ASSESSMENT OF THE IMPACT OF TOURISM ON MACROECONOMIC INDICATORS: EMPIRICAL RESEARCH FOR ARMENIA

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Key words: tourism revenue, economic growth, regression analysis, Granger causality, vector autoregression model

Introduction

International tourism is rapidly developing today, becoming a significant source of income for many countries. Tourism, due to its socio-economic importance, stimulates investments, promotes job creation, generates income and profits, supports community development, helps in poverty alleviation, enhances infrastructure development, and increases foreign currency inflow.

The tourism sector of the Republic of Armenia has grown significantly over the last ten years, with an average annual increase of 10% in the number of incoming tourists. According to the Tourism Committee the number of tourists visiting Armenia rose from 382,240 in 2006 to 2.3 million people by 2023 (Figure 1).

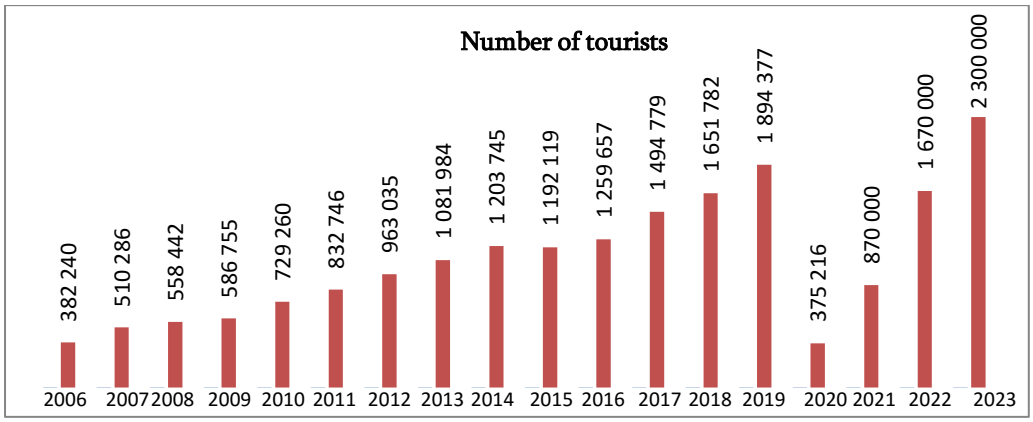

Figure 1. Tourist visits to Armenia in 2006-2023 (person)

Considering the socio-economic, cultural, environmental, and political significance of tourism, as well as its important role in national economies, the impact of tourism on the development of a country's economy is widely studied in the economic literature using econometric methods today. The aim of this research is to assess the impact of international tourism on the economy of Armenia. *This study proposes and tests the following hypotheses using econometric models: 1) the development of tourism in Armenia contributes to the appreciation of the national currency, 2) it has a positive effect on private*

consumption, 3) it contributes to economic growth, 4) it positively influences the import of goods and services.

Research methodology

In the empirical research, the following quarterly data for the Republic of Armenia from 1996 to 2024 have been used: USD/AMD exchange rate (EXR), tourism revenue[1] (TINC), GDP at current prices (GDP), real GDP (RGDP), private consumption (CONS), export of goods and services (EX), import of goods and services (IM), and personal remittances from abroad (REM). The data sources are the Statistical Committee of the Republic of Armenia [ARMSTAT, 2024] and the Central Bank of Armenia [RA Central Bank, 2024]. The stationarity condition for the variables was checked using the Augmented Dickey-Fuller (ADF) test. When applying the ADF test, the following equation is estimated:

$$\Delta X_t = \beta_1 + \gamma X_{t-1} + \beta_2 t + \sum_{i=1}^{k} c_i \Delta X_{t-i} + \varepsilon_t, \quad (1)$$

where $\beta_1, \beta_2, \gamma,$ and c_i are coefficients, t is the time or trend variable, and ε_t is the random error representing the White Noise process. The ADF test evaluates the hypothesis "The time series has a Unit Root," and if this hypothesis is rejected, the series is considered stationary.

