The relationship between airport performance and privatisation policy: A nonparametric metafrontier approach

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ABSTRACT

The assessment of economic and technical efficiency is a useful tool for selecting the most appropriate technology for airport operations. However, traditional models require that the units being assessed operate with the same technology. To overcome this limitation, one can use a non-concave metafrontier approach that is based on Data Envelopment Analysis (DEA) to calculate the techno-economic efficiency and Technological Gap Ratios (TGRs) with non-homogeneous technologies for airports across countries and with different ownerships. The previous studies mainly applied DEA to measure the operational efficiency of airports. Our results indicate that privately owned airports have better technical efficiency than public ones. In addition, our empirical analysis shows that public airports in the Asia-Pacific area have the lowest techno-economic efficiency.

1. Introduction

Airport efficiency evaluation has been a burgeoning area of research in recent years. These assessments are important for a variety of stakeholders including airports, regulatory bodies, governments, passengers, and airlines (Humphreys and Francis, 2002).

Lai et al. (2012) pointed out that since the year 2000, > 50 papers related to airport efficiency have been published. From a methodological perspective, one of the dominant approaches taken has been the application of econometric tools, featured in 80% of all published papers in this area. In terms of the specific techniques adopted, Data Envelopment Analysis (DEA) was featured in one of the first papers published (Gillen and Lall, 1997) and has become the most popular tool since then, being employed in around half of these papers. As a result, developments to improve accuracy in the employment of DEA, such as bootstrapping, have been incorporated into its use (Curi et al., 2011). Some other methods, such as Stochastic Frontier Analysis (SFA) and Total Factor Productivity (TFP), were also applied to evaluate airport efficiency in different regions, such as the UK, Europe, and other airports around the world (Barros, 2008; Pels et al., 2001; Oum et al., 2006).

However, only a few papers in the past, such as Oum et al. (2006) and Lin and Hong (2006), attempted to estimate airport efficiency in terms of ownership. Oum et al. (2006) found that airport ownership did affect airport efficiency. On the other hand, Lin and Hong (2006) found that airport efficiency was not influenced by airport ownership. This difference in findings may have resulted from the different time periods and different analysis methods[1] that were applied in these two papers. Accordingly, this paper attempts to use a longer data period (2001–2013) and different analysis approaches to see what the relationship is between ownership and operational efficiency for airports.

Another objective of this paper is to show how meta-frontier function and group frontier work can be efficiently based on the concept of DEA. As was mentioned, the DEA is the most popular nonparametric and nonstochastic approach to efficiency measurement. Therefore, this paper uses the DEA approach to analyse the difference in the efficiency performance of technical efficiency and technical gap effects.

Among the previous papers, during the analysis process, the sample airports were considered as a homogeneous group, that is to say, the considered airports were evaluated by means of the same technology and were assumed to be completely homogeneous organizations. However, airport operations include many diverse sectors, such as different populations served, different locations, different economic situations, and different numbers of competitors. Hence there could be differences between the efficiencies of airports depending on the sector to which they belong (Medal-Bartual et al., 2014). To account for this

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[1] Oum et al. (2006) applied A Variable Factor Productivity (VFP) and data for four years to evaluate airport efficiency among 116 airports worldwide. Lind and Hong (2006) employed DEA and one year of data to evaluate 20 major airports around the world.
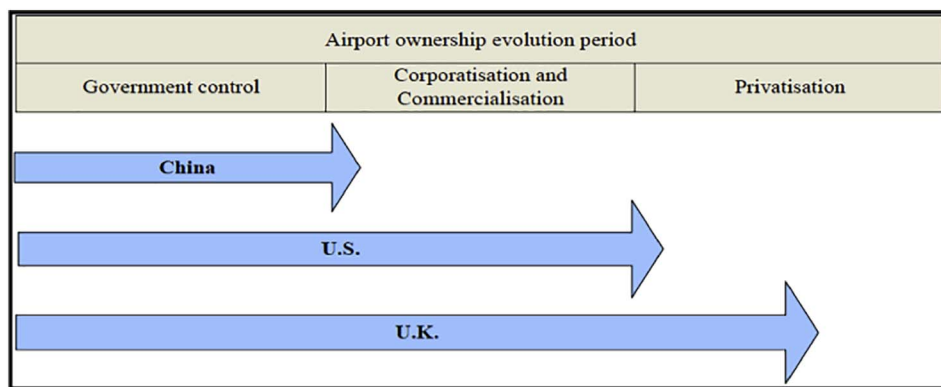
Fig. 1. Evolution of airport ownership structure. (Source: Organised by author.)

heterogeneity problem, O'Donell et al. (2008) introduced the concept of a metafrontier, as described in the next section.

