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An econometric study of tourist arrivals in Aruba and its implications

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Abstract

The principal purpose of this study is to analyze econometric estimates in order to explain tourist arrivals to Aruba from the United States, The Netherlands and Venezuela. The study specified a dynamic econometric model for modeling short term as well as the long-term responses. It estimated both linear and log-linear functions, and it applied the Box–Cox statistical method to determine the appropriate functional form. The inclusion of Venezuela as a developing country permitted the comparison of the behavior of tourism demand in relatively rich and poor countries. The results indicated the extent to which cross-country behavior of demand differs with respect to changes in effective prices and exchange rates. This study can assist in the formulation of future macroeconomic policies as well as market and pricing strategies in a small or microstate economy.

Keywords: Modeling; Dynamic; Elasticity; Policy formulation; Small economy

1. Introduction

The Caribbean has been engaged in tourism for nearly 100 years (Schwartz, 1999), and tourism's contribution to the economies of Caribbean countries is clear and convincing. Nowhere has tourism growth been more robust than among the islands in the Caribbean. The region has been identified as the most tourism-dependent region in the world (Bryan, 2001).

There are several studies on international tourist flows to Caribbean countries (Archer, 1976; Clarke, 1978; Summary, 1983; Archer, 1984; Rosensweig, 1988; Metzgen-Quemarez, 1989; Carey, 1991; Dharmaratne, 1995; Yoon & Shafer, 1996; Dalrymple & Greenidge, 1999; Greenidge, 2000; Vanegas & Croes, 2000; Croes, 2000). This is a relatively small number, however, given the importance of tourism to the Caribbean. What is clear from the studies that do exist is that income in the tourist-generating country can explain the variation in demand for tourism products in the region, while the role of price is inconclusive.

The objective of this study is to examine determinants and functional forms of international tourism demand to Aruba from its main markets: the United States, Venezuela and The Netherlands. These origin countries accounted for approximately 82.5% of total world tourism arrivals in 2000 (Table 1). Furthermore, the United States and The Netherlands represent two of the world's major tourist regions (i.e., North America and Europe together cover 70% of the distribution of global tourism), while Venezuela represents a typical developing country from the South engaged in generating tourists to the South.

This article has expanded significantly upon previous studies of Vanegas and Croes (2000), and Croes (2000). It contributed to the literature with an application of dynamic econometric modeling of international tourism demand. Furthermore, it examined two distinct regions in the global spatial distribution of tourism: (1) the North by analyzing the United States and The Netherlands, and (2) the South by analyzing Venezuela. By including the latter region, the study fills an important

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Table 1
Trends in tourist arrivals by country of origin (1975–2000) (in thousands)

Year	United States	Venezuela	The Netherlands	Rest of the World	Total tourist arrivals
1975	75.0	24.8	2.7	26.4	128.9
1976	94.7	30.4	2.7	17.7	145.5
1977	95.6	35.2	3.0	17.4	151.2
1978	104.9	38.2	3.3	17.5	163.9
1979	118.5	40.8	4.0	21.8	185.1
1980	110.8	54.0	4.4	19.7	188.9
1981	124.0	66.3	5.6	25.5	221.4
1982	114.3	74.4	4.9	26.6	220.2
1983	131.6	28.5	5.0	30.1	195.2
1984	148.5	21.4	6.1	34.2	210.2
1985	152.1	21.6	5.0	28.0	206.7
1986	132.4	14.4	6.2	28.2	181.2
1987	161.1	16.5	9.4	44.6	231.3
1988	187.9	19.7	15.1	55.3	278.0
1989	210.5	32.3	25.3	76.2	344.3
1990	245.9	50.4	28.0	108.5	432.8
1991	263.4	74.7	35.3	127.9	501.3
1992	286.5	90.3	34.2	130.7	541.7
1993	315.3	84.7	32.5	129.5	562.0
1994	324.3	75.2	32.2	150.4	582.1
1995	344.9	85.6	33.3	151.6	615.4
1996	371.5	74.8	36.2	158.3	640.8
1997	364.9	88.4	33.3	163.3	649.9
1998	372.5	99.1	31.0	144.8	647.4
1999	416.9	103.6	32.0	130.8	683.3
2000	452.2	112.0	30.6	126.4	721.2

Source: Aruba Tourism Authority Statistics.

vacuum in the literature by focusing the analysis on the export level between two developing countries.

The study specified dynamic econometric models for modeling short-term impacts as well as long-term dynamics. The observed significance of the lagged dependent variable in such models indicates empirically that a dynamic structure is likely to be a necessary part of the model specifications (Fujii & Mak, 1981; Witt & Martin, 1987; Sinclair & Stabler, 1997). The inclusion of the lagged dependent variable as an explanatory variable, in part, considers the structural questions that modeling evokes.

The first section will examine the theoretical framework of tourism demand, describe tourism developments in Aruba and set forth the specification of the demand model for international tourism to Aruba. The second section will review the econometric methodology and the estimation results. The third section will consider the policy implications of the estimates elasticity's for tourism policy formulation. The final section will summarize the findings of the study.

