A cost-efficiency analysis of European air navigation service providers

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A B S T R A C T

Air Navigation Service Providers (ANSPs) as the third major component of the aviation industry have been less of a focus in research than their airline and airport counterparts. In this paper we analyse European ANSPs cost structures using a stochastic frontier analysis approach within a Bayesian estimation framework in order to incorporate regularity conditions. Our results show that ownership is not directly impacting neither the ANSPs cost structures nor their cost efficiencies and that the European ANSPs are operating on the increasing return to scale part of the technology, hence supporting the choice of ANSPs agglomeration.

1. Introduction

Air Navigation Service Providers (ANSPs) are the third major component within the aviation industry, connecting the other two components; airlines and airports through their provision of air navigation services (ANS) whilst ensuring the safety of operations and the promotion of efficient traffic flows. ANSPs are entities providing both air traffic control (ATC) and air navigation services (ANS) collectively referred to as air traffic management (ATM) (Oster and Strong, 2007). ANSPs offer en-route, approach and aerodrome control air traffic services. Many also offer oceanic ANS and some provide services to civil and military aviation. As a result, ANS can account for between five and ten percent of airlines operating costs, with delays generating significant costs to the airlines (Quendt et al., 2007). Considering this, it is recognised that improvements for the enhancement of flight and airspace efficiencies will facilitate significant cost savings within the industry (McDougall and Roberts, 2008). Historically, ANSPs have been owned and controlled by their respective governments. However, there is a trend towards separation from the government and a commercialisation of the ANSP organisations, with many ANSPs world-wide having moved from the traditional governmental departments and agencies towards various different organisational forms with some degree of commercial focus within their service provision. This is often a result of increasing financial constraints faced by governments, increased congestion and outdated equipment and facilities. As such within Europe, several ANSPs have undergone institutional reform to become commercialised allowing them to generate internal improvements and liberating them from governmental budgetary controls which in turn should enable benefits and efficiencies for the airspace users. Most ANSPs have already diversified into non-core business activities, with some explicitly stating intentions of expanding such activities. As such, it is interesting to determine the impact, if any, that the commercialisation, privatisation and resultant non-core business activities may have upon the cost-efficiencies which they seek. A number of publications and studies have tried to assess the contribution which privatisation and commercialisation can have on the provision of ANS both within Europe and world-wide. For example, Lewis and Zolin (2004) undertook a comparative analysis of the institutional arrangements for governance of several global ANSPs ascertaining that privatisation is directly related to the ANSP's ability to respond to user needs. They suggest

