	120.78	79.31	49.23	24.58	106.8	136.21	47.14
Number of credit cards per 1,000 adults	674.31	56.67	83.62	395.8	422.41			2659.13		
Number of debit cards per 1,000 adults	7087.19	813.12	1007.5	1887.81	1099.67	1310.04		4143.19		
Number of mobile and internet banking transactions per 1,000 adults		13615.1	24474.77	798138.2	157604.4	32435.64				
Value of mobile and internet banking transactions (% of GDP)		29.52	177.24	657.13	365.82					
Number of life insurance policies per 1,000 adults	1190.21	327	19929.47	740.96	491.8			1701.72		
Number of Non-life insurance policies per 1,000 adults	557.15	237.01			1223.76					

Note: Blank cells represent data not available.

Source: International Monetary Fund (Financial Access Survey), 2021.

3. LITERATURE REVIEW

Economic growth affects both the demand and supply of financial services. The study by Demetriades and Hussein (1996) supports the demand side, stating that a booming economy provokes the need for sustainable financial infrastructure, which should be based on a strong and inclusive financial system. Only a handful of studies focus on the direct association between FI and the growth of an economy. However, researchers in cross-country studies (Rousseau and Watchel, 2005; Berentsen and Shi, 2008; Masoud and Hardaker, 2012; Barajas et al., 2012) have observed that FI is indirectly associated with economic growth.

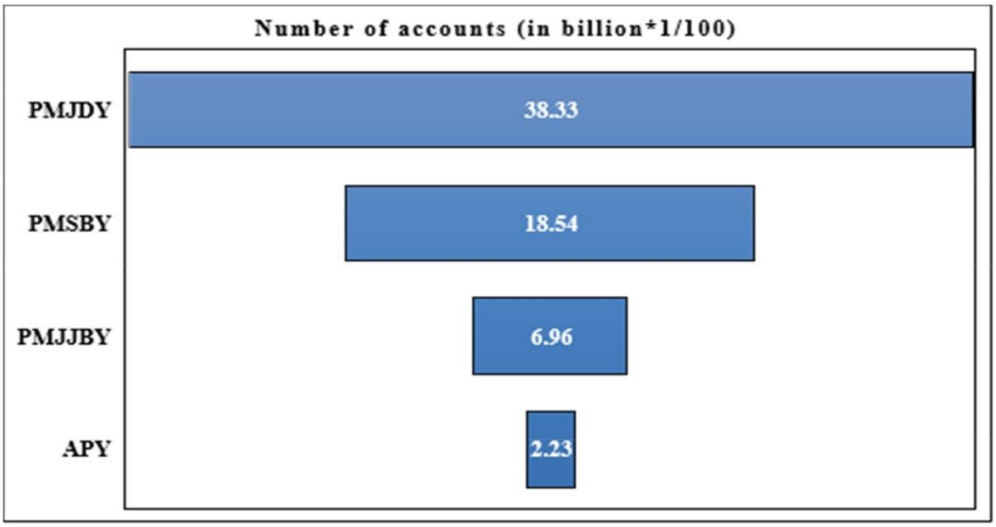
Lucas (1988) found that the finance-growth and growth-finance linkage is not observed positively in every case and concluded that researchers are inclined to exaggerate the role of the financial system. It is not vital that all economic systems will reveal a positive linkage with financial inclusion and showed measurable heterogeneity across countries due to regulatory/supervisory characteristics (Barajas et al., 2012). The financial crisis and failure of economic systems significantly affect the finance-growth linkage. Excess financing and the 2008 crisis slowed down growth in developed economies like Germany, France and the UK, whereas the Indian and Chinese economies experienced sustained high growth (Bhattarai, 2015). In developing economies, financial inclusion and growth are co-integrated in the long run and demonstrate causality (Pradhan, 2010). However, in a cross-country analysis of 15 OECD and 50 non-OECD countries, Apergis et al. (2007) found bidirectional causality between financial inclusion and growth.

The linkage between FI and GDP growth indicators has been studied extensively. Beck et al. (2007) discovered a new set of banking indicators across countries, strongly associated with economic development. Sarma and Pais (2011) studied various macroeconomic and social factors strongly related to FI, like income, literacy and inequality. Lenka and Barik (2018) have demonstrated the unidirectional causality from the growth of mobile and Internet services to expanded financial inclusion in the SAARC countries. Further studies (Ghosh, 2011; Mehrotra et al., 2009; Sharma, 2016) have identified the positive relationship between financial inclusion and economic growth. Kumar and Mohanty (2011) established that FI is a prerequisite for inclusive development in SAARC countries and their study underlines illiteracy, distance from banking provisions, lack of interest facilities and high-interest rates as the main barriers to FI.

The spread of mobile and internet technologies has considerably facilitated digital financial inclusion penetration. A study by Chinoda and Kwenda (2019), which used data from 2004-2016 for 49 countries, reveals that financial inclusion is significantly associated with mobile phone penetration, economic growth, and bank stability. Lee et al. (2021) studied the impact of mobile banking in Bangladesh and found that poor rural households where family members had migrated to the city have witnessed higher remittance payments. They can spend more on food and other items and are less likely to

experience extreme poverty. Online payments such as wages and government support directly into the account of beneficiaries can help achieve development goals. A glance at the number and value of banking transactions based on mobile and internet platforms exhibits Malaysia as the frontrunner based on both digital parameters. Further, supplementary FI insurance measures show Indonesia and Thailand to be ahead with 19929 life insurance and 1224 non-life insurance policies per thousand adults, respectively. In most nations, both traditional and digital means of FI have improved, particularly in the last few years. However, the contribution of traditional and digital platforms has been varied and demands independent analysis (Khera et al., 2021).

Every citizen in India who is willing and eligible requires to be provided with a basic bouquet of financial services that include a Basic Savings Bank Deposit Account, credit, a micro life and non-life insurance product, a pension product and a suitable investment product (RBI, 2020). Figure 1 demonstrates that the PMJDY scheme covered 0.38 billion beneficiaries linked with a bank as of 31 March 2020. Regarding account openings, the extent and penetration are much less than satisfactory regarding usage by marginalized sections, people in the informal economy, and those living in remote areas (Swain and Jain, 2019). The impact study of PMJDY at the district level by Yadav et al. (2020) reveals that the PMJDY framework has not driven the economy toward high financial inclusion. Inoue (2018) finds that public-sector banks can curb poverty more effectively than private banks. In contrast, accounts coverage by PMJJBY, PMSBY, and APY are 0.07 billion, 0.18 billion and 0.02 billion respectively by 31 March 2020. All the above schemes, viz. PMJDY, PMJJBY, PMSBY and APY are at the individual level across states.



Source: Department of Finance Services, Min of Finance, GoI, March 2020 (based on RTI)

Figure 1. Key Financial Inclusion Schemes Initiated by the Government of India

It is acknowledged that efforts are still needed to provide access to insurance, pension and credit to the PMJDY account holders (RBI, 2020). There is no study to capture major insurance and pension schemes in the FI bouquet while establishing the relationship with economic growth. This article is an attempt to fill this gap.

4. DATA AND METHODOLOGY

As the study strives to examine the role of FI on growth in India, incorporating not only various traditional measures of FI but also digital usage mediums, insurance, pension indicators and likewise, a suitably chosen sample period is considered to exhibit adequate coverage of various variables. The quarterly dataset spans from June-2015 to March-2022 collated from various sources such as National Statistical Office (NSO), Reserve Bank of India (India) and Right to Information (RTI) from Department of Finance Services, Ministry of Finance (Government of India). The snapshot of variables is presented in Table 2.

