Does air pollution drive away tourists? A case study of the Sun Moon Lake National Scenic Area, Taiwan

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ARTICLE INFO

ABSTRACT

Tourism is evidently one of critical contributors to air pollution, while, air pollution seems to drive tourists away. This paper aims to explore whether air pollution, especially the carbon dioxide emission, would affect the business cycle of the demand for tourism at a popular scenic spot in Taiwan, i.e., the Sun Moon Lake. Macroeconomic variables and additional weather patterns are also considered as potential determinants of the demand for tourism in our Markov regime-switching model. The empirical results serve as evidence that the effects of air pollution and rainfall on the demand for tourism depend significantly on the phases of business cycle, and show that, during the peaks, monthly numbers of tourists traveling at the Sun Moon Lake would fall by 25,725 people as the number of bad-air-quality day increases by one. The finding can provide policymakers an insight into the evaluation of the trade-off between industrial development and environmental protection.

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1. Introduction

Air pollution seems to drive tourists away, namely, poor air quality is likely to decline the demand for outdoor leisure activities. Accordingly, atmospheric conditions could be vital determinants in the selection of tourist destinations, especially for a spot whose scenic attraction lies in its climate or weather conditions. For instance, Rosselló (2011) asserts that atmospheric and climate conditions would cause a shift in international travel air demand and thus alter tourist destination choice. Katircioğlu (2014) utilizes Granger causality tests to show that air pollution would probably affect the choice of tourist destination because there exists a long-term relationship between tourism development and carbon emission in Singapore. Hereby, more attention should continue to be devoted to inspecting the influences of any changes in atmospheric conditions on the demand for tourism since extreme weather events are becoming more intense and more frequent.

The purpose of this study is to explore whether air pollution, especially the carbon dioxide emission, would affect the business cycle of the demand for tourism at the Sun Moon Lake National Scenic Area in Taiwan, using a Markov regime-switching model over the period from January 2004 to December 2011.[1] It is widely acknowledged that the Sun Moon Lake,

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[1] The time period starts from the year 2004 because Taiwan Tourism Bureau released the database "Visitors to the Principal Scenic Spots in Taiwan" since 2004. The time period ends at December 2011 in order to avoid the potential political shocks. The Taiwanese government loosed several restrictions for mainland China tourists to visit Taiwan in April 2012, and the number of Chinese tourists increased 44.96% in the same year. And the ratio of Chinese tourists to all Taiwan's inbound visitors increased from 24.4% in 2011 to 35.4% in 2012.

located at the geographical midpoint of Taiwan, is a must-visit destination for Taiwan's inbound tourism.[2] Its rich natural ecology, various aboriginal cultures, and elegant landscapes have been attracting millions of inbound and domestic tourists every year. The annual number of tourists who travel at the Sun Moon Lake National Scenic Area increased from 1,481,481 in 2004 to 7,983,597 in 2011, and the average annual number of tourists is 4,082,815 during the period 2004–2011.[3] However, the Sun Moon Lake scenic area has been suffering from a huge amount of carbon dioxide emissions produced by Taichung Power Plant, the highest carbon emitting power plant in the world in 2009 and emits more than 35 million tons of carbon dioxide annually.[4] The Taichung Power Plant is only 55 km west of the Sun Moon Lake. Hundreds of residents in Puli Township, one of the tourist spots of Sun Moon Lake National Scenic Area, therefore threatened to boycott the usage of coal and petroleum coke recently because a high level of PM 2.5 concentrations would worsen public health and natural ecology.[5] Hereby, the concerns regarding the effects of air pollution can be critical starting points in explanation of the volatility of tourism demand for the Sun Moon Lake.

