Determinants of Digital Economy in Developing Countries of Asia

Abdul Zahir[1], Dilawar Khan[2] and Ihtisham Ul Haq[3]

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Abstract

In recent decades, the digital economy has played a pivotal role in driving global economic growth. Developing countries in Asia also fuel their economic development through the digital economy. However, these countries have inefficient technical infrastructure, limited access to modern technology, and inadequate investment in innovation and communication. Therefore, this study was conducted to empirically explore the determinants of the digital economy in Asia's developing countries from 2001 to 2021. The results of diagnostic tests suggest the use of a cross-sectionally augmented autoregressive distributed lags (CS-ARDL) model. The results of the CS-ARDL show that technical infrastructure is statistically significant in both the short run and the long run. When technical infrastructure increases by 1 percent, the related outcome increases by 0.61percent. However, in the short run, all other variables, such as access to modern technology, return on telecom investment, and technological innovations, have statistically insignificant effects. However, these variables play a crucial role in the long run, like return on telecom investment has a strong positive effect with a coefficient of 0.25, technological innovation has a coefficient of 0.20, and modern technology access has a negative coefficient of -0.30, but significant, and shows that extensive access might seem helpful at first, but leads to oversaturation. The result also shows that the model is dynamically stable, and any short-run disequilibrium can be corrected in the long run. Ultimately, the study presented several valuable suggestions for policymakers.

Keywords: Digital Economy; Technical Infrastructure; Modern technology Access; Return on Telecom Investment; Technological innovations; CS-ARDL.

Introduction

The digital economy has emerged as a critical factor in promoting economic development, particularly among developing nations aiming to modernize their economic frameworks. The concept of the digital economy was first introduced by Tapscott, who explained that it is not just about connecting technologies, but about connecting people through technology. The digital economy is the combination of digital and network technologies, and it is a key part of social and economic activities, gaining deeper meaning over time (Tapscott, 1996). The digital economy was defined by Mesenbourg (2001) as comprising three major components: e-business infrastructure, e-business, and e-commerce. This sector includes activities boosted by digital technologies,

[1]*Department of Economics, Kohat University of Science & Technology, Kohat, Pakistan.*
[2]*Department of Economics, Kohat University of Science & Technology, Kohat, Pakistan.*
Corresponding Author Email: dilawar@kust.edu.pk
[3]*Department of Economics, Kohat University of Science & Technology, Kohat, Pakistan.*

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including e-commerce, online services, and financial technology, as well as the extensive application of information and communication technologies (ICTs) within both business and governance (Bukht & Heeks, 2018). In many Asian developing countries, the digital economy is regarded as an effective means of accelerating growth, generating employment, and enhancing inclusivity by lowering market access barriers (Kraus et al., 2021).

Due in large part to systemic issues, the progress of digital transformation is outstandingly uneven in many developing Asian nations. According to Nayyar (2022), problems such as inadequate infrastructure, limited internet access, low digital literacy levels, and a lack of investment in telecommunications and innovation all hinder digital development. In particular, disparities in access to mobile networks and electricity in urban and rural areas severely limit digital participation in countries such as Bangladesh, India, Indonesia, and Pakistan (Mothobi & Gillwald, 2019).

Several key factors affecting the growth of the digital economy in less developed countries have been identified through empirical research by the (Kumar, et al 2023), analyzed data from 150 countries and found that investing in information and communication technology (ICT) and basic infrastructure, such as access to electricity, significantly increases internet use, Market coverage, internet pricing, participation in the labor market, urbanization, and gender empowerment are some of the factors that are positively related to barriers to internet adoption. Price sensitivity in low-income countries highlights the importance of affordability. Research focused on the Asia-Pacific region reveals that macroeconomic factors, such as GDP per capita growth, financial sector expansion, and urbanization, as well as governance factors like political stability, are all crucial for promoting digitalization. On the other hand, corruption hinders progress, and high levels of inequality and high digital costs are significant problems (Sedik et al., 2023).

