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Research Paper

The impact of major tourist markets on health tourism spending in the United States

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ABSTRACT

This study investigates the impact of key inbound visitor markets on health tourism spending in the United States (US), for the period 1986–2016. Although there is a wealth of studies on health tourism, the emphasis on inferential research has inadvertently been neglected. The research uses secondary data and considers both short- and long-term perspectives, and volume and price effects. It enriches the literature by providing an inferential research approach, using a dynamic microeconomic elasticity scheme, and by providing new propositions that can contribute to the theory-building process. The methodology involves data decomposition and standardization, unit root testing, and instrumental variable regression. The results show that overall health spending in the US is primarily being affected by the long-term variations in several inbound visitor markets. This insight could benefit the pursuit of a competitive edge.

1. Introduction

The global growth of patients, health professionals, and medical technology has given an impetus to new patterns of consumption and production of healthcare services in the recent decades (Lunt et al., 2011). This creates the potential for health tourism to become an important constituent of overall tourism receipts. According to a combined estimate based on data from Patients Beyond Borders (https://www.patientsbeyondborders.com/medical-tourism-statistics-facts) for the case of medical tourism, and the Global Wellness Institute (2017) for that of wellness tourism, total worldwide health tourism spending is estimated between $608 and $635 billion. This is roughly 50% of the 2015 total international tourism receipts calculated by the United Nations World Tourism Organization (UNWTO, 2017). To be competitive in this environment, there is a need to understand which countries of origin drive health tourism spending. The overall market may be too large to serve, and by dividing the tourists into heterogeneous geographical groups there may be certain segments that are more attractive to target for their potential (Walker, 2006). However, to target the right markets requires information on the impacts of the individual geographical markets on overall health tourism spending. In an environment with limited information on the contribution of individual markets to health tourism spending, alternative strategies are needed to understand these connections. This study proposes a microeconomic elasticity approach to understand the long- and short-term dynamics of individual tourism markets on total health tourism spending in the US, using secondary data for the period 1986–2016. The distinction between long- and short-term effects is not based on sequential movements (first short-run and then long-run), but on simultaneous occurrence of both effects (long- and short-term effects manifesting concurrently) (Ridderstaat, Croes, & Nijkamp, 2016).

Health tourism has multiple designations in the literature, but is defined here in line with Kaspar (1996) as "the sum of all the relationships and phenomena resulting from a change of location and residence by people in order to promote, stabilize and, as appropriate, restore physical, mental and social well-being while using health services and for whom the place where they are staying is neither their principal nor permanent place of residence or work." (Translation by Mueller & Kaufmann, 2001, p. 7). This definition implicitly incorporates elements of both medical and wellness tourism. Like the case of health tourism, there is no agreed definition of medical or wellness tourism, and the study follows that of Carrera and Bridges (2006, p. 447) who defined medical tourism as "the organized travel outside one's local environment for the maintenance, enhancement or restoration of the individual's well-being in mind and body." Sheldon and Bushell (2009, p. 11) define wellness tourism as "a holistic mode of travel that integrates a quest for physical health, beauty, or longevity, and/or a heightening of consciousness or spiritual awareness, and a connection with community, nature, or the divine mystery."

There is a wealth of literature on health, medical and wellness tourism, covering themes such as history (Buck & Steffen, 2007; Connel, 2011; Smith & Puczkó, 2009), economics (Connel, 2011; Hanefeld &

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Smith, 2015; Martinez Alvarez, Smith, & Chanda, 2013; Morgan, 2015; Reisman, 2015), and destinations offering these services (Ali-Knight, 2009; Cheung, 2015; Cohen, 2008; Martinez Alvarez et al., 2013; Nam Jin, 2015; Reisman, 2010; Smith & Puczkó, 2009; Snyder et al., 2013; Tuohino & Komppula, 2010; White, 2009; Williams, 2009). However, despite the abundant literature, most studies were based on descriptive research, which only describes and presents information from samples or populations (Brase & Brase, 2016; Levine, Stephan, & Szabat, 2017; Weiers, 2011), contrary to the inferential research approach, which allows for cause-effect examination and/or determining the intensity of the relationship between dependent and independent variables (White & McBurney, 2013).

The US has a growing annual health tourism spending reaching almost $4 billion, but it is unclear which markets of tourism demand are contributing to this growth and to what extent they stimulate health tourism. A strategy to become a global leading exporter of health services requires an understanding of the drivers and the dynamic effects that determine health tourism spending. This study investigates the impact of key inbound visitor markets on total health tourism spending in the US, using a dynamic microeconomic elasticity approach. The research uses secondary data for the period 1986–2016 and considers both short- and long-term perspectives, and volume and price effects. The applied methodology consists of data interpolation and standardization, followed by unit root testing, and application of instrumental variable regression (Limited Information, Maximum Likelihood).

This study contributes in three ways to the tourism literature. First, the study enriches the extant literature on health tourism, particularly by its inferential research approach and its emphasis on the role of developed countries as providers of health tourism services. Second, the study supplements the literature by applying an economic approach to understand the effect of different demand markets on overall health tourism spending, from both a long- and short-term perspective. This approach is in line with the proposition of Song, Dwyer, and Zhengcao (2012) to continuously seek for new approaches, tools, and perspectives to understand the workings of tourism. Third, as a case study, this investigation aims to support the advancement of theory building by providing theoretical propositions that could assist in the theory-building process, in line with Amaratunga and Baldry (2001), Eisenhardt and Graebner (2007), Smith (2010), Veal (2006) and Yin (2009). A case study tries to expand and generate theories (analytical generalization), instead of enumerating frequencies (statistical generalizations) (Yin, 2009). This means that this study does not seek to produce findings represented in a general sense (Veal, 2006), but to articulate new ideas derived from the acquired evidence (Smith, 2010).

The remainder of this paper is organized as follows. The next section presents an overview of the literature on health tourism, whereby a distinction is made between health, medical and wellness tourism. The third section discusses the data and applied methodology, while the fourth section analyzes the empirical findings. Section five concludes and considers the managerial implications, study limitations, and the lines for future research.

2. Literature review

2.1. The past and present-day health tourism

Health tourism has been practiced for thousands of years, going back to Egyptian, Greek, and Roman timelines. People in those days traveled, for example, to seek the alleged benefits of some god, to take the waters at spas, to pilgrim to a holy place for the spirits to soothe and heal, or to benefit from warm thermal baths considered good for the joints (Cormany, 2017; Reisman, 2010). In the modern time, many countries have attempted (or are still trying) to develop and promote health tourism as a high-value tourism product to broaden their tourism base (OECD, 2016). This explains in part the broad attention this tourism niche has received in the literature.

2.2. Definitional and classification issues

This elevated interest in health tourism and its related components has complicated our understanding of this phenomenon. For instance, there are different definitions of health tourism (and its components) (e.g. Carrera & Bridges, 2006; Erfurt-Cooper & Cooper, 2009a; Hall, 2011; Mueller & Kaufmann, 2001; Myers, Sweeney, & Witmer, 2000), some of which are debatable. To illustrate the latter, according to Connel (2011), medical tourism has to do with patients traveling overseas for operations and various invasive therapies. However, perhaps this is only a partial description of this concept, as it emphasizes only those purposely looking for medical treatment abroad. According to the typology of medical tourists proposed by Cohen (2008), different tourists seek medical treatment abroad: (1) the medicated tourist (who receives medical treatment for accidents and health problems incidentally encountered in his or her journey in the host country); (2) the medical tourist proper (whose visit to the host country includes both, tourism and medical treatment for matters unrelated to the trip); (3) the vacationing patient (who visits the host country mainly for medical treatment, but uses vacationing opportunities, especially during the recuperation period, following an operation or other treatment); and (4) the more patient (who visits the host country solely for medical treatment, and does not make use of any vacationing).

