

Making a digital and financial leap towards sustainable tourism in Ghana

Alhassan Musah

*Department of Sustainable Development Studies, University for Development Studies,
Tamale, Ghana*

Ibrahim Nandom Yakubu

*Department of Finance, School of Business, University for Development Studies,
Tamale, Ghana, and*

Abdul-Fatawu Shaibu

*Department of Agribusiness Management and Finance,
University for Development Studies, Tamale, Ghana*

Abstract

Purpose – The study investigates the impact of information and communications technology (ICT) and financial development on tourism development in Ghana.

Design/methodology/approach – The researchers employ data covering from 1995Q1 to 2020Q4 and apply the autoregressive distributed lag (ARDL) estimation technique.

Findings – The findings reveal that ICT exerts a positive significant impact on tourism development in both long- and short-term periods. The authors find that financial development has a negative significant effect on tourism development in the long run. However, financial development significantly increases tourism revenue in the short term. The results further reveal a significant positive link between infrastructure development and tourism receipts in the long run.

Originality/value – This study is a pioneering effort to investigate the impact of ICT and financial development on tourism development in Ghana, as far as the researchers are aware. Additionally, the use of an index of ICT adds novelty to the literature. In terms of policy, the findings of this study can inform policymakers on the importance of investing in ICT and financial development to boost the tourism industry in Ghana.

Keywords ICT, Financial development, Tourism, Ghana, ARDL

Paper type Research paper

1. Introduction

Tourism is among the most prominent and expanding sectors in the world economy. The sector contributes significantly to national growth through diverse means including employment creation (Manzoor, Wei, Asif, Haq, & Rehman, 2019). Tourism also increases a country's foreign exchange reserves and fosters infrastructure and human capital development (Fauzel & Seetana, 2023). Inarguably, on a global scale, countries have seen an uptick in the significance of the international tourism industry. The World Travel and Tourism Council estimated that the contribution of travel and tourism to the world GDP in 2017 was \$8,240.74bn which rose to \$8,811bn and \$9,127bn in the years 2018 and 2019 respectively.

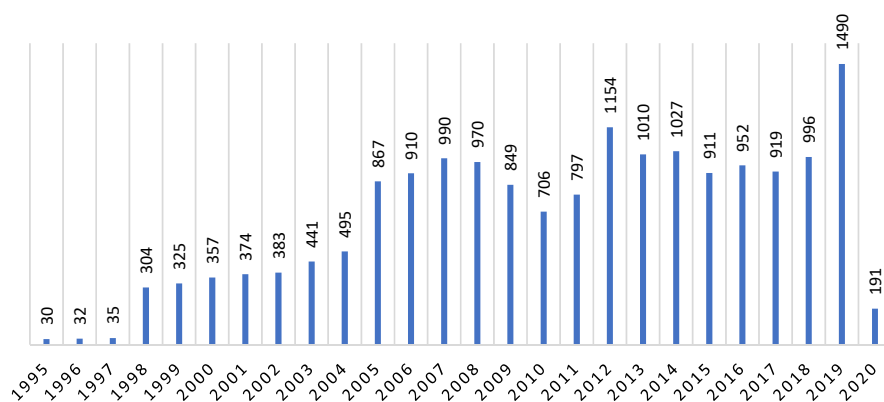


For developing nations, tourism frequently offers the most environmentally friendly means of economic growth while also lowering the degree of poverty (Mo, 2021). Also, given the low cost of travel, emerging and developing economies continue to receive a large number of tourist arrivals. According to Okupe, Ward, and Adeola (2018), Africa plays a significant role in the world tourist business due to its cultural and historical landmarks. The demand for tourism in Africa has improved over the past few decades as a direct result of increased investment in the industry by both the private and public sectors (Adeola & Evans, 2020).

In recent times there has been a growing interest in sustainable tourism, which the World Tourism Organisation defines as tourism that takes account of current and future economic, social and environmental impacts while addressing the needs of visitors, the industry, the environment and host communities (United Nations Environment Programme, 2005). We infer from this definition that the concept of sustainable tourism hinges on the ability of the industry to deliver prosperity to a broad range of actors into the foreseeable future. The United Nations Environment Programme (UNEP) articulates this clearly, arguing that sustainable tourism should deliver viable, long-term economic operations, providing socio-economic opportunities including stable employment and income-earning schemes to all groups thereby contributing to poverty alleviation.

The tourist industry in Ghana has expanded rapidly in recent years and has contributed significantly to the economic growth of the country. There are several distinctive and spectacular tourist sites in Ghana. Given its central location on the globe coupled with a stable political environment, the country is easily accessible and attractive. Travel and tourism contributed to Ghana's GDP to the tune of 3.5bn US dollars in 2018 and 3.8bn US dollars in 2019. The overall revenue from tourism has been increasing in Ghana, as indicated in Figure 1, especially since the year 2004, notwithstanding volatility in some of the years. For example, there was a significant drop in overall receipts in the year 2020 compared to the previous years. In 2019, total receipts amounted to \$1490m, which drastically reduced to \$191m in 2020. Similarly, there was a sharp decline in the number of international tourist arrivals in the year 2020 as shown in Figure 2. Obviously, the reduction in tourism receipts and tourist arrivals in the year 2020 could be attributed to the COVID-19 outbreak, which disrupted travel as a result of the enforcement of several restrictions and protocols by national governments.