In the present paper, the number of monthly visitors traveling at the Sun Moon Lake is employed to identify two distinct stages of business cycle of the demand for tourism: the peaks and the troughs, and the Pollution Standards Index (PSI) is used to measure air quality conditions. A vast literature has been done toward showing how the demand for tourism is sensitive to atmospheric and climate changes. Gómez Martín (2005) discusses the linkages between climatology and tourist activities and provides some useful suggestions for tourism management. Hamilton and Tol (2007) find that climate changes would lead international tourism demand to decrease; however, reginal pattern of demand for tourism vary across countries since reginal climate changes may not be homogeneous in each country. Álvarez-Díaz et al. (2010) explore tourist data in the Balearic Island at Spain by using an autoregressive distributed lag model and Granger causality tests and find that any changes in atmosphere phenomenon have statistically significant impacts on the international tourism demand. Rosselló et al. (2011) examine the numbers of UK outbound flows and claim that weather conditions are crucial determinants of travel destination decisions. Njoroge (2015) identifies that the relationships between sustainability and climate changes have been generating a growing interest in tourism research. Rosselló and Waqas (2016) argue that favorable weather conditions are decisive factors that attract international tourists in large numbers. Smith et al. (2016) claim that visitors would alter their travel behaviors to respond to any changes in climate and environmental conditions.[6]

Apart from air pollution, literature also indicates that there exists additional weather conditions and macroeconomic variables that affect the demand for tourism. The impact of temperature on tourism demand (or, tourist destination choice) has been examined intensively in the literature, see Gómez Martín (2005), Bigano et al. (2006), Hamilton and Tol (2007), Tol (2007), Álvarez-Díaz et al. (2010), Falk (2014), Michailidou et al. (2016), and Smith et al. (2016). In addition, Altalo and Hale (2002), Gómez Martín (2005), Álvarez-Díaz et al. (2010), and Falk (2014) illustrate that the demand for tourism hinges negatively on precipitation. Gómez Martín (2005), Álvarez-Díaz et al. (2010), and Smith et al. (2016) point out that a windy day or a storm pushes tourists to change their scheduled outdoor activities. Bigano et al. (2006), Rosselló et al. (2011), and Falk (2014) show that the more the sunshine hours, the more the tourists. Furthermore, the influences of macroeconomic conditions on the demand for tourism have attracted much interest from researchers; for instance, Seddighi and Shearing (1997), Garín-Muñoz (2009), Guizzardi and Mazzocchi (2010), and Otero-Giráldez et al. (2012) find that a rise in consumer prices would induce a lower demand for tourism because a higher tourism price would lead travel costs (including transportation costs and living costs) or price differentials to increase. Altalo and Hale (2002) and Colman and Dave (2013) indicate that a higher unemployment would lead to a higher demand for leisure and therefore to a greater demand for recreational activities and tourism. Wong (1997), Nieh and Chou (2002), Katircioğlu (2009), Wang (2009), Otero-Giráldez et al. (2012), and Katircioğlu (2014) empirically confirm that a higher personal (or, household) income makes a higher purchasing power and therefore causes the demand for tourism greater. Additionally, a country's macroeconomic business cycle is probably an important determinant of tourism demand, see Guizzardi and Mazzocchi (2010).

Judging from the above knowledge, we further consider macroeconomic variables (i.e., unemployment rate and consumer price index) and weather patterns (i.e., temperature and rainy days) as potential factors that affect tourists' willingness to travel. The theoretical prediction of the adverse impact of air pollution on tourism sounds convincing, while, more empirical evidence is needed to support this point. Since the achievement that has not been discussed above is the examination of the influences of atmospheric conditions on the phases of business cycle of the demand for outdoor recreation, this paper aims to address this issue. The rest of this study is organized as follows. Section 2 introduces the data collection and the estimation model. Empirical results are reported in Section 3, and conclusions are drawn in Section 4.

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[2] Sun Moon Lake National Scenic Area includes the Sun Moon Lake scenic area, Formosan Aboriginal Culture Village, Shueili Snake Kiln, and Checheng, and extends to nearby townships such as Puli Township, Yuchi Township, and Xinyi Township. The whole area is about 18.1 thousand hectares.

[3] Data source: Annual Statistical Report on Tourism, published by Tourism Bureau, Ministry of Transportation and Communications, Taiwan.

[4] See the report by Carbon Monitoring for Action (CARMA). Available at http://www.carma.org/plant.

[5] See the report by Taipei Times: http://www.taipeitimes.com/News/taiwan/archives/2015/04/19/2003616293.

[6] Otherwise, some studies show that associated climate regulations may also affect the demand for tourism. Tol (2007) and Mayor and Tol (2010) assert that various climate policies can lower global welfare and decrease the international tourism demand for the European Union. For more previous efforts to the relationships between climate changes and tourism demand (or, tourism development), see Buckley (2012).