Besides descriptional unanimity, there is also disagreement on the internal boundaries of health tourism. There is, for instance, no consensus in the literature on the relationship between health, medical and wellness tourism. Some studies (e.g. Botterill, Pennings, & Mainil, 2013; Connel, 2006, 2011; and Hall, 2011) have considered health and medical tourism as separate entities, while other investigations (e.g. Erfurt-Cooper & Cooper, 2009a; Hambirrao Mohite, 2016; Smith & Puczkó, 2009) have applied a similar approach to the case of health and wellness tourism. An idiosyncratic approach has reached to the level of tourism statistics compilation, where the United Nations' International Recommendations for Tourism Statistics (UNWTO, 2010) has suggested to split both health and medical tourism into separate orders, while simultaneously abstaining from providing explicit recognition to wellness tourism. The 'health and medical care' category in this handbook is broad and includes “receiving services from hospitals, clinics, convalescent homes and, more generally, health and social institutions, visiting thalassotherapy and health and spa resorts and other specialized places to receive medical treatments when they are based on medical advice, including cosmetic surgeries using medical facilities and services.” (UNWTO, 2010, p. 25). Services such as thalassotherapy and spa treatments are, generally, closely linked to wellness, but the UNWTO's manual does not explicitly recognize this category. The International Monetary Fund's Balance of Payments and International Investment Position Manual (International Monetary Fund, 2009) interprets health as an umbrella concept when compiling statistics on tourism expenditure. But this coverage is only for medical tourism, as wellness tourism is not mentioned. However, their health-related spending concept (which includes, for example, medical services, other health care, food, accommodation, local transport, acquired by those travelers for medical purposes) leaves open the possibility of including spending related to wellness tourism through “other healthcare” (International Monetary Fund, 2009, p. 167). The umbrella concept of health tourism has also been adopted by studies of, for example, Arellano (2007), Helble (2011), Loh (2014), Pocock and Phua (2011), and Turner (2007, 2011), either implicitly or explicitly. This concept will be followed in the further course of this study.

2.3. Areas and types of studies

The health tourism literature has abundantly covered both medical and wellness tourism, from angles such as historical background (Buck & Steffen, 2007; Connel, 2011; Smith & Puczkó, 2009), economics (Connel, 2011; Hanefeld & Smith, 2015; Martinez Alvarez et al., 2013;

Morgan, 2015; Reisman, 2015), marketing (Dann & Nordstrand, 2009; Nam Jin, 2015; Reisman, 2010), intervention (Erfurt-Cooper & Cooper, 2009b; Giannotti, 2017; Holliday et al., 2013; Konu, Tuohino, & Komppula, 2010; Mast & DeMicco, 2017; Schiano & Rhodes, 2013; Van Hoof & Pennings, 2013), associated risks (Hall, 2015), destinations offering this service (Ali-Knight, 2009; Cheung, 2015; Cohen, 2008; Martinez Alvarez et al., 2013; Nam Jin, 2015; Reisman, 2010; Smith & Puczkó, 2009; Snyder et al., 2013; Tuohino & Komppula, 2010) or countries of origin of the tourists (Martinez Alvarez et al., 2013; Turner, 2013; White, 2009; Williams, 2009), to name a few. However, most studies on health tourism have been descriptive of nature, which could probably be explained by the lack of trustable data in specific areas, such as the number of medical tourists (Connel, 2011), and by the lack of internationally agreed definitions for health, medical, and wellness tourism, which hinders data comparison (Helble, 2011). The limitation of descriptive research is that it only describes and presents information from samples or populations (Brase & Brase, 2016; Levine et al., 2017; Weiers, 2011), contrary to the inferential research approach, which allows for cause-effect analysis and/or determining the intensity of the relationships between dependent and independent variables (White & McBurney, 2013).

However, some authors have applied an inferential approach when studying health tourism, either by using cross-sectional, panel or time series data. For instance, Lehto, Brown, Chen, and Morrison (2006) investigated the socio-demographic and motivational characteristics of yoga tourists using survey data, while applying factor and multiple regression analyses. Loh (2014, 2015) applied, respectively panel and time series data, using health-related travel spending from the International Monetary Fund's Balance of Payments Statistics database. Johnson, Youngquist, Garman, Hohmann, and Cieslak (2015) studied the factors influencing medical tourism in the US using linear regression models with a negative binomial distribution and log link function. These studies show that inferential research-based coverage of health tourism is still in the early developing stage, but has potential to further unravel this branch of activity within tourism.

Most health tourism studies have considered the flow of tourists from developed to developing countries, almost negating the international demand for health services in the developed countries. While, for example, large numbers of Americans go abroad each year for medical purposes, there is a steadily growing interest from international tourists to receive medical treatment in the US (Florida TaxWatch, 2014; Johnson, Garman, Hohmann, Meurer & Allen, 2012; Vequist & Valdez, 2009). This is also confirmed by US data on health-related tourism spending showing an increasing trend for more than a decade. The US is renowned for the quality of its doctors, its state-of-the-art medical technology, and the low waiting times, which is attractive for people who can afford the best of the best (Florida TaxWatch, 2014; International Medical Travel Journal, 2010). In terms of the countries of origin of these people, the available information is conflictive. One source indicates that the majority of inbound medical tourists are from the Middle East, South America and Canada (Florida TaxWatch, 2014), while another reference indicates that the three largest markets for inbound health tourism to the US are the Caribbean, Europe, and Central America (Chambers, 2015). And according to Johnson, Garman, Hohmann, Meurer, and Allen (2012), international patients arriving in the US since the 1960s were predominantly from Latin America, the Middle East, Europe, and Asia. It is clear from these regional classifications that there is no clear view of the tourism markets behind the inbound health tourism to the United States. This hiatus inhibits the possibility for market segmentation, which according to authors such as Hoek, Gendall, and Esslemont (1996) and Dolnicar (2008) could obstruct a full understanding of the workings of each market of tourism demand, the ability to predict their behavior, and the capacity to exploit opportunities and achieve the competitive edge. Bridging the gap in our understanding of the health tourism in developed countries is essential to nurture and grow this niche market in these nations.

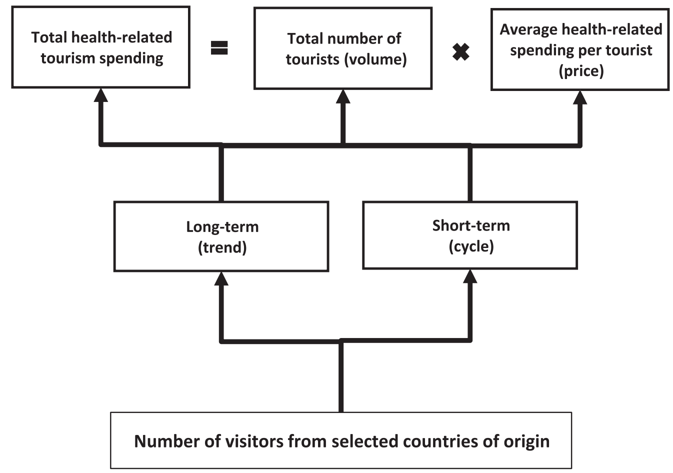

Fig. 1. Schematic overview of the research.

