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Identifying the next non-stop flying market with a big data approach

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HIGHLIGHTS

- The paper introduces a conceptual model for identifying the next direct flight route for a destination.
- The model combines buying funnel theory and gravity model.
- The study examines three different visitor types: flight passengers, hotel guests, and mobile device users.
- The study compares the market's potential to travel to its interest in the destination to identify the most potential market.

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ABSTRACT

Destination Marketing Organizations (DMOs) strive to increase visitor volume through targeting potential markets and eliminating barriers to travel, such as opening non-stop flight routes. This study develops a comprehensive model to identify the next direct flight route for a destination by deploying buying funnel theory and gravity model. In addition to the geographical and economic characteristics of each market of origination, web traffic at the destination's Convention and Visitors Bureau (CVB) website—a proxy for the market's interest in the destination—is used to determine the markets that would exhibit the most potential to generate visitors if a non-stop flight route was opened. The model estimates each market's potential, using multiple gravity models, and compares it to the market's interest in the destination based on buying funnel theory. The present study then empirically tests the model using the actual data of Charleston, South Carolina, where five potential cities were identified.

1. Introduction

Attracting more visitors is one of the primary responsibilities of a Destination Marketing Organization (DMO). A series of literature has tried to identify potential customers and pinpoint target markets through market segmentation (e.g., Andereck & Caldwell, 1994; Dolnicar, 2008; Jang, Morrison & O'Leary, 2002; Müller & Hamm, 2014; Smith, 1956; Tkaczynski, Rundle-Thiele, & Beaumont, 2009). Another method of increasing visitor volume is to identify and eliminate barriers to travel (Heung, Kucukusta, & Song, 2011), including opening direct flight routes (see Tables 1 and 2, Fig. 6).

The lack of a non-stop flight route can be a barrier for visitors from potential markets to reach a destination (Grosche, Rothlauf, & Heinzl, 2007). However, it has been difficult to locate any study that attempted to estimate the increase in visitor volumes as a result of offering a new direct flight route. This paper introduces a model for estimating potential markets by eliminating a possible barrier—the lack of a non-stop flight—for a tourist destination. It introduces a comprehensive model that is based on actual visitation and interest and tries to identify the markets that would produce the most significant increase in visitor volume if a non-stop flight route were to open for those points of origin.

The present study combines the buying funnel theory with a single-destination gravity model to estimate a market's potential to generate visitors in the case of a new direct flight route. Traditional gravity models explain tourism demand using the push and pull factors of tourism such as GDP per capita, population, income, transportation cost, and distance (Morley, Rosselló, & Santana-Gallego, 2014; Tinbergen, 1962). In marketing literature, buying funnel theory explains customers' decision process with four steps: awareness, research, decision, and purchase (Clow, 2013; Jerath, Ma, & Park, 2014). In the research and decision steps, prospective visitors may search online for destinations with desired features. People tend to pursue faster and more comfortable ways to travel. The availability of a direct flight would come into the decision-

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Table 1
Regression estimation steps.

Step 1	Step 2	Step 3	Step 4	Step 5
Regress different dependent variables	Compare fitted values to actuals	Estimate the potential numbers	Compare to web traffic volumes	Identify the candidate cities

Table 2
Three regression models.

Model	Dependent Variable	Independent Variables	Potential Market
1	Flight passengers	Income, population, distance, flight time[a], air fare and availability of direct flight	Potential market for airlines
2	Hotel guests		Potential market for the hospitality industry
3	Mobile device users		Potential market for total visitor volume

[a] Flight time was excluded for hotel guests and mobile device users.

making process during the research process (Gronau, 1970). Thus, direct flights can potentially reduce transportation cost and thus be included in the gravity model as a cost factor. Creating a direct flight can function as a mechanism to increase the number of passengers for airlines and the number of visitors to the destination (Fujii, Im, & Mak, 1992; Tveteras & Roll, 2014). By estimating the parameters for the director flight variable and compare to the actual visitor volumes, we can estimate the potential visitor volumes if a direct flight were to open. Also, web traffic for the Convention and Visitors Bureaus (CVBs) of such destinations represents visitor interest and can be considered a proxy for potential interest as travelers search information online before visiting a city. An origin's potential can only be realized if there were enough interests to travel to the destination. This web traffic can corroborate the estimates from the modeling results.

