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**Working Paper**

## Digital financial inclusion, economic freedom, financial development, and growth: Implications from a panel data analysis

ADB Working Paper Series, No. 1244

**Provided in Cooperation with:**

Asian Development Bank Institute (ADBI), Tokyo

*Suggested Citation:* Rekha, G.; Rajamani, K.; Resmi, G. (2021) : Digital financial inclusion, economic freedom, financial development, and growth: Implications from a panel data analysis, ADB Working Paper Series, No. 1244, Asian Development Bank Institute (ADBI), Tokyo

This Version is available at:

<https://hdl.handle.net/10419/238601>

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## **ADB Working Paper Series**

### **DIGITAL FINANCIAL INCLUSION, ECONOMIC FREEDOM, FINANCIAL DEVELOPMENT, AND GROWTH: IMPLICATIONS FROM A PANEL DATA ANALYSIS**

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No. 1244  
March 2021

**Asian Development Bank Institute**

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Suggested citation:

Rekha, G., K. Rajamani, and G. Resmi. 2021. Digital Financial Inclusion, Economic Freedom, Financial Development, and Growth: Implications from a Panel Data Analysis. ADBI Working Paper 1244. Tokyo: Asian Development Bank Institute. Available: <https://www.adb.org/publications/digital-financial-inclusion-economic-freedom-financial-development-growth>

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**Abstract**

An all-inclusive financial system is one of the channels through which information and communication technology (ICT) affects economic growth. Digital financial inclusion is an evolving phenomenon that enhances the ease of access to and availability of formal financial services. Further, economic freedom is one of the significant factors affecting financial development and growth. Hence, there is a strong rationale for examining the effect of economic freedom on financial inclusion. However, there is no empirical evidence on the linkages between these variables in the literature. Accordingly, we examined these relationships. The results of a panel data analysis that we performed on a dataset pertaining to emerging economies show that the nexus of ICT diffusion–economic freedom–financial development has a positive impact on financial inclusion in the long run, highlighting the importance of creating an economic environment that is conducive to sustained economic growth. The findings of this study have significant implications from an economic policy standpoint and call for a more holistic approach.

**Keywords:** financial inclusion, ICT, economic freedom, financial development, emerging economies, VECM

**JEL Classification:** G20, G21, G28

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# 1. BACKGROUND

Research has considered financial inclusion (FI) as a significant catalyst for economic development (Claessens 2006). FI refers to the availability of formal financial services to everyone, including deprived households and micro-enterprises (ADB 2000). Although an inclusive financial system has several merits, according to the Global Findex Database (2017), of the total global adult population, 50% (around 2 billion people) does not have access to formal financial services. As the World Bank reported, more than 50 countries are actively developing plans and policies for achieving FI to achieve universal financial access.

Though FI is a global socioeconomic challenge, its impact will be greater for less-developed countries than for developed countries since research has determined that FI is fundamental for growth and poverty alleviation (Kim 2016). The experience of emerging nations, like India, is unique and severe, and the growth has been non-inclusive, one of the key reasons being the failure to achieve greater financial inclusion (Shafi and Medabesh 2012). Since the situation in emerging economies is different, it is imperative to study the dynamics in that context.

Two critical types of factors that the literature has identified as driving FI across countries are structural factors and policy-related factors. While structural factors primarily decide the cost of delivering financial services to the population, policy-related factors are essential in creating a facilitating environment for financial inclusion. One of the primary structural factors is the information and communication technology (ICT) infrastructure. The diffusion of ICT has caused an intensive transformation of the world and allowed more access to finance.

Technological innovation plays a vital role in economic growth. ICT reduces income disparities by formalizing the financial sector, and the literature has argued that FI is one of the ways in which ICT facilitates economic growth (Kpodar and Andrianaivo 2011; Tchamyu, Erreygers, and Cassimon 2019). Digital financial inclusion refers to leveraging ICT to enhance financial inclusion meaningfully. It is an evolving phenomenon, and understanding its associations with financial inclusion has many policy implications. Economic models indicate that economic freedom can influence production and resource efficiency. Countries with a low level of regulations will have more economic freedom than countries with more regulations—the greater the economic freedom, the greater the income and growth of a society. Economic researchers have reported that free choices and a supply of resources, rivalries between enterprises, and the trade and safety of private liberties are crucial to economic progress (North and Thomas 1973).

