

Ranking World Economies based on Fintech Vertical Opportunity Index (FVOI)

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Abstract

FinTech has evolved in economies based on level of financial inclusion available. Fintech plays critical role in granting access to common man to finance and economic ecosystem provisioning for higher economic growth and poverty reduction. The IMF Global Findex Database of 143 economies provides for parameters that helped us define the opportunity space for Fintech through FinTech Vertical Opportunity Index (FVOI) proposed in the paper. The parameters indicate the potential of financial transaction and access to individuals through FinTech development. UNDP approach for development of index ranks world economies with highest and lowest levels of financial inclusion and hence the highest level of vertical and lowest level of vertical opportunity for FinTech has been designed. USA, Norway & Canada feature as top 3 economies with highest financial inclusion based on FVOI. Morocco, Afghanistan & Madagascar show low rankings indicating low financial inclusion & hence a lower vertical set of opportunities for FinTech. The challenges of regulatory framework need to be defined and re-defined to ensure financial stability, integrity, competition and consumer protection.

JEL Code : F43; E5; I3; I32; O3; O4; O5

Keywords : Fintech; Index; Economies; Financial Inclusion; FVOI; IMF; UNDP; World; Growth; Poverty; Banking; India

I. Introduction

IMF/WORLD BANK Bali Fintech Agenda (2018) pointed out that Financial Technologies (Fintech) can support potential growth and poverty reduction by strengthening financial development, inclusion, and efficiency – but it may pose risks to consumers and investors and, more broadly, to financial stability and integrity (Agarwal and Agarwal, 2017, 2018). Economic prosperity and development evades the poorest of the poor and the small and medium enterprises by not giving them access to financial and

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economic ecosystem. Role of financial intermediation and disintermediation in reaching people for their growth and development cannot be undermined (Agarwal, Agarwal and Agarwal, 2006). The access to financial services and financial ecosystem itself provides an array of opportunities for growth. Finance and Technology together have tried to bridge the gap of the underserved as it is estimated that there are 1.7 billion people who have no access to banks and 95% small companies employing 60% workforce can be potential borrowers as firms and for individuals working with them. The lack of access to financial institutions and their framework due to various reasons have left many excluded from the benefits of economic development. Documentation, trust, religion, reach and expense may be some of the causes for not holding accounts with financial institutions. Mobile phones and internet have enabled easy access to online platforms for various services (Agarwal, Agarwal and Agarwal, 2006; Agarwal and Agarwal, 2017, 2018; Agarwal, Agarwal, Agarwal and Agarwal, 2018, 2020). It has revolutionized the consumers choice to borrow, lend, purchase and transfer funds. Fintech have revolutionized these choices and made a difference. It has changed the way people access their routine requirements. Ease with which an individual can transact with a click of a button is an underlying feature of the fast growth of FinTech. Inclusion of these technologies has been possible for they are available at low costs. Government and policy makers worldwide have recognized the role FinTech play in financial inclusion. The ability to generate trust, speed in transaction, network effects and accessibility makes FinTech an essential tool in inducing financial inclusion that can promise higher economic growth for economies and a better standard of living for a larger population (Agarwal, Agarwal, Agarwal and Agarwal, 2015, 2018, 2020 ; Agarwal and Agarwal, 2022). A significant effect of the technology development in all spheres of life can be observed in the ease of living where the queues for any financial transactions and need for physical infrastructure has reduced with greater empowerment of the consumer to access services and information leading to higher utility sphere with added choices from the world wide web. The generated consumer utility is changing from one income group to another income group as the needs differ. Fintech have started unbundling many traditional financial services (Basole and Patel, 2018). They are rebundled with a range of non financial services provided through a range of services via application software (Bank of Japan, 2018). The key enabling technologies used by Fintech are Application programming Interface (API), Cloud Computing, Biometrics, Distributed Ledger Technology, Big Data, Artificial Intelligence and Machine Learning.

