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Short communication

Perceived pollution and inbound tourism in China

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ABSTRACT

Pollution inherently conjures negative thoughts; particularly when that pollution can be hazardous to your health. However, the extent to which pollution discourages tourism has yet to be studied empirically. In this research letter, we examine the interaction between perceived pollution and inbound tourism in China through a VAR model. Concerns about pollution are measured by Google Trends data. We find that perceived pollution lowers inbound tourism. Our results show that the rising unease about pollution could hurt the tourism sector in an economy.

1. Introduction

China's tourism industry has been a driving force to boost economic growth and employment. According to the China National Tourism Administration, employment in the tourism industry contributed to 10.2% of the country's total employment in 2015. The industry's success has primarily been driven by domestic travel, the inbound tourism industry, on the other hand, has been struggling[1]. In 2014, China ranked 118 out of 178 concerning environmental quality[2]. In the same year, there were 26 million inbound foreign visitors; the numbers for 2013 and 2012 was 26 and 27 million respectively[3]. Anecdotal evidence has suggested that pollution in China has made the country a less attractive destination for overseas tourists[4]. In this paper, we empirically study the relationship between people's perception of the pollution level and how it relates to inbound tourism in China. We use Google Trends search results to represent people's concern about pollution in China.

Research has found that many economic and non-economic factors could affect international tourist arrivals, see Balli, Balli, and Louis (2016). The effect of environmental pollution, perceived level or real level, on visitors, has been examined much less. Traditionally empirical studies have focused on the adverse impact of the tourism industry on climate change, especially greenhouse gas emissions; see Pang, McKercher, and Prideaux (2013) for a comprehensive overview. The potential impact of pollution on tourist arrivals has only attracted scholars' interests recently. Sajjad, Noreen, and Zaman (2014) use regional aggregate data to examine the Granger causality between air pollution and tourism indicators. They found that air pollution Granger causes tourism indicators but not vice versa. Becken, Jin, Zhang, and Gao (2016) survey 600 U.S. and Australian residents and found westerner's negative feelings towards air quality in China lowers their intention to visit China. Our study shares a similar spirit, but we have adopted a different approach. Instead of using survey data, we use Google Trends search results to represent people's perception of the pollution level in China. Our results are drawn from worldwide search trends, which covers a larger population base compared to the 600 residents from two countries used in Becken et al. (2016).

The use of Google Trends data gained widespread usage in recent years, especially in the tourism research community. Pan, Xiang, Tierney, Fesenmaier, and Law (2010) and Pan, Chenguang Wu, and Song (2012) look at how Google Trends data can be utilized by the tourism industry by using such data to forecast hotel room demand or estimate destination image. Google Trends data can also be used to improve the forecasting accuracy of time series models with respect to tourist arrivals (see Yang, Pan, Evans, and Lv (2015) and Bangwayo-Skeete and Skeete (2015)). Researchers have speculated as to how we can incorporate Google Trends data into environmental studies regarding pollution. An interesting study that looks at this is Cha and Stow (2015), who utilize Twitter and Google Trends data to assess the social impact of environmental accidents. Furthermore, they found that there are often immediate responses to such events

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[1] http://english.gov.cn/news/top_news/2015/12/08/content_281475250248880.htm.

[2] Information regarding the ranking of China concerning environmental concerns is from the Environmental Performance Index found at http://archive.epi.yale.edu/epi/country-rankings.

[3] This statistic can be found in the Yearbook of China Tourism Statistics (2013–2015).

[4] For example, "Tourism is one of the first sectors to feel the pinch when Beijing and other Chinese cities choke. Previous episodes have turned people away. According to the China Tourism Academy, the number of overseas visitors to the country fell for three consecutive years through 2014. It blamed catastrophic air pollution." Reported by CNN Money (December 08, 2015), http://money.cnn.com/2015/12/08/news/economy/china-pollution-business/.

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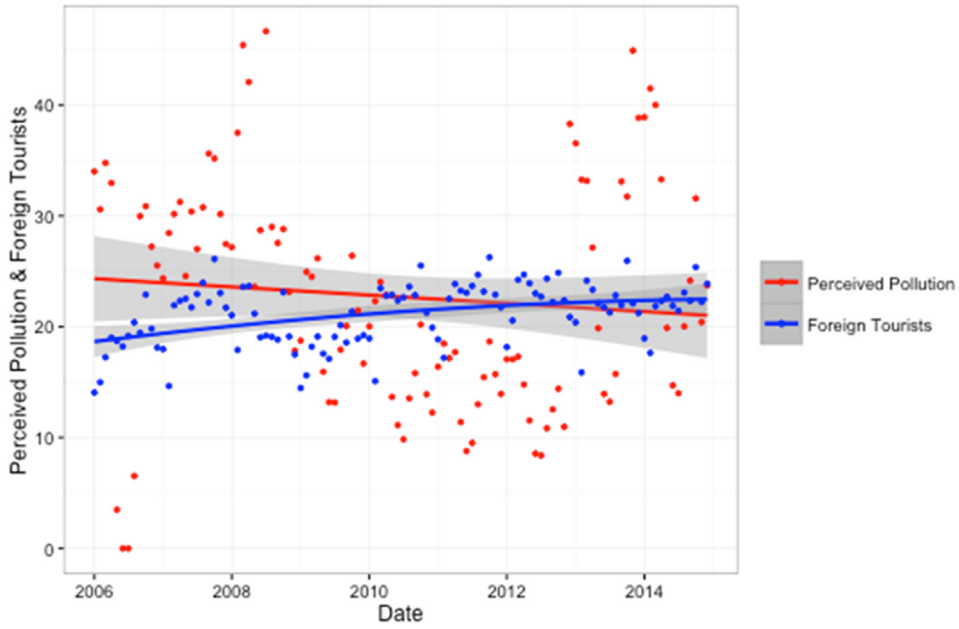