2. Literature review and demand model

Empirical studies can help to explain the level and pattern of tourism demand. They can also discern its responsiveness to the variables on which it depends, such as income in the tourist-generating country and the relative inflation and exchange rates between the origin and destination countries. Most studies that have attempted to model tourism demand have used the single equations model as noted recently by Lim (1997), Sinclair and Stabler (1997), Morley (1997), Song and Witt (2000), and Divisekera (2003).

Tourism demand is viewed as the amount of tourist goods that a customer is willing and able to buy at a certain time and under certain conditions. In this case, demand is a function of a set of variables. The theoretical issue is the identification of this set of variables in the demand equation and the selection of the functional form (e.g., linear or log-linear) appropriate for the estimation of the parameters in the equation. This is expressed in mathematical form as follows:

$$D = f(x_1, x_2, \ldots, x_n),$$

where D may be viewed as a tourism demand function, it is expressed as a function of x_n: price, income and other variables. According to Sinclair and Stabler (1997), the advantages of the use of single equations model are three-fold: (1) it provides useful information through the estimation of elasticities (which could be useful information regarding the marginal utility and total revenues of a destination); (2) the elasticity value can be calculated

over time, thus providing information about the adjustment time period required for any countervailing policy to have effects; and (3) the elasticity can be estimated for different products and profiles of customers.

Single equation specifications, however, have been criticized as being somewhat ad hoc and spurious, and lacking an explicit theoretical basis (Sinclair & Stabler, 1997; Song & Witt, 2000; Divisekera, 2003). In response to such criticism, some have advocated a so-called "systems" approach, which allegedly responds better to the theoretical underpinnings of the choice process of a customer. The results of this approach are mixed at best, however (Mergoupis & Steuer, 2003). The restrictions on the systems of demand equations have been tested using static models only. Further, atypical events in destinations cannot be taken into account, and they indicate a violation of the assumptions of homogeneity and symmetry of the choice process, which creates doubt on the core assumption of the theory of the rationality of the representative customer (Mergoupis & Steuer, 2003; Sinclair & Stabler, 1997).

The decision-making process based on rationality seems to be influenced by the social context. It would be difficult to expect the same type of rationality, for example, among American, Dutch and Venezuelan customers in their purchasing behavior of tourist products. The difference basically responds to different incentive structures within these three tourist-generating countries. Furthermore, the assumption of a standard or "reference" household is highly questionable at the national level, and it seems particularly inappropriate at the level of the three importing countries in question. Divisekera (2003) argued in favor of the systems approach based on the assumption that tourists desire to be engaged in multiple destination tourism, and thus are confronted with competing and complementing tourist products.

This assumption also is questionable. It is not clear why a tourist wishes to buy multiple destinations at the same time and not just one destination. Evidence suggests that tourists visiting Aruba, for example, are buying just one destination and that they do not consider a range of destinations in their choice. Surveys conducted by the Central Bureau of Statistics (CBS) asked explicitly whether in-bound tourists to Aruba bought other destinations as well. The response is that more than 90% of in-bound tourists buy only Aruba. This suggests that the relevant question is the degree of substitutability of domestic and foreign (origin/destination) competing goods instead of the simultaneous analysis of demand from a given country to a range of destinations.

3. A brief overview of tourism development in Aruba

Table 1 provides a breakdown of tourist arrivals since 1975 and demonstrates a sustained expansion in the tourism sector over the last 25 years. International tourist arrivals to Aruba increased from nearly 129,000 tourists in 1975 to nearly 721,000 in 2000, or an annual average growth rate of nearly 7.1% (Table 2). Although the number of arrivals increased throughout this period, not all markets performed consistently.

During this period, there was a significant increase in Venezuelan tourists following the increase in world oil prices in 1979–1980 and the resulting benefit to the Venezuelan economy. The expansion of the US market was the result of a dramatic increase in hotel room supply, a significant increase in air seat capacity (e.g. the creation of Air Aruba), the aggressive promotion of Aruba and the occurrence of certain international political events (Vanegas & Croes, 2003).

Further analysis of tourist arrivals by country of origin demonstrates the dominance of the US market, which has provided nearly 60% of all visitors. Venezuela, the second largest market, regularly provided nearly 13–16% of the total (Vanegas & Croes, 2003). Although the long haul travel from The Netherlands has fallen to approximately 3% for the last 5 years, it remains the third largest tourist-generating country to Aruba. The combined total tourists from Argentina, Canada, Brazil and Colombia represented only 13% of the Aruban tourism market, but they are still important in terms of market diversification.

International tourism has had a tremendous impact on the Aruban economy. It stimulated economic

Table 2
Annual average growth rates[a] of tourist arrivals by market of origin (%)

Period	The United States	Venezuela	The Netherlands	Rest of the World	Total tourist arrivals
1975–2000	7.2	4.1	6.9	8.1	7.1
1975–1985	5.9	−0.8	8.1	4.9	4.9
1985–1995	9.8	20.3	19.8	18.8	13.2
1995–2000	4.9	6.9	−2.5	−4.9	2.8

Source: Authors' calculations based on Table 1.

[a]The annual average growth rate is calculated using the following exponential equation: $Y = \alpha X^{\beta \mathrm{Time}}$, where β multiplied by 100 provides the annual average growth rate.

