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AN ECONOMETRIC STUDY OF THE DETERMINANTS OF TOURISM COMPETITIVENESS IN THE CARIBBEAN

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Executive summary

This paper analyzes the main determinants of competitiveness in the Caribbean tourism stay-over industry using panel data for the period 1995 to 2006, based on an augmented version of an empirical model by Craigwell (2007). The analysis is based on observations available for the 34 member countries of the Caribbean Tourism Organization (CTO), except for Mexico. The ex-post measure of competitiveness used is the share of world outbound tourists from Canada, the United Kingdom, and the United States of America arriving in a Caribbean destination. The paper finds evidence that Caribbean tourism competitiveness can be enhanced through policy measures that favor increases in investment, private sector development, better infrastructure, lower population density, lower government consumption, lower trade openness, a more flexible labor market, reduced vulnerability to natural disasters, better health and cheaper oil prices. When disaggregated by source markets, the analysis reveals that British tourists are relatively price insensitive while Canadian tourists are very price sensitive. This seems to suggest that destinations that rank low on price competitiveness indicators could target price insensitive and upper market tourists coming from, say, the United Kingdom market.

INTRODUCTION

Tourism is dominant in the Caribbean[1], which is in fact the most tourism-penetrated region in the world. The establishment of tourism as a major economic activity was initially driven by a post-independence economic restructuring throughout the region away from traditional agriculture and towards services and manufacturing. This restructuring was deemed necessary in the face of declining competitiveness in traditional sectors (namely agriculture), and a need for building competitiveness in non-traditional areas.

According to the latest comprehensive report for the Caribbean published by the World Travel and Tourism Council (WTTC, 2004), travel and tourism demand in the region amounted to US$40.3 billion in 2004 (out of US$5.5 trillion worldwide or 0.7% of the total), and is expected to rise to US$81.9 billion by 2014. By this indicator, the largest travel and tourism economies in the Caribbean are Puerto Rico (22.4% of total regional demand), Dominican Republic (12.9%), Cuba (12.0%), the Bahamas (9.0%) and Jamaica (8.2%). These five destinations accounted for almost two thirds of the total market demand. The smallest travel and tourism economies are Dominica, Anguilla, St Kitts and Nevis, Grenada and St Vincent and the Grenadines, accounting for 1.7% of the total demand. In terms of output generation, based on figures, three small islands (British Virgin Islands, Antigua and Barbuda, and Anguilla) have more than 70% of its GDP originating from the travel and tourism industry. For Aruba, Barbados and the Bahamas, the contribution of this sector to GDP lies in the range of 50-70%. In terms of job creation, travel and tourism activities account for more than two thirds of the employment in Anguilla, Aruba, Bahamas, Antigua and Barbuda, and British Virgin Islands, the figures being 95% for the latter two. For another seven, the employment dependency ranges between 30% and 60%; and for another six, the range is between 15% and 30%.

In a recent regional report, the WTTC (2008) estimates that the travel and tourism economy would contribute about 14.8% to the region's GDP in 2008, the highest level in the world. It also would generate some 2,148,000 jobs or 12.9% of total employment. However, the report also ranks the Caribbean as the region with the second weakest expected annual real growth rate from tourism (ahead of the European Union) for the next 10 years. All these figures seem to point to one major conclusion: the Caribbean is the most tourism dependent region in the world and yet its prospects for future growth are not as bright as those of some other regions, such as Asia. The high dependency of most Caribbean States on tourism makes it imperative for the region as a whole to understand and analyze the major determinants of its tourism competitiveness. There is a need to inform policy makers on the choice of public policies and strategies that the tourism sector needs in order to enhance its competitiveness.

To shed some light on these important issues, this paper estimates an empirical model of competitiveness in the tourism sector using panel data for 32 Caribbean countries in 1995-2006. The next section defines the concept of tourism competitiveness and discusses its major determinants and measures. In section II the model to be estimated is introduced, whereas section III presents some econometric results on the main drivers of tourism competitiveness in the Caribbean. The last section concludes.

[1] Defined as the 32 member countries/territories of the CTO excluding Mexican destinations (Cancun and Cozumel).

I. MEASURES AND DETERMINANTS OF TOURISM COMPETITIVENESS

Tourism competitiveness is influenced by a wide set of factors or determinants. The literature on tourism recognizes tourism competitiveness as a relative, multi-dimensional, complex concept determined by a range of economic, political, ecological, cultural and political variables (Craigwell, 2007).[2]

A measure of ex-ante tourism competitiveness that has been commonly used is the WTTC Tourism Competitiveness Index (WTTC TCI) built around eight dimensions: price competitiveness, infrastructure development, environmental quality, technology advancement, degree of openness, human resources, social development and human tourism indicators. This index focuses on the macroeconomic determinants of competitiveness that sheds information on the competitive strengths and weaknesses of tourist destinations. Table 1 summarises and describes the different components of the index.

Table 1: Main sub-indexes and components of the WTTC Tourism Competitiveness Index

Main sub-indexes	Components
Price competitiveness	Hotel prices, indirect taxes, purchasing power parities
Human tourism	Volume and value of inbound and outbound tourism
Infrastructure	Roads, railways, water, sanitation
Environment	Population density, CO2 emissions, ratification of international treaties on the environment
Technology	Internet access, telephones, mobile phones, high-tech exports
Human resources	Life expectancy, literacy, enrolment rates in education, employment in travel and tourism, unemployment, population, gender indicators
Openness	Visa requirements, trade openness, taxes on trade, tourism openness
Social development	Human Development Index, personal computers, televisions, newspapers, crime rates

Source: WTTC (2006).

The World Economic Forum (WEF) has taken over the WTTC TCI and since 2007 produces a Travel and Tourism Competitiveness Index (TTCI) for 124 countries rating them on three dimensions: travel and tourism regulatory framework, business environment and infrastructure, and human, cultural and natural resources. Table 2 summarises and describes the different components of this index.

[2] Tourism Competitiveness in Small Island Developing States. Roland Craigwell. United Nations University WIDER Research Paper No. 2007/19. April 2007.

Table 2: Main sub-indexes and components of the WEF Travel and Tourism Competitiveness Index

Main sub-indexes	Components
Regulatory framework	Policy rules and regulations, environmental regulation, safety and security, health and hygiene, and prioritisation of travel and tourism strategies
Business environment and infrastructure	Air transport infrastructure, ground transport infrastructure, tourism infrastructure, ICT infrastructure, and price competitiveness
Human, cultural and natural resources	Education and training, availability of qualified labour, workforce wellness, national tourism perception, and natural and cultural resources

Source: WEF (2007).

II. EMPIRICAL MODELLING

Craigwell (2007) assumes that a country's international stay-over tourist arrivals (V) depend on three key factors: technological advantage (A); industrial organizational advantage (O) and price advantage (P). This author also postulates that a change in a country's tourist arrivals from period T-1 to T will be driven by deviations in the competitiveness conditions of that country's tourism sector relative to those prevailing in its competitors. In this paper, the framework used by Craigwell is refined and augmented by borrowing both from the model of destination competitiveness of Dwyer and Kim (2003)[3] and the WTTC TCI outlined above to postulate that:

$$V = \Phi(P, I, E, A, O, S, EX) \qquad (1)$$

where

P = Price competitiveness advantages;
I = Infrastructure advantages;
E = Environmental advantages;
A = Technological advantages;
O = Industrial organizational advantages that reflect the market-based conditions that can influence the competitiveness environment facing firms and industries such as the degree of openness, government interventions, access to human resources, access to finance and regulatory environment;
S = Social advantages including quality of the human environment such as health and sanitation; and
EX = Exogenous advantages determined by history, culture and geography.

[3] L. Dwyer and C. Kim (2003), "Destination competitiveness: Determinants and indicators". *Current Issues in Tourism*, vol. 6, n. 4.

The estimated panel regression equation is of the following form:

$$S_{ijt} = \frac{V_{ijt}}{V_{it}} = \alpha + \beta_1 P_{ijt} + \beta_2 I_{jt} + \beta_3 E_{jt} + \beta_4 A_{jt} + \beta_5 O_{jt} + \beta_6 S_{jt} + \beta_7 EX_j + \varepsilon_{jt} \qquad (2)$$

where

S_{ijt} = Tourism performance indicator reflecting ex-post competitiveness of Caribbean destination j from source market i in year t .

V_{ijt} = Total stay-over tourist arrivals to Caribbean destination j from source market i where i = Canada, the United States and the United Kingdom (among the 3 main source markets in the Caribbean) in year t.

V_{it} = Total world outbound tourists from Canada, the United States and the United Kingdom in year t.

P_{ijt} = Measures of price competitiveness advantages for Caribbean destination j vis-à-vis source market i in year t.

I_{jt} = Measures of infrastructure advantages for Caribbean destination j in year t.

E_{jt} = Measures of environmental advantages for Caribbean destination j in year t.

