



# An empirical evaluation of the effects of European public policies on island airfares<sup>☆</sup>



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## ABSTRACT

In this paper we estimate a pricing equation using data, at route and airline levels, for five European countries where a significant proportion of the territory is located on islands; France, Greece, Italy, Portugal and Spain. By using two complementary empirical strategies, instrumental variables and matching procedures, we find that the imposition of Public Service Obligations does not seem to be effective in reducing prices. Furthermore, we find that prices are higher on routes where only island residents enjoy subsidies, but not on routes where subsidies do not discriminate between residents and non-residents. Finally, prices seem to be higher on routes with flat rates in contrast to routes where subsidies to residents are made through fare discounts. Overall, the results of our analysis suggest the need to change policies in order to support air services to islands and to avoid distortions in the market fares offered by airlines.

## 1. Introduction

The link between air transportation and regional economic growth is well established in the literature. In this regard, several studies have shown a strong relationship between air traffic and different measures of urban or regional economic performance (Brueckner, 2003; Green, 2007; Bel and Fageda, 2008; Percoco, 2010; Sheard, 2014; Bilotkach, 2015; Albalate and Fageda, 2016; Fageda, forthcoming).

The role of air transportation in supporting the mobility of people is particularly relevant on islands where surface transportation is only available within the islands, and maritime transportation is only a reasonable choice for short-haul distances (usually on trips between islands). Furthermore, governments may be interested in protecting air services to islands to spur tourism or promote national cohesion (Williams, 2010).

Hence, governments in European countries where a significant part of the territory is located on islands have implemented policies to subsidize air services on domestic routes from the islands to the mainland (or viceversa). This is the case of France on routes to Corsica, Greece on routes from the main cities to several small islands, Italy on routes to Sardinia, Sicily and Lampedusa, Portugal on routes to Madeira and Azores and Spain on routes to the Canary and Balearic Islands.

These policies may be associated with the imposition of Public Service Obligations (PSO) where governments set restrictions on

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entry, prices and frequencies, and grant subsidies through a competitive tender to an airline that meet these requirements. Furthermore, governments may provide subsidies only to residents on islands by imposing a flat rate on the prices that they must pay or establishing discounts that are computed as a percentage of market fares. These subsidies to residents may be embedded in the PSO or may be separate to it. In this regard, France and Italy have imposed PSO on several routes and these PSO include in some cases subsidies to residents in the form of flat rates. In Greece, some routes are subject to PSO but residents do not enjoy subsidies from them. Finally, Portugal and Spain specifically subsidize island residents on routes to the mainland without imposing PSO through discounts on market fares.

This paper draws on route-level fares for domestic links from the mainland to the islands for these five countries. With these data, we exploit the variability in the policies implemented in those countries to examine their impact on market fares. Our interest here is to examine the effectiveness of PSO that are associated with a price-cap and whether we can find differences between routes with subsidies that do not discriminate between residents and non-residents and routes with subsidies only to residents.

In this regard, several studies have analyzed the design and effects of the PSO applied in different European countries. Williams and Pagliari (2004), Williams (2010), Merkert and Fee (2013) and Wittman et al. (2016) show the high heterogeneity in the PSO programs across various European countries. Such heterogeneity includes the criteria for defining an eligible route or the determination of service levels, fares and subsidies.

Other studies analyze the execution of the program in specific countries. Lian (2010) and Lian and Ronnevik (2011) assess the weaknesses of the PSO regulation implemented in Norway. In particular, they show that competition is weak and there is a high variation in the fares and subsidies per passenger. Di Francesco and Pagliari (2012) analyze the potential negative impact on airfares of eliminating PSOs on the routes connecting the Italian mainland to the island of Sardinia. Calzada and Fageda (2012) find that prices on routes subject to PSO are lower than on unprotected routes with similar characteristics. Finally, Angelopoulos et al. (2013) find inconsistencies in the designation of PSO routes and the average amount of subsidies per passenger on Greek routes.

Studies also include econometric analysis with cross-country datasets. Calzada and Fageda (2014), for example, find that PSOs reduce competition on protected routes, while their effect on the number of flights differs depending on national regulations. Santana (2009) finds that PSOs increase the operation costs of European carriers, but she does not observe a similar effect in the US system. Merkert and Williams (2013) show that European operators perform better in the early months of the PSO contracts than when the contract is approaching termination, suggesting that airlines have fewer incentives to increase efficiency before the tender finishes due to the absence of competition. Finally, some other papers have examined the design of PSOs in European air markets. Pita et al. (2013) propose an operational planning model to examine the design of subsidized air transportation, and apply this methodology to assess the Azores PSO system; while Pita et al. (2014) extended this model and apply it to an analysis of the PSO network in Norway.

Regarding discounts to residents, econometric studies have focused on the case of Spain. Calzada and Fageda (2012) show that routes benefiting from price discounts are priced more highly than the remainder of the domestic routes. Fageda et al. (2012) draws on data of routes departing from Gran Canaria airport, including national and international destinations. They compare prices on subsidized routes (domestic flights from Gran Canaria) with those that are unsubsidized (international flights from Gran Canaria), and find that non-resident passengers pay higher prices than international passengers. Fageda et al. (2016) did not find changes in fares following an increase in the percentage of discounts for residents of market fares.

Valido et al. (2014) compare the different effects of *ad-valorem* and specific subsidies for resident passengers in air transport markets in a 'market power context'. They show that non-resident passengers may be expelled from the market if the proportion of resident passengers is high enough. They also analyze the most desirable situation between both types of subsidies, *ad-valorem* or specific, showing that their effects depend on the passengers' willingness to pay. Next, they apply the model to the Canary Island markets, concluding that the *ad-valorem* subsidy is not the best for the conditions of this market. Finally, Cabrera et al. (2011) carry out a comparative description of these kinds of subsidies in Europe's outermost regions (they also analyzed PSO declarations in these regions).

This paper contributes to the literature on PSO and subsidies to residents by examining the impact on prices of the different policies applied in European countries with islands. We draw on a large sample of domestic routes that link the mainland with islands for the winter and summer seasons of 2016 to estimate a pricing equation that controls for different factors, capacity on the route, distance, competition or the presence of low-cost airlines. Furthermore, we apply two different estimation strategies. First, we use an instrumental variables procedure that takes into account the potential endogeneity of the variable for the size of the route. Second, we use a matching procedure with data at the route-airline level that focuses on observations that have similar observed attributes.

We find that PSO do not seem to be effective in reducing prices in comparison to routes that are operated on a free subsidy basis. Furthermore, we find that prices are higher on routes where only island residents enjoy subsidies but not on routes where subsidies do not discriminate between residents and non-residents. Finally, prices seem to be higher on routes with flat rates in contrast to the routes where subsidies to residents are made through discounts of market fares.

In the following section, we provide some details on the policies applied in European countries to ensure air services to islands. Next, we explain the data used, and some descriptive statistics are given. In the last section, the empirical strategy is developed and the results of the econometric analysis are explained. Finally, the paper concludes with some policy recommendations.

## 2. Subsidy scheme in Europe

From the period of airline liberalization to date there have been many cases of PSO implemented in Europe. However, each country's government has applied this policy in different ways "In order to maintain appropriate scheduled air services on routes

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