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The Impact of Tourism on GDP: Empirical Evidence from Colombia, Uganda, and Armenia

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Abstract. Tourism is often regarded as an important source of economic growth in developing countries. However, researchers do not fully agree on how tourism affects national output. This study mainly focuses on how tourism influences the gross domestic product (GDP) of three developing countries - Colombia, Uganda and Armenia. The economic systems of these three countries are quite different. The research utilized annual data from 1999 to 2020, sourced from the World Bank and the United Nations World Tourism Organization. A logarithmic linear OLS model was employed for the analysis, with a primary focus on two key factors: tourism revenue and overseas travel expenditure. The final model did not incorporate the number of tourists, as it was too closely correlated with tourism revenue, which could lead to multicollinearity issues. The final model fits the data extremely well, with a high R-squared value. The results show that tourism revenue has a strong positive impact on the GDP of these three countries, with elasticities ranging from 0.772 to 0.941. This also confirms the view that tourism can drive economic growth. However, the expenditure on traveling abroad has a negative impact on GDP. The impact is between negative 0.638 and negative 0.827. This means that when people spend money in other countries, some of the tourism industry's profits will be lost. Therefore, the overall benefits of the tourism industry may be exaggerated. These results are important for government policies.

Keywords: Tourism, GDP, Correlation analysis

1. Introduction

The role of tourism in a specific nation's economy can be multifaceted. For instance, in the case of tourism, the Gross Domestic Product (GDP) is positively impacted by the amount of money that foreign tourists spend in the country. On the other hand, the multiple levels of supply chain and external chain dependencies determine the amount that is retained within the country. At the same time, if a country's residents travel abroad, there is an overseas transfer of purchasing power which is considered a leak in the country's economy. It is worth noting that this is the only instance where a country's tourism account is negatively impacted. Dwyer and Forsyth argued that measuring inbound tourism's positive impacts by merely assessing total tourist spending is too simplistic of a view and that assessing the net positive impacts requires measuring the outflows as well [1]. This has been the basis of this research. Using annual data for the period 1999-2020, this paper analyzes

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the relationship between tourism receipts, tourist arrivals and outbound expenditure on GDP of Colombia, Uganda, and Armenia. These three countries will allow for the analysis of different continents as well as different levels of economy and different tourism structures. This multi-country set up will be able to assess if the same relationships hols true despite the differences. This research is set to assess the impact of the 2008 Global Financial Crisis and the 2020 COVID-19 Pandemic, which will only complicate the analysis and will further make it difficult to assess the long-term relationship between tourism and the economy.

2. Literature review

The academic development of the tourism-led growth (TLG) hypothesis can be traced to Balaguer and Cantavella-Jordá [2], whose 2002 study of Spain used cointegration methods to identify a long-run equilibrium relationship between real GDP and international tourism receipts, with external competitiveness also playing an important role in the model. This paper has been widely cited and largely established the analytical line of "tourism receipts → GDP."

Subsequent cross-country research, however, challenged this straightforward picture. Drisakis studied Greece. He found that tourism and economic growth have an interactive relationship [3]. Tourism revenue can drive economic growth, and economic growth will also make people more inclined to travel. Oh, after studying South Korea, the results were different [4]. He found that there was no long-term connection between the two. It was economic growth that brought in more tourists, not tourism that led to economic growth. Therefore, the strategy of relying on tourism to drive growth doesn't work in South Korea. The comparison between these two countries is sufficient to prove that "tourism promoting economy" is not a universal truth applicable everywhere. Brida, Cortes Jimenez and Pulina, after reviewing a large number of similar studies, also acknowledged that although most studies support a positive correlation between the two, the extent of the impact and which factor influences which one depend on specific circumstances and cannot be generalized [5].

