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Macroeconomic Determinants of International Tourism Arrivals in the Philippines

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ABSTRACT

Tourism is a major driver of the Philippine economy, contributing significantly to employment, income generation, and regional development. Despite its importance, empirical modeling of international tourism demand in the Philippines remains limited. This study addresses this gap by estimating a tourism demand function using two econometric approaches—Ordinary Least Squares (OLS) and Seemingly Unrelated Regression (SUR)—to examine the macroeconomic determinants of international tourist arrivals. The analysis focuses on the top five source markets—South Korea, the United States, Japan, China, and Australia—using annual time-series data from 2007 to 2023. Data were sourced from the Department of Tourism, World Bank, Philippine Statistics Authority, EM-DAT, and the Bangko Sentral ng Pilipinas. Descriptive results reveal a steady increase in tourist arrivals from 2007 to 2019, followed by a sharp decline during the COVID-19 pandemic (2020–2021), and a gradual recovery beginning in 2022 with the easing of global travel restrictions. Econometric findings indicate that real per capita income and exchange rates positively and statistically significantly affect tourism demand, while relative prices and crime rates negatively affect arrivals. Notably, the frequency of natural disasters exhibits a moderate positive association with tourism demand, possibly reflecting post-disaster reconstruction efforts and intensified tourism promotion. Comparative results show that the SUR model yields more efficient and consistent estimates than OLS, due to the presence of contemporaneous correlation across country-specific equations. Overall, the findings underscore the interdependence of tourism demand across major source markets and provide policy-relevant insights for enhancing the competitiveness and resilience of the Philippine tourism sector.

Keywords: Contemporaneous correlation, demand, generalized least squares, seemingly unrelated regression (SUR), tourism arrivals

INTRODUCTION

Tourism plays a pivotal role in driving economic growth by generating employment, creating income, and supporting infrastructure development (Premovic & Arsic, 2020). In 2023, the global tourism industry supported approximately 295 million jobs and contributed 9.1 percent to global GDP, equivalent to USD 9.5 trillion. Despite persistent global economic uncertainties, the sector has demonstrated strong resilience (Theobald, 2012). Given its significant socioeconomic contributions, sustained investments and sound policy interventions aimed at enhancing visitor experience are essential for achieving inclusive and sustainable development. Although international tourist arrivals have gradually recovered in recent years, the Philippines continues to lag behind most ASEAN economies. In 2023, Thailand recorded over 28 million tourist arrivals, Vietnam received 12.06 million, while the Philippines registered only 5.45 million—an improvement from 2022 but still comparatively low (The National Thailand, 2024).

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This gap underscores the need to examine the macroeconomic drivers of tourism performance through rigorous econometric modeling to inform strategies that enhance recovery and competitiveness.

Existing empirical studies highlight the importance of macroeconomic and structural factors in shaping tourism demand. For instance, Jeon (2014) found that income, market size, and direct flight availability positively influence tourist arrivals, whereas geographical distance exerts a negative effect. Similarly, Manuela and de Vera (2015) reported that aviation safety downgrades significantly reduce tourist inflows, while An (2022) demonstrated that tourism demand determinants vary across country clusters. In addition, Camillo et al. emphasized the combined influence of macroeconomic and environmental factors in explaining international tourism flows.

The Philippines' top five source markets are South Korea, the United States, Japan, China, and Australia (Philippine News Agency, 2024). In 2022, the country recorded 2,010,522 international visitor arrivals, with South Korea accounting for the largest share (27.19% or 546,726 arrivals), followed by the United States (15.71%), China (6.49%), Japan (6.13%), and Australia (4.38%). These markets play a crucial role in shaping aggregate tourism demand and therefore warrant focused empirical investigation.

Despite the growing body of literature, several gaps remain. First, existing studies largely emphasize cross-country or regional analyses, with limited country-specific modeling for the Philippines. Second, much of the literature relies on pre-pandemic data, failing to capture structural changes in travel behavior, income responsiveness, and market dynamics following COVID-19. Third, prior research often examines individual determinants in isolation, with limited integration of key macroeconomic variables—such as exchange rates, inflation, and income—in a unified empirical framework. Addressing these gaps is essential for understanding tourism demand in a post-pandemic, developing economy context.

This study contributes to the literature by providing a country-specific, post-pandemic analysis of the macroeconomic determinants of international tourist arrivals in the Philippines. Using robust econometric techniques, the study identifies key drivers of tourism demand across major source markets. The findings offer evidence-based insights to support policy formulation aimed at strengthening tourism recovery, enhancing resilience, and improving the country's competitiveness within the ASEAN region.

Objectives of the Study

The primary objective of this study is to estimate the demand function for tourism arrivals in the Philippines.

Specifically, this research attempts to:

1) analyze the trends in international tourist arrivals from the Philippines' top source markets from 2007 to 2023;
2) estimate the effects of key macroeconomic determinants on international tourist arrivals; and,
3) compare the performance and efficiency of Ordinary Least Squares (OLS) and Seemingly Unrelated Regression (SUR) models in estimating tourism demand across source countries.

METHODOLOGY

Research Design

This study utilizes a descriptive–correlational research design to examine the relationships between macroeconomic factors and international tourism arrivals in the Philippines. The descriptive component provides an analysis of trends and patterns in tourist arrivals and selected macroeconomic indicators over the study period. In contrast, the correlational component employs econometric modeling to estimate the magnitude and direction of relationships between tourism demand and key explanatory variables, including real per capita income, exchange rates, relative prices of goods and services, infrastructure expenditures, natural disasters, and crime rates.

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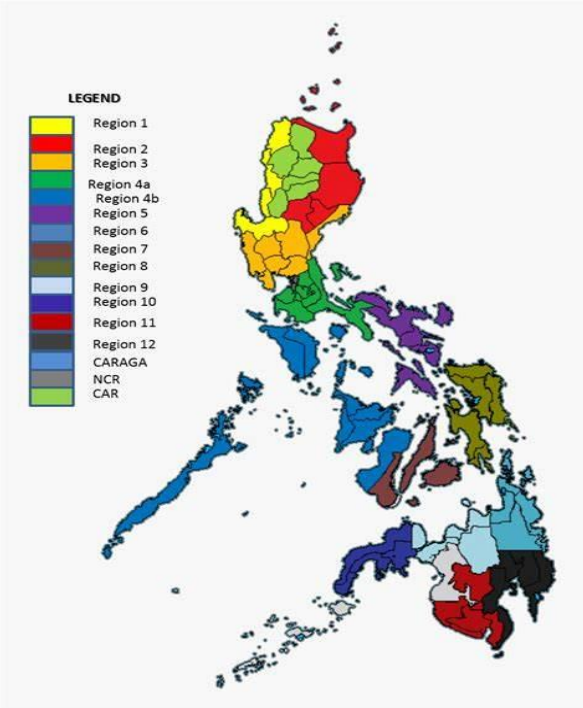
This research design enables a systematic assessment of how macroeconomic conditions influence tourism demand without manipulating the underlying variables, thereby preserving the observational nature of time-series data (Creswell & Creswell, 2017). It is particularly appropriate for identifying statistically significant associations and informing predictive insights in the context of tourism demand analysis.

