

# The Impact of the Digital Economy Development on Economic Growth in RCEP Region

Conghui Bai<sup>1,2\*</sup>, Lim Ee Shiang<sup>1</sup>, Soo Yean Chua<sup>1</sup>

<sup>1</sup> School of Social Sciences, Universiti Sains Malaysia, Penang, Malaysia

<sup>2</sup> School of Digital Economy, Taishan University, China

\*Corresponding Author: [baiconghui@student.usm.my](mailto:baiconghui@student.usm.my)

Received: 16 July 2024 | Accepted: 19 September 2024 | Published: 1 December 2024

DOI: <https://doi.org/10.55057/ijaref.2024.6.4.9>

**Abstract:** *The objective of this research is to investigate how the digital economy has affected economic growth within the Regional Comprehensive Economic Partnership (RCEP) region between 2010 and 2022. Using principal component analysis (PCA), the research constructs an extensive index to evaluate the level of digital economy development across 12 RCEP countries. The research aims to present solid evidence on the crucial role played by the digital economy in promoting equitable and sustainable growth in the RCEP region through benchmark regression analysis. The findings aim to provide governments and stakeholders with practical insights and policy recommendations to enhance digital economy initiatives, mitigate developmental gaps, and foster long-term economic resilience and integration in the RCEP region. This study employs a quantitative research design to analyze panel data from RCEP countries spanning 2010 to 2022, examining the impact of digital economy development on economic growth. The digital economy development index is constructed using Principal Component Analysis (PCA). The study then applies Fixed Effects (FE), Random Effects (RE), and Ordinary Least Squares (OLS) models to assess the relationship between digital economy development and economic growth. Control variables such as capital investment, labor force, trade openness, and innovation are included to ensure the robustness of the findings. The findings demonstrate that the digital economies of the RCEP member nations have advanced and varied significantly, with notable advances shown in Singapore, China, Japan, South Korea, Australia, and New Zealand. The GDP growth of the RCEP region is substantially influenced by the development of digital economy in member nations. RCEP countries could invest significantly in digital economy from infrastructure, digital government, digital integration, and human capital to enhance economic growth. This research provides a comprehensive analysis of the impact of the digital economy on economic growth within the RCEP region, employing principal component analysis (PCA) to construct an extensive index from multiple dimensions and utilizing benchmark regression. It provides unique insights into the development level and growth disparities of the digital economy across RCEP countries. By highlighting the critical roles of digital infrastructure, services, skills, and economic environment, this research adds significant value to the existing literature on digital transformation and economic development. Policymakers in the RCEP region will find particular value in the findings, which offer evidence-based suggestions for promoting equitable and sustainable economic growth through focused digital economy efforts.*

**Keywords:** Digital economy, Regional Comprehensive Economic Partnership (RCEP), GDP growth, principal component analysis (PCA), benchmark regression

## 1. Introduction

The RCEP region, comprising 15 countries, represents a significant portion of the global economy, accounting for approximately 30% of the world's GDP and encompassing about 2.2 billion people (UNCTAD, 2021). The agreement, which came into effect in January 2022, is to simplify trade and investment flows, making it easier for businesses to operate across member countries. By creating a more integrated economic space, RCEP aims to boost intra-regional trade and investment, stimulate innovation, and strengthen economic resilience by establishing a more connected economic landscape. The agreement's provisions, which demonstrate its all-encompassing approach to regional economic integration, span a number of industries, including products, services, investment, e-commerce, and intellectual property (ASEAN, 2022). The RCEP region, however, is distinguished by notable differences in economic growth among its member nations, in spite of its enormous potential (UNCTAD, 2021). These differences make it difficult to come up with practical solutions that can close the economic divide and promote inclusive growth throughout the area (ADB, 2022; Mohamad & Cheng, 2020). For example, some countries like Singapore and South Korea, have highly advanced digital economies, while other nations, such as Cambodia and Laos, have less developed in digital infrastructure and access (Anukoonwattaka et al., 2022). Because of this unequal development, regional policies aiming at economic integration and growth may be less effective overall, calling for customized approaches that take into account the unique requirements and conditions of each member countries (Ishikawa, 2021). Therefore, how to identify effective strategies to bridge these gaps and foster inclusive regional growth is the challenge for RCEP countries.

The digital economy, defined by Bukht and Heeks (2017) as encompassing all economic activities enabled by digital technologies, infrastructure, services, and data, presents a timely opportunity to drive economic growth across the RCEP region. The digital economy includes a wide array of activities such as e-commerce, digital banking, online education, and telemedicine, all of which have seen significant growth during the COVID-19 pandemic. These technologies not only improve efficiency and productivity but also open new markets and opportunities for innovation. For countries within the RCEP, leveraging digital technologies could be a key strategy for overcoming traditional development challenges and accelerating economic growth. According to the OECD (2020), digital technologies facilitate new business models, improve productivity, and create economic opportunities, making them critical components of modern economic strategies. The OECD highlights those countries investing in digital infrastructure, such as high-speed internet and mobile broadband, can experience substantial and significant economic benefits.