For the above reasons, this paper introduces the metafrontier approach to examine airport efficiency. The sample airports in this paper have been selected from Europe and the Asia-Pacific region. The sample airports can be divided into two groups according to their type of ownership, that is, private or public.

The structure of the paper is as follows. First, it reviews the literature about airport efficiency evaluation. An overview of the metafrontier analysis used to compare the technical efficiencies of the airports is presented in the second part, followed by the empirical work, which comprises a description of the data used, the estimation, and discussion of the results. Finally, the conclusions are presented.

2. Airport privatisation

In most developed countries around the world, including the EU and the US, airport ownership and governance have seen considerable change. As governments began to deregulate airline services and subsequently pursue airport expansion policies, low-cost airline companies emerged and new terminal construction began in several EU airports (Graham, 2008). The shift that occurred in many countries had several common sources. Air traffic was growing rapidly, airports needed to invest in capacity, and there was a general rethinking of the role government should play in the economy. Airports were considered a place where the private sector could legitimately provide much-needed service improvements and investment funds. This was driven by successes in the deregulated airline sector, which was showing significant improvements in productivity and product innovation, which, many argued, could be extended to airports (Evans and Kessides, 1993; Assaf and Josiassen, 2011; Barros and Couto, 2013). Accordingly, there was a newfound recognition of the relationship between ownership structure, governance, and performance.

Airport privatisation can occur in several different ways. The types of privatisation models fall broadly into five categories (Carney and Mew, 2003):

(a) Share flotation:

In a share flotation, the government will give up total or partial ownership, while transferring the economic risk and effective control to new shareholders. To date, the only 100% share flotation to have taken place was with BAA in 1987 in the UK.

(b) Trade sale:

In a trade sale, some or all of an airport will be sold to a trade partner or consortium of investors, usually through a public tender. The first significant trade sale took place in 1990, when 76% of Liverpool airport was sold to British Aerospace. Subsequently several other UK airports, such as East Midlands, Cardiff, and Bournemouth, have been sold off to a trade partner (Graham, 2008).

(c) Concession:

Here an airport management company or consortium will purchase a concession or lease to operate the privatised airport for a defined period of time, usually for 20 to 30 years. Luton airport provides an example where a consortium, originally consisting of Barclays Investment, Bechtel Enterprises, and Airport Group International (AGI), was given a 30-year concession to run the airport in 1998.

(d) Project finance privatisation:

A company usually builds or develops, and then operates, an airport or specific facility, such as a terminal, for typically around 20 or 30 years. Build-Operate-Transfer (BOT) is also based on this kind of privatisation. The Eurohub, the second largest passenger terminal of Birmingham airport, was built under a BOT-type arrangement in 1991 (Lambert, 1995).

(e) Management contract:

In this system, ownership of an airport remains with the government, but contractors take responsibility for its day-to-day operation, usually for 5 to 10 years. This kind of model has not been adopted in the UK.

The evolution of airport ownership in North America, Europe, and Asia has taken place during different periods of time. Fig. 1 shows the evolution of airport ownership in the UK, the US, and China. Airports in China are currently in the early stage of a second period of development, because of outsourcing of airport operations, while the government still retains ownership. Since the late 1990s, the Chinese government has embarked on a policy of floating state-owned airlines and airports in the stock markets in order to improve their efficiency and performance. Even after a localisation program, which was started in 1988 and completed in 2003, among these 142 commercial airports, so far only six Chinese airport companies have been listed on stock exchanges in Hong Kong, Shanghai, and Shenzhen (Gong et al., 2012).

However, the state still holds majority ownership in these listed companies. The FAA in the US has tried to privatise only a few airports, and most of the day-to-day operations in most US airports has been commercialised. Therefore, airport ownership evolution in the US is in the early stage of privatisation. In addition, UK airports have been transferred between owners several times; so their evolution should be classified as being in the middle of privatisation.

3. Airport efficiency evaluation

In the mid-1990s, the literature on efficiency evaluation, which had