Research Locale

The Philippines was chosen as the study location because it is a rich and diverse tourism destination. The country is one of the best tourist destinations in ASEAN, comprising 16 regions, 82 provinces, and 7,641 islands (Philippine Statistics Authority, 2023), which annually receive millions of visitors. The Philippines is known for its cultural heritage, clean beaches, diving spots, and colorful festivals, yet it has achieved international recognition. It received eight World Travel Awards in 2024, which underscores its growing role in the global tourism market (GMA News, 2024).

Figure 1

The map of the Philippine islands



Note: Adapted from *"Philippine Map High Resolution,"* by Emerson Carrie, 2020. Retrieved from Emerson Carrie's Blog. Copyright 2020 by the author.

Data Analysis

Descriptive Statistics

This research has utilized secondary statistics from 2007 to 2023, from the Philippine Statistics Authority, EM-DAT, Philippine Crime Rates Statistics, World Bank, Bangko Sentral ng Pilipinas, Department of Budget and Management, and Department of Tourism to acquire the inbound tourists' arrivals from South Korea, Australia, China, the United States, and Japan.

Statistical Methods

To achieve the third objective of the study, multiple linear regression (MLR) and seemingly unrelated regression (SUR) were used. These methods allow a comprehensive assessment of how independent variables, such as real per capita income, the relative price of goods and services, exchange rates, infrastructure expenditures, natural

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disasters, and crime rates, affect tourism flows from South Korea, Australia, Singapore, the United States, and Japan.

The Variables of the Study

Dependent Variable

International Tourist Arrivals from Top Five Source Countries refer to the annual number of inbound visitors to the Philippines originating from its major tourism markets—South Korea, the United States, Japan, China, and Australia. This variable serves as a proxy for tourism demand and reflects the overall attractiveness of the Philippines as a destination. It is influenced by both domestic and international economic conditions and non-economic factors, and is widely used as a key indicator of tourism inflows.

Independent Variables

Real Per Capita Income of the Origin Country

To obtain real GDP, nominal GDP is corrected for inflation by dividing it by the CPI. Real GDP is then divided by the population to obtain real income per capita. An increase in real income typically implies greater international mobility of residents; hence, this variable plays a significant role in the study of tourism flows to the Philippines (Ongan *et al*., 2017). The formula to calculate the Real GDP per Capita of the origin country is:

$$Y_{it} = \frac{\frac{GDP_{it}}{CPI_{it}}}{Total\ Population_{it}}$$

Where: Y_{it} = real income per capita of country i at time t

- GDP_{it} = Gross Domestic Product of the origin country at time t
- CPI_{it} = Consumer Price Index of country i at time t
- Total $Population_{it}$ = Population of the country i at time t

Related Price

The related price (P) is determined by the ratio of the Philippine Consumer Price Index (CPI) to the CPI of the origin country. This measure reflects the relative cost of goods and services between the two countries. A higher P value indicates that the cost of living in the Philippines is higher than in the country of origin, which may discourage inbound tourism due to higher travel and living costs. Conversely, a lower P value suggests that the Philippines offers a more affordable destination for tourists, making it more attractive for international travellers (Seetanah *et al*., 2015). The formula for the Related Price (P) between the Philippines and the origin country is:

$$P_{it} = \frac{CPI_{pht}}{CPI_{it}}\ x\ 100$$

Where: P_{it} = relative price faced by tourists from the country i at time t

CPI_{pht} = Consumer Price Index of the Philippines at time t

CPI_{it} = Consumer Price Index of the origin country at time t

The relative cost of tourism between a destination and a tourist-origin country is a key determinant of international tourism demand. In the tourism demand literature, price competitiveness is frequently proxied by relative consumer price levels because direct data on tourism-specific price indices are rarely available. Consumer price indices (CPIs) are widely used as proxies for the general cost of goods and services encountered by tourists in both destination and origin countries (Martin & Witt, 1987).

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While some studies incorporate exchange rate adjustments into price measures, this study models the exchange rate as a separate explanatory variable to avoid potential multicollinearity and to isolate the distinct effects of price levels and currency movements on tourism demand (Song & Witt, 2012).

Exchange Rate

The exchange rate is defined as the annual average bilateral nominal exchange rate, expressed as Philippine pesos per unit of the origin country's currency. It captures the effect of currency movements on tourists' purchasing power. A depreciation of the Philippine peso (i.e., higher exchange rate) makes the destination relatively cheaper for foreign visitors and is therefore expected to increase tourism demand.

$$ER_{it} = PHP\ per\ unit\ of\ currency\ of\ country\ i$$

Infrastructure Expenditures

Infrastructure expenditures refer to government spending on the development and maintenance of physical infrastructure that supports tourism activity, including transportation networks (e.g., roads, airports, seaports), utilities, and public services. This variable captures the extent to which a destination enhances accessibility, connectivity, and service quality for visitors. Improved infrastructure reduces travel costs, increases convenience, and enhances the overall tourist experience, thereby stimulating tourism demand.

Frequency of Natural Disasters

Frequency of natural disasters is defined as the annual number of recorded disaster events—such as typhoons, floods, earthquakes, and other extreme natural hazards—affecting the destination country. This variable reflects environmental risk and potential disruptions to tourism activity. A higher frequency of disasters can damage infrastructure, disrupt transportation, and reduce destination attractiveness, thereby discouraging international tourist arrivals.

Crime Rate

Crime rate refers to the number of reported criminal incidents within the destination country, typically measured per 100,000 population per year. It serves as a proxy for the safety and security conditions tourists face. Higher crime rates negatively influence destination image and perceived risk, which can deter both first-time and repeat visitors, ultimately reducing tourism demand.

