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Elevating regional competitiveness: How tourism and ICT development shape Indonesian provinces

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Abstract

This study examines the influence of tourism development and Information and Communication Technology (ICT) on regional competitiveness across Indonesian provinces. Using cross-sectional data from all provinces in 2022, the research employs multiple regression analysis with comprehensive classical assumption testing to assess these relationships. Data was sourced from three national institutions: the Regional Competitiveness Index from BRIN, tourism development data from the Ministry of Tourism and Creative Economy, and ICT development data from Central Bureau of Statistics. The analysis reveals significant positive relationships between both predictors and regional competitiveness, with tourism development emerging as the stronger predictor. The findings demonstrate that provinces investing in tourism development and ICT infrastructure gain substantial competitive advantages. These results provide important implications for policymakers, suggesting that an integrated approach incorporating both tourism and ICT development initiatives might yield optimal results for enhancing regional competitiveness. The study contributes to the understanding of regional development dynamics in developing economies, particularly in the Indonesian context, offering valuable insights for policy formulation and strategic planning in regional development.

Keywords: Tourism Development, ICT, Regional Competitiveness

Abstrak

Penelitian ini mengkaji pengaruh pengembangan pariwisata dan Teknologi Informasi dan Komunikasi (TIK) terhadap daya saing daerah di provinsi-provinsi Indonesia. Menggunakan data cross-sectional dari seluruh provinsi pada tahun 2022, penelitian ini menerapkan analisis regresi berganda dengan pengujian asumsi klasik yang komprehensif untuk menilai hubungan tersebut. Data bersumber dari tiga lembaga nasional: Indeks Daya Saing Daerah dari BRIN, data pengembangan pariwisata dari Kementerian Pariwisata dan Ekonomi Kreatif, dan data pengembangan TIK dari Badan Pusat Statistik. Hasil analisis menunjukkan bahwa kedua prediktor memiliki hubungan positif yang signifikan dengan daya saing daerah, dimana pengembangan pariwisata muncul sebagai prediktor yang lebih kuat. Temuan ini menunjukkan bahwa provinsi yang berinvestasi dalam pengembangan pariwisata dan infrastruktur TIK memperoleh keunggulan kompetitif yang substansial. Hasil ini memberikan implikasi penting bagi pembuat kebijakan, menunjukkan bahwa pendekatan terpadu yang menggabungkan inisiatif pengembangan pariwisata dan TIK dapat menghasilkan hasil optimal untuk meningkatkan daya saing daerah. Studi ini berkontribusi pada pemahaman dinamika pembangunan daerah di negara berkembang, khususnya dalam konteks Indonesia, memberikan wawasan berharga untuk perumusan kebijakan dan perencanaan strategis dalam pembangunan daerah.

Kata kunci: Pengembangan Pariwisata, TIK, Daya Saing Daerah

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1. Introduction

Regional competitiveness encompasses a multifaceted framework of economic, social, and technological capabilities that determine a region's capacity to generate sustainable growth and prosperity in an increasingly interconnected global economy. According to Smith et al. (2020), regional competitiveness can be defined as the capacity of a region to create, maintain, and enhance a competitive economic environment that enables businesses to thrive, attracts investments, and sustains high living standards for its inhabitants through the effective utilization of available resources and capabilities.

Recent studies by Stranieri et al. (2024) highlight that regional competitiveness is significantly influenced by the strategic use of geographical indications, which serve as valuable assets for fostering economic growth and differentiation. Meanwhile, the role of innovation remains complex and context-dependent, requiring further exploration to fully understand its impact on local systems and industries. Kovshov et al. (2024) further suggest that regional competitiveness reflects a region's ability to foster economic growth, attract resources, and improve living standards through effective utilization of its unique strengths and strategic advantages.

Strategic resource utilization, innovation, and effective economic policies play vital roles in fostering competitiveness, attracting investment, and driving regional development (He et al., 2024). Robertson et al. (2020) demonstrate that economic growth and regional competitiveness are dynamically linked through entrepreneurial ecosystems, where innovative activities and entrepreneurial development serve as catalysts for enhancing regional economic performance and competitive advantage.