Considering the growth potential of tourism in Ghana, there is an urgent need for extensive empirical research to guide policy. In reality, until relatively recently, the majority



Source(s): World Bank (2020)

Figure 1.
International tourism
receipts (million US\$)

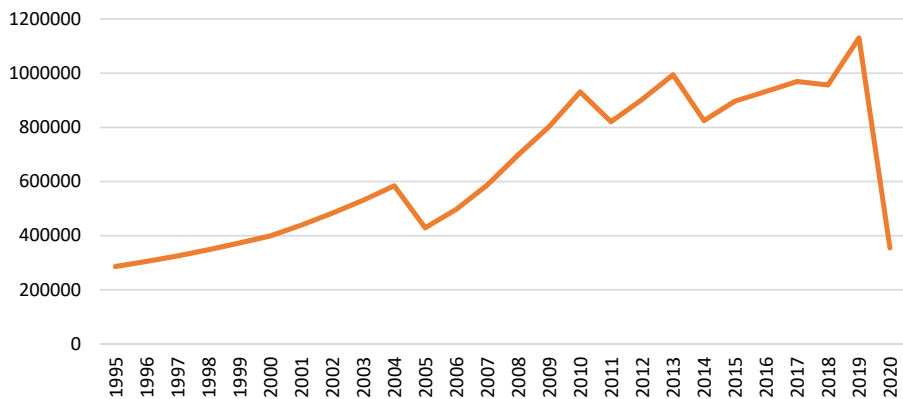


Figure 2.
International tourist
arrivals

Source(s): World Bank (2020)

of empirical research on the drivers of tourism were mostly undertaken in the context of industrialized nations, with an emphasis on its relationships with revenue generation and economic growth (Baumann & Matheson, 2013; Lickorish, 1987; Smith, 2005). Only a few of such studies are conducted in the developing world, particularly Africa and with little focus on the impact of ICT. This study, therefore, adds a dimension to the discussion by analyzing the short and long-term determinants of tourism development in Ghana by examining the role of ICT and financial development.

The tourism literature has uncovered a number of factors that influence tourism development. However, the role that information and communications technology (ICT) plays in boosting tourism has been largely disregarded in empirical studies, despite the fact that ICT applications have dramatically revolutionized the tourism industry in recent years (Zaidan, 2017; Adeola & Evans, 2020). ICT, for instance, makes it easier to promote and sell local tourist services directly to international customers. Thanks to technological advancements, visitors may now exchange information and give feedback on the level of service and the surroundings of tourist destinations (Farkhondehzadeh *et al.*, 2013). Moreover, in response to the increased competition for international tourism, tourism-related organizations have enthusiastically embraced modern ICTs to boost their competitiveness in the tourism market (Abrhám & Wang, 2017; Lee, Chen, Wu, & Xing, 2021).

In essence, ICTs continue to be essential for the tourism industry and offer a wide range of innovative opportunities for tourism growth. Nonetheless, there is currently almost no empirical research exploring the ICT-tourism development nexus in Ghana. As a result, we aim to fill this gap in the literature by empirically investigating whether ICT matters for Ghana's tourism growth.

In addition to ICT, we examine the impact of financial development on tourism development. Tourist decision-making particularly destination choices may be significantly influenced by financial development. From a demand-side perspective, a highly developed financial sector in the host country is likely to stimulate tourism, given that tourists are able to access banking and other financial services while on vacation (Tsauroi, 2018). Financial development also stimulates foreign direct investment (FDI) in the tourism industry, which carries with it several additional benefits including the transfer of cutting-edge technologies and managerial competencies (Fauzel & Seetana, 2023). While many studies have examined the impact of tourism on financial development (such as Cannonier & Burke, 2017; Shahbaz, Benkraiem, Miloudi, & Tiwari, 2019; Yenişehirlioğlu & Bayat, 2019; Musakwa & Odhiambo, 2022; Musakwa, Odhiambo, & Nyasha, 2022), there is comparatively little empirical research

that examines the impact of financial development on tourism to reinforce the relationship between the two (see [Liao et al., 2018](#); [Shahbaz et al., 2019](#); [Fauzel & Seetanah, 2023](#) among others). Therefore, the purpose of the present study is to add to the little literature on the link between financial development and tourism in the context of Ghana. Essentially, we seek to answer the following research question: Do ICT and financial development influence sustainable tourism in Ghana?

Generally, the contribution of this study is twofold. First, per the researchers' knowledge, this study presents an initial attempt to specifically examine the impact of ICT and financial development on tourism development in Ghana. Second, given the dimensions of ICT, we use the principal component analysis to construct an index of ICT based on two key indicators of ICT (individuals using the internet (% of population) and mobile cellular subscriptions per 100 people) which are commonly employed in the literature. With this, the study departs from the use of single indicators to gauge ICT. Besides, by using ICT index, we are able to reduce the high correlation between the variables. Also, by employing the ARDL technique, we examine the long- and short-run impact of ICT and financial development on tourism development in Ghana.

The rest of the work is organized as follows: [Section 2](#) provides a review of the literature. [Section 3](#) outlines the research methodology. [Section 4](#) presents and discusses the empirical results. [Section 5](#) concludes the study while policy recommendations are documented in [Section 6](#).

2. Literature review on the determinants of tourism development

The factors influencing tourism development have been extensively investigated in the literature. For instance, [Jovanoviã and Ivana \(2016\)](#) demonstrated that an increase in investment in infrastructure is a significant factor affecting tourism development in Southeast Europe. The empirical analysis of [Giap, Gopalan, and Ye \(2016\)](#) reported that government expenditures on tourism and infrastructural investment significantly drive tourism growth in Malaysia. [Yashobanta, Parul, and Chowdhury \(2017\)](#) also evidenced that increasing government expenditure on tourism and economic development exert a significant positive effect on tourism receipts in Indian states. In a panel analysis, [Javid and Katircioglu \(2017\)](#) found that globalization (in economic, social and political aspects) has a significant impact on tourism development. In assessing the determinants of international tourism demand in Africa, [Adeola et al. \(2018\)](#) applied the Poisson regression model with data covering the years 1995-2015. The study found that institutional quality factors (political stability and absence of violence), real exchange rate, FDI, trade openness and per capita income are the significant variables influencing tourism demand in Africa. [Vítová, Harmáček, and Opršal \(2019\)](#) reported that economic and infrastructure development, political stability and accessibility to destinations significantly influence tourism inflows in Small Island Developing States. [Wamboye, Nyaronga, and Sergi \(2020\)](#) showed that tourist income level and infrastructure development of the host country are the primary factors that determine the demand for tourism in Tanzania. In a comparative study, [Nyasha and Odhiambo \(2021\)](#) investigated the key drivers of tourism development in South Africa, Brazil and Vietnam using data covering the period 1995-2018. Employing the ARDL technique, the findings generally revealed that while political stability and the disposable income of tourists have a positive impact on tourism development, environmental pollution (measured by carbon dioxide emission) and exchange rate negatively influence tourism. Applying the logistic regression, [Moghal, Mukhopadhyay, Jena, and Joshi \(2021\)](#) noted that tourism development in Jammu and Kashmir is influenced by economic stability, poverty alleviation and income generation. [Ibragimov et al. \(2022\)](#) assessed the economic factors driving tourism in Central Asia with data spanning from 2008 to 2018. The authors established that language

