University of the Basque Country UPV/EHU

Master in Economics: Empirical Applications and Policies


# An Analysis of the Tourism Demand in the Dominican Republic
From 2001 to 2021

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**Abstract**

In this study, we estimate the tourism demand elasticities model by income and prices in the Dominican Republic from the top ten leading countries in tourism, from the first quarter of 2001 to the last quarter of 2021. The tourism demand is measured by tourist arrivals, tourism prices, the source country's real GDP, tourism price in the substitute destination ─Mexico─ and structural breaks; the model are estimated jointly and separately for the primary source countries using the dynamic common correlated effect estimator and the Autoregressive-Distributed Lag (ARDL) bound testing approach to cointegration in the presence of structural breaks. We found that the demand for the Dominican Republic's tourism is income elastic and price inelastic for the top ten countries.

*Keywords*: tourism demand, ARDL approach; elasticities.

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# 1. Introduction

The geographic and strategic location of the Dominican Republic, in addition to the tropical weather, its beautiful beaches, and its natural resources, are the characteristics that make the Dominican Republic one of the most preferred countries for tourists. It has become one of the most preferred destinations in the Caribbean region in the last two decades. Additionally, the Dominican Republic remains within the 50$^{th}$ position of the rank of international visitors' arrivals from the world tourism barometer of the World Tourism Organization. The organization sustains that the positive results are a consequence of the increase in air connectivity, market diversification, and marketing activities. (World Tourism Organization, 2019)

Tourism has become one of the sectors of the economy with an important contribution to the Gross Domestic Product (GDP). On average, hotels, bars, and restaurants represent 7.5% of the GDP of the Dominican Republic for the period 2010-2019, one of the top seven sectors with the highest fractions of the GDP. This sector has, on average, a year-over-year growth of 5.68% for the period in analysis. From 2010 to 2021, tourism services contributed US$64,920 million to the balance of services; this amount is equivalent to 78% of the credit of the balance of services and, 32% of the credit of the good and services' balance with year-over-year growth of 7.7%.

From 2010 to 2021 Dominican Republic has almost 52 million tourists by air from different countries worldwide. More than half of these tourists arrived from North America, 54.5%, other 26.55% from Europe and 12.57% from South America, and the rest from other parts of the world. Tourism has contributed US$6,407 million in Foreign Direct Investment (FDI), equivalent to 22% of all the foreign direct investment in the Dominican Republic from 2010 to 2021, the second sector with higher contributions to the FDI.

In order to know how tourists react to changes in the leading economic variables such as income and price; the primary goal of this study is to estimate the price and income elasticity of demand for tourism to the Dominican Republic, considering jointly and separately the major international source markets from 2001 to 2021; with data from the

Central Bank and Ministry of Tourism of the Dominican Republic and the International Monetary Fund.

To obtain the income and price elasticity of the demand for tourism to the Dominican Republic, we use the Autoregressive-Distributed Lag (ARDL) bound testing approach to cointegration in the presence of structural breaks (Pesaran et al., 2001) for each major country. To estimate the elasticities jointly for the countries, we will estimate a dynamic common-correlated effect estimator – pooled mean group (CS-ECM).

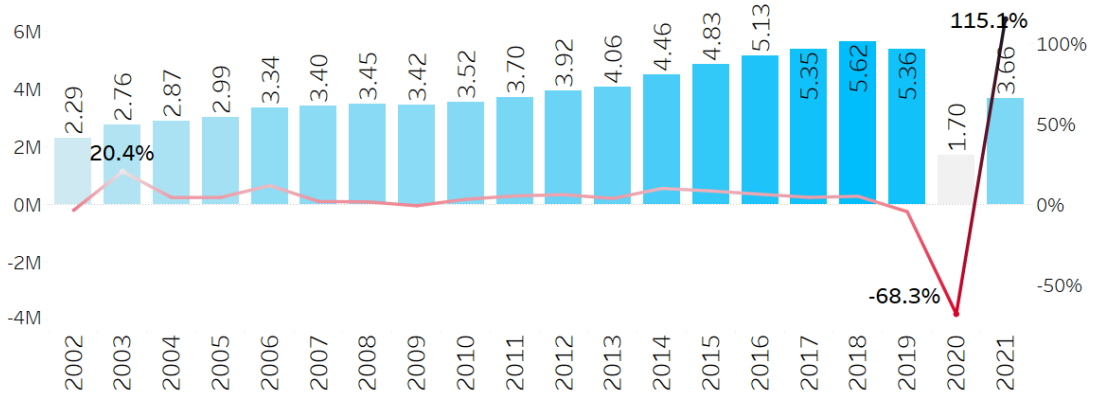
Section 1 presents a summary of the international inbound to the Dominican Republic, then Section 2 presents a literature review on estimating the price and demand elasticity of tourism demand, in the analyzed period. Section 3 explains in detail the methodology implemented, then Section 4 describes the data and the tests performed that allow us to apply the selected methodology and Sections 5 and 6 concludes with the results and conclusions, respectively.

## 2. Inbound Tourism in the Dominican Republic

According to the data from the Central Bank of the Dominican Republic, from 2001 to 2021, the Dominican Republic has received almost 79 million tourists by air, with an average year-over-year growth of 4.7% in the analyzed period, as shown in Figure 1. In 2003 arrivals increased by 20.4% compared to the previous year, the highest rise experienced in this interval, followed by the rise of 11.6% in 2006 and 9.8% in 2014.

From the third quarter of 2019, tourists' arrivals decreased given to some adverse situations related to tourism and ended the year with a reduction of 4.6% concerning 2018. Then in 2020, due to the Covid-19 pandemic and the measures taken worldwide to mitigate the virus, the inbound tourism in the Dominican Republic decreased by 68.3%.