Econometric Models

The OLS method was used to estimate the model's parameters. This method yields the smallest sum of squared vertical displacements between the observed values in the dataset and the regression model's estimates (minimizing the sum of squared deviations from the estimated regression line). Assumptions, for the parameter estimates to be BLUE (Best Linear Unbiased Estimator), are as follows:

a.) $E\ (\varepsilon_t) = 0$

This implies that the mean of the error terms is zero.

b.) $E\ (\varepsilon_t{}^2) = var\ (\varepsilon_t) = 0^2$

This is the property of homoscedasticity, meaning that the errors have a common variance.

c.) $Cov(\varepsilon_i, \varepsilon_j) = 0$ where $i \neq j$.

This is the property of no autocorrelation, meaning that no two error terms are serially correlated.

In this study, one of the key assumptions of the Ordinary Least Squares (OLS) method, specifically the

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assumption of no autocorrelation, was violated, justifying the use of alternative estimation techniques.

Having defined the variables, the full specification of the demand function of tourism in the Philippines is presented in the Linear form as:

$$TA_{it} = \beta_{oi} + \beta_{1i}X_{1i} + \beta_{2i}X_{2i} + \beta_{3i}X_{3i} + \beta_{4i}X_{4i} + \beta_{5i}X_{5i} + \beta_{6k}X_{6k} + \varepsilon_k \quad (1)$$

Where:

$TA_{i,t} =$ is the number of tourist arrivals from country i (i.e. South Korea, USA, Japan, China, and Australia) at year t.

$\beta_o =$ is the aggregate value of tourist arrivals in the Philippines when all other explanatory variables are equal to zero. In many cases, β_o has no clear economic interpretation, but it is always included in the model because it helps in the overall estimation and prediction.

$\beta_{1,} \ldots \beta_6 =$ are the coefficients of all the explanatory variables for country i, which are parameters of how much the change in value of the dependent variable when the value of an explanatory variable changes by its unit, holding other variables constant.

$Xit =$ represent the actual values of the five explanatory variables from country i at time t.

$\varepsilon_i =$ random error term of associated with the tourist arrivals from country i which are assumed to be normally distributed, with a mean of zero and constant variance.

For this study, i represents the country where:

i = 1 for South Korea i = 4 for China

i = 2 for Japan i = 5 for Australia

i = 3 for the United States of America

Seemingly Unrelated Regression (SUR) Estimation

The seemingly unrelated regression (SUR) model (Zellner, 1962) comprises a set of equations in which the error terms are correlated across equations. It is used when there are common factors that simultaneously influence all equations, leading to cross-correlations in the errors. To enhance efficiency and accuracy in the study, the SUR is applied to estimate tourism demand in South Korea, the USA, Japan, and Australia, which are the top five source countries. The Breusch-Pagan test is used to test for contemporaneous correlation; a high test statistic justifies the use of SUR rather than independent OLS models. The subscripts are used to represent variables and countries (J, C, U, A, K) in the coefficients (β). It is assumed that cross elasticities are zero. For the matrix equations (1) to (5), they can be written compactly as follows:

$$\begin{aligned} Y_k &= X_k\beta_k + \varepsilon_k \\ Y_j &= X_j\beta_j + \varepsilon j \\ Y_{usa} &= X_{usa}\beta_{usa} + \varepsilon_{usa} \quad (2) \\ Y_c &= X_c\beta_c + \varepsilon_c \\ Y_a &= X_a\beta_a + \varepsilon_a \end{aligned}$$

Where $Y_k, Y_j, Y_{usa}, Y_c, Y_a$ are (Tx1) vectors containing T observations on the logarithms of several tourist arrivals

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from South Korea, Japan, the USA, Singapore, and Australia, respectively. For this study, T=16, the total number of observations for each country.

If we consider X for Japan, we have:

$$X_j = \begin{bmatrix} 1 & \mathrm{InPCI_{1j}} & \mathrm{InRP_{1j}} & \mathrm{InER_{1j}} & \mathrm{InIE_{1j}} & \mathrm{InND_{1j}} & \mathrm{InCR_{1j}} \\ 1 & \mathrm{InPCI_{2j}} & \mathrm{InRP_{2j}} & \mathrm{InER_{2j}} & \mathrm{InIE_{2j}} & \mathrm{InND_{2j}} & \mathrm{InCR_{2j}} \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ 1 & \mathrm{InPCI_{tj}} & \mathrm{InRP_{tj}} & \mathrm{InER_{tj}} & \mathrm{InIE_{tj}} & \mathrm{InND_{tj}} & \mathrm{InCR_{tj}} \end{bmatrix} \quad (3)$$

(Description for Y_k, Y_{usa}, Y_s, Y_a Follow a similar description accordingly. The remaining matrices β_j and ε_j can be expanded as

$$\beta_i = \begin{bmatrix} \beta_{oj} \\ \beta_{1j} \\ \beta_{4j} \end{bmatrix}, \varepsilon_i = \begin{bmatrix} \varepsilon_{1j} \\ \varepsilon_{2j} \\ \varepsilon_{Tj} \end{bmatrix} \quad (4)$$

The system of equations in (5) could further be written compactly as:

$$Y = X\beta + \varepsilon \quad (5)$$

where:

$$Y = \begin{bmatrix} Y_k \\ Y_j \\ Y_{usa} \\ Y_c \\ Y_a \end{bmatrix}, X = \begin{bmatrix} X_k & 0 & 0 & 0 & 0 \\ 0 & X_j & 0 & 0 & 0 \\ 0 & 0 & X_{usa} & 0 & 0 \\ 0 & 0 & 0 & X_c & 0 \\ 0 & 0 & 0 & 0 & X_a \end{bmatrix}, \beta = \begin{bmatrix} \beta_k \\ \beta_j \\ \beta_{usa} \\ \beta_c \\ \beta_a \end{bmatrix}$$

The disturbance term is given by:

$$\varepsilon = \begin{bmatrix} \varepsilon_k \\ \varepsilon_j \\ \varepsilon_{usa} \\ \varepsilon_c \\ \varepsilon_a \end{bmatrix}$$

Hence, we can represent the four-equation "super model" in the environment of a single-equation linear model. For SUR estimation, the disturbance variance is time-invariant within each equation or country, but each equation may have a different variance (Judge *et al*., 1982).