Businesses may reach new markets, improve operational efficiency, and create cutting-edge goods and services based on these expenditures. Digital technologies can also assist governments in promoting greater civic engagement, improving public services, and increasing transparency. For example, the digital economy contributed significantly to Singapore's economic performance in 2022, accounting for 17.3% of the country's GDP (Inforcomm Media Development Authority, 2023). The success of Singapore serves as an example of how smart investments in digital infrastructure combined with advantageous laws can stimulate economic expansion. The city-state has put in place a number of programs to encourage digital innovation, including as financial incentives for tech firms, strong cybersecurity defenses, and extensive digital literacy campaigns. As a result of these initiatives, Singapore is now recognized as a pioneer in the digital economy worldwide and a role model for other RCEP nations. Despite these advancements, there remains no unified and standard method to measure

the digital economy, which makes it more difficult to evaluate its e impact comprehensively. Cross-country comparisons are challenging due to variations in the measurements and methodology used by different nations to measure the size and growth of their digital economies. The absence of uniformity presents difficulties for decision-makers who are trying to create logical and successful plans for the growth of the digital economy. A standardized framework for measuring the digital economy would facilitate better benchmarking, policy formulation, and international cooperation.

Using benchmark regression, this study examines the effects of the digital economy on economic growth in countries that are part of the Regional Comprehensive Economic Partnership (RCEP) between 2010 and 2012. Principal component analysis (PCA) is used to create an index based on four dimensions—digital infrastructure, digital services, digital skills, and digital economy environment—in order to assess the progress of the digital economy in RCEP countries. This multifaceted approach captures the complexity and interconnectedness of digital activities, enabling a nuanced assessment of the evolution of the digital economy. By combining several indicators into a single composite index, the PCA approach makes it easier to compare data over time and between different nations. An important instrument for examining the connection between the rise of the digital economy and economic expansion is this index.

Specifically, it examines the current level of digital economy development in RCEP countries, highlighting the disparities and commonalities among these nations and quantifying this development using a comprehensive and standardized index. Additionally, the study also explores the extent to which the digital economy influences economic growth in RCEP countries. By focusing on these areas, the study aims to examine how the digital economy contributes to the RCEP region's economic expansion and provide evidence-based suggestions for how governments should use digital technology to promote equitable and sustainable development.

The remaining section of this article is structured into five sections. The second section presents a review of the theoretical and empirical literature. The research methodology of this study is developed in section three. The fourth section describes the research findings. The empirical findings are then discussed in section five. The article concludes with the final section summarizing the main findings.

## **2. Literature Review**

### **2.1 Determinants of Economic Growth**

A multitude of factors impact the complex process of economic development. These determinants comprise interest rates, inflation rates, oil revenue, federal government spending, money supply, foreign private investment, and foreign exchange rates (Oyeyemi & Awujola, 2014). There exists a correlation between the gross domestic product and the following variables: population, foreign direct investment, export and import merchandise, gross national income, and remittance pay and receive (Jannat et al., 2020). Reviewing the important research on the main factors influencing economic development, this section concentrates on urbanization, population increase, and foreign direct investment (FDI).

It is commonly acknowledged that urbanization is a key factor of economic development. Henderson (2010) argues that urbanization facilitates economic activities by providing better access to markets, resources, and services. Because of agglomeration effects and economies of

scale, productivity is generally higher in urban regions. Jedwab and Vollrath (2015) provide historical evidence showing that urbanization has been a significant driver of economic growth by enhancing productivity and innovation. This perspective is further reinforced by Gollin, Jedwab, and Vollrath's (2016) findings, which show that urbanization contributes to economic growth by improving resource allocation and fostering innovation. Their study highlights that urbanization is often accompanied by industrialization, which drives economic development by creating jobs and generating income.

The relationship between population growth and economic development is complex and context dependent. According to Kelley and Schmidt (1995), population growth can increase the labor force and open up new market, but it can also add a burden on infrastructure and resources, potentially offsetting economic benefits. Bloom, Canning, and Fink (2010) argue that the impact of population growth on economic development varies based on demographic transitions, human capital, and policy environments. More recent studies, such as those by Ashraf, Weil, and Wilde (2013), examine the conditions under which population growth can be beneficial or detrimental to economic development. They emphasize the importance of factors such as education, health, and economic policies in mediating the effects of population growth.

FDI is essential to economic growth, especially when it comes to capital accumulation and knowledge transfer. Researchers found that FDI positively affects economic growth, especially when host countries have adequate human capital to absorb new technologies (Borensztein et al., 1998). Alfaro et al. (2004) demonstrate that local financial markets play a significant role in maximizing the benefits of FDI, highlighting the importance of a supportive economic environment. Studies by further explore the mechanisms through which FDI influences economic development. They find that FDI not only provides capital but also enhances productivity by introducing new technologies and managerial practices (Dunning, 2001; Balasubramanyam et al., 1996).