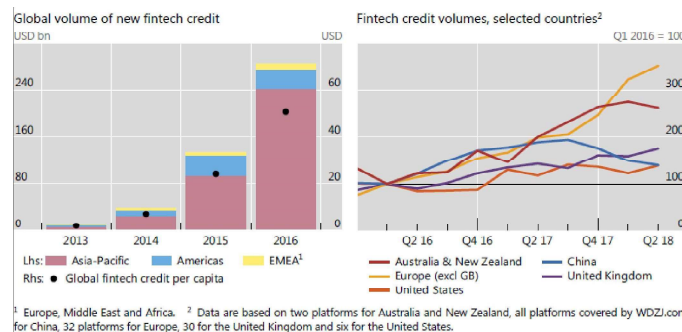
Financial Technologies (FinTech) in given digital space have played an important role in granting access to the common man to the financial and economic ecosystem creating an enabling environment for growth and development (Agarwal, Agarwal and Solojentsev, 2008; Agarwal and Agarwal, 2017, 2018; Agarwal, Agarwal, Agarwal and Agarwal, 2018, 2020). They have moved from payment and lending verticals to wealth, brokerage, insurance and multisector companies (KPMG 2019) Credit contributes to economic growth and development (Levine 2005). It has been found that the unit cost of financial intermediation which remained at 200 basis points in

US has reduced in past 10 years with the fintech's efficiency gains playing a crucial role, Phillipon (2020). Fintechs serve the less privileged and offer lower cost of credit than traditional channels (Jagtiani and Lemieux 2017; de RourePelizzon, and Thakor 2018). Covid 19 has given new opportunities to Fintech to accelerate the pace of financial inclusion (Agur and Rochon 2020). During Covid 19 pandemic, FinTech have changed to address the demand of financial services amid social distancing and in need to adopt containment measures they have enhanced financial inclusion. This pandemic has helped many countries accelerate the pace of digital inclusion like India, Kenya, Ghana, Myanmar and others and has also aided in bringing government transfers in countries like Uganda Peru, Namibia, Zambia and others. Restructuring and giving loans in many countries like India, Kenya and United Kingdom has been possible with digital financial services. Digital financial inclusion can help reduce the effects of economic shocks and smooth consumption (Jack and Suri 2014). Big Tech (Stulz 2019), Fintech credit (Classen, Frost, Turner and Zhu 2018), Central Bank Digital Currency finance (Agarwal, Agarwal, Agarwal and Agarwal, 2015, 2018, 2022) and alternative financing like peer to peer lending, balancesheet lending, invoice trading, crowd funding have changed the way lending takes place in digital equipped economies. Fintech enables financial and economic access and have an immense role to affect the economic growth, income inequalities and in reducing poverty. Fintech credit extended in 2017, at US\$ 545 billion, is about 0.14% of the stock of global financial system assets (Frost, 2020).

Fintech have made the access to financial services pre, during and post Covid time inclusive to aid recovery at a faster pace. The process of digitalization has made these services cheaper and less expensive to the traditional financial services which compliments and substitutes the traditional banking channels. Giving an opportunity to both traditional and fintech companies to expand in the post Covid period. Financial inclusion is still a challenge in many economies due to digital infrastructure, lack of financial literacy, low literacy levels and lack of point of touch infrastructure like mobile phones, computers, laptops and others. Among other important challenges for the regulators is the challenge to balance between adopting newer technologies, financial integrity and stability (Agarwal, Agarwal, Agarwal and Agarwal, 2015, 2018, 2020). Supervision and Regulation needs to control any innovations that threaten the confidence in the financial system and at the same time aids financial access and financial inclusion (Agarwal and Agarwal, 2022).

Fintech have developed in different parts of the world at a considerably different pace. The adoption of the product, process or technology differs on the basis of the unmet demand of the financial services. Massive data generation, advancements in computing algorithms and processing power has lead to the development of Fintechs. The growth has been possible with technologies like high speed internet, cloud computing, artificial intelligence, biometrics, big data analytics, IOT and others. BuchakMatvos, Piskorski and Seru (2018) find that differences in regulations and technology can explain the growth of Fintechs and shadow banking. Covid-19 has placed a great stress on social distancing and safety which has enabled many fintech

to grow their sphere of financial services. Several international efforts like the creation of Alliance for Financial Inclusion in 2008 set the stage for development and focus of policy makers on financial inclusion. Financial inclusion became a part of the SDGs 2030 in 2015. Further the effort of IMF-World Bank through the Bali Fintech Agenda laid emphasis on the development of fintech for financial inclusion. It is estimated that the credit from Fintech reached 223 billion in 2018-19. The largest markets for fintech are China, United States and United Kingdom. Cornelli, Frost, Gambacorta, Rau, Wardrop and Ziegler (2020) in their cross country panel regression found that fintech lending is more developed in countries with higher GDP where banking sector markup are high and banking regulations are less stringent. Funding by fintechs was also found to more prominent where branches per capita were low. They also found that the fintech credit was mostly supported by greater ease of doing business, investor protection disclosures and efficient judicial system. Besides that alternative credit complement the traditional credit instead of substituting it. It is difficult to evaluate the effect of fintech on the credit provision and mobilization of funds as there are survey based studies that report lending come from Cambridge Centre for Alternative Finance (CCAF), e.g. Rau (2020) and Ziegler (2020). Classen, Frost, Turner and Zhu (2018) found that higher the incomes of the economy the less competitive its banking system and larger the fintech activity. Measuring the size of fintech credit is difficult due to its size and diversity. The data available is mostly on the basis of surveys.



