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Devising airport groupings for financial benchmarking

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A B S T R A C T

This paper uses cluster analysis to assess whether it might be a useful tool to select airport groups for comparative financial and economic performance studies. The research uses a sample of 73 airports, or airport operators, from all over the world. Nine key performance indicators (KPIs) are used to determine the clusters and the relationship between these clusters and possible explanatory variables is explored. Three clusters are produced which are similar for 2003 and 2010. One consists almost entirely of North American airports, one is dominated by European airports and one has a mixture of European and other (non-North American) airports. It is concluded that such an approach may indeed prove useful, not only just in the financial and economic areas, but with other aspects of airport performance that can be measured with a selection of KPIs.

1. Introduction

In recent years, there has been growing pressure for airports to benchmark their performance against other airports. One of the major problems that exist with this is in identifying the most suitable airports to use as comparators. If inappropriate comparators are chosen, airports may set benchmarking targets that are unachievable. Typically one-dimensional criteria, such as location, size or ownership, are used to group the airports, being often chosen for data availability or convenience reasons. However research suggests that airport performance is influenced by a number of different factors, with no single one being dominant. Therefore the aim of this research is to assess whether cluster analysis might be a useful tool to construct airport groupings which can be used to select samples for comparative performance studies. Within each grouping it might then be possible to identify the 'best' airport for each performance measure and to set this as a realistic benchmark or target for all other airports to follow.

Traditionally airport performance was primarily assessed using ratios or performance indicators that focus on strengths and weaknesses in different areas and help indicate to management where specific improvements can be made. However this approach only gives a partial view of the situation and does not show how efficiently airports combine all their inputs to produce a combination of outputs. This can be investigated by using more complex analytical methods, such as stochastic frontier analysis (SFA) and data envelopment analysis (DEA), which have increasingly been used in this sector (Morrison, 2009). Nevertheless partial measures remain an important management tool for the airport industry (ACI, 2012) and it is this practical application of partial performance measures that is the focus of this research.

Partial measures can be used to benchmark a number of different areas of airport management such as financial, environmental and operational performance (Graham, 2005). The research here considers economic and financial measurement. The problems related to the choice of comparator airports in this area are all too apparent. For example one aspect of performance (e.g. related to costs) may be largely explained by geographical differences, such as labour costs, whereas another aspect (e.g. related to revenues) may be primarily related to traffic characteristics, such as the proportion of international traffic.

In some cases airport operators will have particular airports in mind to benchmark with and often these are their main rivals that are located geographically close to them. However in many other circumstances airports want to benchmark themselves, not to specifically gauge how they are performing compared to their competitors, but instead to assess how they are performing against what is actually achievable within the industry. In this situation the selection of appropriate comparator airports can be difficult which is the reason for this specific research.

The structure of this paper is as follows. Section 2 provides the background context for the research by considering the current

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airport classifications that exist and previous research that has investigated the factors that influence airport performance. Section 3 then explains the airport sample and methodology which has been used for this research. This is followed by Section 4 which presents and examines the findings. The conclusions and recommendations for future research are discussed in Section 5.

2. Current airport classifications and groupings

Current airport classifications are broadly related to five factors:

- Airport location.
- Volume of traffic.
- Nature of traffic and role of airport.
- Congestion, utilisation and technical characteristics.
- Ownership, organisation and regulation.

The most basic classifications that are used relate to airport location where airports can be grouped according to national or regional boundaries. Such groupings are used by organisations such as the European Commission (national) and ACI (regional). Classifying according to the volume of traffic or range of air services is also very popular. Eurostat, the European Commission and ACI-Europe all have categories based on passenger numbers whilst the FAA in the USA choses a grouping based on the share of total enplaned passengers. Rather than just taking into account the volume of traffic, some classifications also consider the nature of the traffic and the role of the airport such as in Italy (international, domestic), Germany (international, regional) and Canada (national, regional, local, small, remote or arctic). More complex groupings, also based on an airport's role, that have been suggested but have yet to be applied to a complete airport sample, have been suggested by ACI-Europe (2010a) (airport network, alliance anchor hub, airport city, multi-modal, airport as final destination, business traffic, 'low cost' base and freight platform), Boston Consulting Group (2004) (primary hubs, international origin and destinations (O&Ds), secondary hubs and O&Ds, and regionals), and Mercer Management Consulting (2005) (primary hubs, secondary hubs, major O&Ds, low cost base and leisure destination airports).