Sub-Saharan Africa, a panel regression analysis reveals that non-technological factors such as government expenditure, employment growth, the regulatory environment for business, logistics efficiency, and access to electricity and water significantly influence the diffusion of digital technology (Mlambo & Chiumya, 2024). Conversely, inadequate trade infrastructure serves as a considerable barrier to digital progress in the region (Mlambo & Chiumya, 2023).

Recent theoretical developments suggest that effective digital economies in developing nations must integrate technological, institutional, human capital, and normative infrastructures. This perspective emphasizes that the success of digitalization is dependent not merely upon the establishment of physical infrastructure, but also significantly influenced by educational systems, regulatory frameworks, and exciting entrepreneurial ecosystems (Lazović et al., 2022).

This study highlights that developing countries need to address several interrelated dimensions, including affordability, infrastructure, skill development, and institutional support, to advance digital growth. However, empirical studies in this area are limited. This study aims to investigate the factors influencing the digital economy's attention in developing Asia by evaluating ICT investment, infrastructure availability, technological innovation, and access to modern technology. The study's findings will inform policymakers in planning strategies for a reasonable digital transformation.

The technical infrastructure comprising broadband networks, data centers, and mobile towers serves as a pivotal foundation for the digital economy. In developing nations, a robust information and communication technology (ICT) infrastructure significantly enhances connectivity, thereby promoting engagement with digital services (Ndubuisi et al.,2023). An appropriate example can be seen in Sub-Saharan Africa, where the expansion of broadband has successfully narrowed the digital divide and stimulated sectors such as e-commerce, finance, and education (Otioma &

Tetteh, 2023; Oughton, 2021). Furthermore, Oughton's (2021) simulations indicate that advancing directly to 4G networks in East and West Africa has facilitated access to reliable and affordable internet, thus driving digital inclusion.

Modern technology, particularly through various devices and platforms, enhances infrastructure by transforming connectivity into practical applications. Research shows that just adding to infrastructure is not enough. To make it work, we need to provide affordable, easy-to-use devices and platforms, as well as skills training and electronic services (Hilko 2021).

The return on investment in telecom (ROI) is crucial for attracting continued investment. Telecom companies are more likely to expand their networks into underserved areas when they get a good return on investment (ROI). Studies show that public-private partnerships, such as Africa's Universal Service Provision Funds and the tower-sharing models in East Africa, are effective at attracting private investment because they demonstrate a reliable source of income from usage (Bakare, 2024). This dynamic creates a virtuous cycle that enhances both the quality of service and the network's reach.

Furthermore, the digital economy is driven by technological innovation, particularly through local research and development, as well as the expansion of digital services. This leads to the creation of new products and ways for people to use them. Strong digital infrastructure enhances technological innovation at the company level, thereby increasing productivity and the value of digital services (Xu & Hou, 2020).

This study adds significant value to the expanding literature on the digital economy and empirical investigation focused on its essential determinants: technical infrastructure, access to modern technology, returns on telecommunications investment, and technological innovation, particularly within developing Asian nations. Distinct from prior research that often emphasizes developed economies or aggregates global data, this work aims to explain how these factors shape digital economic development in a context marked by varying socio-economic and technological landscapes. Utilizing the Cross-Sectionally Augmented ARDL (CS-ARDL) framework to analyze panel data spanning the period from 2001 to 2022, the study yields insightful findings regarding the intricate interplay between infrastructure, innovation, and digital expansion in both the short and long run. Furthermore, it introduces a composite technical infrastructure index, encompassing electricity access and network coverage, advancing the methodology for assessing readiness for digitalization. The outcomes not only enhance the academic discourse surrounding digital transformation in Asia's developing countries but also offer strategic recommendations for policymakers committed to fostering comprehensive and sustainable digital economic initiatives.

The remaining study proceeds as follows: the next section reviews previous research studies based on key theoretical frameworks and empirical research concerning the factors that influence the digital economy. The third section explains the research methodology, covering data sources, variable development, and the econometric model, known as CS-ARDL, employed for analysis. The fourth section presents the results and empirical findings, analyzing both short-run and long-run effects of the identified determinants on the advancement of the digital economy in developing Asian nations. The final section concludes with a summary of the key findings, policy recommendations, and avenues for future research.