However, the main characteristic of SUR is that disturbances across equations corresponding to the same period are positively correlated. This is what we refer to as "contemporaneous correlation". Wherever the disturbances come in different periods, whether in the same or different equations, they are uncorrelated. Otherwise, we can say that autocorrelation does not exist.

Testing for Contemporaneous Correlation

If contemporaneous correlation is absent, OLS for each equation, applied separately, is efficient in fullness, and using the seemingly unrelated regression estimator is unnecessary. Thus, one can test whether the contemporaneous covariances are zero. In this study, the null and alternative hypotheses for the contemporaneous correlation test are:

$$H_o: \sigma_{12} = \sigma_{13} = \sigma_{14} = \sigma_{23} = \sigma_{24} = \sigma_{34} = 0$$

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H_1: At least one covariance is non-zero.

Rejecting the null hypothesis implies there is a contemporaneous correlation and that the preference for SUR over OLS is justified.

Treatment of Infrastructure Expenditure Variable

Infrastructure expenditure was initially included in the model as a potential determinant of tourism performance, given its theoretical importance in supporting productive capacity, improving connectivity, and facilitating economic growth. The variable was constructed using annual government infrastructure expenditure data for the study period (17 observations). However, during the estimation of the Seemingly Unrelated Regression (SUR) system, the infrastructure variable produced a coefficient estimate that was effectively zero across all equations. This result showed that the variable did not have a measurable short-term effect on tourism arrivals within the study period. In addition, the relatively small sample size and the possibility that infrastructure investment influenced economic activity with longer time lags may have limited the model's ability to capture its short-run effects.

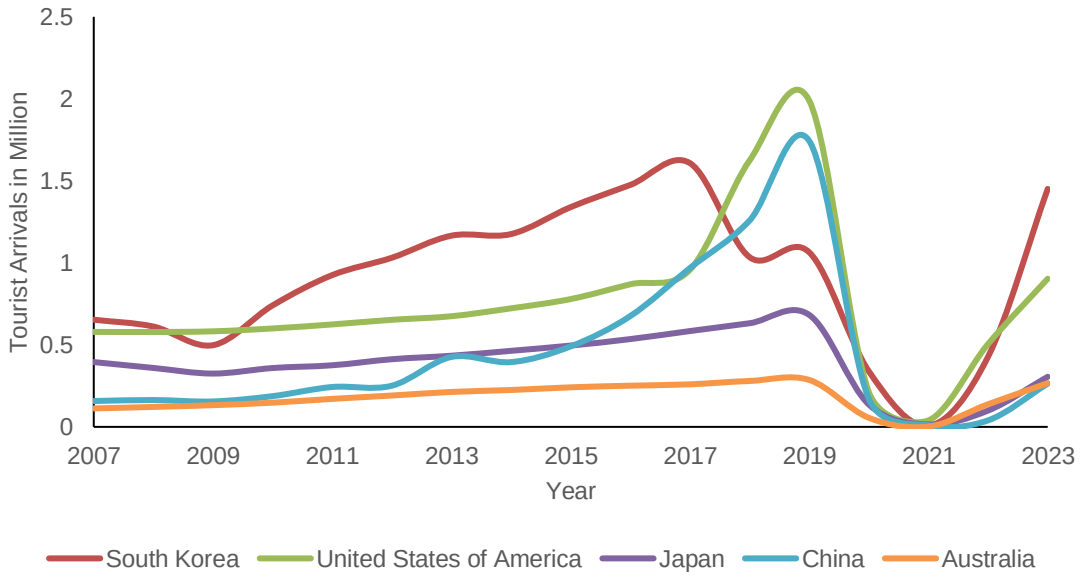
Consequently, the infrastructure expenditure variable was omitted from the final SUR estimation to improve model stability. The omission was not interpreted as evidence that infrastructure investment had no economic impact; rather, it indicated that its effects were indirectly captured through other included variables or materialized over longer horizons than those examined in the specification. This treatment ensured greater transparency in the model specification and enhanced the robustness of the estimated results.

RESULTS AND DISCUSSION

Tourism Arrivals in the Philippines from Top Visiting Countries, 2007 – 2023

Tourism plays a significant role in the Philippines' economic development, with international tourist arrivals serving as a key indicator of the country's performance and competitiveness in the global tourism market. Figure 2 presents the trends in tourist arrivals from the top five source markets—South Korea, the United States, Japan, China, and Australia—over the period 2007 to 2019.

Figure 2 Trends of Tourist Arrivals in the Philippines, 2007-2023



Note: Tourist arrival trends in the Philippines from 2007 to 2023 are based on data adapted from the Department of Tourism (DOT).

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The data reveal a sustained upward trend in arrivals across all five countries prior to the COVID-19 pandemic, indicating a period of expanding international demand for Philippine tourism. South Korea consistently remained the largest source market, with arrivals reaching approximately 1.98 million in 2019. The United States ranked second, exhibiting steady growth from 578,983 arrivals in 2007 to 1.62 million in 2018. China demonstrated the fastest growth among the top markets, with arrivals peaking at 1.74 million in 2017, underscoring the growing importance of emerging Asian markets. Japan followed with 682,788 arrivals in 2019, reflecting stable but moderate growth over time. Meanwhile, Australia recorded the fewest arrivals among the five countries, though it maintained a consistent upward trajectory—from 112,466 arrivals in 2007 to 286,170 in 2019. These trends underscore the Philippine tourism sector's growing reliance on a concentrated set of major source markets, particularly in Asia, prior to the pandemic. This pattern highlights both opportunities for market expansion and potential vulnerabilities associated with market concentration.

Descriptive Statistics of the Variables

Tourist arrivals to the Philippines are primarily driven by South Korea, with an average of 914,000 visitors, followed by the United States (750,000), China (446,990), Japan (388,820), and Australia, which records the lowest average arrivals.

Table 1

Descriptive Statistics of the Variables

Variable	Average	Minimum	Maximum
Arrivals			
South Korea	914520.00	6456.0	1607800.00
USA	758470.00	39326.00	1989300.00
Japan	388820.00	15024.0	682790.00
China	446990.00	9674.0	1743300.00
Australia	181950	2181	286170
Real Per Capita Income			
South Korea	296034.09	278856.42	312316.17
USA	517.76	471.43	569.51
Japan	40575.40	38032.71	41753.75
China	481.19	324.94	638.50
Australia	42809.81	14469.27	107346.81
Related Price			
South Korea	279852.35	172900	363130
USA	244.67	185.36	279.85
Japan	25356.82	5138	39004
China	1626.78	1378.3	1966.8
Australia	307.64	221.86	418.62

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Exchange Rate			
South Korea	0.04	0.04	0.05
USA	47.76	42.22	55.63
Japan	0.54	0.38	1.95
China	7.17	6.05	8.09
Australia	38.47	34.14	44.72
Infrastructure Expenditure	305711049235	2314154000	893121040000
Natural Disaster	10.41	4	16
Crime Rates	8.15	4.32	10.84

Note: The Author's calculation is based on the collected data.