## **2.2 Digital Economy and Economic Growth**

Since the world is still in its early stages of digitalization, there is no widely accepted definition of the digital economy and related concepts. Studies confirmed that implementation of information and communication technology (ICT) is the technical support for the digital economy. Tsyganov and Apalkova (2016) referred that the adoption of ICT has led to the development of the digital economy that has had a substantial impact on economic efficiency and effectiveness. Johansson et al. (2006) also emphasized the essential functions of the rapid development, adoption, and use of ICTs innovations, which was driven by the economy and even its all-sectors transformations and stimulated this emergence of the digital economy. Ganichev and Koshovets (2021) stated that the present notion of the digital economy refers to the digital transformation of all aspects of the economy and social existence.

Because no unified definition of the digital economy, the measurements are diversity. Zhang et al. (2018) utilized factor analysis and weights distribution to measure the digital economy in digital technology infrastructure, ICT readiness, economy development, government innovation support, education and digital literature, digital contents and applications based on 31 regions between 2014 and 2016. To evaluate the digital economy status, Abendin and Duan (2021) used principal component analysis (PCA) estimation process and selected three dimensions to construct the digital economy index including access side factors, usage side factors and skills side factors based on 53 countries' data from 2000 to 2018. Su et al. (2021)

chose entropy method to measure the digital economy level by setting index system in digital investment, digital environment, and digital output.

ICT as the technology support for the digital economy is also investigated by researchers. For example, Dahmani et al. (2022) employed the cross-section augmented autoregressive distributed lag (CS-ARDL) model and Dumitrescu and Hurlin Granger causality test to investigate the impacts of ICT on Tunisia's economic growth based on panel data for 14 economic sectors in the period 1995–2018. In this study, the authors cited the ICT definition by OECD (2009) as “all economic activities that contribute to the visualization, processing, storage, and transmission of information electronically”. The findings show that ICTs have significantly positive impacts on economic growth in Tunisia and manufacturing of ICT products would be an essential concern for the government. Similarly, Bahrini and Qaffas (2019) investigated the impacts of information and communication technology (ICT) diffusion on economic growth by adopting a panel Generalized Method of Moment (GMM) growth model based on 45 developing countries in the Middle East and North Africa (MENA) region and the Sub-Saharan Africa (SSA) region from 2007 to 2016. The result shows that ICT including mobile phone, internet usage, and broadband adoption has promoted economic growth in MENA and SSA developing countries. Moreover, internet usage and broadband adoption of the MENA region are better than in SSA countries. Similar results have been confirmed by researchers that ICT could promote the economic growth in 25 Europe countries over the past three decades (Pradhan et al.,2019).

In addition, the digital economy enhances productivity by improving efficiency and fostering innovation. The OECD (2020) emphasizes that digital infrastructure investments significantly boost economic performance, suggesting that countries investing in broadband and mobile internet can expect substantial economic gains. Niebel (2018) investigates the impact of ICT investment on economic growth, finding a positive correlation, particularly in developing and emerging economies.

### **2.3 Research Hypotheses**

Hypothesis 1: The development of the digital economy has positive effects on economic growth within the RCEP region.

The hypothesis is grounded in the extensive body of literature that links digital economy development with economic growth. The digital economy is increasingly recognized as a vital driver of economic growth. Bukht and Heeks (2017) define the digital economy as encompassing all economic activities enabled by digital technologies, including infrastructure, services, and data. They highlight that digital technologies facilitate new business models, improve productivity, and create economic opportunities. Similarly, the OECD (2020) emphasizes the transformative impact of digital technologies on economies, suggesting that investments in digital infrastructure can significantly enhance economic performance. Zhang et al. (2022) indicated that despite the clear regional disparities in digital economy development among countries along the “Belt and Road”, the digital economy exerts a markedly positive influence on their economic growth.

### **3. Method**

Due to the data availability for the digital economy index, this study uses panel data from 12 countries in RCEP (except for Brunei, Myanmar and Viet Nam) from 2010-2022. The data are obtained from UNCTAD, World Bank and International Telecommunication Union (ITU).

This study will make use of fixed effects (FE), random effects (RE) and ordinary least square (OLS) to examine the relationship between the development of the digital economy and economic growth within RCEP region.

Based on benchmark regression, the model is written as follows:

$$\ln GDP_{it} = \beta_0 + \beta_1 DIG_{it} + \beta_2 PGR_{it} + \beta_3 UR_{it} + \beta_4 \ln FDI_{it} + \varepsilon_{ijt} \quad (1)$$

where,  $GDP_{ijt}$ , as the dependent variable, represents the Gross Domestic Product (GDP) of country  $i$  in year  $t$ .  $DIG_{it}$  as the core explanation variable, represents the digital economy development level of country  $i$  in year  $t$ , the  $PGR_{it}$  represents the population growth rate of country  $i$  in year  $t$ ,  $UR_{it}$  represents the urban population of country  $i$  in year  $t$ ,  $FDI_{ij}$  represents the net inflows of foreign direct investment of country  $i$  in year  $t$ , and  $\varepsilon_{ijt}$  is a random error item.