Source: Classen, Frost, Turner & Zhu (2018)

Figure 1
FinTech Credit Volumes

Buchak, Matvos, Piskorski and Seru (2018) finds that Fintech serve more credit worthy borrowers and charge higher interest rates. Fuster et al (2019) find that Fintech are faster in processing loan applications than traditional lenders and quicker to adjust supplies of finance to demand in mortgage markets. However, Sahay, Eriksson-von-Allmen, Lahreche, Khera, Ogawa, Bazarbash and Beaton (2020) provide that they do not disrupt the traditional financial services as the services provided by Fintech to small clients differ from the services offered by traditional financial firms and hence act as complementing services to the traditional firm services which provide loan to larger clients with longer duration.

Fintech helps to make the financial system more inclusive and efficient and can help in economic growth (Frost 2020). Sahay (2015) and Eihák and Sahay (2020) through their empirical evidence support that financial inclusion supports growth and lowers inequality and improves the effects of macroeconomic policies (Loukoianova and Yang 2018). Sahay, Eriksson-von-Allmen, Lahreche, Khera, Ogawa, Bazarbash and Beaton (2020) found that in 52 countries covered by them digital financial inclusion has increased over 2014-2017 even where traditional finance was stagnant or stalled and indicate positive association with GDP growth especially giving opportunities to income and unemployment amid Covid-19 shock.

Philippon (2020) argues that Fintech are likely to remove unwarranted human biases against minorities. Barlett, Morse, Stanton and Wallace (2018) evidence that Fintech discriminate 40% lesser than the face to face lenders in mortgage markets. Fintech could lead to financial exclusion on account of lack of digital infrastructure, digital literacy, algorithm biases is a matter of concern (Sahay, Eriksson-von-Allmen, Lahreche, Khera, Ogawa, Bazarbash and Beaton, 2020). Credit boom can also be a signal for financial crisis and recession (see Drehmann, 2010, Schularick and Taylor, 2012; Kindleberger and Aliber, 2015). Fintech and BigTech are essentially not so big to presently put a systemic risk to the financial intermediation system (FSB 2017, 2018).

In the light of the above background we carry out the investigation into the opportunities for Fintech in the present state of financial inclusion which have changed the present financial services landscape as reflected in Figure 2.

User Needs	Traditional Model	Gaps ²	Technological Innovations ³				Fintech Solutions
			AI/ML	Data/Cloud Platforms	DLT/ Crypto	Mobile	
Pay	Cash/ATM Check Wire/MTO's Debit/Credit Cards Centralised Settlement	Speed Cost Transparency Access Security	L	H	H	H	Virtual currencies Remittances Mobile payments Mobile P2P P2P payments B2B transactions DLT-based settlement
Save	Bank deposits Mutual funds Bonds Equities		L	H	H	L	Virtual currencies Mobile market funds Blockchain bonds
Borrow	Bank loan Bonds Mortgages Trade credit		H	H	H	L	Credit modeling Platform lending Crowd-funding Blockchain bonds Auto-underwriting
Manage Risks	Brokerage underwriting Structured products Trading regulatory Compliance KYC Insurance		H	L	H	L	Regtech, Smart contracts Supertech Crypto-asset exchanges eKYC, Digital ID
Get Advice	Financial planner Investment advisor		H	M	L	M	Robo-advising Automated wealth management

Source: IMF and World Bank (2019)

Figure 2
Financial Service Landscape

Figure 2 helps us understand that

- i. This figure maps users' needs for financial services — explained by IMF to traditional solutions and emerging fintech solutions. In doing so, it flags the key gaps that technology seeks to fill, and which new technologies are applied in different services.
- ii. In gaps, transparency encompasses search and matching frictions, while access encompasses product tailoring needs.
- iii. AI/ML refers to Artificial Intelligence and Machine Learning algorithms applied to extract insights from large amounts of data. Data/Cloud Platforms are cloud-based technologies which facilitate B2B, C2B, C2C, and B2C exchange of data via Application Programming Interfaces (APIs), across fintech firms, financial institutions, customers, and governments. Access to digital platforms can be secured with digital identification technologies, such as biometrics. DLT/Crypto captures distributed ledgers, such as smart contracts and related decentralized technologies. Mobile refers to feature phones and smartphones running financial apps. The colors scheme reflects a judgement on whether the specific technology has a low (L), medium (M), or high (H) level of benefit for the corresponding fintech solutions. Scaling is purely illustrative.