3. Schematic overview, model, data, and methods

3.1. Schematic overview

The premise here is that total health tourism spending is an aggregate of a volume effect (total demand for the specific market) and a price effect (average spending per person per market) (Fig. 1). This study looks at how several visitors from a selected number of countries of origin of the tourists affect the aggregate health tourism spending and its volume and price components, from both long- (trend) and short-term (cycle) perspectives. In line with Ridderstaat et al. (2016), the distinction between long- and short-term should not be understood in a chronological sense, meaning that the long-run changes should follow the short-run ones, but as both developments occurring simultaneously, where the short-run changes should be interpreted as deviations from the long-run movements.

3.2. The model

The models to be estimated can be derived starting with a modified approach of the total and marginal revenue analysis discussed in microeconomics textbooks (e.g., Baumol & Blinder, 2016; Varian, 2014):

$$TR = Q.\ P \quad \text{with } Q = \sum_i^n Q_i \text{ and } P = \sum_i^n P_i \tag{1}$$

where

TR = Total revenue (or total health-related spending);
Q = Quantity (or the total number of tourists);
P = Price (or average spending per tourist, for all countries);
Q_i = Quantity per country of origin (or number of tourists per country of origin);
P_i = Price per country of origin (or average spending per country of origin);
i = Country of origin;
n = Maximum number of countries of origin.

Taking the logarithm of Eq. (1) would change the relationship from multiplicative to additive form:

$$\text{Log}(TR) = \text{Log}(Q) + \text{Log}(P) \tag{2}$$

Given that $Q = \sum_i^n Q_i$, we can determine the marginal revenue from Eq. (2), which indicates how much TR (and its volume and price components) would change with one unit of Q_i. The equation indicating the marginal revenue for any country of origin is indicated as follows:

Table 1
Variable description.
Source: U.S. Department of Commerce; Bureau of census; ITA National Travel & Tourism Office

Variable	Description	Source
H_REC	Total travel receipts for health-related purposes	International Monetary Fund
PH_REC_VIS	Average travel receipts per visitors, for health-related purposes	Authors' calculation
TOTVIS	Total number of visitors	US Department of Commerce ITA National Travel & Tourism Office; and the US Bureau of Census.
CAN	Total number of visitors from Canada	
MEX	Total number of visitors from Mexico	
UK	Total number of visitors from United Kingdom	
JAP	Total number of visitors from Japan	
BRA	Total number of visitors from Brazil	
CHIN	Total number of visitors from China	
ITA	Total number of visitors from Italy	
NETH	Total number of visitors from the Netherlands	
SPA	Total number of visitors from Spain	
SWE	Total number of visitors from Sweden	
SWIT	Total number of visitors from Switzerland	
FRA	Total number of visitors from France	
GER	Total number of visitors from Germany	
KOR	Total number of visitors from Korea	
AUSTRAL	Total number of visitors from Australia	
ARG	Total number of visitors from Argentina	
COL	Total number of visitors from Colombia	
VEN	Total number of visitors from Venezuela	
ISRAEL	Total number of visitors from Israel	
SAUDI	Total number of visitors from Saudi Arabia	

$$MR = \frac{\Delta(\text{Log(TR)})}{\Delta(\text{Log}(Q_i))} = \frac{\Delta(\text{Log(Q)})}{\Delta(\text{Log}(Q_i))} + \frac{\Delta(\text{Log(P)})}{\Delta(\text{Log}(Q_i))} \quad (3)$$

Where

MR = Marginal revenue

In other words, the marginal revenue associated with health tourism is equal to the marginal total tourism demand for the US and the marginal average health spending per tourist. Following Cameron and Trivedi (2010), we can calculate the elasticity of the marginal revenue ($\in_{MR}$) as follows:

$$\in_{MR} = \frac{\frac{\Delta(\text{Log(TR)})}{\text{Log(TR)}}}{\frac{\Delta(\text{Log}(Q_i))}{\text{Log}(Q_i)}} = \frac{\frac{\Delta(\text{Log(Q)})}{\text{Log(Q)}}}{\frac{\Delta(\text{Log}(Q_i))}{\text{Log}(Q_i)}} + \frac{\frac{\Delta(\text{Log(P)})}{\text{Log(P)}}}{\frac{\Delta(\text{Log}(Q_i))}{\text{Log}(Q_i)}} \quad (4)$$

whereby:

$$\frac{\frac{\Delta(\text{Log(Q)})}{\text{Log(Q)}}}{\frac{\Delta(\text{Log}(Q_i))}{\text{Log}(Q_i)}} = \in_Q \text{ and } \frac{\frac{\Delta(\text{Log(P)})}{\text{Log(P)}}}{\frac{\Delta(\text{Log}(Q_i))}{\text{Log}(Q_i)}} = \in_P \quad (5)$$

with

$\in_Q$ = Elasticity of total number of visitors;
$\in_P$ = Elasticity of average health-related spending per visitor.

The elasticity of the marginal revenue is equal to the elasticity of quantity (Q) and the elasticity of price (P), all to a unit change in Q_i:

$$\in_{MR} = \in_P + \in_Q \quad (6)$$

Following Wooldrige (2013), Eqs. (4) and (5) could be rewritten as:

$$\in_{MR} = \frac{\%\Delta(\text{Log(TR)})}{\%\Delta(\text{Log}(Q_i))} = \frac{\%\Delta(\text{Log(Q)})}{\%\Delta(\text{Log}(Q_i))} + \frac{\%\Delta(\text{Log(P)})}{\%\Delta(\text{Log}(Q_i))} \quad (7)$$

where

$$\frac{\%\Delta(\text{Log(Q)})}{\%\Delta(\text{Log}(Q_i))} = \in_Q \text{ and } \frac{\%\Delta(\text{Log(P)})}{\%\Delta(\text{Log}(Q_i))} = \in_P \quad (8)$$

The elasticity of marginal revenue ($\in_{MR}$) indicates the percentage change in total health tourism spending to a 1% change in the number of tourists from a country of origin. Similarly, the elasticity of quantity ($\in_Q$) indicates the percentage change in the total number of tourists to a 1% change in the number of tourists from a country of origin. And the elasticity of price ($\in_P$) indicates the percentage change in average health spending per tourist for all countries to a 1% change in number of tourists from a country of origin.

In line with Wooldridge (2013), the model for each elasticity in Eqs. (7) and (8) could be approximated by these equations:

$$\text{Log(TR)}_t = \alpha_0 + \alpha_1 \text{Log}(Q_i)_t + \varepsilon_{1t} \quad (9)$$

$$\text{Log(Q)}_t = \beta_0 + \beta_1 \text{Log}(Q_i)_t + \varepsilon_{2t} \quad (10)$$

$$\text{Log(P)}_t = \gamma_0 + \gamma_1 \text{Log}(Q_i)_t + \varepsilon_{3t} \quad (11)$$

Where

$\alpha_0, \beta_0, \gamma_0$ = Intercepts;
$\alpha_1, \beta_1, \gamma_1$ = Coefficients;
t = Time;
$\varepsilon_1, \varepsilon_2, \varepsilon_3$ = Residuals.

Following the conceptual scheme (Fig. 1), the independent variable (Q_i) is split into a long- (Q_i^T) and a short-run component (Q_i^C) to reflect the long- and short-term impacts of the number of visitors per country of origin:

$$\text{Log(TR)}_t = \alpha_0 + \alpha_1 \text{Log}(Q_i^T)_t + \alpha_2 \text{Log}(Q_i^C)_t + \varepsilon_{1t} \quad (12)$$

$$\text{Log(P)}_t = \beta_0 + \beta_1 \text{Log}(Q_i^T)_t + \beta_2 \text{Log}(Q_i^C)_t + \varepsilon_{2t} \quad (13)$$

$$\text{Log(Q)}_t = \gamma_0 + \gamma_1 \text{Log}(Q_i^T)_t + \gamma_2 \text{Log}(Q_i^C)_t + \varepsilon_{3t} \quad (14)$$

Table 2
Unit root tests.