Globally airports are classified according to their level of congestion and availability of slots under the IATA scheduling system (co-ordinated, schedules facilitated and non-co-ordinated). ICAO also has technical classifications based, for example, on runway length and width or precision approach category. In addition ICAO (2008) divided airports into four groups by ownership; namely government (ministry or other; regional or municipal government; civil aviation authority), autonomous body (state owned or private), concession or leasing agreement and other. Likewise ACI-Europe (2010b) separated its member airports between public, mixed and private ownership. Furthermore classifications may relate to the type of economic regulation, for instance in the UK where there are 'price regulated' airports, 'regulated' airports and 'other' airports.

Clearly it is convenient to use one of these established classifications for the selection of airport comparators for performance studies but there needs to be a logical rationale to do so.

Previous research that has considered explanatory variables that influence performance can give some insight into this issue. Even though most of the useful studies use total rather than partial measures, they can nevertheless provide some indication as to whether such explanatory variables match up with the criteria currently used in airport classifications.

Firstly, as regards location, many studies have focused on just one country to produce findings that will be of national interest, and perhaps to overcome the difficulties associated with data availability and comparability with inter-country studies. Hence in these cases the impact of different locations cannot be assessed. Some research has focused on one region such as Europe (Suzuki et al., 2011) or Asia-Pacific (Lam et al., 2009) whereas others have covered a mixture of world regions. Whilst some of these make no attempt to investigate regional differences (Martín and Voltes-Dorta, 2011a; Assaf and Gillen, 2012), there are a few that do – albeit with inconsistent findings. For example Vasigh and Gorjidooz (2006) found that US airports outperformed European airports, and Lin and Hong (2006) concluded that North American and European airports have higher operational efficiencies than those in Asia and Australia. By contrast Oum et al. (2006) found that, compared to North American airports, operating in Asia and Europe had a negative impact on efficiency whilst operating in Australia and New Zealand had a positive impact. In addition, Perelman and Serebrisky (2010) concluded that Latin American airports were less efficient than Asian and North American airports but more efficient than European airports. Regional differences can also be observed in industry studies (e.g. ACI, 2011).

Considering traffic volume, many studies have investigated whether there are constant, increasing or decreasing returns to scale. Some have found increasing returns to scale, for instance Barros (2008) in Argentina, Wanke (2012) in Brazil, Barros and Dieke (2007) in Italy and Yoshida (2004) in Japan. A number of others observed that larger size had a positive impact on performance (Oum et al., 2003; Martin and Roman, 2008; Assaf, 2009). In contrast to these, Bazargan and Vasigh (2003) found that small airports consistently outperformed large airports in the US. Moreover whilst Martín and Voltes-Dorta (2011b) identified increasing returns to scale as being unexhausted in Spain, for the UK Doganis and Thompson (1973) and Assaf (2010) observed that larger airports were scale efficient or operating in a region of decreasing returns to scale. Similar conclusions to this UK situation were drawn by Salazar de la Cruz (1999) and Murillo-Melchor (1999) for Spain, and Pels et al. (2003) for Europe.

In some of the research a distinction is made concerning the role of the airport, for example as to whether it is a hub. Oum et al. (2004) observed that such a role lowered the performance of an airport whereas Sarkis (2000), Barros and Dieke (2008), Lin and Hong (2006), Assaf (2011), Perelman and Serebrisky (2010) argued that hub airports had better performance. A few studies have also found that other traffic characteristics can have an impact on performance, such as the proportion of international traffic (Oum et al., 2003) or cargo traffic (Oum and Yu, 2004), which both had a positive impact the higher the traffic share. In addition capacity constraints or congestion were found to have a positive impact on performance in the global study of Oum et al. (2004).

Ownership and governance have been popular factors that have been investigated. Vogel (2006) found that partially and fully privatized European airports operated more efficiently than public ones. Similarly Barros and Dieke (2007) concluded that private Italian airports were more efficient than public Italian airports, whilst Fung et al. (2008) observed that airports that had been publicly listed in China were more efficient than non-listed ones. Oum et al. (2006) concluded that airports with government majority ownership were significantly less efficient than airports with a private majority ownership and Oum et al. (2008) observed that there was a high probability that airports owned/operated by a majority private firm achieved higher efficiency than those owned/operated by a mixed enterprise with government majority ownership. By contrast Curi et al. (2010) found public airports in Italy more efficient-contradicting previous research of Barros and Dieke (2008).

Related to airport governance, in Italy again it was found that the nature of the airport concession influenced performance (Gitto and