**Figure 1. Tourist arrivals**
(By air, million, year over year growth)

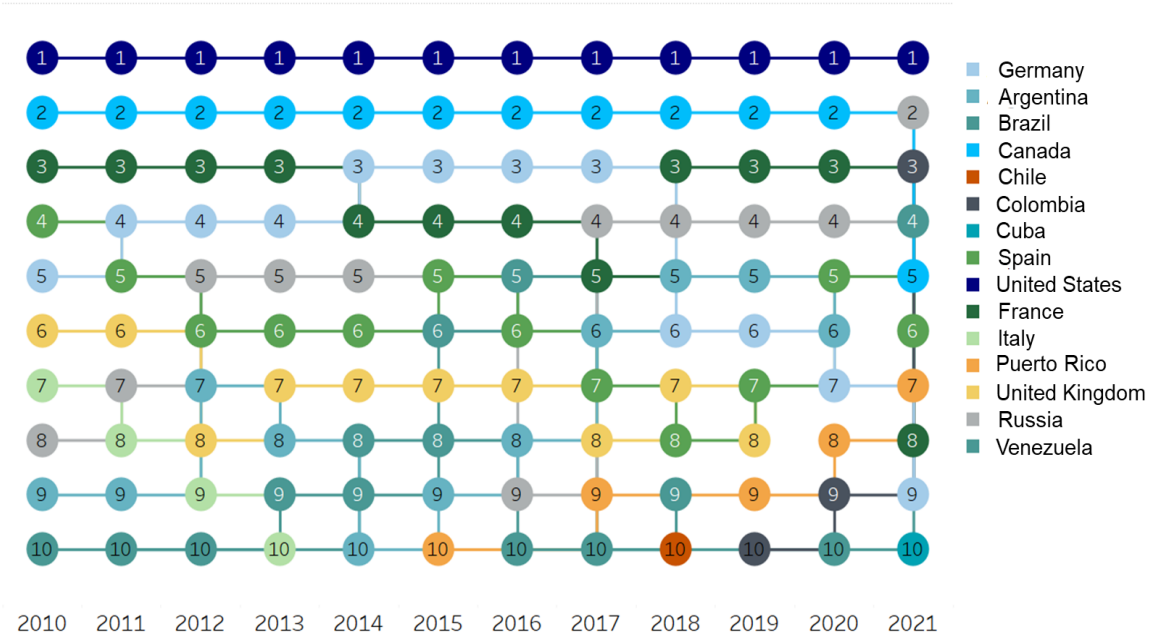



Source: Own elaboration based on data from the Central Bank of the Dominican Republic.

The evolution of the top 15 major source countries is seen in Figure 2; the United States maintains its position in the first place from 2010 to 2021, followed by Canada, which remains in the second position rank until 2020. In 2021, Canada's position moved down to the fifth spot due to the measurement executed to restrict international flow to mitigate the propagation of Covid-19. Russia started in the eighth position in 2012 and then escalated to fifth place from 2012 to 2014. In 2015, Russia left the rank and reentered in 2016 at ninth place. From 2017 onwards, the country retained its fourth position until 2021, when Russia ranked second.

In 2010 United States led the top emissary country list with 34.8% of the total arrivals, followed by Canada with 18.7%, and France and Spain with 6.9% and 5.4%, respectively. These top four emissary countries captured 65.8% of the total. In 2019 Puerto Rico and Colombia appeared in the top 10 emissary countries, while the United States, Canada, and France remain in the first three positions with 58.2% of the total arrivals. Russia and Argentina positioned upwards in 2010, and Germany, Spain, and United Kingdom fell downward.

**Figure 2. Rank tourist arrivals**
(By country of origin, top 15, air inbounds)

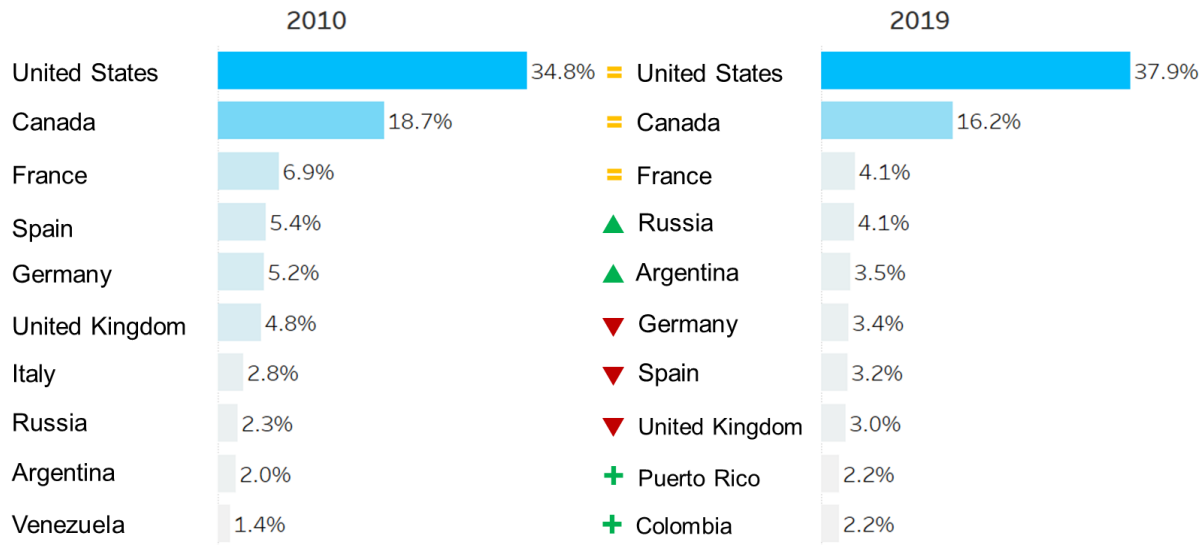



Source: Own elaboration based on data from the Central Bank of the Dominican Republic.

From 2010 to 2011, 52.2% of the arrivals were from North America, 32.2% from Europe, 10.0% from South America, and the rest from other regions. The United States is home to most tourists who travel to the Dominican Republic, making up 39% of the total tourist arrivals, followed by Canada with 15.5%, France with 4.95%, and Germany capturing 4.48% of the total, followed by Russia with 3.69%.