Literature Review

The growth of the digital economy in developing Asian countries depends on a complicated interplay of several important factors, including basic infrastructure, user access, investment incentives, and the ability to innovate. Essential technical infrastructure, such as broadband

networks, mobile coverage, and a stable power supply, is crucial for enabling digital services to function effectively. According to research, a 10% increase in broadband use in developing countries could boost GDP per capita growth by 1.38% to 2.5% (Moghazi & Whalley, 2022). The International Telecommunication Union's studies indicate that mobile broadband has a significantly greater impact on economic growth in these areas than fixed broadband. This finding underscores the significance of connectivity, especially in regions with limited resources, where robust digital infrastructure can promote economic growth and societal advancement. Therefore, it is crucial to address these interconnected issues to establish a strong digital economy in these emerging markets (Sojka & Pietrucha, 2024).

Access to modern technology, such as smartphones, computers, and digital platforms, enables infrastructure capabilities for real digital engagement. In 1989, Davis developed the Technology Acceptance Model. It demonstrates how people choose to adopt new technology based on how easy and helpful they perceive it to be (Davis,1989). According to Esely & Taonezvi (2024), devices that are cheaper and teach people how to use the internet efficiently significantly increase digital use in developing regions. This makes the idea even stronger. These factors are crucial for encouraging people to utilize technology effectively.

Maintaining a robust return on telecom investment (RTI) is crucial for attracting private capital necessary for infrastructure expansion. Paelo and Robb (2020) demonstrate that when telecommunications operators achieve consistent returns on investment, they are better positioned to expand their services into underserved areas. This crowding-in effect is further enhanced by development finance institutions, such as the report by British International Investment (2024), which play a vital role in facilitating public-private partnerships. Technological innovation is crucial for enhancing existing infrastructure, developing new digital services, and enhancing productivity. Localized research and development, patent activity, and digital entrepreneurship make this possible (Maneejuk et al., 2020).

Research indicates that four key factors are crucial for digital economic growth. The most important of these is the importance of ICT infrastructure. According to Nguyen (2023), research using panel data from Southeast Asian countries reveals that factors such as broadband penetration, mobile network availability, and access to electricity have a statistically significant and positive impact on GDP growth.

Cross-country studies support the idea that ICT investments are crucial, especially in Sub-Saharan Africa, where mobile phone use has become a significant driver of economic growth, with elasticities ranging from 0.05 to 0.52 (Andrianaivo & Kpodar, 2011; Lee et al., 2012; Aghaei & Rezagholizadeh, 2017). A study conducted in Chinese cities supports this trend by showing that a 1% increase in ICT stock leads to an annual growth rate increase of approximately 0.9–1.1 percentage points for each city. The positive effects of technological diffusion remain strong regardless of their location in the world (Czernich et al., 2011; Xu et al., 2022)

Access to modern technology is just as crucial as ICT infrastructure. Empirical models indicate that the increasing ownership of smartphones and other digital devices makes it significantly easier to utilize digital services. However, it is essential to note that factors such as cost and digital literacy serve as important moderating variables in this relationship (Kurniawati, 2022).

The third factor is the return on investment (ROI) that comes with working in the telecommunications industry. This leads to the long-term growth of infrastructure. Case studies from Africa demonstrate that models such as tower-sharing and the establishment of Universal Service Funds increase the likelihood that private investors will invest in areas lacking sufficient capital, thereby promoting economic growth (Oughton, 2021; Bakare, 2024).

Lastly, technological innovation is necessary for improving economic performance. Research and development (R&D)-driven innovation networks, especially in China and among members of the Organization of Islamic Cooperation (OIC), are helping to boost productivity and expand the range of digital services (Xu & Hou, 2022; Aghaei & Rezagholizadeh, 2017).

In conclusion, these empirical findings all point to the same conclusion: that technical infrastructure, access to technology, investment viability, and innovation are interconnected and collectively support significant progress in the digital economy, particularly in developing countries. Each determinant strengthens the others, creating a synergistic effect that drives genuine economic growth and enhances the digital landscape in various areas.