Variable	Model form	Data format	ADF	PP	KPSS	Tests outcome
SDLTOTVIS	No intercept	Level	− 1.3042	− 1.6394	0.5343***	I(0) or I(1)
		First difference	− 3.5349***	− 3.4662***	0.1354*	
SDLPH_REC_VIS	No intercept	Level	− 1.8320*	− 0.8019	0.6403***	I(0) or I(1)
		First difference	− 1.1904	− 3.7772***	0.1566*	
SDLH_REC	No intercept	Level	− 0.6364	− 0.8719	0.7259***	I(0) or I(1)
		First difference	− 1.6225*	− 3.4689***	0.1290*	
			Trend components			
SDLCAN_T	No intercept	Level	− 1.5576	− 1.5883	0.7223***	I(0) or I(1)
		First difference	− 0.1996	− 5.3291***	0.2948*	
SDLMEX_T	No intercept	Level	− 1.2944	− 0.9272	0.3588**	I(0) or I(1)
		First difference	− 7.2988***	− 7.2264***	0.5000***	
SDLUK_T	No intercept	Level	− 1.3492	− 3.8015***	0.5971**	I(0) or I(1)
		First difference	− 5.3874***	− 3.2260***	0.6173***	
SDLJAP_T	No intercept	Level	− 1.8251*	− 3.9330***	0.2724*	I(0) or I(1)
		First difference	− 3.4430***	− 5.0106***	0.6791***	
SDLBRA_T	No intercept	Level	− 0.5948	−0.5550	0.7085***	I(0) or I(1)
		First difference	− 5.7085***	− 5.7072***	0.1801*	
SDLCHIN_T	No intercept	Level	0.5526	0.2638	0.5077***	I(0) or I(1)
		First difference	− 4.3854***	− 4.3854***	0.5398***	
SDLITA_T	No intercept	Level	− 1.5118	− 1.5118	0.7346***	I(0) or I(1)
		First difference	− 1.5196	− 5.7338***	0.3521**	
SDLNETH_T	No intercept	Level	1.4972	− 2.7535***	0.6903***	I(0) or I(1)
		First difference	− 3.4195***	− 5.3508***	0.6372***	
SDLSPA_T	No intercept	Level	− 0.0236	− 1.1201	0.7313***	I(0) or I(1)
		First difference	− 0.9599	− 4.9130***	0.3526**	
SDLSWE_T	No intercept	Level	1.4292	− 1.2897	0.7373***	I(0) or I(1)
		First difference	− 1.1567	− 6.2624***	0.1719*	
SDLSWIT_T	No intercept	Level	− 3.2662***	− 3.2071***	0.7081***	I(0) or I(1)
		First difference	− 5.7319***	− 6.4091***	0.3300*	
SDLFRA_T	No intercept	Level	2.4000	− 1.7010	0.7357***	I(0) or I(1)
		First difference	− 1.7707*	− 5.8659***	0.3377*	
SDLGER_T	No intercept	Level	− 2.1623**	− 4.2151***	0.6142***	I(0) or I(1)
		First difference	− 6.1783***	− 6.3842***	0.3909**	
SDLKOR_T	No intercept	Level	1.1503	− 1.1071	0.7358***	I(0) or I(1)
		First difference	− 1.4182	− 5.5873***	0.2937*	
SDLAUSTRAL_T	No intercept	Level	− 1.6599*	0.0263	0.7086***	I(0) or I(1)
		First difference	0.4182	− 5.1257***	0.5000***	
SDLARG_T	No intercept	Level	0.7882	0.3106	0.6673***	I(0) or I(1)
		First difference	− 5.7213***	− 6.0467***	0.3049*	
SDLCOL_T	No intercept	Level	− 0.7227	− 0.6282	0.7249***	I(0) or I(1)
		First difference	− 7.2710***	− 7.0964***	0.2974*	
SDLVEN_T	No intercept	Level	0.3634	− 3.5685***	0.6402***	I(0) or I(1)
		First difference	− 4.1301***	− 6.7777***	0.5753***	
SDLISRAEL_T	No intercept	Level	1.7076*	− 1.7988*	0.6959***	I(0) or I(1)
		First difference	− 5.3742***	− 5.4289***	0.5000***	
SDLSAUDI_T	No intercept	Level	0.2119	0.1107	0.4607**	I(0) or I(1)
		First difference	− 5.6144***	− 5.6245***	0.4496**	
			Cycle components			
SDLCAN_CF	No intercept	Level	− 2.7862***	− 2.8248***	0.1279*	I(0) or I(1)
		First difference	− 6.1583***	− 7.5166***	0.1818*	
SDLMEX_CF	No intercept	Level	− 2.2531**	− 2.2531**	0.1189*	I(0) or I(1)
		First difference	− 5.9379***	− 6.0995***	0.1061*	
SDLBRA_CF	No intercept	Level	− 1.5830	− 1.8036*	0.1354*	I(0) or I(1)
		First difference	− 4.9490***	− 4.9445***	0.1100*	
SDLUK_CF	No intercept	Level	− 3.0213***	− 3.0771***	0.2294*	I(0) or I(1)
		First difference	− 6.1780***	− 7.7179***	0.1634*	
SDLJAP_CF	No intercept	Level	− 3.0526***	− 3.0797***	0.1254*	I(0) or I(1)
		First difference	− 6.4524***	− 9.1517***	0.2602*	
SDLCHIN_CF	No intercept	Level	− 2.2963**	− 2.2963**	0.2257*	I(0) or I(1)
		First difference	− 5.6528***	− 5.8193***	0.1240*	
SDLITA_CF	No intercept	Level	− 3.1429***	− 2.2898**	0.1089*	I(0) or I(1)
		First difference	− 4.8174***	− 4.1057***	0.1188*	
SDLNETH_CF	No intercept	Level	− 2.4599**	− 2.5985**	0.1059*	I(0) or I(1)
		First difference	− 5.0186***	− 5.6094***	0.1384*	
SDLSPA_CF	No intercept	Level	− 2.5041**	− 2.6221**	0.1084*	I(0) or I(1)
		First difference	− 5.3100***	− 5.8094***	0.1214*	
SDLSWE_CF	No intercept	Level	− 2.7683***	− 2.8504***	0.1274*	I(0) or I(1)
		First difference	− 5.8631***	− 7.0213***	0.1504*	
SDLSWIT_CF	No intercept	Level	− 1.8840*	− 1.8840*	0.1137*	I(0) or I(1)
		First difference	− 4.7254***	− 4.6990***	0.0741*	
SDLFRA_CF	No intercept	Level	− 2.4766**	− 2.4766**	0.1190*	I(0) or I(1)
		First difference	− 5.8055***	− 6.0510***	0.1036*	
SDLGER_CF	No intercept	Level	− 3.0341***	− 3.0341***	0.1078*	I(0) or I(1)
		First difference	− 6.6437***	− 8.0729***	0.1563*	

(*continued on next page*)

Table 2 (*continued*)