IMF and World Bank (2019) estimates of the Global fintech survey with 97 responses that Fintech is that there is modest expectation of the Fintech to cover gender gaps. Over 60% jurisdictions consider fintech as part of their National Financial Inclusion plan where 41% jurisdiction aimed as fostering adoption of Fintech, 41% encouraged digitalisation for government processes, 33% considered it important to establish public private dialogue. 80% jurisdictions reported differentiated compliance requirement for fintech product and services for unbanked and underserved.

II. Objectives

To study the opportunities of Fintech in Four distinct categories of Economies namely High Income, Upper Middle Income, Lower Middle Income and Low Income Economies.

2.1 Sub Objectives

- i. To develop a Fintech Vertical Opportunity Index based on parameters selected from Global Findex Database for 143 countries for determining the verticals of Fintech opportunity.
- ii. To understand which regulatory factors can enable a fintech friendly ecosystem.

III. Data and Methodology

The study uses the survey results of the IMF Global Findex Database 2020 which is nationally represented survey of 150,000 adults for 143 economies.

To develop the Fintech Vertical Opportunity Index we use the following financial opportunity parameters from a large number of parameters studied in the Global Findex Database which are:

- i. Account (% age 15+)
- ii. Financial institution account (% age 15+)

- iii. Withdrawal in the past year (% with a financial institution account, age 15+)
- iv. Used the internet to pay bills or to buy something online in the past year (% age 15+)
- v. Used the internet to buy something online in the past year (% age 15+)
- vi. Saved at a financial institution (% age 15+)
- vii. Outstanding housing loan (% age 15+)
- viii. Debit card ownership (% age 15+)
- ix. Borrowed for health or medical purposes (% age 15+)
- x. Borrowed to start, operate, or expand a farm or business (% age 15+)
- xi. Borrowed from a financial institution or used a credit card (% age 15+)
- xii. Borrowed from family or friends (% age 15+)
- xiii. Borrowed any money in the past year (% age 15+)
- xiv. Coming up with emergency funds: possible (% age 15+)
- xv. Coming up with emergency funds: not possible (% age 15+)
- xvi. Main source of emergency funds: savings (% able to raise funds, age 15+)
- xvii. Main source of emergency funds: family or friends (% able to raise funds, age 15+)
- xviii. Main source of emergency funds: money from working (% able to raise funds, age 15+)
- xix. Main source of emergency funds: loan from a bank, employer, or private lender (% able to raise funds, age 15+)
- xx. Main source of emergency funds: sale of assets (% able to raise funds, age 15+)
- xxi. Main source of emergency funds: other (% able to raise funds, age 15+)
- xxii. Paid utility bills in the past year (% age 15+)
- xxiii. Paid utility bills: using an account (% age 15+)
- xxiv. Paid utility bills: using a mobile phone (% age 15+)
- xxv. Paid utility bills: using cash only (% age 15+)
- xxvi. Received wages in the past year (% age 15+)
- xxvii. Received wages: in cash only (% wage recipients, age 15+)
- xxviii. Used a mobile phone or the internet to access an account (% age 15+)
- xxix. No deposit and no withdrawal from a financial institution account in the past year (% age 15+)
- xxx. Received government payments: into a financial institution account (% age 15+)
- xxxi. Made or received digital payments in the past year (% age 15+)
- xxxii. Made digital payments in the past year (% age 15+)

As in cases of UNDP indexes we initially develop the dimensional index for each dimension of Financial Inclusion Opportunity indicator for different economies. The dimension index for the i th dimension, d_i , is computed by the following formula.

$$d_i = \frac{A_i - \min_i}{\max_i - \min_i}$$

where, A_i Actual value of dimension i
 \min_i Minimum value of dimension i
 \max_i Maximum value of dimension i

This formula ensures that the value of d_i lies between 0 and 1. Higher the value of d_i higher is the achievement of the country in respect to that dimension of the financial inclusion indicator.