similarities and common borders boost tourism in Central Asia whereas political instability negatively affects tourism flows in the host country. Khan, Alim, Begum, Han, and Mohamed (2022) revealed that the tourism industry in Pakistan is negatively affected by terrorism and inflation levels, while tourism expenditure enhances the growth of tourism. Soudager & Wani (2023) reported that tourist arrivals in India are reduced by geopolitical risk and real exchange rates. The authors also established that an increase in gross domestic product per capita results in higher foreign tourist arrivals, suggesting a positive correlation between income and tourism. Using data covering the period 1996–2018, Aydin (2022) demonstrated that tourism development in Turkey is positively and significantly driven by political stability and renewable energy consumption. Sharma, Mohapatra, and Giri (2023) documented that currency stability and income are crucial factors that induce tourism in India. Noonan (2023) investigated how cultural amenities affect tourism demand in various European cities. The study results showed that cultural amenities such as landmarks, sights, museums, concerts and shows have a positive impact on tourism demand in the selected cities.

For the impact of ICT on tourism, Adeola and Evans (2020) found that ICT has a significant positive effect on tourism development in Africa. Shehzad *et al.* (2019) revealed that the emergence of ICT has a significant effect on tourism development in China. Employing different panel estimation methods, Tsauroi and Chimbo (2019) established that ICT significantly enhances tourism development in some selected emerging economies. Kumar and Kumar (2020) documented that ICT positively drives tourism demand in some selected major tourist destinations. Applying the second-generation techniques, Bano, Liu and Khan (2022) reported that tourism in the BRICS economies is motivated by ICT.

Despite the fact that some related studies, including those by Liao *et al.* (2018), Katircioglu, Katircioglu, and Altinay (2018), Shahbaz *et al.* (2019), Goh, Koh, Lee, Gan, and Lee (2020), Fauzel & Seetanah (2023), attempted to shed more light on the relationship between financial development and tourism in Asia and a few European countries with mixed results, we believe that the relationship between the two is still relatively new and under-investigated. While the majority of these studies revealed a strong positive correlation between financial development and tourism, few found a negative correlation. By including ICT in our model with a special indicator of the population's access to the internet and mobile cellular subscriptions as a composite variable, and further examining both the short- and long-term impacts, we offer a new dimension to the issue.

3. Methodology

3.1 Data

The study employed quarterly data covering from 1995 to 2020. Quarterly data is measured and recorded every three months, or four times a year, and it provides a more detailed view of the underlying patterns in the data compared to annual data. It is important to note that the study focuses on Ghana, utilizing country-level data. This implies that the analysis and findings of the study are based on a representative dataset from the entire country.

The authors collected the data from the World Bank. In accessing the data, the researchers visited the World Bank's World Development Indicators (WDI) database, which provides users with access to a vast array of datasets covering different countries, regions and thematic areas. The researchers navigated through the available datasets and selected the required variables for the study. The data was downloaded into Excel for cleaning and further analysis. In cleaning the data, the authors ensured that it was in a consistent format and thoroughly checked for any inaccuracies or inconsistencies, promptly correcting any errors that were found. This rigorous data cleaning process aimed to maintain the integrity and accuracy of the dataset, ensuring its suitability for analysis.

3.2 Description of variables

The dependent variable is tourism development measured by international tourist arrivals (TARR) and international tourism receipts (TREC) in US dollars. The independent variables of interest are ICT and financial development which are estimated alongside economic growth and infrastructural development as additional variables. In measuring ICT, we use the principal component analysis (PCA) to construct an ICT index based on two key dimensions of ICT. The sub-indices include individuals using the internet (% of population) and mobile cellular subscriptions (per 100 people). Financial development is gauged by domestic credit provided by the financial sector (% of GDP). The study controls for the effect of economic growth and infrastructure development on tourism development. Economic growth is measured by GDP growth in annual percentage (Bunyaminu & Yakubu, 2022). In line with Adeola and Evans (2020), we use gross fixed capital formation (% of GDP) as a proxy for infrastructure development.

3.3 Model specification

To examine the impact of ICT and financial development on tourism development, the basic empirical model is specified as:

$$\text{TOUR}_t = \alpha_0 + \beta_1 \text{ICT}_t + \beta_2 \text{FIND}_t + \beta_3 \text{ECG}_t + \beta_4 \text{INFR}_t + \varepsilon_t \quad (1)$$

From equation (1), the abbreviations TOUR, ICT, FIND, ECG and INFR are tourism development, information communications and technology, financial development, economic growth and infrastructure development respectively. The error term is denoted by ε and t is the time period. The intercept is represented by α , and β_1 to β_4 are the coefficients of the regressors.

Based on the measures of tourism (TOUR), equation (1) is restated as follows:

$$\text{TARR}_t = \alpha_0 + \beta_1 \text{ICT}_t + \beta_2 \text{FIND}_t + \beta_3 \text{ECG}_t + \beta_4 \text{INFR}_t + \varepsilon_t \quad (2)$$

$$\text{TREC}_t = \alpha_0 + \beta_1 \text{ICT}_t + \beta_2 \text{FIND}_t + \beta_3 \text{ECG}_t + \beta_4 \text{INFR}_t + \varepsilon_t \quad (3)$$

where TARR and TREC are international tourist arrivals and international tourism receipts respectively.