Variable	Model form	Data format	ADF	PP	KPSS	Tests outcome
SDLKOR_CF	No intercept	Level	− 2.3407**	− 2.3696**	0.1727*	I(0) or I(1)
		First difference	− 5.9954***	− 6.1242***	0.1088*	
SDLAUSTRAL_CF	No intercept	Level	− 1.8978*	− 2.0572**	0.1484*	I(0) or I(1)
		First difference	− 4.8116***	− 4.8572***	0.1235*	
SDLARG_CF	No intercept	Level	− 2.5648**	− 2.5648**	0.1085*	I(0) or I(1)
		First difference	− 5.9984***	− 6.4243***	0.1191*	
SDLCOL_CF	No intercept	Level	− 2.4711**	− 2.4863**	0.2019*	I(0) or I(1)
		First difference	− 5.6373***	− 7.2665***	0.3001*	
SDLVEN_CF	No intercept	Level	− 2.3692**	− 2.4895**	0.1061*	I(0) or I(1)
		First difference	− 5.1403***	− 5.5051***	0.1210*	
SDLISRAEL_CF	No intercept	Level	− 2.9205***	− 3.2657***	0.2424*	I(0) or I(1)
		First difference	− 1.6409*	− 9.1238***	0.2689*	
SDLSAUDI_CF	No intercept	Level	− 1.7169*	− 1.7169*	0.1705*	I(0) or I(1)
		First difference	− 4.6086***	− 4.5600***	0.0988*	

Note: For the Augmented Dickey-Fuller test, the lag-length selection was based on the Schwarz Information Criterion. The Phillips-Perron- and the Kwiatkowski-Phillips-Schmidt-Shin tests' bandwidth selections were based on the Newey-West Bandwith Criterion. Unit root tests include no intercept and no trend, because of the standardized variables. The asterisks indicate significance levels: ***1%, **5%, and *10%.

3.3. Data and methods

All data used in this research were collected from online sources that provide these numbers free of charge to the public. Data on health tourism spending were collected from the International Monetary Fund, whereas visitors' statistics were compiled from the US Department of Commerce ITA National Travel & Tourism Office, and the US Bureau of Census. The required data were only available on an annual basis, covering the period of 1986–2016. Table 1 provides an overview of the collected data.

The data is influenced by the joint workings of long-run (or trend), short-run (or cycle), and irregular factors. The trend indicates the long-term secular increase or decrease of the data; cycles indicate the non-periodic recurring variations around the trend, whereas the irregular factors embody erratic and irregular movements in the data, reflecting a myriad of unpredictable disturbances such as hurricanes, strikes, etc. (Bails & Peppers, 1993; Makridakis, Wheelwright, & McGee, 1983). Irregular factors are actually random noise effects, and according to Makridakis, Wheelwright, and Hyndman (1998), it is advisable to eliminate these effects from the analysis. The authors applied the Christiano-Fitzgerald filter method (Christiano & Fitzgerald, 1999) to study the short and long-term elasticity effects. To get a 'clean' version of the cycle component, the authors followed an approach with similarities to the one suggested by Nilsson and Gyomai (2011) and Gyomai and Benedetti (2012) for the Hodrick-Prescott filter. The approach entailed applying the Christiano-Fitzgerald filter twice, the first time on the whole data, and the second time on the estimated cyclical component only. The last result is a proxy for a 'clean' version of the cyclical element of the data. Since the study analyzes both the long- and short-term effects, the authors estimated the long-run (trend) component by deducting the estimated first-round cyclical element from the overall data.

Before proceeding with any further analysis, the authors standardized the data, for comparability, whereby the data was transformed from logarithm to standardized values, i.e. by subtracting the mean value from the variable and subsequently dividing this outcome by the standard deviation of the variable. The result is a standardized variable with a mean approaching zero and a standard deviation that is equal to 1.

Variables commonly show periods of both increases and decreases and could show non-stationary properties that could cause biased standard errors, and unreliable relationships in regression analyses (Mahadeva & Robinson, 2004). That is why the study tested whether the applied variables contained unit roots, using the Augmented Dickey-Fuller test (ADF), the Phillips–Perron test (PP) and the Kwiatkowski–Phillips–Schmidt–Shin test (KPSS) (Dickey & Fuller, 1979; Kwiatkowski, Phillips, Schmidt, & Shin, 1992; Phillips & Perron, 1988). Authors such as Pao, Fu, and Teng (2012) and Jafari, Othman, and Nor (2012) have presented the KPSS test as an often used third assessment technique to complement the widely used ADF and PP tests to obtain robust results.

After unit root testing, the authors determined the long- and short-term elasticity effects of demand based on Eqs. (12)–(14). Chances are that one or both the independent variables may be correlated with the error term, causing all the estimated elasticity coefficients to be biased and inconsistent (Gujarati, 2015; Wooldridge, 2013). The models may contain one or more endogenous variables correlated with their respective residual terms. In such a case, endogeneity will introduce bias into the Ordinary Least Squares estimator (Kennedy, 2008). This potential endogeneity problem led the authors to apply the instrumental variable approach (IV), specifically the Limited Information Maximum Likelihood technique (LIML). The latter has been suggested by Hayashi (2000), Poi (2006), and Stock, Wright, and Yogo (2002), when the sample size was small (also known as the finite-sample property). According to Stock and Yogo (2005), tests based on this approach are also far more robust to weak instruments than those based on two-stage least squares.

The strategy for choosing the instruments for the instrumental variable analysis was firstly based on the recommendations by Gujarati (2015): (1) variables must be correlated either positively or negatively with the variable for which it acts as an instrument; (2) they must not be correlated with the error term; and (3) they must not belong to the original model. The applied instruments consisted mostly of the aggregate version of tourism demand from the country of origin being analyzed in the trend and cycle form in the model and aggregate and/or cycles and trends of tourism demand from other markets.

4. Empirical findings and discussion

4.1. Unit root test results

Unit root tests show that the data could be integrated at both the level and the first difference forms (Table 2). However, more specific analysis of the statistical significance of the tests shows that in multiple cases the first difference form of the data indicated better results than the level form. In other words, transforming the data from its original form (level) to a series containing the differences between values of subsequent years (first difference) is likely to produce results with adequate predictive power. Therefore, the analysis was undertaken using the first-difference form of the data.

To counter for biasing effects of outliers, the study included two dummy variables, following Bails and Peppers (1993). The first dummy

Table 3
Elasticity effect estimations (Total tourism-related health spending).