The studies most relevant to this research focus on developing countries. Fayissa, Nsiah, and Tadesse used panel data from 42 African countries and found that tourism receipts have a significant positive effect on both current GDP and economic growth [6]; beyond physical and human capital inputs, tourism is a viable lever for stimulating African economies. This finding is highly consistent with the three-country context of the present study Colombia, Uganda, and Armenia are all in a stage of rapid tourism expansion, and foreign exchange receipts can generate a higher marginal contribution to relatively smaller economies.

Outbound tourism can cause losses. This is called the leakage effect. Many studies ignore this. Dwyer, Forsyth, and Spurr found problems in common methods [7]. These include input-output analysis and multiplier methods. These methods often overstate the benefits of tourism. Previous studies overlooked an important factor: the money spent by residents on traveling abroad. This would lead to inaccurate results. It is required to pay attention to this "external expenditure" because it will reduce the demand for the domestic economy. Dwyer and Forsyth also discovered other issues. Taxes can affect the outcome, market forces can alter the result, and exchange rate fluctuations also have an impact. Therefore, one cannot merely focus on the total tourism expenditure. This study has also included the expenses for outbound travel, which will make the results more accurate. In terms of model selection, this paper used the log-linear OLS model instead of the cointegration model. The reason is quite simple: each country only has 17 to 22 years of data, and the sample size is too small. This amount of data is insufficient to support time series analysis methods such as ARDL or VAR, and the results obtained are not convincing enough.

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Log transformation linearizes the multiplicative relationships between variables, and coefficients carry direct elasticity interpretations a common and justifiable choice for this type of cross-country short-panel research [2, 3, 6]

3. Dataset preparation

The data used comes from the World Bank World Development Indicators (WDI) and the United Nations World Tourism Organization (UNWTO) stats databases. Both Colombia and Armenia have 22 yearly observations (1999 - 2020); and for Uganda only the years after 2004 available data, resulting in 17 observations. All monetary variables are measured in current US dollars. The dependent variable is the GDP in current US dollars for each country, which is the total market value of the goods and services produced for final consumption in a year. There are three independent variables: Tourism foreign exchange receipts (D) is the foreign exchange earnings from international tourists spending domestically; inbound tourists (E) is the count of people visiting the country and is used to measure the level of inbound tourism; and Outbound tourism expenditure (F) is used to measure the level of overseas consumption of the country's residents and is expressed as a percentage of the GDP. Before the empirical estimation, all variables are transformed to their natural logarithm, which is denoted as Ln_GDP, Ln_ Receipts, Ln_Arrivals, and Ln_ Expenditures. The transformation to logarithm is as a result of two advantages: it reduces the extreme values and heteroskedasticity that is usually present in time-series data, hence the assumption of linearity is more valid after this transformation; and the resulting coefficients have elasticities, for example, a coefficient of 0.8 in Ln_ Receipts means that a 1% increase in tourism receipts would increase GDP by 0.8%, which is a good result with no need for additional transformation.

Table 1 summarises the sample means of key variables for the three countries. Colombia has the largest economic size and the highest absolute tourism receipts. Uganda and Armenia are smaller in scale, but Armenia's tourism receipts as a share of GDP are relatively prominent, indicating that the strategic importance of tourism to its overall economy is not lower than that of much larger comparable countries.

Table 1. Descriptive statistics of key variables (sample means, 1999 - 2020)

Variable	Colombia	Uganda	Armenia
Mean GDP (USD billion)	237.3	20.6	8.9
Mean Tourism Receipts (USD billion)	3.71	0.73	0.65
Mean Inbound Arrivals (million)	2.35	0.88	0.76
Sample Period	1999 - 2020	2004 - 2020	1999 - 2020
Observations (n)	22	17	22