According to the Civil Aviation Board of the Dominican Republic, from 2010 to 2021, the Dominican Republic received more than 547,000 inbound flights ─charter and regular─ with an average year-over-year growth of 4.4% from 2010 to 2019. In 2010 the Dominican Republic was connected by air with 58 countries, increasing to 70 in 2021. Bolivia, Bulgaria, Dominica, Slovakia, Greenland, Ukraine, and Uruguay are some of the countries that incorporate flights to the Dominican Republic ─comparing 2021 with 2010─.

**Figure 3. Tourist Arrivals**
(% of the total, 2010 & 2019, top 10)




Source: Own elaboration based on data from the Central Bank of the Dominican Republic.

Similarly, the Dominican Republic was connected with 241 airports worldwide in 2010. This number rose 23% in 2021 with 297 airports; 39.8% of the airports were located in North America in 2010, and this proportion grew to 48.1% in 2021. Also increases the number of airports connected with the Dominican Republic in South America from 22 in 2010 to 30 in 2021. It should be noted that in 2010 does not exist flights from airports in Asia, and in 2021 four airports in this continent had flights to the Dominican Republic. Additionally, in 2010 around 142 different airlines offered flights to the Dominican Republic, expanding to 331 airlines in 2021, more than 130% from 2010.

Around 63% of the flights come from the United States in 2021, 5.4% from Puerto Rico, 4.2% from Panama, 4.0% from Venezuela, and the rest of the flight from other countries. New York has a higher proportion of flights with 18.8%, followed by Newark with 11.2%, Miami with 11%, San Juan with 5.2%, and Fort Lauderdale with 4.9%; these five cities captured 51% of the total Flights in 2021. The United States is the country with a significant proportion of inbound flights. New York, Newark, Miami, Fort Lauderdale, and Boston capture 72% of the flight from the United States.

# 3. Literature

Following the Second World War, the tourist industry saw rapid global growth and was the subject of numerous studies. Song et al. (2009) sustained that the interest in modeling tourism demand to analyze the effects of distinct determinants and to obtain a precise forecast of the future demand for tourism are the two focal points of the major tourism demand focuses. However, Song, Wong & Chon 2003, set out that the tourism demand analysis can be divided into two broad groups. The first group focuses on non-casual modeling approaches, while the second considers casual techniques ─econometrics─.

Guthrie (1961), Gerakis (1965), and Gray (1966) are considered the pioneers in this field; after that date, considerable progress has been made in this field of study in terms of a variety of research methodologies and strategies and theoretical foundations. Additionally, advances in econometrics in the early 90s and its introduction to the field of study have furthered its development. (Song et al., 2009). More than 200 empirical studies have been made on tourism demand modeling and forecasting since 1990.

As a proxy of tourism demand, the variable tourist arrivals is the most used, followed by tourist expenditure and nights in registered accommodations (Song et al., 2009). Other indicators for measuring tourism demand are visitors as a population ratio and share of expenditure in income as a pecuniary criterion (Crouch, 1994). Song & et al. 2009 set out that real personal disposable income (PDI) is a relatively good measure of the origin country's income.

Moreover, the National Disposable Income (NDI), Gross Domestic Product (GDP), and Gross National Income (GNI), in constant prices, are considered a proxy of income in some studies (Kulendran & Witt, 2003). Most empirical studies have obtained results consistent with the economic theory that income positively affects tourism demand. They also conclude that international tourism is a luxury product; the income elasticity is higher than 1.0, which means that changes in the country of origin's income results in a more than proportionate increase in the tourism demand (Peng et al., 2015).

The tourism price in both the destination and the alternative destination is less likely to be available, so researchers opted to assess the relative cost of tourism by dividing the Consumer Price Index (CPI) of the destination country and the CPI of the origin country

(Peng et al., 2015). Some studies consider specific tourism price variables, such as the service price index (Cheung & Law, 2001) or the weighted prices of food, accommodation, transport, entertainment, and other services (Dwyer, Forsyth, & Rao, 2000). Tourists tend to be more aware of exchange rate changes before their travel than inflationary effects in the destination they want to visit. Exchange rates are frequently used to alter the comparable costs or may be included in demand models (Peng et al., 2015).

Furthermore, to add information on travel costs, researchers consider economy airfares between the main cities in the origin countries and the destination country as a proxy (Dritsakis, 2004). Although travel costs have been considered in several empirical studies, they do not always show significant effects on tourism demand (Kulendran & King, 1997). Other variables considered are marketing expenditure and one-off events ─dummy variables used to capture the effects of various events which have shown a worldwide impact on tourism demand─.

Kumar et al., 2019 estimate inbound international tourism demand models the small Pacific Islands at the level of each source market-destination and overall destination. Visitor numbers, travel costs, the real GDP of the source nation, travel costs in alternative locations, seasonality, and structural breaks were all considered to be credible factors of tourist demand. They estimated the model with the ARDL-bounds method, structural breaks were found with the Bai and Perron break test.

Nguyen, 2021 estimate the elasticity of the demand for travel based on regional income and price levels as well as overall global markets. It was distributed over two distinct regions, ranging from Asia and the intercontinental to Vietnam, and ten significant source markets overall. Nguyen analyzed the demand from 1995 to 2019 using a nonlinear panel ARDL technique demonstrate that while demand for travel to Vietnam from key Asian economies is substantially income elastic, it is comparatively price inelastic. Nguyen also found that the demand for travel is less responsive to price in transcontinental markets than it is in Asian countries, particularly those with high own price elasticities.

# 4. Methodology and Data

## 4.1. Tourism demand function

From the literature review, we found that tourist income, price in the destination, and prices in the substitute destinations are the most common variables used to explain the tourism demand function.

$$TD_{ij,t} = \int(Y_{j,t}, TP_{i,t}, SP_{s,t}, X_{ij,t}, \varepsilon_{ij,t})$$

Where $TD_{ij,t}$ is the tourism demand in the Dominican Republic from the country *j* at the time *t*; $Y_{j,t}$ is the income level of tourists in the country of origin *j* at time *t*; $TP_{ij,t}$ is the price of tourism in the Dominican Republic at time t; $SP_{s,t}$ is the price of tourism for substitute destinations at time t; $X_{ij,t}$ is a dummy variable that represents qualitative factors from the origin country or from the Dominican Republic or both countries at time t; $\varepsilon_{ij,t}$ is the disturbance term that captures all the other factors that can affect the demand for tourism in the Dominican Republic by residents of the origin country *j*, at time *t.*

We will use the number of tourist arrivals from the country of origin to the Dominican Republic as a proxy for tourism demand and the Gross Domestic Product (GDP) as a proxy for the income level of tourists in the origin country. ─ "Since the tourist arrivals variable include business and leisure travelers, the GDP of the tourism generating country is used as the income variable, rather than disposable income; in order to reflect the business activities of tourism demand"─ (Song, Witt, & Li, The Advanced Econometrics of Tourism Demand, 2009).