Fig. 1. Perceived Pollution (Google Trends) with number of foreign tourists/100,000.

thus influencing public perception. Additional uses of Google Trends have been utilized to predict decision behavior, see Smith (2012) and Preis, Moat, and Stanley (2013) for more information.

Fenichel, Kuminoff, and Chowell (2013) use Google Trends data to measure public concern over swine flu. They find that passengers respond to Google Trends data by forgoing non-refundable flights during the epidemic, but they do not respond to actual reported cases. Their results highlight the importance of transparent risk communication. Pollution is a type of risk associated with international travel. Following Fenichel et al. (2013), we examine how perceived pollution, measured by Google Trends, can help us analyze the inflow of tourists into China. Our results complement the ones in Sajjad et al. (2014), with significant methodology differences. We believe pollution itself may not matter as much as how people perceive the pollution level in the decision to tour or not to a country. Thus, it is possible that perceived pollution is detrimental to a destination's image.

Despite the heated discussion, to the best of our knowledge, this is the first paper that combines the Google Trends data to study the interaction between concerns over pollution and international tourism. We contribute to the literature by using Google Trends search results to represent people's perception on pollution level in China. The motivation of this research letter is to test whether perceived pollution has a causal effect on tourist volume using search engine data. We find that perceived pollution Granger causes inbound tourism.

The remainder of the paper is organized as follows. Section 2 provides a brief discussion of our dataset. Section 3 presents our empirical methodology and results. Section 4 concludes.

2. Data

Data were collected from two sources; inbound tourism data were found in the Yearbook of China Tourism Statistics (2007–2015), and people's pollution perception data were collected from Google Trends.

As for the tourist volume data, we use the number of tourist arrivals in China over the period 2006–2014. We use three types of inbound tourist data: total tourists (*TOT*), foreigner tourists (*F*) and tourists from Hong Kong (*HK*). Fig. 1 illustrates the relationship between perceived pollution and foreign tourists arrivals in China.

Google Trends is based on Google search query data. It illustrates how often a particular search term is entered about the total search volume across various countries, and in various languages. Google Trends data does not report the raw level of search queries but rather a query index (Choi and Varian (2012)). The query index is made from a query share, the definition of which, provided by Choi and Varian, is the total volume of search query terms in a geographic region divided by the total number of queries in that region at given period. Once the data are in this format, the query share was normalized to 0 for the first (full) week in January 2004. Values at later dates report the percentage deviation from the query share for this week. When extracting data from Google Trends, the data are presented as a weekly query index, which indicates the percentage deviation from the date, to which the data are normalized. Google Trends data are classified into groupings, with each search query given to a particular grouping by natural processing methods. Chamberlin et al. (2010) offer an example of the grouping methodology where they also discuss the potential shortcomings for utilizing relative volume.

We are interested in keyword search results related to pollution in China. We used “China pollution” as our general search query at the international level to take advantage of the largest collection of foreign countries outside of China. However, as this is a generalized global search it does include China and Hong Kong. We admit that this is a limitation of the analysis; however, search results from within China should be relatively small since the primary search engine used in China is Baidu[5]; furthermore, Google has not been allowed in mainland China since 2010, thus drastically declining the number of search results from there.

The primary benefit of using Google Trends data is that it is a suitable source of timely information. The data were available on a weekly basis, but the analysis required a monthly time series to match up with inbound tourism; therefore the Google Trends data needed to be aggregated. The method of aggregation implemented in this paper is a weighted average - for a given search query or grouping, each week's index is weighted according to the share of the week that falls in the target month. Therefore a week that falls solely within a month will be given the weight of 7 divided by the total number of days in the month. Weeks that extend across two months are weighted by the number of days that are in a month

[5] According to data reported by China Internet Network Information Center (CNNIC), the market penetration rate for Baidu and Google was 92.9% and 32.7%, respectively in 2009. Only 12% of the Internet users regard Google as their first choice. Since 2010, Google has moved out of Mainland China and Baidu's penetration rate is up to 97.4% in 2014.