Table 3
Trends in GDP and tourism receipts

Year	Nominal GDP (US$ million)	Growth rate (%)	Tourism receipts (US$ million)	Growth rate (%)	Tourism receipts (as % of GDP)
1975	343.18	−3.2	56.51	1.5	16.4
1985	420.78	−23.3	126.54	6.7	30.1
1995	1410.06	6.0	520.56	11.2	36.9
1996	1537.04	9.0	613.46	17.9	39.9
1997	1647.49	7.2	668.32	8.9	40.6
1998	1728.55	4.9	729.89	9.2	42.2
1999	1847.60	6.9	788.60	8.0	42.7
2000	1969.50	6.6	859.39	9.0	43.6

Source: Central Bank of Aruba.

growth, and its economic importance is fully recognized by both the public and private sectors. As shown in Table 3, foreign tourism receipts have experienced increasing growth since the mid-1980s. In 2000, Aruban foreign tourism receipts exceeded US$ 850 million. This represents a growth of 9% over the previous year.

A more meaningful measure of tourism, however, is its net value contribution to the economy, which amounted to about 84% of total tourism receipts. This figure is significantly higher than that of the Caribbean as a whole (Vanegas & Croes, 2003; Bryan, 2001). The ratio of foreign tourism receipts to gross domestic product (GDP) was 43.6%. The ratio of foreign tourism receipts to exports was approximately 70%. During this period, tourism became the mainstay of the overall economy. It comprises the largest service activity in Aruba both in terms of share of GDP and employment.

4. Model specification and determinants of demand

Economic theory postulates that income and price-type factors are likely to play a central role in determining the demand for international tourism. As international tourism is generally regarded to be a luxury commodity or service, it is not surprising that the study of such variables has dominated the past research (Crouch, 1994). Several empirical studies (e.g., Croes, 2000; Vanegas & Croes, 2000; Barry & O'Hagan, 1972) have found that economic factors alone account for much of the variation in tourist arrivals and expenditure. Non-economic and other exogenous factors, such as political instability, terrorism, foreign exchange restrictions and natural disasters, also may affect the taste and preference of travelers.

Croes (2000), Metzgen-Quemarez (1989) and O'Hagan and Harrison (1984), for example, found non-economic factors (social problems, political instability and related issues) to be significant in their studies of tourism demand: (1) from the United States, Venezuela, and The Netherlands to Aruba, (2) from Sweden and the United States to selected Caribbean countries, between selected Caribbean countries and Mexico, and selected Caribbean countries to Southern Europe, and (3) from the United Kingdom and the United States to Ireland. According to Sauran (1978), the main difference between the economic and non-economic types of factors is that economic variables generally account for the total demand of an origin country for all destinations and that the role of the non-economic variables has more to do with the selection of particular destinations or types of tourism.

Determining the demand for international tourism is basically an empirical question. There are, however, well-known and serious problems in measuring the degree of responsiveness from consumers to income and price changes. They arise from the difficulties in approximating theoretical formulations of functional relationship to observed real-world situations, primarily due to data problems. Despite these problems, however, many functional forms for international tourism demand models exist, and it is neither efficient nor practical to consider all the possibilities each time a model is estimated.

The functional forms that can be used range from simple linear regression models to complex forms derived from econometric or statistical theory. In the last three decades, many studies have assumed a multiplicative form of model made linear by a logarithmic transformation of the variables (Song & Witt, 2000; Croes, 2000; Vanegas & Croes, 2000, Poole, 1988; Witt & Martin, 1987; Summary, 1983; Arbel & Ravid, 1985, Stronge & Redman, 1982; Loeb, 1982; Paraskevopoulos, 1977; Laber, 1969, Gray, 1966).

Other functional forms include the flexible dynamic econometric model (Syriopoulos, 1995), logit regression (Sheldon & Mak, 1987), the Almost Ideal Demand System (De Mello, Pack, & Sinclair, 2002; Dharmaratne, 1995; White, 1985; O'Hagan & Harrison, 1984), and Box and Cox (1964) transformation of the variables

(Fujii & Mak, 1981). Moreover, Gaudry and Wills (1978) have shown that whether an explanatory variable is significant or not, or even if it has the correct sign, can depend on the functional form of the model. Thus, an error in specification of the model form can result in the incorrect inclusion or exclusion of explanatory variables and incorrect estimates of the values of parameters measuring the effect of variables on demand.

While these studies are inconclusive, they nonetheless indicate that the choice of functional form for a model can have a significant effect on the results and the conclusions, such as the importance of variables in affecting demand, derived from a particular form are not necessarily applicable to another form. The real world, however, presents us with a curious mixture of short- and long-run adjustments. The adjustment of tourism demand to long-run levels may be gradual, and past demand levels can affect current tourism consumption.

In the formulation of dynamic models, economists often have considered expectations about future economic variables in theoretical development. They have increasingly used lagged variables in recent econometric work in various attempts to formulate certain tourism demand relationships more realistically. The assumption is that adjustment of international tourism demand is spread over time. Rigidities, including supply fixity and difficulty of changing travel plans in the short run, mean that tourism demand cannot respond fully to a change in income and prices. A dynamic demand model can account for this, and it is on this basis that the adjustment and expectations models are justified.