With the estimation models and the actual data, the current study empirically tests the theoretical framework with a tourist destination, specifically, Charleston, South Carolina. The paper locates markets with high potential for travel to Charleston and a high interest in the destination, but without any direct flights available. This study identifies the top five potential markets for Charleston's next non-stop air route. The model could serve as a means for any destination to target its potential markets for generating inbound travel.

2. Literature review

This paper proposes a model for a single destination to identify potential markets using economic and geographical characteristics, availability of a non-stop flight route, and web traffic at the local DMO's website. In this section, the paper introduces previous studies that used gravity models to provide the basis for including economic and geographical factors. It also examines literature that incorporated the buying funnel theory to provide the rationale for interpreting a lack of direct flights as a barrier, as well as the level of web traffic as an indicator of destination interest.

2.1. Gravity model in social science and tourism research

Various disciplines of social science have adopted the gravity model. The gravity model originated from Newton's law of universal gravitation in physics (Newton, 1966). The law posits that distance and mass determine gravitational forces between two objects. Many researchers have used the model to explain visitor volumes between origins and destinations empirically (e.g., Balli, Balli, & Louis, 2016; Durbarry, 2008; Eryiğit, Kotil, & Eryiğit, 2010; Genç, 2013; Kaplan & Aktas, 2016; Keum, 2010; Khadaroo & Seetanah, 2008; Morley et al., 2014; Yang & Wong, 2012).

In tourism context, distance, as well as each market's attracting factors, are used to explain the gravitational pull that determines visitor volume. Greater distance between a destination and visitor origin is expected to decrease gravitational pull, whereas a higher number of people and a higher level of income is expected to increase it. Hence, the gravity model is presented as follows:

$$X_{ijt} = G\frac{\left(A_{it}^{\alpha}A_{jt}^{\beta}\right)}{Distance^{\gamma}}$$

X_{ijt} represents the number of visitors between location i and location j, at time t. A_{it} and A_{jt} represent attracting factors at location i and location j, respectively, at time t (e.g. population and income are widely used as attracting factors). G stands for the gravitational constant, and Latin superscripts indicate the degree of impact each factor has.

Many studies have added other factors to the simple gravity model to model visitor behavior more precisely. Some have used socio-institutional variables, such as tourism climate index, cultural index, incidents of earthquakes, a shared border, or one-off events such as the Iraq War and the September 11 terrorist attacks (Eryiğit et al., 2010; Zhang, Li, & Wu, 2017). Genç (2013) and Balli et al. (2016) both included immigration information in their gravity models, explaining tourism flow for New Zealand and bilateral traveler flows between 34 OECD countries, respectively. Khadaroo and Seetanah (2008) adjusted the gravity equation to account for the role of transportation infrastructure in inbound tourists. Yang and Wong (2012) and Massidda and Etzo (2012) included variables that represented tourist attractions. Yang and Wong used destination's number of national parks, World Heritage Sites and AAAA scenic spots to quantify tourist attraction; Massidda and Etzo employed destination's regional relative endowment of touristic places to the total national endowment as a proxy.

Some used economic variables in their gravity models. Durbarry (2008) included the real effective price of tourism products, along with common language and EU variables, to understand tourism inflows to the United Kingdom. Santana-Gallego, Ledesma-Rodríguez, and Pérez-Rodríguez (2010, 2016a,b) also examined the relationship between international tourism flows and exchange rate, participation in the European Union monetary system, and international trade. Similarly, Hanafiah and Harun (2010) include consumer price index as a consideration of price sensitivity, along with economic crisis as a possible factor that could affect Malaysia's tourism industry. In conclusion, socio-institutional and economics factors further explain tourism flow at an international scale.

The gravity model can explain how a market's economic, geographical, and social-institutional factors affect visitor flow to a destination. However, it is hard to explain the role of non-stop flights and web traffic in determining visitor volume. For that purpose, buying funnel theory provides insights by combining an