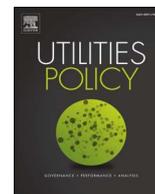


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Ownership structure and the technical, cost, and revenue efficiency of Italian airports

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ABSTRACT

This paper investigates the role of the different ownership types of operators in the Italian airport sector. A meta-frontier conceptualization is utilized to consider ownership heterogeneity and compare airport efficiencies. Efficiencies are measured from multiple perspectives. Cluster analysis is adopted to uncover airport configurations with respect to inefficiencies. The results suggest that ownership heterogeneity may exert substantial influence on airport efficiency. However, while PPP airports have greater technical efficiency than airports operated by publicly owned operators, the meta-frontier analysis relative to cost and revenue efficiency does not provide evidence that PPP airports perform better. Indeed, publicly managed airports achieve comparable or better performance in terms of revenue efficiency. Findings also indicate that ownership is not the only factor affecting airport performance.

1. Introduction

The air transport industry has much weight in the European economy, playing an important role in social and economic development at the regional and national levels. Indeed, a number of empirical studies have shown that the air transport sector has a positive impact on the Gross Domestic Product (GDP) (Aschauer, 1989; Button and Taylor, 2000; Green, 2007; Mukkala and Tervo, 2013). The aviation industry contributes to more than 110 billion euro to GDP, or as much as 300 billion euro if indirect and induced impacts are taken into account, and employs over one million people (Debyser, 2016).

Over the last 40 years, the structure of the air transport industry has been fundamentally re-shaped, often changing faster than actors can adapt, challenging the traditional business model (Phillips, 1985; Rubin and Joy, 2005). Airports are a central component of the air transport industry. Thus, expanding the national and regional airport infrastructure and improving airport management have been two major policy goals in both developed and developing countries over the last two decades. Airport operators are facing several challenges and pressures, such as meeting increased capacity demand, improving the quality of service and customer satisfaction, making extensive investment to tackle the infrastructure bottleneck and, at the same time, lowering costs and increasing revenues. Evolving rules and requirements relative to the environment, security, and safety issued by international and national aviation regulatory agencies and local governments, and the evolution from a point-to-point to a hub-and-spoke traveling model, are all factors that contribute to putting airport

operations under pressure (Cento, 2009).

For a long time, in most countries, airport infrastructure assets have been owned by governments and managed by public entities. However, since the end of the 1980s, budget constraints have induced governments to leverage private participation in infrastructure through Public-Private Partnerships (PPPs), including airports. The research literature and experience suggest that PPPs may be superior to publicly owned and operated services in terms of improving efficiency, expanding the infrastructure assets, and transferring risks to the private partner in the delivery of service (Grimsey and Lewis, 2005). The growing intensity of the competitive pressure consequent to market liberalization and the emergence of low cost carriers and the simultaneous need to improve the quality of the transport service and infrastructure assets through investment have led governments to increasingly open the aviation market to the private sector with the aim of adapting airport operations to become more efficient and profitable (Hooper, 2002). Consequently, airports are no longer considered just as public service providers but as business firms that compete in the market to attract customers providing them transport services and make profits by performing both aeronautical and non-aeronautical activities. The transformation of the airport operators from public service providers to commercial firms has motivated them to search for new business opportunities to generate revenues and achieve financial sustainability (Lyon and Francis, 2006). Graham (2009) claims that, on average, commercial revenues account for about half of all airport revenues and include substantial revenues from retail services. However, the profitability of airports, particularly smaller ones, remains problematic (Adler et al., 2013b). From 2001 to

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2010 traffic in European regional airports increased by 60%, but about half of them experienced losses in 2010 (European Court of Auditors, 2014). According to airport statistics released by the Airports Council International (ACI), aeronautical revenues do not cover all airport operations costs, so financial sustainability is often derived from non-aeronautical revenues (ACI, 2016). A report by the Airports Council International states that “[...] although the airport industry as a whole is profitable, most airports are actually in the red on their financial statements, the latest estimates suggest that as many as 69% of airports worldwide operate at a net loss. Most of these airports have fewer than one million passengers per annum, smaller airports have neither sufficient traffic to achieve economies of scale nor to generate significant or non-aeronautical revenue” (ACI, 2015).

Recently, there has been a growing interest both of scholars and policymakers in the measurement of airport performance, in particular, to evaluate the potential benefits of private-sector involvement and, more generally, to evaluate productivity and operational efficiency under different ownership and regulatory frameworks. The findings can be used to implement industry-specific policies relative to aviation service tariffs, infrastructure investment, and tax schemes (Oum et al., 2004). Toward this purpose, benchmarking studies have become well established in the industry (Fry et al., 2005; Graham, 2005; Reinhold et al., 2010). However, results of these studies with regard to the impact of ownership on airport efficiency are ambiguous. This may be because many studies rely on a simplified model of the production process utilized by the airport management companies to perform service operations. Many also neglect how different ownership forms may imply differences in the utilization of inputs, and thus production models. This research contributes to the literature by extending knowledge on the relationship between ownership form and performance, focusing on the aviation industry in Italy. First, the airport operator service system is decomposed into three related sub-processes that use different sets of inputs and produce different sets of outputs. The performance of each sub-process is measured by a specific efficiency index, providing a comprehensive understanding based on three perspectives: technical, cost and revenue. Second, as airports operated under different ownership forms face different production opportunities, the corresponding production processes are modeled by taking into account heterogeneous production functions and performing a bootstrapped meta-frontier Data Envelopment Analysis (DEA) to evaluate efficiencies. Third, cluster analysis is used to uncover homogeneous configurations of airports by adopting structural and managerial inefficiency measurements as clustering variables.