Additionally, as a proxy for the price of tourism in the Dominican Republic and in the substitute destination, we will calculate it based on the real relative price through the consumer price index and the bilateral exchange rate. The formula to calculate the relative price (Nguyen, 2022; Ramos, Untong, & Kaosa-ard, 2017; Kumar, Kumar, Patel, Hussain Shahzad, & Stauvermann, 2019) is as follows:

$$TP_{i,t} = \frac{CPI_{DR,t}}{CPI_{i,t}\ x\ EX_{\frac{i}{DR,t}}}$$

Where $CPI_{DR,t}$ is the consumer price index of the Dominican Republic at time t; $CPI_{i,t}$ is the CPI of the origin country i at time t; and $ER_{i/_{DR,t}}$ is the bilateral exchange rate of country i's currency to the Dominican Republic in time t.

Following Kumar et al. 2019 we sustain that the substitute price is the weighted average of the ratio of the consumer price index to exchange rates in competing destinations and is calculated as:

$$SP_{s,t} = \sum_{l=1}^{S} \frac{CPI_l}{EX_l \; x \; w_l}$$

Where $CPI_l$ is the consumer price index of the substitute destination $l$, $EX_l$ is the exchange rate of substitutes destinations expressed in USD, and $w_l$ is the weight of substitute destination $l$ for each quarter of the year, calculated as $w_l = \frac{TA_l}{\sum_{l=1}^{S} TA_l}$, where $TA_l$ is total arrivals from country $l$ and S is the number of destination countries under consideration. The substitute countries need to share similar climates, cultures, and geography with the Dominican Republic (Song & Li, 2008). In this case, we only consider Mexico as a substitute destination for the Dominican Republic.

## 4.2. Autoregressive Distributed Lag (ARDL)

We use the autoregressive distributed lag (ARDL) model to estimate the tourism demand function for every country. This estimator allows us to have variables stationaries I (0) and variables cointegrated of order one I (1). Also, with cointegration, in the long run, we obtain estimated coefficients for the long and short run. The ARDL model is specified as follows:

$$\begin{aligned} \Delta lnArrival_t = \alpha_0 &+ \sum_{i=1}^{q_1} \beta_{1i} \Delta lnArrival_{t-i} \\ &+ \sum_{i=0}^{q_2} \beta_{2i} \Delta lnGDP_{t-i} + \sum_{i=0}^{q_3} \beta_{3i} \Delta lnTP_{t-i} + \sum_{i=0}^{q_4} \beta_{4i} \Delta lnSP_{t-i} \\ &+ \varphi_1 lnArrival_{i,t-1} + \varphi_2 lnGDP_{i,t-1} + \varphi_3 lnTP_{i,t-1} \\ &+ \varphi_4 lnTP_{i,t-1} + \mathrm{u_{it}} \end{aligned} \qquad \textbf{4.1}$$

Where $lnArrival_t$ is tourist arrivals from the source country $j$, $\alpha_0$ is the deterministic component which includes the intercept term, time trend seasonality dummies, and structural break dummies. $GDP_t$ is the real GDP of the source country $j$ at time $t$; $TP_t$ is the tourism price concerning the source country $j$, and $SP_t$ is the substitute tourism price. For each country, we found the specific/s structural/s break/s.

From equation 4.1 in the short-run, $\beta_{2i}$ is the income elasticity of tourism demand, $\beta_{3i}$ is the price elasticity of tourism demand, $\beta_{4i}$ is the substitute elasticity of tourism demand, $\beta_{2i}$ —the coefficient of the lag of the dependent variable— is also known as the world of mouth effect or consumer or habit persistence. This variable explains the intention of tourists to return to the destination or spread the destination's information, which may influence other people's choice behavior (Peng et al., 2014).

In the long run, the coefficient of the lagged independent variable is also known as the error-correction term or speed of adjustment in the long run (ECT); it shows how much of the disequilibrium in the previous period is being adjusted in t; If we have a positive sign means divergence of the model; contrary to a negative sign which indicates convergence (Nkoro & Uko, 2016) which should be $-1 < \varphi_1 < 0$ to guarantee that the model is dynamically stable. — To test for the existence of an error correction mechanism, the presence of a long-run cointegration relationship needs to be tested first (Song, Witt & Li, 2009) — in the long run; $-\frac{\varphi_2}{\varphi_1}$ is the income elasticity of tourism demand, $-\frac{\varphi_3}{\varphi_1}$ is the price elasticity, and $-\frac{\varphi_4}{\varphi_1}$ is the substitute price elasticity.

Besides the value and sign of the error-correction term and the test of the long-run relationship, to estimate an ARDL model, another requirement that should be met is that only a single long-run relationship exists. Through the trace, the Maximal eigenvalue, or the F-statistics, we can establish a single long-run relationship among the variables to apply an ARDL approach.

### 4.3. Dynamic common-correlated effects

To estimate the tourism demand function for all the countries, we need to employ an estimator for dynamic heterogeneous panels; we will consider the Mean Group (MG) and the Pooled Mean Group (PMG). The Mean Group estimator proposed by (Pesaran et al.,

1995) consists of estimating regressions separately for each group and averaging the coefficients over groups. However, it does not consider the fact that specific parameters may be the same across groups, while the PMG estimator allows the intercept, short-run coefficients, and error variances to differ freely across groups but constrains the long-run coefficients to be the same (Pesaran et al., 1999) The Hausman test allows us to identify the estimator that fits better with the tourism demand model for the Dominican Republic.