Dependent variable	Trend (long-term effect)	Cycle (short-term effect)	DUMTERR	DUMFIN	Kleibergen-Paap rk LM statistic ($\chi 2$)	P-value	Kleibergen-Paap rk Wald F statistic	Stock-Yogo weak ID test critical values (maximal LIML size):				Hansen J statistic (Overidentification test of all instruments; H0: variables are exogenous)	P-value
								10%	15%	20%	25%		
					Dependent = SDLH_REC								
SDLCAN	0.1010	0.0065	− 0.0206	0.0811 ***	11.676	0.0395	520.825	4.84	3.56	3.05	2.77	3.463	0.4836
SDLMEX	− 0.0067	0.0114	− 0.0082	0.0978 ***	14.092	0.0150	80.589	4.84	3.56	3.05	2.77	1.463	0.8331
SDLUK	0.2157***	0.0117	0.0028	0.0929 ***	16.006	0.0068	384.175	4.84	3.56	3.05	2.77	6.820	0.1457
SDLJAP	.0893**	0.0019	0.0037	0.1041 ***	10.775	0.0560	623.921	4.84	3.56	3.05	2.77	3.828	0.4298
SDLBRA	0.1940**	0.0234	− 0.0239	0.0567 **	9.919	0.0775	15.693	4.84	3.56	3.05	2.77	4.017	0.4037
SDLCHIN	0.3396***	0.0080	− 0.0793***	0.0383	11.298	0.0102	7.429	6.46	4.36	3.69	3.32	1.5260	0.4663
SDLITA	0.1799***	0.0406	0.0157	0.0577 ***	15.283	0.0092	141.399	4.84	3.56	3.05	2.77	6.757	0.1493
SDLNETH	0.2207***	0.0446	0.0273	0.0731 ***	14.589	0.0123	599.825	4.84	3.56	3.05	2.77	4.153	0.3858
SDLSPA	0.3069***	0.0209	− 0.0099	0.0566	14.421	0.0131	46.492	4.84	3.56	3.05	2.77	7.678	0.1041
SDLSWE	0.1584***	0.0172	0.0111	0.0684 **	12.927	0.0241	92.418	4.84	3.56	3.05	2.77	4.877	0.3002
SDLSWIT	0.1018***	0.0362	0.0209	0.0813 ***	12.319	0.0307	657.524	4.84	3.56	3.05	2.77	2.583	0.6298
SDLFRA	0.1898***	0.0339	0.0144	0.0562 **	14.816	0.0112	141.299	4.84	3.56	3.05	2.77	1.491	0.8282
SDLGER	0.0731**	0.0105	− 0.0027	0.0898 ***	17.383	0.0038	576.030	4.84	3.56	3.05	2.77	6.768	0.1487
SDLKOR	0.1978*	− 0.0052	− 0.0136	0.0740 ***	9.510	0.0904	20.880	4.84	3.56	3.05	2.77	0.622	0.9605
SDLAUSTRAL	0.3158***	0.0067	− 0.0082	0.0397 *	13.239	0.0212	35.544	4.84	3.56	3.05	2.77	4.693	0.3202
SDLARG	0.1217***	0.0342	0.0671	0.0631 ***	12.750	0.0258	91.483	4.84	3.56	3.05	2.77	5.163	0.2709
SDLCOL	0.1376*	0.0202**	− 0.0361	0.0926 ***	10.860	0.0542	113.140	4.84	3.56	3.05	2.77	6.911	0.1407
SDLVEN	0.0657	0.0342	− 0.0046	0.0921 ***	12.860	0.0247	182.382	4.84	3.56	3.05	2.77	4.232	0.3755
SDLISRAEL	0.1786***	0.0047	− 0.0072	0.0825 ***	10.037	0.0742	4646.186	4.84	3.56	3.05	2.77	7.594	0.1077
SDLSAUDI	0.1370	0.0074	0.0094	0.0665 ***	12.940	0.0239	8.974	4.84	3.56	3.05	2.77	7.450	0.1140

Note: The symbols *** , **, and * indicate, respectively, the 1%, 5%, and 10% significance levels.

variable (DUMTERR) aims to eliminate the effect of the September 11, 2001, terrorist attacks in the US and its aftermath in 2002. The second dummy (DUMFIN) is for mitigating the effects of the global financial crisis (2007–2010) that affected tourism demand for the United States.

4.2. Elasticity effects and model adequacy tests

The next step was to estimate the elasticity effect of both long- and short-term impulses of the selected markets of tourism demand on, respectively, health tourism spending, its volume and price components. For this purpose, the LIML instrumental variable approach discussed in the previous section was applied. Given that the variables were standardized, this means that the intercept term in the models will always be zero (Gujarati & Porter, 2009). The results of the instrumental variable application are presented in Tables 3–5. Table 3 shows that total health tourism spending is influenced by all the main markets involved in the study, except for the two largest markets (Canada and Mexico), Venezuela, and Saudi Arabia, where the results were statistically nonsignificant (or not different from zero). The results show that the elasticity effects are virtually always positive, and also almost derived from the long-term perspective of the demand data, except for Colombia, where the effect is both long- and short-term. This implies that, save for the case of Colombia, short-term spurts or slumps in tourism demand from the countries of origin of the tourist are not likely to significantly affect overall health tourism spending. Further tests of the applied model indicate that the equation was not under-identified (the Kleibergen-Paap rk LM statistic rejected the null hypothesis of model under-identification). This means that the excluded instruments were not considered relevant, or correlated with the endogenous variables. The Kleibergen-Paap Wald rk F statistics were larger than Stock and Yogo (2005) critical values at 10%, 15%, 20%, and 25%, indicating that the model contained no weak instrument variables. In other words, the excluded instruments were not found to be weakly correlated with the endogenous variables, which, otherwise, could have limited the effectiveness of the instrumental variable approach. The Hansen J statistic was not significant in all cases, indicating that the model was not over-identified, which means that the applied instruments were valid for the model and that the excluded instruments were correctly excluded from the estimated equation.

With the volume component of the elasticity effect estimations, the results generally show the effective workings of several of the selected main countries of origin, often on both the long- and short-terms (Table 4). The latter is the case for Canada, Mexico, Japan, Italy, The Netherlands, Spain, Sweden, Germany, Australia, and Saudi Arabia, where the long- and short-term impulses from these countries has a positive effect on the total of international visitors to the US. In several cases, the impulse effect was statistically relevant only from the long-term view (United Kingdom, China, Switzerland, France, Korea, Argentina, and Israel). With Saudi Arabia, the impulse effect was short-term only. The model adequacy tests showed no signs of statistical under-identification, weak identification, and over-identification.

Table 5 shows the results for the price component of the elasticity effect estimations. A good portion of the effects showed a negative outcome, indicating that the more tourists there are from each market, the lower the average health tourism spending per visitor would be. This was the case for the long-term effects of demand from Canada, Mexico, Italy, Switzerland, and Germany, while the short-term changes in demand from Mexico, Japan, Sweden, Germany, Australia, and Saudi Arabia showed a similar outcome on the average spending. Sometimes, the impulse effect on the average was positive, such as the case of demand from both Israel and Saudi Arabia (long-term) and Argentina (short-term). The estimated models were not statistically under-, weakly, or over-identified, as indicated by the additional model tests.

The regression coefficients in Tables 3–5 were based on dependent and independent variables standardized beforehand to achieve comparable dependent and independent variables in the analysis. To make practical inferences about the elasticity relationships for health tourism spending, the authors followed the method discussed by Kim (2011) to calculate the unstandardized regression coefficients from the results in Tables 3–5. This calculated outcome would provide a percentage change effect in health tourism spending (and its volume and price effects) following a 1% change in each of the tourism markets in this study. The relationship between the standardized and unstandardized regression coefficients can be determined according to this formula (Kim, 2011):

Table 4
Elasticity effect estimations (Total tourism demand).