Table 2. Variable Description

Group	Variable	Definition	Data Source
Economic Growth	R_GR_RATE	Real GDP growth rate	RBI
Infrastructure indicators	BRAN	Number of bank branches	RBI
	ATM	Number of Automated Teller Machines	RBI
	POS		RBI
Traditional usage	AMT_DEP	Amount of deposit balance	RBI
	AMT_CRE	Amount of credit outstanding	RBI
Electronic usage	N_NEFT	Volume of NEFT transactions	RBI
	AMT_NEFT	Amount of NEFT transactions	RBI
	N_IMPS	Volume of IMPS transactions	RBI
	AMT_IMPS	Amount of IMPS transactions	RBI
	N_RTGS	Volume of RTGS transactions	RBI
	AMT_RTGS	Amount of RTGS transactions	RBI
Card usage	N_D_CARD	Volume of debit card transactions	RBI
	AMT_D_CARD	Amount of debit card transactions	RBI
	N_C_CARD	Volume of credit card transactions	RBI
	AMT_C_CARD	Amount of credit card transactions	RBI
Digital usage	N_MOBILE	Volume of mobile transactions	RBI
	AMT_MOBILE	Amount of mobile transactions	RBI
Insurance subscribers	N_PMSBY	Number of subscribers of PMSBY	RTI
	N_PMJJBY	Number of subscribers of PMJJBY	RTI
Pension subscribers	N_APY	Number of subscribers of APY	RTI

GDP growth rate has been obtained from NSO. Real GDP growth has been utilized as the sole dependent variable. All the other variables are considered as exogenous/pre-determined. Various aspects of banking such as banking infrastructure and usage are collated from the publicly available RBI portal. The number of branches, ATMs and POS instruments are included as supply-side/infrastructure parameters. Usage indicators have been classified into traditional, electronic, card and digital. Separate groups have been created to assess the differential impact on economic development. Apart from banking, auxiliary variables have also been analyzed comprising pension and insurance sectors. In this regard, information related to PMSBY, PMJJBY and APY was gathered from the Department of Finance Services, Ministry of Finance.

Table 3. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Standard Deviation
Real GDP growth rate	4.79	6.47	9.67	3.08*	7.12*
Physical Infrastructure (Accessibility)					
Number of Branches	11.60	11.61	11.64	11.52	0.03
Number of ATMs	12.04	12.05	12.09	11.92	0.04
Digital Utilization					
Volume of NEFT	8.23	8.28	8.77	7.64	0.32
Value of NEFT	14.92	15.05	15.47	14.14	0.43
Volume of IMPS	7.48	7.72	8.93	5.52	1.02
Value of IMPS	11.93	12.21	13.36	9.86	1.10
Card Utilization					
Volume of debit card	10.00	9.99	10.27	9.59	0.18
Value of debit card	13.36	13.39	13.61	13.02	0.18
Mobile Utilization					
Number of Mobile Banking transaction	8.64	8.56	11.04	6.11	1.58
Amount of Mobile Banking transaction	12.83	12.88	14.69	10.48	1.17
Banking Utilization					
Amount of Deposit	15.98	15.99	16.24	15.73	0.15
Insurance					
Number of PMSBY subscribers	18.37	18.47	18.92	17.46	0.43
Number of APY subscribers	14.92	15.12	15.65	13.40	0.62

Note: All values normalized by population in millions. Natural logarithms transformation is taken for all variables. * Minimum of GDP is adjusted for negative growth during the Covid-19 period.

Table 3 provides the summary of different indicators for the time-period March-2015 to December-2020. From Table 3, the mean value of ATMs and branches are observed as 12.04 and 11.60 respectively. It signifies a greater density of ATMs compared to

branches as regards accessibility of physical infrastructure. In the digital utilization aspect, the average usage of NEFT both in terms of volume and value is higher than that of IMPS, implying the prevalence of NEFT vis-à-vis IMPS. As regards ancillary financial services, PMSBY is more at 18 per million persons compared to around 15 per million persons of APY subscribers. The finding shows the predominance of insurance services compared to pension products amongst the public.

In terms of methodology, we employ the BVAR framework to explore the linkage between financial inclusion and economic growth. Considering the limited length of the data set and the classical VAR method suffering from shorter data sizes with a high number of parameters, BVAR is appropriate to improve accuracy. In this way, Bayesian VAR utilizes sample/data information and prior information about the parameters. Let, the VAR(p) model is represented as,

$$y_t = a_0 + \sum_{j=1}^{p} A_j y_{t-j} + \varepsilon_t. \tag{1}$$

The above equation may be re-written parsimoniously in matrix notation as,

$$Y = XA + E. \tag{2}$$

Here, Y and E are $T \times m$ matrices of endogenous variables and stochastic error respectively. $X = (x_1, \cdots, x_t)'$ is a $T \times (mp + 1)$ matrix of a combination of lagged endogenous and exogenous variables. A is a $(mp + 1) \times m$ matrix of associated coefficients of X matrix. Finally, $E \sim N(0, \sum_{\varepsilon} \otimes I_T)$. The likelihood function of equation (2) is derived as,

$$l(\theta, \sum_{\varepsilon}) \propto |\sum_{\varepsilon} \otimes I_T|^{-1/2} exp\left\{-\frac{1}{2}(y - (I_m \otimes X)\theta)'(\sum_{\varepsilon} \otimes I_T)^{-1}(y - (I_m \otimes X)\theta)\right\}. \tag{3}$$

In Equation (3), $\theta = vec(A)$. Assuming $\sum_{\epsilon}$ to be known and following multivariate normal distribution for θ, the prior for θ is obtained as,

$$\Pi(\theta) \propto |V_0|^{-1/2} exp\left\{-\frac{1}{2}(\theta - \theta_0)' V_0^{-1}(\theta - \theta_0)\right\} \tag{4}$$

As above, the prior mean is denoted by θ_0 and V_0 symbolizes the prior covariance matrix. The posterior distribution is a combination of likelihood and priors as already defined in Equations (3) and (4) respectively, represented as,

$$\Pi(\theta|y) = exp\left\{-\frac{1}{2}\left(\left(V_0^{-\frac{1}{2}}(\theta - \theta_0)\right)'\left(V_0^{-\frac{1}{2}}(\theta - \theta_0)\right) + \left\{\left(\sum_{\epsilon}^{-1/2} \otimes I_T\right)y - \left(\sum_{\epsilon}^{-1/2} \otimes X\right)\theta\right\}'\left\{\left(\sum_{\epsilon}^{-1/2} \otimes I_T\right)y - \left(\sum_{\epsilon}^{-1/2} \otimes X\right)\theta\right\}\right)\right\}. \tag{5}$$

As observed, Equation (5) is a multivariate normal distribution. As a next step, suitable priors need to be chosen for θ_0 and V_0. In this context, the commonly used Litterman or Minnesota prior is employed that not only leads to simple posterior inference (Litterman, 1986) but also shrinks the unrestricted model towards a compact naive benchmark that reduces the parameter uncertainty and improves model prediction accuracy (Karlsson, 2013). Minnesota prior assumes that each variable follows a random walk process, possibly with drift, and therefore consists of a normal prior on a set of parameters with fixed and known covariance matrix. Additionally, hyper-parameters can be appropriately chosen as per the prior beliefs (Giannone et al., 2015). Herein, $\sum_{\varepsilon}$ is replaced by $\widehat{\sum_{\varepsilon}}$, so we need to only specify the prior for θ parameter. The prior coefficient θ as per Litterman (1986) is given as:

$$\theta \sim N(\bar{\theta}, \bar{V}), \tag{6}$$

where, $\bar{\theta} = \bar{V}[V_0^{-1}\theta_0 + \left(\widehat{\sum_{\varepsilon}^{-1}} \otimes X\right)' y]$ and $\bar{V} = \left[V_0^{-1} + \left(\widehat{\sum_{\varepsilon}^{-1}} \otimes X'X\right)\right]^{-1}$.