In the case of the existence of cross-sectional dependence, we will perform a dynamic common correlated estimator- pooled mean group. Not accounting for unobserved dependence between cross-sectional units causes the error term to be autocorrelated and leads to biased regressions results (Ditzen, 2018). It considers the lagged dependent variable and cross-sectional dependence.

### 4.4. Data

The panel data is composed of data of inbound tourism of the Dominican Republic desegregated by country of origin from the Central Bank of the Dominican Republic and the Ministry of Tourism of the Dominican Republic, in addition to macroeconomic variables such as Gross Domestic Product, Consumer Price Index, and the Exchange Rate of the country of origin and its substitute from the Global Economic Monitor of the International Monetary Fund and Government institutions. The sample period consisted of quarterly data from the first quarter of 2001 to the last quarter of 2021.

The data on tourist arrivals to the Dominican Republic was seasonally adjusted using the US Census Bureau (2013) X-13 ARIMA-SEATS method. The approach consists of two steps. First, the series is extended backward and forwards using a regression model with ARIMA residuals, then adjusted for outliers, holiday effects, and trading days. Second, applying MA filters to seasonally adjust the data from the X-11 program or the ARIMA-based adjustment from SEATS (Ridderstaat, Croes, Oduber, & Nijkamp, 2014).

Gross Domestic Product (constant 2010 USD), seasonally adjusted from the source, Consumer Price Index and Exchange Rate, new LCU per dollar, extended backward, average period─ with January 2010 as the base year. As the origin countries, we are considering the top 10 tourism emissary countries to the Dominican Republic and Mexico

as the substitute destination; this results in a panel with 840 observations, ten countries, and 84 observations for each.

**Table 1. Descriptive statistics**
(2001Q1-2021Q4)

| Variable | | Mean | Std. dev. | Min | Max | Observations | |
|---|---|---|---|---|---|---|---|
| Arrivals (ln) | overall | 10.49 | 1.42 | 0.69 | 13.36 | N = | 840 |
| | between | | 1.15 | 8.9 | 12.62 | n = | 10 |
| | within | | 0.92 | 1.93 | 12.53 | T = | 84 |
| GDP (ln) | overall | 13.21 | 0.88 | 11.02 | 15.37 | N = | 840 |
| | between | | 0.92 | 11.44 | 15.17 | n = | 10 |
| | within | | 0.11 | 12.79 | 13.41 | T = | 84 |
| Tourism Prices (ln) | overall | 0.10 | 0.44 | -1.57 | 3.16 | N = | 840 |
| | between | | 0.17 | -0.1 | 0.5 | n = | 10 |
| | within | | 0.41 | -1.97 | 2.76 | T = | 84 |
| Substitute Prices (ln) | overall | -0.02 | 0.09 | -0.21 | 0.15 | N = | 840 |
| | between | | 0 | -0.02 | -0.02 | n = | 10 |
| | within | | 0.09 | -0.21 | 0.15 | T = | 84 |

Source: Own elaboration using data from the Central Bank of the Dominican Republic, Ministry of Tourism of the Dominican Republic, and International Monetary Fund.

The mean of the logarithm of arrivals is 10.5 with an overall standard deviation of 1.42, decreasing between the panel to 1.15 and 0.92 within the panel (

Table 1). The mean of the GDP is 13.2 with an overall standard deviation of 0.88, which increase between the panel to 0.92. On the other hand, in the logarithm of tourism and substitute prices, the standard deviation is greater than the mean in all categories.

### 4.4.1. Unit Roots

To perform an ARDL cointegration approach, we need to satisfy three initial conditions; the first is that all the variables are stationary or cointegrated in order one or both, and the second is that exits cointegration in the long run. The third is that, at most, one long-run relationship is present between the variables. Table 2 shows the result of the test of Levin, Lin, and Chu (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF), and

the Philips Perron (PP) of unit roots first considering only the constant or intercept and then the constant and trend.

The logarithm of arrivals is the only variable that is stationary in all the tests at a 1% level of significance. Considering the intercept and trend, the logarithm of the GDP is a stationary variable. As the variables are a mixture of I(0) and I(1), the data satisfy the first condition to perform the ARDL cointegration approach.

**Table 2. Unit roots tests**

| | Constant | | | | Constant + trend | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | LLC | IPS | ADF | PP | LLC | IPS | ADF | PP |
| Arrivals (ln) | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** |
| GDP (ln) | I(0)*** | I(1)*** | I(1)*** | I(1)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** |
| Tourism Prices (ln) | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(1)*** |
| Substitute Prices (ln) | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(0)*** | I(1)*** | I(1)*** | I(1)*** |

Note: * 0.1 ** 0.05 ***0.01 statistical level of significance.
Source: Own elaboration using data from the Central Bank of the Dominican Republic, Ministry of Tourism of the Dominican Republic, and International Monetary Fund.

#### 4.4.2. Panel: cross-sectional dependence, cointegration, and slope homogeneity

An issue involving working with heterogeneous panels is the exitance of cross-sectional dependence. If not taken into account, it can potentially lead to omitted variable bias, and residuals can be correlated across units (Sarafidis & Wansbeek, 2012; Ditzen 2021). To test cross-sectional dependence, we computed the Pesaran (2015) test for weak cross-sectional dependence with the null hypothesis of weakly cross-sectional dependence vs. the alternative of strong dependence. For all the variables of the model, we do reject the de null hypothesis of weak dependence at a 1% level of significance, which means that we need to perform the model through an estimator that considers corrects it.