Based on these specifications, the international tourism demand functions for Aruba have the following general form:

(1) $TAUSA_t = f_1$ (Income, Price, D7982, D86, D9091, Lagged Tourist Arrivals).
(2) $TAVEN_t = f_2$ (Income, Price, Exchange Rate, D9091, D83, D93, Lagged Tourist Arrivals).
(3) $TANET_t = f_3$ (Income, Price, D9091, D88, D89, Lagged Tourist Arrivals).

4.1. Defining the dependent variable

Data limitations constrain the representation of the dependent variable. The demand for international tourism, and the data used to represent it, assumes several forms in the literature. In this study, the tourism demand is measured in terms of total tourist arrivals. The dependent variable is defined as the number of tourists visiting Aruba from the United States ($TAUSA_t$), Venezuela ($TAVEN_t$), and The Netherlands ($TANE_t$), each year. The form and degree of comprehensiveness of the available information and data have not permitted the construction of a reliable tourism receipts variable for each of the origin countries under study.

4.2. Defining the independent variables

The literature suggests a large number of possible variables for inclusion in a model of international tourism demand. The most commonly tested explanatory variables are income, relative prices, exchange rates, and transportation costs (Sinclair & Stabler, 1997; Song & Witt, 2000). These variables receive the most attention because they are considered to have the greatest effect on demand for international tourism. Sometimes, they are supplemented by variables of time trend, marketing expenditure (O'Hagan & Harrison, 1984), and special factors.

Variables such as income and price are sometimes lagged. The lagged dependent variable has been included as an independent variable reflecting supply fixity, habit, word of mouth diffusion of information about a destination, and the capacity of the destination's services (Song & Witt, 2000; Sinclair & Stabler, 1997; Morley, 1991; Witt & Martin, 1987). The use of these variables, however, depends on the availability of data and its quantitative measurement, the non-existence of collinearity between explanatory factors, the utility of the explanatory variables, and the parsimony of the model in question.

These examples illustrate some of the problems with the variables that may appear in the equation. In addition, not all of the variables can be included in models of international tourism demand. Fewer explanatory variables will result in higher degrees of freedom, which is important in estimation and *t*-tests. This study chose to focus on income, relative prices and exchange rates in particular, as it investigates how adequately these variables can explain fluctuations in Aruba's international tourism demand patterns. The specification of the model in a dynamic form permits examination of both the short- and the long-run elasticities.

4.2.1. Income

As a country's income increases, more of its residents can afford to visit other countries, and therefore tourist arrivals are a positive function of income. Past studies have used a range of alternative consumer income measures: per capita national income (Gunhadi & Boey, 1986), permanent income (Bond, 1978), gross national product (Jud & Joseph, 1974), and total personal income (Bechdolt, 1973). These studies also found that the income variable is generally highly elastic, which indicates that tourism arrivals increase at a more rapid percentage rate than income. The present study defined income as real gross domestic product for the United States and The Netherlands. For Venezuela, the study defined income as real per capita gross domestic product.

4.2.2. Price

Demand theory hypothesizes that the demand for international tourism is an inverse function of relative prices, i.e., the lower the cost of living in the destination country relative to the origin country, the greater the tourism demand, and vice versa. Previous research supported the hypothesis that the relative price variable is significant (Lee, Var, & Blaine, 1996; Uysal & Crompton, 1984; Loeb, 1982; Kwack, 1972). In this study, the tourist's cost of living variable is specified in relative form to allow for substitutability. Therefore, the relative price variables were calculated as the cost of living in Aruba, represented by the Aruba's consumer price index and deflated by the consumer price index of the tourist generating countries. The consumer price index is set equal to unity in 1990.

4.2.3. Exchange rate

The exchange rate variable involves several interesting theoretical and empirical questions. There is controversy in the research literature over the appropriateness of the inclusion of both prices and exchange rates as separate explanatory variables in empirical tourism demand analysis. Several studies have found that it may lead to multicollinearity because the exchange rate is also a measure of relative prices. Some commentators (Rosensweig, 1988; Chadee & Mieczkowski, 1987; Gray, 1966; Gerakis, 1965), however, argued that most travelers are not completely aware of prices in advance and, thus, the level of price recognized by them will rely heavily on the rate of exchange. From this perspective, exchange rate could be an important factor in the competitiveness and it is expected that a decline in a destination's exchange rate would lead to an increase in the demand for international tourism (Metzgen-Quemarez, 1989).

It is unclear, however, whether the inclusion of exchange rates is statistically significant in describing international tourism demand. While it was found to be statistically insignificant in some studies (Croes, 2000; Vanegas & Croes, 2000, Lee et al., 1996; Loeb, 1982; Quayson & Var, 1982; Gray, 1966), it was statistically significant in others (Uysal & Crompton, 1984; Artus, 1972; Gerakis, 1965). Despite this divergence, the present study included the exchange rate variable to determine whether international tourists to Aruba are sensitive to exchange rates, independent of living costs between countries. The study calculated real exchange rates by deflating the relative consumer price indices of Aruba and the source countries.