To study the impact of tourism on Armenia's macroeconomic indicators, the multivariate regression models were used. The Granger causality test was used to determine the presence and direction of causality between the two variables. The hypothesis being tested is: “X does not Granger cause the change in Y” and “Y does not Granger cause the change in X”. To assess the interactions between variables and analyze the effects of shocks, the Vector Autoregression (VAR) model was applied. For two endogenous variables, the VAR model is represented by the following system of equations:

$$Y1_t = \alpha_1 + \sum_{j=1}^{J} \beta_{1j} Y1_{t-j} + \sum_{j=1}^{J} \delta_{1j} Y2_{t-j} + \sum_{k=1}^{K} \gamma_{1k} X_{kt} + u_{1t} \quad (2)$$

$$Y2_t = \alpha_2 + \sum_{j=1}^{J} \beta_{2j} Y1_{t-j} + \sum_{j=1}^{J} \delta_{2j} Y2_{t-j} + + \sum_{k=1}^{K} \gamma_{2k} X_{kt} + u_{2t} \quad (3)$$

where $Y1_t$ and $Y2_t$ are endogenous variables, and X_{kt} is an exogenous variable.

The hypothesis being tested is that To check for the independence and homoscedasticity of the residuals in the models, the Breusch-Godfrey LM test for autocorrelation and the Breusch-Pagan-Godfrey test for heteroscedasticity were used, respectively. The Jarque-Bera test was applied to verify normal distribution. To assess the quality of the models, the adjusted coefficient of determination ($Adj.R_{sq}$) was used, while the statistical significance of the estimated parameters and hypothesis testing were evaluated using the $t, F,\ and\ Chi\_sq$ statistics.

[1] The unit of measurement for all variables is million Armenian drams.

Literature review

The impact of tourism on a country's macroeconomic indicators has been assessed in several studies by economists. Rasool and co-authors indicate that tourism, financial development and economic growth are cointegrated in the long run and there is a two-way positive effect between tourism and economic growth in BRICS countries [Rasool et al., 2021, 1-11]. Cortes-Jimenez and Pulina demonstrated that tourism contributes to economic growth in Spain and Italy [Cortes-Jimenez & Pulina, 2010, 61-74]. Perles-Ribes and co-authors also found a significantly positive impact of tourism on Spain's economic growth [Perles-Ribes et al., 2017, 96-109]. Ren and co-authors, studying eight Mediterranean countries, found that tourism positively affects economic growth but has a negative impact on environmental emissions [Ren et al., 2019, 1-17]. Tugcu showed that the effects of tourism on economic growth are relatively greater in developing countries than in developed ones [Tugcu, 2014, 207-212]. Brida and Risso studied Chile and South Tyrol [Brida & Risso, 2010, 14-28], Manzoor and co-authors examined Pakistan [Manzoor et al., 2019, 1-14], and Tang and Jang focused on the USA [Tang & Jang, 2009, 553-558], all concluding that tourism contributes to long-run economic growth. Based on regression analyses conducted for a large number of countries, Du and Ng concluded that tourism has no significant impact on per capita income [Du & Ng, 2011, 1-8]. Lee and Chien demonstrated that there is no long-term relationship between tourism and economic growth in Taiwan [Lee & Chien, 2008, 358-368]. Wijesekara and co-authors, examining data from 105 countries, show that in most regions tourism contributes significantly to economic growth and vice versa. In addition, there is a bidirectional relationship between trade openness and economic growth [Wijesekara et al., 2022, 1-21].

Using a VEC model Dritsakis showed that the development of tourism contributes to Greece's long-run economic growth [Dritsakis, 2004, 305-316]. Kasimati, applying the VEC model found that there is no long-run relationship between tourism and economic growth [Kasimati, 2011, 79-85]. The presence of conflicting results for Greece is attributed to differences in the variables included in the analyses and the time periods considered. These contradictory findings indicate that, despite the extensive economic literature on the interconnections between tourism and economic growth, conclusions regarding these relationships must be verified through empirical research specific to each country.