Research by Borsekova et al. (2021) emphasizes that socio-economic cohesion and institutional development significantly shape regional competitiveness, with capital cities demonstrating stronger performance and requiring targeted policies to address persistent disparities across different territories. Patelli et al. (2023) note that research capabilities and innovation dynamics across territories shape regional competitiveness, revealing development gaps between advanced and emerging areas while emphasizing the importance of strategic resource allocation for balanced growth.

Zhu et al. (2024) find that the sustainable development of industries is shaped by factors such as related and supporting industries, resource endowment, and market demand, with certain regions consistently leading in competitiveness while others show steady improvement over time. Priambodo (2023) conceptualizes regional competitiveness as a region's capacity to generate sustainable economic growth and maintain high living standards through effective resource utilization, policy implementation, and institutional frameworks, ultimately influencing key economic indicators such as employment rates and overall economic development at the local administrative level. Supporting this view, Pizzuto (2020) demonstrates that regional competitiveness serves as a crucial determinant of a region's ability to withstand economic shocks, as evidenced by its significant influence on employment resilience during crisis periods.

In examining specific factors that drive regional competitiveness, Information and Communications Technology (ICT) has emerged as a critical element. Chen and Majeed (2024) argue that ICT plays a vital role in enhancing regional competitiveness by driving innovation, economic growth, and sustainability across diverse regions. This perspective is reinforced by Adams et al. (2024), who demonstrate that ICT and digital technologies enhance regional competitiveness by driving trade integration and economic collaboration through institutional frameworks like free trade agreements.

Ozkaya and Erdin (2020) position ICT infrastructure and capabilities as fundamental components of smart city development, contributing significantly to regional competitiveness by enabling efficient urban management and enhancing a city's ability to compete globally alongside other critical dimensions such as transportation and quality of life. Li et al. (2024) observe that regional competitiveness is influenced by the uneven development of the digital economy, with stronger performance in areas with advanced infrastructure and innovation, while disparities persist, as seen in the westward decreasing trend and low-low agglomeration patterns.

Camagni et al. (2022) expand the measurement of regional competitiveness beyond traditional labor productivity metrics to encompass technological advancement, sectoral shifts, product innovation, and market dynamics, revealing diverse competitive strategies across regions. Alam et al. (2018) demonstrate that regional competitiveness is enhanced through strategic digital transformation initiatives, where effective digital connectivity and technological adaptation serve as key drivers for socio-economic progress and competitive advantage.

The relationship between ICT and regional competitiveness extends to spatial differences as well. Stamopoulos et al. (2025) find that ICT specialization and digital technology adoption drive regional competitiveness by influencing economic performance and highlighting disparities between metropolitan and rural areas. Wang et al. (2025) further note that regional competitiveness is shaped by ICT policy adoption behaviors, which influence digital divides and foster spatial-temporal disparities in digital development.

Kacani and Shaqiri (2024) observe that ICT investments and technology spillovers drive regional competitiveness by fostering knowledge-based clusters and enhancing local absorptive capacity. Priambodo et al. (2024) find that the GRDP of the information and communication sector serves as a crucial mediator in the relationship between ICT factors and regional taxes and levies. Additional perspectives from Shi (2023) suggest that regional ICT development boosts regional competitiveness by fostering innovation, bridging the digital divide, and enhancing workforce adaptability.

The broader impact of ICT on society has been documented by Suharno et al. (2022), who note that the progress of ICT has profoundly influenced the development of civilization. More specific analyses by Sergio et al. (2023) demonstrate that ICT agglomeration enhances regional competitiveness by driving high-tech innovation, fostering inter-sectoral spillovers, and promoting inter-regional knowledge diffusion.

Wu et al. (2023) further emphasize that ICT capability enhances regional competitiveness by driving the development of strategic emerging technologies and enabling breakthroughs in technological transformation.

Beyond ICT, tourism has emerged as another key factor influencing regional competitiveness. Armis and Kanegae (2021) demonstrate that tourism attributes and experiences, ranging from heritage sites to recreational facilities and culinary offerings, play a vital role in shaping regional competitiveness by influencing a destination's overall performance and market position. Priambodo et al. (2022) characterize tourism as a global cultural phenomenon with an inextricable impact on socioeconomic activity that is now recognized as a key factor in promoting economic development.