4.2.4. Transportation costs

The variable transportation costs may be an important determinant in explaining international tourism demand. As such, air fair may induce some potential visitors not to come to a destination at all, if it negates expected consumer surplus from a visit (Mak & Moncur, 1979). Measuring the cost of transportation, however, presents substantial difficulties. Problems arise because modes of travel vary and because fares vary according to the season and class of travel. For prospective tourists deciding to visit Aruba, however, the cost of transportation by air is something that all of them must bear before being able to enjoy the fruits of travel.

Several studies, which included this variable in the form of surface or airfare travel costs, have found this variable statistically insignificant (Stronge & Redman, 1982; Quayson & Var, 1982; Jud & Joseph, 1974; Gray, 1966). Others, however, found no satisfactory estimate of the effect of transportation costs on demand (Lawson, Snoth, & Paulin, 1995; Metzgen-Quemarez, 1989; Rosensweig, 1986). The inclusion of this variable also caused multicollinearity between airfare and income, which resulted in dropping the transportation cost variable from the model (Fujii & Mak, 1981; Jud & Joseph, 1974). In other words, it can be said that the effect of the cost of transportation on international tourism demand is still not well understood.

We attempted to investigate the transportation cost issue, but the inclusion of this variable did not improve the empirical results. Therefore, the present study does not explore this variable in determining the international tourism demand to Aruba. There are two principal reasons for this. First, there is considerable difficulty in identifying and deciding on an appropriate measure of transportation cost to Aruba. Second, the variables included explain most of the variation in the international tourism demand to Aruba.

4.2.5. Lagged dependent variable

In the formulation of dynamic tourism models, academic researchers and practitioners have often considered expectations about future economic variables in theoretical development. Lagged variables have been employed to an increasing extent in econometric work in various attempts to formulate tourism relationships more realistically. The approach used to model dynamic effects has varied. A number of studies simply have lagged relevant explanatory variables by one or more time increments (Crouch, 1994). Advances in modeling include a geometric declining weighting on the independent variable, a polynomial-distributed lag structure (Bond, 1978), a lagged dependent variable (Witt & Martin, 1987) and a flexible dynamic econometric model (Syriopoulos, 1995).

Factors such as lack of knowledge, habit, supply fixity, inertia, institutional constraints, difficulty of changing tourism demand plans in the short-run, etc., may preclude full adjustment to optimal level. The assumption is that adjustment to optimum tourism demand is spread over time. This is accounted for in a

dynamic tourism demand model, and it is on this basis that the adaptive expectations models are justified. In this study, including a lagged dependent variable among the list of independent variables in Eqs. (1)–(3) is equivalent to assuming a geometric-distributed lag model (Nerlove, 1958). Moreover, the measurement of dynamic impacts allows us to derive the long-run demand elasticities.

4.2.6. *Special factors*

A large number of special factors or events may influence the demand for international tourism. Modeling the special factors as separate dummy variables allows the incremental impacts of the special factors to vary. Further, this can relax the assumption that every observation in a time series is impacted by the independent variables in the same way during the time span under review.

This study included seven dummy variables in the econometric models to account for the effects of worldwide factors or special events on the international demand of Aruban tourism: (D7982) for the impact of the 1979–1982 recession in the United States; (D86) portraying the impact of the 1986 airlift problems in Aruba; (D9091) for the impact of the political instability in the Middle East in 1992; (D83) for the impact of the 1983 devaluation and social problems in Venezuela; (D93) for the impact of the 1993 devaluation and internal political disturbances in Venezuela; (D88) for the impact of the 1988 Air Aruba enhanced airlift between Aruba and The Netherlands; and (D89) for the 1988 KLM enhanced airlift between The Netherlands and Aruba. A dummy variable obtains the value of unity for the years of occurrence of the special event and the value of zero otherwise.

5. Estimation procedure and data

Because the choice of a functional form of demand equation can have a significant effect on the results, this study estimated both double log-linear and linear functional forms. To choose the appropriate functional form for tourism demand for Aruba, this study applied the Box and Cox (1964) procedure. This procedure transforms the dependent variable in such a way that the residual sums of squares from the two equations are comparable. The study used the equation with the smaller residual sum of squares. The Box and Cox procedure, however, is used only to choose between double log-linear and linear equations. The estimated coefficients reported in this paper, however, are from double log-linear and linear equations without the geometric mean of the Box and Cox transformation.

Moreover, to make the final decision about the functional form, these functions are compared in terms of expected coefficient signs, statistical significance of the estimated coefficients, and explanatory power of the model. Some researchers argued, however, that the practice of trying a few forms and using the one that yields the best results has some rationale and can improve on the use of standard model forms. It was discovered that the extra effort involved in the estimation yielded more reliable results.

The study estimated equations using two estimation procedures: ordinary least squares (OLS) and OLS estimation method with the Cochrane and Orcutt (1949) correction for serial correlation. Without exception, the parameter estimates obtained from the two estimation procedures were nearly equal. Consequently, this paper presents only the best results of the OLS estimations. The Durbin–Watson (DW) test for serial correlation is not strictly valid when dependent lagged variables are used as explanatory variable in the equations.