Dependent variable	Trend (long-term effect)	Cycle (short-term effect)	DUMTERR	DUMFIN	Kleibergen-Paap rk LM statistic (χ2)	P-value	Kleibergen-Paap rk Wald F statistic	Stock-Yogo weak ID test critical values (maximal LIML size):				Hansen J statistic (Overidentification test of all instruments; H0: variables are exogenous)	P-value
								10%	15%	20%	25%		
						Dependent = SDLTOTVIS							
SDLCAN	0.6526***	0.0729***	− 0.3734***	0.1844	11.113	0.0039	15.855	8.68	5.33	4.42	3.92	0.863	0.3529
SDLMEX	0.2713***	0.1121***	− 0.4810***	0.1650	5.595	0.0609	63.62	8.68	5.33	4.42	3.92	2.038	0.1534
SDLUK	0.7467***	0.3970	− 0.2329***	0.4088*	12.361	0.0149	4.708	4.32	3.13	2.78	2.6	4.630	0.2010
SDLJAP	0.3003**	0.0809**	− 0.2593***	0.3228**	10.775	0.0560	623.922	4.84	3.56	3.05	2.77	7.071	0.1322
SDLBRA	0.3028	− 0.0021	− 0.4235***	0.2470	9.919	0.0775	15.693	4.84	3.56	3.05	2.77	5.590	0.2319
SDLCHIN	0.9585**	− 0.0348	− 0.5748***	0.0676	11.5470	0.0091	6.5380	6.46	4.36	3.69	3.32	4.151	0.1255
SDLITA	0.6932***	0.1360***	− 0.2729***	0.1438	11.8360	0.0027	58.4750	8.68	5.33	4.42	3.92	0.058	0.8091
SDLNETH	0.6935***	0.0780**	− 0.2840***	0.2236	11.8670	0.0079	122.1830	6.46	4.36	3.69	3.32	3.638	0.1622
SDLSPA	0.7407***	0.1131***	− 0.3417***	0.1888	11.6210	0.0030	32.7910	8.68	5.33	4.42	3.92	0.175	0.6755
SDLSWE	0.7145***	0.1135***	− 0.2294***	0.1640	9.3330	0.0094	48.3540	8.68	5.33	4.42	3.92	0.590	0.4424
SDLSWIT	0.4175***	0.0512	− 0.2809***	0.2578	7.3360	0.0255	30.9900	8.68	5.33	4.42	3.92	0.002	0.9688
SDLFRA	0.6311***	0.0395	− 0.3151***	0.1750	9.2350	0.0099	39.0830	8.68	5.33	4.42	3.92	0.075	0.7837
SDLGER	0.3990***	0.0935***	− 0.2824***	0.2492	15.626	0.0014	54.9320	6.46	4.36	3.69	3.32	1.574	0.4552
SDLKOR	0.4644***	− 0.0533	− 0.3861***	0.2384*	6.0330	0.0490	22.5430	6.46	4.36	3.69	3.32	0.047	0.8289
SDLAUSTRAL	0.9440***	0.1400**	− 0.2673***	0.1089	10.648	0.0049	19.831	8.68	5.33	4.42	3.92	2.409	0.1207
SDLARG	0.2964*	0.0268	− 0.2093	0.2220	11.3700	0.0034	19.0110	8.68	5.33	4.42	3.92	0.030	0.8636
SDLCOL	0.2222	0.0066	− 0.4334**	0.2652	13.9460	0.0160	155.8500	4.84	3.56	3.05	2.77	7.401	0.1162
SDLVEN	0.0657	0.0342	− 0.3868	0.3010	12.7700	0.0256	97.2300	4.84	3.56	3.05	2.77	6.793	0.1472
SDLISRAEL	0.4616*	0.0174	− 0.3667***	0.2568	8.6430	0.0133	16.0940	8.68	5.33	4.42	3.92	2.370	0.1237
SDLSAUDI	0.3171	0.2297***	− 0.2839	0.2318***	9.2930	0.0256	8.9350	6.46	4.36	3.69	3.32	2.216	0.3302

Note: The symbols *** , **, and * indicate, respectively, the 1%, 5%, and 10% significance levels.

$$b_j = b_j^* \frac{S_Y}{S_X} \tag{15}$$

Where

b_j = Unstandardized regression coefficient;
b_j^* = Standarddized regression coefficient;
S_Y = Standard error of the dependent variable;
S_X = Standard error of the independent variable.

The unstandardized coefficient is equal to the standardized coefficient multiplied by the standard error of the dependent variable and subsequently divided by the standard error of the independent variable. The complete set of calculated unstandardized coefficients for the demand from each of the analyzed markets is presented in Table 6. When looking at the overall effect on health tourism spending, most markets showed a positive and statistically significant elasticity on the long-run, meaning that a 1% increase in demand from each market would cause a positive effect on long-term health tourism spending. Israel, for example, had the highest long-term elasticity effect, with a 1% growth in this market causing a 0.5925% increase in overall health spending by tourists in the US in the long-run, all else remaining equal (ceterus paribus). In the short-term, only the Colombian tourism market showed

Table 5
Elasticity effect estimations (Average tourism-related health spending per tourist).

Dependent variable	Trend (long-term effect)	Cycle (short-term effect)	DUMTERR	DUMFIN	Kleibergen-Paap rk LM statistic (χ2)	P-value	Kleibergen-Paap rk Wald F statistic	Stock-Yogo weak ID test critical values (maximal LIML size):				Hansen J statistic (Overidentification test of all instruments; H0: variables are exogenous)	P-value
								10%	15%	20%	25%		
						Dependent = SDLPH_REC_VIS							
SDLCAN	− 0.1967***	− 0.0330	0.1774***	0.0040	11.1130	0.0039	15.8550	8.68	5.33	4.42	3.92	0.568	0.4511
SDLMEX	− 0.1504***	− 0.0471*	0.2509***	0.0384	5.5950	0.0609	63.6200	8.68	5.33	4.42	3.92	0.747	0.3874
SDLUK	− 0.0471	− 0.0010	0.1916***	− 0.0290	11.7280	0.0084	5.9660	4.32	3.13	2.78	2.6	1.162	0.5593
SDLJAP	− 0.0451	− 0.0425*	0.1499***	− 0.0372	10.7490	0.0295	742.2580	5.44	3.87	3.30	2.98	3.082	0.3791
SDLBRA	0.1298	− 0.1498	0.1274*	0.0081	10.9650	0.0270	5.5240	4.32	3.13	2.78	2.6	1.513	0.6793
SDLCHIN	0.0667	0.0237	0.1876***	− 0.0192	11.5470	0.0091	6.5380	6.46	4.36	3.69	3.32	2.714	0.2574
SDLITA	− 0.1349*	− 0.0200	0.1745***	− 0.0019	12.3850	0.0062	90.7090	6.46	4.36	3.69	3.32	0.405	0.8168
SDLNETH	− 0.0585	0.0188	0.1995***	− 0.0268	11.4240	0.0033	197.1810	8.68	5.33	4.42	3.92	0.821	0.365
SDLSPA	− 0.0280	− 0.0347	0.1770***	− 0.0230	11.6210	0.0030	32.7910	8.68	5.33	4.42	3.92	0.004	0.9498
SDLSWE	− 0.0877	− 0.0411*	0.1529***	− 0.0154	9.3330	0.0094	48.3540	8.68	5.33	4.42	3.92	0.065	0.7989
SDLSWIT	− 0.1073*	0.0206	0.1821***	− 0.0312	7.4280	0.0594	120.1690	6.46	4.36	3.69	3.32	2.922	0.232
SDLFRA	− 0.0697	0.0255	0.1987***	− 0.0246	9.2350	0.0099	39.0830	8.68	5.33	4.42	3.92	0.194	0.6593
SDLGER	− 0.0984*	− 0.0377*	0.1579***	− 0.0181	15.6140	0.0004	98.2350	8.68	5.33	4.42	3.92	0.013	0.9078
SDLKOR	− 0.0213	0.0228	0.1956***	− 0.0273	6.0330	0.0490	22.5430	8.68	5.33	4.42	3.92	0.025	0.8740
SDLAUSTRAL	− 0.0118	− 0.0738**	0.1358***	− 0.0205	10.6480	0.0049	19.8310	8.68	5.33	4.42	3.92	2.082	0.1491
SDLARG	0.1068	0.0419**	0.2779***	− 0.0634	11.3700	0.0034	19.0110	8.68	5.33	4.42	3.92	0.007	0.9332
SDLCOL	0.0451	0.0235	0.1951***	− 0.0180	11.6800	0.0086	64.8920	6.46	4.36	3.69	3.32	1.206	0.5473
SDLVEN	0.0117	0.0214	0.2070***	− 0.0341	12.8600	0.0247	182.3820	4.84	3.56	3.05	2.77	7.420	0.1153
SDLISRAEL	0.2156*	− 0.0030	0.2113***	− 0.0506	8.3120	0.0157	24.1900	8.68	5.33	4.42	3.92	0.181	0.6704
SDLSAUDI	0.1947*	− 0.1141***	0.2109***	−0.0804*	9.2930	0.0256	8.9350	6.46	4.36	3.69	3.32	0.700	0.7046

Note: The symbols *** , **, and * indicate, respectively, the 1%, 5%, and 10% significance levels.