Li et al. (2024) find that tourism enhances regional competitiveness by leveraging local resources, cultural appeal, and sustainable development strategies to attract visitors and stimulate economic growth. This perspective is reinforced by Lopes and Estevão (2024), who demonstrate that tourism plays a critical role in enhancing regional competitiveness by leveraging enabling environment factors, such as ICT readiness, labor market quality, and safety, to drive sustainable growth and innovation.

Wang et al. (2025) position tourism as playing a pivotal role in enhancing regional competitiveness by driving economic growth, fostering innovation, and promoting the sustainable development of local industries and infrastructure. Shan et al. (2024) provide empirical evidence that tourism significantly contributes to regional competitiveness by boosting economic development, fostering financial inclusion, and enhancing productivity-driven growth.

The impact of tourism on regional competitiveness extends to cross-border contexts as well. Novotný (2025) demonstrates that cross-border tourism enhances regional competitiveness by leveraging unique cultural heritage, fostering cross-border integration, and driving socio-economic growth in peripheral rural areas. Mendieta-Aragón et al. (2025) observe that the use of digital sharing economy platforms in tourism fosters regional competitiveness by promoting collaborative tourism, identifying spatial inequalities, and enhancing interregional coordination to ensure balanced growth across regions.

Tan et al. (2024) find that regional tourism competitiveness is influenced by factors such as technological efficiency, transportation accessibility, and economic openness, which shape the productivity networks and spillover effects between regions. Tesfa and Zewdie (2023) highlight that geo-tourism can play a significant role in boosting regional tourism by leveraging unique geological and geomorphic features, fostering local economic development and regional tourism growth.

Makkonen and Williams (2024) position tourism as playing a crucial role in enhancing cross-border interaction and knowledge flows, which are key drivers of regional innovation, yet its potential to facilitate cross-border regional integration remains underexplored. Curtale et al. (2023) document that the COVID-19 pandemic significantly impacted regional tourism demand, revealing substantial variations across

urban and rural destinations, with urban areas and foreign-dependent regions experiencing higher losses, while domestic and proximity-based destinations with natural assets fared better.

This study aims to analyze the dual impact of tourism development and ICT implementation on regional competitiveness across Indonesian provinces. While the literature identifies numerous factors that could influence regional competitiveness, our research specifically focuses on these two key predictors based on their prominence in previous studies and their particular relevance to Indonesia's development context. This focus aligns with our regression model, which examines how tourism development (TD) and ICT capabilities (ICT) directly influence regional competitiveness (RC).

Our research tackles the pressing challenge of uneven regional development in Indonesia, where provinces show varying levels of competitive advantage despite similar resource endowments. This disparity is not merely an assertion but is based on empirical evidence from official Indonesian government data and previous research findings. We specifically examine how tourism and ICT capabilities contribute to these differences in competitive positioning.

Previous studies have examined regional competitiveness through various lenses, including innovation systems (Robertson et al., 2020), digital transformation (Alam et al., 2018), and tourism development (Armis & Kanegae, 2021). Our research uniquely combines these perspectives to provide a comprehensive understanding of their joint influence on regional competitiveness. We focus specifically on tourism development and ICT implementation as the two key predictors in our research model, which allows for a targeted analysis of their combined effect on regional competitiveness as expressed in our regression equation.

The novelty of our study lies in its integrated approach to analyzing both tourism and ICT factors simultaneously, moving beyond the traditional single-factor analyses that dominate existing literature. Furthermore, our focus on Indonesia's diverse provincial landscape provides valuable insights for other developing economies with similar geographical and economic characteristics.

Our research contributes significantly to the academic discourse by employing a robust quantitative methodology to examine cross-sectional data from all 34 Indonesian provinces. This approach offers empirical evidence of the relationship between tourism development, ICT implementation, and regional competitiveness that has been previously unexplored in this specific context.

The significance of our study is further enhanced by its practical implications for policymakers, providing evidence-based insights for regional development strategies. Our methodological rigor in employing multiple regression analysis with comprehensive classical assumption testing strengthens the validity of our findings and contributes to the growing body of literature on regional competitiveness in emerging economies.