**Table 1: Description of Variables and a Priori Expectations**

Variables	Description	Expected Sign	Data Source
GDP	The gross domestic product of country $i$ in year $t$	-	World Bank
DIG	Digital economy development level of country $i$	Positive	Calculated by author
PGR	Population growth rate of country $i$ in year $t$	Positive	World Bank
UR	Urban population of country $i$ in year $t$	Positive	World Bank
FDI	Net inflows of foreign direct investment of country $i$ in year $t$	Positive	World Bank

Since there is no uniformed digital economy measurement standard, this study will construct digital economy index (DIG) specially for RCEP countries based on indicators used by international organizations. Considering the data availability, this index will be constructed from four dimensions and utilized PCA to evaluate the digital economy development: infrastructure, digital public environment, digital economy integration and human capital. Table 2 presents the dimensions and indicators for the digital economy index.

**Table 2: Digital Economy Development Index**

Target Level	Dimension	Sub-dimension	Indicator	References
Digital economy	Infrastructure	Fixed broadband coverage	Total fixed broadband subscriptions	ITU
			Fixed broadband subscriptions per 100 inhabitants (%)	ITU
		Mobile broadband	Mobile-cellular subscriptions	ITU
			Active mobile-broadband subscriptions	ITU
			Fixed-telephone subscriptions	ITU
			Population covered by at least 3G	ITU
			Population covered by at least 4G	ITU
			Internet users	Individuals using Internet
		Priced digital services	Fixed-broadband basket (5GB)	ITU
			Data-only mobile broadband basket	ITU
	Mobile cellular low usage basket		ITU	
	E-government		E-government development	NRI
	Digital public environment	E-government	E-participation	NRI
			Online-services	NRI
Telecommunication infrastructure			IDI	

	Security	Secure internet servers	NRI
Digital economy integration	Trade related to the DE	ICT goods export	UNCTAD
		ICT services export	UNCTAD
		International trade in digitally deliverable services	UNCTAD
		International trade in ICT services	UNCTAD
		High-technology exports	UNCTAD
	Trade logistics	Logistic performance	UNCTAD
		Efficiency of customs clearance	UNCTAD
Human capital	Human capital	Human capital index	OECD

#### 4. Findings

There has been a great deal of improvement and variance in the digital economy development of the RCEP nations between 2010 and 2022 (Table 3). The digital economy development of Singapore, China, Japan, South Korea, Australia, and New Zealand have been steadily rising, which is indicative of their progress in digital infrastructure and integration. On the other hand, a number of nations—including Malaysia, Thailand, the Philippines, Indonesia, Lao PDR, and Cambodia—show a slow but steady improvement, with some even moving from negative to positive scores, demonstrating the difficulties and continuous efforts involved in the digital transformation process.

**Table 3: Scores of Digital Economy Development Index in RCEP**

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<b>Singapore</b>	0.68	0.89	1.15	1.35	1.7	1.76	1.95	2.12	2.28	2.56	2.72	2.81	2.98
<b>China</b>	-1.61	-1.28	-1.08	-0.9	-0.32	0.32	0.62	0.89	1.3	1.61	1.9	2.06	2.25
<b>Japan</b>	-0.24	-0.07	0.75	1.05	1.28	1.3	1.33	1.56	1.71	1.89	2.02	1.93	2.07
<b>Korea, Rep</b>	0.69	0.77	0.86	0.92	1.33	1.35	1.33	1.43	1.53	1.63	1.81	1.86	1.86
<b>Australia</b>	0.15	0.26	0.51	0.82	1	1.05	1.14	1.18	1.25	1.32	1.37	1.4	1.52
<b>New Zealand</b>	-0.19	-0.07	0.02	0.18	0.54	0.79	0.83	0.96	1.03	1.06	1.17	1.13	1.18
<b>Malaysia</b>	-0.53	-0.45	-0.29	-0.22	-0.13	0.17	0.28	0.42	0.62	0.78	1.06	1.05	0.97
<b>Thailand</b>	-2.05	-1.94	-1.76	-1.25	-1.03	-0.74	-0.24	-0.12	0.1	0.32	0.52	0.57	0.72
<b>Philippines</b>	-1.58	-1.44	-1.27	-1.24	-0.99	-0.82	-0.26	-0.11	0.12	0.31	0.42	0.36	0.37
<b>Indonesia</b>	-2.47	-2.25	-2.06	-2	-1.69	-1.77	-1.61	-0.81	-0.73	-0.52	-0.21	-0.07	-0.01
<b>Lao PDR</b>	-3.69	-3.35	-3.09	-3	-2.65	-2.69	-2.56	-2.35	-2.14	-2.08	-1.84	-1.44	-1.05
<b>Cambodia</b>	-3.74	-3.48	-3.26	-3.11	-2.59	-2.52	-2.35	-2.14	-1.79	-1.48	-1.14	-1.1	-1.22

Source: Calculated by author

As shown in Table 4, the descriptive statistics for the study variables are as follows: The GDP's natural logarithm (ln gdp) ranges from 22.688 to 30.519, with a mean of 26.861 (SD = 1.902). The values of the digital economy index (dig) range from -3.74 to 2.98, with an average of -0.007 (SD = 1.567). The range of the urbanization rate (ur) is 20.294 to 100, with a mean of 65.167 (SD = 23.906). Due to four missing data, the natural logarithm of foreign direct investment (ln fdi) covers 152 observations and has a mean of 23.206 (SD = 1.641) with a range of 19.446 to 26.564. The population growth rate (pgr) ranges from -4.17 to 3.309, with a mean value of 0.969 (SD = 0.798).

