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# Competitive impact of the air ticket levy on the European airline market

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ABSTRACT

In tribute to Jules Dupuit, this study analyzes how the innovative financing tax for development has influenced the competition among airline companies and to what extent it affected their sales. To do so, we specify an econometric model where the representative consumer chooses the utility maximizing alternative among the differentiated products offered by the airlines which compete in terms of prices. It is a fairly reasonable and well accepted representation of the competition in the airline industry, assuming that the structure of their networks is given in the short run. The present solidarity tax has increased the average price for the European airlines by only 0.08% and could increase average prices by 1% if it were applied to all European airlines. Implemented by all countries it would lead to a 0.17% increase in Air France prices while the price increase would be 1.05% for the other airlines in our sample. These numbers compared to the growth rate of the air traffic show that the impact of the solidarity tax would be very small. Overall the air ticket levy applied by all European airlines would not affect significantly the degree of competition among airlines.

## Foreword

Besides the various innovations that Jules Dupuit, this adept of the "laissez-faire," has offered to the economic science, in particular the concept marginal utility, his name is strongly associated with the need to ground taxes on solid economic analysis using the notion of surplus. A first key question is then how to estimate what he calls the "strength of desire" of consumers and he writes: "it is beyond doubt that a tax can add nothing to the utility of a product; but when we look at it from the consumer's point of view we can say that its existence brings to light undeniably that the product has a utility greater than the cost of production." (See Dupuit, 1884, p. 85.) A buyer pays a good on which a tax is imposed if he finds at least an equivalent utility in it. Dupuit adds: "for, in spite of the tax, he is at perfect liberty to buy it or not to buy it. It is not within the power of the state to make him pay, by means of the tax, anything more than the utility which he derives from this purchase." (See Dupuit, 1884, p. 85.) A second key question is to account for the differentiation of products which can trigger as many "strength of desire" than they are consumers. Jules Dupuit is one of the first economists to address this situation by business strategies based on price discrimination. In this sense, the market structure is really close to oligopolistic competition.

The following study is an attempt along the lines of the Jules Dupuit's philosophy of economics.

## 1. Introduction

Air transport is one of industries that benefits most from globalization. In 2013, the air traffic shows a 5.2% increase in passenger demand, in line with the annual growth rate of the past 30 years. The International Air Transport Association (IATA) has recently forecasted a 4.1% average annual growth in demand for air connectivity until 2034 that will result in more than a doubling of the 3.3 billion passengers expected to travel in 2014.

An actual case of global governance concerning this industry is the air-ticket solidarity levy initiated by France in July 2006. The idea is to impose a tax on those who benefit from globalization and redistribute revenue to those who benefit the least from globalization bycharging a 10–40 euros and 1–4 euros tax on business and economy class passenger fares, respectively. The revenue serves for improving access of the poor to treatment of diseases such as HIV, malaria and tuberculosis through its governing mechanism, UNITAID.

### *Consider the following events*

On June 24, 2015, Korean Air Lines Co. and Asiana Airlines Inc. cancelled 230 flights to and from Japan due to the ongoing spread of the Middle East Respiratory Syndrome (MERS) coronavirus through South

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Korea. Korean Air suspended a total of 122 flights connecting Japanese airports of Okayama, Akita, Komatsu, Aomori, and Kagoshima with Incheon Airport in Seoul from June 24. The length of the suspensions varied depending on the route. The Okayama-Incheon route remained closed until August 10, making it the longest suspension.

Asiana Airlines canceled 108 flights to Narita, Haneda, Chubu, Hiroshima, Toyama, and Matsuyama airports between June 30 and July 30. Excluding With Narita, Haneda and Chubu, none of the remaining eight Japanese airports had flights operated by other airlines that fly to South Korea.

The MERS outbreak had also a significant toll on South Korea's tourism industry such that tourist arrivals in the June 2015 have fallen by 25% compared to June 2014. (See WTTC, 2015.)

Ebola has cost billions dollars to Ginea, Liberia and Sierra Leone. In World Bank (2014), they estimate the medium-term impact of Ebola on output for West Africa as a whole. Under Low Ebola, the loss in Gross Domestic Product (GDP) is estimated to be 2.2 billion dollars in 2014 and 1.6 billion dollars in 2015. Under High Ebola, the estimates are even higher as 7.4 billion dollars in 2014 and 25.2 billion dollars in 2015.

These facts – and many others can be reported-are evidence that the air transport is one of the first industries impacted by the development of epidemics, which then affects the activities of other industries like tourism and trade.

It is therefore in the interest of the airline industry to experience lower risk of epidemic. In this perspective, investing in the improvement of health infrastructure and programs in developing countries is crucial. To finance these investments, one possible economic tool is to raise a tax. The economic rationale is classical: As nobody is ready to pay for the negative externality that epidemics impose on the world social welfare, public economics advocates the use of taxes to solve this market failure.