2. Research Method

This study adopts a quantitative approach using cross-sectional data collected from all 34 provinces in Indonesia for the year 2022 to explore the effects of tourism development (TD) and Information and Communication Technology (ICT) on regional competitiveness (RC). The data were sourced from three reputable national institutions: the Regional Competitiveness Index (RCI) from the National Research and Innovation Agency (Badan Riset dan Inovasi Nasional/BRIN), tourism development statistics from the Ministry of Tourism and Creative Economy, and ICT development data from the Central Bureau of Statistics (Badan Pusat Statistik/BPS). These datasets were chosen for their reliability and comprehensive coverage of the variables examined. The analysis was conducted using the Statistical Package for the Social Sciences (SPSS) software, with multiple regression analysis as the core method to assess the relationships between the independent variables (TD and ICT) and the dependent variable (RC). The regression model is specified as:

$$RC = \beta_0 + \beta_1 TD + \beta_2 ICT + \varepsilon$$

Where RC denotes regional competitiveness, β_0 is the constant term, β_1 and β_2 are regression coefficients for TD and ICT, TD represents tourism development, ICT represents Information and Communication Technology, and ε is the error term.

To validate the regression model, classical assumption tests were performed. Normality was assessed using the Kolmogorov-Smirnov (K-S) test with Lilliefors correction and the Shapiro-Wilk test, prioritizing K-S due to its suitability for the sample size (n = 34). A significance level of α = 0.05 was used, with a p-value greater than 0.05 indicating normal distribution. Multicollinearity was evaluated through Tolerance and Variance Inflation Factor (VIF) statistics, with thresholds of Tolerance > 0.10 and VIF < 10.0 confirming the independence of TD and ICT. Homoscedasticity was checked via a scatterplot of standardized predicted values against standardized residuals, where a random dispersion of points indicates constant variance. Linearity between ICT and RC was tested using an ANOVA approach, with a significant linearity p-value ($p < 0.05$) and non-significant deviation from linearity ($p > 0.05$) validating the linear model.

Following these tests, multiple regression analysis was conducted. The significance of individual predictors was assessed using t-tests, and the overall model fit was evaluated with an F-test, both at α = 0.05. The coefficient of determination (R^2) and adjusted R^2 measured the variance in RC explained by TD and ICT, with the standard error of the estimate indicating prediction accuracy. The sample size of 34 provinces ensures sufficient statistical power, reflecting Indonesia's provincial diversity, and all analyses were performed in SPSS for robustness and reproducibility.

3. Results and Discussion

3.1. Results

The normality assumption was tested using the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests. The K-S test yielded a p-value of 0.154 (> 0.05), indicating

normality, while the Shapiro-Wilk test showed a p-value of 0.016 (< 0.05). Given the suitability of the K-S test with Lilliefors correction for the sample size (n = 34), and the robustness of regression analysis to mild normality violations in moderate samples, the normality assumption was accepted.

Table 1. Normality test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
RC	0.130	34	0.154	0.920	34	0.016

a. Lilliefors Significance Correction

Table 2. Multicolinearity test

Model	Collinearity Statistics	
	Tolerance	VIF
TD	0.564	1.774
ICT	0.564	1.774

a. Dependent Variable: RC

The multicollinearity test results indicate no serious issues, with both Tourism Development (TD) and Information and Communication Technology (ICT) showing identical Tolerance values of 0.564 and Variance Inflation Factor (VIF) values of 1.774. These values, well within the acceptable thresholds (Tolerance > 0.10 and VIF < 10.0), confirm the independence of the variables, ensuring reliable estimation of their effects on regional competitiveness (RC).