A_{jt} = Measures of technological advantages for Caribbean destination j in year t.

O_{jt} = Measures of industrial organizational advantages for Caribbean destination j in year t.

S_{jt} = Measures of social advantages for Caribbean destination j in year t.

EX_j = Measures of exogenous advantages for Caribbean destination j (fixed factors).

ε_{jt} = Disturbance term for Caribbean destination j in year t that can de decomposed into $\varepsilon_{jt} = \eta_j + \nu_{jt}$ where η_j is a country specific random error term with mean zero and constant variance and ν_{jt} is a random disturbance term that has mean zero and constant variance for each country j and varies across j.

Assumptions: $E(\varepsilon_{jt}) = 0$ that is ε_{jt} has mean zero; $Var(\varepsilon_{it}) = \sigma_j$ that is ε_{jt} has constant variance within each country j but varies across j; Cov (ε_{jt}, X_{jt}) = Cov (η_j, X_{jt}) = Cov (ν_{jt}, X_{jt}) = 0, that is the error terms and its components are uncorrelated with the explanatory variables X_{jt}. $E(\varepsilon_{jt},\varepsilon_{jt+1}) = 0$, that there is no serial autocorrelation in error term within a country j. $E(\varepsilon_{st},\varepsilon_{jt+1}) = 0$, that is there is no contemporaneous correlation in the error terms across any countries j and s.

These assumptions imply that the panel regression equation will be estimated under the assumption of cross-sectional heteroskedasticity. The model is estimated using three alternative methods, i.e. Ordinary Least Squares (OLS, pooled regression), Generalised Least Squares (GLS) and Random Effects (RE). The latter is preferred over Fixed Effects (FE) according to standard Hausman tests.

III. ECONOMETRIC RESULTS

A. Variables and data description

The starting point is a sample that consists of the 32 member countries of the Caribbean Tourism Organization (excluding Mexico) for the period 1995-2006 that results in a potential maximum sample of 384 annual observations.

Dwyer, Forsyth and Rao (2000)[4] distinguish between two components of tourism price competitiveness (P) for a destination: a component that reflects the cost of ground content within the destination (accommodation, tour services, food and beverage, entertainment, etc.) and a component that reflects the cost of transport services to and from the destination and the source market. Based on this, in a first instance two measures of price competitiveness are included in the regression equation, namely the bilateral real exchange rate calculated as the ratio of the price level in the source market to the price level in the destination denominated in the latter's national currency, and the growth rate of international oil prices. The latter is used as a proxy for airfares between the destination and the source market and as a proxy for the costs of ground transportation within the destination. In a second instance, three measures of transportation costs are also included, one per source market. Following Craigwell (2007), these are constructed as the product of the growth rate in oil prices and the geographical travelling distance from the source market to the Caribbean destination relative to the distance from the source market to the destination's major non-Caribbean competitor. The growth rate in prices is taken instead of the price level itself due to the non-stationary behaviour of the latter. This implies that tourism competitiveness is more sensitive to the growth rate of the growth in oil prices rather than to growth in oil prices alone. Faster and larger increases in oil prices hurt tourism competitiveness much more than slow and moderate increases as the former are likely to pass through faster onto transportation costs[5]. For the United Kingdom source market, the major non-Caribbean competitor is taken to be Spain; for the United States, it is taken to be Mexico; and for Canada, it is taken to be the United States that is proxied to be Florida[6]. It is expected that the share of the United Kingdom, United States and Canadian tourists to each Caribbean destination will increase with a real depreciation of the local currency relative to the source market's currency, with slower rate of growth in oil prices and with lower transportation costs.

As a measure of infrastructural competitive advantage (I), the share of real gross fixed capital formation in GDP is used as a proxy for infrastructure and capital upgrading. This measure should capture investment efforts in expanding and improving general infrastructure in the destination. It is expected that tourism competitiveness increases with higher levels of infrastructure investment.

Population density and an index of environmental vulnerability are used to capture environmental advantages (E). The former is expected to reduce tourism competitiveness to the extent that it is associated with factors such as over-crowding, pollution or environmental degradation that may reduce the attractiveness of the destination to certain types of tourists, especially eco-tourists. However, population density can also be associated with a higher prevalence of urban, leisure and cultural facilities such as shopping, entertainment and sports that may increase the attractiveness of the destination to other types of tourists in certain niche

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[4] L. Dwyer, P. Forsyth and P. Rao (2000), "The price competitiveness of travel and tourism destinations: A comparison of 19 destinations". *Tourism Management*, vol. 21.

[5] An increase in oil prices by say 1% may not cause transport companies to increase their prices in order not to lose customers; however a high increase in oil prices by say 10% may incite transport companies to immediately adjust their prices, transpiring into increases in transportation costs in order to prevent big losses in profits. There are costs to transport companies for adjusting their prices in relation to fuel costs. These adjustment costs fall with faster and larger increases in fuel costs.

[6] In 2006, according to UNWTO statistics, Spain was the top tourist destination for British tourists; Mexico was so for the United States tourists and the latter country was the top tourist destination for Canadians.

markets (shopping, sports, gambling and the like). Therefore, the effect of population density on tourism competitiveness is ambiguous. On the other hand, higher environmental vulnerability caused by exposure to natural disasters such as hurricanes, environmental degradation and marine pollution is expected to reduce tourism competitiveness. In the Caribbean context, exposure to natural disasters, such as hurricanes, can severely impact on tourism performance. This particular determinant is entered as a fixed factor in the regression using data from the United Nations Environment Programme (UNEP) and the South Pacific Geo-science Applied Commission (SOPAC) Environmental Vulnerability Index (EVI) that is available for a single year only. The expectation is that greater exposure to natural disasters reduces the attractiveness of the destination as a safe haven and impacts negatively on the destination competitiveness.

Technological competitiveness advantage (A) is captured in the regression equation by the inclusion of an indicator on telephone mainlines in use, with the expectation that such an indicator is likely to be positively correlated with other sources of technological advantages reflected in the WTTC TCI, such as internet access or mobile phone use. Access to good technology not only raises tourism competitiveness by increasing attractiveness of the destination as a comfortable destination to high-end tourists, it also raises the attractiveness of the destination as an investment location for tourism investors whose capital finances supply expansion in the tourism sector. Due to limited data availability, only telephones as an indicator of technological advantage is used and only initial values at the start of the sample are used to minimize gaps in the time series data.

Industrial organizational advantages (O) are taken to reflect factors that will affect the competitiveness of the business environment faced by firms in the tourism industry. Four main factors are identified that can affect the cost competitiveness of the destination tourism industry: local private sector development, degree of trade openness, labour market competitiveness and government interventions in the economy. The tourism sector is input-intensive and in destinations where the local private sector is undeveloped, this translates into high import-intensiveness as most inputs need to be imported rather than sourced locally at cheaper prices. Import leakage rates in the Caribbean tourism sector are recognized to be very high (ECLAC, 2008)[7]. Support for the development of the local private sector in tourism destinations can raise tourism price competitiveness by making cheaper local inputs available. It can also raise the attractiveness of the destination by making a range of privately supplied facilities available to the tourists. Thus, domestic credit to the private sector as a share of GDP is included in the regression equation to capture this dimension. In addition, open trade policies that stifle domestic private sector development and increase import dependency may harm tourism competitiveness. However openness to trade can also facilitate the use of cheaper and higher-quality imported inputs over dearer and lesser quality local inputs for the tourism sector, thereby augmenting competitiveness. Overall, trade openness can either benefit or harm tourism competitiveness and this remains to be settled empirically. A measure of trade openness (namely exports plus imports as a share of GDP) is entered in the regression equation to control for this factor.

Tourism is also a labour-intensive industry (Jayawardena, 2002)[8]. Tourism competitiveness therefore will directly depend on labour market conditions in the destination

[7] ECLAC (2008), "Structural Change and Productivity Growth: 20 Years Later. Old problems, New opportunities". Table V.20. Page 220. ECLAC Thirty second session working document. 2008. See also "Caribbean Tourism, Trends, Policies and Impact. 1985-2002". ECLAC Port of Spain. LC/CAR/G.765. 2003.

[8] C. Jayawardena, ed. (2002), Tourism and Hospitality Education and Training in the Caribbean.

country. Factors such as real wage levels, ease of hiring and firing workers, labour regulations and quality of human resources will affect the destination cost competitiveness. Competitiveness of the labour market is accounted for by entering an employment index measuring rigidity in the labour market[9] in the regression equation. The data is taken from the Doing-Business Database from the World Bank. Data for the Caribbean is available for the years 2006 onwards. Under the assumption that labour market reforms are slow to occur and that institutional quality takes time to improve, the earliest observation available for each destination is used to enter the index as a time-invariant factor in the equation.