Analysis

The analysis of the Descriptive Statistics of the variables indicates that between 1996 and 2024, *the average quarterly revenue from tourism (77731.06 mln drams) in Armenia exceeds the average amount of personal remittances from abroad (62279.52 mln drams)*. Income from tourism has started to exceed amount of personal remittances from abroad since 2014. The time series of the variables used in the research, except for the exchange rate series, exhibit seasonality and have therefore been smoothed using the Census X-12

method. The stationarity condition was checked using the Augmented Dickey Fuller test, and the results showed that all variables are first-order integration processes. Therefore, they were used in the models with first-order differences. To assess the impact of tourism on Armenia's macroeconomic indicators, four multivariate regression models were constructed (Table 1). The results of the residuals tests show that the residuals for all models are homoscedastic, not autocorrelated, have a normal distribution. Additionally, the Ramsey RESET test was applied, confirming that the model specifications are correct.

Table 1. Regression Analysis Results

	D(EXR)	**D(LCONS)**	**D(LRGDP)**	**D(LIM)**
C	1.599325	0.018546*	0.035254*	0.012460
D(LGDP)	-11.56442*			
D(LRGDP(-1))			-0.291000*	
D(LRGDP(-2))			-0.264339*	
D(LRGDP(-3))			-0.165534***	
D(LTINC)		0.032393*	0.038545*	0.058568*
D(LTINC(-2))	-7.936025*	0.030356*		
D(LEX)		-0.220949*		
D(LEX(-1))	-24.57225*			
D(LEX(-4))			0.153515*	
D(EXR(-1))	0.409496*			
D(EXR(-2))	0.182793***			
D(LCONS)				0.672968*
D(LCONS(-2))		-0.182137**		
D(LIM)		0.368982*		
D(REM(-1))	-0.000367**			
Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	2.146461	1.946445	0.347098	0.199484
Prob. F-statistic	0.0542	0.0928	0.8831	0.8194
Breusch-Godfrey Serial Correlation LM Test				
F-statistic	2.090190	1.338116	0.975829	2.736132
Prob. F-statistic	0.1289	0.2669	0.3804	0.0693
Obs.	114	114	114	114

* 1% significance level, ** 5% significance level, *** 10% significance level
L denotes the logarithmic values of the variables, d – the first differences of the variables.

Based on the results from *Model 1*, a 1% increase in exports after one quarter leads to an appreciation of the national dram by 0.246 points, ceteris paribus. Additionally, a 1% increase in nominal GDP in the current quarter results in an appreciation of the national dram by 0.116 points, ceteris paribus. Finally, *a 1% increase in tourism revenue after two quarters results in an appreciation of the national dram by 0.079 points*, ceteris paribus. Model 1 also reveals a statistically significant negative effect of personal remittances from abroad on the AMD/USD exchange rate, indicating that these transfers cont-

ribute to the appreciation of the national dram. According to Model 2, *a 1% increase in tourism revenue contributes to the growth of private consumption by an average of 0.032% during the current quarter and a 0.03% growth two quarters later*, ceteris paribus. Additionally, in the current quarter, private consumption will rise by 0.37% as a result of a 1% increase in imports, and down 0.18% due to a 1% increase in exports, ceteris paribus. The results of Model 3 show that *a 1% increase in tourism revenue leads to a 0.04% increase economic growth in the current quarter*, ceteris paribus. Additionally, a 1% increase in exports will lead to a 0.15% economic growth four quarters later, ceteris paribus. Tourism revenue has a positive effect on imports, both indirectly, by increasing the income of the country's population, and directly, through tourists' demand for imported goods. Based on the results of Model 4 *a 1% increase in tourism revenue contributes to a 0.06% increase in imports during the current quarter, ceteris paribus*. In addition, according to the model, a 1% increase in private consumption in the current quarter contributes to a 0.673% increase in imports. Based on the constructed regression models, forecasts have been made. Prediction quality tests for all models show high prediction quality, which is also evidenced by the comparison of graphs of statistical and model-predicted series (Figures 2 to 5).

