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## Effect of air quality in the place of origin on outbound tourism demand: Disposable income as a moderator

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### HIGHLIGHTS

- A unique dataset comprising OTA outbound orders is built.
- The push effect of air quality on outbound tourism demand is confirmed.
- The moderate effect of disposable income is explored.
- The push effect of air quality will be delayed up to five days.
- The study results benefit operation management of OTAs.

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### ABSTRACT

Tourism is largely dependent on climate and weather, and thus climatic attributes are expected to alter decisions of tourists. Utilising transaction data from a leading online travel agent (OTA) in China, this study explores the impacts of air quality, a critical environmental indicator, on outbound tourism demand whilst considering the moderating effects of disposable income at the city level. Empirical results show that air quality in the place of origin creates a pushing effect as local outbound tourism demand increases as air quality deteriorates. This relationship is negatively moderated by local disposable income level. This study also identifies a delay effect of five days in the impacts of air quality on outbound tourism demand. The theoretical contributions and implications of these findings for the operation management of OTAs and tourism destinations are presented at the end of this study.

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### 1. Introduction

Tourism is a climate-dependent industry, and climatic variations can either facilitate or inhibit tourist participation in various destinations (Becken & Wilson, 2013). According to de Freitas (2003), climate has three facets, namely, aesthetic, physical and thermal aspects which are interdependent on each other. Aesthetic aspects, which greatly determine the attractiveness of a place as a tourism destination, are mainly affected by physical elements, such as sunlight, cloudiness and air quality of the location (Goh, 2012). Tourism researchers investigated impacts of climate on the tourism industry, ranging from geographical space and supply to demand

and market agent of the tourism system (Martín, 2005). The rationale behind is that climate and weather conditions are major criteria to assess the suitability of tourism activities and ultimately determine destination choices (Amelung, Nicholls, & Viner, 2007; Becken, 2013; Goh, 2012; Rosselló-Nadal, 2014).

Changes in climate and weather conditions can also lead to tourism demand variations. For example, Goh (2012) moved beyond the conventional tourism demand framework by including non-economic factors (i.e. the socio-psychological variable of climate). Her findings confirm the proposed significance of climate in affecting tourism demand to Hong Kong from four source markets (i.e. the US, the UK, Japan and mainland China). Climate and weather conditions can also influence outbound tourism demand. Using transfer function models, Rosselló-Nadal, Riera-Font, and Cárdenas (2011) found that the dynamics of outbound British flows are contingent on a series of climatic variables, such as temperature, heat, air frost, sunshine days and short-term weather

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conditions. In accordance with the simple and useful pull–push framework, which explains driving forces underlying tourist mobility, climatic variables represent both a push and a pull factor in shaping the patterns of tourism demand.

A noteworthy feature of relevant literature is that research on the pulling aspects of climatic variables in tourism destinations discusses mainly the relationship between tourism demand and climatic conditions. The pushing effects of climatic variables are underlying the pulling effects. According to [Dann \(1977\)](#), ‘push factors precede pull factors’ (p. 207). Analytically, decisions on where to go and what to see come down to one essential choice: whether to go. In addition, the pulling effects of climatic attributes involved in selecting among alternative tourism destinations correspond closely to ambient environment in their place of residence (i.e., perceived differences of climate in the origin–destination pairs). [McKercher, Shoval, Park, and Kahani \(2015\)](#) suggested that the notions of tourists about weather are largely contingent on their perceived discrepancy between the weather in the destination (a novel place) and the familiar weather in the place of origin.

Most studies investigating the pushing effects of climate conditions on outbound tourism demand only consider the meteorological variables of rainfall, sunshine and temperature ([Agnew & Palutikof, 2006](#); [Rosselló-Nadal et al., 2011](#); [Alvarez-Díaz & Rosselló-Nadal, 2010](#)). Few academic efforts have been devoted to the impacts of air quality on outbound tourism demand. Like other climatic variables, air quality pertains to the physical comfort which is crucial to tourist experiences. In recent years, air quality has become a severe concern for human health. Evidence produced in medicine suggests that short-term and long-term exposures to ambient air pollution can engender a wide variety of acute and chronic health problems ([Seaton, Godden, MacNee, & Donaldson, 1995](#)).

Therefore, seeking for fresh air can become a critical motivational stimulator for spatial mobility at the international level that may ultimately affect international tourism flows and outbound tourism demand. Behavioural finance researchers found that environmental stimuli such as air quality can trigger mood swings which can bias the decision-making process at the time of making a choice ([Kourtidis, Šević, & Chatzoglou, 2016](#); [Li & Peng, 2016](#)). In line with this finding, air quality is expected to strongly influence outbound tourist flows. However, verification of this effect is scarce in existing research.