In economically free societies, governments permit free mobility of labor, capital, and other resources and refrain from imposing constraints on liberty beyond a degree that is necessary to defend and preserve democracy itself (Heritage Foundation 2019). The Economic Freedom Index indicates that a total of 90 countries (50%) offer organizational conditions in which private firms enjoy at least a reasonable degree of economic freedom to achieve greater wealth and accomplishments. Furthermore, economic freedom is one of the significant factors affecting financial development and growth. Hence, there is a strong rationale for examining the effect of economic freedom on financial inclusion. However, there is no empirical evidence on the linkages between economic freedom and financial inclusion.

The critical question facing practitioners and researchers regarding how to achieve an all-inclusive financial system remains unanswered. In this context, this paper aims to explore the linkages among ICT diffusion, economic freedom, financial development, and financial inclusion by empirically examining a panel dataset pertaining to 22 emerging economies. The organization of the rest of the paper is as follows. Section 2 contains a brief review of the relevant conceptual and empirical literature on financial inclusion, ICT diffusion, economic freedom, and financial development. Section 3 discusses the data, sources, and empirical model that this study uses. Section 4 presents the empirical procedure and the results. Section 5 provides a discussion and policy implications. Section 6 presents the concluding remarks.

## 2. BRIEF REVIEW OF THE LITERATURE

Both theoretical and empirical studies have observed that economies with higher degrees of financial inclusion have higher rates of GDP growth as well as lower income disparities (King and Levine 1993; Clark et al. 2006; Beck et al. 2007; Demirgüç-Kunt and Levine 2009; Demirgüç-Kunt, Klapper, and Singer 2017). Studies have presented empirical evidence on the FI–economic development nexus. Financial inclusion in developed economies primarily focuses on awareness of equal and affordable financial services, whereas, in developing economies, both access to financial services and financial literacy are involved. Financial exclusion focuses primarily on issues related to access, in particular the availability of banking outlets (Leyshon and Thrift 1995).

Neaime and Gaysset (2018) observed that financial inclusion exerts a positive impact on financial stability and reduces income disparities in MENA countries. The numbers of loans/savings accounts and ATMs have unidirectional causation effects on the growth of the economy (Sharma 2016). Kim, Yu, and Hassan (2018) investigated the link between FI and economic growth in 57 countries through a panel regression analysis. They argued that financial inclusion has a positive impact on economic growth. Sarma and Pais (2011) examined the relationship between financial inclusion and development using country-specific factors related to FI. They proposed that variables such as income, discrimination, literacy, urbanization, communication networks, and knowledge play a significant part in financial inclusion.

Sethi and Sethy (2019) confirmed that FI positively influences economic growth by analyzing both the demand and the supply side of financial services. The study also indicated that improving FI makes economic growth possible in the long run. Kumar (2013) investigated the availability of financial inclusion indicators in 29 Indian states using fixed effects and the generalized method of moments. The study suggested that the branch network is an important indicator of FI in India. Anarfo et al. (2019) examined the triadic connection between FI, financial sector development, and economic growth pertaining to sub-Saharan Africa, employing a VAR estimation method. It is evident from the study that FI is a critical factor in financial sector development.

Further, evidence from the literature has suggested that FI supports economic growth through ICT. ICT in financial inclusion facilitates digital access to the use of formal financial services for excluded and underserved populations. Joia and dos Santos (2017) determined that e-government ventures fulfill the population's need to access financial products and services. Another study suggested that the government could create central information repositories to provide the general public with general information about financial service providers to facilitate financial inclusion (Bongomin, Ntayi, and Munene 2016). Andrianaivo and Kpodar (2012) investigated the impact of

ICT, especially that of mobile and fixed telephone penetration, on growth on a panel of African countries using the generalized method of moments (GMM) estimator. Mihasonirina and Kangni's (2011) similar study also confirmed the importance of communication technologies for FI. Tchamyu, Erreygers, and Cassimon (2019) investigated the effect of ICT on economic disparity through the dimensions of depth, efficiency, activity, and size of the financial sector in African countries. The result showed that ICT lessens income disparity by formalizing the financial services sector. Another work based on the MENA region suggested that a high degree of ICT diffusion influences financial development favorably and enhances economic growth (Sassi and Goaid 2013). Falahaty and Jusoh (2013) also highlighted the significance of ICT in the financial growth of MENA countries.