We worked on the time series data under the Bayesian VAR framework, so the stationarity of data was checked. The data should not have unit root problems for econometric modeling. Only major variables of various FI components are included in the model to minimize the collinearity issue. The augmented Dickey-Fuller test was applied to test the existence of the unit root issue. Based on the data set and above models, endogeneity among variables was also investigated employing Granger Causality.

5. EMPIRICAL RESULTS AND DISCUSSIONS

In this section, we present the empirical results and study the linkage between the various dimensions of FI and economic growth. Figure 2 represents the growth of major indicators of FI categorized under physical infrastructure, mobile banking, digital utilization and insurance. The trend shows that the expansion of physical infrastructure such as new branches and ATMs post 2020 remained muted due to more usage of digital banking during Covid-19 pandemic. Positive growth in mobile banking and digital utilization services such as NEFT, IMPS is recorded in 2020. Insurance schemes such as PMSBY and APY, which generally can be opened with a PMJDY account, have shown slow growth post June-2018. Overall, both PMSBY and APY growth shows a consistent pattern and less growth post Sep-2018, except a slight demand in PMSBY between May-2021 to Sep-2021.

We applied the Augmented Dickey-Fuller (ADF) test to validate the stationarity of the data series. The result of the stationarity test (Table 4) shows that most of the variables are integrated of order one i.e. I(1). Accordingly, we have utilized the first difference of all the pre-determined variables in the analysis. All the variables are differenced once at lag 4 as it leads to uniformity in the interpretation of the results and removes seasonality if any. Moreover, differencing of an I(0) process does not break the stationarity property of the series (Enders, 2008).

Table 4. Results of Unit-root Test

Variable	Level	First difference
R_GR_RATE	-3.26***	-
BRAN	-2.19	-7.11***
ATM	0.92	-3.61**
POS	2.67	-3.02**
AMT_DEP	1.86	-6.36***
AMT_CRE	1.14	-3.65**
N_NEFT	2.37	-8.20***
AMT_NEFT	3.31	-2.75*
N_IMPS	-5.33***	-
AMT_IMPS	-3.79***	-
N_RTGS	-1.48	-10.64***
AMT_RTGS	-1.18	-3.74***
N_D_CARD	-2.89*	-
AMT_D_CARD	-2.60	-8.07***
N_C_CARD	-0.67	-6.25***
AMT_C_CARD	-3.45**	-
N_MOBILE	3.14	-3.65**
AMT_MOBILE	5.29	-3.66**
N_PMSBY	-0.04	-8.49***
N_PMJJBY	-0.13	-8.49***
N_APY	-0.06	-4.01***

Notes: *, **, *** depict significance at 10, 5 and 1 percent significance level respectively.

