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DOES DIGITAL TRANSFORMATION DRIVE ECONOMIC GROWTH? EVIDENCE FROM ASIAN AND EUROPEAN COUNTRIES

Saeed A.A. Saif
Department of Economic Development, Faculty of Economics and Business,
Universitas Islam Indonesia, Yogyakarta, Indonesia
Corresponding e-mail: saeed.aa.saif.econ@gmail.com

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Abstract

This study investigates the impact of digital transformation on economic growth using panel data from selected Asian and European countries. It examines how key digitalization indicators shape differences in economic performance across regions with distinct structural and developmental characteristics. The analysis employs a fixed-effects panel model to control for unobserved country-specific heterogeneity. Descriptive statistics, correlation analysis, and robustness tests using Driscoll–Kraay standard errors are applied to address heteroscedasticity, autocorrelation, and cross-sectional dependence. Economic growth is measured by GDP per capita. Digital transformation is captured through internet usage, mobile subscriptions, ICT service exports, and high-technology exports. The model also includes control variables for infrastructure availability and trade openness. The results show that digital transformation significantly supports economic growth, although its effects vary across regions. Internet penetration, mobile connectivity, and ICT service exports have positive and statistically significant effects on GDP per capita, particularly in Asian economies. In contrast, high-technology exports are negatively associated with growth, indicating possible structural limitations and adjustment costs in technology-intensive sectors. The regional analysis suggests that Asian countries benefit more from expanding basic digital infrastructure, while European economies gain more from advanced ICT services. Overall, the findings provide comparative regional evidence on the digital transformation–growth nexus and emphasize the importance of context-specific digital development strategies.
Keywords: Digital Transformation; Economic Growth; ICT Exports; Panel Data

Abstrak

Studi ini mengkaji dampak transformasi digital terhadap pertumbuhan ekonomi menggunakan data panel dari negara-negara terpilih di Asia dan Eropa. Studi ini menganalisis bagaimana indikator digitalisasi utama membentuk perbedaan kinerja ekonomi di berbagai wilayah dengan karakteristik struktural dan perkembangan yang berbeda. Analisis menggunakan model panel efek tetap untuk mengendalikan heterogenitas spesifik negara yang tidak teramati. Statistik deskriptif, analisis korelasi, dan uji ketahanan menggunakan kesalahan standar Driscoll–Kraay diterapkan untuk mengatasi heteroskedastisitas, autokorelasi, dan ketergantungan antar-sektor. Pertumbuhan ekonomi diukur melalui PDB per kapita. Transformasi digital diukur melalui penggunaan internet, langganan seluler, ekspor layanan ICT, dan ekspor teknologi tinggi. Model ini juga mencakup variabel kontrol untuk ketersediaan infrastruktur dan keterbukaan perdagangan. Hasil menunjukkan bahwa transformasi digital secara signifikan mendukung pertumbuhan ekonomi, meskipun efeknya bervariasi antar wilayah. Penetrasi internet, konektivitas seluler, dan ekspor layanan ICT memiliki efek positif dan signifikan secara statistik terhadap PDB per kapita, terutama di ekonomi Asia. Di sisi lain, ekspor teknologi tinggi terkait negatif dengan pertumbuhan, menunjukkan kemungkinan batasan struktural dan biaya penyesuaian di sektor-sektor yang intensif teknologi. Analisis regional menunjukkan bahwa negara-negara Asia lebih diuntungkan dari perluasan infrastruktur digital dasar, sementara ekonomi Eropa lebih diuntungkan dari layanan ICT canggih. Secara keseluruhan, temuan ini memberikan bukti komparatif regional mengenai hubungan antara transformasi digital dan pertumbuhan ekonomi, serta menekankan pentingnya strategi pengembangan digital yang disesuaikan dengan konteks lokal.
Kata kunci: Transformasi Digital; Pertumbuhan Ekonomi; Ekspor ICT; Data Panel.

1. Introduction

Over the past two decades, digital transformation has emerged as a key driver of structural change in the global economy. The widespread adoption of digital technologies such as internet connectivity, mobile communication, and information and communication technologies (ICT) have reshaped production systems, market organization, and patterns of economic interaction. By reducing transaction costs and improving access to information, digitalization enhances efficiency and stimulates innovation. As a result, it creates new opportunities for productivity gains and long-term economic growth across countries at different stages of development.