Tourism is also essentially a private sector activity though it needs an appropriate physical, regulatory, fiscal and social framework to grow in a sustainable fashion that can only be provided by governments or public sector authorities (WTO, 2000)[10]. The share of real government final consumption expenditure in GDP is added to control distortions-inducing government activity in the economy that can harm tourism competitiveness. High government consumption financed by higher taxes on the private sector including the private tourism sector will harm tourism competitiveness. Any resources used by government for consumption rather than productive investment that raises productivity and efficiency for the private sector will also be detrimental to private sector tourism competitiveness.

To reflect social advantages (S) such as level of human development as a determinant of destination tourism competitiveness, two health-related variables are included in the equation, namely start of sample values for tuberculosis death rate per 100,000 inhabitants and new reported Acquired Immune-Deficiency Syndrome (AIDS) cases[11]. The quality of the health environment and environmental safety in general, has been recognized as important factors affecting tourism arrivals in the Caribbean (CAREC/PAHO)[12]. It is expected that improvements in health and human development indicators will raise the attractiveness of a country as a safe and comfortable destination. Due to the limited availability of data on crime and murder rates, this variable is left out.

Finally, a set of exogenously given determinants of destination competitiveness (EX) is included in the regression equation. These determinants can be fixed factors that can account for historical and cultural advantages that a particular destination may possess. A dummy variable for United Kingdom and Spanish former colonies is included to reflect any advantages a destination may have from a given source market on account of historical and colonial background, language ties and cultural heritage. It is expected that the coefficient of the Spanish dummy variable will be large and significant given the dominance of the three Spanish-speaking countries in Caribbean tourism, both in terms of level and growth of stay-over arrivals (Cuba, Dominican Republic and Puerto Rico account for about 45-50% of the total stay-over market in the Caribbean). However, it is also expected that English-speaking countries have a relative

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[9] The rigidity of employment index is an average of three indexes that measure how difficult it is to hire new workers, how rigid the regulations are on working hours and how difficult it is to dismiss a redundant worker.

[10] WTO (200), Public-Private Sector Cooperation: Enhancing Tourism Competitiveness. World Tourism Organization Business Council.

[11] Initial values only are used to minimize significant gaps in time series.

[12] Refer to http://www.carec.org/projects/hotels/qtc_project.htm for an overview of CAREC/PAHO Quality of Tourism for the Caribbean Initiative to promote competitiveness in tourism by promoting health and environmental safety and standards.

advantage from United Kingdom, United States and Canadian source markets. Exogenously given determinants that relate to domestic conditions in the source markets or world business conditions are also controlled. Real income growth from the source markets as exogenous determinants of tourism competitiveness is included, with the expectation that faster real income growth in source markets raises Caribbean tourism competitiveness. A weighted average index of real income growth across the three source markets is constructed with the weights given by the initial share of these source markets in total stay-over arrivals in the given destination. Finally, time dummy variables for the period 1996 to 2005 are included to control changes in the given external world environment. Table 3 summarises variables descriptions and sources.

Table 3: Summary description of variables

Variables	Description	Sources
Sij	Share of UK,US and Canadian stay-over arrivals (aggregated) to destination j in total world outbound UK, US and Canadian tourist arrivals i = Source markets = UK, US and Canada j = Caribbean destination $S_{ij} = (T_{UKj} + T_{USj} + T_{CANj}) / (W_{UK} + W_{US} + W_{CAN})$ Where T_{ij} = Total stay-over arrivals to destination j from source i; W_i = total world outbound stay-over tourists from country i.	United Nations World Tourism Organization (UNWTO)
Yj	Weighted average of GDP growth in UK, US and Canada, weights are shares of UK, US and Canada in the total stay-over market of Caribbean destination j as at 1995. These shares are adjusted so that the weights sum to 1.	World Bank World Development Indicators (WDI) Caribbean Tourism Organization (CTO)
Y_{US} Y_w	GDP growth rate of U.S. and GDP growth rate of world, respectively	WDI
GPOIL	Annual growth rate in world crude oil prices (US$ per barrel)	Energy Information Administration (EIA)
$TC_{UK,j}$ $TC_{US,j}$ $TC_{CAN,j}$	Transport costs from UK/US/Canada to destination j calculated as the product of growth rate in oil prices and $DIST_{UK,j}$, or $DIST_{US,j}$, or $DIST_{CAN,j}$, respectively where: $DIST_{UK,j}$ = distance from London Heathrow to main international airport of Caribbean destination j relative to distance from London Heathrow to Madrid international airport $DIST_{US,j}$ = distance from New York JFK international airport to main international airport of Caribbean destination j relative to distance from New York JFK to Mexico City's international airport $DIST_{CAN,j}$ = distance from Toronto L. Pearson international airport to main international airport of Caribbean destination j relative to distance from Toronto L. Pearson international airport to Miami international airport	EIA www.webflyer.com
RERj $RER_{UK,j}$ $RER_{US,j}$ $RER_{CAN,j}$	Weighted average of real exchange rate of UK, US and Canada, weights are share of UK, US and Canada in the total stay-over market of Caribbean destination j as at 1995. These shares are adjusted so that the weights sum to 1. Real exchange rate of source i relative to Caribbean destination j is calculated as follows: $RER_{i,j} = (P_i / P_j)^* E$ E= Nominal exchange rate of local currency per US$ divided by nominal exchange rate of source market i per US$ = Nominal exchange rate of source market i currency per local currency P = GDP deflators (base 1990, national currency) as proxies for price levels	United Nations Statistics Division Common Database (UNCD)
INVj	Share of gross fixed capital formation in GDP (at constant prices, national currency)	UNCD
GCONSj	Share of government final consumption expenditure in GDP (at constant prices, national currency)	UNCD
TRADEOPENj	Ratio of the sum of exports and imports of goods and services to GDP (at constant prices, national currency)	UNCD
POPDENSj	Population density calculated as total population divided by total land area in hectares	UNCD
CREDITPSj	Domestic credit to private sector (% of GDP)	WDI
Fixed factors/ Time invariant variables		
EMPLINDEXj	Rigidity of employment index. Values as at 2006 or 2007 whichever is available.	World Bank Doing Business Database
COLSPAINj	Dummy variable for a country colony of Spain at time of independence	Central Intelligence Agency World Factbook (CIA)
COLUKj	Dummy variable for a country colony of UK at time of independence	CIA
EVIj EVIDj	EVI = Environmental Vulnerability Index. The index is computed from an aggregate of 50 indicators with values ranging from years 1993 to 2004. EVID refers to the indicator on exposure to natural disasters	United Nations Environment Program and South Pacific Applied Geoscience Commission
Time invariant variables where initial values (1995) are taken		
AIDSj	AIDS new cases reported. 1995 values	UNCD
TUBERj	Tuberculosis death rate per 100,000. 1995 values	UNCD
TELj	Telephone mainlines in use per 100 inhabitants 1995 values or previous earliest value available	UNCD

Source: ECLAC.

The final sample consists of only 80 observations out of a potential 384 due to limited data availability for most Caribbean states and territories. Nine countries are covered and these are Belize, Dominican Republic, Grenada, Jamaica, St Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines, Suriname and Trinidad and Tobago. Panel unit root tests (Levin-Lin-Chu test) were carried out to ensure that all variables are stationary. Simple correlation coefficients between the dependent variable, S_{ij}, and each explanatory variable were also calculated. Table A-1 in the Annex shows descriptive statistics for the variables, the correlation coefficients and test statistics for the unit root tests.[13]

B. Regression results

Table 4 shows two sets of regression estimation results for two different equation specifications (A and B), using pooled Ordinary Least Squares (OLS), pooled Generalized Least Squares (GLS) and Random Effects (RE) model estimation, all allowing for cross-sectional heteroskedasticity. To verify the appropriateness of the latter method as opposed to the Fixed Effects (FE) model estimation, Hausman tests were performed to check for the non-correlation of the country–specific random term (η_j) in the error term with the explanatory variables under both specifications A and B. In both cases, the null hypothesis that the random effects model produces efficient estimators could not be rejected at the 1% level of significance. It is worth noting the high goodness of fit of all regressions, as revealed by an R-square value of 98% in OLS and RE estimations, coupled with Wald Chi-squared statistics that are statistically different from zero in all regressions regardless of the estimation method used. These results imply a rejection of the null hypothesis that all explanatory variables taken together are statistically insignificant in affecting the behaviour of tourism competitiveness.

[13] At a 10% level of significance, we find that the significant positive correlates with the tourism competitiveness indicator in the sample are: the Spanish colony dummy variable, news cases of AIDS reported and tuberculosis prevalence rates. Significant negative correlates include: a weighted index of real exchange rate appreciation between the currency of the destination relative to the currencies of the three source markets (both when aggregated across all three source markets and disaggregated by source market), real government final consumption expenditure in GDP, trade openness, domestic credit to private sector as a percentage of GDP, the United Kingdom colony dummy variable and number of telephone mainlines in use per 100 inhabitants.