3.4 Analytical approach

In time series analysis, various techniques are utilized, including the ordinary least squares (OLS), fully modified OLS (FMOLS), autoregressive distributed lag (ARDL), vector autoregression and others. In this study, we aim to investigate the short- and long-run effects of ICT and financial development on tourism development. For this purpose, we employ the ARDL model. Compared to other techniques such as OLS and FMOLS, the ARDL method is considered a better technique for a number of reasons. For instance, the ARDL is appropriate for studies with small samples (Yakubu, 2020). The technique is robust to the issue of endogeneity and can be used for both I(0) and I(1) variables, making it more flexible and applicable to a wider range of datasets. Several previous studies (see Aydin, 2022; Khan *et al.*, 2022; Soudager & Wani, 2023; Sharma *et al.*, 2023) that explored the determinants of tourism development have utilized the ARDL as an analytical technique.

The ARDL method has several assumptions that must be satisfied to obtain accurate and reliable results. These assumptions include the requirement that the variables used in the model should be stationary, or the non-stationarity should be removed through differencing. In addition, there should be no serial correlation or heteroscedasticity, meaning that the residuals of the model should not be correlated with each other and the variance of the residuals should be constant across all observations.

Prior to the ARDL estimation, we assess the level of integration of the variables by using the Phillips–Perron (PP) unit root test which is consistent with the studies by [Amaefula \(2021\)](#), [Firat \(2016\)](#), [Yakubu, Abokor, and Gedik Balay \(2021\)](#). To apply the ARDL technique, the variables are required to be integrated at level $I(0)$ or first difference $I(1)$. In order to estimate the short-run and long-run effect of our variables, the ARDL model is specified as follows:

$$\begin{aligned}
 TOUR_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta TOUR_{t-1} + \sum_{i=0}^n \alpha_{2i} \Delta ICT_{t-1} + \sum_{i=0}^n \alpha_{3i} \Delta FIND_{t-1} \\
 & + \sum_{i=0}^n \alpha_{4i} \Delta ECG_{t-1} + \sum_{i=0}^n \alpha_{5i} \Delta INFR_{t-1} + \delta_1 TOUR_{t-1} + \delta_2 ICT_{t-1} \\
 & + \delta_3 FIND_{t-1} + \delta_4 ECG_{t-1} + \delta_5 INFR_{t-1} + \rho ECT_{t-1} + \varepsilon_t
 \end{aligned}
 \tag{4}$$

where Δ is the difference operator. $\alpha_1 - \alpha_5$ and $\delta_1 - \delta_5$ are short-run and long-run coefficients respectively. The coefficient of the error correction term (ECT) is represented by ρ and ECT_{t-1} is the error correction term lagged by one period.

In analyzing the long-term relationship between the variables, the authors employ bound testing. The null hypothesis, which states that there is no long-run relationship between the variables, is tested against the alternative hypothesis of cointegration as follows:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0 \tag{5}$$

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 = 0 \tag{6}$$

The upper and lower bounds critical limits are used to test for the presence of cointegration. A long-run relationship is established when the estimated F -statistic exceeds the upper critical bound $I(1)$.

4. Empirical results

4.1 Descriptive statistics

In [Table 1](#), we present the descriptive statistics of the variables. On average, international tourist arrivals are estimated at 646,226 with a minimum of 286,000 and a maximum of 1,130,307 tourists for the study period. The mean value of tourism receipts is 673.654 million US dollars and it ranged from 30 million US dollars to 1,490 million US dollars. The number of individuals using the internet (as a percentage of the total population) is approximately 13 while those with mobile cellular subscriptions (per 100 people) is approximately 56. Financial development gauged by domestic credit by the financial sector has an average value of 12.677%. The mean of economic growth is 5.531% with a maximum growth rate of 14.047%. Whereas international tourist arrivals, internet users, mobile cellular subscriptions, and

	TARR	TREC	INUSE	MOBS	FIND	ECG	INFR
Mean	646226.2	673.654	12.564	55.970	12.677	5.531	21.002
Minimum	286000	30	0.0003	0.036	5.074	0.414	11.764
Maximum	1130307	1490	58	137.517	15.882	14.047	29.002
Standard dev	265043.5	392.267	17.418	55.004	2.902	2.703	4.766
Kurtosis	-1.492	-0.825	1.318	-1.671	1.178	2.939	-0.630
Skewness	0.182	-0.138	1.537	0.327	-1.213	1.170	-0.199

Table 1.
Descriptive statistics

Source(s): Authors' own computation

economic growth are positively skewed, tourism receipts, financial development and infrastructure development (measured by gross fixed capital formation) are skewed to the left.

4.2 Unit root tests

The unit root test results based on the Phillips–Perron (PP) unit root test are reported in Table 2. From the test results, while ICT, financial development and economic growth are stationary at level $I(0)$, all the variables are integrated at order 1 or show stationarity at the first difference $I(1)$. Evidently, our study satisfies the requirements for applying the ARDL model due to the mixed order of integration of the variables.

4.3 Bounds testing for cointegration

Table 3 displays the cointegration test results. We test for the presence of cointegration in two scenarios. First, we consider international tourist arrivals as the dependent variable where ICT, financial development, economic growth and infrastructure development are the explanatory factors. In the second scenario, tourism receipts serve as the dependent variable which is tested together with the explanatory variables. In both cases, the bounds-testing results established a long-run relationship among the variables given that the F -statistics in both scenarios are greater than the upper critical bound value at 1% significance level.