To test the cointegration of the variables in the panel in the long run, we conducted the Pedroni and Kao tests with the null hypothesis of no cointegration; The Pedroni test for cointegration was performed under three ways, the first one without trend, the second one considering the trend, and the last one without intercept. We reject the null hypothesis of no cointegration at a 5% significance level for the first and second ways. We reject the null hypothesis at a 10% significance level in the third test. Additionally, we performed

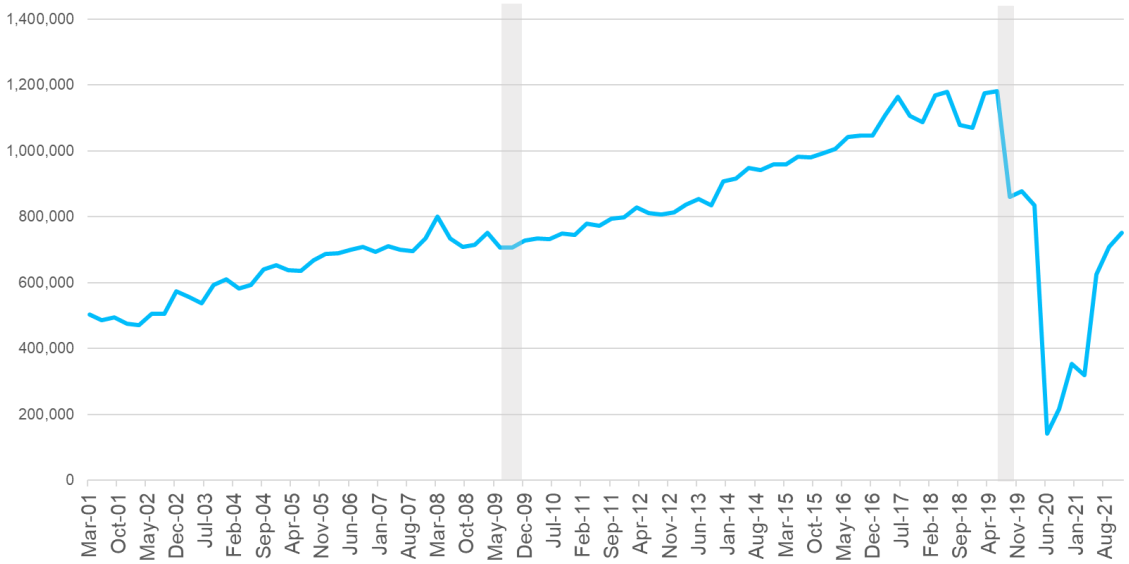
the Kao test considering the cross-sectional dependence; we reject the null hypothesis of no cointegration at a 1% level of significance, which means that the variables have a relationship in the long run. These tests fulfill the second condition to estimate the proposed model through the ARDL approach.

To identify what estimator will be more accurate to the tourism demand model for the Dominican Republic is necessary to test the homogeneity of the slope. We computed the test for slope homogeneity (Pesaran & Yamagata, 2008) with the null hypothesis of homogenous slopes; we do not reject the null hypothesis of slope homogeneity; it implies that all slope coefficients are identical across cross-sectional units ─countries─ (Bersvendsen & Ditzen, 2021).

### 4.4.3. Structural breaks

Perron (1989) argued that ignoring the issue of potential structural breaks can invalidate the statistical results (Bist & Bista, 2018). The tourism industry was affected by the pandemic of Covid-19; one of the measures adopted to mitigate the propagation of it was to restrict the tourist flows; this can be one of the structural breaks present in the data. From the multiple break test of Bai-Perron, we identified two structural breaks in the sample; in the third quarter of 2009 and 2019, as highlighted in Figure 4.

**Figure 4. Structural breaks**
(Tourist arrivals, seasonally adjusted, identified structural breaks)




Source: Own elaboration using data from the Central Bank of the Dominican Republic, Ministry of Tourism of the Dominican Republic, and International Monetary Fund.

According to the World Tourism Organization and the International Labour Organization (2013), The 2008-2009 global economic crisis had a significant influence on international tourism, as seen by the 4 percent fall in international visitor arrivals and the 6 percent decline in foreign tourist receipts in 2009. As expected, the financial crisis was the first identified structural break in the sample affecting all the economies. It is expected that the demand for tourism as a luxury good relies on the change in income ─more than the change in the income level─.

The second structural break identified was in the third quarter of 2019, before Covid-19, as a consequence of adverse situations related to tourism in the Dominican Republic. The Central Bank of the Dominican Republic claims that the decrease in visitors was primarily brought on by an aggressive media campaign about unfortunate incidents involving some United States visitors in the first half of 2019, which led to cancellations from the United States, as well as a slow demand from some European and South American markets.

# 5. Results

## 5.1. Dynamic common correlated

To estimate the demand for tourism function for the Dominican Republic and the top ten major source countries, we perform a dynamic common correlated effect estimator – pooled mean group (CS-ECM); this approach allows us to consider the cross-sectional dependence and the homogeneity of the slope. A pooled mean group approaches all the countries to have the same long-run coefficients. Table 3 shows the result of the estimation, the coefficients in the short run are insignificant, but in the long run, the coefficients are significant at a 5% level of significance.

We estimate the model through the Newey-West estimator to avoid heteroscedasticity in the results; then, we test for cross-sectional dependence, and we do not reject the null hypothesis of weakly cross-sectional dependence as we expected. Additionally, we do not find autocorrelation post-estimation.

The error correction term is negative and significant at a 1% level of significance, meaning that there exists a stable long-term relationship between the variables Arrivals and GDP, TP, SP, and the structural breaks. The speed of adjustment or convergence rate

is 24.0% implying that by the next quarter, the arrivals' deviation from the long-run growth rate will have been corrected by 24.0%.

**Table 3. Dynamic common correlated effects estimator - pooled mean group**

| $\Delta lnArrival$ | Coef. | Std.Err. | z | P>z |
|---|---|---|---|---|
| | Short Run Est. | | | |
| $\Delta lnArrival_{-1}$ | 0.08 | 0.06 | 1.24 | 0.22 |
| $\Delta lnGDP$ | -3.05 | 3.42 | -0.89 | 0.37 |
| $\Delta lnGDP_{-1}$ | -1.81 | 1.78 | -1.02 | 0.31 |
| $\Delta lnGDP_{-2}$ | 1.25 | 2.29 | 0.54 | 0.59 |
| $\Delta lnTP$ | 0.07 | 0.10 | 0.71 | 0.48 |
| $\Delta lnSP$ | -0.08 | 0.14 | -0.53 | 0.59 |
| ***Adjust. Term*** | | | | |
| $\Delta lnArrival_{-1}$ | -0.24*** | 0.03 | -7.67 | 0.00 |
| | Long Run Est. | | | |
| $\Delta lnGDP$ | 0.72*** | 0.11 | 6.60 | 0.00 |
| $\Delta lnTP$ | -0.13*** | 0.06 | -2.15 | 0.03 |
| $\Delta lnSP$ | 0.06*** | 0.05 | 1.15 | 0.02 |
| $2009_{Q3}$ | 0.04*** | 0.01 | 3.23 | 0.00 |
| $2019_{Q3}$ | -0.26*** | 0.04 | -7.00 | 0.00 |
| Constant | -5.86 | 3.75 | -1.56 | 0.12 |

*$p$<0.1; ** $p$<0.05; *** $p$<0.01
Source: Own elaboration.