This could be a rationale behind the air ticket levy. However, it is legitimate to doubt that such a tax is innocuous on the working of the airline industry and in particular on its competitive conditions.

It is precisely the objective of this study to analyze how the innovative financing tax for development has influenced the competition among airline companies and to what extent it affected their sales.

To study the effect of the solidarity tax, we specify an econometric model where the representative consumer chooses the utility maximizing alternative among the differentiated products offered by the airlines which compete in terms of prices. It is a fairly reasonable and well accepted representation of the competition in the airline industry, assuming that the structure of their networks is given in the short run.

This report is structured as follows. Section 2 describes the data and provides descriptive analysis. In Section 3 we discuss the simulation results. Section 4 we provide an evaluation of these results. Section 5 explains the passengers' and airlines' behavior and introduces the models with estimation results.

## 2. Data

Four main sources are used for the construction of the database for this study: The International Civil Aviation Organization (ICAO) Data plus, the French Civil Aviation Authority (DGAC) annual statistics bulletins, the National School of Civil Aviation (ENAC) Air Transport Data and the Association of European Airlines (AEA) data. The ICAO Data plus provides information on air carrier traffic, finance, fleet size and number of personnel, and international traffic by stage. The passenger traffic from France by air carrier is collected from DGAC annual statistics bulletins. In addition to ICAO Data plus, we use the ENAC Air Transport Data to complete the data on air carrier finance and traffic, and carrier characteristics such as number of destinations and fleet size. The share of business and economy classes in each network is provided by the AEA data. The demographic data are collected from Eurostat and the World Bank.

While the data are aggregated at the firm level, we are able to obtain an average per passenger solidarity tax by combining the origin-destination data of DGAC, ICAO and AEA as explained below. The sample includes annual observations of 17 European airlines for the period 2000–2013 (See Table 1A in the Appendix.).

**Table 1**
Descriptive statistics.

| Variable (unit) | Mean | Min | Max |
|---|---|---|---|
| Traffic (million) | 22.84 | 1.13 | 81.39 |
| Price ($ per passenger) | 238.80 | 68.48 | 515.51 |
| Weighted Solidarity Tax | 0.21 | 0.00 | 5.40 |
| Distance (billion km) | 0.29 | 0.02 | 0.93 |
| Market Size (million) | 878.49 | 862.09 | 899.37 |
| Real GDP per capita (thousand) | 37.67 | 12.11 | 55.02 |
| Country population (million) | 37.31 | 0.28 | 82.53 |

Table 1 reports the summary statistics of the main variables of the econometric model. The average number of passengers is 22.8 million in the sample data. The air ticket fares are calculated as a ratio of the total passenger revenues to the number of passengers for each airline and the overall average ticket fare is $238.8.[1] Note that it is a proxy since the ticket price data are not available in Europe. The average solidarity tax per passenger is $0.21. We include a network measure in the empirical model which is the total number of kilometers flown by an airline per year. We measure the market size as the total population of Europe and Central Asia since most of the air traffic of airlines in our sample is within this region. The model comprises demographic variables: Income and population of the country where airlines' headquarter is located. We measure income as the real GDP per capita (measured in 2011 $) of the country.

### *Computation of the average solidarity tax*

The basic rules governing the solidarity tax is that it is collected at the origin, it is not collected when the passenger is in transfer, and it differs depending on the destination and the type of fare class. In July 2006, France began collecting an "international solidarity contribution" of €1 on all European economy class flights (€10 in business class) and €4 on international economy flights (€40 in business class) departing from its territory. The tax rates have been increased with effect from 2015. Now the levels of the solidarity tax in France are provided in Table 2.

Almost all Air France flights are originated from French airports, and therefore any ticket provided by Air France includes the tax. For Lufthansa, for instance, only the flights originated form French airports are affected by the solidarity tax. This structure necessitates origin destination data in order to study the impact of solidarity tax. From AEA data, we obtain the number of passengers for business and economy classes within Europe and in the international markets for the airlines which are members of AEA. Note that the solidarity tax is charged per ticket depending on the destination and the fare class, and the AEA data provides the number of passengers for each class and network but not the ticket prices. The main drawback of European data is that ticket price data are not available. For that reason, we use data aggregated at firm level and compute a firm level average solidarity tax by taking the weighted average of tax, as follows:

[1] Note the prices can fall on a very large range of values (See Table 1.). This is probably due the strategy of yield management implemented by the airlines. We account for part of this heterogeneity through airline specific effects, time effects and effects of observable characteristic. The other effects are related at unobservable characteristics or at random effects that are included in our model, but probably not in the right structural way. Indeed we abstract from the dynamic aspects raised by the yield revenue management systems. How this affects measure of market power and degree of competition is an open question. We believe that in terms of the comparison among airlines, the average price is a correct and meaningful measure of the competitive positioning of each airline in the market.