Table 4: Regression results[a]

(Dependent variable S_{ij}; sample 1995-2006; annual frequency)

	Model specification A			Model specification B		
	OLS[b]	**GLS[c]**	**RE**	**OLS[b]**	**GLS[c]**	RE
Yj	-0.0004	-0.0001	-0.0004	..	..	..
	(0.510)	(0.808)	(0.604)			
Y_{US}	..	..	..	0.3371*	0.3238*	0.3371
				(0.094)	(0.088)	(0.191)
Y_w	..	..	..	1.4045*	1.2898*	1.4045
				(0.061)	(0.068)	(0.143)
GPOILj	-0.0031*	-0.0027*	-0.0031	..	..	..
	(0.055)	(0.078)	(0.120)			
$TC_{UK,j}$	..	..	..	-0.0071**	-0.0063*	-0.0071
				(0.049)	(0.067)	(0.119)
$TC_{US,j}$	..	..	..	0.0870*	0.0721	0.0870
				(0.061)	(0.107)	(0.119)
$TC_{CAN,j}$	..	..	..	-0.0482*	-0.0410*	-0.0482
				(0.057)	(0.096)	(0.117)
RERj	0.0005***	0.0004***	0.0005***	..	..	..
	(0.000)	(0.001)	(0.000)			
$RER_{Uk,j}$	..	..	..	-0.0457	-0.0502*	-0.0457
				(0.140)	(0.090)	(0.183)
$RER_{US,j}$	..	..	..	-0.1000	-0.0734	-0.1000
				(0.111)	(0.214)	(0.138)
$RER_{CAN,j}$	..	..	..	0.2745***	0.2558***	0.2745***
				(0.000)	(0.000)	(0.000)
INVj	-0.0012	-0.0001	-0.0012	-0.0003	0.0008	-0.0003
	(0.306)	(0.957)	(0.395)	(0.757)	(0.367)	(0.817)
GCONSj	-0.0067*	-0.0064*	-0.0068*	-0.0090**	-0.0075**	-0.0090**
	(0.067)	(0.058)	(0.093)	(0.020)	(0.033)	(0.032)
TRADEOPENj	-0.0014***	-0.0014***	-0.0014***	-0.0013***	-0.0012***	-0.0013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
POPDENSj	1.7766***	1.1103***	1.7766***	1.7239***	1.1838***	1.7239***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CREDITPSj	0.0027**	0.0030***	0.0027*	0.0037***	0.0030***	0.0037**
	(0.034)	(0.007)	(0.085)	(0.004)	(0.006)	(0.023)
EMPLINDEXj	-0.6496***	-0.4081***	-0.6496***	-0.6216***	-0.4323***	-0.6216***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COLSPAINj	13.0408***	..	13.0408***	12.377***	19.1195***	12.3768***
	(0.000)		(0.000)	(0.000)	(0.001)	(0.000)
COLUKj	-5.3441***	-11.3570***	-5.3441***	-5.1121***	6.9959*	-5.1120***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.053)	(0.000)
EVIDj	-4.7653***	-2.9667***	-4.7653***	-4.5567***	-3.1437***	-4.5567***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AIDSj	-0.0131***	-0.0076***	-0.0131***	-0.0121***	-0.0080***	-0.0121***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
TUBERj	-0.0004	0.0003	-0.0004	0.0003	0.00004	0.0003
	(0.755)	(0.760)	(0.801)	(0.797)	(0.970)	(0.840)
TELj	0.1576***	0.0984***	0.1575***	0.1507***	0.1030***	0.1507***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	80	80	80	80	80	80
R-square	0.98	..	0.98	0.98	..	0.98
Wald statistic	54067.0	3765.8	2769.1	5255.5	5309.9	3177.4
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hausman test (fixed effect vs. random effects)						
Chi-squared test statistic	**..**	**..**	15.54	**..**	**..**	11.61
			(0.557)			(0.901)

Source: ECLAC estimations.

[a] Including time dummies in all regressions.

[b] Ordinary Least Squares estimation with heteroskedasticity corrected standard errors.

[c] Generalized Least Squares allowing for cross-sectional heteroskedasticity only.

Note: The pooled OLS estimator is an un-weighted average of the FE and between effects (BE) estimator while the RE estimator is a matrix-weighted average of the FE and BE estimator. The RE estimator converges towards the OLS estimator as the variance of the country-specific random error term converges towards zero and the two are exactly identical when the variance of the country-specific random error term is zero.

p-values in parentheses. * = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

.. = not included, not applicable or dropped from regression due to collinearity.

In model specification A, the real income growth variable is included as a weighted average of the GDP growth rate in each source country (Y_j) as defined in Table 3. The same is true in the case of the real exchange rate variable (RER_j). Likewise, the rate of growth of oil prices (GPOIL) is included as a single proxy variable for transportation costs. The econometric results provide evidence at the 1% level of significance that tourism competitiveness in the Caribbean is negatively affected by a real appreciation of the local currency relative to the currencies of the source markets, trade openness (TRADEOPEN), rigidity in employment conditions (EMPINDEX), exposure to natural disasters (EVID) and the prevalence rate of AIDS (AIDS). These results hold independently of the estimation method used (OLS, GLS or RE).

In addition, higher rates of growth in oil prices are also found to depress tourism competitiveness using either OLS or GLS, although only at the 10% level of significance. It does not exhibit significance using RE. Surprisingly, ex-English colonies are found to be at a competitive disadvantage relative to non ex-English colonies as revealed by the negative estimated parameter associated to COLUK. This result may be driven by the presence of the Dominican Republic in the sample, which is one of the three dominant Spanish-speaking markets in Caribbean tourism, besides Cuba and Puerto Rico. The other side of the coin is confirmed, i.e. that Spanish ex-colonies have a big competitive edge in the region relative to non-Spanish ex-colonies as evidenced by the relative high positive values exhibited by the estimated parameters linked to COLSPAIN that are statistically different from zero at the 1% level of significance regardless of the estimation method used. There is also evidence at the 1% level of significance that the availability of technological facilities, as proxied by the number of telephone mainlines in use (TEL), fosters tourism competitiveness. Finally, the positive and highly significant estimated coefficient on the population density variable (POPDENSITY) could indicate that the availability of urban facilities attracts certain types of tourists to the region.

On the other hand, the impact of government consumption (GCONS) on tourism competitiveness is found to be negative, but only at the 10% level of significance using the three estimation methods in model specification A. In the case of domestic credit to the private sector (CREDITPS), it was found that it stimulates tourism competitiveness at different levels of significance depending on the estimation method used.

As regards the time dummies included in the regression (not shown), the one for 2001 exhibited a negative and highly significant estimated parameter signalling the detrimental impact of the September 2001 attacks in the United States. Perhaps more importantly, there is strong evidence to suggest that the Caribbean has been losing competitiveness in 2001-2005 relative to 1995 given the large, negative and statistically significant estimated coefficients on these time dummy variables (significant at the 1% level using either estimation method). This is a worrisome outcome.

All in all, two surprising results stand out. First, that there is no evidence that higher levels of investment (INV) in the Caribbean will benefit the tourism sector in terms of competitiveness. Second, that real income growth in the source markets (Y) is not statistically significant in affecting tourism competitiveness in the region. Thus, real income growth in the source markets on average does not seem to impact on tourism competitiveness at all. It is possible that the inclusion of the time dummy variables are capturing the impact of world business economic cycles that are strongly correlated with real income growth in countries such

as the United Kingdom, the United States and Canada and that such inclusion is rendering the income variables insignificant due to collinearity.

To address this latter issue, another regression specification (B) was estimated disaggregating both the income growth variable (Y) and the real exchange rate variable (RER) used in specification A into their individual source market components. Therefore, variable Y was decomposed in real income growth in the United States (Y_{us}), Canada (Y_{CAN}) and the United Kingdom (Y_{UK}). However, since the series on real income growth in the last two countries failed to pass the Levin-Lin-Chu test for stationarity, only real income growth in the United States (Y_{US}) was included, along with real income growth in the world (Y_W) as the two series showed stationary behaviour. The latter variable was used as a proxy variable for real income growth in Canada and the United Kingdom. The simple correlation coefficient between Y_W and Y_{CAN}, and between Y_W and Y_{UK} is 0.54 in both cases, and are statistically significant at the 5% level. By the same token, the real exchange rate index (RER) was disaggregated into the three bilateral real exchange rates between the local currency and the currency of each source market, (RER_{UK}, RER_{US}, RER_{CAN}) which were included in the regression specification. In addition, three transportation costs variables were included, one for each source market (TC_{UK}, TC_{US}, TC_{CAN}) that combines the oil price evolution and the distance between the source and the destination market (see Table 3 for details), in exchange for the single proxy variable GPOIL used in specification A. The results are shown in Table 4.