From Table 3, we can extract the estimated elasticities in the long run; from equation *4.1*, we know that the income elasticity is $-\frac{\widehat{\varphi_2}}{\widehat{\varphi_1}}$; the tourism price elasticity $-\frac{\widehat{\varphi_3}}{\widehat{\varphi_1}}$, and the substitute price elasticity $-\frac{\widehat{\varphi_4}}{\widehat{\varphi_1}}$. Table 4 shows the estimated long-run elasticities and coefficients; the income price elasticity, in the long run, is positive and greater than 1.0, implying that an increase in the income level of the top ten major source countries results in a more than proportionate rise in the demand for the Dominican Republic tourism from these countries; this result is coherent with the economic theory that sustains that change in the income has a greater impact on the demand for luxury goods. With an increase of 1% in the income level of the primary source markets, the tourism demand will increase by 3%, ceteris paribus.

**Table 4. Estimated long-run elasticities and coefficients**

| Variable | Elasticity |
|---|---|
| Income elasticity | 3.00*** |
| Price elasticity | -0.52*** |
| Substitute price elasticity | 0.23*** |
| $2009_{Q3}$ | 0.18*** |
| $2019_{Q3}$ | -1.07*** |

*$p$<0.1; ** $p$<0.05; *** $p$<0.01
Source: Own elaboration.

The price elasticity ─TP tourism price─ is negative and lower than the unit, which means that the demand for the Dominican Republic tourism is price inelastic; an increase in the prices in the Dominican Republic leads to a decrease ln the demand less than the change in prices ─an increase of 1% of the prices in the Dominican Republic leads to a decrease of 0.5% of the tourism demand, ceteris paribus─. Meanwhile, the coefficient for the substitute price elasticity is positive and lower than the unit; the positive sign reflects that Mexico is a competitive destination for the Dominican Republic; rises in the price of Mexico result in an increase in the demand for the Dominican Republic's tourism but in a lower proportion than the increment of the price in Mexico.

On the other hand, the financial crisis has had a positive impact on the tourism demand by all the origin countries; but as expected, the break in the third quarter of 2019 also included the Covid-19's pandemic has a negative impact on the demand for Dominican Republic's tourism for the top ten major source countries.

## 5.2. Autoregressive distributed lag estimator per country

After the estimation of the tourism demand model of the panel, we estimated through the autoregressive distributed lag estimator the tourism demand function for each major source market; the first step was testing the unit-roots of the variables, then found the optimal lags; after that identifying the structural/s break/s and performed the Johansen test of cointegration without and with the breaks. Additionally, post-estimation, we perform the bound test for a long-run relationship, Breusch Pagan and White's test for

heteroscedasticity, Breusch-Godfrey and Durbin's test for autocorrelation, and the cumulative sum test for parameter stability.

After performing the unit-root test, we found that for all the countries, the variables are stationary I(0) or integrated of order one I(1), satisfying the first condition for ARDL estimations; for all the countries, exists almost one long-run relationship among the variables fulfilling the second and third conditions. The results of the estimations are presented in table 3; it should be noted that these results are estimated through the Newey-West estimator to correct heteroscedasticity in the necessary cases. Moreover, the residuals do not present autocorrelation, and the estimations are stable according to the cumulative sum test.

We found a stable long-run relationship among all the countries except for the United Kingdom; all the error correction terms are negative and significant at a 5% level of significance ─except for Brazil, which is significant at a 10% level of significance─. The estimation for Canada exhibits the greater speed of adjustment with 122% and Italy the lowest with 16%. Seven of the nine countries have a positive and significant income coefficient. In the long run, only for the United States, the coefficient of tourism price is significant, meanwhile, just for Argentina, the coefficient of substitute price is significant at a 5% level of significance, and four of nine countries have a significant coefficient for the identified structural/s break/s.

In the short run, we obtain income elasticities positive and significant for four countries ─United States, Canada, Germany, and the United Kingdom─; these countries present sensitive responsiveness of demand to changes in the income level, being greater for the United Kingdom and Canada. The demand for the Dominican Republic tourism in the United States is price elastic; when the price in the Dominican Republic rises, the demand for tourism in the United States decreases more than the changes in prices.

Meanwhile, the elasticity price for Argentina is price inelastic, and the positive sign of the substitute price elasticity or cross elasticity is positive, indicating that Mexico is a substitute destination; when the price in Mexico increases by 1%, the demand for tourism in the Dominican Republic from Argentina rises 138%, ceteris paribus. The word-of-mouth effects or consumer persistence appear only in Canada and United Kingdom with

a positive sign suggesting that they enjoyed their visit and recommended the destination (Kumar et al., 2019).

**Table 5. Estimated Short-run elasticities and coefficients**

| Country | Income | Price | Substitute price | World of moth effect |
|---|---|---|---|---|
| United States | 8.89*** | -1.22** | | |
| Canada | 15.16*** | | | 0.89*** |
| Germany | 6.47* | | | |
| United Kingdom | 15.22*** | | | 1.09*** |
| Argentina | | 0.93*** | 1.38* | |

*$p$<0.1; ** $p$<0.05; *** $p$<0.01
Source: Author's estimation in Stata 17.

The estimated long-run elasticities and coefficients are presented in Table 6; all the income elasticities are greater than the unit with a positive sign which means that the demand for the Dominican Republic tourism is income elastic for seven of the top ten major sources countries. Exists big variations between the origin countries in terms of the responsiveness of tourism demand to changes in the income level in the origin countries; Russia, Italy, and Argentina show greater responsiveness to changes in the income level.