that privatisation should lead to the improvement of financial performances, safety and efficiency. Button and McDougall (2006) indicate that in the long-term, ANSP commercialisation results in reductions in charges levied on customers, achieved through competition. Their study suggests that commercialisation often leads to improvements of service portfolios and provides flexibility. Similar results are provided in McDougall and Roberts (2008); the authors suggest that ANSP commercialisation generally achieves service quality improvements, modernisation of technologies, financial stability and high safety levels. When turning the attention towards ANSP cost efficiency, few studies have tried to analyse the European air navigation system. EUROCONTROL, a European regulation body providing member states with guidance to achieving safe, efficient and environmentally sound air traffic services,[1] produces a benchmark analysis of ANSPs. They publish reports which monitor performance and targets for improvements, including the annual Air Traffic Management Cost Effectiveness (ACE) benchmarking report which mainly compares ANSPs on financial and economic gate-to-gate key performance indicators. Besides these reports, EUROCONTROL performance review unit (PRU) commission studies on the efficiency of air navigation systems such as those by Mouchart and Simar (2003), NERA Economic Consulting (2006) and Competition Economists Group (2011). Mouchart and Simar (2003), focus on the technical efficiency of European air control centres (i.e. the regional centres composing the ANSPs) applying a non-parametric methodology. The main conclusions of the report are that the efficiency of the Centres are similar to the year 2000 and that the delay variable has a significant effect on the individual inefficiencies. Finally, the authors argue that the returns-to-scale in the production process of the Centres are characterised by increasing or near constant returns-to-scale for small units and decreasing returns-to-scale for larger Centres. NERA (2006) and the Competition Economists Group (2011) are, to the best of our knowledge, the only two works estimating European ANSPs cost efficiency using a stochastic frontier approach. NERA (2006) compared the cost efficiency of 34 ANSPs between 2001 and 2004 using a Cobb Douglas functional form, however the results were considered to be poor given the insufficient number of observations and no major conclusions were drawn. Similarly, the Competition Economists Group (2011) assessed ANSP cost-efficiency extending the previous work by NERA. The report analysed the cost efficiency of ANSPs for the period 2002–2009 applying a Cobb Douglas total cost stochastic frontier analysis. Despite problems of estimation convergence, the report shows an average level of inefficiency ranging from 13% to 60%, as a function of the assumption with respect to the inefficiency distribution. Besides these works, few other researchers benchmarked European ANSPs applying a data envelopment approach (e.g., Button and Neiva, 2014, Bilotkach et al., 2015). Generally, no research has been undertaken in order to connect ownership and efficiency by showing the influence that ownership and institutional structure has upon ANSP (cost) efficiency. The aim of this research is to fill this gap in the literature. By adopting a stochastic frontier approach, we evaluate the impact of ownership over the ANSPs cost structures and cost efficiencies. We estimate the cost functions (total cost and variable cost) within a Bayesian framework in order to incorporate regularity conditions following the economics theory. By satisfying the economics regularity assumptions, our estimates are therefore providing useful information to the regulator in regards to industry elasticities and economies of scale.

1.1. European ANSPs

ANS within Europe are coordinated and integrated by EUROCONTROL. EUROCONTROL aims to facilitate the establishment of a Single European Sky (SES), a European Union initiative looking to address issues facing the European ATM system including increasing traffic levels, high costs of ANSP services, heterogeneous working practices and constraints of air route networks. Although a controversial concept, with possibilities of workforce redundancies, the SES looks to restructure and defragment the European airspace to enhance capacity and enable a more efficient air navigation system. The SES has introduced the concept of Functional Airspace Blocks (FABs) with the intent to increase cooperation and integration of ANS provision amongst ANSPs, or, in cases, through an integrated provider. This concept aims to reorganise the current airspace blocks across Europe which are established according to national boundaries into nine functional airspace blocks, thereby defragmenting the European airspace. The SES legislative package most notably Regulation EC No. (1070/2009) defines FABs as an airspace block which is developed in accordance with operational requirements irrespective of national boundaries enabling the provision of ANS and associated functions to be performance-driven and optimised. Moreover, SES has resulted in the European Commission deciding on common regulatory approaches and they oversee implementation at national level, with a focus on performance regulations to stimulate ANSP cost-efficiency and service quality. As an example, prior to 2012 the ANSP charges were regulated under full cost-recovery mechanisms resulting in increased charges following any revenue shortfalls and with any profits redistributed to the airspace users (European Commission, 2010). In accordance with the more recent regulation 1191/2010, ANSPs are now not guaranteed to cover their costs and they have incentives to be efficient given the possibility of retaining profits. However, despite being directed by rules and business pressures prescribed by EUROCONTROL, ANSPs within Europe still differ significantly. Each ANSP has duties mandated by laws unique to them, with governments providing different definitions and responsibilities of their respective ANSPs. Almost all ANSPs are engaged in both core and non-core business activities, however, the extent to which varies across each ANSP.

1.2. Ansps privatisation and commercialisation

It is possible to recognise three main ANSP ownership and institutional structures: state entities, commercialised organisations and privatised organisations. State entities are those which are considered a governmental department. Commercialised organisations can vary in type, for example, they can operate as an autonomous public sector entity, or may be a fully government owned entity

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[1] Notice that EUROCONTROL includes as members some non-EU countries (e.g. Armenia, Albania, Ukraine, etc.)