The remainder of the paper is as follows. Section 2 provides a literature review on efficiency analysis and the impact of ownership on performance in the airport industry. Section 3 describes the contextual setting of the aviation industry in Italy. Sections 4 and 5, respectively, present the method and model specification. Section 6 illustrates and discusses the results. The last section presents conclusions, limitations, and implications.

2. Literature review

A number of scholars have investigated the impact of different forms of ownership, particularly privatization, on airport performance. Table 1 summarizes our review of the research literature on the analysis of the effect of ownership on airport efficiency reporting information about samples, variables, and major results.

As Liebert and Niemeier (2013) emphasize, results from the empirical studies that examined the relationship between ownership and airport efficiency are often ambiguous and inconsistent. Some studies clearly find evidence of the influence of ownership on airport efficiency, others are unable to discover any relevant effect, and still others show that the effect of ownership on airport efficiency depends on many other factors related to the market and competitive environment, the governance structure of the operating company and the concession

agreement, and characteristics of the airport infrastructure that generate economies of scale. Researchers have used different samples, variables, time periods, and research methods (see Table 1). Certain discrepancies across results are undoubtedly due to differences in research approach. Contrasting results have been found for the same or similar airport samples in different timeframes (see, for instance, Gitto and Mancuso, 2012a; Gitto and Mancuso, 2012b; Oum et al., 2003; Oum et al., 2006 and Oum et al., 2008). Heterogeneities in the samples and datasets make benchmarking studies problematic and can strongly bias the efficiency analysis because the operational environments of airports are very different (Adler et al., 2013a; Marques et al., 2015). Furthermore, as Cruz and Marques (2011) underline, the influence of privatization on airport efficiency cannot be easily evaluated because of the lack of detailed information relative to the roles of the public and private sectors.

Some researchers did not find any difference between private and publicly owned or managed airports (Gitto and Mancuso, 2012a; Lin and Hong, 2006; Oum et al., 2003; Parker, 1999). Gitto and Mancuso (2012a) measured the operational performance of 28 Italian airports between 2000 and 2006. They found that the type of ownership – public majority vs. private majority – does not have a significant influence on performance, but may affect airport productivity; there are also productivity variations among airports located in the South and airports in the North of Italy. Lin and Hong (2006) implemented DEA to evaluate the efficiency of 20 major airports in the world. No correlations between airport operational performance, size, and form of ownership were found. Efficiency was correlated to the existence of a hub, airport location, and the economic growth of the country. Oum et al. (2003) calculated gross total factor productivity measurements relative to 50 major airports in Asia, Europe, and North America and regressed them on factors beyond managerial control to compute true productivity. Results indicate that scale economies affect the performance of larger airports more than operational efficiency, while the airport ownership structure has no statistically significant effect on productivity. Parker (1999) assessed the effect that privatization had on the operational efficiency rate of airports in the UK, but without finding any relevant effect.

Some studies support the idea that airport efficiency is influenced by ownership type. In particular, some scholars found that privatization increases airport efficiency (Adler and Liebert, 2014; Assaf, 2011; Gitto and Mancuso, 2012b; Malighetti et al., 2007; Marques and Barros, 2011; Marques et al., 2015; Oum et al., 2006; Perelman and Serebrisky, 2012). Adler and Liebert (2014) performed a two-stage DEA procedure to evaluate the influence of environmental factors on cost efficiency for a sample of 48 European and three fully privatized Australian airports. They found that mixed ownership airport operators with a majority of public holding are not cost-efficient. Assaf (2011) measured productivity, efficiency, and technological changes in major Australian airports from 2002 to 2007 using bootstrapped DEA. He found that after privatization, most airports experienced significant productivity growth. Gitto and Mancuso (2012b) used two-model specifications to assess the impact of regulatory reform on the technical efficiency of 28 Italian airports. The first model includes only aviation activities while the second model includes both aviation and non-aviation activities. They found that efficiency is positively influenced by the inflow of private capital and type of concession agreement. Malighetti et al. (2007) studied the efficiency of Italian airports applying a DEA model to 34 airports over the period 2005–2006. They found a positive influence of private ownership on airport efficiency. Marques and Barros (2011) investigated the effect that regulation, ownership, and unobserved managerial ability have on the cost function of a sample of 32 European airports between 2001 and 2004. They found that public airports are less efficient than private airports. In order to take into account heterogeneity, Marques et al. (2015) employed robust conditional m-order DEA to measure the efficiency of 141 international airports. They found that the operational environment has an influence

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