In the n-dimensional space, the point $O = (0,0,0,...,0)$ represents the point indicating the worst situation while the point $I = (1,1,1,...,1)$ represents the highest achievement in all dimensions. The Fintech Opportunity Index for the i th country is then measured as the normalised inverse normalized inverse Euclidean distance of the point D_i from the ideal point $I = (1,1,1,...,1)$. The calculation for the BSSI is as follows

$$FI_i = 1 - \frac{\sqrt{(1-d_1)^2 + (1-d_2)^2 + (1-d_3)^2 + (1-d_4)^2 + (1-d_5)^2 + (1-d_6)^2}}{\sqrt{n}} = 1 - \frac{\sqrt{D}}{\sqrt{n}}$$

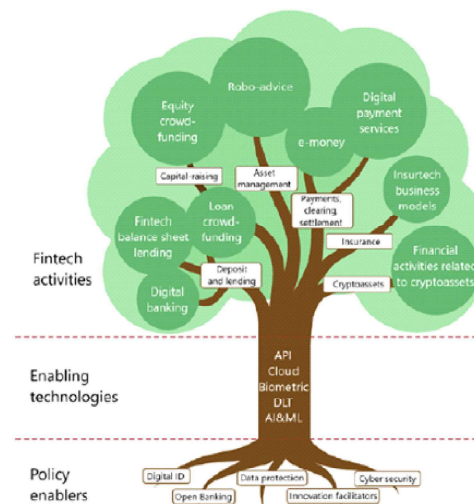
where, d_i the i th dimension of the financial soundness indicators
 n Total number of dimensions used in the index here it is 32

Here in this formula for Financial Inclusion Opportunity Index the numerator of the second component is the Euclidean distance of d_i from the ideal point I , normalizing it by n and subtracting by 1 gives the inverse normalized distance. The normalization is done in order to make the value lie between 0 and 1 and the inverse distance is considered so that higher value of the Financial Inclusion Opportunity which would correspond to higher level of Financial Inclusion Opportunity in the economy representing the Opportunity for Fintech through the various verticals. The opportunity to the fintech in terms of its innovation and services would depend on the level of financial inclusion Opportunity matrix that this Financial Inclusion Opportunity Index would develop. The possibility of higher financial inclusion brings together a different set of opportunities then a country has a lower financial inclusion. We call this index a Fintech vertical opportunity index as it can decide the vertical of entering the market based on the level of financial inclusion. Innovation would differ on the level of financial inclusion and intermediation and hence this index can be used by Fintech's to determine the space they wish to enter. Computing power, Cryptography, Big data and artificial Intelligence with mobile access and high internet speed have changed the innovation penetration in different economies and also affect the overall stability of the financial system as they affect the manner in which credit is offered, deposit is accepted, investment are made, insurance, pension and many other financial services are bought or sold at micro and macrolevel decisions making.

IV. Results and Discussion

The pattern of Fintech adoption is puzzling as it does not indicate economic development or political boundaries (Agarwal, 1969, 1988; Agarwal and Agarwal, 2004; Frost, 2020; Agarwal and Agarwal, 2022). Global Fintech adoption Index 2019 indicates that the adoption of Fintech services has progressed from 16% in 2015 to 33% in 2017 to 64% in 2019 (RBI, 2020; Agarwal, Agarwal, Agarwal and Agarwal, 2020). Big tech mobile payments made up 16% of GDP in China according to the most recent

data, but less than 1% in the United States, India and Brazil (Frost, 2020). The Fintech activities can be broadly classified into (a) Deposit and Lending-Digital Banking, Fintech Balancesheet lending, and loan crowd funding; (b) Capital Raising-Equity crowd funding (c) Asset Management-Roboadvisors (d) Payments, clearing and settlement-e-money and Digital payment services (d) Insurance-Insurtech business model and (e) cryptoassets-Bitcoin and digital currencies. The enabling environment for Fintech opportunity is the access to basic financial services and the need for demand for financial transactions at low cost and with ease to access fostering trust and cooperation. Frost (2020) identified that cities like – like Hangzhou, Seattle, and Tel Aviv were hotbeds for Fintech Activities as against traditional centres like Tokyo or Milan. The difference in need for financial services and demand of the financial services may be one of the reasons. The range of service will depend on the economic development. The parameters selected by us indicate the potential of the financial transaction and financial access to the individuals which fosters fintech development. The development of the innovation would differ on the basis of the scope of Financial need and inclusiveness. To evaluate this we rank 143 countries based on our Fintech Vertical Opportunity Index. Based on the methodology we determine the country ranks which indicates that the most advanced economies with highest financial inclusion and financial opportunity needs a high vertical of fintech whereas a low ranking economy would project a greater need for lower level of fintech vertical. United States, Norway and Canada have the top 3 ranks indicating a high financial transactions with financial inclusion giving ample opportunity for development of higher vertical Fintech like Roboadvisors, digital currencies and others. Morocco, Afghanistan and Madagascar show low ranking indicating low financial transactions and financial inclusion indicating