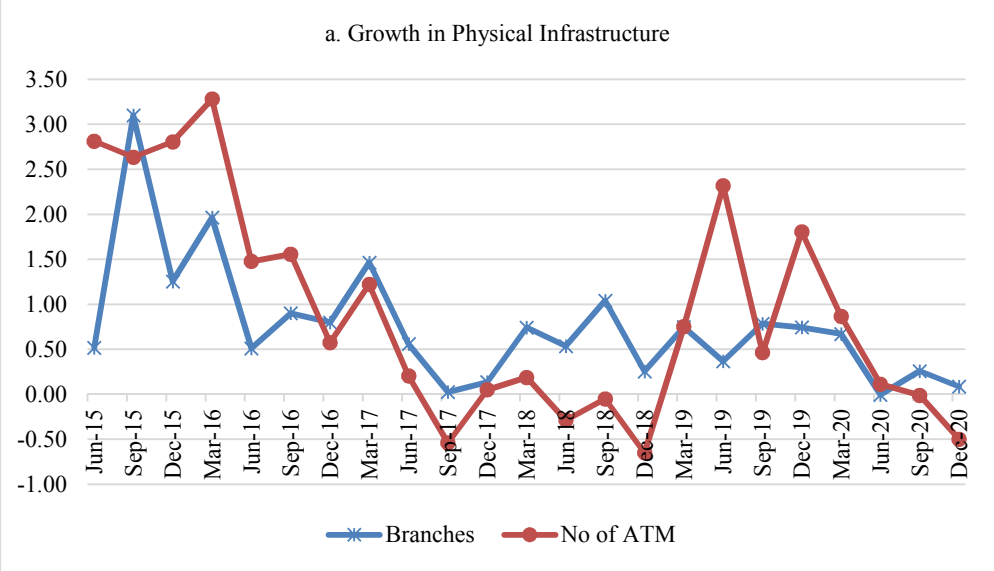


Figure 2. Growth Trend of Financial Inclusion Indicators

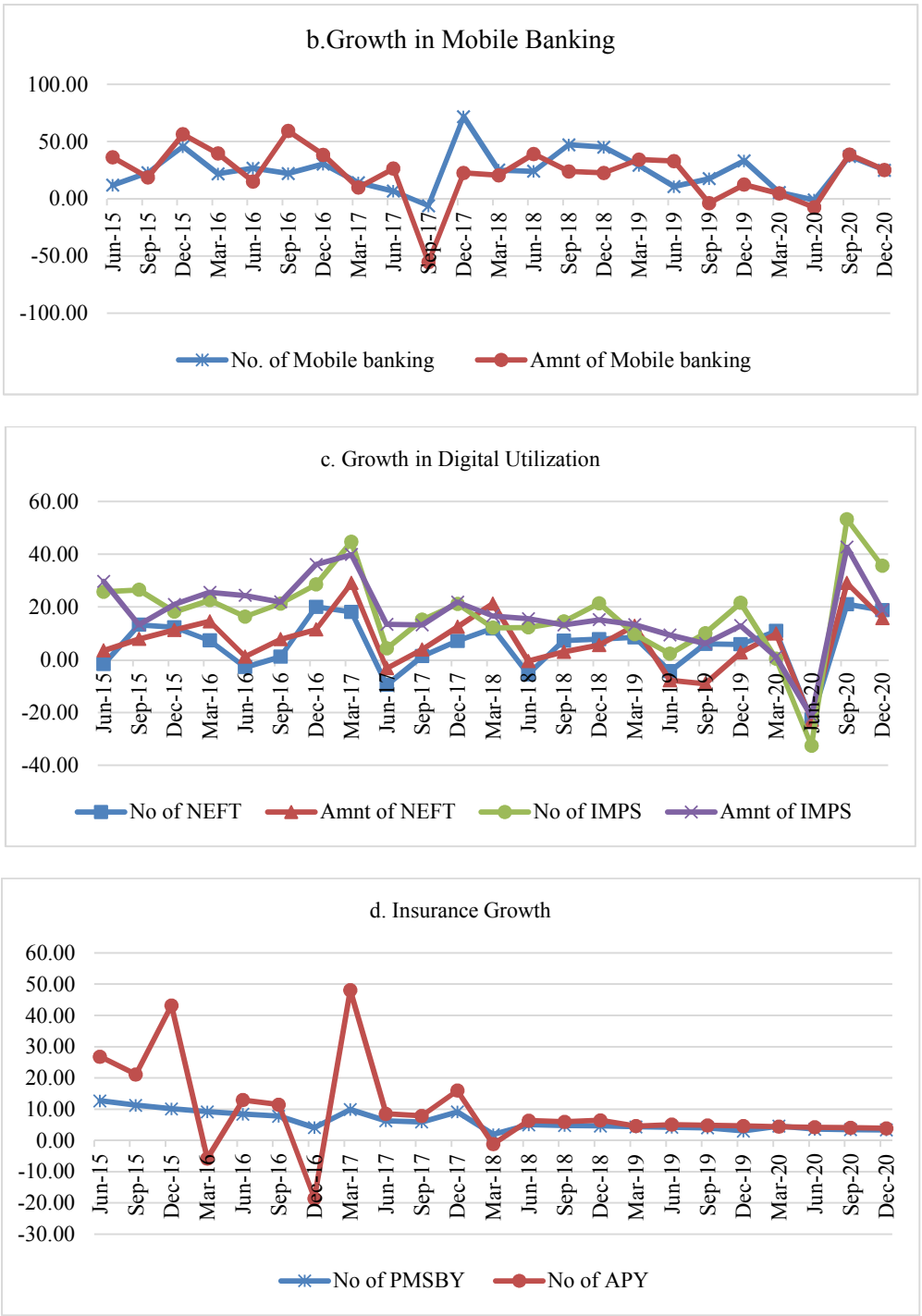


Figure 2. Growth Trend of Financial Inclusion Indicators (cont')

As most of the variables in our analysis display the existence of a unit root, Johansen's cointegration test revealed no indication of any cointegrating relationship amongst the variables. Further, it is pertinent to examine the direction of causality to apply the proper modeling approach. The results of the Granger Causality test (Table 5)show that most of the electronic platforms viz., IMPS, NEFT, RTGS are displaying substantial bi-directional causality with real GDP growth both in terms of volume and value. Amongst the card transactions, the volume of debit card transactions is found to be having a statistically significant impact on output growth while credit card transactions are turning out to be insignificant for volume and value both. Next, mobile-led financial operations are found to exhibit strong bi-directional causality. Again the outcome is comparable for transactions measured in terms of both number and amount. As numerous FI parameters display two-way causality, we have chosen all FI indicators as endogenous along with GDP growth rate in the BVAR formulation.

Subsequently, we carry out the Bayesian VAR estimation with real GDP growth as the dependent variable regressed on a set of universal FI indicators to isolate their respective impact on economic growth. Unlike in certain previous studies, wherein the FI index is compiled before carrying out the regression (Dahiya and Kumar, 2020; Singh and Stakic, 2021), the current study has not compiled any aggregate index. An index is not only prone to weighing issues but also inadequate in identifying the specific components sharing a significant association with the dependent variable. The Bayesian VAR technique circumvents such limitations to provide an efficient procedure to estimate multiple equations systems in a single step with the limited dataset.

Several permutations and combinations were tested before choosing the reference model. The results of reference BVAR are presented in Table 6. The first lag of pre-determined variables are selected that was found to be most reasonable in terms of overall model adequacy. At the outset, lagged GDP growth is witnessed to have a positive and statistically significant impact on current GDP growth. The result is quite anticipated as a robust economic activity is expected to continue with healthy output in successive periods displaying persistence in absence of any unfavourable shock. Amongst the parameters related to physical infrastructure, it is revealed that the number of bank branches is sharing a strong and beneficial relationship with the GDP growth rate. The result vindicates the importance of supply-side measures like liberal branch authorization by RBI towards FI initiatives and thereby growth and development of the Indian economy (Kumar, 2013; RBI, 2014). Further, within the parameters related to an electronic medium, the National Electronic Funds Transfer (NEFT) transaction amount explains GDP growth significantly and positively. Considering the usage of net banking, it is evident that NEFT transaction is an integral part of digital FI and a key factor in economic progress. It vindicates the beneficial impact of NEFT which was introduced in November 2005 by RBI. With no upper or lower limits for transaction amounts fixed in NEFT, it provides round-the-clock funds transfer facility in 48 batches from 16 December 2019 onwards with nil processing fees. Moving to complementary FI activities, it is found that the insurance component of universal FI such as the number of beneficiaries enrolled under the PMSBY scheme has a significant and favourable impact on economic growth. PMSBY has been a hugely popular insurance scheme due to its low insurance premium, reasonable coverage for death/disability and flexibility to continue/discontinue the policy.

Table 5. Test of Granger Causality

Null Hypothesis	F-Statistic
BRAN does not Granger Cause R_GR_RATE	0.60
R_GR_RATE does not Granger Cause BRAN	0.51
ATM does not Granger Cause R_GR_RATE	0.84
R_GR_RATE does not Granger Cause ATM	0.41
POS does not Granger Cause R_GR_RATE	1.03
R_GR_RATE does not Granger Cause POS	0.52
N_RTGS does not Granger Cause R_GR_RATE	2.07
R_GR_RATE does not Granger Cause N_RTGS	0.76
N_NEFT does not Granger Cause R_GR_RATE	2.49*
R_GR_RATE does not Granger Cause N_NEFT	1.00
N_IMPS does not Granger Cause R_GR_RATE	3.1**
R_GR_RATE does not Granger Cause N_IMPS	2.91**
AMT_RTGS does not Granger Cause R_GR_RATE	3.84**
R_GR_RATE does not Granger Cause AMT_RTGS	2.25*
AMT_NEFT does not Granger Cause R_GR_RATE	3.44**
R_GR_RATE does not Granger Cause AMT_NEFT	7.80***
AMT_IMPS does not Granger Cause R_GR_RATE	7.98***
R_GR_RATE does not Granger Cause AMT_IMPS	3.37**
N_C_CARD does not Granger Cause R_GR_RATE	1.37
R_GR_RATE does not Granger Cause N_C_CARD	1.50
N_D_CARD does not Granger Cause R_GR_RATE	3.21**
R_GR_RATE does not Granger Cause N_D_CARD	1.93
AMT_C_CARD does not Granger Cause R_GR_RATE	0.90
R_GR_RATE does not Granger Cause AMT_C_CARD	1.66
AMT_D_CARD does not Granger Cause R_GR_RATE	0.71
R_GR_RATE does not Granger Cause AMT_D_CARD	1.28
N_MOBILE does not Granger Cause R_GR_RATE	20.74***
R_GR_RATE does not Granger Cause N_MOBILE	3.34**
AMT_MOBILE does not Granger Cause R_GR_RATE	3.84**
R_GR_RATE does not Granger Cause AMT_MOBILE	6.35***
N_PMJJBY does not Granger Cause R_GR_RATE	0.38
R_GR_RATE does not Granger Cause N_PMJJBY	0.08
N_PMSBY does not Granger Cause R_GR_RATE	0.25
R_GR_RATE does not Granger Cause N_PMSBY	0.10
N_APY does not Granger Cause R_GR_RATE	0.41
R_GR_RATE does not Granger Cause N_APY	0.44

Note: All variables first difference at lag 4 except R_GR_RATE. Please refer to Table 3 for notes on tables.