As can be seen, there is strong evidence[14] that tourism competitiveness in the Caribbean is significantly (at the 1% level) positively correlated with population density (POPDENS) and technological facilities (TEL), and negatively correlated with openness to trade (TRADEOPEN), rigidities in the labour market (EMPINDEX), vulnerability to natural disasters (EVID) and AIDS prevalence (AIDS). All these results are consistent with the previous findings from the estimation of specification A using either OLS, GLS or RE. The high positive and statistically significant impact of the ex-Spain colony dummy variable (COLSPAIN) is also confirmed. However, the negative impact found in specification A for the ex-United Kingdom colonies (COLUK) is corroborated only using OLS and RE model estimation, but not when applying GLS (actually, the sign of the estimated coefficient is positive and significant at the 10% level). In addition, government consumption (GCONS) is found to negatively affect tourism competitiveness at the 5% level of significance (at the 10% in specification A), whereas the surprising result found in the estimation of specification A about the null effect of investment (INV) on tourism competitiveness is confirmed. Notwithstanding, under specification B, most of the time dummy variables are no longer significant except for the time dummy for year 2004 (results not shown in Table 4) which showed a negative estimated coefficient. This may be related to the impacts of Hurricanes Jeanne, Ivan, Frances and Charley in that year. 2004 was marked by an unusually active hurricane season with all four hurricanes striking within two months[15] .

Perhaps more interesting are the results that differ from the previous estimation, i.e. specification A. There is partial evidence from the OLS and GLS estimations that both real income growth in the United States and in the World – a rough proxy for income growth rates in

[14] The coefficients are significant across all three estimation methods at levels of significance of 10% or less.
[15] ECLAC estimated losses to have been more than US$ 2.2 billion in 2004 due to the hurricanes affecting four countries (three of which are included in our sample): The Bahamas, Grenada, Jamaica and the Dominican Republic.

the United Kingdom and Canada which exhibited non-stationary behaviour – raise tourism competitiveness in the Caribbean though just at the 10% level of significance. In addition, there is evidence to suggest that British and Canadian tourists are more sensitive to increases in transportation costs induced by higher oil prices than their American counterparts. This is revealed by the negative coefficients associated with TC_{UK} and TC_{CAN} in both the OLS and the GLS estimations that are statistically different from zero at the 10% level of significance (at the 5% level of significance in the case of TC_{UK} using OLS). The latter result does not hold however using RE estimation. Thus, increases in transportation costs would deter British and Canadian tourists from travelling to the Caribbean and induce them to shift to relatively lesser distant non-Caribbean destinations (such as Spain or the United States) with lower airfares.

By the same token, there is some indication that suggests that higher transportation costs induced by higher oil prices may actually induce United States tourists to switch to nearer Caribbean destinations relative to more distant non-Caribbean countries as revealed by the positive estimated coefficients associated with TC_{US} though this coefficient is significant only at the 10% level in the OLS estimation. On the other hand, Canadian tourists seem to be the most price-sensitive as compared to their British and United States counterparts. Indeed it is found that a real appreciation of the local currency relative to the Canadian currency has a large and significant (at the 1% level) negative impact on tourism competitiveness using the three estimation methods. On the contrary, United Kingdom and, especially, United States tourists seem to be price-insensitive[16]. This could reflect differences in the income segments of tourists targeted by the destination across its source markets. Canadian travellers to the Caribbean tend to be low-budget travellers who target the cheap end of the tourism market and flock mostly to the Spanish-speaking Caribbean that has a range of low to medium-budget accommodation. Indeed some 60% of Canadians to the Caribbean end up either in Cuba or the Dominican Republic, according to the CTO. Dependency on the Canadian source market is generally low in the non-Spanish speaking Caribbean (it is less than 10% for most countries, save Cuba, Dominican Republic, Guyana, Haiti and Turks and Caicos). British tourists to the Caribbean, on the other hand, are more likely to be upper-income travellers targeting the high-end of the market with Barbados as their destination of choice. Of course, the low-budget travellers are expected to be far more price sensitive than the upper-end market travellers.

C. Robustness checks

Two robustness checks are now performed on the results. The first is to control for potential endogeneity between some explanatory variables and the error disturbance term. Under the standard assumptions of the classical linear regression model, estimation by ordinary least squares yields unbiased and efficient estimators for the parameters on the explanatory variables as long as there is no contemporaneous correlation between the explanatory variables and the error disturbance term and such explanatory variables are determined exogenously to the estimation model. However such an assumption is usually violated if there are omitted variables from the model that turn out to be contemporaneously correlated with the explanatory variables included in the model; and/or if the dependent variable is thought to contemporaneously influence the explanatory variables. To address such sources of potential endogeneity, models A

[16] Although the negative estimated coefficient associated to TC_{UK} is significant at the 10% level in the GLS estimation.

and B again are estimated using one period lagged values for the explanatory variables that are time variant within a given panel and that can potentially be influenced contemporaneously by the dependent variable. Such explanatory variables are: the bilateral real exchange rates, trade openness, domestic credit to the private sector, the share of gross fixed capital formation in GDP and the share of government final consumption expenditure in GDP. The remaining time variant variables within the panels, namely the transportation costs (that vary with growth in oil prices only), the growth in real incomes in the source markets and population density are taken to satisfy the condition of exogeneity. It is reasonable to argue that growth in oil prices and growth rates in the source markets are unlikely to be correlated with the determinants of competitiveness specific to each Caribbean tourism destination. Oil prices are set by world demand and world supply forces that Caribbean destinations take as exogenous, while income growth in Canada, the United States and the United Kingdom are unlikely to be influenced or correlated with Caribbean specific competitiveness conditions. Population density for a given destination is likely to change slowly over a 10-year period as land size is fixed while changes in population are slow and determined exogenously to tourism competitiveness conditions.

Table 5 reports the results when the potentially endogenous explanatory variables are lagged by one year.

Table 5: Regression results[a]

(Dependent variable S_{ij}; sample 1996-2006; annual frequency)

	Model specification A			Model specification B		
	OLS[b]	**GLS**	**Random Effects**	**OLS**[b]	**GLS**	**Random Effects**
Yj	-0.0007	0.0001	-0.0007	..	..	..
	(0.234)	(0.795)	(0.335)			
Y_{US}	..	..	..	0.2569	0.2347	0.2569
				(0.109)	(0.130)	(0.259)
Y_w	..	..	..	1.1187*	0.9221	1.1187
				(0.067)	(0.119)	(0.196)
GPOILj	-0.0014***	-0.0011***	-0.0014***	..	..	..
	(0.000)	(0.000)	(0.001)			
$TC_{UK,j}$	..	..	..	-0.0054*	-0.0042	-0.0054
				(0.067)	(0.143)	(0.182)
$TC_{US,j}$	..	..	..	0.0662*	0.0496	0.0662
				(0.078)	(0.168)	(0.184)
$TC_{CAN,j}$	..	..	..	-0.0387*	-0.0300	-0.0387
				(0.057)	(0.125)	(0.160)
Lagged RERj	0.0005***	0.0003*	0.0004***	..	..	..
	(0.000)	(0.014)	(0.000)			
Lagged $RER_{Uk,j}$	..	..	..	0.0041	-0.0294	0.0041
				(0.894)	(0.275)	(0.902)
Lagged $RER_{US,j}$	..	..	..	-0.0118	0.0206	-0.0118
				(0.861)	(0.716)	(0.861)
Lagged $RER_{CAN,j}$	..	..	..	0.0539	0.0783	0.0539
				(0.521)	(0.263)	(0.513)
Lagged INVj	0.0011	0.0023	0.0011	0.0015	0.0028***	0.0015
	(0.384)	(0.957)	(0.499)	(0.184)	(0.002)	(0.343)
Lagged GCONSj	-0.0088***	-0.0079**	-0.0088**	-0.0110***	-0.0077***	-0.0110***
	(0.009)	(0.013)	(0.027)	(0.000)	(0.002)	(0.003)
Lagged TRADEOPENj	-0.0011***	-0.0011***	-0.0011***	-0.0010***	-0.0010***	-0.0010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
POPDENSj	1.5940***	1.2653***	1.5940***	1.6839***	0.9991***	1.6839***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged CREDITPSj	0.0029**	0.0026**	0.0029**	0.0031**	0.0029***	0.0031**
	(0.019)	(0.020)	(0.044)	(0.005)	(0.002)	(0.028)
EMPLINDEXj	-0.5875***	-0.4681***	-0.5875***	-0.6140***	-0.3689***	-0.6140***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COLSPAINj	16.6041***	..	16.6041***	12.437***	..	12.4368***
	(0.000)		(0.000)	(0.000)		(0.000)
COLUKj	..	-13.2328***	..	-4.9507***	-10.3839***	-4.9507***
		(0.000)		(0.000)	(0.000)	(0.000)
EVIDj	-4.2998***	-3.4032***	-4.2998***	-4.4926***	-2.6660***	-4.4926***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AIDSj	-0.0117***	-0.0089***	-0.0117***	-0.0122***	-0.0067***	-0.0122***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TUBERj	-0.0004	-0.0005	-0.0004	-0.0007	-0.0005	-0.0007
	(0.703)	(0.611)	(0.756)	(0.519)	(0.575)	(0.616)
TELj	0.1410***	0.1101***	0.1410***	0.1464***	0.0852***	0.1464***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	72	72	72	80	80	80
R-square	0.98	..	0.98	0.98	..	0.98
Wald statistic	4294.2	4266.5	2938.0	6176.0	4368.2	3512.8
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Source: ECLAC estimations.