A growing body of empirical research documents a positive relationship between digitalization and economic performance. Cross-country evidence indicates that higher levels of internet penetration, mobile usage, and ICT investment are associated with higher GDP per capita and stronger growth outcomes (Asma et al., 2024; Magoutas et al., 2024). In Europe, digital transformation has been linked not only to economic expansion but also to progress in sustainability objectives (Bocean & Vărzaru, 2023; Cioacă et al., 2020). Similar patterns are observed in Asian and ASEAN economies, where improvements in digital infrastructure significantly accelerate growth dynamics (Damayanti et al., 2023).

Beyond its contribution to long-term growth, digitalization also strengthens economic resilience. During the COVID-19 pandemic, countries with more advanced ICT infrastructure experienced smaller output declines and faster recoveries. Digital technologies enabled remote work, supported digital trade, and maintained economic activity under mobility restrictions (Bilal et al., 2024). These findings suggest that digital transformation acts not only as a growth engine but also as a stabilizing force during economic shocks.

Despite broad agreement on its positive effects, the impact of digitalization on growth is not uniform. Empirical studies reveal substantial heterogeneity across regions and levels of development. (Trinh Nguyen Chau et al., 2024) show that the magnitude of ICT's contribution differs between developed and developing economies. Similarly, (Touitou Mohammed & Laib Yacine, 2025) highlight the role of institutional quality in shaping the effectiveness of digital transformation. However, limited research provides systematic regional comparisons within a unified empirical framework that adequately controls for unobserved country-specific characteristics.

To address this gap, the present study examines the impact of digital transformation on economic growth using an unbalanced panel dataset and a fixed-effects estimation approach. The analysis incorporates key digital indicators, including internet usage, mobile subscriptions, ICT service exports, and high-technology exports, along with measures of electricity access and trade openness. Importantly, the study conducts a comparative analysis between Asian and European economies to evaluate differences in the magnitude and significance of digitalization effects. By adopting this regional perspective, the study offers context-sensitive empirical evidence on the digital transformation growth nexus and provides policy-relevant insights for designing effective digital development strategies.

2. Method

2.1 Data and Sample

This study uses an unbalanced panel dataset covering selected Asian and European countries from 2000 to 2023. Panel data allow the analysis to account for both cross-country heterogeneity and time dynamics in assessing the relationship between digital transformation and economic growth. The unbalanced structure reflects differences in data availability across countries and years. Such an imbalance is common in cross-country studies and does not affect the consistency of fixed-effects estimations.

The sample includes six Asian economies Indonesia, Malaysia, India, China, Thailand, and Japan and five European economies Germany, France, Italy, the Netherlands, and Poland. These countries were selected based on data availability, economic relevance, and their representation of different stages of digital and structural development. The Asian group captures economies experiencing rapid digital expansion alongside structural transformation. In contrast, the European group represents relatively mature digital economies with established institutional and technological systems.

Focusing on these two regions enables a structured comparison of how digital transformation affects economic growth under different economic structures and levels of digital maturity. This regional approach helps identify variation in both the magnitude and transmission channels of digitalization effects.

All variables are obtained from the World Development Indicators (WDI) published by the World Bank. The WDI provides internationally comparable data on economic performance, digital infrastructure, trade, and related macroeconomic indicators, ensuring consistency across countries and time.

2.2 Variables Description

Economic growth is measured by gross domestic product per capita (GDP per capita) in current U.S. dollars. Digital transformation is captured through multiple indicators representing different dimensions of digital development. Internet penetration is measured as the percentage of individuals using the internet. Mobile connectivity is proxied by mobile cellular subscriptions per 100 people. ICT service exports are measured as a percentage of GDP and reflect engagement in digital and technology-related services. High-technology exports are expressed as a percentage of manufactured exports and represent the intensity of technology-based production.

To control for broader economic conditions, the model includes access to electricity as a proxy for basic infrastructure and trade openness measured as the ratio of total trade to GDP. These variables account for structural and institutional factors that may influence growth outcomes.

A detailed definition of all variables and their data sources is presented in Table 1.