Methodology

To achieve the objective of this study, balanced panel data from 2001 to 2022 were used to investigate the determinants of the digital economy in Asia. The dependent variable of this study is the digital economy. The term "digital economy", according to the Organization of Economic Cooperation and Development (OECD, 2020), includes all economic activities that rely on or benefit from digital inputs, including digital technologies, infrastructure, and services. The Independent variables of this study are technical infrastructure, return on telecom investment, technical innovation, and modern technology access. The technical infrastructure index will be composed of two indicators, namely Access to electricity and network coverage of the telecom sector. Indexes of technical infrastructure and digital economy will be constructed through principal component analysis (PCA). Technical infrastructure, which includes reliable internet access, communication networks, and electricity, is considered the backbone of the digital economy and is the driver of the digital economy (Quinones et al., 2015) The study of Yonazi et al. (2012) postulates the connection between the digital economy and return on telecom investment and highlights that the digital economy depends on massive investments in broadband networks or global connections and the private sector cannot handle this financial burden due to risks and limited return on investment. Thus, the return on investment in the telecom sector is considered a key driver of the digital economy's expansion. According to the International Telecommunication Union (2015), Access to modern technology is another factor of digital economy development, like mobile broadband, fixed broadband, and bandwidth speed.

Along with access to modern technology, new technical innovation is considered an expander of the digital economy. Technological innovation refers to the development of new technology or the enhancement of existing technology. Technological advances facilitate the development of new methods of production and the introduction of new products and services to meet consumer needs (Dahlman et al., 2016). Table 1 presents the variables' names, data sources, and measures

Table 1: Description of variables

Variables	Abbreviations	Measurement/Meaning	Source
Digital Economy:	DE	Index	World Bank (2023)
This index was constructed from the following three dimensions.		Network environment security, supervision & governance	
Digital infrastructure			
Safe internet servers (per one million people)		Upgradation of the information infrastructure	
Fixed broadband endowment (per one hundred people)		Development of the information infrastructure	

Firm telephone subscription (per one hundred people) Cellular mobile phone endowment (per one hundred people) persons using the Web (percentage of population) Digital Economy Openness High technology exports (%age of fabricated products exports) Information and communication technologies goods exports (total goods exports) Computerize technology Environment Registration in higher education organization (%age of total community) R&D expenditures (%age of national income (GDP)		Improvement of the information infrastructure Internet user base Openness of the web economy, international ambitiousness of technology Abundance of the internet and web professionals Digital technology innovation environment	World Bank (2023) World Bank (2023)
Technical Infrastructure: Technical infrastructure index was constructed from the two factors. Access to electricity Network coverage	TI	Index Percentage of total population Percentage of network coverage	World Bank (2023) International Telecommunication Union (2023)
Return on Telecom Investment	RTI	Constant US Dollar	International Telecommunication Union (2023)
Technological Innovation	TI	Total patent Application (Residents/Nonresidents)	World Bank (2023)
Modern Technology Access	MTA	Bandwidth Speed, Mbit/s	International Telecommunication Union (2023)

Before estimating the causal relationship of digital economy with other variables, cross-sectional dependence tests and unit root tests were conducted. Most economic time series are non-stationary or have problem of unit root. Regressing nonstationary variable on another nonstationary variable produces spurious regression. Unit root tests are used to identify unit root problem in a variable. First generation panel root tests assume that the cross-sectional units of the panel are independent of each other, while in real-life, cross-sectional units are correlated. To tackle the correlation problem in cross-sectional units, second generation unit root tests were used. Before using second generation panel unit root tests, cross-sectional dependence test was used to examine the correlation between cross-sectional units (countries). The presence of cross-sectional dependency makes estimators consistent, but causes estimator to be inefficient. Therefore, cross-sectional dependency produces biased standard errors. In the case of countries as cross-sectional units, cross-sectional dependency may occur due to their growing financial and economic integration. Pesaran cross-sectional dependence (CSD) test was conducted for checking cross-sectional dependence. CIPS test introduced by Pesaran (2007) was used to check the unit root in the variables of this