[a] Including time dummies in all regressions. The estimated coefficients of the dummies on years 2004-2005 were negative and significant at a 10% level in all three cases in model A. The estimated coefficient on year 2004 was negative and significant at a 10% level in two cases in model B.

[b] Ordinary Least Squares estimation with heteroskedasticity corrected standard errors.

[c] Generalized Least Squares allowing for cross-sectional heteroskedasticity only.

Note: The Hausman tests failed and subsequently are not reported.

* = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

.. = not included, not applicable or dropped from regression due to collinearity.

Comparing Table 4 to Table 5, it can be seen from model A that the results remain broadly robust. The main differences are that, using model B, the evidence that an appreciation of the local currency relative to the Canadian currency significantly undermines tourism competitiveness of the local destination vanishes, and for the first time it is found that increases in gross fixed capital formation in GDP could significantly raise tourism competitiveness (using GLS).

A second robustness check consists in testing for the sensitivity of the results to the potential presence of influential observations in the data. The figures in the Annex plot leverage points against the normalized standard residuals when estimating models A and B by OLS. Points in the upper left corner signal the presence of leverage points[17] while points in the lower right corner signal unusually high residuals. From these plots, visually there are several observations that can potentially be influential (high leverage and/or high standardized residuals). To control influential observations, the estimations as in Table 4 are carried out, this time omitting variables with a Cook's statistic that exceeds the cut off value of (4/n) where n is the sample size (in this case 80) as is standard procedure[18]. Results are reported in Table 6.

[17] According to Kennedy (2007), there are two kinds of outliers that may have a strong influence on estimates produced by OLS. The first type of outliers consists of observations with unusually large errors and the second type consists of leverage points, that is, observations with unusual values on an explanatory variable. What should be controlled are not outliers per se but rather influential observations, i.e. outliers that have a strong influence on OLS estimates. Such influential observations are data points whose removal from the estimation would dramatically alter the coefficients obtained from the regression model.

[18] OLS is used to estimate model A and B in Table 4 and calculate the Cook's statistic for these two models respectively. Then Table 4 is estimated again by omitting variables with a Cook's statistic exceeding 0.05 (4/80). A definition and explanation of the Cook's statistic can be found at http://en.wikipedia.org/wiki/Cook's_distance which is reproduced in the Annex.

Table 6: Regression results[a]

(Dependent variable S_{ij}; sample 1995-2006; annual frequency)

	Model specification A			Model specification B		
	OLS[b]	GLS	Random Effects	OLS[b]	GLS	Random Effects
Yj	-0.0006	-0.0003	-0.0006	..	..	..
	(0.121)	(0.399)	(0.226)			
Y_{US}	..	..	..	0.3984**	0.3030*	0.3984*
				(0. 029)	(0.067)	(0.090)
Y_w	..	..	..	1.5944**	1.1521*	1.5944*
				(0.020)	(0.065)	(0.070)
GPOILj	-0.0016	-0.0018*	-0.0016	..	..	..
	(0.168)	(0.088)	(0.267)			
$TC_{UK,j}$	..	..	..	-0.0077**	-0.0053*	-0.0077*
				(0.021)	(0.079)	(0.064)
$TC_{US,j}$	..	..	..	0.109**	0.0430*	0.1095*
				(0.015)	(0.051)	(0.055)
$TC_{CAN,j}$	..	..	..	-0.0606**	-0.0430*	-0.0606*
				(0.013)	(0.051)	(0.053)
RERj	0.0004***	0.0003***	0.0004***	..	..	..
	(0.000)	(0.000)	(0.000)			
$RER_{Uk,j}$	..	..	..	-0.0478*	-0.0601**	-0.0478*
				(0.094)	(0.022)	(0.100)
$RER_{US,j}$	..	..	..	-0.0388	0.0483	-0.0388
				(0.565)	(0.413)	(0.563)
$RER_{CAN,j}$	..	..	..	0.2241***	0.1573**	0.2241***
				(0.005)	(0.021)	(0.008)
INVj	-0.0001	-0.0004	-0.0001	0.0010	0.0021**	0.0010
	(0.934)	(0.683)	(0.948)	(0.283)	(0.012)	(0.440)
GCONSj	-0.0082***	-0.0093***	-0.0082***	-0.0098***	-0.0063**	-0.0098**
	(0.003)	(0.000)	(0.005)	(0.002)	(0.023)	(0.013)
TRADEOPENj	-0.0014***	-0.0013***	-0.0014***	-0.0011***	-0.0011***	-0.0011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
POPDENSj	1.0279***	0.8007***	1.0279***	1.6368***	1.0816***	1.6368***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CREDITPSj	0.0040***	0.0033***	0.0040***	0.0019*	0.0012	0.0019
	(0.000)	(0.000)	(0.000)	(0.079)	(0.215)	(0.154)
EMPLINDEXj	-0.3748***	-0.2922***	-0.3748***	-0.5992***	-0.4076***	-0.5992***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COLSPAINj	10.2161***	7.8508***	20.0426***	17.0588***	11.7165***	..
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
COLUKj	..	..	9.8265***	..	..	-17.0588***
			(0.000)			(0.000)
EVIDj	-2.7267***	-2.1065***	-2.7267***	-4.3757***	-2.9453***	-4.3757***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AIDSj	-0.0067***	-0.0049***	-0.0067***	-0.0121***	-0.0081***	-0.0121***
	(0.000)	(0.003)	(0.001)	(0.000)	(0.000)	(0.000)
TUBERj	0.0011	0.0011	0.0011	-0.0012	-0.0020**	-0.0012
	(0.217)	(0.200)	(0.339)	(0.278)	(0.044)	(0.376)
TELj	0.0917***	0.0712***	0.0917***	0.1427***	0.0936***	0.1427***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	73	73	73	68	68	68
R-square	0.99	..	0.99	0.99	..	0.99
Wald statistic	8011.5	8004.1	8574.1	4592.2	4554.1	4663.3
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Source: ECLAC estimations.

[a] Including time dummies in all regressions. The dummies on years 2001-2005 were negative and significant at a 1% level in all three cases in model A. The dummy on year 2004 was negative and significant at a 5% level in two cases in model B.

[b] Ordinary Least Squares estimation with heteroskedasticity corrected standard errors.

[c] Generalized Least Squares allowing for cross-sectional heteroskedasticity only.

Note: The Hausman tests failed and subsequently are not reported.

p-values in parentheses.

* = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

.. = not included, not applicable or dropped from regression due to collinearity.

Comparing Table 6 to Table 4, it can be seen that results are fairly robust using both models. Results from model specification B show some slight differences as compared to Table 4, though. After controlling influential observations, there is partial evidence that increases in gross fixed capital formation in GDP can benefit tourism competitiveness (using GLS). In addition, there is evidence that growth in incomes in the United States and worldwide result in a greater share of tourists landing in the Caribbean. Both income growth variables are significant either at the 10% or the 5% level.

Table 7: Regression results[a]

(Dependent variable S_{ij}; sample 1996-2006; annual frequency)