This pattern indicates that South Korea and the United States serve as stable, high-volume source markets, while China and Japan contribute moderately, and Australia remains a relatively underexploited market segment. In terms of economic capacity, real per capita income is highest in South Korea (296,034.09), followed by Australia (42,809.81) and Japan (40,575.40), while comparatively lower values are observed for China (481.19) and the United States (517.76). These differences support the theoretical expectation that higher income levels enhance the capacity for international travel (Adeleye et al., 2022). Relative price indicators suggest that the Philippines is relatively more expensive for tourists from South Korea (279,852.35), Japan (25,356.82), and China (1,626.78), while it remains more price-competitive for visitors from Australia (307.64) and the United States (244.67). This finding is consistent with the notion that price competitiveness plays a critical role in destination choice (Radukic et al., 2023). Exchange rate averages further highlight differences in purchasing power, with higher values observed for the United States (47.76) and Australia (38.47), compared to China (7.17), Japan (0.54), and South Korea (0.04). These variations suggest differing cost advantages for tourists across origin countries, reinforcing the importance of currency movements in shaping tourism demand (Suh & Kim, 2018). On the supply side, infrastructure expenditure averages 305.71 billion, reflecting sustained government investment in facilities and services that support tourism development (Catudan, 2016). Meanwhile, the average frequency of natural disasters is 10.41, indicating moderate exposure to environmental risks that may affect tourism stability (Etulle-Tapanan, 2015). The average crime rate of 8.15 suggests moderate safety concerns, which remain an important consideration in shaping tourists' destination preferences.

OLS and Seemingly Unrelated Regression Results and Interpretation

A series of diagnostic tests was conducted to assess the validity of the Ordinary Least Squares (OLS) assumptions. Given the time-series nature of the data, serial correlation is a primary concern. The Durbin–Watson test results indicate positive autocorrelation across all five country-specific models, as reported in Table 2. This suggests a violation of the OLS assumption of no serial correlation, leading to the rejection of the null hypothesis of independent error terms. In contrast, the results of the Breusch–Pagan, White's, and Park tests consistently show no evidence of heteroskedasticity across all models, indicating that the homoskedasticity assumption is satisfied.

Table 2 Diagnostic Test Results for OLS Assumptions Across Country Models

Country	Autocorrelation (Durbin-Watson)		Heteroskedasticity Tests		
	Positive	Negative	Breusch-Pagan-style test	White's test	Park Test
South Korea	0.03^{ns}	0.96*	0.18*	0.18*	0.19*

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USA	0.00^{ns}	0.99*	0.10*	0.09*	0.14*
Japan	0.01^{ns}	0.99*	0.38*	0.34*	0.51*
China	0.00^{ns}	0.98*	0.10*	0.13*	0.19*
Australia	0.00^{ns}	0.99*	0.76*	0.60*	0.95*

* Satisfied

ns – not satisfied (Violated the Assumptions)

Given the presence of autocorrelation in the country-specific models, a test for contemporaneous correlation was conducted. The Breusch–Pagan test results indicate statistically significant cross-equation error correlation (p-value < 0.05), as reported in Table 3. This finding confirms that the error terms across the five country models are interdependent, thereby justifying the use of Seemingly Unrelated Regression (SUR).

Table 3 Diagnostic Test Results for Seemingly Unrelated Regression (SUR)

Test Type	Test Statistic	Degrees of Freedom (df)	p-value
Breusch-Pagan LM Test for Diagonal Covariance Matrix	101.94	10	0.0005

Table 4 presents the estimation results of Ordinary Least Squares (OLS) and Seemingly Unrelated Regression (SUR) models examining the relationship between macroeconomic indicators and international tourist arrivals to the Philippines from its primary source markets—South Korea, the United States, Japan, China, and Australia. The dependent variable is tourist arrivals, while the explanatory variables include real per capita income, relative price, exchange rate, infrastructure expenditure, frequency of natural disasters, and crime rate. OLS estimation is limited in this context as it assumes independence across equations and fails to account for correlated disturbances among countries. However, diagnostic results suggest the presence of both serial correlation and contemporaneous correlation, likely arising from shared global shocks and common economic conditions affecting multiple source markets simultaneously (Wooldridge, 2016; Gujarati, 2009). To address these limitations, the study employs Seemingly Unrelated Regression (SUR), which explicitly models cross-equation error correlations. Following Zellner's (1962) framework, SUR yields more efficient and consistent parameter estimates than OLS, thereby enabling a more reliable assessment of the macroeconomic determinnts of tourism demand across countries.

Table 4 OLS and SUR Estimates for Tourism Demand in the Philippines

Variable	Coefficient Estimates by Country									
	Ordinary Least Squares					Seemingly Unrelated Regression				
	South Korea	USA	Japan	China	Australia	South Korea	USA	Japan	China	Australia
INC	-16,152,000^{ns} *(19,980,000)*	3,358,700^{ns} *(17,240,000)*	4,684,600^{ns} *(4,239,000)*	58,759^{ns} *(114,900)*	-11,301^{ns} *(107,300)*	12.85^{ns} *(14.71)*	11,008^{ns} *(8571)*	107.54* *(36.31)*	13,012* *(4,579)*	-0.68^{ns} *(0.85)*