The selection of the data sources was based on theoretical considerations, data availability, reliability of data sources, and sufficiency of data and ability of the variable to be measured in the equation. The data utilized in this study are annual time series data, totals and averages for the period 1975–2000. Tourist annual figures are taken from Annual Statistical Reports on Tourism, published by the Aruba Tourism Authority. The consumer price indices, real gross domestic product, and exchange rates data were obtained from the Central Bureau of Statistics (2002), the Ministry of Economic Affairs and Tourism, and the Central Bank of Aruba. GDP, consumer price indices and exchange rates data on the United States, Venezuela and The Netherlands are taken from International Financial Statistics, a publication of the International Monetary Fund.

6. Empirical results and policy implications

The empirical results from the estimation of the demand models for tourism in Aruba by the United States, Venezuela and The Netherlands are set forth in Table 4. Overall, the models appear to perform satisfactorily. The magnitudes and the signs of the coefficients on the independent variables included appear theoretically satisfactorily and are statistically significant in most cases. No signs of serial correlation were found. The model explains a respectable amount of the variation as measured by the adjusted R^2: 91% for Venezuela; 98.4% for The Netherlands; and 98.8% for the United States. In the short run, changes in tourism demand for Aruba are determined principally by changes in income and changes in relative inflation rates between the destination and the origin country. Relative exchange rate differentials also are important determinants of Aruban tourism demand from the Venezuelan market, apart from the effect

Table 4
Estimates of the demand for Aruba tourism

Variable	Eq. (4) The United States ($TAUSA_t$) Log-log-linear	Eq. (5) The Unites States ($TAUSA_t$) Log-log-linear	Eq. (6) Venezuela ($TAVEN_t$) Linear	Eq. (7) The Netherlands ($TANET_t$) Log-log-linear
Constant	−10.65	−9.353	−90,086.3	−5.892
	(−3.4716)[a]	(−3.216)[a]	(−2.3912)[b]	(−2.338)[b]
Income	1.431	1.391	829.6	2.522
	(4.862)[a]	(3.693)[b]	(2.603)[a]	(2.273)[b]
	−0.12	−0.072	−10,804.7	−0.016
	(−1.07)[NS]	(−0.49)[NS]	(−2.518)[b]	(−0.282)[NS]
Exchange rate			240.1	
			(2.174)[b]	
D7982		−0.038		
		(−0.64)[NS]		
D86	−0.262	−0.254		
	(−4.523)[a]	(−4.383)[a]		
D9091		0.032	14,693	0.25
		(−0.632)[NS]	(1.837)[c]	(1.811)[c]
D83			−33,173	
			(−0.612)[NS]	
D93			−6,021.0	
			(−3.207)[a]	
D88				0.491
				(3.538)[a]
D89				0.391
				(2.812)[a]
$TAUSA_{t-1}$	0.4633	0.4686		
	(3.9118)[a]	(3.8137)[a]		
$TAVEN_{t-1}$			0.5281	
			(3.235)[a]	
$TANET_{t-1}$				0.626
				(5.034)[a]
R^2 adjusted	0.965	0.9876	0.91	0.984
(F) Statistics	439.53	346.23	247.82	214.15
DW	2.2344	2.6234	1.633	2.416

Note 1: Values in parentheses indicate Student (t) values associated with the corresponding coefficient.
Note 2: The Durbin–Watson (DW) test for serial correlation cannot be used or the test is not strictly valid when there are lagged dependent variables in the equations.
[a]Indicates statistically significant at 1% level.
[b]Indicates statistically significant at 5% level.
[NS]Indicates not significant.

of relative national inflation rates. They are less important, however, for the American and Dutch markets.

The estimated income elasticity values show that the economies of the United States, Venezuela and The Netherlands can exhibit different patterns of demand for tourism in Aruba in both the short and long run. Travel to Aruba appears to be a greater luxury for Dutch tourists than for American and Venezuelan tourists. The coefficients on the income variable were found statistically significant for all cases at the 95% confidence intervals, and, as expected, the signs of the coefficients were positive.

As shown in Table 5, in the short run, the income elasticities range from the low 1.43 (Eq. (4)) for the United States to the high 2.52 (Eq. (7)) for The Netherlands. This indicates that the degree of responsiveness of international tourist arrivals to Aruba due to a change in income differs from country to country. For example, a 10% increase in income from US tourism will lead to an increase in tourist arrivals to Aruba by 14.3%, whereas the same percent increase in The Netherlands income will increase tourist arrivals to Aruba by 25.2%. In general, tourists from all three countries appeared to be highly sensitive to the income variable. In terms of magnitude, the long-run income elasticities in the models are larger than the short-run elasticities. All are well above unity, and they range from 2.66 for the United States to 6.75 for The Netherlands.

In all the three equations, the estimated coefficients of relative prices had the expected negative signs for all countries, but the coefficients for the United States and The Netherlands were not statistically significant. The

Table 5
Coefficient of adjustment and estimated elasticities of Aruba tourism demand

Elasticity	Coefficient of adjustment (γ)[a]	Income	Price	Exchange rate
The United States (*Eq.* (4))				
Short run		1.43	−0.12	
Long run	0.5367	2.66	−0.22	
Venezuela (*Eq.* (6))				
Short run		1.82	−0.77	0.87
Long run	0.4719	3.86	−1.62	1.84
The Netherlands (*Eq.* (7))				
Short run		2.52	−0.016	0.02
Long run	0.3736	6.75	−0.044	0.06

Source: Table 4.