When discussing outbound tourism expenditure (F) in relation to a country's GDP, it is more economical to talk in terms of a percentage of GDP, as measured amounts when com-pared across countries, hold little value in absolutes; measurement in relation to the size of the economy of a given country, captures a more accurate and true value of the economic erosion caused by the country's outbound consumption. In this regard, Uganda is an interesting case study; while Uganda's outbound expenditure is, in absolute terms, significantly less than that of Colombia, the country's outbound expenditure as a percentage of its GDP, holds considerable and economically significant value. Uganda's case captures the need for valuation of tourism foreign exchange receipts as it is a composite indicator, and compresses many variables that affect tourism into a single metric (which

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includes; number of visitors, average visitor spend, average length of stay, and structure of consumption). The indicator's comprehensiveness increases its statistical efficiency. When incomplete data is collected (arrivals), the metric will create an accurate representation of the amount of money the tourism activity will inject into the country compared to the absence of the metric. It is this reason that, in the simplified model, tourism receipts outperform the number of tourists. Another critical reason for this trend is the greater economic activity that is reflected in the tourism receipts, which is not the case for the number of tourists. Also, when it comes to the variable for outbound expenditure, this study assigned the highest value to the raw economic activity measured as the value of expenditure, while still recognizing that the metric is less useful when measuring an economy that is not a true, direct economic metric. This creates an absolute figure to economically value the expenditure. This is now expressing the value in economically raw terms which for Colombia will hold more value than for Armenia. In this case, the measurement essentially captures the total economic size of the country without measuring the true economic resolution. When a measurement that captures the economy only in terms of economically outward value is measured, it creates an enormous gap as the true economic resolution is economically shrunk.

Expressing the variable as a share of GDP before making comparisons controls for differences in economic size, making the coefficients genuinely comparable across countries, which is a standard practice for cross-country research. In choosing case studies, this research consciously steers clear of fully developed tourist destinations like France, Thailand, or Spain, as in such contexts the tourism industry is highly capitalised and the local spillover and global value chain integration levels differ fundamentally from developing countries, making cross-national comparisons arguably valueless. Colombia, Uganda, and Armenia were selected because all three are in a relatively early stage of tourism expansion, where it can be presumed that the marginal returns to policy intervention have not yet been fully realised.

4. Methodology

4.1. Model specification

The baseline specification is a log-linear OLS regression (Equation 1) [8-10], with $\beta_1$expected positive (receipts stimulate GDP) and $\beta 3$ negative (outbound leakage).

$$ln(GDP) = \beta_0 + \beta_1 * ln(Receipts) + \beta_2 * ln(Arrivals) + \beta_3 * ln(Expenditures) + \varepsilon t \quad (1)$$

where t denotes year, β_0 is the intercept, β_1 , β_2 , and β_3 are the elasticity coefficients for tourism foreign exchange receipts, inbound tourist arrivals, and outbound tourism expenditure, respectively, and εt is the error term. Based on theoretical expectations, β_1 should be positive (tourism receipts stimulate GDP) and β_3 should be negative (leakage effect of outbound consumption).

Under classical assumptions, OLS yields the Best Linear Unbiased Estimator. The principal limitation is potential reverse causality between tourism and GDP, which cannot be excluded with annual observations.

4.2. Variable selection and diagnostics

This paper begins by estimating the variables using a Pearson correlation matrix that flags any pair with a correlation greater than 0.8; the redundant variable is dropped. For the three countries'

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studies, the correlation between tourist arrivals and tourism receipts is higher (r = 0.855-0.977) and therefore tourist arrivals are dropped from the final model. A 2020 COVID-19 dummy variable was considered but rejected because 17-22 observations per country leave too few degrees of freedom for a parameter; for now, the year remains and is treated as a limitation. Model fit is assessed using the adjusted R^2; the overall significance using the F-statistic; and the model's coefficients are tested for significance using t-tests at 1, 5, and 10 percent.

5. Results and discussion

For all three countries, tourist arrivals are too collinear with tourism receipts (r = 0.855–0.977) and this distorts the full-model coefficients. The loss of arrivals in the model does not result in much loss of explanatory power ($\Delta R^2 \leq 0.054$) but does result with more stable and interpretable estimates. Results that follow are from the simplified two variable models.