Table 1. Variables description

Variable	Definition (World Bank)	Measurement	Source
GDP per capita	Gross domestic product is the total income earned through the production of goods and services in an economic territory during an accounting period. It can be measured in three different ways: using either the expenditure approach, the income approach, or the production approach. The core indicator has been divided by the general population to achieve a per capita estimate. This indicator is expressed in current prices, meaning no adjustment has been made to account for price changes over time. This indicator is expressed in United States dollars.	GDP per capita (current US$)	World Bank (WDI)
Internet	Internet users are individuals who have used the Internet (from any location) in the last 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.	Percentage of individuals using the Internet (%)	World Bank (WDI)
MobInternetile	Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of postpaid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months). The indicator applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.	Mobile cellular subscriptions (per 100 people)	World Bank (WDI)
ICT_Exp	Information and communication technology service exports include computer and communications services (telecommunications and postal and courier services) and information services (computer data and news-related service transactions).	ICT-related exports (% of GDP)	World Bank (WDI)
High_tech_Exp	High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.	High-technology exports (% of manufactured exports)	World Bank (WDI)
Electricity	Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.	Access to electricity (% of population)	World Bank (WDI)
Trade	Trade is the sum of exports and imports of goods and services. This indicator is expressed as a percentage of Gross Domestic Product (GDP) which is the total income earned through the production of goods and services in an	Trade (% of GDP)	World Bank (WDI)

Variable	Definition (World Bank)	Measurement	Source
	economic territory during an accounting period.		

Source: World Bank Indicators

2.3 Data Analysis Technique

2.3.1 Model Specification

To assess the impact of digital transformation on economic growth, the study estimates panel regression models with both country and time fixed effects. This approach controls for unobserved heterogeneity across countries and common shocks over time.

$$ln(GDPpc_{it}) = \beta_0 + \beta_1\, Internet_{it} + \beta_2 Mobile_{it} + \beta_3 ICTExp_{it} + \beta_4\, High\_tech\_Exp_{it} + \beta_5\, Electricity_{it} + \beta_6\, Trade_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad \ldots\ldots (1)$$

Where $i$denotes the country and $t$denotes the time period. $\mu_i$captures unobserved, time-invariant country-specific characteristics, while $\lambda_t$controls for common time effects such as global technological trends and international economic shocks. The error term ε_{it}represents idiosyncratic disturbances.

2.3.2 Estimation Strategy

The empirical analysis follows a structured procedure to ensure the reliability of the results. First, descriptive statistics summarize the main characteristics of the data. Second, Pearson correlation analysis examines preliminary relationships among variables and provides an initial assessment of potential multicollinearity.

To further evaluate multicollinearity, the Variance Inflation Factor (VIF) is calculated. VIF values below standard threshold levels indicate that multicollinearity does not threaten coefficient stability. To control for unobserved heterogeneity, both Fixed Effects (FE) and Random Effects (RE) models are estimated. The Hausman test is used to determine the preferred specification. Time-fixed effects are included in all regressions to account for shocks that simultaneously affect all countries.

Given differences in data availability, the study employs an unbalanced panel framework. This approach allows the inclusion of all available observations while maintaining estimator consistency. To meet the comparative objective, the models are estimated separately for Asian and European subsamples. This enables a direct evaluation of regional differences in the growth effects of digital transformation.

3. Results and Discussion

3.1 Results

This section presents the empirical findings of the study in a structured and objective manner. The results are reported using descriptive statistics, correlation analysis, and fixed-effects panel estimations for the full sample as well as for Asian and European subsamples.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ln gdp	264	9.35	1.322	6.093	11.059
internet	262	53.255	30.281	.528	97.693
Mobile	264	98.256	42.938	.338	181.222
ICT Exp	264	10.122	11.948	.634	52.088
High tech Exp	180	20.58	12.156	3.883	59.416
Electricity	264	97.245	7.153	60.3	100
Trade	264	79.285	44.577	19.56	220.407

Source: Author's Calculation

Table 2 reports the descriptive statistics for all variables included in the analysis. The results indicate substantial variation across countries and over time, reflecting differences in economic development, digital infrastructure, and trade openness among Asian and European economies. GDP per capita displays wide dispersion, consistent with the inclusion of both high-income and middle-income countries. Digital indicators, such as internet usage and mobile subscriptions, also vary considerably, suggesting heterogeneous levels of digital adoption. ICT-related exports and high-technology exports show marked variation, reflecting structural differences in production and export composition. Access to electricity remains relatively high on average, though disparities persist, while trade openness varies significantly, highlighting differences in integration into the global economy.