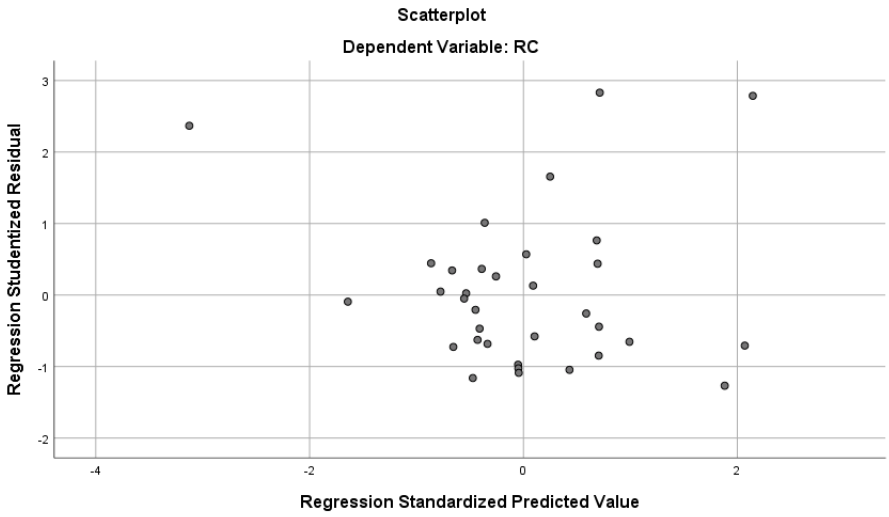

Figure 1. Heteroscedasticity Test

Figure 1 presents a scatterplot illustrating the relationship between regression standardized predicted values (x-axis) and regression standardized residuals (y-axis) for the Regional Competitiveness (RC) model. The plot shows a random dispersion of points, ranging from approximately -2.0 to 2.0 on the predicted value axis and -2.0 to 3.0 on the residual axis, with no discernible systematic pattern, funneling, or clustering. This random distribution confirms homoscedasticity, indicating that the variance of error terms remains constant across different levels of predicted values, satisfying the assumption for reliable regression analysis.

Table 4. Linearity test

			Sum of Squares	df	F	Sig.
RC * ICT	Between Groups	(Combined)	1.458	31	17.340	0.056
		Linearity	0.791	1	291.586	0.003
		Deviation from Linearity	0.667	30	8.198	0.114

Table 4 presents the linearity test between Regional Competitiveness (RC) and Information and Communication Technology (ICT) using ANOVA. The analysis shows a significant linear relationship (F = 291.586, p = 0.003) and a non-significant deviation from linearity (F = 8.198, p = 0.114), confirming that the linear regression model is appropriate for this study.

Table 5. F test

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.832[a]	0.691	0.672	0.12068

a. Predictors: (Constant), ICT, TD

b. Dependent Variable: RC

Table 5 presents the model fit statistics for the regression analysis predicting Regional Competitiveness (RC) using Tourism Development (TD) and Information and Communication Technology (ICT). The model shows a strong correlation (R = 0.832) and explains 69.1% of the variance in RC (R^2 = 0.691), with an adjusted R^2 of 0.672 after accounting for predictors. The standard error of the estimate (0.12068) indicates good prediction precision, confirming the model's substantial explanatory power.

Table 6. T test

Model	Coefficients	Std. Error	t	Sig.
(Constant)	1.402	0.282	4.980	0.000
TD	0.888	0.228	3.895	0.000
ICT	0.620	0.210	2.959	0.006

a. Dependent Variable: RC

Table 6 presents the regression coefficients from the multiple regression analysis examining the effects of Tourism Development (TD) and Information and Communication Technology (ICT) on Regional Competitiveness (RC). The constant is 1.402 ($p < 0.001$), with TD showing a significant positive effect ($\beta = 0.888$, $p < 0.001$) and ICT also significant ($\beta = 0.620$, $p = 0.006$). The standardized coefficients ($\beta = 0.518$ for TD, $\beta = 0.393$ for ICT) and low standard errors (0.228 and 0.210) confirm their substantial roles in explaining RC.

3.2. Discussion

Tourism Development and Regional Competitiveness

The findings of this study highlight that tourism development significantly enhances regional competitiveness across Indonesian provinces, emerging as the stronger predictor compared to ICT. This result aligns with previous empirical research by Armis and Kanegae (2021), who found that tourism attributes, such as heritage sites and

recreational facilities, play a vital role in shaping regional competitiveness by improving a destination's market position. In the context of Indonesian provinces, tourism development likely drives economic diversification by creating new market opportunities, stimulating growth in related sectors like hospitality and transportation, and attracting investments that bolster regional economic activity.

Moreover, the positive influence of tourism development on regional competitiveness resonates with the findings of Li et al. (2024), who demonstrated that tourism enhances competitiveness by leveraging local resources and cultural appeal to stimulate economic growth. This study supports their observation, as provinces with more developed tourism sectors tend to benefit from improved infrastructure and service quality, which are critical for competitive advantage. Similarly, Lopes and Estevão (2024) noted that tourism contributes to regional competitiveness by leveraging enabling environmental factors like labor market quality and safety, a mechanism likely at play in Indonesian provinces where tourism initiatives often lead to broader socio-economic improvements.