4.4 Regression results

In Table 4, the regression results on the long-run and short-run impact of ICT, financial development and the control variables on tourism development are presented. The estimates

Variables	Phillips–Perron (PP) unit root test	
	Level $I(0)$	First difference $I(1)$
TARR	−1.779	−10.063***
TREC	−2.078	−10.296***
ICT	−7.831***	−11.552***
FIND	−2.744*	−10.109***
ECG	−2.724*	−10.086***
INFR	−2.383	−10.002***

Note(s): * and *** denote stationary at 10% and 1% significance level

Source(s): Authors' own computation

Table 2.
Unit root test results

		Significance		Critical values	
				$I(0)$	$I(1)$
<i>Model 2: TARR = f(ICT, FIND, ECG, INFR)</i>					
F -Statistic	9.115***	10%	2.2	3.09	
k	4	5%	2.56	3.49	
		1%	3.29	4.37	
<i>Model 3: TREC = f(ICT, FIND, ECG, INFR)</i>					
F -Statistic	11.283***	10%	2.2	3.09	
k	4	5%	2.56	3.49	
		1%	3.29	4.37	

Note(s): k represents the number of independent variables and *** denotes 1% significance level

Source(s): Authors' own computation

Table 3.
Bounds test for
cointegration
relationship

Variables	Model 2 Dependent variable: Tourist arrivals (TARR) Model: ARDL(1, 1, 2, 4, 4)	Model 3 Dependent variable: Tourism receipts (TREC) Model: ARDL(1, 1, 3, 4, 4)
<i>Long-run estimates</i>		
ICT	0.152*** (0.000)	0.166*** (0.000)
FIND	-0.011** (0.014)	-0.019*** (0.009)
ECG	-0.024*** (0.000)	0.089*** (0.000)
INFR	-0.018*** (0.000)	0.026*** (0.000)
Constant	6.438*** (0.000)	7.966*** (0.000)
<i>Short-run estimates</i>		
ICT _t	0.119*** (0.000)	0.905*** (0.000)
FIND _{t-1}	-0.002 (0.422)	
FIND _{t-2}		0.115*** (0.000)
ECG _{t-3}	0.003* (0.074)	-0.111*** (0.000)
INFR _{t-3}	0.007*** (0.000)	-0.069*** (0.000)
ECT _{t-1}	-0.399*** (0.000)	-7.212*** (0.000)
R-square	0.584	0.984
Adj. R-square	0.516	0.963
Durbin-watson stat	1.732	2.475
F-Statistic	319.347	16.694
Prob. (F-Statistic)	0.000	0.007

Note(s): *, ** and *** represent 10%, 5% and 1% statistical significance respectively and values in parentheses () are *p*-values

Source(s): Authors' own computation

Table 4.
Regression estimates

show that in both long- and short-term periods, ICT exerts a positive significant impact on tourism development (measured by both international tourists' arrival and tourism receipts). This means that advancement in information and communication technologies in Ghana will lead to significant growth in the country's tourism sector. The implication is that ICT allows tourist locations to improve their online presence, which is essential to remain competitive in the international tourism market by enhancing tourism demand and revenues. Our results sync with the findings of prior research that document a positive link between ICT and tourism growth (Adeola & Evans, 2020; Tsaurai & Chimbo, 2019; Kumar & Kumar, 2020; Bano *et al.*, 2022).

We find that financial development has a negative significant effect on tourism development in the long-run. This shows that the growth of Ghana's financial sector does not influence the decisions that tourists make regarding their travel plans to the country. Our finding refutes the claim that a highly developed financial sector in the host country is likely to stimulate tourism, given that tourists are able to access banking and other financial services while on vacation (Tsaurai, 2018). However, in the short-term financial development significantly increases tourism revenue in Ghana.

As a control variable, economic growth has a significant influence on tourism development in the long-run, though the effect on tourists' arrival is negative. The inverse relationship between economic growth and tourists' arrival contradicts the results of Seetanah (2019) and Fauzel & Seetanah (2023). The short-run results indicate that economic growth significantly motivates tourists' arrival and reduces tourism receipts in Ghana. The results further document that infrastructure development influences tourism receipts positively in the long-run. Nonetheless, the impact on tourists' arrival is inimical. For the short-run results, infrastructure development significantly boosts tourist demand but decreases tourism revenue.

For both Models 2 and 3, the coefficient of the lagged error correction term (ECT_{t-1}) is negative and statistically significant, and it depicts the speed of the adjustment back to the long-run equilibrium after a short-run shock. The F -statistic and its probability value suggest that the regression models are statistically significant in overall, demonstrating that the independent variables in the models are significant factors determining Ghana's tourism development.

4.5 Diagnostic tests results

The diagnostic tests are reported in [Table 5](#). By using the Breusch-Godfrey Serial Correlation LM test, we check for serial correlation in the study. Similarly, the heteroscedasticity test is performed to eliminate heteroscedasticity issues in our analysis. At 5% significance level, the test results indicate that there are no serial correlation and heteroscedasticity issues in the study. Also, the Ramsey RESET test is utilized to check for the presence of omitted variables or incorrect functional forms in the regression model. The test results indicate that there is no functional form misspecification. We further infer that there is normal distribution in the study when Model 3 is employed. We test for the stability of the models using the cumulative sum (CUSUM) and the CUSUM of squares. If the CUSUM plot is within the critical bounds, it indicates that the model is stable with no structural change in the relationship over time. However, if it exceeds the bounds, it suggests an unstable model with a structural break or changes in the relationship between variables. In this study, at 5% significance level, the CUSUM and CUSUM of squares plots in [Figures 3 and 4](#) respectively show that Model 2 is stable given that the CUSUM lines are in the critical boundaries. However, for Model 3, though the CUSUM is stable, the CUSUM of squares is not stable as illustrated in [Figures 5 and 6](#) respectively.

5. Conclusion

This study assesses the impact of ICT and financial development on tourism development in Ghana using data from the World Bank's World Development Indicators for the period 1995Q1-2020Q4. By applying the ARDL estimation technique, the paper examines the short- and long-run effects of ICT and financial development on tourism development. The ARDL estimation shows that ICT exerts a positive significant impact on tourism development in both short- and long-term periods. We find that financial development has a negative significant effect on tourism development in the long run. However, in the short-term, financial development significantly increases tourism revenue, and the impact on tourist arrivals is insignificant. In the long run, economic growth has a significant influence on tourism

Test	F -statistics	Prob
<i>Model 2: TARR = f(ICT, FIND, ECG, INFR)</i>		
Breusch-godfrey serial correlation	0.574	0.566
Heteroscedasticity	1.685	0.073
Ramsey RESET	2.376	0.128
Normality	24.581	0.000
<i>Model 3: TREC = f(ICT, FIND, ECG, INFR)</i>		
Breusch-godfrey serial correlation	0.702	0.587
Heteroscedasticity	0.790	0.678
Ramsey RESET	0.481	0.538
Normality	1.230	0.541