Table 6
Unstandardized elasticity coefficients.

	Total health-related tourism spending		Total tourism demand (volume)		Average health-related spending per market (price)	
Independent variables	Long-term (trend)	Short-term (cycle)	Long-term (trend)	Short-term (cycle)	Long-term (trend)	Short-term (cycle)+
Canada	0.3349	0.0216	2.1648***	0.2418***	− 0.6525***	− 0.1096
Mexico	− 0.0093	0.0157	0.1548***	0.1548***	− 0.2078***	− 0.0651*
United Kingdom	0.3183***	0.0172	1.1016***	0.5857	− 0.0694	− 0.0015
Japan	0.2030**	0.0043	0.6827**	0.1839**	− 0.1024	− 0.0967*
Brazil	0.1859**	0.0224	0.2901	− 0.0020	0.1244	− 0.1436
China	0.2519***	0.0060	0.7110**	− 0.0258	0.0494	0.0176
Italy	0.2806***	0.0633	1.0811***	0.2122***	− 0.2103*	− 0.0312
The Netherlands	0.3167***	0.0640	0.9949***	0.1119**	− 0.0839	0.0270
Spain	0.3475***	0.0237	0.8386***	0.1281***	− 0.0317	− 0.0393
Sweden	0.2478***	0.0268	1.1173***	0.1776***	− 0.1371	− 0.0642*
Switzerland	0.2074***	0.0737	0.8506***	0.1043	− 0.2185*	0.0420
France	0.3011***	0.0537	1.0010***	0.0626	− 0.1105	0.0404
Germany	0.1411**	0.0202	0.7707***	0.1805***	− 0.1901*	− 0.0728*
Korea	0.1162*	− 0.0031	0.2727***	− 0.0313	− 0.0125	0.0134
Australia	0.4073***	0.0087	1.2175***	0.1805**	− 0.0152	− 0.0952**
Argentina	0.1313***	0.0369	0.3197*	0.0289	0.1152	0.0452**
Colombia	0.1514*	0.0222**	0.2443	0.0072	0.0496	0.0259
Venezuela	0.2179	0.1134	0.2179	0.1134	0.0389	0.0709
Israel	0.5925***	0.0156	1.5312*	0.0578	0.7151*	− 0.0100
Saudi Arabia	0.4545	0.0246	1.0520	0.7620***	0.6458*	− 0.3786***

Note: The symbols *** , **, and * indicate, respectively, the 1%, 5%, and 10% significance levels.

a positive statistically significant elasticity effect on the total health-related tourism spending. These findings imply that cyclical fluctuations in markets' tourism demand are less likely to influence total health tourism spending than long-term patterns of tourism development from these countries of origin.

4.3. Volume and price effects

When considering the volume and price effects, the results show that the long-term elasticity increases in overall health tourism spending are more likely to be explained by the volume than the price side of the effects, because the latter generally had a mitigating effect on the prior. Long-term price effects were usually statistically insignificant and negative, the latter meaning that a 1% increase in visitors from a certain market led to a long-term decrease in the average health spending by all visitors to the US. When it comes to the short-term volume and price effects, the results show that the effects counter each other often, particularly with a positive short-term volume elasticity effect being mitigated by a negative short-term price elasticity effect.

The preceding analysis has shown that many of the main tourism demand markets for the US have the potential to increase overall long-term health tourism spending, particularly because increased volume effects overcast decreases in average visitor spending effects.

5. Conclusion

5.1. Summary of findings

The U.S. health system continues to appeal to tourists, because of its high-quality services and its closeness to large patient markets (Chambers, 2015), and market segmentation could offer opportunities for competitive advantage, provided that the markets are identifiable (Dolnicar, 2008). This study investigated the effects of several markets of origin of inbound tourism on total health tourism spending in the US, both from a long- and short-term perspective and considering volume and price effects. The study applied a microeconomic elasticity model and an LIML approach on annual data between 1986 and 2016.

The results show several main tourism markets having a positive effect on the growth of overall health tourism spending, although predominantly in the long-run. This implies that short-term changes (booms or busts) in individual tourism markets have an almost sterile effect on overall health tourism spending and that the impetus on the latter should come from the long-term development in the selected markets of tourism demand.

5.2. Managerial implications

These findings are important because they shed new light on the driving forces behind health tourism spending in the US. This allows for a better understanding of this tourism slice and could provide the building blocks for a more methodical approach to further develop health tourism in the US. From a managerial and policy-making perspective, the results bring forward two implications. First, market segmentation in health tourism is possible and even necessary to achieve a competitive edge on health tourism. The basis for this segmentation is the impulse contribution of each tourism market to the overall health tourism spending, considering long/short and volume/price dimensions. Based on the latter, the top 10 potential markets to consider for further development of health tourism in the US are Israel, Australia, Spain, United Kingdom, The Netherlands, France, Italy, China, Sweden, and Switzerland. Managers and policy-makers could specialize on the needs of each of the market segments and cater on their specific requirements on health tourism, which could entail for example, (i) cheap and fine medical service, (ii) save waiting time for treatment, (iii) advanced or unique medical technology, (iv) unique exotism and tourism environment, and (v) status symbol (Guojinga & Zhijun, 2013). Second, developing health tourism as an engine of growth in overall tourism spending will probably be a gradual process, given that the elasticity effects were mostly in the long-run (trend) part of the data. Also, there are still different challenges faced by the international patients and their caregivers in the US, such as language barriers and cultural differences (Cawcutt & Wilson, 2016), all requiring time to correct. Managers and policy-makers should, for example, try to cut the communication barriers by hiring personnel who speak the language of the tourists, while ensuring proper training for the caregiver's staff to recognize and consider the cultural background of the visiting patients (Cawcutt & Wilson, 2016). Market segmentation and demand understanding could, therefore, be strategic steps towards success in this niche tourism opportunity.

5.3. Theoretical implications

Three theoretical inferences can be condensed from this study. First, demand elasticity of health tourism spending can provide a basis for market segmentation in health tourism. Though market segmentation based on demand elasticity is not new, its application for the health tourism niche should be deemed novel, since health tourism has remained under-researched when it comes to inferential-based analyses. The originality of this approach is further emphasized by considering the long/short and volume/price dimensions, which offer detailed opportunities for maximizing the benefit of this niche form of tourism. Second, the potentials of health tourism expansion are likely to be in the long-run, as adequate nurturing and understanding of the individual health tourism markets requires time and efforts. The distinction between long- and short-term perspectives offers an additional dimension to understand the timeframe of navigating health tourism to a successful endeavor. Third, overall health tourism development ultimately depends on the workings of volume and price-related factors, adding depth to our understanding of health tourism development. Ideally, these forces should work in the same constructive direction, but sometimes, this is not the case. Understanding and routing these settings is a precondition for maximizing the benefits of health tourism development.

5.4. Study limitations

Some limitations apply to this study, mainly stemming from data-availability problems. First, the study timeframe was limited to annual data on health tourism spending, both on the aggregate and market-specific levels. This prevented a deeper analysis into the seasonally recurring developments of health tourism spending, and the dynamics of its driving forces. Second, the study was limited to the first 20 most influential countries of origin of the tourists, without considering the impact of other markets, again due to data availability problems.

5.5. Recommendations for future research

Future studies should expand the analysis by considering other countries and their elasticity effects on health tourism spending. Future studies should consider as well other analysis techniques, such as country-specific surveys, to further understand the characteristics of the specific tourism market(s) on health tourism spending, and what type of treatment are the tourists seeking abroad. These future studies could allow for a better understanding of health tourism to developed countries and could contribute to advancing the empirical studies on this niche tourism (Chambers, 2015).

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