Table 3. Pairwise Correlations Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ln_gdp	1.000						
(2) internet	0.814*	1.000					
	(0.000)						
(3) Mobile	0.600*	0.731*	1.000				
	(0.000)	(0.000)					
(4) ICT_Exp	-0.432*	-0.265*	-0.257*	1.000			
	(0.000)	(0.000)	(0.000)				
(5) High_tech_Exp	0.034	0.258*	-0.005	-0.235*	1.000		
	(0.647)	(0.001)	(0.946)	(0.001)			
(6) Electricity	0.679*	0.584*	0.582*	-0.663*	0.252*	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)		
(7) Trade	0.085	0.223*	0.145*	-0.248*	0.483*	0.201*	1.000
	(0.166)	(0.000)	(0.018)	(0.000)	(0.000)	(0.001)	

** p<0.05*

Source: Author's Calculation

Table 3 presents the Pearson correlation matrix among the study variables. Overall, the correlations are moderate and broadly consistent with theoretical expectations. GDP per capita is positively and significantly correlated with internet usage and mobile subscriptions. By contrast, ICT service exports show a negative correlation with GDP per capita, while high-technology exports exhibit no statistically significant bivariate relationship. Importantly, none of the correlations among explanatory variables exceed commonly accepted thresholds, suggesting that multicollinearity is unlikely to be a serious concern.

Table 4. Baseline Fixed Effects Regression (Full Sample)

ln_gdp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
internet	.005	.001	4.50	0.00	.003	.007	***
Mobile	.002	.001	2.63	.009	0.00	.003	***
ICT_Exp	.025	.009	2.69	.008	.007	.043	***
High_tech_Exp	-.013	.006	-2.35	.02	-.024	-.002	**
Electricity	.02	.008	2.40	.018	.003	.036	**
Trade	-.002	.001	-1.65	.101	-.004	0.00	
Constant	7.344	.879	8.35	0.00	5.608	9.081	***
Mean dependent var	9.653		SD dependent var		1.109		
R-squared	0.600		Number of obs		178		
F-test	34.230		Prob > F		0.000		
Akaike crit. (AIC)	-236.415		Bayesian crit. (BIC)		-210.961		

**** p<.01, ** p<.05, * p<.1*

Dependent variable: ln_gdp
Source: Author's Calculation

Table 4 reports the fixed-effects regression results for the full sample. The findings indicate that digital transformation variables play a statistically significant role in explaining economic growth. Internet usage, mobile penetration, and ICT-related exports have positive and significant coefficients, implying that broader digital access, mobile connectivity, and ICT service integration contribute positively to economic performance. Access to electricity is also positively and significantly associated with GDP per capita, underscoring the importance of basic infrastructure. In contrast, high-technology exports are negatively and significantly related to economic growth, which may reflect structural adjustment costs, limited domestic value added, or transitional inefficiencies in technology-intensive sectors. Trade openness shows a negative but statistically insignificant coefficient.

Table 5. Panel A: Regional Fixed Effects Results: Asia

ln_gdp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
internet	.004	.002	2.89	.005	.001	.007	***
Mobile	.002	.001	1.79	.077	0.00	.004	*
ICT_Exp	.02	.007	2.78	.007	.006	.035	***
High_tech_Exp	-.017	.009	-1.79	.076	-.035	.002	*
Electricity	.017	.006	2.84	.006	.005	.029	***
Trade	-.005	.002	-2.33	.022	-.009	-.001	**
Constant	7.325	.67	10.93	0.00	5.992	8.658	***

Mean dependent var	8.912	SD dependent var	0.998
R-squared	0.656	Number of obs	93
F-test	25.702	Prob > F	0.000
Akaike crit. (AIC)	-85.987	Bayesian crit. (BIC)	-68.258

*** p<.01, ** p<.05, * p<.1

Dependent variable: ln_gdp
Source: Author's Calculation

Table 5 presents the fixed-effects estimation results for Asian economies. The findings show that internet penetration, ICT-related exports, and access to electricity have positive and statistically significant effects on GDP per capita, indicating that digital connectivity, ICT service expansion, and basic infrastructure play an important role in supporting economic growth in the region. Mobile subscriptions exhibit a positive but weakly significant coefficient, suggesting a more limited contribution to growth. In contrast, high-technology exports are negatively associated with economic growth at the 10% significance level, which may reflect structural constraints, limited domestic value added, or reliance on imported intermediate inputs in high-tech production. Trade openness also shows a negative and statistically significant effect, potentially indicating exposure to external competition or uneven integration into global markets.