study. Test of slope homogeneity was also conducted and the results show that slopes are heterogeneous. The results of these diagnostic tests suggest the use of the Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model, therefore, CS-ARDL was used to empirically analyze the determinants of digital economy. The Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model is a useful tool for analyzing data from multiple sources over time. It builds on the traditional ARDL approach by considering how different groups might influence one another and recognizing that not everything changes the same way across different units. This model looks at averages of dependent and independent variables to filter out common factors that could affect all groups at once, like global events. It combines past and present data in each unit to understand both short-term trends and long-term relationships (Chudik and Pesaran, 2015).

Results and Discussion

This study empirically investigated Determinants of the Digital Economy Developing Countries in Asia. Table 1 presents the descriptive statistics of the variables employed in this study. The descriptive statistics highlight the key characteristics of the data series. The series used in study Digital Economy, Technical Infrastructure, Return on Telecom investment, technical innovation, and Modern technology Access. The mean value of the digital economy is 2.42, technical infrastructure 3.16, return on telecom investment 22.286, technical innovation 8.203, and modern technology access is 11.09.

Table 2: Descriptive Statistics of the data

Variable	Mean	Std. Dev.	Min	Max
DE	2.42	1.58	0.07	6.21
TII	3.16	1.57	0.54	7.42
RTI	22.28	1.91	17.41	26.15
MTA	11.09	3.76	2.07	18.02
TI	8.20	2.40	3.17	14.28

Table 2 presents the outcome of cross-sectional dependence tests. The Pesaran CD test was used in the study which reveal that there is cross-sectional dependence among the variables selected for this study. When looking at the statistics for DE, TII, RTI, and MTA, we find highly significant results ($p = 0.00$). This means we can confidently say there's strong dependence across these cross-sectional units (countries). On the other hand, for lTI, the statistic is low and not significant ($p = 0.60$), indicating there's either weak dependence or none at all among the units for this variable.

Table 3: Pesaran CD test

Variable	CD-test	p-value
DE	29.42	0.00
TII	27.66	0.00
RTI m	24.76	0.00
MTA	30.09	0.00
TI	0.51	0.60

After checking cross- sectional dependence of the data the problem of the presence of unit roots within the dataset. In assessing stationarity within panel data, it is crucial to consider cross-sectional dependency, which requires employing a unit root test designed specifically for this framework. Traditional first-generation unit root tests prove inadequate when cross-sectional dependence is present. Consequently, this study applied a second-generation unit root test, specifically the Cross-sectionally Implied Panel Stationarity (CIPS) test, to evaluate the presence of unit roots across each series effectively. This approach ensures a strong and accurate analysis of the underlying data characteristics, accommodating the complexities inherent in panel datasets. Table 3 presents the results of a unit root test. The results of the CIPS test reveal that the series DE, RTI, MTA, and TI are integrated of order one, denoted as I (1), with their first differences showing stationarity, I (0), across all examined specifications. Additionally, TII is identified as I (1) when a time trend is included in the analysis. The results of the unit root test show that there is a mix order of integration, i.e., I (0) and I (1). Therefore, the CS-ARDL model was used in this study because the model is applicable when some series are of I (0) and some series are of I (1).