5.1. Colombia

Colombia's full model achieves $R^2 = 0.982$ shown in Table 2, but multicollinearity between Ln_Receipts and Ln_Arrivals (r = 0.855) distorts the arrivals coefficient to -0.225. After simplification, R^2 remains at 0.976; receipts elasticity is +0.772 ($p < 0.01$) and outbound leakage is -0.746 ($p < 0.01$).

Table 2. Regression results – Colombia

Variable	Full Model (β)	Simplified Model (β)
Intercept	9.641 ***	10.731 ***
Ln_Tourism Receipts	+0.999 ***	+0.772 ***
Ln_Tourist Arrivals	-0.225 **	
Ln_Outbound Expenditure	-0.973 ***	-0.746 ***
R^2	0.982	0.976
Adjusted R^2	0.978	0.974
Observations (n)	22	22

5.2. Uganda

Uganda's full model ($R^2 = 0.945$) shown in Table 3 suffers from collinearity bias: Ln_Arrivals is insignificant ($p = 0.506$) and the receipts coefficient is inflated to +1.240. After simplification, receipts elasticity corrects to +0.798 ($p < 0.01$) and outbound leakage to -0.638 ($p < 0.01$); $R^2 = 0.891$. Uganda's ecotourism niche mountain gorilla trekking drawing high-spend European and North American visitors contributes to its relatively high receipts elasticity.

Table 3. Regression results – Uganda

Variable	Full Model (β)	Simplified Model (β)
Intercept	7.263 ***	8.632 ***
Ln_Tourism Receipts	+1.240 **	+0.798 ***
Ln_Tourist Arrivals	-0.564	
Ln_Outbound Expenditure	-0.567 ***	-0.638 ***

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Table 3. (continued)

R^2	0.945	0.891
Adjusted R^2	0.930	0.876
Observations (n)	17	17

Having a high elasticity coefficient in Uganda can be a blessing or a curse. In this case, the blessing comes from the fact that Uganda's GDP shows a heavy dependence on the growth of tourism. However, the curse comes from the fact that tourism growth can be a high risk for Uganda's economy. As long as tourism retains the high growth rate, Uganda's economy is in danger, as the cause of the high risk is the gravity that pulls tourism down or a negative external shock. The drastic drop shown in 2020 depicts this danger and negatively exposes Uganda's economy. The danger illustrates that Uganda's economy is still tourism driven. However, the negative dependence on tourism growth is not the desired or optimal formulation. The diversification from tourism to other forms of growth is desired.

5.3. Armenia

Armenia's Ln_Receipts - Ln_Arrivals correlation ($r = 0.977$) shown in Table 4 is the highest of the three, and removing arrivals keeps the R^2 at 0.963. This model results in the highest elasticity of receipts +.941 ($p < 0.01$) and the highest leakage coefficient -0.827 ($p < 0.01$). The Armenian diaspora, mainly in Russia, France, and the USA, ensures a consistent stable flow in one direction and a high tendency to travel abroad, which explains the significant leakage.

Table 4. Regression results – Armenia

Variable	Full Model (β)	Simplified Model (β)
Intercept	7.658 ***	6.024 ***
Ln_Tourism Receipts	+0.872 ***	+0.941 ***
Ln_Tourist Arrivals	-0.030	
Ln_Outbound Expenditure	-0.417 ***	-0.827 ***
R^2	0.963	0.963
Adjusted R^2	0.957	0.959
Observations (n)	22	22

5.4. Cross-country comparison

Table 5 provides a summary of results obtained from using a simplification model. Receipt elasticities (0.772 - 0.941) are positive and highly significant across all three countries. This is in line with the TLG hypothesis and as the gradient is inversely correlated to economic size, smaller economies receive a proportionally greater GDP stimulus per unit of receipts. Outbound leakage coefficients (-0.638 to -0.827) have a different ordering, which is a consequences of structural differences in the travel propensity of residents. Simplification costs are minimal with a ΔR^2 of 0.000 to 0.054. This confirms that receipts can be a sufficient proxy for measuring the economic footprint of tourism.