Source: Ehrentraud, Ocampo, Garzoni and Piccolo (2020)

Figure III
FinTech Adoption Tree

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a greater need for fintechs that can provide more opportunities to financial transactions and financial inclusion. The most popular example of M-Pesa the mobile money transfer system provided by telecom provider Safaricom in 2008 in Kenya is one example that there is no limit to Fintech adoption but the services may differ. Similarly studies of Hau (2018); Tang (2019); Jagatani and Lemeiux (2018); De Roure (2016); Frost (2019); Agarwal, Agarwal, Agarwal and Agarwal (2015, 2018, 2020); Agarwal and Agarwal (2022) indicate that the Fintech has aided in providing services to the underserved. The rate of Fintech adoption is greater in jurisdictions where there is unmet demand for financial services, less competition from traditional financial institutions, macroeconomic conditions are conducive, regulations accommodative and demographics favourable (Frost, 2020). Fintech activities can be found in the following financial services categories: (a) deposits and lending; (b) capital-raising and alternative sources of funding; (c) asset management, trading and related services; (d) payments, clearing and settlement services; (e) insurance; and (f) cryptoassets (Ehrentraud, Ocampo, Garzoni and Piccolo (2020).

IMF and World Bank (2019) found that Africa has seen rapid growth in mobile money as a driver for greater financial inclusion; Asia has made advances in nearly every aspect of fintech; the European fintech market is growing rapidly but remains unevenly distributed; the Middle East, North Africa, Afghanistan, and Pakistan (MENAP) and Caucasus and Central Asia (CCA) regions are seeing a gradual pick-up in activity, especially in some countries; and the LAC region is taking off, albeit at an earlier stage than other regions.

Table I
Country Ranking based on Fintech Vertical Opportunity Index (FVOI)

Country	Income Grouping	Rank	Fintech Vertical Opportunity Index
United States	High income	1	0.6835
Norway	High income	2	0.6823
Canada	High income	3	0.6761
Australia	High income	4	0.6749
New Zealand	High income	5	0.6742
Denmark	High income	6	0.6595
Sweden	High income	7	0.6568
United Kingdom	High income	8	0.6551
Finland	High income	9	0.6520
Luxembourg	High income	10	0.6510
Ireland	High income	11	0.6504
Netherlands	High income	12	0.6407
Iran, Islamic Rep.	Upper middle income	13	0.6405
Belgium	High income	14	0.6394
Korea, Rep.	High income	15	0.6371
Israel	High income	16	0.6361
Spain	High income	17	0.6333
United Arab Emirates	High income	18	0.6291
Switzerland	High income	19	0.6272
Germany	High income	20	0.6217
Estonia	High income	21	0.6216
Austria	High income	22	0.6178
Bahrain	High income	23	0.6170

(Contd....)

Table I (Continued)