Table 6. Jarque-Bera Test for Normality

Component	Jarque-Bera Statistics
1	1.09
2	1.81
3	0.34
4	4.54
5	0.48
6	16.13
7	0.55
8	1.45
9	1.89
10	0.62
11	4.54
12	0.98
13	0.47
14	1.07
Joint	35.96

Note: All values are insignificant at 10 percent significant level except for component 6.

Table 7. BVAR Estimation Results

Variable	**Estimate**	**Standard Error**
R_GR_RATE(-1)	0.26***	0.08
BRAN(-1)	2.6E-04***	9.4E-05
ATM(-1)	3.3E-05	2.9E-05
N_NEFT(-1)	2.2E-04	3.5E-04
AMT_NEFT(-1)	5.3E-07*	3.1E-07
N_IMPS(-1)	1.2E-04	3.5E-04
AMT_IMPS(-1)	1.7E-06	4.3E-06
N_D_CAR(-1)	3.3E-05	4.4E-05
AMT_D_CAR(-1)	1.3E-06	1.2E-06
N_MOBILE (-1)	-5.1E-05	3.8E-05
AMT_MOBILE(-1)	-3.9E-07	5.2E-07
AMT_DEP (-1)	8.5E-08	4.1E-07
N_PMSBY(-1)	7.4E-08***	2.6E-08
N_APY(-1)	1.1E-07	1.5E-07
Model fit statistics		
Adj. R-squared	0.16	
F-statistic	2.26**	

Note: R_GR_RATE is the dependent variable. All variables first differenced at lag 4 except R_GR_RATE. The first lag is denoted by -1. Hyper-parameters selected are: Mu: 0, L1: 0.1, L2: 0.99, L3: 1. Initial residual covariance is: Univariate AR. Please refer to Table 2 for notes on fields.

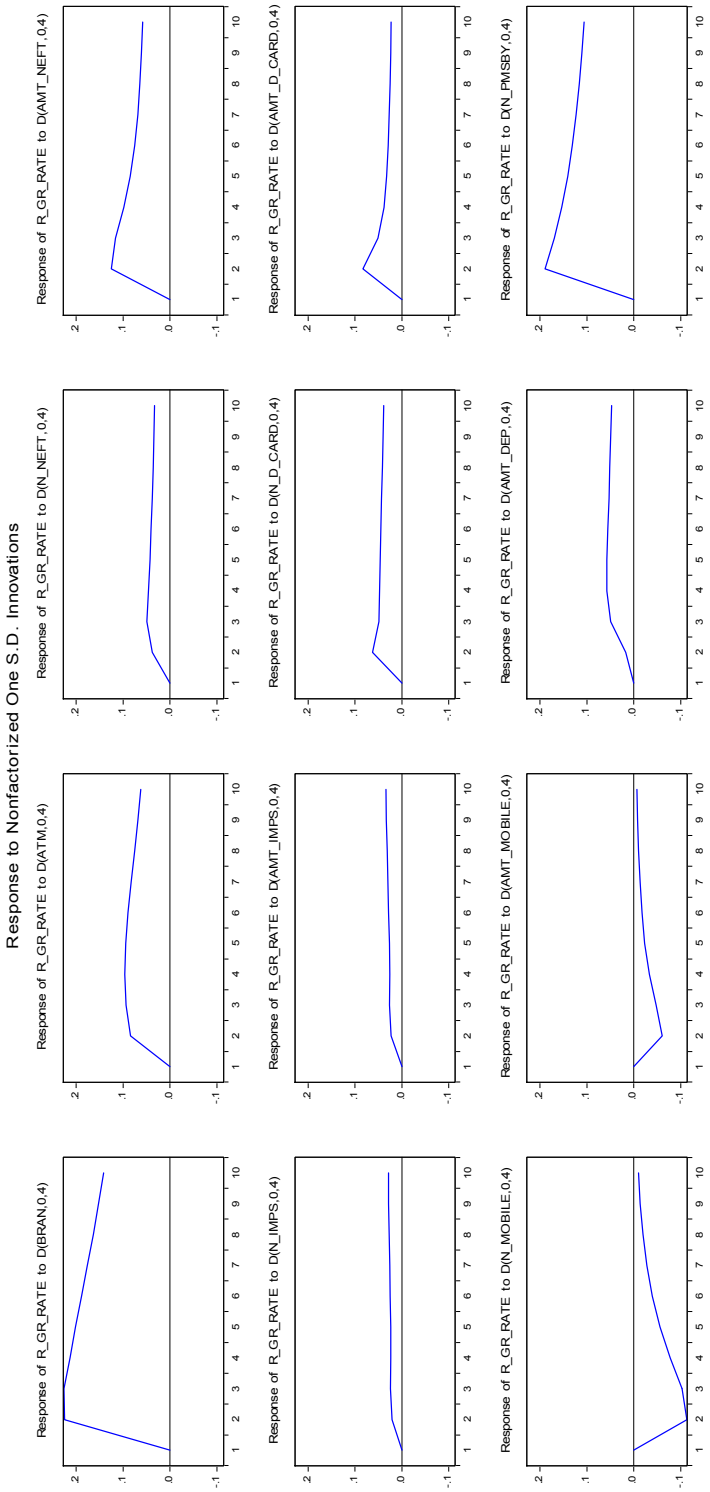


Figure 3. Impulse Response Analysis

Finally, examination of certain model diagnostics is vital to test their validity. In this context, adjusted R^2 shows a decent score of 16.3 percent along with significant F-statistics implying a reasonable fit. Additionally, in a VAR system, it is imperative to test for inverse roots of the AR characteristic polynomial associated with the different lag orders specified in the model. It is depicted that all inverse roots are lying within a unit circle implying stability and hence the validity of BVAR estimates (Figure A1, Appendix). Additionally, a diagnostic test for normality is presented in Table 6. In this regard, the Jarque-Bera test is carried out that has the null hypothesis that the stochastic term follows a normal distribution. As per the normality test, the p-values for most of the components and final joint are greater than 5 percent favouring the null hypothesis and hence establishing the accuracy of significance testing performed for various parameter estimates.

BVAR estimates a system of multiple equations simultaneously (Table 7). So, interpretation of the relationship amongst variables may be complicated. The impulse response function (IRF) is of prime importance in the BVAR framework that traces the impact of a one-time shock in one parameter on the current and future values of other variables. IRF summarises the directions and persistence in the response variable for a unit standard deviation shock to the residuals of an exogenous variable.

As per Figure 3, the IRF outcome shows that a positive shock in most of the pre-determined variables has a beneficial impact on the GDP growth rate. It is observed that the uptick in GDP growth is especially substantial for a shock in BRAN, AMT_NEFT, N_PMSBY. The result corroborates the findings of the BVAR regression analysis as observed earlier. Moreover, it is noted that the impact of shock persists for more than two years on the GDP growth rate before eventually normalising to pre-shock levels.