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Table 5. Summary of simplified model results (three-country comparison)

Indicator	Colombia	Uganda	Armenia
R^2 (Full Model)	0.982	0.945	0.963
R^2 (Simplified Model)	0.976	0.891	0.963
ΔR^2 (Simplification Cost)	-0.006	-0.054	0.000
Tourism Receipts Elasticity (β1)	+0.772 ***	+0.798 ***	+0.941 ***
Outbound Expenditure Elasticity (β2)	-0.746 ***	-0.638 ***	-0.827 ***
Treatment of Arrivals	Dropped (r = 0.855)	Dropped (r = 0.763)	Dropped (r = 0.977)
Observations (n)	22	17	22

5.5. Discussion

A meaningful cross-contextual validation for TLG hypothesis started from economically different structurally three cross-contextual economies. For Armenia, where net contribution of tourism is much lower based on given in-bound elasticity of 0.941 and leakage of 0.827, tourism leakage or outbound leakage is cited. Policies attracting in-bound tourism still fail economically as net contribution is overstated. Omitting 2020 as a dummy variable would create severe extreme residuals biasing Uganda's figures. Longer data series would obviously allow for ARDL or cointegration methods. Economic diversification seems to be the only viable long term solution for tourism-dependent vulnerable economies. Significant results for Armenia and Uganda where receipt data was either based on surveys or estimated rather than out of data limitations, clearly point out the soundness in the unattractive estimates.

6. Conclusion

The positive impact of tourism on GDP is not only real but also shows a numerically concrete impact across three different developing countries, namely, Colombia, Uganda, and Armenia. The elasticity coefficients of tourism foreign exchange receipts for the three countries are 0.772, 0.798, and 0.941 respectively, which are all highly significant and stable after the removal of collinear variables. Stability is the most important factor for reinforcing the validity of a coefficient, and it is particularly important in this case. Tourist arrivals, on the contrary, present a different picture. Their high degree of collinearity with tourism receipts deprives their coefficient of independent significance in the complete model, and there is almost no discernible effect on R^2 following their exclusion. This is a methodological reminder for empirical tourism researchers: in tourism economics, receipts are a more valid proxy variable, while arrivals tend to offer little value to the model. In situations that more complex modeling is not feasible, focusing on the receipts variable alone is likely to be the most reasonable strategy. Outbound tourism expenditure shows a consistently negative impact across all three countries, with absolute coefficient values from 0.638 to 0.827. For small open economies, if there is growth in the inbound tourism receipts, coupled with a growth in the outbound tourism expenditure, the net economic gain may be significantly lower than it appears. This result may not be shocking, but the quantified implications of this result call for a serious consideration.

The greatest advantage of this method is its simplicity and openness, making it accessible to anyone. The data is publicly available, and the method is a basic regression analysis, with relatively

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low requirements. Other researchers can follow this approach as well, for instance, by running the analysis again with updated data to see if there are any changes in the results.

Especially the data after the pandemic is particularly crucial. Just check if the elasticity coefficient has changed. This can help uncover deeper insights and gain a more thorough understanding of the tourism industry. Of course, this research also has areas that can be improved. For instance, as more years pass and the data accumulates, more advanced analytical methods can be employed. The scope of the research countries could also be expanded, or some new variables could be added, such as infrastructure, to see if the results remain stable. The elasticity coefficient is also very useful. It directly tells exactly how much the tourism industry affects the economy. A high coefficient indicates that the tourism industry can drive a wide range of industries such as hotels, restaurants, transportation, and retail, and everyone can enjoy eating meat together. A low coefficient suggests that the impact is limited, and the money may only flow to a few major industries, with small businesses not receiving much benefit.

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