Figure 2: Statistical and forecasted series of exchange rate

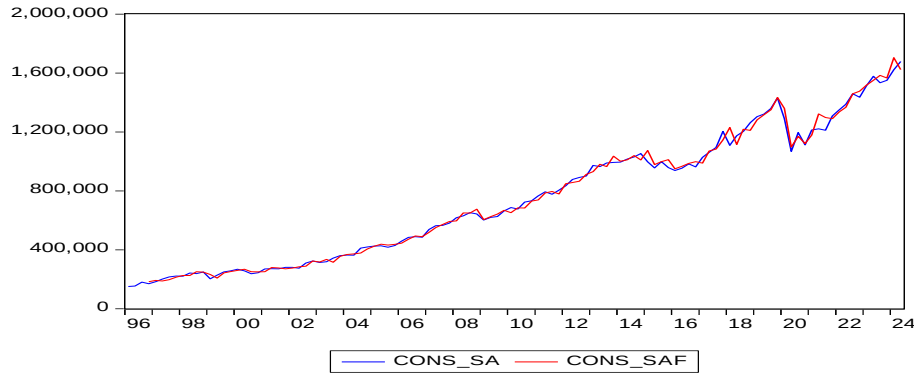

Figure 3: Statistical and forecasted series of consumption, mln drams

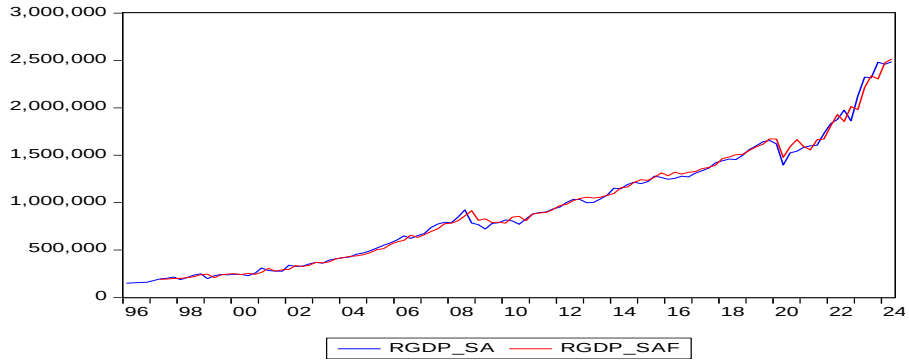

Figure 4: Statistical and forecasted series of Real GDP, mln dra//ms

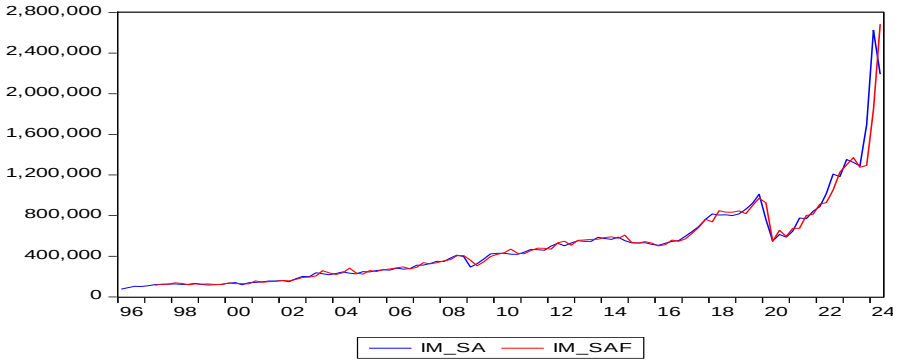

Figure 5: Statistical and forecasted series of imports, mln drams

To assess the interactions between economic growth, tourism revenue, and private consumption, a VAR model has been constructed. The exogenous variables of the model are exports and the exchange rate. The best lag for the VAR model is 2. All roots of the characteristic polynomial of the model are less than 1 in absolute value, indicating that the stability condition of the VAR model is satisfied. *According to the results of the Granger causality test, tourism revenue is the cause of changes in private consumption* (Chi-sq=7.799055 and prob (Chi-sq) = 0.0203< 0.05), while consumption is not the cause of changes in tourism revenue. There is no Granger causality between the other variables. Johansen's test showed that cointegration relationships between the variables included in the model are absent. The VAR model is presented in the following system of equations:

$$d(ln(RGDP))_t = -0.246d(ln(RGDP))_{t-1} - 0.329d(ln(RGDP))_{t-2} + 0.005d(ln(Tinc))_{t-1} + 0.014d(ln(Tinc))_{t-2} + 0.008d(ln(Cons))_{t-1} - 0.003d(ln(Cons))_{t-2} + 0.035 + 0.058d(ln(EX))_t - 0.334d(ln(EXR))_t + e_t$$

$$d(ln(Tinc))_t = 0.137d(ln(RGDP))_{t-1} + 0.435d(ln(RGDP))_{t-2} - 0.045d(ln(Tinc))_{t-1} - 0.065d(ln(Tinc))_{t-2} + 0.37d(ln(Cons))_{t-1} - 0.564d(ln(Cons))_{t-2} - 0.006 + 0.069d(ln(EX))_t + 0.583d(ln(EXR))_t + e_t$$

$$d(ln(Cons))_t = 0.001d(ln(RGDP))_{t-1} - 0.069d(ln(RGDP))_{t-2} + 0.003d(ln(Tinc))_{t-1} + 0.034d(ln(Tinc))_{t-2} - 0.246d(ln(Cons))_{t-1} - 0.165d(ln(Cons))_{t-2} + 0.026 + 0.045d(ln(EX))_t - 0.317d(ln(EXR))_t + e_t \quad (4)$$

The model's estimated coefficients reveal the following results: a) a 1% increase in tourism revenue contributes to a 0.03% rise in private consumption two quarters later, ceteris paribus, b) a 1% depreciation of the Armenian dram results in a 0.32% decrease in private consumption in the current quarter, ceteris paribus, c) a 1% increase in exports of goods and services contributes to a 0.06% economic growth in the current quarter, ceteris paribus. The impact of external shocks on economic growth, tourism, and pri-vate consumption has been analyzed using the impulse response function (Figure 6). All endogenous variables positively respond to shocks in real GDP. The posi-tive impact of its own shock on economic growth sharply decreases in the second quarter and dissipates by the seventh quarter. The response of tourism revenue to shocks in economic growth is weakly positive, while the response to consumption shocks is nearly absent. In addition to its own shock, private consumption is sig-nificantly positively influenced by shocks in both economic growth and tourism.

