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Airports and tourism in Mozambique

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HIGHLIGHTS

- Airport infrastructure is an important determinant of growth and development in developing countries like Mozambique.
- In 2008, the Mozambique government launched its "Pro-Poor Tourism" strategy, aiming to reduce the poverty rate in the long run.
- Airports permit tourists to access Mozambique.
- The study uses cost function model to assess Mozambique's airports.
- Efficiency analysis of Mozambique airports permits to ranking airports by efficiency and aids policy development.

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ABSTRACT

This paper analyses airport efficiency in Mozambique from 2000 to 2012, estimating a cost function with random and fixed effects stochastic frontier models. A robustness test is undertaken with a Bayesian stochastic frontier model. The airports are ranked according to their technical efficiency (TE). The policy implication is that Mozambique should upgrade its managerial procedures to cope with the frontier of best practices.

1. Introduction

The performance management of airports is a major theme in tourism research because of its important implications for local tourism development (Assaf, 2010a, 2010b; Bel, 2009; Castillo-Manzano, 2010; Francis, Humphreys, & Ison, 2004; Humphreys & Francis, 2002; Lin & Chen, 2012; Martín-Cejas, 2006; Percoco, 2010; Spencer, 2009). The importance of tourism for the economic and social development of the African continent – in the second half of the 20th century – is well documented (Dieke, 2000), with the conclusion being reached that only those African countries that have adopted a tourism strategy are converging towards the US real product per capita (Cuñado & Pérez de Gracia, 2006). In this context, in 2008, the Mozambique government launched its "Pro-Poor Tourism" strategy, aiming to reduce the poverty rate in the long run. Airports are regarded as strategic assets for the success of this tourism strategy, and therefore it is considered important to analyse the cost performance of airports. The overall aim of this paper is to assess the efficiency of Mozambican airports, thereby enabling them to improve their relative efficiency with appropriate policy decisions.

This paper innovates in the field of airport efficiency by focussing on Mozambican airports, going beyond DEA models and homogeneous production frontier models and adopting random and fixed effect stochastic frontiers. This approach enables us to measure the contribution of the covariates to the frontier cost framework. Finally, a robustness test is adopted with a Bayesian stochastic cost frontier, which also validates previous results.

The present research had several motivations. Firstly, while there exists a large body of research on the efficiency of airports, no previous study has examined Mozambican airport efficiency in the context of the "Pro-poor" tourism Strategy. Secondly, benchmarking is a way for airports to manage their relative performance, and therefore an important means by which airports can manage their competitiveness (Gillen & Lall, 1997). Thirdly, random frontier models are commonly used in applied airport research, but fixed effect frontier models are not. Given the dispersal of airports across

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Mozambique, the fixed effect random frontier would appear to be a suitable model for taking into account this fixed effect heterogeneity. Heterogeneity is a concept that is opposed to that of homogeneity, which is used to characterise a context that is uniform in its composition or character. Therefore heterogeneity defines a distinctly non-uniform context. In economics, there are two types of heterogeneity. Firstly, there is observed heterogeneity, which is captured in the fixed effects model when dummy variables with heterogeneous characteristics are adopted. This usually arises due to the existence of different sub-populations in a sample, based on distinct cultural traditions. In Mozambique, the northern part of the country is Muslim, while the southern part is Catholic. This cultural heterogeneity is reinforced by distinct tribal traditions, resulting in a very heterogeneous population that is united by their common language and their shared territory. This observed heterogeneity is captured by a dummy parameter in the fixed effects model. If there is heterogeneity in the allocation of inputs and outputs at Mozambican airports, the fixed effect panel data model will be chosen and the fixed effect coefficient for measuring statistical significance. Secondly, there is unobserved heterogeneity, which has been a subject of great concern and analysis in many recent works (Chesher, 1984; Chesher & Santos-Silva, 2002). It usually arises from the varied behaviour of multiple users and from multiple situations relating to decisions taken in the airport context. This unobserved heterogeneity is identified by the fixed effects model in the constant term, but there is no specific parameter identifying the type of heterogeneity discovered. This was the procedure adopted in this paper, based on the unclear heterogeneity of Mozambican airports. In fact, there exists heterogeneity based on tribal and religious factors, but other unknown forms of heterogeneity also exist.