In Table 8, the variance decomposition analysis provides a means of determining the relative importance of variables in explaining variations due to shock in the variable of interest (GDP growth rate in our case). The results of the variance decomposition analysis for 10 quarters ahead show that the proportion of the forecast error variance in the GDP growth explained by its innovations is the highest. This is followed by a number of branches that occupies the highest explanatory power amongst the pre-determined variables. The number of branches records a sequential increase in a variance decomposition analysis from a low of 5 percent in the second quarter to a high of nearly 23 percent by the tenth quarter displaying a nearly five-fold increase. Other FI mediums that deserve attention are a number of NEFT transactions and debit card transactions. Both register a roughly improving trend with NEFT transactions occupying a share of approximately 6 percent compared to 5 percent for debit card transactions in the tenth quarter. Certain other variables like the amount of NEFT transactions and the number of subscribers of PMSBY are also noted to be monotonically increasing to touch the level of 2.4 and 1.5 percent respectively. Broadly, the finding of the variance decomposition depicts the relevance of numerous FI indicators like BRAN, N_NEFT, AMT_NEFT, N_D_CARD, AMT_DEP, N_PMSBY that have an impact on output growth in India, especially at a longer horizon.

Last but not the least, the robustness of our results needs to be tested to establish the validity of interpretations. In this respect, Table 7 represents the robustness analysis of FI variables across models with alternate variables for various categories of FI. In Model 1, variables like a number of POS, RTGS, and PMJJBY have been introduced vis-à-vis the

reference model. Model 2 incorporates the volume and amount of credit card transactions. The amount of deposit is replaced by credit outstanding in Model 3. Model 4 includes both the insurance measures viz., PMSBY and PMJJBY. It is found that the variables such as the number of branches, the value of NEFT transactions, number of subscribers of the PMSBY scheme are largely robust across the models. These variables retain their significance with a consistent sign across the different models. This substantiates our results and inferences as obtained previously based on the reference model.

Table 8. Outcome of Variance Decomposition Analysis

Variable	Period									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Standard Error	0.81	0.93	1.01	1.06	1.11	1.15	1.18	1.21	1.23	1.25
R_GR_RATE	100	82.9	73.86	68.19	64.1	60.95	58.44	56.42	54.76	53.37
BRAN	0	5.32	9.09	12.25	14.98	17.27	19.12	20.6	21.75	22.65
ATM	0	1.23	1.58	1.6	1.54	1.47	1.41	1.36	1.32	1.3
N_NEFT	0	1.25	2.62	3.57	4.2	4.65	5	5.28	5.53	5.74
AMT_NEFT	0	0.97	1.6	1.94	2.13	2.24	2.31	2.36	2.4	2.43
N_IMPS	0	0.46	0.57	0.56	0.52	0.49	0.49	0.52	0.58	0.66
AMT_IMPS	0	0.01	0.06	0.17	0.3	0.44	0.59	0.74	0.89	1.04
N_D_CAR	0	3.04	4.24	4.68	4.84	4.87	4.85	4.81	4.76	4.72
AMT_D_CAR	0	2.54	2.87	2.81	2.69	2.57	2.47	2.37	2.29	2.22
N_MOBILE	0	0.31	0.48	0.54	0.54	0.53	0.51	0.49	0.47	0.46
AMT_MOBILE	0	0.16	0.19	0.18	0.18	0.17	0.16	0.15	0.15	0.14
AMT_DEP	0	1.24	1.97	2.47	2.83	3.11	3.32	3.5	3.65	3.78
N_PMSBY	0	0.57	0.84	1.02	1.14	1.23	1.3	1.36	1.41	1.45
N_APY	0	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Note: R_GR_RATE is the dependent variable. All variables first differenced at lag 4 except R_GR_RATE.

Table 9. BVAR Regression Results for Robustness Analysis

Model 1		Model 2		Model 3		Model 4	
R_GR_RATE(-1)	0.29000000***	R_GR_RATE(-1)	0.26000000***	R_GR_RATE(-1)	0.25000000***	R_GR_RATE(-1)	0.27000000***
	-0.08000000		-0.08000000		-0.08000000		-0.08000000
BRAN(-1)	0.00031***	BRAN(-1)	0.00026***	BRAN(-1)	0.00025**	BRAN(-1)	0.00026***
	-0.00008200		-0.00009400		-0.00009400		-0.00009300
POS(-1)	0.00000017	ATM(-1)	0.00003200	ATM(-1)	0.00003500	ATM(-1)	0.00003600
	-0.00000031		-0.00002900		-0.00002900		-0.00002800
N_IMPS(-1)	0.00010000	N_NEFT(-1)	0.00019000	N_NEFT(-1)	0.00022000	N_NEFT(-1)	0.00014000
	-0.00035000		-0.00036000		-0.00035000		-0.00034000
AMT_IMPS(-1)	0.00000140	AMT_NEFT(-1)	0.00000054*	AMT_NEFT(-1)	0.00000049	AMT_NEFT(-1)	0.00000062**
	-0.00000430		-0.00000031		-0.00000031		-0.00000031
N_RTGS(-1)	0.00200000	N_IMPS(-1)	0.00007700	N_IMPS(-1)	0.00009000	N_RTGS(-1)	0.00160000
	-0.00600000		-0.00036000		-0.00035000		-0.00590000
AMT_RTGS(-1)	0.00000001	AMT_IMPS(-1)	0.00000110	AMT_IMPS(-1)	0.00000120	AMT_RTGS(-1)	0.00000001
	-0.00000002		-0.00000450		-0.00000440		-0.00000002
N_D_CAR(-1)	0.00004100	N_C_CAR(-1)	0.00001400	N_D_CAR(-1)	0.00002800	N_D_CAR(-1)	0.00003300
	-0.00004300		-0.00050000		-0.00004400		-0.00004400
AMT_D_CAR(-1)	0.00000130	AMT_C_CAR(-1)	0.00001600	AMT_D_CAR(-1)	0.00000110	AMT_D_CAR(-1)	0.00000120
	-0.00000120		-0.00001700		-0.00000120		-0.00000120
N_MOBILE(-1)	-0.00005900	N_MOBILE(-1)	-0.00005500	N_MOBILE(-1)	-0.00005600	AMT_DEP(-1)	-0.00000009
	-0.00003800		-0.00003900		-0.00003900		-0.00000039
AMT_MOBILE(-1)	-0.00000039	AMT_MOBILE(-1)	-0.00000043	AMT_MOBILE(-1)	-0.00000040	N_PMSBY(-1)	0.000000062***
	-0.00000051		-0.00000052		-0.00000051		-0.00000002
AMT_DEP(-1)	0.00000015	AMT_DEP(-1)	0.00000001	AMT_CRE(-1)	0.00000059	N_APY(-1)	0.00000009
	-0.00000041		-0.00000041		-0.00000055		-0.00000015
N_PMSBY(-1)	0.00000008***	N_PMSBY(-1)	0.000000072***	N_PMSBY(-1)	0.000000072***	N_PMJJBY(-1)	0.00000002
	-0.00000003		-0.00000003		-0.00000003		-0.00000002
N_PMJJBY(-1)	0.00000002	N_APY(-1)	0.00000011	N_APY(-1)	0.00000010		
	-0.00000002		-0.00000015		-0.00000015		
Model fit statistics							
Adj. R-squared	0.150		0.070		0.210		0.130
F-statistic	2.230		2.100		2.340		2.200

Note: Please refer to Table 2 for notes on tables.