	Model specification A			Model specification B		
	OLS[b]	GLS	Random Effects	OLS[b]	GLS	Random Effects
Yj	-0.0004	0.0004	-0.0004	..	..	..
	(0.449)	(0.272)	(0.558)			
Y_{US}	..	..	..	0.2021	0.2122	0.2021
				(0. 212)	(0.168)	(0.355)
Y_w	..	..	..	0.8413	0.8093	0.8413
				(0.177)	(0.171)	(0.322)
GPOILj	-0.0013***	-0.0008***	-0.0013***	..	..	..
	(0.000)	(0.088)	(0.000)			
$TC_{UK,j}$	..	..	..	-0.0040	-0.0036	-0.0040
				(0.179)	(0.201)	(0.312)
$TC_{US,j}$	..	..	..	0.0602	0.0508	0.0602
				(0.134)	(0.163)	(0.258)
$TC_{CAN,j}$	..	..	..	-0.0350	-0.0302	-0.0350
				(0.109)	(0.129)	(0.232)
Lagged RERj	-0.0000	-0.0001	-0.0000	..	..	..
	(0.879)	(0.286)	(0.928)			
Lagged $RER_{Uk,j}$	..	..	..	-0.0198	-0.0487*	-0.0198*
				(0.537)	(0.090)	(0.539)
Lagged $RER_{US,j}$	..	..	..	-0.0408	0.0551	-0.0408
				(0.589)	(0.360)	(0.570)
Lagged $RER_{CAN,j}$	..	..	..	0.1378*	0.0804	0.1378*
				(0.098)	(0.250)	(0.097)
Lagged INVj	0.0039***	0.0041***	0.0039***	0.0031***	0.0031***	0.0031**
	(0.000)	(0.000)	(0.012)	(0.001)	(0.000)	(0.034)
Lagged GCONSj	-0.0110***	-0.0070**	-0.0082***	-0.0104***	-0.0066***	-0.0104***
	(0.002)	(0.019)	(0.005)	(0.000)	(0.007)	(0.004)
Lagged TRADEOPENj	-0.0008***	-0.0010***	-0.0110**	-0.0010***	-0.0011***	-0.0010***
	(0.000)	(0.000)	(0.011)	(0.000)	(0.000)	(0.000)
POPDENSj	1.3620***	0.9654***	1.3620***	1.5435***	0.9343***	1.5435***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged CREDITPSj	0.0041***	0.0025***	0.0041***	0.0027**	0.0025***	0.0027*
	(0.000)	(0.004)	(0.003)	(0.014)	(0.007)	(0.067)
EMPLINDEXj	-0.4975***	-0.3565***	-0.4975***	-0.5644***	-0.3476***	-0.5644***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COLSPAINj	13.8995***	10.0422***	13.8995***	16.0136***	9.8202***	28.0555***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COLUKj	..	..	..	..	..	-17.0588***
						(0.000)
EVIDj	-3.6248***	-2.5662***	-3.6248***	-4.1155***	-2.5058***	-4.1155***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AIDSj	-0.0092***	-0.0062***	-0.0092***	-0.0111***	-0.0063***	-0.0111***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
TUBERj	0.0001	-0.0006	0.0001	-0.0010	-0.0009	-0.0010
	(0.894)	(0.474)	(0.921)	(0.309)	(0.263)	(0.442)
TELj	0.1173***	0.0810***	0.1173***	0.1330***	0.0793***	0.1330***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	66	66	66	68	68	68
R-square	0.99	..	0.99	0.99	..	0.99
Wald statistic	11671.7	11838.1	3140.4	4869.7	4832.1	6540.0
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Source: ECLAC estimations.

[a] Including time dummies in all regressions. The estimated coefficient for 2004 was negative and significant at the 10% level using either estimation method in model A. The coefficient for year 2005 was similarly negative and significant at a 10% level for the OLS and GLS estimations. In model B, the estimated coefficients for 2004-2005 were both negative and significant at the 10% level only using OLS.

[b] Ordinary Least Squares estimation with heteroskedasticity corrected standard errors.

[c] Generalized Least Squares allowing for cross-sectional heteroskedasticity only.

Note: The Hausman tests failed and subsequently are not reported.

p-values in parentheses.

* = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level.

.. = not included, not applicable or dropped from regression due to collinearity.

In Table 7, both endogeneity and influential observations are controlled as compared to Table 4. Doing so yields a set of robust results. There is firm evidence that tourism competitiveness in the Caribbean is significantly hampered by growth in oil prices, increases in government final consumption expenditure in GDP, trade openness, rigidity in employment and labour market conditions, exposure to natural disasters, and health diseases such as AIDS in the destination country. At the same time competitiveness benefits from increases in gross fixed capital formation in GDP, credit support to the private sector, population density and better infrastructure as mirrored by increases in telephone mainlines in the destination country. There is also firm evidence that Spanish-speaking countries have a comparative advantage relative to English-speaking Caribbean countries. There is partial evidence that British tourists may be price insensitive in the sense that a real appreciation of the destination currency relative to the British pound leaves them undeterred to come and spend their holidays in the Caribbean. On the other hand, there is partial evidence to suggest that Canadian tourists are more price sensitive relative to American and British tourists and that a real appreciation of the local destination currency relative to the Canadian dollar induces them to substitute away from Caribbean destinations. However, there is no evidence from model B that income growth from source markets matters or that geographical distance by source markets matters as opposed to growth in oil prices alone. No evidence is found from model A that the weighted average of bilateral real exchange rates exerts a significant impact on tourism competitiveness. These three findings are inconsistent with some of the previous findings showed in Tables 4 -6.

Summing up the results from Tables 5 and 7, the robustness checks actually enhance the significance of most of the explanatory variables used and with signs in the expected direction. However, in the case of the income growth variables, real exchange rates and transportation costs by source markets, the obtained evidence is mixed.

Based on the RE estimation from model A in Table 7, in terms of the magnitudes of the impacts that are significant at least at a 10% level:

(a) A one standard deviation increase in the rate of growth of oil prices will lead to the share of world United Kingdom, United States and Canadian tourists coming to the Caribbean to fall by 0.03 standard deviation;

(b) An increase in the share of gross fixed capital formation in GDP by one standard deviation can cause the share of world United Kingdom, United States and Canadian tourists coming to the Caribbean to increase in the following year by 0.04 standard deviation, while a fall in the share of government final consumption expenditure in GDP by one standard deviation will increase the Caribbean's share of world United Kingdom, United States and Canadian tourist arrivals to increase by 0.06 standard deviation units in the following year;

(c) A fall in the ratio of exports and imports to GDP by one standard deviation can cause in the following year the world share of United Kingdom, United States and Canadian tourists coming to the Caribbean to increase by 0.07 standard deviation;

(d) A one standard deviation increase in credit to private sector can cause in the following year a 0.08 standard deviation increase in the share of such tourists coming to Caribbean shores;

(e) A one standard deviation increase in the index of exposure to natural disasters and new cases of AIDS reported can cause, respectively, the share of United Kingdom, United States and Canadian tourists to fall by 1.87 and 2.00 standard deviation; and

(f) A one standard deviation increase in the number of telephones mainlines in use can increase the measure of tourism competitiveness by 1.02 standard deviation units.

IV. CONCLUSIONS: MAIN DRIVERS OF TOURISM COMPETITIVENESS IN THE CARIBBEAN AND POLICY RECOMMENDATIONS

The above results are only preliminary. This paper has focused on only one ex-post competitiveness indicator (namely share in world arrivals), while it will be important to assess as well the factors that affect changes in the share of tourism expenditures in GDP. Given the significance of the tourism sector in the Caribbean, there is an urgent need to undertake detailed country case studies in order to carefully analyze the determinants of tourism competitiveness by source markets in most Caribbean countries.

Based on the above preliminary econometric results, the main findings are:

(a) A real exchange rate depreciation could increase tourism competitiveness, but only in relation to stay-over arrivals of Canadian tourists. On the other hand, British tourists tend to be price (i.e. exchange rate) insensitive.

(b) As long as increases in transportation costs are linked to hikes in oil prices, stay-over arrivals especially from Canada and the United Kingdom would be reduced. It may be the case that this fosters tourism from the United States, as the Caribbean is a closer destination, with presumably lower air fares.

(c) Ex-Spanish colonies seem to have an advantage in terms of tourism competitiveness over ex-English colonies.

(d) Other factors that negatively and robustly affect tourism competitiveness in the Caribbean include government consumption, trade openness, rigidities in the labour market, exposure to natural disasters and AIDS prevalence rate.

(e) Other factors that positively and robustly affect tourism competitiveness in the region include population density, domestic credit to the private sector, gross fixed capital formation in GDP and telephone mainlines in use.

(f) There is no strong evidence that real income growth in source markets (i.e. United States, United Kingdom and Canada) plays a major role in tourism competitiveness behaviour in the Caribbean.

There is some evidence that suggests that Caribbean competitiveness in stay-over tourism is slowing down. The region as a whole has not made any significant gains in the total world

market share of stay-over arrivals for almost four decades. Thus, the Caribbean countries will need to find new ways to stimulate tourism competitiveness for greater economic gains. To maintain or enhance its tourism competitiveness, Caribbean destinations will need to become more cost and price-competitive at home. This may involve supporting local private sector development in order to reduce import leakages and build linkages between the tourism sector and the rest of the economy, reducing government consumption to maintain competitive tax rates, reducing vulnerability to natural disasters, reforming labour markets and business regulations in general, maintaining a healthy and safe environment, investing in human development and technology, and developing a transport/aviation policy that will result in lower transportation costs to and from the region.

The Caribbean will also need to reduce its vulnerability to external factors that are not within its control such as income shocks from abroad and oil price shocks. English-speaking small Caribbean States are particularly vulnerable, even more so in the context of the dominance of the larger Spanish-speaking countries in the tourism sector, despite the embargo on Cuba. In the medium term, reducing vulnerability to external forces that can seriously impact on tourism competitiveness will require further market diversification within the tourism sector as well as continually attracting price and income-insensitive tourists from the upper-end of the tourism markets. To this end, the creation and worldwide promotion of the "Caribbean brand" as a tourist destination would be very helpful, and would also foster regional integration, a goal that has been pursued by Caribbean countries for decades.