**Table 4: Descriptive Statistics**

Variables	N	Mean	Std. Dev.	Min	Max
ln_gdp	156	26.861	1.902	22.688	30.519
dig	156	-0.007	1.567	-3.74	2.98
ur	156	65.167	23.906	20.294	100
ln_fdi	152	23.206	1.641	19.446	26.564
pgr	156	0.969	0.798	-4.17	3.309

The correlation matrix reveals significant relationships among the key variables (Table 5). There is a strong positive correlation between ln\_gdp and dig ( $r = 0.633$ ,  $p < 0.01$ ), ur ( $r = 0.541$ ,  $p < 0.01$ ), and ln\_fdi ( $r = 0.767$ ,  $p < 0.01$ ), while ln\_gdp is negatively correlated with pgr ( $r = -0.465$ ,  $p < 0.01$ ). Additionally, dig is positively correlated with ur ( $r = 0.847$ ,  $p < 0.01$ ) and ln\_fdi ( $r = 0.594$ ,  $p < 0.01$ ) but negatively correlated with pgr ( $r = -0.356$ ,  $p < 0.01$ ). Pgr is negatively correlated with ur ( $r = -0.231$ ,  $p < 0.01$ ) and ln\_fdi ( $r = -0.302$ ,  $p < 0.01$ ). All correlations are statistically significant, indicating robust interrelationships among these economic indicators.

**Table 5: Pairwise correlations**

Variables	(1)	(2)	(3)	(4)	(5)
(1) ln_gdp	1.000				
(2) dig	0.633* (0.000)	1.000			
(3) pgr	-0.465* (0.000)	-0.356* (0.000)	1.000		
(4) ur	0.541* (0.000)	0.847* (0.000)	-0.231* (0.004)	1.000	
(5) ln_fdi	0.767* (0.000)	0.594* (0.000)	-0.302* (0.000)	0.472* (0.000)	1.000

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 6 presents the Variance Inflation Factor (VIF) values for the key independent variables in the regression analysis, indicating the level of multicollinearity among them. The VIF values are as follows: DIG has a VIF of 4.81, UR has a VIF of 3.82, LnFDI has a VIF of 1.57, and PGR has a VIF of 1.19. The mean VIF for all variables is 2.85, suggesting that while some multicollinearity is present, it is not severe enough to warrant concern, as all values are below the common threshold of 10 (Hair et al., 2010; Kutner et al., 2004).

**Table 6: Variance inflation factor test for multicollinearity**

Variable	DIG	UR	LnFDI	PGR
VIF	4.81	3.82	1.57	1.19
Mean VIF	2.85			

The regression analysis investigates the relationship between GDP and several explanatory variables, including the digital economy (DIG), population growth rate (PGR), urbanization rate (UR), and foreign direct investment (FDI) as a percentage of GDP. The results from the FE, RE, and OLS models consistently highlight the significant role of the digital economy and urbanization in influencing economic growth in the RCEP region. The coefficient for the digital economy (dig) is positive and highly significant at the 1% level across all models (0.148, 0.139, and 0.139), indicating that a one-unit increase in the digital economy index is associated with

approximately a 13.9% to 14.8% increase in GDP. This robust significance underscores the crucial role that digital economy development plays in driving economic growth in the RCEP region. The urbanization rate (ur) also demonstrates a positive and significant impact on GDP, with coefficients of 0.023, 0.026, and 0.026, all significant at the 1% or 5% level. In contrast, the population growth rate (pgr) does not exhibit a significant impact on GDP, with coefficients of -0.003, -0.005, and -0.005, none of which are statistically significant. Finally, foreign direct investment (ln\_fdi) shows a positive and significant impact on GDP, with coefficients of 0.039, 0.045, and 0.045, all significant at the 5% level. The significance of FDI highlights its importance, although its impact is less pronounced compared to the digital economy and urbanization rate.

**Table 7: Regression results**

	FE	RE	OLS
	ln_gdp	ln_gdp	ln_gdp
dig	0.148*** (5.27)	0.139*** (5.37)	0.139*** (5.37)
pgr	-0.003 (-0.20)	-0.005 (-0.29)	-0.005 (-0.29)
ur	0.023** (2.35)	0.026*** (3.09)	0.026*** (3.09)
ln_fdi	0.039** (2.10)	0.045** (2.41)	0.045** (2.41)
_cons	24.468*** (27.72)	24.098*** (27.77)	24.098*** (27.77)
N	152	152	152
r <sup>2</sup>	0.689	0.688	0.688

*t* statistics in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

To ensure the robustness of the findings, the digital economy variable was lagged by one period and included in the regression analysis. The results indicate that the lagged digital economy index (l\_dig) continues to have a positive and highly significant impact on GDP, with coefficients of 0.105, 0.101, and 0.101 across different models, all significant at the 1% level (t-values of 4.11, 4.26, and 4.26). The urbanization rate (ur) also remains positively and significantly associated with GDP, with coefficients of 0.031 and 0.032, significant at the 1% level. The population growth rate (pgr) and foreign direct investment (fdi) do not show significant effects on GDP. These findings reinforce the critical role of the digital economy and urbanization in driving economic growth in the RCEP region, even when accounting for potential lagged effects.