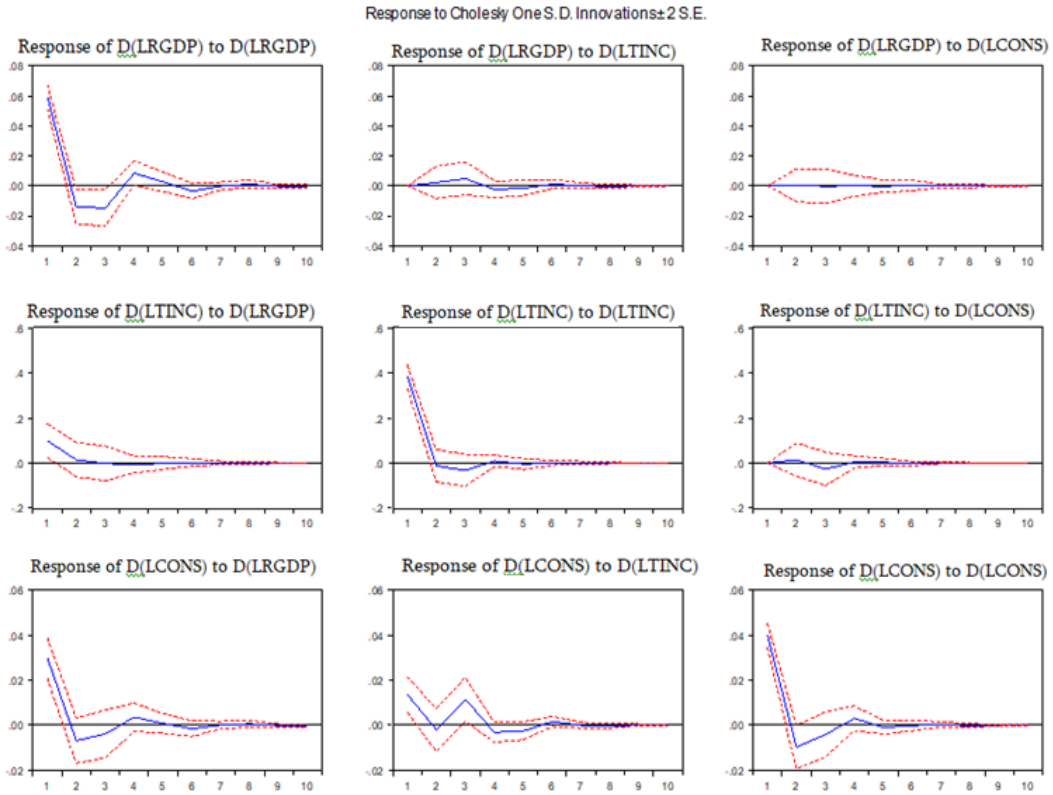

Figure 6. Impulse function results

The results of the variance decomposition analysis of the shocks in the VAR model also indicate that shocks in economic growth and tourism revenue contribute significantly to the variation in private consumption. Meanwhile, the contribution of its own shock is substantial in the variances caused by shocks in economic growth and tourism revenue.

Conclusions

Since 2004, the tourism sector in Armenia has developed significantly. The results of the multivariate regression and VAR models constructed to assess the impact of tourism on the Armenian economy serve as the basis for the following conclusions:

- The increase in the number of tourists in Armenia promotes the inflow of foreign currency, which strengthens the national currency, the Armenian dram. According to Model 1, a 1% increase in tourism revenue leads to an appreciation of the Armenian dram against the US dollar by 0.079 points after two quarters, thereby confirming our first hypothesis.
- The development of tourism in Armenia contributes to higher earnings for public catering, retail, entertainment businesses, as well as hotels and guesthouses, which in turn raises household incomes. This leads to an increase in private consumption expenditures. Model 2 and the VAR model show that higher tourism revenue boosts private consumption, thus confirming the second hypothesis.
- The development of tourism, by increasing total demand in Armenia, contributes to GDP growth. According to Model 3, a 1% increase in tourism revenue leads to a 0.04% increase in economic growth in the current quarter, thus confirming the third hypothesis under investigation.
- The rise in consumer spending due to increased tourism revenue includes the consumption of both domestic and imported goods. Results from Model 4 indicate that a 1% increase in tourism revenue contributes to a 0.06% rise in imports in the current quarter, confirming the fourth hypothesis.
- There is a unidirectional causality between tourism and consumption: according to the Granger causality test, tourism revenue is the cause of changes in private consumption, while consumption is not the cause of changes in tourism income.
- According to the VAR model results, a 1% depreciation of the Armenian dram in the current quarter leads to a 0.32% decrease in private consumption, and a 1% increase in exports contributes to a 0.06% increase in economic growth in the current quarter.
- Analysis of the impulse function showed that economic growth, tourism revenue, and private consumption respond positively to shocks in real GDP. Economic growth and tourism revenue shocks significantly affect private consumption, while own shock contributions have a large share of economic growth and tourism income shocks.

Thus, the positive impact of tourism on the development of the Armenian economy is undeniable. This implies that one of the main directions of the Armenian government's macroeconomic policy should continuously focus on the development of tourism.

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Assessment of the impact of tourism on macroeconomic indicators: empirical research for Armenia

Key words: tourism revenue, economic growth, regression analysis, Granger causality, vector autoregression model

This study assesses the impact of tourism on the economy of Armenia. Hypotheses were proposed, the reliability of which was tested by multivariate regression and Vector Auto-regression (VAR) models. A Granger causality test was applied, according to which tourism revenue is the cause of changes in private consumption, and the reverse is not true. There is no Granger causality between the other variables. The interactions between tourism, economic growth and private consumption, as well as the dynamic effects of random shocks on these variables, were evaluated using the VAR model. According to the results of models, the development of tourism contributes to the appreciation of Armenia's national currency. Tourism has a significantly positive impact on Armenia's economic growth, private consumption, and imports of goods and services. Specifically, a 1% increase in tourism revenue: a) boosts private consumption by an average of 0.032% in the current quarter and 0.03% two quarters later, b) raises imports by an average of 0.06 percentage points in the current quarter, and c) leads to a 0.04% increase in economic growth in the current quarter.