Table 6. Panel B: Regional Fixed Effects Results: Europe

ln_gdp	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
internet	.001	.002	0.73	.467	-.002	.005	
Mobile	.001	.001	1.17	.245	-.001	.004	
ICT_Exp	.027	.006	4.17	0	.014	.039	***
High_tech_Exp	-.002	.007	-0.25	.804	-.015	.012	
Electricity	-.475	.41	-1.16	.25	-1.292	.342	
Trade	.002	.001	1.42	.161	-.001	.005	
Constant	57.311	40.884	1.40	.165	-24.152	138.775	

Mean dependent var	10.464	SD dependent var	0.476
R-squared	0.407	Number of obs	85
F-test	8.468	Prob > F	0.000
Akaike crit. (AIC)	-175.041	Bayesian crit. (BIC)	-157.942

*** p<.01, ** p<.05, * p<.1

Dependent variable: ln_gdp
Source: Author's Calculation

Table 6 reports the fixed-effects results for European countries. The findings indicate that the impact of digital transformation on economic growth differs markedly from that observed in the Asian subsample. Among the digital indicators, ICT service exports exhibit a positive and statistically significant association with GDP per capita, highlighting the importance of knowledge-intensive and digitally driven service sectors in European economies. In contrast, internet usage and mobile penetration do not show statistically significant effects, which may reflect relatively high levels of digital saturation across European countries. Other control variables, including trade openness and access to electricity, also do not display significant effects on economic growth within this regional subsample.

Table 7. Robustness Check: Driscoll–Kraay Standard Errors (Full Sample)

Regression with Driscoll-Kraay standard errors	Number of obs = 178
Method: Fixed-effects regression	Number of groups = 11
Group variable (i): country_id	F (6, 16) = 84.74

maximum lag: 2

Prob > F = 0.0000
within R-squared = 0.5995

Drisc/Kraay

ln_gdp	Coefficient	std.	err.	t	P>t	[95%	cof.	interval]
internet	0.005	0.001	4.590	0.000	0.003	0.007		
Mobile	0.002	0.001	1.840	0.085	-0.000	0.004		
ICT_Exp	0.023	0.008	2.880	0.011	0.006	0.040		
High_tech Exp	-0.013	0.004	-3.470	0.003	-0.022	-0.005		
Electricity	0.019	0.004	4.780	0.000	0.010	0.027		
Trade	-0.002	0.002	-1.120	0.280	-0.005	0.002		
_cons	7.480	0.319	23.470	0.000	6.805	8.156		

Dependent variable: ln_gdp
Source: Author's Calculation

To assess the robustness of the main findings, Table 6 reports the fixed-effects estimates using Driscoll–Kraay standard errors, which are robust to heteroscedasticity, autocorrelation, and cross-sectional dependence. The key coefficients retain their signs and statistical significance, confirming the stability of the baseline results.

These robustness checks provide additional confidence that the observed relationships between digital transformation and economic growth are not driven by estimation bias or model mis specification.

3.2 Discussion

The empirical results provide strong and consistent evidence that digital transformation constitutes a significant driver of economic growth, although its magnitude and transmission channels differ across regions and digital dimensions. For the full sample of Asian and European countries, the positive and statistically significant effects of internet usage and mobile penetration support the theoretical view that digital connectivity enhances productivity by reducing transaction costs, improving information flows, and facilitating knowledge diffusion. These findings are well aligned with recent cross-country evidence documenting the growth-enhancing role of digital access in both developing and advanced economies (Asma et al., 2024; Majeed et al., 2018; Trinh Nguyen Chau et al., 2024).

The results further highlight the importance of ICT-related exports as a key mechanism through which digital transformation translates into economic growth. Across the full sample and particularly in European economies, ICT service exports exhibit a strong and robust positive association with GDP per capita. This finding reinforces the argument that service-oriented digital activities rather than solely manufacturing-based technological outputs are increasingly central to modern growth processes. Similar conclusions are reported by (Magoutas et al., 2024) and (Metin Gürler, 2023), who emphasize that digitally intensive services and ICT capabilities play a crucial role in sustaining growth in digitally mature economies. The European subsample results are also consistent with (Bocean & Vărzaru, 2023), who show that digital transformation strengthens economic performance in the European Union through advanced digital skills and infrastructure.

