

主 論 文 要 旨

報告番号	甲 乙 第 号	氏 名	ロドリゴ・ゴンザレス
<p>主 論 文 題 名 :</p> <p>AN ANALYSIS OF THE ENVIRONMENTAL IMPACT OF AIRCRAFT EMISSIONS: THE CASE OF JAPAN</p>			
<p>(内容の要旨)</p> <p>This dissertation is the final delivery of six years of research on the environmental impact of commercial aviation. Its purpose is to familiarise the reader with the general extent of aircraft emissions, their evolution and sustained growth and the importance to include them in every effort to curtail CO2 emissions and to hold back climate change. It includes the most up-to-date information and reviews a substantial part of the available literature related to aviation and climate. Moreover, it presents a novel and detailed analysis of different aspects of aviation pollution that, to the best of the author's knowledge, has not been documented before.</p> <p>CHAPTER ONE</p> <p>This chapter addresses the problem of growing CO2 emissions by analysing data relevant to the aviation fuel tax adopted in Japan. Specifically, it investigates the effects of a reduction in aviation fuel tax on CO2 emissions by the aviation sector. Because of the 30% reduction in tax implemented by the Japanese government in April 2011, it is possible for us to compare the amount of CO2 emissions before and after the tax adjustment. We find that the amount of CO2 emissions from Japanese domestic flights would increase significantly compared with a situation where such a tax reduction was not implemented, reflecting the effectiveness of fuel tax for reducing CO2 emissions by aircraft. This finding is of great importance because an increase in the amount of CO2 emissions is considered unavoidable, especially in a region that has a rapidly expanding airline market.</p> <p>The study investigated the Aviation Fuel Tax of Japan (koukuukinenryouzei) by</p>			

considering both its impact on the national demand for aviation fuel and its indirect contribution to Japan's environmental efforts for reducing the amount of CO₂ emissions, using a Bayesian time series approach that contrasted the results before and after the 30% tax reduction. Through the application of causal impact analysis, based upon Brodersen et al. (2015), this study constructed a scenario that predicted the market's response in the absence of the tax reduction, which allowed an estimation of the quantity of additional fuel consumed between April 2011 and December 2015. Thus, the study estimated the causal impact of the 30% reduction in the aviation fuel tax, which to the best of the author's knowledge, has not been undertaken before.

The causal impact analysis method adopted in this paper is an analysis of a causality mechanism that measures the difference between the observed values of fuel consumed after the tax was adjusted and the (unobserved) values that would have been obtained had the tax not changed. In accordance with the recent interest in "big data" sets and predictive analysis, the study adopts a modern approach of using Google Correlate™ to generate a collection of time series variables showing high correlation with the data before the intervention, and then combine them into a single synthetic control that is used to estimate the causal impact. Thus, the modelling of the counterfactual of the time series observed both before and after the tax cut can be achieved. The key to the selection of the control variables is that they should not be affected directly by the intervention, such that it is possible to assume that the relationship that existed before the tax change would continue afterward. This is because they account for the variance components that are shared by the series, including those effects of other possible unobserved causes that otherwise would be ignored by the model.

CHAPTER TWO

This chapter analyses the different attitudes and behaviour of regular and non-regular air travellers toward aviation and its environmental impact. It examines the profile of an individual who, based on their revealed attitudes and statements, is more likely to modify their behaviour about the use of air travel, which is not only important to assess the general awareness of users around this

matter, but is also key to efficient policy implementation. The study is developed around a household survey conducted over the internet in October, 2017, in three of Japan's most populated cities: Tokyo, Osaka and Fukuoka, which are not only strategic aviation hubs, but cities that are also connected by a more environmentally conscious alternative: the Shinkansen.

The objective of this chapter is to identify the sociodemographic characteristics of individuals who, based on their answers, are more likely to modify their behaviour in the face of growing aviation emissions. This is of particular importance given the urgency for policy to become behavioural rather than information-oriented. Indeed, numerous studies (Blake, 1999; Kollmuss and Agyeman, 2002; Howarth et al., 2009; Davison et al., 2014; others) have recurrently exposed the problematic "gap" between people's environmental awareness and their actions. The present study binds together a thorough assessment of people's behaviour and attitudes, with a statistical approach for more impactful environmental policy.

CHAPTER THREE

The purpose of this chapter is to analyse the low-cost airline industry in a specific, limited region, in this case, the domestic market of Japan. The study analyses the factors that influence passengers' decisions to choose one of two types of service, namely full-service airlines (FSA) or LCC. By means of a stated preference survey, the study gathers the impressions and valuations of Japanese respondents who have used either one of the two types of airline in the last 12 months. Furthermore, the study tries to determine the extent to which there is a reason for concern about the environmental implications of the no-frills airline model. This follows some of the points concerning the environmental impact of air transport that were discussed at large in Chapters 1 and 2 of this dissertation.

The motivation to study the LCC phenomenon in Japan comes from the significant changes that the Japanese domestic market has undergone over the past two decades years. In 2000, Japanese aviation was for all intents and purposes an LCC-free duopoly. Together with their subsidiary companies, the two main airlines, Japan Airlines (JAL) and All Nippon Airways (ANA), controlled 98% of the national

aviation (RPK) (MLIT, 2017b). However, by 2016, the market share of these two groups had dropped to 75%, after the appearance of regional and budget airlines.

CONCLUSIONS

It is the categoric recommendation of this analyst that the tax on aviation fuel existent in Japan (koukuukinenryouzei) remains in force. Following the conclusions of our previous study (González and Hosoda, 2016) which showed how aviation taxes have a directly proportional effect on fuel consumption, figures by the Japanese authorities show that over the five years since the 30% reduction of the aviation fuel tax (2011 – 2016), domestic aviation in Japan increased in 125 thousand flights and carried as many as 20 million more passengers (MLIT, 2017a).

Aviation is a fast expanding industry with a blatant disregard for its negative externalities, and whose contribution to CO2 emissions, although minor at a global scale, continues to grow faster than any other human activity. Forecasts by both airline associations, regulators and aircraft manufactures agree that commercial aviation will have doubled current standards over the next 15 years (Airbus, 2017; Boeing, 2017; IATA, 2017a; ICAO, 2017a). It is paramount that this activity, whose effect on the environment has been repeatedly reported in academic journals, is hold accountable for its role in climate change, and that both companies and passengers fulfil their due part.