Source(s): Authors' own computation

Table 5.
Diagnostic tests

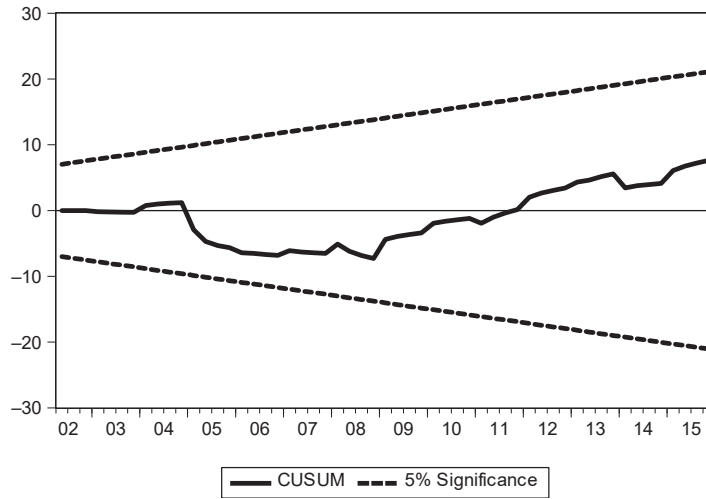


Figure 3.
Plots of CUSUM for
model 2

Source(s): Authors' own computation

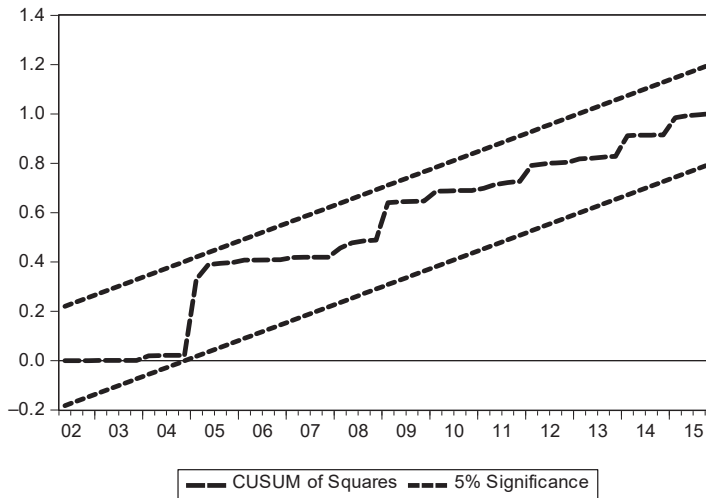


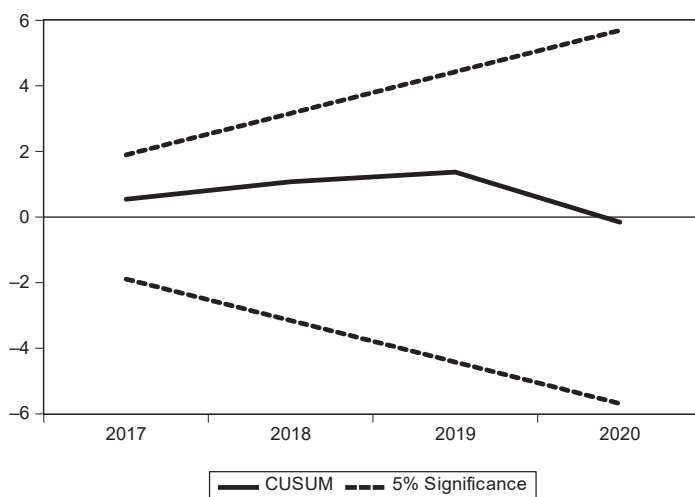
Figure 4.
Plots of CUSUM of
squares for model 2

Source(s): Authors' own computation

development albeit a negative effect on tourists' arrival. The results further reveal that infrastructure development influences tourism receipts positively in the long run. Nonetheless, the impact on tourists' arrival is negative. In the short term, infrastructure development significantly enhances tourist demand but reduces international tourism receipts.

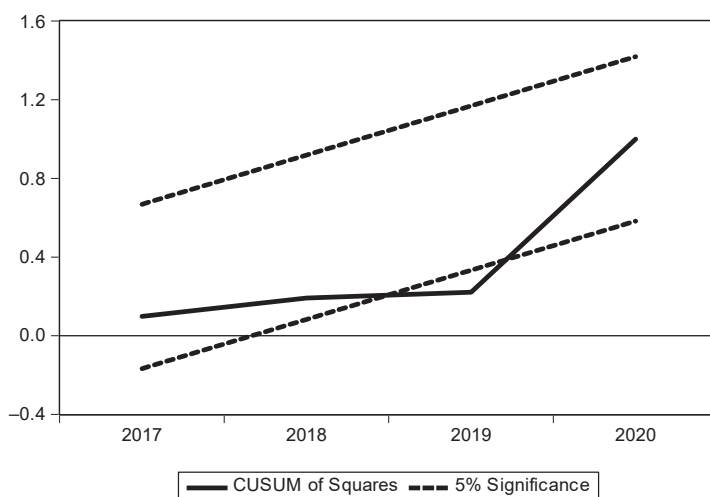
6. Implications for policy and practice

We provide the following major policy recommendations based on our findings that might help make the tourism sector in Ghana and other developing nations, especially in Africa,



Source(s): Authors' own computation

Figure 5.
Plots of CUSUM for
model 3



Source(s): Authors' own computation

Figure 6.
Plots of CUSUM of
squares for model 3

more sustainable: To begin with, ICT should be viewed as crucial to the effective development of tourism in Ghana since it has a positive and significant short- and long-run impact on both tourist arrivals and tourism receipts. Thus, policymakers and key players in the tourism sector should closely monitor ICT trends and advancements to improve operational efficiency, enhance digital marketing strategies and leverage innovative technologies to attract and serve tourists more effectively. This proactive approach to incorporating ICT in tourism can lead to increased revenue and improved overall performance of the sector.