6. CONCLUSION AND POLICY IMPLICATIONS

The advocacy of FI policy as a welfare measure is well recognized. In this context, the present analysis dwells on the connection of FI parameters with economic prosperity for India. The study employs conventional banking indicators of usage and access along with supplementary mediums of FI like pension and insurance subscribers etc., thereby leading to universal FI. The article applied the Bayesian vector autoregression methodology for analysis purposes that is established to provide robust results even with limited datasets. The analytical outcome suggests that measures like branch networks, electronic remittance services and insurance schemes display a significant role for economic growth in India. The outcome of the analysis points to the relevance of electronic modes of FI without disregarding the physical infrastructure like brick-and-mortar branches in the contemporary phase. Specifically, the impact of such financial inclusion mediums becomes more prominent at a longer horizon.

The results of this study have a number of policy implications. Firstly, despite the digital push, supply-side infrastructure, such as a number of branches have a crucial role in strengthening FI and facilitating economic growth. In the digital era, the importance of brick-and-mortar bank branches cannot be overemphasized. Still a vast section of society is reluctant to use digital mode due to various concerns like trust and customer care, transacts through physical branches. Moreover, certain complex issues like business loan account opening wherein security is an issue may be sorted out better by visiting a physical branch. In fact, such physical branches may be more crucial in rural areas with a vast vulnerable and financially less aware populace. Secondly, with the advancement of technology such as internet speed, mobile, etc., people are more inclined to use digital mediums of transactions like NEFT facility.

The policymakers could target to provide more kiosks or common service centres with an online facility to allow the transaction using NEFT or IMPS. Moreover, the result shows that health or accidental insurance such as PMSBY should be encouraged more at a grassroots level, which can be a driving factor for the growth of the economy. Further studies on the subject may incorporate a richer database for a more comprehensive analysis on the subject.

APPENDIX

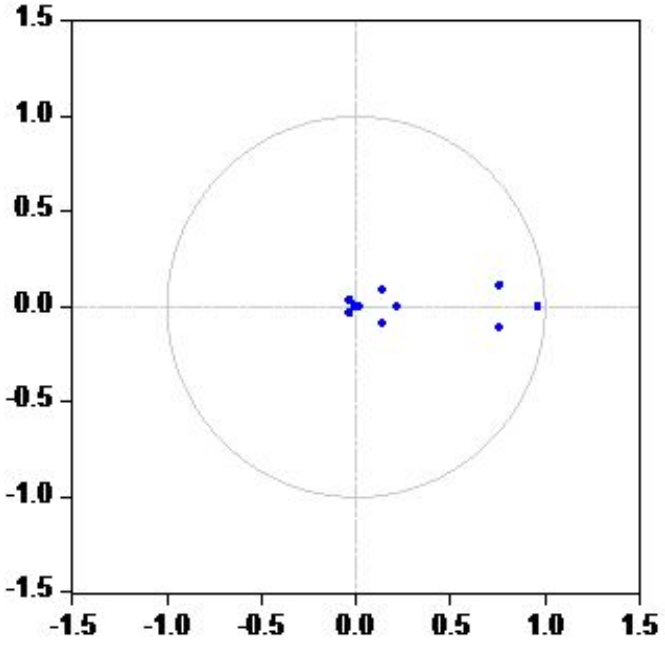


Figure A1. Inverse Roots of AR Characteristics Polynomial

REFERENCES

Ahmed, J.U. (2015), "Performance Evaluation of Regional Rural Banks: Evidence from Indian Rural Banks," *Global Business Review,* 16(5), 125-139.

Apergis, N., I. Filippidis and C. Economidou (2007), "Financial Deepening and Economic Growth Linkages: A Panel Data Analysis," *Review of World Economics*, 143(1), 179-198.

APMAS (2017), "Impact and Sustainability of Self Help Group Bank Linkage Programme in India," *Mahila Abhivruddhi Society, Andhra Pradesh (APMAS), Hyderabad,* Available at http://apmas.org/pdf/report-shgblp-in-%20india-mas.pdf, Accessed on June 29, 2021.

Barajas, A., R. Chami and R. Yousefi (2012), "The Finance and Growth Nexus Re-examined: Do All Countries Benefit Equally?" Working Paper No. WP/13/130,

IMF.

Basu, P. (2006), *Improving Access to Finance for India's Rural Poor* in *Directions in Development – General* Book Series, Washington DC: World Bank.

Beck, T., A. Demirguc-Kunt and M. Peria (2007), "Banking Services for Everyone? Barriers to Bank Access and Use Around the World," *World Bank Economic Review*, 22(3), 397-430.

Berentsen, A. and S. Shi (2008), "Financial Deepening, Inflation and Economic Growth," Available at https://www.economicdynamics.org/meetpapers/2008/paper_673.pdf, Accessed on October 6, 2021.

Bhattarai, K. (2015), "Financial Deepening and Economic Growth in Advanced and Emerging Economies," *Review of Development Economics*, 19(1), 178-195.

Chinoda, T. and F. Kwenda (2019) "Do Mobile Phones, Economic Growth, Bank Competition and Stability Matter for Financial Inclusion in Africa?" *Cogent Economics & Finance*, 7(1), 1622180.

CRISIL (2015), *CRISIL Inclusix, Mumbai,* Available at https://www.crisil.com/content/dam/crisil/crisil-foundation/generic-pdf/CRISIL-Inclusix-Volume-III.pdf, accessed on October 05, 2021.

Dahiya, S. and M. Kumar (2020), "Linkage between Financial Inclusion and Economic Growth: An Empirical Study of the Emerging Indian Economy," *Vision*, 24(2), 184-193.

Demetriades, P. O. and K. A. Hussein (1996), "Does Financial Development Cause Economic Growth? Time-Series Evidence from 16 Countries," *Journal of Development Economics*, 51(2), 387−411.

Dev, S. M. (2006), "Financial Inclusion: Issues and Challenges," *Economic and Political Weekly,* 41(41), 4310-4313.

Enders, W. (2008), *Applied Econometric Time Series*, John Wiley & Sons.

Ghosh, S. (2011), "Does Financial Outreach Engender Economic Growth? Evidence from Indian States," *Journal of Indian Business Research*, 3(2), 74-99.

Giannone, D., M. Lenza and G.E. Primiceri (2015), "Prior Selection for Vector Autoregressions," *Review of Economics and Statistics*, 97(2), 436-451.

GoI (Government of India) (2008), "Report of the Committee on Financial Inclusion," Committee on Financial Inclusion, GoI.

Inoue, T. (2018), "Financial Inclusion and Poverty Reduction in India," *Journal of Financial Economic Policy*, 11(1), 21-33.

Iqbal, B.A. and S. Sami (2017), "Role of Banks in Financial Inclusion in India," *Contaduría y Administración*, 62(2), 644-656.

Kanungo, R.P. and S. Gupta (2021), "Financial Inclusion through Digitalisation of Services for Well-Being," *Technological Forecasting and Social Change*, 167(1), 120721.

Karlsson, S. (2013), "Forecasting with Bayesian Vector Autoregression," *Handbook of Economic Forecasting*, 2, 791-897.

Khera, P., Ng. Stephanie, S. Ogawa. and R. Sahay (2021), "Measuring Digital Financial

Inclusion in Emerging Market and Developing Economies: A New Index," Working Paper No.WP/21/90, IMF.

Khaki, A.R., and M. U. D. Sangmi (2017), "Does Access to Finance Alleviate Poverty? A Case Study of SGSY Beneficiaries in Kashmir Valley," *International Journal of Social Economics*, 44(8), 1032-1045.