Annex

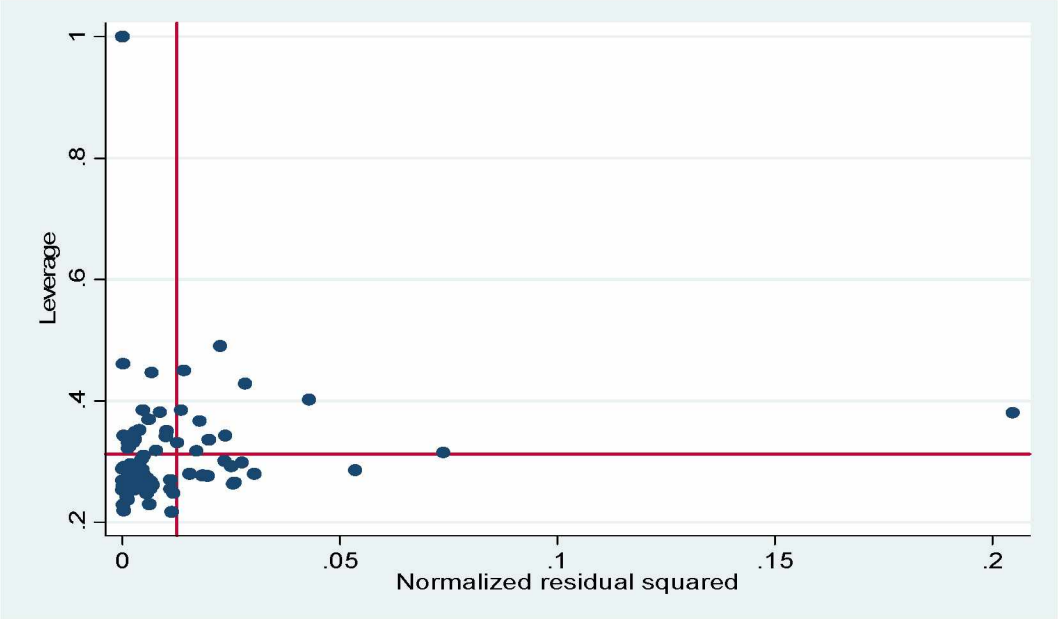
Table A-1: Descriptive Statistics, Correlation Coefficients and Panel Unit Root Tests

Variables (No of Obs = 80)	Mean	Standard Deviation	Minimum	Maximum	Correlation coefficient with Sij[1]	Panel Unit root test Levin-Lin-Chu Test[2]	
						Test Statistic	P-Value
Sij	0.286	0.346	0.004	1.063	1.000	Z = -0.235	P = 0.000
Yj	178.221	77.827	13.042	378.240	0.205*	Z = -0.651	P = 0.000
$RYGROWTH_{US}$	3.168	1.196	0.759	4.548	-0.015	Z = -2.916	P =0.0468
$RYGROWTH_{w}$	2.998	0.838	1.540	4.130	0.037	Z =-3.181	P =0.0211
GROWTHOILj	14.052	24.328	-30.034	57.084	0.032	Z = -3.201	P = 0.020
$TC_{UK, j}$	81.020	139.924	-181.261	385.019	0.041	Z = -3.201	P = 0.020
$TC_{US, j}$	12.944	22.517	-31.875	60.584	-0.027	Z = -3.201	P = 0.020
$TC_{CAN, j}$	24.692	43.111	-60.954	115.851	-0.026	Z = -3.201	P = 0.020
RERj	218.266	141.987	0.015	696.790	0.435*	Z = -0.754	P = 0.000
$RER_{Uk, j}$	5.759	3.399	0.006	16.846	0.408*	Z = - 0.587	P =0.000
$RER_{US, j}$	3.467	1.945	0.003	8.595	0.408*	Z =-0.467	P = 0.001
$RER_{CAN, j}$	2.468	1.463	0.003	7.114	0.411*	Z = -0.358	P =0.000
RINVGDPj	31.166	13.084	7.261	83.910	-0.082	Z = -0.261	P = 0.005
RGGDPj	16.219	5.926	2.766	30.037	-0.254*	Z = -0.328	P = 0.000
TRADEOPENj	149.683	86.326	73.687	464.553	-0.279*	Z = -0.329	P = 0.000
POPDENSITYj	2.226	0.789	0.0277	3.095	-0.027	Z = -0.034	P = 0.000
CREDITPTESECTORj	53.675	21.176	14.490	92.611	-0.456*	Z = -0.167	P = 0.024
EMPLINDEXj	13.937	7.975	4	28	0.009	Constant series	
COLSPAINj	0.125	0.333	0	1	0.352*	Dummy Variable	
COLUKj	0.862	0.346	0	1	-0.120*	Dummy Variable	
EVIj	347.262	41.013	211	393	-0.101	Constant series	
EVIDj	3.009	0.516	1.82	4.14	-0.020	Constant series	
AIDSj	185.562	220.273	6	511	0.824*	Constant series	
TUBERj	48.875	57.359	8.4	39.6	0.438*	Constant series	
TELj	19.271	8.587	9	188	-0.205*	Constant series	

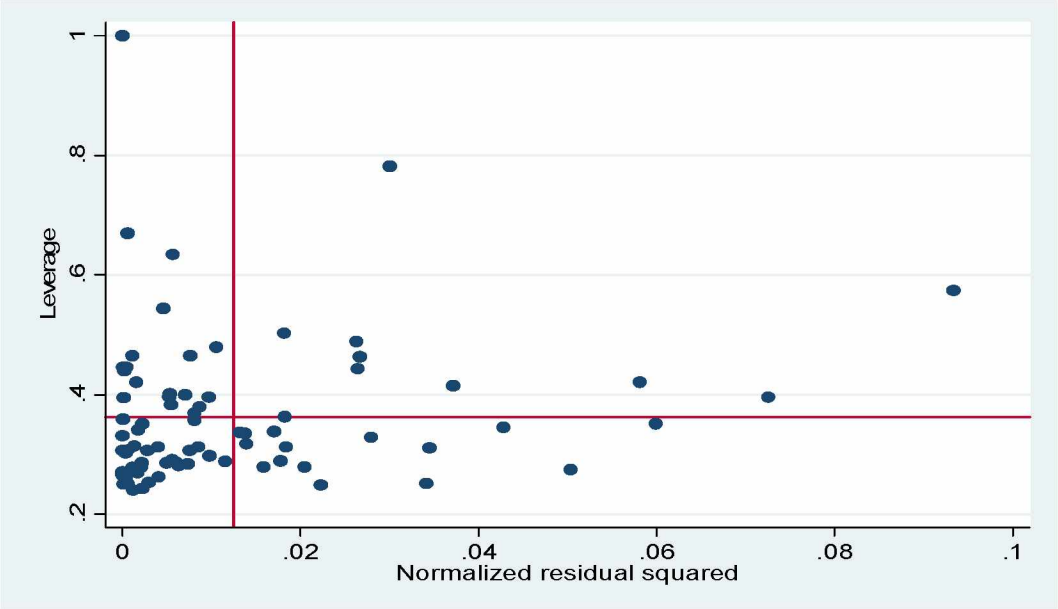
1. Simple correlation coefficient. * denotes significance at a 10% level.
2. The Levin –Lin-Chu test can only be performed on a balanced panel data set. In order to perform the test, we ensured that each individual series were without gaps over either the period 1989 to 2006 or 1995 to 2005/2006. "The test may be viewed as a pooled Dickey-Fuller test, or an Augmented Dickey-Fuller (ADF) test when lags are included, with the null hypothesis that of nonstationarity (I(1) behavior)" (Stata). All variables are stationary according to this test.

Figure 1: Leverage v/s Squared Residuals Plots (L-R plots)

Model A



Model B



Note: These are obtained by estimating Model A and B as described in Table 4 using OLS only.

Definition of Cook's Statistic
Source: Wikipedia Encyclopedia

In statistics, **Cook's distance** is a commonly used estimate of the influence of a data point when doing least squares regression. Cook's distance measures the effect of deleting a given observation. Data points with large residuals (outliers) and/or high leverage may distort the outcome and accuracy of a regression. Points with a Cook's distance of 1 or more are considered to merit closer examination in the analysis.

The following is an algebraically equivalent expression

$$Di = \sum_{j=1}^{n} (\hat{Y}j - \hat{Y}j_{(i)})^2 / p.MSE$$

$$Di = [e_i^2/p.MSE] \, . \, [h_{ii} / (1- h_{ii})^2]$$

In the above, h_{ii} is the i-th diagonal element of the hat matrix , $X (X^T X)^{-1} X^T$, e_i is the crude residual (i.e. the difference between the observed value and the value fitted by the proposed model), MSE is the mean square error of the regression model and p is the number of fitted parameters in the model.

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