In addition to prioritizing ICT, Ghana should make substantial efforts to integrate well into the global financial market. This integration will enhance the efficiency of banking services provided to residents and foreigners alike. By ensuring accessible and efficient financial services, the country can mitigate the negative long-term impact of financial development on tourism growth. Strengthening financial infrastructure and facilitating international transactions can contribute to a more conducive financial environment for the tourism sector.

Furthermore, building resilient infrastructure that includes park facilities, accommodation options, cultural and arts attractions, transportation networks and interchanges is paramount for attracting tourists and ensuring sustainable tourism growth. With a resilient infrastructure, the country can enhance the overall tourist experience, accommodate larger numbers of visitors and ultimately increase tourism revenue. Likewise, investing in infrastructure not only boosts the tourism sector but also contributes to broader economic development.

While embracing actions that seek to boost tourism, policymakers should also incorporate measures that address environmental concerns to ensure that the benefits accruing from tourism deliver prosperity to all sections of society — current and future generations.

7. Limitations of the study

Although the study carries significance for both literature and policy, there are certain limitations that should be acknowledged. For instance, while this study provides insights into the impact of ICT and financial development on tourism development in Ghana, it is important to note that the findings may not be generalizable to other countries or regions with different economic and tourism development characteristics. Ghana's unique socio-economic and cultural context may limit the transferability of the study's findings to other contexts. Therefore, future studies can enhance the comprehensiveness of the analysis by exploring the impact of ICT and financial development on sustainable tourism development across different country groups or key tourism destinations in Africa. Also, the study only investigated the direct impact of ICT and financial development on tourism, without considering potential moderating variables. Thus, future research should explore the extent to which factors such as institutional quality may moderate the relationship between the variables. This will provide a more comprehensive understanding of the complex interplay between ICT, financial development, institutional quality and tourism development in Ghana. An additional limitation of the study is that it relies solely on the ARDL technique, without using other methods to test the robustness of the findings. To overcome this limitation, future research may consider incorporating other techniques to ensure the accuracy and reliability of the results.

References

- Abrhám, J., & Wang, J. (2017). Novel trends of using ICTS in the modern tourism industry. *Czech Journal of Social Sciences, Business and Economics*, 6(1), 37–43.
- Adeola, O., & Evans, O. (2020). ICT, infrastructure, and tourism development in Africa. *Tourism Economics*, 26(1), 97–114.
- Amaefula, C. G. (2021). A simple integration order test: An alternative to unit root testing. *European Journal of Mathematics and Statistics*, 2(3), 77–85.
- Aydin, M. (2022). The impacts of political stability, renewable energy consumption, and economic growth on tourism in Turkey: New evidence from Fourier Bootstrap ARDL approach. *Renewable Energy*, 190, 467–473.

- Bano, S., Liu, L., & Khan, A. (2022). Dynamic influence of aging, industrial innovations, and ICT on tourism development and renewable energy consumption in BRICS economies. *Renewable Energy*, 192, 431–442.
- Baumann, R. and Matheson, V. (2013). Infrastructure investments and mega-sports events: Comparing the experience of developing and industrialized countries. Working Paper, Holy Cross, Worcester, MA.
- Bunyaminu, A., & Yakubu, I. N. (2022). Green energy demand and financial development: Evidence from Africa. In A. Rafay (Ed.), *Finance for Sustainability in a Turbulent Economy* (pp. 26–48). IGI Global.
- Cannonier, C., & Burke, M. G. (2017). Tourism and financial development in small states: Evidence from Caribbean countries. *Tourism Economics*, 23(6), 1369–1377.
- Farkhondehzadeh, A., Robat Karim, M. R., Roshanfekar, M., Azizi, J., & Legha Hatami, F. (2013). E-Tourism: The role of ICT in tourism industry. *European Online Journal of Natural and Social Sciences*, 2(3(s)), 566–573.
- Fauzel, S., & Seetanah, B. (2023). Does financial development spur tourism growth? A dynamic time series analysis for the case of an SIDS. *Journal of Policy Research in Tourism, Leisure and Events*, 15(1), 52–68.
- Firat, H. (2016). Is real GDP stationary? Evidence from some unit root tests for the advanced economies. *Journal of Social and Economic Statistics*, 5(2), 60–80.
- Giap, T. K., Gopalan, S., & Ye, Y. (2016). Drivers of growth in the travel and tourism industry in Malaysia: A geweke causality analysis. *Economics*, 4(1), 1–15.
- Goh, W. C., Koh, B. S., Lee, W. W., Gan, S. L., & Lee, S. X. E. (2020). *The influence of financial development towards the international tourism in Malaysia*. Malaysia: Doctoral Dissertation, UTAR Institutional Repository.
- Ibragimov, K., Perles-Ribes, J. F., & Ramón-Rodríguez, A. B. (2022). The economic determinants of tourism in central Asia: A gravity model applied approach. *Tourism Economics*, 28(7), 1749–1768.
- Javid, E., & Katircioglu, S. (2017). The globalization indicators-tourism development nexus: A dynamic panel-data analysis. *Asia Pacific Journal of Tourism Research*, 22(11), 1194–1205.
- Jovanoviá, S., & Ivana, I. L. I. Ä. (2016). Infrastructure as important determinant of tourism development in the countries of Southeast Europe. *Ecoforum Journal*, 5(1), 288–294.
- Katircioglu, S., Katircioğlu, S., & Altinay, M. (2018). Interactions between tourism and financial sector development: Evidence from Turkey. *The Service Industries Journal*, 38(9-10), 519–542.
- Khan, N. U., Alim, W., Begum, A., Han, Hand Mohamed, A. (2022). Examining factors that influence the international tourism in Pakistan and its nexus with economic growth: Evidence from ARDL approach. *Sustainability*, 14(15), 1-15.
- Kumar, N., & Kumar, R. R. (2020). Relationship between ICT and international tourism demand: A study of major tourist destinations. *Tourism Economics*, 26(6), 908–925.
- Lee, C. C., Chen, M. P., Wu, W., & Xing, W. (2021). The impacts of ICTs on tourism development: International evidence based on a panel quantile approach. *Information Technology & Tourism*, 23(4), 509–547.
- Liao, K. C., Yue, M. Y., Sun, S. W., Xue, H. B., Liu, W., Tsai, S. B., & Wang, J. T. (2018). An evaluation of coupling coordination between tourism and finance. *Sustainability*, 10(7), 1–23.
- Lickorish, L. (1987). Trends in industrialized countries. *Tourism Management*, 8(2), 92–95.
- Manzoor, F., Wei, L., Asif, M., Haq, M. Z. U., & Rehman, H. U. (2019). The contribution of sustainable tourism to economic growth and employment in Pakistan. *International Journal of Environmental Research and Public Health*, 16(19), 1–14.
- Mo, S. (2021). Tourism dependency of island and developing countries. Available from: <https://globaledge.msu.edu/blog/post/55658/tourism-dependency-of-island-and-develop> (accessed 1 July 2022).