The results also echo the perspective of Shan et al. (2024), who provided evidence that tourism boosts regional competitiveness by fostering economic development and productivity-driven growth. In this study, the emphasis on tourism development as a key driver suggests that Indonesian provinces can achieve substantial competitive gains by prioritizing tourism initiatives, particularly those that promote sustainable growth and local resource utilization, as also suggested by Wang et al. (2025).

Tourism Development and Regional Competitiveness

This study also reveals that ICT development positively influences regional competitiveness, though its effect is relatively less pronounced than that of tourism development. This finding is consistent with Chen and Majeed (2024), who argued that ICT enhances regional competitiveness by driving innovation and economic growth. In the Indonesian context, ICT development likely facilitates better business processes and market access, enabling provinces to participate more effectively in the digital economy, a mechanism that aligns with their observations.

The role of ICT in this study also supports the findings of Ozkaya and Erdin (2020), who positioned ICT infrastructure as a fundamental component of smart city development, contributing to regional competitiveness by enabling efficient urban management. For Indonesian provinces, ICT development appears to enhance competitiveness by improving business efficiency and connectivity, particularly in urban centers where digital infrastructure is more advanced. This observation is further reinforced by Stamopoulos et al. (2025), who found that ICT specialization and digital technology adoption drive regional competitiveness, though they also highlighted disparities between metropolitan and rural areas—a pattern that may explain the relatively weaker influence of ICT in less developed Indonesian provinces.

Additionally, the positive impact of ICT aligns with Alam et al. (2018), who demonstrated that regional competitiveness is enhanced through digital transformation initiatives that improve connectivity and technological adaptation. In this study, ICT's

contribution to knowledge dissemination and innovation capacity mirrors their findings, suggesting that provinces with advanced ICT infrastructure are better positioned to foster innovation and adapt to modern economic demands. Similarly, Sergio et al. (2023) noted that ICT agglomeration promotes competitiveness by driving high-tech innovation and inter-regional knowledge diffusion, a dynamic that likely supports the competitive advantage of ICT-developed provinces in Indonesia.

Comparative Insights and Implications

The combined influence of tourism development and ICT on regional competitiveness in this study highlights the complementary roles of traditional economic sectors and modern technological infrastructure, as also implied by the integrated approach of Lopes and Estevão (2024). While tourism development drives immediate economic and infrastructural gains, ICT provides a foundation for long-term innovation and market connectivity, a balance that is crucial for sustainable regional development in Indonesia. Compared to previous studies, this research uniquely underscores the stronger role of tourism in a developing economy context, where resource-based sectors often have a more immediate impact than technology-driven factors, which may require more time and institutional support to fully mature, as noted by Li et al. (2024) regarding digital economy disparities.

4. Conclusion

This research has demonstrated that both tourism development and ICT implementation play significant roles in enhancing regional competitiveness across Indonesian provinces. The results emphasize that tourism development stands out as a more dominant factor, driving economic growth, infrastructure improvements, and market opportunities that directly contribute to a province's competitive edge. Meanwhile, ICT development supports competitiveness by improving business efficiency and fostering innovation, though its impact appears less immediate in certain regions, likely due to disparities in digital infrastructure.

These findings offer valuable insights for policymakers in Indonesia. Prioritizing tourism development can provide quicker gains in regional competitiveness, particularly through investments in local attractions and supporting industries. At the same time, sustained efforts to expand ICT infrastructure are essential to ensure long-term growth, especially in bridging the digital divide between urban and rural areas. A balanced strategy that integrates both tourism and ICT initiatives is likely to yield the best outcomes for sustainable regional development.

Looking ahead, further studies could explore how these two factors interact more deeply, especially across different types of provinces with varying levels of development. Investigating other potential influences, such as local governance or education, might also provide a fuller picture of what drives regional competitiveness in Indonesia. Overall, this study underscores the importance of leveraging both traditional sectors like tourism and modern infrastructure like ICT to strengthen regional economies in a developing country context.

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