**Table 6. Estimated long-run elasticities and coefficients**

| Country | Income | Price | Substitute price | TB | TB1 |
|---|---|---|---|---|---|
| United States | 3.2*** | 2.2** | | | |
| Canada | 2.6*** | | | -1.7***(2020Q2) | |
| France | | | | -0.5**(2018Q2) | |
| Germany | | | | -1.1**(2018Q4) | |
| Russia | 10.6*** | | | | |
| Spain | 3.9*** | | | -0.6**(2014Q4) | -0.7**(2019Q4) |
| United Kingdom | | | | | |
| Argentina | 8.6*** | | -2.0** | | |
| Brazil | 8.5* | | | | |
| Italy | 13.1*** | | | | |

*$p$<0.1; ** $p$<0.05; *** $p$<0.01
Source: Author's estimation in Stata 17.

In the long run, the demand for the Dominican Republic's tourism from the United States is price elastic, changes in the price result in an increase more than proportionate in demand for Dominican tourism; Sometimes known as the Veblen effect or "conspicuous consumption," this phenomenon describes people who, when the price of certain "high status" goods and services rises, want more of them in an effort to impress others. (Dwyer,

Forsyth, & Dwyer, Tourism Economics and Policy, 2010). In the case of Argentina, and Mexico, in the long run, it plays as a complementary destination instead of a substitute destination; All the identified breaks for Canada, France, Germany, and Spain have a negative impact on the demand for Dominican tourism, capturing adverse situations.

**Table 7. Autoregressive Distributed lag estimation**

| Variables | United States | Canada | France | Germany | Russia | Spain | United Kingdom | Argentina | Brazil | Italy |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Long-run | | | | | |
| $\Delta lnArrival$ | | | | | | | | | | |
| $\Delta lnArrival_{-1}$ | -0.42*** | -1.12*** | -0.34** | -0.36** | -0.59*** | -0.48*** | | -0.36** | -0.31* | -0.16** |
| $lnGDP$ | 1.34*** | 2.95*** | -0.39 | 0.18 | 6.25*** | 1.88*** | | 3.11*** | 2.62* | 2.09*** |
| $lnTP$ | 0.92** | -0.36 | -0.06 | -0.04 | 0.84 | 0.03 | | -0.04 | 0.15 | 0.05 |
| $lnSP$ | -0.21 | 0.25 | -0.08 | 0.33 | 0.85 | -0.44 | | -0.71** | -0.25 | 0.07 |
| TB | -0.27 | -1.87*** | -0.16** | -0.38** | -1.46 | -0.29** | | -0.40 | 0.16 | -0.11 |
| TB1 | | | -0.05 | | | -0.32** | | -0.37 | -0.36 | |
| | | | | | Short-Run | | | | | |
| $\Delta lnArrival$ | | | | | | | | | | |
| $\Delta lnArrival_{-1}$ | | 0.89*** | | | -0.05 | | 1.09*** | | | |
| $lnGDP$ | | | | | | | | | | |
| $\Delta lnGDP$ | 31.29*** | -5.28*** | 0.61 | 6.47* | 25.52 | 1.91 | 15.22*** | 0.47 | 3.72 | 1.72 |
| $\Delta lnGDP_{-1}$ | 8.89*** | -20.31*** | 0.43 | | | | | | | |
| $\Delta lnGDP_{-2}$ | | 15.16*** | -0.32 | | | | | | | |
| $lnTP$ | | | | | | | | | | |
| $\Delta lnTP$ | 0.41 | 0.31 | -0.11 | -0.52 | 0.87 | 0.42 | 0.43 | 0.93*** | -0.53 | 0.05 |
| $\Delta lnTP_{-1}$ | -1.22** | 0.19 | 0.03 | 1.29 | -0.23 | 0.04 | | 0.13 | 0.10 | 0.05 |
| $\Delta lnTP_{-2}$ . | | | | | | | | 0.38 | 0.01 | |
| $lnTP_{-1}$ | | | | | | | -0.30 | | | |
| $lnTP_{-2}$ | | | | | | | -0.11 | | | |
| $lnSP$ | | | | | | | | | | |
| $\Delta lnSP$ . | -0.77 | 0.05 | 0.03 | -1.36 | 2.75 | 0.40 | -0.40 | 1.38* | -0.66 | 0.12 |
| $\Delta lnSP_1$ | | | | | | | 0.71 | | | |
| TB | | | | | | | 0.14 | | | |
| Constant | -15.14** | -24.68*** | 8.97 | 1.43 | -75.21** | -18.82** | -2.24 | -31.91*** | -31.62* | -26.00*** |

*$p$<0.1; ** $p$<0.05; *** $p$<0.01
Source: Own elaboration.

# 6. Conclusions

Dynamic common correlated effect estimator - the pooled mean group is an accurate estimator for assessing the price and income elasticity demand of tourism in the Dominican Republic from the top ten major source countries from 2001 to 2021. Its estimator takes into account the cross-sectional dependence present in the data and the homogenous slope in the long run. It should be added that the residuals of the estimation do not present autocorrelation, and we implemented the Newey-West estimator to correct heteroscedasticity.

Arrivals and GDP, tourism price, substitute price, and structural breaks have a consistent long-term relationship with one another. By the end of the next quarter, the arrivals' deviation from the long-run growth rate will have been rectified by a factor of 24.0%, according to the convergence rate. As a luxury good, the tourism demand of the Dominican Republic is income elastic; with an increase of 1% of the income level of the primary source countries, the tourism demand will increase by 3%.

The demand for the Dominican Republic tourism is price inelastic for the top ten Major source markets; an increase of 1% in the prices in the Dominican Republic leads to a decrease of 0.5% in the tourism demand. Meanwhile, the cross-price elasticity reflects that Mexico is a competitive destination for the Dominican Republic; rises in the price of Mexico result in an increase in the demand for the Dominican Republic’s tourism but in a lower proportion than the increment of the price in Mexico. As expected, the break in the third quarter of 2019 also includes the Covid-19's pandemic has had a negative impact on the demand for Dominican Republic's tourism in the top ten major source markets.

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