**Table 8: Regression results of digital economy one-period lag**

	(1)	(2)	(3)
	ln_gdp	ln_gdp	ln_gdp
l_dig	0.105*** (4.11)	0.101*** (4.26)	0.101*** (4.26)
pgr	-0.010 (-0.60)	-0.010 (-0.62)	-0.010 (-0.62)
ur	0.031*** (3.09)	0.032*** (3.66)	0.032*** (3.66)
fdi	0.000	0.000	0.000

	(1.26)	(1.50)	(1.50)
_cons	24.871***	24.756***	24.756***
	(37.81)	(35.47)	(35.47)
N	144	144	144
r <sup>2</sup>	0.614	0.614	0.614

*t* statistics in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 5. Discussion and Implications

### 5.1 Discussion

The findings from our analysis provide robust evidence that the digital economy and urbanization have a significant positive impact on economic growth within the RCEP region. The fixed effects (FE), random effects (RE), and ordinary least squares (OLS) models all consistently highlight that the digital economy (DIG) is a key factor driving GDP growth. Specifically, the coefficient for the digital economy (dig) remains positive and highly significant across all models, indicating that improvements in digital infrastructure and integration are important factors driving economic growth. These findings are consistent with previous research by Niebel (2018) and Vu et al. (2020), which also emphasize the importance of the digital economy in enhancing productivity and growth.

A more thorough examination of how the digital economy affects economic growth identifies a number of important ways by which it functions. Firstly, the digital economy improves information and communication technology (ICT) infrastructure, reducing information costs and improving access to information, thereby boosting productivity and market efficiency. The RCEP countries have made large investments in digital infrastructure in recent years, especially in broadband and mobile internet, which has improved the convenient conditions for economic activities. In line with our findings, Niebel (2018) points out that ICT plays a particular essential role in economic growth in developing and emerging economies.

Secondly, the rapid development of the digital economy has spawned new business models and innovation activities. For example, e-commerce, fintech, and the sharing economy have flourished in the RCEP region, driving economic transformation, and upgrading. China and Singapore, as leaders in digital economy development in the region, demonstrate that policy support and market demand jointly propel the rapid rise of the digital economy. Vu et al. (2020) indicate that the digital economy not only directly promotes GDP growth but also indirectly boosts overall economic development by driving the digital transformation of traditional industries.

Furthermore, there are significant employment and income distribution effects associated with the development of the digital economy. The digital economy has created numerous new jobs, particularly in areas such as technology development, data analysis, and digital marketing. This not only increases labor market flexibility but also provides more employment opportunities for workers with different skill levels. Moreover, the digital economy facilitates broader market access and trade opportunities, helping to reduce regional and income disparities and promote inclusive growth.

However, it is important to note that the development of the digital economy also faces challenges. For instance, the digital divide remains an issue in the RCEP region, with some countries and regions unable to fully leverage the opportunities presented by the digital

economy due to lagging infrastructure development. Additionally, data privacy and cybersecurity issues pose potential threats to the sustainable development of the digital economy. Policymakers need to strengthen the formulation and implementation of relevant laws and regulations to ensure data security and user privacy while promoting digital economy development.

The significant coefficients for urbanization rate (ur) further underscore the importance of urban development in fostering economic growth. The positive and significant impact of urbanization is consistent with studies by Henderson (2010) and Jedwab and Vollrath (2015), who argue that urbanization facilitates economic activities, increases efficiency, and promotes innovation. Our results indicate that as countries in the RCEP region continue to urbanize, they can expect to see substantial gains in economic output.

In contrast, the population growth rate (pgr) does not exhibit a significant impact on GDP. This result might be attributed to the varying absorptive capacities of the economies within the RCEP region or the nature of population growth dynamics that may not directly translate to immediate economic gains. This is in line with findings by Kelley and Schmidt (1995), who argue that the relationship between population growth and economic development is complex and context dependent.

The significance of foreign direct investment (ln\_fdi) in our models highlights its importance, although its impact appears less pronounced compared to the digital economy and urbanization rate. Previous studies, such as those by Borensztein et al. (1998) and Alfaro et al. (2004), have documented the positive effects of FDI on economic growth, particularly through technology transfer and capital accumulation. Our findings suggest that while FDI remains a vital component of economic development, the digital economy and urbanization may play more crucial roles in the context of the RCEP region.

To further ensure the robustness of our findings, we included a lagged digital economy variable (l\_dig) in the regression analysis. The lagged variable continues to demonstrate a positive and highly significant impact on GDP, reinforcing the critical role of the digital economy in driving economic growth, even when accounting for potential delayed effects. This result suggests that investments in the digital economy yield substantial benefits over time, supporting the notion of sustainable and long-term economic development.