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RP	3,166,900^{ns} *(3,370,000)*	1,122,700^{ns} *(770700)*	21,903^{ns} *(271,300)*	122,840^{ns} *(128,000)*	730,380^{ns} *(752,600)*	6.17^{ns} *(4.33)*	12,216* *(6,299)*	19.77** *(11.06)*	-3,504.90** *(1,922)*	1,854.5* *(630.1)*
EX	5,551,200^{ns} *(6,440,000)*	8,180,700^{ns} *(8,855,000)*	-50,290^{ns} *(42,950)*	-871,360^{ns} *(492,000)*	686,790^{ns} *(1,098,000)*	18,245,000^{ns} *(40,400,000)*	81,841* *(35,800)*	438,860* *(186,800)*	-777,280** *(454,900)*	8,678.4^{ns} *(7,802)*
INF	-216.57^{ns} *(151,000)*	176,450^{ns} *(102,000)*	2337.7^{ns} *(44,460)*	98,197^{ns} *(104,300)*	8140.9^{ns} *(25,870)*	0.00* *(0.00)*	0.00* *(0.00)*	0.00* *(0.00)*	0.00* *(0.00)*	0.00* *(0.00)*
DIS	27,986^{ns} *(698,200)*	107,430^{ns} *(379,900)*	494,250^{ns} *(320,800)*	231,530^{ns} *(338,100)*	41,957 ^{ns} *(87,550)*	33,428^{ns} *(36,910)*	48,886** *(28,880)*	43,217* *(13,490)*	47,256** *(25,310)*	8,315.7^{ns} *(5,688)*
CRI	-587,690^{ns} *(1,534,000)*	-4,052,900* *(1,257,000)*	-570,990^{ns} *(483,800)*	-3,435,900** (792,800)	-362,330^{ns} *(231,000)*	77,927^{ns} *(68,430)*	-43,853^{ns} *(59,500)*	-2,933.7^{ns} *(14,130)*	-67,114** *(38,200)*	6,927.9^{ns} *(8,972)*
_cons.	86,563,000^{ns} *(109,100,000)*	-21,233,000^{ns} *(63,260,000)*	-21,212,000^{ns} *(19,830,000)*	2,099,400** *(104,300)*	-1,017,700 *(2,213,000)*	-5,980,300^{ns} *(4,836,000)*	-11,647,000** *(6,980,000)*	-4,968,800* *(1,535,000)*	5,845,500^{ns} *(3,694,000)*	-734560** *(443,000)*
R^2	0.45	0.69	0.71	0.80	0.49	0.26	0.50	0.67	0.64	0.37
σ^2	*418,160*	*323,690*	*124,190*	*267,380*	*73,799*	*372,820*	*316,010*	*100,380*	270,840	62,971
								System R^2	0.96	

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Values in parentheses are the standard error of the coefficient

Note: INC is income INF is infrastructure expenditure

* Significant at 5%,

** Significant at 10%

RP is relative price

DIS is natural disaster of disaster

ns – not significant at the 5% and 10% level of significance

EX is the exchange rate

CRI is the crime rate

Interpretation of Estimates for Real Per Capita Income for the Philippines' Top Visiting Countries

Real per capita income captures the purchasing power of tourists in the origin country and is expected to positively influence outbound travel. The SUR estimates indicate that income has a positive and statistically significant effect on tourist arrivals from Japan (107.54) and China (13,012), while the coefficients for South Korea (12.85), the United States (11,008), and Australia (-0.68) are statistically insignificant.

Under a linear specification, the coefficients imply that a one-unit increase in real per capita income is associated with approximately 108 additional arrivals from Japan and 13,012 additional arrivals from China, holding other factors constant. The absence of significance for South Korea and the United States suggests that tourism demand from these mature markets may be less sensitive to income changes, possibly due to already high travel propensity or saturation effects.

Consistent with tourism demand theory, these findings support the view that tourism is a normal good and, in some cases, a luxury good, particularly in emerging markets (Lim et al., 2008). The findings support the view that tourism demand responds to income growth, particularly in markets where outbound travel is still expanding.

Interpretation of Estimates for Relative Price for the Philippines' Top Visiting Countries

The relative price reflects the Philippines' cost competitiveness relative to the origin countries. The SUR results show that the relative price is statistically significant for the United States (12,216), Japan (19.77), China (-3,504.90), and Australia (1,854.5), but insignificant for South Korea.

The negative and significant coefficient for China is consistent with economic theory, indicating that an increase in relative prices (i.e., the Philippines becoming more expensive) reduces tourist arrivals. Specifically, a one-unit increase in relative price is associated with a decrease of approximately 3,505 Chinese tourists, ceteris paribus.

In contrast, the positive coefficients for the United States, Japan, and Australia suggest that higher relative prices are associated with increased arrivals. This counterintuitive result may reflect inelastic demand, strong destination preferences, or the influence of omitted factors such as tourism promotion, diaspora ties, or travel bundling (e.g., package tours), which may offset price effects.

These findings indicate that price sensitivity varies across markets, with China appearing more responsive to cost conditions than other source countries.

Interpretation of Estimates for Infrastructure Expenditure for the Philippines' Top Visiting Countries

Infrastructure expenditure has a positive, statistically significant effect across all countries, though the magnitude

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is relatively small. In a linear framework, the coefficients indicate that increases in government spending on infrastructure are associated with incremental increases in tourist arrivals.

This suggests that improvements in transportation, utilities, and tourism-related facilities enhance accessibility and overall visitor experience, thereby supporting tourism demand. The consistency of significance across all markets underscores the importance of sustained infrastructure investment in strengthening tourism competitiveness.

Interpretation of Estimates for the Exchange Rate for the Philippines' Top Visiting Countries

The exchange rate influences tourism demand by affecting tourists' purchasing power. The SUR estimates reveal that exchange rate effects are positive and significant for the United States (81,841) and Japan (438,860). This implies that a depreciation of the Philippine peso (i.e., an increase in the exchange rate) makes the destination more affordable and is associated with higher tourist arrivals.

In contrast, the coefficient for China (-777,280) is negative and significant, indicating that peso depreciation is associated with a decline in Chinese arrivals. This result suggests that exchange rate effects are market-specific and may reflect differences in travel behavior, policy constraints, or substitution patterns across destinations.

The coefficients for South Korea and Australia are not statistically significant, suggesting that exchange rate movements do not decisively influence tourism demand from these countries.

These findings are consistent with prior studies emphasizing that exchange rate effects are country-specific and context-dependent (Yap, 2013).

Interpretation of Estimates for the Natural Disaster for the Philippines' Top Visiting Countries

Natural disasters—such as typhoons, earthquakes, and floods—are generally expected to reduce tourism demand due to travel disruptions and infrastructure damage (Rosselló et al., 2020; Ritchie, 2004). However, the SUR estimates indicate positive and statistically significant coefficients for the United States (48,886), Japan (43,217), and China (47,256), while the effects for South Korea (33,428) and Australia (8,315.7) are statistically insignificant.