- Moghal, A., Mukhopadhyay, D., Jena, P. K., & Joshi, D. P. (2021). Determinants of tourism development in Jammu and Kashmir: An empirical analysis. *Academy of Marketing Studies Journal*, 25(4), 1–5.
- Musakwa, M. T., & Odhiambo, N. M. (2022). Tourism and financial development in South Africa: A trivariate approach. *Journal of Policy Research in Tourism, Leisure and Events*, 14(2), 148–164.
- Musakwa, M. T., Odhiambo, N. M., & Nyasha, S. (2022). Does tourism influence financial development in Kenya?. *Acta Economica*, 20(36), 155–173.
- Noonan, L. (2023). The role of culture as a determinant of tourism demand: Evidence from European cities. *International Journal of Tourism Cities*, 9(1), 13–34.
- Nyasha, S., & Odhiambo, N. M. (2021). Determinants of tourism development: Empirical evidence from three developing countries. *Economia Internazionale/International Economics*, 74(3), 335–368.
- Okupe, A., Ward, T., & Adeola, O. (2018). Enhancing hospitality and tourism industry competitiveness in Sub-Saharan Africa. *Africa's competitiveness in the global economy* (pp. 137–167). Cham: Palgrave Macmillan.
- Seetanah, B. (2019). Telecommunication and tourism development: An island perspective. *Tourism Review*, 74(4), 815–829.
- Shahbaz, M., Benkraiem, R., Miloudi, A., & Tiwari, A. K. (2019). Tourism-induced financial development in Malaysia: New evidence from the tourism development index. *Tourism Economics*, 25(5), 757–778.
- Sharma, M., Mohapatra, G., & Giri, A. K. (2023). The determinants of inbound tourism demand in India: New evidence from ARDL Co-integration approach. *Business Perspectives and Research*, 1–14.
- Shehzad, K., Liu, X., Rauf, A., Arif, M., Mazhar, S., Sohail, N., & Amin, W. (2019). Revolutionising tourism development in China: An effective role of ICT and Western Silk Road project. *Asia Pacific Journal of Tourism Research*, 24(9), 965–977.
- Smith, A. (2005). Reimagining the city: The value of sport initiatives. *Annals of Tourism Research*, 32(1), 217–236.
- Soudager, M. A., & Wani, S. H. (2023). Nexus between geopolitical risk and tourism demand in India: Evidence from the ARDL approach. *The Indian Economic Journal*, 71(4), 645–658.
- Tsaurai, K. (2018). The role of financial sector development in the tourism-growth nexus: A case of southern african countries. *Journal of Economics and Behavioral Studies*, 10(3), 100–110.
- Tsaurai, K., & Chimbo, B. (2019). Information and communication technology (ICT) led tourism growth nexus in transitional markets. *Acta Universitatis Danubius. Economica*, 15(5), 36–53.
- United Nations Environment Programme (2005). Making tourism more sustainable: A guide for policy makers. Available from: <https://wedocs.unep.org/20.500.11822/8741> (accessed 19 July 2022).
- Vítová, P., Harmáček, J., & Opršal, Z. (2019). Determinants of tourism flows in small island developing states (SIDS). *Island Studies Journal*, 14(2), 3–22.
- Wamboye, E. F., Nyaronga, P. J., & Sergi, B. S. (2020). What are the determinants of international tourism in Tanzania?. *World Development Perspectives*, 17, 1–15.
- Yakubu, I. N. (2020). Institutional quality and foreign direct investment in Ghana: A bounds-testing cointegration approach. *Review of International Business and Strategy*, 30(1), 109–122.
- Yakubu, I. N., Abokor, A. H., & Gedik Balay, I. (2021). Re-Examining the impact of financial intermediation on economic growth: Evidence from Turkey. *Journal of Economics and Development*, 23(2), 116–127.
- Yashobanta, P., Parul, B., & Chowdhury, J. R. (2017). Determinants of tourism in Indian states: An empirical analysis. *Tourism Review*, 72(3), 330–343.
- Yenişehirlioğlu, E., & Bayat, T. (2019). The relationship between tourism income and financial development in the MENA countries. *İşletme Araştırmaları Dergisi*, 11(2), 1183–1190.
- Zaidan, E. (2017). Analysis of ICT usage patterns, benefits and barriers in tourism SMEs in the Middle Eastern countries: The case of Dubai in UAE. *Journal of Vacation Marketing*, 23(3), 248–263.

Further reading

- Adeola, O., Boso, N., & Evans, O. (2018). Drivers of international tourism demand in Africa. *Business Economics*, 53(1), 25–36.
- Bethapudi, A. (2013). The role of ICT in tourism industry. *Journal of Applied Economics and Business*, 1(4), 67–79.
- Ko, T. G. (2005). Development of a tourism sustainability assessment procedure: A conceptual approach. *Tourism Management*, 26(3), 431–445.

Corresponding author

Ibrahim Nandom Yakubu can be contacted at: kassiibrahim@gmail.com