## 5.2 Implications

This study provides compelling evidence that the digital economy and urbanization are key drivers of economic growth in the RCEP region. Governments should invest significantly in high-speed internet and mobile broadband infrastructure, ensuring equitable access to quality digital services across both urban and rural areas to bridge the digital divide and promote balanced regional development. Enhancing digital literacy and skills among the population is crucial, which can be achieved by incorporating digital technology training into educational curricula and providing opportunities for upskilling and reskilling. Establishing robust regulatory and policy frameworks, including data privacy, cybersecurity, and e-commerce regulations, will create a secure, transparent, and predictable digital environment that attracts more investment and fosters innovation. Additionally, promoting international cooperation and knowledge sharing among RCEP member countries is essential. Enhancing collaboration in the digital economy sector, sharing best practices, and establishing regional digital economy cooperation platforms can facilitate technology transfer and innovation, driving the overall growth of the digital economy in the region. By implementing these recommendations, RCEP

countries can better harness the opportunities presented by the digital economy and urbanization, driving regional economic growth and achieving sustainable and inclusive development objectives.

### 5.3 Limitations

While this study provides valuable insights into the relationship between the digital economy and economic growth within the RCEP region, several limitations should be noted. First, the study is constrained by data availability, leading to the exclusion of Brunei, Myanmar, and Vietnam from the analysis. This exclusion may limit the generalizability of the findings to the entire RCEP region. Second, the study's timeframe (2010-2022) may not fully capture the long-term effects of digital economy developments, especially in the rapidly evolving technological landscape. Finally, while the use of Principal Component Analysis (PCA) to construct the digital economy index offers a comprehensive measure, it may oversimplify the complex and multifaceted nature of the digital economy. Future research could explore the mechanisms through which the digital economy and urbanization impact economic growth and examine the role of other potential factors in this relationship.

### 6. Conclusion

The development of the digital economy of RCEP countries presents significant growth from 2010 to 2022. Despite this overall progress, there remain substantial disparities between advanced and emerging economies within the region.

This study has provided comprehensive evidence on the significant role of the digital economy and urbanization in driving economic growth within the RCEP region. By analyzing data from 2010 to 2022 across RCEP countries, our findings highlight the substantial contributions of digital infrastructure, services, skills, and the economic environment to GDP growth. The results consistently show that advancements in the digital economy are positively correlated with economic performance, emphasizing the importance of digital technologies in fostering productivity, innovation, and market efficiency.

Furthermore, the study underscores the critical impact of urbanization on economic growth. The positive and significant coefficients for urbanization rate in our regression models align with existing literature, confirming that urban development facilitates economic activities, increases efficiency, and promotes innovation. Our findings indicate that as RCEP countries continue to urbanize, they can expect to see significant gains in economic output.

Despite the robust positive impacts of the digital economy and urbanization, the study also acknowledges the challenges associated with these growth drivers. Issues such as the digital divide need to be addressed to ensure sustainable and inclusive development. Policymakers must prioritize investments in digital infrastructure, enhance digital economy integration, and promote digital environment to fully leverage the potential of the digital economy.

### References

- Abendin, S., & Duan, P. F. (2021). International trade and economic growth in Africa: the role of the digital economy. *Cogent Economics & Finance*, 9(1), 1911767. <https://doi.org/10.1080/23322039.2021.1911767>
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: the role of local financial markets. *Journal of International Economics*, 64(1), 89-112.

- Anukoonwattaka, W., Romao, P., Bhogal, P., Bentze, T., Lobo, R. S., & Vaishnav, A. (2022). Digital economy integration in Asia and the Pacific: Insights from DigiSRII 1.0. *Asia-Pacific Sustainable Development Journal*, 28(2), 113–148. <https://doi.org/10.18356/26178419-28-2-4>
- Arabia, S. (2020). A G20 Roadmap toward a Common Framework for Measuring the Digital Economy: Report for the G20 Digital Economy Task Force (DETF).
- Asian Development Bank (ADB). (2022). The Regional Comprehensive Economic Partnership Agreement: a new paradigm in Asian Regional Cooperation? <http://dx.doi.org/10.22617/TCS220172-2>
- Association of Southeast Asian Nations (ASEAN), 2022. RCEP agreement enters into force. ASEAN. <https://asean.org/rcep-agreement-enters-into-force/>
- Bahrini, R., & Qaffas, A. (2019). Impact of information and communication technology on economic growth: evidence from developing countries. *Economies*, 7(1), 21. <https://doi.org/10.3390/economies7010021>
- Balasubramanyam, V. N., Salisu, M., & Sapsford, D. (1996). Foreign direct investment and growth in EP and IS countries. *The Economic Journal*, 106(434), 92-105.
- Bloom, D. E., Canning, D., & Fink, G. (2010). Implications of population aging for economic growth. *Oxford Review of Economic Policy*, 26(4), 583-612.
- Borensztein, E., De Gregorio, J., & Lee, J.-W. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics*, 45(1), 115-135.
- Bukht, R. and Heeks, R. (2017). Defining, Conceptualising and Measuring the Digital Economy (August 3, 2017). Development Informatics Working Paper no. 68, Available at SSRN: <https://ssrn.com/abstract=3431732> or <http://dx.doi.org/10.2139/ssrn.3431732>
- Dahmani, M., Mabrouki, M., & Ben Youssef, A. (2022). ICT, trade openness and economic growth in Tunisia: What is going wrong? *Economic Change and Restructuring*, 55(4), 2317–2336. <https://doi.org/10.1007/s10644-022-09388-2>
- Dunning, J. H. (2001). The eclectic (OLI) paradigm of international production: Past, present and future. *International Journal of the Economics of Business*, 8(2), 173-190.
- Ganichev, N. A., & Koshovets, O. B. (2021). Forcing the digital economy: how will the structure of digital markets change as a result of the COVID-19 pandemic. *Studies on Russian Economic Development*, 32(1), 11–22. <https://doi.org/10.1134/S1075700721010056>
- Gollin, D., Jedwab, R., & Vollrath, D. (2016). Urbanization with and without industrialization. *Journal of Economic Growth*, 21(1), 35-70.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Prentice Hall.
- Henderson, J. V. (2010). Cities and development. *Journal of Regional Science*, 50(1), 515-540.
- Infocomm Media Development Authority. (2023). Singapore Digital Economy Report 2023. Achieved on [www.ima.gov.sg](http://www.ima.gov.sg)
- International Telecommunication Union. (2019). The ICT Development Index (IDI): Methodology, indicators and definitions. ICT Data and Statistics Division, Telecommunication Development Bureau, International Telecommunication Union.
- International Telecommunication Union. (2022). Global connectivity report 2022. ITU Publications.
- Ishikawa, K. (2021). The ASEAN Economic Community and ASEAN economic integration. *Journal of Contemporary East Asia Studies*, 10(1), 24–41. <https://doi.org/10.1080/24761028.2021.1891702>