King, R.G. and R. Levine (1993), "Finance and Growth: Schumpeter Might be Right," *Quarterly Journal of Economics*, 108(3), 717-737.

Kpodar, K. and M. Andrianaivo (2011), "ICT, Financial Inclusion and Growth Evidence from African Countries," Working Paper No.WP/11/73, IFM.

Kumar, N. (2011), "A Non-Parametric Approach to Financial Inclusion Analysis Through the Postal Network in India," *International Journal of Research in Commerce, Economics and Management*, 1(5), 19-24.

_____ (2013), "Financial Inclusion and Its Determinants: Evidence from India," *Journal of Financial Economic Policy*, 4(1), 4-19.

_____ (2012), "An Empirical Analysis of Financial Inclusion Across Population Groups in India," *IUP Journal of Bank Management*, 11(1), 97-111.

Kumar, B. and B. Mohanty (2011), "Financial Inclusion and Inclusive Development in SAARC Countries with Special Reference to India," *Vilakshan: The XIMB Journal of Management*, 8(2), 13-21.

Kumar, N. and R. Sensarma (2017), "Efficiency of Microfinance Institutions in India: A Stochastic Distance Function Approach," *Journal of Emerging Market Finance*, 16(2), 151-168.

Kumar, N. and S. Sharma (2021), "Performance of Small Finance Banks – An Early Reflection," *RBI Bulletin*, August, 93-103.

Kuri, P.K. and D. Laha (2011), "Financial Inclusion and Human Development in India: An Inter-State Analysis," *Indian Journal of Human Development*, 5(1), 61-77.

Lee, J.N., J. Morduch, S. Ravindran, A. Shonchoy and H, Zaman (2021), "Poverty and Migration in the Digital Age: Experimental Evidence on Mobile Banking in Bangladesh," *American Economic Journal: Applied Economics*, 13(1), 38-71.

Lenka, S.K. and R. Barik (2018), "Has Expansion of Mobile Phone and Internet Use Spurred Financial Inclusion in the SAARC Countries?" *Financial Innovation*, 4(5), 1-19.

Litterman, R. B. (1986), "Forecasting with Bayesian Vector Autoregressions - Five Years of Experience," *Journal of Business & Economic Statistics*, 4(1), 25-38.

Lucas, R.E. (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics*, 22(1), 3-42.

Masoud, N. and G. Hardaker (2012), "The Impact of Financial Development on Economic Growth: Empirical Analysis of Emerging Market Countries," *Studies in Economics and Finance*, 29(3), 148-173.

Mehrotra, N., V. Puhazhendhi, G. Nair and B.B. Sahoo (2009), "Financial Inclusion: An Overview," *Occasional Paper,* Mumbai, Department of Economic Analysis and Research, National Bank for Agriculture and Rural Development (NABARD).

Mohanty Committee (2015), "Report of the Committee on Medium-term Path on Financial Inclusion", Reserve Bank of India.

Niti Aayog (2021), *Tendulkar Poverty Estimates and Lakdawala Poverty Estimates for Rural and Urban India since 1973-74 to 2011-12*, NITI, New Delhi.

Pal, R. and R. Pal (2012), "Income Related Inequality in Financial Inclusion and Role of Banks: Evidence on Financial Exclusion in India," Working Paper No. 2012–013, Indira Gandhi Institute of Development Research, Mumbai, India.

Park, C.Y. and R. Mercado (2015), "Financial Inclusion, Poverty, and Income Inequality in Developing Asia," *Singapore Economic Review*, 63(01), 185-206.

Pradhan, R.P. (2010), "Financial Deepening, Foreign Direct Investment and Economic Growth: Are They Cointegrated," *International Journal of Financial Research*, 1(1), 37-43.

Prasad, A., G. Srinivasan, H.K. Pradhan, I. Ghosh, M.S. Sriram, P.K. Agarwal, R. Bhaskaran and S. Bali (2020), *Inclusive Finance India Report 2020*, An Access Publication, New Delhi: Access Assist.

Rangarajan Committee (2008), *Report of the Committee on Financial Inclusion.*

RBI (2008), *Report of the Committee on Financial Inclusion*, Available at www.nabard.org/report_comfinancial.asp, Accessed on 12 September 2016.

_____ (2014), *Master Circular on Branch Authorisation*, July 1, Mumbai.

_____ (2014), *Guidelines for Licensing of Small Finance Banks in the Private Sector*, November 27, Mumbai.

_____ (2015), *Guidelines for Licensing of Payments Banks*, November 27, Mumbai.

_____ (2020), *National Strategy for Financial Inclusion 2019-2024;* Mumbai*,* Available at https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=1154, Accessed on June 2, 2021.

_____ (2021), *Consultative Document on Regulation of Microfinance*, June 14, Department of Regulation, Mumbai.

Roubini, N. and X. Sala-i-Martin (1992), "Financial Repression and Economic Growth," *Journal of Development Economics*, 39(1), 5-30.

Rousseau, P.L. and P. Wachtel (2005), "Economic Growth and Financial Depth: Is the Relationship Extinct Already?" Available at SSRN 825744.

Sarma, M. and J. Pais (2011), "Financial Inclusion and Development," *Journal of International Development*, 23(5), 613-628.

Sehrawat, M. and A.K. Giri (2015), "Financial Development and Economic Growth: Empirical Evidence from India," *Studies in Economics and Finance*, 32(3), 340-356.

Sethi, D. and S.K. Sethy (2018), "Financial Inclusion Matters for Economic Growth in India: Some Evidence from Cointegration Analysis," *International Journal of Social Economics*, 46(1), 132-151.

Sharma, D. (2016), "Nexus Between Financial Inclusion and Economic Growth: Evidence from the Emerging Indian Economy," *Journal of Financial Economic Policy*, 8(1), 13-36.

Singh, D. and N. Stakic (2021), "Financial Inclusion and Economic Growth Nexus:

Evidence from SAARC Countries," *South Asia Research*, 41(2), 238-258.

Singh, T. (2008), "Financial Development and Economic Growth Nexus: A Time-Series Evidence from India," *Applied Economics*, 40(12), 1615-1627.

Swain, N. and A. Jain (2019), "Status of Financial Inclusion in India, Persisting Challenges and Way Forward," *International Journal of Recent Technology and Engineering*, 8(2S10), 268-272.

UN (United Nation) (2016), "Final List of Proposed Sustainable Development Goal Indicators, *UN*," *Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators,* Available at https://sustainabledevelopment.un.org/content/documents/11803Official-List-of-Proposed-SDG-Indicators.pdf, accessed on June 4, 2021.

_____ (2018), "Igniting SDG Progress Through Digital Financial Inclusion," United Nations Secretary-General's Special Advocate for Inclusive Finance for Development, UN.

Vyas, V. and P. Jain (2021) "Role of Digital Economy and Technology Adoption for Financial Inclusion in India," *Indian Growth and Development Review,* 14(3), 302-324.

Yadav, V., S.K. Singh, N. Velan, A. Aftab, R. Kumar and A.K. Swaranakr (2020), "Impact Assess Assessment of Pradhan Mantri Jan-Dhan Yojana in Augmenting Financial Inclusion in India - A District-Level Analysis," *PalArch's Journal of Archaeology of Egypt / Egyptology*, 17(9), 5449-5475.

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