This study aims to fill this research void and strengthen the theoretical and empirical foundation of the tourism demand literature. Firstly, this study focuses on the climatic element in places of origin instead of that in tourism destinations. Climatic attributes discussed in extant literature include sunny weather, cosy temperature, quality beaches and water-based activities which pull tourists away from their home places ([Day, Chin, Sydnor, & Cherkauer, 2013](#)). However, underlying these pull factors is a push concept that defines destination as a place of escape for self-recovery and recreation that gives tourists a sense of intimacy ([Prayag & Ryan, 2011](#); [Trauer & Ryan, 2005](#)). Analysing climate elements in tourists’ home countries as a push factor offers a new angle to understand tourism demand.

Secondly, this study avoids providing a general overview of the concept of climate. Rather, this study focuses on the specific climatic variable of air quality. [McKercher et al. \(2015\)](#) found that air quality is the most significant factor, and based on this finding, they highlighted air quality as an influential behavioural indicator for future research. Although many studies consider air quality a core external cost in the tourism industry (e.g. [Saenz-de-Miera & Rosselló, 2014](#)), few studies examine the effects of air quality on tourism demand. Evidence from air quality is normally associated

with health costs, such as the acute and chronic effects of particulate matter (PM, PM10 and PM2.5) on human health ([Chen, Ebenstein, Greenstone, & Li, 2013](#); [Kampa & Castanas, 2008](#)). Residents more likely exhibit denial and adopt exaggerated perceptions than new tourists because air quality is closely interrelated with home, work and social interaction settings ([Evans, Jacobs, & Frager, 1982](#)).

Thirdly, apart from precisely identifying the influence of air quality on tourism demand, this study considers the moderating effect of disposable income. Tourism scholars generally incorporated disposable income into the orthodox tourism demand framework and their empirical analyses depict disposal income as a crucial determinant for demand (e.g. [Cai, Hu, & Feng, 2002](#); [Wang, 2010](#); [Yang, Liu, & Qi, 2014](#)). In previous studies, a straightforwardly linear relationship between disposable income and tourism demand exists. That is, high-level income denotes high automobility. People with higher income than others are more capable of removing constraints to participating in tourism activities. Facing the ambient environment of worsening air quality, can disposable income still drive people overseas to escape the severe smog back home? The existing literature has not resolved this question.

This study seeks to address this research gap by evaluating the impact of a specific climatic variable (i.e. air quality) on outbound tourism demand whilst considering the moderating role of personal disposable income in such a relationship. Data for this study were gathered from a dominant online travel agent (OTA) in China. Given the difficulty of obtaining information related to the travel demand of individual tourists, this study follows previous studies, such as [Granados, Gupta, and Kauffman \(2012\)](#) and [Li, Granados, and Netessine \(2014\)](#) by using the number of orders tourists placed on this OTA within a single day as a proxy for tourism demand.

## 2. Literature review

### 2.1. Climate and tourism

Extensive studies on the travel motivations of tourists reveal multiple factors, including climate, discretionary time, travel costs and scenery ([Jang & Wu, 2006](#)), that are all connected to climate and weather to an extent ([Gössling, Scott, Hall, Ceron, & Dubois, 2012](#)). [Smith \(1993\)](#) identified two types of tourists, namely, climate-dependent and weather-sensitive tourists. The former refers to tourists who are attracted by favourable weather conditions in tourism destinations, whereas the latter refers to those who emphasise the critical role of weather in their decision-making process. These two categories correspond to pull–push factors relating to distinct decisions which are made at two separate timepoints. The pull–push provides a basic frame to analyse the impacts of climatic variables on the tourism industry.

[Becken and Wilson \(2013\)](#) found that half of their surveyed tourists changed their trip plans due to climatic conditions, whereas [Martín \(2005\)](#) found that temperate climatic variations merely drive tourists to switch from outdoor to indoor activities. Destination choice and tourism demand are also contingent on the climate in tourists’ place of origin. Asymmetries exist in climate preferences across different source markets as the discrepancy between the climate in home places of tourists and that in their selected tourist destination frames their perceptions of climate ([Bigano, Hamilton, & Tol, 2006](#)). [Scott, Gössling and de Freitas \(2008\)](#) suggested that the preferred temperature of Swedish respondents is higher by almost 4 °C and 2 °C than that of their New Zealand and Canadian counterparts, respectively. Climate as a pulling force leads to a cross-regional substituting effect in destination selection. Pulling effect concerns where to go and what to do

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