[a]The coefficient or elasticity of adjustment (γ) determines the relation among the short-run and the long-run elasticities and can be obtained by subtracting the statistically estimated coefficient of the lagged dependent variable ($TAUSA_{t-1}$, $TAVEN_{t-1}$, and $TANET_{t-1}$) in Eqs. (4)–(7) from 1. By dividing the coefficients of income, price and exchange rate by the value of (γ), we obtain income, price and exchange rate elasticities of the long-run demand function.

coefficient for Venezuela was statistically significant at the 95% level of confidence. The response of tourism demand to price changes, in the short run as well as in the long run, differs by origin countries. The short-run elasticities of this variable ranged from a low of −0.02 (Eq. (7)) for The Netherlands to a high of −0.77 for Venezuela (Table 5). Tourists from Venezuela appeared to be more responsive to relative price changes than those from the other two countries.

For the United States and The Netherlands, the magnitude of the coefficient estimate is close to zero. This suggests that price has little impact on demand for tourism, which is reasonable given that the US market has reached maturity and The Netherlands market is more related to the so-called ethnic travel (e.g., a visit to friends and relatives) and official (business) travel. Therefore, it appears that effective relative price fluctuations between Aruba and the origin countries of the United States and The Netherlands do not play a leading role in tourism consumption by the United States and The Netherlands. The insignificant impact of the relative price variable also indicate that tourism receipts may not fluctuate considerable, enhancing the benefits anticipated from highly income elastic demand. Long-run price elasticities range from −0.04 (The Netherlands) to −1.62 (Venezuela).

To date, the knowledge of information on price elasticities could play an important role in determining the appropriate strategy to realize more benefits from tourism. The study reveals that tourist exports are relatively price inelastic at least within the range of prices that have prevailed in Aruba. In itself, this is an important piece of information at the pricing level of the destination. Under the current conditions, the destination can entertain the objective in its pricing strategy of maximizing the net economic surplus appropriated by the destination. In this case, the government can impose higher taxes on the provision of tourist services (such as increasing the room tax) or can promote a national cartel strategy in the domestic tourist industry, particularly in the accommodation sector, in order to maximize tourist expenditures, thereby increasing the yield of the industry.

A profit-maximizing strategy could have an additional benefit for the destination, because high prices may be interpreted as signals of high quality. According to Keane (1996), charging premium prices is an incentive to deter components in the tourist industry to cheat on quality of the tourist product. Keane identified Bermuda as a high-quality destination that charges premium prices in order to undertake quality maintenance of its hotel inventory and to increase its reputation to attract more customers. This is an important feature under conditions of imperfect information (Keane, 1996).

The inclusion of the exchange rate variable was difficult for the United States and The Netherlands, and it did not improve the empirical results. The coefficient for the exchange rate variables, however, had the expected positive signs for all countries, but was not statistically significantly different from zero except for Venezuela. Therefore, the exchange rate variable was retained only in the equation for Venezuela where its appearance resulted in a clear improvement in the empirical results in terms of expected signs or magnitudes of the coefficients of the other independent variables, statistical significance of coefficients or higher explanatory power of the model. Again, the results for Venezuela conform to a priori expectations, with the elasticities varying from 0.87 in the short run to 1.84 in the long run.

The Aruban Florin is pegged to the US dollar, and thus the US dollar depreciation has no direct affect on the price of the Aruban travel services facing American consumers. It seems reasonable to suggest that, as long as the market structure of Aruba reflects the dominance of the United States, it is prudent for Aruba to continue to peg its currency to the US dollar. Any change of course regarding this policy could lead to a loss of market share, as occurred to Barbados in the early 1980s, when it pegged its currency to the US dollar and thereby removed itself from the Sterling region.

Of course, this macro economic policy could have adverse effects on other markets. It appears that, in the case of developing countries, the presence of the variable of exchange rate could be essential to depict the consumer behavior of such a country, particularly if inflation is the result of price and exchange rate volatility. This volatility could affect adversely the domestic distribution of income in such a country by impoverishing a substantial group of nationals and, therefore, affecting negatively its ability to travel. To some extent, the elasticity figure implies that Venezuelan tourists are responsive to currency valuations in the short run. The relatively low short-run exchange rate elasticity value indicates currency valuations may take some time before they affect demand for Aruba, and this is supported by the higher long-run exchange rate elasticity.

One further aspect of greater importance to Venezuelan travel behavior than the other two countries is the relevance of political disturbances. Such disturbances appear to be more important than income in Venezuela. This finding confirmed similar findings by Metzgen-Quemarez (1989).

The basic tourism demand response discussed above incorporates dynamic elements in two different ways. First, it incorporated dynamic elements in the basic tourism demand response model through a description of expectation formation generated by Eqs. (1)–(3), indicating the influence that tourism demand of the previous period has on current demand. In this context, the lagged dependent variable can be regarded as capturing, among other things, some of the effects of changes in tastes and preferences, habit persistence, the effect of repeat visitation (or destination loyalty), word of mouth effects, rigidity in supply, planning vacations, and the effect of promotion. Second, it made a distinction between a long-run equilibrium position toward which tourism consumers are assumed to be moving and their current or static position.