Table 4: CIPS unit root test

Variable	Deterministics	CIPS	10%	5%	1%	Results
DE	None	-1.33	-1.57	-1.72	-1.98	Non-Staionary
	Constant	-1.75	-2.21	-2.33	-2.57	Non-Staionary
	Constant & Trend	-2.25	-2.73	-2.86	-3.1	Non-Staionary
D.DE	None	-2.95	-1.58	-1.72	-2	Stationary
D.DE	Constant	-3.40	-2.21	-2.34	-2.6	Stationary
D.DE	Constant & Trend	-3.77	-2.74	-2.88	-3.15	Stationary
TII	None	-2.21	-1.57	-1.72	-1.98	Stationary
TII	Constant	-2.63	-2.21	-2.33	-2.57	Stationary
TII	Constant & Trend	-3.44	-2.73	-2.86	-3.1	Non-Staionary
RTI	None	-1.40	-1.57	-1.72	-1.98	Non-Staionary
RTI	Constant	-2.11	-2.21	-2.33	-2.57	Non-Staionary
RTI	Constant & Trend	-2.35	-2.73	-2.86	-3.1	Non-Staionary
D.RTI	None	-4.49	-1.58	-1.72	-2	Stationary
D.RTI	Constant	-4.81	-2.21	-2.34	-2.6	Stationary
D.RTI	Constant & Trend	-4.96	-2.74	-2.88	-3.15	Stationary
MTA	None	-1.26	-1.57	-1.72	-1.98	Non-Staionary
MTA	Constant	-1.98	-2.21	-2.33	-2.57	Non-Staionary
MTA	Constant & Trend	-2.78	-2.73	-2.86	-3.1	Non-Staionary
D.MTA	None	-4.13	-1.58	-1.72	-2	Stationary
D.MTA	Constant	-4.11	-2.21	-2.34	-2.6	Stationary
D.MTA	Constant & Trend	-4.15	-2.74	-2.88	-3.15	Stationary
TI	None	-1.52	-1.57	-1.72	-1.98	Non-Staionary
TI	Constant	-1.36	-2.21	-2.33	-2.57	Non-Staionary
TI	Constant & Trend	-1.72	-2.73	-2.86	-3.1	Non-Staionary
D.TI	None	-2.62	-1.58	-1.72	-2	Stationary
D.TI	Constant	-3.02	-2.21	-2.34	-2.6	Stationary
D.TI	Constant & Trend	-3.14	-2.74	-2.88	-3.15	Stationary

Before applying the CS-ARDL model in the study the heterogeneity slope test was conducted. Table 4 presents the heterogeneity test of the data. This test was proposed by Pesaran and Yamagata (2008), along with its adjusted variant (Δ_adj), to evaluate the homogeneity of slope coefficients within our panel model. The findings yielded values of $\Delta = 11.056$ ($p = 0.00$) and $\Delta\_adj = 13.08$ ($p = 0.00$), both of which provide strong evidence against the null hypothesis of slope homogeneity. This outcome suggests that the effects of the explanatory variables differ significantly across the cross-sectional units analyzed, thereby invalidating the assumption of a uniform slope parameter.

Table 5: Testing for slope heterogeneity

	Delta	P-values
	11.06	0.00
Adj.	13.08	0.00

Finally, CS-ARDL model was estimated to achieve the objective of this study. Table 5 presents the results of both long-run and short run coefficients and coefficient speed of adjustment. In the short term, investigation using the Cross-Sectionally Augmented ARDL (CS-ARDL) model shows that technical infrastructure (TII) makes a great difference. Specifically, when TII goes up by one percent, the related outcome increases by about 0.615 percent. This is a clear reminder that having strong infrastructure is crucial for getting quick results. However, the other factors we observed at—like return on telecom investment (RTI), technological innovation (TI), and access to modern technology (MTA)—didn't show any significant short-run effects.
In the analysis it is also observed the presence of a negative error correction term (ECT), which is about -0.385. This means that if any divergences from the long run balance arise, we can expect roughly 38.5% of that gap to close in the next period. In the long run results, we perceive that all four variables provide interesting information. TII continues to positively impact outcomes with a coefficient of 0.105. This indicates its lasting importance. This links with the view that improvements in electricity access, broadband, and mobile coverage quickly reduce transaction costs and create network externalities, thereby promoting online transactions and digital engagement in the short run (Katz & Shapiro, 1985; Brynjolfsson & McAfee, 2014). Return on telecom investment (RTI) also plays a crucial role, showing a strong positive effect with a coefficient of 0. 252.This indicate that return on telecom investment requires time to have an impact on broader digital economic activity. This process involves diffusion, complementary investments and end-user adoption (Romer, 1990; Aghion & Howitt, 1992). Meanwhile, technological innovation (TI) has a modest long-term effect, with a coefficient of 0.209, suggesting that the benefits of innovation in the digital economy are mostly realized in the medium to long run, as companies utilize new technologies, build platforms, and users interact with them (Brynjolfsson & McAfee, 2014). Interestingly, access to modern technology (MTA) shows a negative long-run coefficient of -0.303. This suggests that while broad access to digital infrastructure can initially increase usage and output, over time constraints, such as fixed infrastructure, resource misallocation, or saturation effects, emerge that slow further gains. (Ammar, 2017). In summary, our CS-ARDL analysis indicates that strong technical infrastructure is vital in the short run, while both telecom investment and technological innovation have lasting positive effects. We also observed that extensive access to modern technology might have a reducing effect in the long run. The significant error correction term highlights how well the model adjusts to maintain balance among these variables.