Croatia	Upper middle income	24	0.6157
Cyprus	High income	25	0.6156
France	High income	26	0.6123
Italy	High income	27	0.6089
Malta	High income	28	0.6073
Kenya	Lower middle income	29	0.6047
Slovenia	High income	30	0.6038
Czech Republic	High income	31	0.6025
Slovak Republic	High income	32	0.6018
Portugal	High income	33	0.5990
Russian Federation	Upper middle income	34	0.5953
Poland	High income	35	0.5941
Taiwan, China	High income	36	0.5910
Mongolia	Lower middle income	37	0.5905
Belarus	Upper middle income	38	0.5893
Lithuania	High income	39	0.5875
Malaysia	Upper middle income	40	0.5855
Latvia	High income	41	0.5854
China	Upper middle income	42	0.5833
Japan	High income	43	0.583
Namibia	Upper middle income	44	0.5782
Hong Kong SAR, China	High income	45	0.5779
Singapore	High income	46	0.5777
Trinidad and Tobago	High income	47	0.5675
Turkey	Upper middle income	48	0.5653
Thailand	Upper middle income	49	0.5641
Saudi Arabia	High income	50	0.5569
Kazakhstan	Upper middle income	51	0.5548
Chile	High income	52	0.5511
South Africa	Upper middle income	53	0.5494
Uganda	Low income	54	0.5470
Costa Rica	Upper middle income	55	0.5427
Hungary	High income	56	0.5414
Venezuela, RB	Upper middle income	57	0.5407
Uruguay	High income	58	0.5352
Brazil	Upper middle income	59	0.5348
Dominican Republic	Upper middle income	60	0.5340
Kuwait	High income	61	0.5310
Mauritius	Upper middle income	62	0.5276
Indonesia	Lower middle income	63	0.5139
Ukraine	Lower middle income	64	0.5135
Armenia	Lower middle income	65	0.5121
Greece	High income	66	0.5118
Sri Lanka	Lower middle income	67	0.5099
Rwanda	Low income	68	0.5067
Bolivia	Lower middle income	69	0.5065
Montenegro	Upper middle income	70	0.5063
Serbia	Upper middle income	71	0.4935
Romania	Upper middle income	72	0.4925
Bulgaria	Upper middle income	73	0.4912
Libya	Upper middle income	74	0.4849
Gabon	Upper middle income	75	0.4843
Zambia	Lower middle income	76	0.4837
Macedonia, FYR	Upper middle income	77	0.4796
Mozambique	Low income	78	0.4794
Botswana	Upper middle income	79	0.4773
Lesotho	Lower middle income	80	0.4718
Georgia	Lower middle income	81	0.4707
Malawi	Low income	82	0.469
Jordan	Lower middle income	83	0.4674

(Contd....)

Table (Continued)

Colombia	Upper middle income	84	0.4652
Peru	Upper middle income	85	0.4628
Philippines	Lower middle income	86	0.4609
Tajikistan	Lower middle income	87	0.4595
Argentina	Upper middle income	88	0.4592
Ghana	Lower middle income	89	0.4579
Tanzania	Low income	90	0.4542
Cameroon	Lower middle income	91	0.4506
Nepal	Low income	92	0.4504
Benin	Low income	93	0.4442
Burkina Faso	Low income	94	0.443
Togo	Low income	95	0.4427
Zimbabwe	Low income	96	0.4422
Cambodia	Lower middle income	97	0.441
India	Lower middle income	98	0.44
Kosovo	Lower middle income	99	0.4374
Panama	Upper middle income	100	0.4373
Lebanon	Upper middle income	101	0.4367
Guatemala	Lower middle income	102	0.433
Vietnam	Lower middle income	103	0.4313
Honduras	Lower middle income	104	0.4312
Liberia	Low income	105	0.426
Haiti	Low income	106	0.4248
Senegal	Low income	107	0.4239
Bangladesh	Lower middle income	108	0.4234
Ecuador	Upper middle income	109	0.4222
Bosnia and Herzegovina	Upper middle income	110	0.4201
Turkmenistan	Upper middle income	111	0.4197
Paraguay	Upper middle income	112	0.4131
Mali	Low income	113	0.4118
Mexico	Upper middle income	114	0.4101
Nigeria	Lower middle income	115	0.4088
Algeria	Upper middle income	116	0.4016
Kyrgyz Republic	Lower middle income	117	0.3993
Cote d'Ivoire	Lower middle income	118	0.3972
Nicaragua	Lower middle income	119	0.397
Ethiopia	Low income	120	0.3839
Albania	Upper middle income	121	0.3819
El Salvador	Lower middle income	122	0.3805
Tunisia	Lower middle income	123	0.3796
Lao PDR	Lower middle income	124	0.379
Uzbekistan	Lower middle income	125	0.3651
Egypt, Arab Rep.	Lower middle income	126	0.3567
Sierra Leone	Low income	127	0.3565
Congo, Rep.	Lower middle income	128	0.3528
Iraq	Upper middle income	129	0.3507
Mauritania	Lower middle income	130	0.3484
Myanmar	Lower middle income	131	0.3482
Central African Republic	Low income	132	0.3455
Guinea	Low income	133	0.3437
Pakistan	Lower middle income	134	0.3375
Azerbaijan	Upper middle income	135	0.3357
West Bank and Gaza	Lower middle income	136	0.3322
Congo, Dem. Rep.	Low income	137	0.33
Chad	Low income	138	0.302
Niger	Low income	139	0.2921
Madagascar	Low income	140	0.2876
Afghanistan	Low income	141	0.2842
Morocco	Lower middle income	142	0.279
South Sudan	Low income	143	0.2692