In a linear specification, these estimates imply that an additional recorded disaster event within a year is associated with higher arrivals from the United States, Japan, and China, holding other factors constant. This counterintuitive result should not be interpreted as disasters promoting tourism. Rather, it likely reflects temporal aggregation effects and demand resilience—that is, annual tourist arrivals may remain strong or recover within the same period despite short-term disruptions.

Several mechanisms may explain this pattern. First, the use of annual data may mask short-lived declines immediately after disaster events, as recovery and reconstruction activities, as well as intensified tourism promotion, can offset initial losses within the year. Second, major source markets may exhibit low sensitivity to short-term shocks, particularly when travel plans are pre-booked or when alternative destinations are limited. Third, the Philippines' tourism sector may demonstrate some structural resilience, allowing it to absorb and recover from environmental shocks without substantial long-term declines in arrivals.

The statistically insignificant results for South Korea and Australia further suggest that natural disasters do not exert a measurable effect on tourism demand from these markets. This may reflect differences in risk perception, travel behavior, or information processing across nationalities (Reisinger & Mavondo, 2005).

The findings indicate that the impact of natural disasters on tourism demand is heterogeneous and context-dependent, and that their adverse effects may be short-term and not fully captured in annual aggregate data.

Interpretation of Estimates for the Crime Rates for the Philippines' Top Visiting Countries

Crime rates are an important determinant of tourism demand, as they shape perceived risk and destination image,

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which in turn influence travel decisions. The SUR estimates indicate that crime has a negative, statistically significant effect only in China (−67,114), while the coefficients for the United States (−43,853), Japan (2,933.7), South Korea (77,927), and Australia (6,927.9) are statistically insignificant.

In a linear framework, this implies that an increase in crime is associated with a reduction in tourist arrivals from China, holding other factors constant. In contrast, the absence of statistical significance for the other countries suggests that crime does not exert a measurable effect on tourism demand from these markets during the study period.

These findings are consistent with the tourism risk literature, which emphasizes that perceived risk, rather than objective crime levels alone, drives tourist behavior (Reisinger & Mavondo, 2005; Karl, 2018). Empirical evidence further shows that safety perception plays a critical role in shaping destination image and travel intention, with higher perceived insecurity reducing tourism demand (Ding & Wu, 2022).

The cross-country differences observed in the results highlight heterogeneity in risk sensitivity across source markets. Tourists from the United States, Japan, South Korea, and Australia may be less responsive to marginal changes in crime due to risk-mitigating strategies, such as organized travel, pre-arranged itineraries, and reliance on official travel advisories. Additionally, these tourists may already incorporate baseline safety conditions into their destination choices, making short-term fluctuations in crime less influential.

In contrast, the significant negative response among Chinese tourists may reflect greater sensitivity to safety concerns or stronger influence from external information channels, such as media coverage and travel networks. From a theoretical perspective, this behavior is consistent with expected utility theory, wherein tourists evaluate destinations by weighing expected benefits against perceived risks.

Test for Equality of Coefficients Per Country

To further validate the results, a Wald test was conducted to assess whether the estimated coefficients of each explanatory variable are statistically equal across the five source-country equations within the Seemingly Unrelated Regression (SUR) framework. Specifically, the test evaluates the null hypothesis that the coefficients for a given variable (e.g., real per capita income, relative price, exchange rate) are identical across all countries—South Korea, the United States, Japan, China, and Australia.

As reported in Table 5, the Wald test provides a formal basis for determining whether macroeconomic determinants exert homogeneous or heterogeneous effects on international tourist arrivals. Rejection of the null hypothesis indicates that the impact of a given variable differs significantly across source markets, thereby supporting the presence of cross-country heterogeneity in tourism demand.

Table 5 Wald Tests for Equality of Coefficients Across SUR Equations

Test of Parameter Equality Across Equations	Wald Chi-Square Statistic	P-Value
INC South Korea=USA=China=Japan=Australia	19.438*	0.000
RP South Korea=USA=China=Japan=Australia	16.996*	0.001
EX South Korea=USA=China=Japan=Australia	12.419*	0.014
INF South Korea=USA=China=Japan=Australia	6.280^{ns}	0.179
DIS South Korea=USA=China=Japan=Australia	8.936**	0.063
CRI South Korea=USA=China=Japan=Australia	5.519^{ns}	0.238

* Significant at 5%, ** Significant at 10%

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ns – not significant at the 5% level of significance

The Wald tests for equality of coefficients across the SUR equations reveal significant cross-country differences in how macroeconomic determinants influence international tourist arrivals to the Philippines. At the 5 percent significance level, the null hypothesis of equal coefficients is rejected for real per capita income, relative price, and exchange rate, indicating that these variables exert heterogeneous effects across the five source markets.

This implies that tourists from South Korea, the United States, China, Japan, and Australia respond differently to changes in income, cost conditions, and currency movements. For instance, the results suggest that the sensitivity of tourism demand to income and exchange rate fluctuations varies across countries, reflecting differences in purchasing power, travel behavior, and market characteristics.

Similarly, the effects of infrastructure expenditure are not uniform across countries, indicating that improvements in tourism-related facilities—such as airports, transportation systems, and accommodations—benefit source markets to varying degrees. In contrast, natural disasters exhibit weaker cross-country differences, with the null hypothesis rejected only at the 10 percent level, suggesting more limited heterogeneity in their impact. Finally, the Wald test indicates that crime rates do not differ significantly across countries. This suggests that the effect of crime on tourism demand is relatively uniform across source markets, although this should not be interpreted as evidence that all tourists perceive the Philippines as uniformly safe. Rather, it indicates that cross-country differences in responsiveness to crime are not statistically distinguishable within the model.

Testing for Contemporaneous Correlation

To test whether or not there is a reason to prefer SUR over OLS (i.e., whether contemporaneous correlation exists or not), the study proceeded with the following hypothesis:

$$H_o: \sigma_{12} = \sigma_{13} = \sigma_{14} = \sigma_{23} = \sigma_{24} = \sigma_{34} = 0$$

$$H_1: \text{At least one covariance is non-zero.}$$

The test statistic given as a Lagrange Multiplier statistic, suggested by Breusch and Pagan (1980), is written as:

$\lambda = T\ (r_{12}^2 + r_{13}^2 + r_{14}^2 + r_{15}^2 + r_{23}^2 + r_{24}^2 + r_{25}^2 + r_{34}^2 + r_{35}^2 + r_{45}^2)$ or $\lambda = T\ \sum_{i<j} r_{ij}^2$

Given the OLS residual covariance matrix, which gives the variances (diagonal) and covariances (off-diagonal) to compute each residual correlation, written as:

$$r_{ij} = cov_{ij}/\sqrt{var_i var_j}$$

Where under H_o, λ Has an x^2 distribution with 3 degrees of freedom (In general, the degrees of freedom are equal to N(N-1) where N is the number of equations.)