In contrast, high-technology exports display a negative and statistically significant association with economic growth in the full sample and in Asian economies. While this result appears to diverge from traditional growth theories that emphasize high-tech manufacturing as a growth engine, it is consistent with emerging empirical evidence suggesting that high-technology exports may generate limited domestic value added in countries with weak innovation ecosystems. In such contexts, high-tech production often relies heavily on imported intermediate inputs, leading to lower spillovers and higher adjustment costs (OECD., 2024). This interpretation is further supported by (Houngbonon et al., 2025), who argue that without deep integration into domestic innovation systems, technology-intensive exports may fail to translate into broad-based economic development. The contrast with findings from China (Lin & Xu, 2025) underscores the importance of domestic absorptive capacity and institutional readiness in shaping the growth impact of advanced technologies.

The regional analysis reveals pronounced heterogeneity in the digital transformation growth nexus. In Asian economies, internet penetration, ICT exports, and access to electricity emerge as the most influential growth drivers, reflecting the critical role of foundational digital and physical infrastructure during earlier stages of structural transformation. This result closely aligns with evidence from ASEAN and developing Asian countries, where improvements in digital infrastructure significantly accelerate economic growth (Damayanti et al., 2023; Dwi Rahmayani et al., 2025; Rizal & Hidayatullah, 2024). The negative and significant effect of trade openness in Asia may indicate exposure to asymmetric global

competition or specialization in low-value-added segments of global trade, limiting the growth benefits of openness (Metin Gürler, 2023).

In European economies, by contrast, the weaker and statistically insignificant coefficients for internet usage and mobile penetration likely reflect digital saturation effects, where marginal gains from additional connectivity are smaller. Instead, growth benefits increasingly depend on the sophistication of digital services and export structures, as reflected in the strong performance of ICT-related exports. This finding supports the view that the growth impact of digitalization becomes more quality-driven rather than quantity-driven at advanced stages of development (Pakhnenko et al., 2025; Regasse & Karfa, 2025).

Finally, the robustness checks using Driscoll–Kraay standard errors confirm that the main results are stable and not driven by heteroscedasticity, autocorrelation, or cross-sectional dependence. This strengthens confidence in the conclusion that digital transformation exerts a meaningful and region-specific influence on economic growth, mediated by structural conditions, export composition, and digital maturity levels.

3.3 Linkage to Research Objectives

This study examined the effect of digital transformation on economic growth and determined whether this relationship differs between Asian and European economies. The empirical findings clearly support both objectives. Digital transformation exerts a statistically significant influence on GDP per capita, although the magnitude and direction of its effects vary across regions and digital dimensions.

In Asian economies, basic digital connectivity and ICT service activities emerge as key growth drivers. In contrast, European economies benefit more from advanced ICT-related exports. The negative association between high-technology exports and economic growth further underscores the importance of structural conditions and domestic absorptive capacity in shaping the digitalization growth relationship. These findings confirm that the growth effects of digital transformation are context dependent rather than uniform across regions.

4. Conclusion

This study analyzes the impact of digital transformation on economic growth using panel data from selected Asian and European countries. The results indicate that digital development plays a significant role in enhancing economic performance, particularly through internet penetration, mobile connectivity, and ICT service exports.

However, the effects of digitalization on growth are not homogeneous. Asian economies benefit primarily from the expansion of foundational digital infrastructure, while European economies derive stronger gains from advanced ICT services. The negative relationship between high-technology exports and growth underscores the importance of structural preparedness, domestic value-added capacity, and technological integration in shaping economic outcomes.

By providing a comparative regional perspective, this study contributes new empirical evidence to the digitalization growth literature. The findings emphasize the need for context-specific digital strategies that reflect differences in economic structure and digital maturity.

Despite these contributions, the analysis is subject to limitations related to data availability and variable coverage. Future research may extend this framework by incorporating broader digital indicators, institutional dimensions, and longer time horizons to clarify further the mechanisms through which digital transformation influences economic growth.

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