Source: Self Computed

The policy framework can be an enabler or deterrent to the working of the Fintechs. Fintech's have a potential impact on the financial system stability and monetary policy. Many economies do not have a dedicated framework for Fintech but have a framework for digital payments and crowd funding (RBI, 2020; Agarwal, Agarwal, Agarwal and Agarwal, 2020; Agarwal and Agarwal, 2022). The innovation are difficult to be clubbed in one basket and to make a single framework operative for all innovation is a challenge before the regulators. Authorities may act in different means. Some countries place a Fintech operative regime where licenses may be granted to fintech, as an alternative they may also choose to allow them to operate in the existing frameworks with specific guideline in place for Fintech with certain prohibitions. It is observed that for digital banking there are regulation in place but for robo advisor services the regulations are not much in place. Similarly, for balancesheet lending there are regulations but not for crowdfunding. Similarly, crypto asset regulations also differ in different jurisdictions. No generalised adjustments have been made to the parameters of financial regulations in order to accommodate their activities as providers of financial services (Restoy, 2021). It has been observed that regulator are keen on drafting policies for technology adoption such as application programming interface (API), cloud computing and biometric identification and authentication. For technologies like artificial intelligence, machine learning and distributive ledger the regulators have not provided specific guidelines. The development in most jurisdictions have been found to accept the digital identity system and enabling regulatory frameworks for data protection of consumers. Policy support need to provided to ensure preservation of financial stability, integrity, competition and consumer protection. Big Tech and Regtech need to be brought in the fold of supervision and control as they have ability to produce systematic risk. The Bigtechs given significant economies of scale, data superiority and the large scope for network externalities, could very well eventually achieve market dominance (De la Mano and Padilla, 2018). Banks often have to meet regulatory requirements and compliance cost put on them puts them to a disadvantageous position against big players and small agile Fintechs. It is important that as part of good regulation traditional and Fintech are provided with good regulations that encourage healthy competition. Restoy (2021) regulatory requirements in the financial industry can be broadly classified as activity based or entity based. Activity based requirement would be a requirement for all institution serving that particular activity. Entity based requirement would be specific to the institution like bank versus non bank and so on. Entity based rules do not provide for level playing field for financial services though it further provides for financial stability, integrity, competition and consumer protection. Accordingly it is believed that the firm action on providing specific activity with a number of specific requirement may be first option to provide support to stability of the financial system. It is further needed that there is harmonisation of competitive conditions for all types of players. Restoy (2021) provides that rules for the protection of consumers of financial products include transparency obligations, mobility across providers, pricing policies, responsible publicity for financial products, and

fitness and suitability assessment. The rules need to be homogenous for homogenous services or even perception based differentiated services. The prudential regulation in any country or jurisdiction should protect the financial system, trust and stability from possible failures of the institution or service that may in the short or long run impact the economy. Vulnerability arising from the potential risk arising from the balancesheets of institutions may warrant the need for entity specific regulations which may continue to guide more stricter regulation and control over deposit taking entities against credit lending services. Countries found with low ranks in our computation need to more effective in their regulation to protect the regulatory framework and while providing opportunity to the Fintech though they offer a greater possibility of financial inclusion but may not be supported with present financial architecture or system framework to protect the consumers. The regulation in the high ranking countries support greater valued added services on the part of the Fintech vertical. The study is limited to its scope in understanding how financial inclusion in different countries distinguished on the basis of their income provide an opportunity to the Fintech. It would be good if research further aim to contribute the specific regulatory dimensions in different countries that balance financial inclusion, financial stability, integrity, competition and consumer protection.

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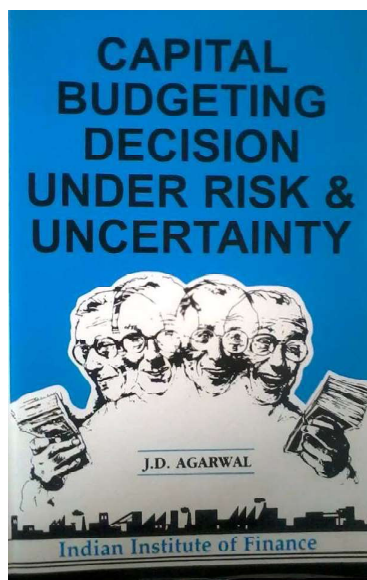
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