Earlier research has considered financial intermediaries as critical catalysts for innovation and economic growth. Schumpeter (1911) and Robinson (1952) argued that finance has no causal effect on development. Instead, financial development follows economic development as a consequence of the increased need for financial services. In the context of the increasing demand for financial services, more financial institutions, financial goods, and services arise in the markets. Ang and McKibbin (2007) investigated the impact of financial development on growth by analyzing Malaysian data in the period 1960 to 2001. The result indicated that financial liberalization has a significant influence on financial sector development.

Many theoretical and empirical studies have supported the causal linkage between financial development and economic growth, indicating that established financial institutions and markets improve service availability, leading to economic development (King and Levine 1993; Neusser and Kugler 1998; Levine, Loayza, and Beck 2000), whereas some of the empirical research has also supported the hypothesis of a causal relationship between economic growth and financial development. Here, the growing demand for financial services could cause financial sector development as the real economy grows. Here, the need for financial services could contribute to the development of the financial sector when the overall economy develops (Goldsmith 1969; Jung 1986). In an economically free society, there will be freedom to work, produce, consume, and invest in any manner.

Hafer (2013) argued that research has identified a substantial link between economic and financial development and economic freedom. The study further revealed that countries with greater economic freedom exhibit a higher degree of development in financial intermediaries, resulting in rapid economic growth. The findings from this research partly justify the association between economic freedom and growth. Carlson and Lundström (2002) suggested that economic freedom has a strong association with development. Financial freedom, which is one of the factors of economic freedom, has a significant long-run relationship with financial inclusion (Rekha, Rajamani, and Resmi 2020). However, there are no empirical studies in the literature on the linkages between economic freedom and financial inclusion.

### **3. METHODOLOGY**

#### **3.1 Data and Sources**

The study used annual data covering the period 2004–2017 pertaining to 22 emerging economies, which the availability of data dictated. We developed an index of financial inclusion (IFI) with three dimensions—namely penetration, availability, and usage—following a method similar to the one that Sarma and Pais (2011) explained, using World Bank data. The ICT Development Index, which measures the digital divide



and enables the comparison of ICT performance across countries, comes from the United Nations International Telecommunication Union (UNITU 2017). The Index uses 11 information and communication technology (ICT) metrics (Table 1) in three sub-indices, namely ICT access, ICT use, and ICT skills, and aggregates the weighted values. The normalized and averaged indicators provide the sub-index values.

**Table 1: Indicators for the ICT Index**

	Weights (Indicators)	Weights (Sub-indices)
<b>ICT access</b>		<b>0.40</b>
Fixed-telephone subscriptions per 100 inhabitants	0.20	
Mobile-cellular telephone subscriptions per 100 inhabitants	0.20	
International Internet bandwidth per internet user	0.20	
Percentage of households with a computer	0.20	
Percentage of households with internet access	0.20	
<b>ICT use</b>		<b>0.40</b>
Percentage of individuals using the internet	0.33	
Fixed-broadband Internet subscriptions per 100 inhabitants	0.33	
Active mobile-broadband subscriptions per 100 inhabitants	0.33	
<b>ICT skills</b>		<b>0.20</b>
Mean years of schooling	0.33	
Secondary gross enrollment ratio	0.33	
Tertiary gross enrollment ratio	0.33	

Source: ITU.

The Heritage Foundation (2019) provided the Economic Freedom Index, which measures the economic freedom in a country. The index covers 12 freedoms, from property rights to financial freedom (Table 2).

**Table 2: Economic Freedom Factors**

SL	Category	Factors
1	Rule of Law	Property rights, government integrity, judicial effectiveness
2	Government Size	Government spending, tax burden, fiscal health
3	Regulatory Efficiency	Business freedom, labor freedom, monetary freedom
4	Open Markets	Trade freedom, investment freedom, financial freedom

Source: Heritage Foundation.

We obtained the Financial Development Index, an aggregate of the Financial Institutions Index and the Financial Markets Index, based on depth, access, and efficiency, from the International Monetary Fund (IMF) database (IMF 2019). We employed the gross domestic product converted into international dollars using purchasing power parity rates (GDP PPP) as a proxy for economic development (World Bank 2018).