- Jannat, F., Rubel Miah, M., Omar Faruk, M., & Alam, S. (2020). Empirical Analysis of Factors Influencing Economic Growth Rate in Bangladesh. *International Journal of Business and Economics Research*, 9(2), 78. <https://doi.org/10.11648/j.ijber.20200902.14>
- Jedwab, R., & Vollrath, D. (2015). Urbanization without growth in historical perspective. *Explorations in Economic History*, 58, 1-21
- Johansson, B., Karlsson, C., & Stough, R. (Eds.). (2006). *The emerging digital economy: Entrepreneurship, clusters, and policy*. Springer.
- Kelley, A. C., & Schmidt, R. M. (1995). Aggregate population and economic growth correlations: the role of the components of demographic change. *Demography*, 32(4), 543-555.
- Kutner, M. H., Nachtsheim, C. J., Neter, J., & Li, W. (2004). *Applied Linear Statistical Models* (5th ed.). McGraw-Hill Irwin.
- Mohamad, J., & Cheng, C. (2020). The Regional Comprehensive Economic Partnership (RCEP): what this means for ASEAN and Malaysia. *ISIS Policy Brief: Economics, Trade and Regional Integration*, 4-20.
- Niebel, T. (2018). ICT and economic growth—Comparing developing, emerging and developed countries. *World Development*, 104, 197-211.
- Organisation for Economic Co-operation and Development (OECD). (2019). *ICT investments in OECD countries and partner economies: trends, policies, and evaluation*. OECD Publishing, Paris.
- Organisation for Economic Co-operation and Development (OECD). (2020). *The Digital Economy Outlook 2020*. Organisation for Economic Co-operation and Development.
- Oyeyemi, A. O., & Awujola, A. (2014). An Appraisal of Some Factors Influencing Economic Growth in Nigeria.
- Pradhan, R. P., Arvin, M. B., Nair, M., Bennett, S. E., & Bahmani, S. (2019). Short-term and long-term dynamics of venture capital and economic growth in a digital economy: A study of European countries. *Technology in Society*, 57, 125–134. <https://doi.org/10.1016/j.techsoc.2018.11.002>
- Su, J., Su, K., & Wang, S. (2021). Does the digital economy promote industrial structural upgrading? —a test of mediating effects based on heterogeneous technological innovation. *Sustainability*, 13(18), 10105.
- Tsyganov, S. & Apalkova, V. (2016) Digital economy: a new paradigm of global information society. *Economic Review*, 45, 295-331.
- Jannat, F., Rubel Miah, M., Omar Faruk, M., & Alam, S. (2020). Empirical Analysis of Factors Influencing Economic Growth Rate in Bangladesh. *International Journal of Business and Economics Research*, 9(2), 78. <https://doi.org/10.11648/j.ijber.20200902.14>
- United Nations Conference on Trade and Development (UNCTAD). (2021). *A new centre of gravity: the Regional Comprehensive Economic Partnership and its trade effects*.
- Zhang, J., Zhao, W., Cheng, B., Li, A., Wang, Y., Yang, N., & Tian, Y. (2022). The Impact of Digital Economy on the Economic Growth: and the Development Strategies in the post-COVID-19 Era: Evidence From Countries Along the “Belt and Road.” *Frontiers in Public Health*, 10, 856142. <https://doi.org/10.3389/fpubh.2022.856142>