The test obtained

$$\lambda = 17(0.4242955 + 0.2839086 + 0.3732883 + 0.7371199 + 0.5197286 + 0.9101933 + 0.8433128 + 0.6143392 + 0.5481716 + 0.7424745)$$

$$= 17\ (5.99683)$$

$$\lambda = 101.94$$

With a critical value of $x^2_{(0.05,10)} \approx 18.31$. Since 101.94 > 18.31, the null hypothesis of no contemporaneous correlation is rejected. Rejecting the null hypothesis implies there is contemporaneous correlation; hence, SUR is preferred over separate OLS.

The value of the Breusch-Pagan Lagrange Multiplier (LM) test is 101.94, which is considerably greater than the

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critical chi-square value of 18.31 under 10 degrees of freedom. The result of the Breusch Pagan test shows that there is a high contemporaneous correlation between the five countries, and this indicates that tourism behaviour is interdependent in the five countries. This implies that changes in the arrival of tourists in one market are likely to be accompanied by changes in other markets. There are global shocks, such as economic downturns or pandemics, that affect all countries simultaneously. But the closest connection is between South Korea and China, which is reactive to changes in price and exchange rates. The moderate linkages among the U.S., Japan, and Australia are also evident in perceptions of cost and safety. These tendencies align with the tourism interdependence theory, which emphasizes the impact of the global environment on travel demand. Thus, the SUR model should be used to analyze multiple countries, with the null hypothesis rejected.

LIMITATIONS OF THE STUDY

Despite its contributions, this study is subject to several limitations. First, the analysis relies on a relatively small time-series dataset spanning 2007 to 2023. While this period captures important events, including the COVID-19 pandemic, the limited number of observations may reduce the statistical power of the estimates and constrain the robustness of inference.

Second, the model focuses primarily on macroeconomic determinants and does not account for other relevant factors that may influence tourism demand, such as air connectivity, visa policies, tourism marketing expenditure, and digital promotion. Excluding these variables may lead to omitted-variable bias, potentially affecting the estimated relationships.

Third, the presence of major structural shocks—most notably the COVID-19 pandemic—may introduce structural breaks in the time series that are not fully captured within the current modeling framework. As a result, the estimated relationships may not fully reflect changes in tourism behavior during periods of disruption.

Fourth, although the Seemingly Unrelated Regression (SUR) approach accounts for contemporaneous cross-country correlation, it does not explicitly model dynamic adjustments or long-run equilibrium relationships, which may be important in tourism demand analysis.

Future research may address these limitations by incorporating a broader set of explanatory variables, utilizing higher-frequency data (e.g., quarterly or monthly), and applying dynamic econometric techniques—such as Autoregressive Distributed Lag (ARDL) or Vector Error Correction Models (VECM)—to better capture both short-run dynamics and long-run relationships in tourism demand.

CONCLUSION

This study demonstrates that key macroeconomic variables play an important role in explaining international tourist arrivals to the Philippines. The application of Seemingly Unrelated Regression (SUR) yields more efficient and reliable estimates than Ordinary Least Squares (OLS), given the presence of contemporaneous correlation across country-specific equations.

The empirical results reveal that real per capita income significantly influences tourist arrivals from Japan and China, indicating that income-driven demand is more pronounced in these markets. The relative price is found to be a significant determinant in Australia, Japan, and the United States, highlighting the role of cost competitiveness in shaping tourism flows. Meanwhile, the exchange rate exerts a positive and significant effect on arrivals from the United States and Japan, suggesting that currency depreciation enhances the Philippines' attractiveness as a destination.

In addition, infrastructure development shows a generally positive association with tourism demand, underscoring the importance of sustained investment in tourism-supporting facilities. The results for natural disasters indicate that their impact is not uniformly negative; while disruptions may occur in the short run, tourism demand appears resilient over time, reflecting recovery dynamics and adaptive capacity. Crime rate, on the other hand, negatively affects tourism demand, though its impact varies across source markets.

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This study confirms that tourism demand in the Philippines is sensitive to macroeconomic conditions and that these effects are heterogeneous across major source countries. The presence of contemporaneous correlation further highlights the interconnected nature of tourism demand across markets, reinforcing the suitability of the SUR framework for this analysis.

RECOMMENDATIONS

Based on the findings of this study, several policy and research recommendations are proposed to enhance the performance and resilience of the Philippine tourism industry.

First, the Department of Tourism, in coordination with relevant government agencies and private sector stakeholders, should strengthen the country's price competitiveness. This may be achieved through the development of affordable yet high-quality tourism packages, the promotion of bundled services, and the provision of targeted discounts or incentives during periods of economic slowdown. Such measures can help sustain demand, particularly in price-sensitive markets.

Second, the government should prioritize sustained investments in tourism-supporting infrastructure, including modernizing airports, improving transport connectivity, and upgrading digital and public service facilities. Enhancing infrastructure is essential for improving accessibility, service quality, and overall visitor experience, thereby increasing the country's attractiveness as a tourism destination.

Third, ensuring safety and security remains critical. Strengthening law enforcement, improving tourist protection mechanisms, and implementing effective communication strategies that promote the Philippines as a safe destination are essential in maintaining positive destination image and visitor confidence.

Fourth, policymakers should adopt a market-specific approach to tourism development, recognizing that source countries respond differently to macroeconomic conditions such as income, prices, and exchange rates. Tailored marketing strategies and targeted interventions can therefore be designed to better align with each market's preferences and sensitivities.

Finally, future research should expand the scope of analysis by incorporating shock-sensitive and structural variables, such as pandemics, geopolitical risks, flight connectivity, visa facilitation, tourism promotion, and digital infrastructure. Researchers are also encouraged to adopt dynamic econometric approaches, including Autoregressive Distributed Lag (ARDL) and Vector Error Correction Models (VECM), to capture both short-run adjustments and long-run relationships in tourism demand. In addition, the use of primary data collection methods—such as surveys, interviews, or digital tracking—can provide deeper insights into tourist behavior, preferences, and spending patterns.

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