Table 6: CS-ARDL results

Variables	Coef.	Std.Err.	T-values	P-values
Short Run Estimates				
TII	0.62	0.10	6.1	0.00
RTI	0.07	0.09	0.7	0.47
TI	0.03	0.04	0.6	0.53
MTA	0.01	0.07	0.1	0.91
ECT	-0.39	0.10	-3.8	0.00
Long Run Estimates				
TII	0.11	0.01	8.75	<0.05
RTI	0.25	0.04	6.30	<0.05
TI	0.21	0.10	2.09	<0.1
MTA	0.30	0.09	3.37	<0.1

Conclusion

This study explored the Determinants of the Digital Economy in developing countries in Asia from 2001 to 2022. The independent variables of the study are technical infrastructure (TII), return on telecom investment (RTI), technological innovation (TIN), and access to modern technology (MTA). These variables were chosen due to their theoretical and empirical significance on the digital economy in various countries. This study was conducted for eleven developing countries in Asia, as data on key variables were available for them. The findings of this study demonstrate that the determinants of the digital economy play a significant role in the expansion of the digital economy in developing countries, both in the short term and the long term. In the short run, technical infrastructure has a positive and significant effect on the Digital Economy, suggesting that strong infrastructure is crucial for achieving quick results. Specifically, when TII increases by one percent, the related outcome increases by approximately 0.615 percent. The other variables, i.e., return on telecom investment (RTI), technological innovation (TI), and access to modern technology (MTA), also have positive short-run effects. The existence of a negative error correction term (ECT), which was found to be approximately -0.385. Therefore, we anticipate that approximately 38.5% of the gap will close in the upcoming period, provided there are no deviations from the long-term balance. This suggests a reliable adjustment mechanism that validates the long-term relationship between these variables. In the long run, all independent variables have a significant effect on the dependent variable, except for Modern technology access, which has a negative coefficient. This implies that while broad access may initially appear beneficial, it may ultimately lead to problems such as oversaturation or shifts in resource allocation, which can cause delays in outcomes.

The CS-ARDL of the study suggests that a robust technical infrastructure is essential in the short term. At the same time, investment in telecommunications and new technologies is more beneficial in the long term. Having much access to new technologies could make things worse in the long run. The large error correction term indicates how effectively the model can adjust to maintain these variables in check.

Finally, this study offers some suggestions for the future course of action regarding the policy of digital economy development for the world in general, and for developing countries in Asia in particular. Policymakers in developing Asian countries should prioritize building a strong technical infrastructure first, as this leads to significant short-run growth in the digital economy.

To ensure long-run growth, governments should establish regulations that promote long-term investment in telecommunications and emerging technologies. Public-private partnerships are examples of strategic incentives that can draw investment to these areas. However, attention must be taken when making modern technologies more widely available. Policies should focus on balanced and efficient distribution to avoid oversaturation and misallocation of resources. Making rules and monitoring systems stronger will help ensure that rapid digital growth remains sustainable and aligned with long-term economic goals.

This study has two limitations. The first limitation is that this study was conducted for eleven countries within Asia, and other developing countries in Asia were excluded due to the unavailability of data on a key variable, i.e., the Digital economy. Second, due to the unavailability of data on other variables of the study beyond 2022, the sample period was kept limited to 2022.

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