### 3.2 Model

Following established procedures, we evaluated the causal interaction between the variables in four stages. Initially, we performed tests for the order of integration of the variables, IFI, FDI, EF, ICT, and GDP. Next, we performed panel cointegration tests to check for long-run relationships among the variables. Then, we applied the VECM to evaluate the long-run cointegration among the variables. Finally, we conducted the Wald test to assess the short-run causality of the variables. The empirical model that we used in the study is as follows:

$$IFI_t = \alpha_1 + \beta_1 ICT_t + \beta_2 EF_t + \beta_3 FDI_t + \beta_4 LGDP_t + \varepsilon_t$$

where  $t$  represents the time from 2004 to 2017,  $\varepsilon$  represents the error correction term,  $\alpha_1$  is the intercept term, and  $\beta_1, \beta_2, \beta_3$ , and  $\beta_4$  are the relevant parameters.

## 4. RESULTS

### 4.1 Panel Unit Root Tests

To check the unit root properties of the data, we used the Levin–Lin–Chu (LLC) (2002), Im–Pesaran–Shin (2003), and Fisher–ADF and Fisher–PP tests; Table 3 presents the results.

**Table 3: Panel Unit Root Tests**

Variable	ICT	EF	FDI	GDP	IFI
<b>Levels</b>					
Levin, Lin, and Chu $t$	−2.74968	−0.20612	−5.11484***	5.93692	−2.96182**
Im, Pesaran, and Shin $W$ -stat.	0.9950	1.02543	−1.48781	6.66121	1.05448
ADF–Fisher chi-square	0.8187	38.5469	57.5040	27.5161	41.3434
PP–Fisher chi-square	0.3391	51.1875	86.4554***	42.9968	36.6331
<b>First difference</b>					
Levin, Lin, and Chu $t$	−14.7119***	−12.6112	−14.8947***	−6.67862***	−8.16149***
Im, Pesaran, and Shin $W$ -stat.	−10.7246***	−10.2551***	−10.2270***	−4.63524***	−5.84759***
ADF–Fisher chi-square	181.057***	173.217***	171.164***	99.2783***	109.321***
PP–Fisher chi-square	229.778***	184.091***	194.987***	93.9469***	118.330***

The results indicate the presence of a unit root in all the series at level and hence they are non-stationarity at level. Table 3 also shows the results of the tests using first differences, which indicate that the variables follow an  $I(1)$  process. Having established that all the variables are integrated to the order  $I(1)$ , we examined the cointegration among the variables to decide whether to control for long-run relationships in the econometric specifications.

### 4.2 Co-integration among Variables

Table 4 and Table 5 present the results of the panel cointegration tests for the data (Kao 1999; Pedroni 1999). The null hypothesis for these tests is that there is no cointegrating relationship. According to the Pedroni test, as Table 4 shows, four out of the seven statistics provide evidence for cointegrating relationships. The Kao test result also suggests panel cointegration at the 1% significance level (Table 5).

**Table 4: Pedroni Panel Cointegration Test**

(Series: IFI ICT EF FDI LGDP)			
Panel Statistic (Within Dimension)		Group Statistic (Between Dimension)	
V	-1.325269	Rho	4.614325
Rho	3.040432	PP	-7.461744***
PP	-3.732644***	ADF	-5.092943***
ADF	-4.202287***		

**Table 5: Kao Test**

Series: IFI ICT EF FDI LGDP	
ADF	-2.611245**
Residual variance	0.000122
HAC variance	0.000157

### 4.3 Panel VECM

Since we found that the variables are cointegrated, we applied the VECM (vector error correction model) to analyze the panel. This technique adjusts to short-run changes in variables as well as to deviations from the equilibrium. We used the AIC values to arrive at a suitable lag length (Table 6); for our model, it was two.