Therefore, if incomes increase, tourist visitors probably would make short-term adjustment in the first year. This can be achieved by: (1) increasing the length of stay; (2) increasing the level of spending; or (3) a combination of both. In the long term, tourists can respond fully to positive income developments by increasing the number of visits to Aruba.

Assuming that visitors do not react instantaneously to the fullest extent to changed conditions, the above values mean that nearly 54% of planned (desired) tourist visitors from the United States (Eq. (4)), nearly 47% from Venezuela (Eq. (5)), and nearly 37% from The Netherlands (Eq. (6)) occur within the first year, respectively. Thereafter, it requires nearly 4 years for the United States, nearly 4.7 years for Venezuela and nearly 6.4 years for The Netherlands for almost complete adjustment to take place, if all other factors remain consistent.[1]

Habit in this case may be explained through the presence of a psychocentric type of tourist based on the positive relationship between current and past demand. In addition, psychocentric tourists may reflect longer adjustment time. In this respect, Dutch tourists may exemplify the psychocentric profile to a greater degree than the American and Venezuelan tourists, who seem to prefer familiarity rather than new experiences and destinations.

In general, however, the tourists from the three generating countries tend to reflect the preference for the familiar setting. This statement is confirmed by the presence of a high repeat tourist business in Aruba. More than 50% of the total amount of tourists has visited Aruba more than twice (Croes, 2000). The presence of repeat guests also can be considered as a deterrent to quality cheating. The repeat customers know the level of quality at a destination and will expect no less when they visit again or tell their friends and family.

With respect to the dummy variables, for the United States the expected negative impact of the 1986 airlift problems (D86) was found to be statistically significant.[2] The dummy variables D7982 (impact of the US economic recession) and D9091 (political instability in the Middle East) had the expected negative and positive impacts, respectively, but both were found statistically not significant. The study eliminated these dummy variables, however, in the final US tourism demand specification. For Venezuela, both dummies (D83) and (D93) have the negative signs but only (D93) proved to be significant at the 1% level of confidence. The dummy for the Middle East was positive but significant at the 10% level of confidence. For The Netherlands, all the dummy variables had the expected signs and proved to be significant except for D9091 that was significant at the 10% level of confidence.

[1] If N is the number of periods required for adjustment to within 5% of the long-run equilibrium level, N may be determined by the formula: $(1-\gamma)^N \geqslant 0.05$, where γ is the coefficient of adjustment.

[2] Eq. (5) is presented in Table 4 for demonstration purposes only.

7. Conclusions

This article examined issues relating to the determinants and functional forms of international tourism demand to Aruba from its main tourist-originating markets. Price and exchange rate are significantly more important and compelling pull conditions for Venezuelan tourists than the American and Dutch tourists. This finding reflects the stage of economic development of Venezuela with respect to the other two countries. For all countries, the most remarkable result is the importance of the income variable, followed by the exchange rates and relative prices. The study concurred with previous studies, which found that income in the originating countries offers a robust explanation for the changes in arrivals, with varying degrees depending on the destination.

The findings further show that the degree of responsiveness of the demand for Aruba tourism resulting from changes in income varies from country to country ranging from 1.43 for the United States to 2.52 for The Netherlands, indicating that Aruba tourism has been perceived as a luxury good (service) by visitors from these generating markets. The evidence presented in this research suggests that the values of income elasticities are considerably higher in the long run when compared with the elasticity values obtained for the short run.

This study found relatively low price elasticities. This finding diverges from other studies, which found extremely high price elasticities (Rosensweig, 1988). The findings of this study seem more plausible than those of Rosensweig, however, because the price level may be the outcome of product differentiation or uniqueness and/or price strategy. The former is reflected in the "homey" touch provided to a visitor's experience, the activities provided by the destination and, in general, the type of interaction between host country and the visitor.

The expectation model examined in this research provides a flexible specification alternative. Moreover, it has the advantage of taking into account short-run dynamics as well as long-run effects. The field can be further expanded by the incorporation of different lagged structures. While the particular dynamic models used in this study are not perfect representations of economic reality, the results nonetheless show that a significant contribution to the solution of specification problems may be achieved by formulating dynamic tourism demand models of the same general type used here. Even though the expectation model employed is relatively simple, the use of this model has been found to yield significant improvements as compared with results of analyses based on static models of behavior.

This research was limited to Aruba. It has much broader relevance, however, and may be replicated for other countries in the Caribbean. Through replication, the generalization of the findings of this research could be validated. Cross-sectional comparison also could be undertaken. The Caribbean region in general faces the challenge of improving tourism performance and adjusting to new, and often adverse, circumstances. Countries in the region could benefit from the use of quantitative modeling because it is an important tool to evaluate these changes. To date, however, such modeling has been underutilized. Quantitative modeling has not been embraced as a policy tool because it has not been fully understood. This study should help to clarify the application and benefits of quantitative modeling in analyzing tourism demand in small and microstates. Consequently, the study should be of significant assistance to such states in developing economic policies for the promotion of tourism.

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