The remainder of the paper is organised as follows. Section 2 presents the contextual setting, followed by a brief literature review in Section 3. Section 4 describes the theoretical framework, while Section 5 explains the methodology. Section 6 presents the hypotheses and data. Section 7 reveals the results, and Section 8 presents the robustness tests. Finally, section 9 presents the paper's findings and policy implications.

2. Contextual setting

Productivity analysis studies concentrating on European, Asian and North and South American countries are commonly found (Adler & Berechman, 2001; Gillen & Lall, 1997; Pels, Nijkamp, & Rietveld, 2001, 2003), whereas studies on African countries are rare. This paper innovates in this field by extending productivity analysis to airports in Mozambique. Table 1 presents some characteristics of the airports analysed. The airports in Mozambique are mainly old ones and are all publicly owned, having been built by the Portuguese during the colonial era. The airports of the two main cities, Maputo and Beira, account for the largest proportions of traffic, as they are the principal airports serving the rest of the country. Mozambique achieved independence from Portugal in 1975, only to become engulfed in a civil war that lasted from 1976 to 1992. The country has an excellent air network covering the entire country. The most frequent means of long-distance internal travel is by air, since the railway system is underdeveloped and unreliable. Most of the international traffic is served by the airport of Maputo, Mozambique's capital.

Mozambique's airports, which are managed by the public company *Aeroportos de Moçambique*, fall into one of three categories: the international airports (Maputo, Beira, Tete, Pemba and Nampula), the other main airports (Lichinga, Inhambane, Chimoio, Quelimane and Vilanculo) and the secondary airports (Angoche, Bilene, Inhaca, Lumbo, Mocimboa da Praia, Ponta de Ouro, Costa do Sol, Ulongue and Songo). The secondary airports are remote airports: some are situated in tourist areas, like Bazaruto Island and Benguera Island, while others are local airports.

Table 1
Characteristics of the Mozambique airports analysed in 2012.

Nobs	Airports	International airport vs. remote airport	Passengers	Tourists	% of international flights
1	Angoche	0	9847	311	0.0000
2	Bazaruto Island	0	12,308	10,139	0.853
3	Beira	1	198,549	46,155	0.177
4	Benguera Island	0	2553	5859	0.832
5	Chimoio	0	27,371	142	0.0007
6	Inhambane	0	33,407	8892	0.4405
7	Lichinga	0	31,150	1670	0.0119
8	Maputo	1	818,185	622,501	0.6719
9	Nacala	0	15,385	5174	0.1066
10	Nampula	1	157,021	3290	0.0481
11	Pemba	1	107,452	2452	0.0728
12	Quelimane	0	63,114	2497	0.0038
13	Songo	0	13,847	4657	0.000
14	Tete	1	98,845	2432	0.2043
15	Vilankulo	0	71,044	2392	0.0921
16	Xai-Xai	0	8862	2980	0.0000
	Mean		104,309	45,096	0.220
	Median		32,279	3135	0.082
	Std. dev.		198,891	154,361	0.305

Source: Annual Reports – Various volumes.

Currently, there are plans to privatise Mozambique's airports, following the positive results that were achieved after the privatisation of the country's seaports. The management of the Mozambican economy is heavily influenced by its powerful neighbour, South Africa, hence the tendency to privatise. However, it must be highlighted that the efficiency of Mozambique's airports is affected by the country's poverty, and in this context tourism is of paramount importance, since it has been shown that only those African countries that adopted a tourism strategy have converged towards the US real product per capita (Cuñado & Pérez de Gracia, 2006).

Mozambique's airports are of paramount importance, given the predominance of air travel over railways. The country's infrastructural system follows the universal model of a hub and spokes, in which Maputo is the hub and the other airports serve as spokes. The throughput of air traffic at Maputo airport is similar to that of any standard European international airport, while the regional spoke airports have volumes of traffic that are similar to those found at regional European airports. Mozambique differs from Europe in that there are no low-cost carriers operating in the country. Furthermore, in contrast to Europe, there are proportionally more private jets, which belong to land owners and other powerful industrial and commercial entrepreneurs and multinational companies exploring their interests in Mozambique (Map 1).

3. Literature survey

While there is an extensive literature on benchmarking applied to a diverse range of economic fields, the scarcity of studies regarding African airports shows that this is a relatively under-researched topic. Studies using data envelopment analysis with diverse DEA models include Gillen and Lall (1997, 2001), Pels et al. (2001), Adler and Berechman (2001), Martín and Román (2001), Yoshida and Fujimoto (2004), Yoshida (2004),