**Table 6: Lag Order Selection Criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-405.8966	NA	0.001208	7.470848	7.593597	7.520636
1	710.9323	2,111.822	2.89e-12	-12.38059	-11.64409	-12.08186
2	777.3900	119.6240	1.36e-12*	-13.13436*	-11.78412*	-12.58670*
3	793.3965	27.35642	1.62e-12	-12.97084	-11.00686	-12.17424
4	815.9359	36.47291	1.71e-12	-12.92611	-10.34838	-11.88057

Table 7 contains the result from the panel VECM. The results confirm the long-run equilibrium association between the variables. They imply that all of the independent variables jointly influence the dependent variable, IFI.

**Table 7: VECM Long-Run Representations: IFI as the Dependent Variable**

(Series IFI ICT EF FDI LGDP)			
Coefficient	Std Error	t-Statistic	Probability Value
-0.005649	0.002595	-2.177062	0.0297

The Wald statistic (Table 8) shows that there is no significant short-run causality running from the independent variables to IFI. Further, it is apparent that FDI, EF, ICT, and GDP have a significant effect on IFI only in the long run. However, when treated independently, EF does not have any significant impact on IFI in either the long or the short run.

**Table 8: VECM Short-Run Representations: Wald Test**

Variable	Value	Probability Value
<i>ICT</i>	0.984579	(0.6112)
<i>EF</i>	0.437569	(0.8035)
<i>FDI</i>	1.256267	(0.5336)
<i>LGDP</i>	2.151797	(0.3410)

Test statistic: Chi-square independent variable IFI.

## 5. DISCUSSION AND IMPLICATIONS

The evidence for a significant long-run association between ICT diffusion and financial inclusion suggests the necessity to strengthen the ICT infrastructure, the rollout of digital banking, and e-commerce services. Policymakers must strengthen the ICT policy measures and concentrate on the promotion of e-governance and e-commerce. For emerging economies, ICT sector investment is critical for advancing even with a weak economic status. Improving access and connectivity, primarily through mobile phone and internet connections, enhances financial depth, which is vital for any economy to develop. The growth of financial intermediaries, such as banks and capital markets, stimulates the overall growth based on ICT. To ensure a long-term sustained effect of ICT diffusion, the role of the government is significant in designing new policies and investment and development strategies to build up the ICT infrastructure.

This will enable citizens to benefit from low-cost, high-speed internet services. Further, it will make e-finance easier for businesses and other industries. Policies aiming to strengthen a country's ICT ecosystem would undoubtedly promote greater financial growth and further resources for developing countries to experience e-financing.

With regard to economic freedom, it is apparent that strategies aim to promote and foster financial access by creating competitiveness and eliminating excessive entry barriers as well as by improving the availability of credit information. Efforts should focus on minimizing government involvement in the financial system through a reassessment of the role of financial institutions. Governments should also minimize restrictive practices in the financial services sector and encourage reforms like providing cheaper bank accounts for the unbanked population. Apart from policies for expanding banking penetration, there should be policies for improving the infrastructure to increase availability and usage. It is also necessary to reduce income inequalities, enhance literacy levels, and improve the communication infrastructure to build financially inclusive societies.

Besides, policymakers should recommend introducing comprehensive financial reforms leading to economic freedom that would create favorable outcomes to boost financial inclusion and growth. In addition to the analytical findings favoring the relationship between financial development and financial inclusion, it seems that improving the quality of financial institutions is necessary to strengthen the relationship between financial development and economic growth.

The results highlight that, in emerging markets, financial sector development has a significant role in inclusive growth and financial markets and institutions strongly influence sustainable development. It could be possible to access informal markets by improving the degree of e-governance and economic freedom. At a broader level, our findings suggest that careful alignment between the ICT policy and the growth policy is critical for addressing financial development, which in turn will reflect favorably on financial inclusion.

## 6. CONCLUSION

This paper examined the inter-linkages of ICT diffusion, economic freedom, financial development, and economic growth with financial inclusion using a panel data analysis of 22 emerging economies. We found that the variables are cointegrated and applying a VECM approach indicated the presence of a long-run relationship between the variables. The literature has shown that financial inclusion and economic growth have a positive association, but, apart from the conventional findings, our results indicate that growth leads to greater financial inclusion in the long run. The other factors, ICT, economic freedom, and financial development, are also positively related to financial inclusion in the long run. These findings have significant policy implications and stress the importance of creating an economic environment that is conducive to sustained economic growth. Future research could analyze the impact of individual factors of economic freedom on financial inclusion using more robust tests to gain further insights.

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