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Tourism and transport systems in mountain environments: analysis of the economic efficiency of cableways in South Tyrol

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ABSTRACT

This paper examines the economic efficiency of cableways in the Autonomous Province of Bolzano, Italy, and relates it to sustainability and tourism issues. Cableways represent an environmental-friendly mode of transport that enables access to remote and environmentally delicate areas. Thus, examining cableways efficiency informs policies that foster regional competitiveness from a sustainable development perspective. Employing annual data from 2002 up to 2008, the pure technical efficiency and scale efficiency are computed using a panel Data Envelopment Analysis. Overall, the empirical findings reveal that this type of transport in the Italian Alps can be regarded as relatively economically inefficient and most of the cableways denote decreasing returns to scale. Nevertheless, some distinctive features are detected amongst cableways classified by district. Policy implications are drawn to help economic agents improve their efficiency scores.

1. Introduction

Accessibility and mobility have very important roles to play in regional development strategies that aim to improve the leisure potential of that geographical area. Transport infrastructure constitutes a necessary enabling factor for areas that are characterised by a tourism vocation and has an important role in supporting and enhancing this economic activity.

In this respect, cableways in mountainous areas offer a dynamic and unique point of view when compared to other modes of transport. The scenery that passengers can view from a cableway is one of the key features of this mode of transport that, *per se*, constitutes an important tourism attraction. Besides, if properly integrated within a multimodal transport system, cableways have a number of advantages both in terms of the connection between the resources employed (economic and environmental) and the optimisation the local mobility. Cableways, a subsystem of the traffic system, allow access to those territories that are appealing to tourists that are often difficult to access via other traffic subsystems (Sever, 2002). In fact, cableway companies involved in the transport of passengers in mountainous areas, often rely on peak traffic occurring during the winter months, when passengers are mainly skiers.

In the economics literature, one of the neglected areas of research is the economic efficiency of cableways that can be considered as a more sustainable means of transport, given specific orographic characteristics of a destination. Težak et al. (2011) present the case of the cableway transport system in Slovenia that allows access to difficult to reach regions. The authors discuss essential elements of the cableway system which, thanks to the new technology, can lead to sustainable development. They also stress that cableways are characterised by low gas and sound emissions and therefore are an eco-compactable means of transport. However, transport modes are rather complex systems and, as Richardson (2005) assesses, there are five main indicators of sustainability that are fuel, access, congestion, emissions and safety. Hence, a cableway system can exert environmental sustainable effects only if combined with a wider range of policy strategies that reduce the overall congestion and emissions in a given region.

It is of interest to investigate the efficiency of cableways. Firstly, cableways are not only a means of transport *per se* used by the local commuters, but also a factor that can help foster tourism as an economic activity in remote and environmentally delicate areas where congestion, caused by the use of private cars, can exert severe socio and environmental externalities. From this perspective, analysing the efficiency of cableways should be seen in the context of the positive effects that help to sustain regional competitiveness and, at the

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same time, protect the natural environment at high altitude. Analysing their economic performance contributes to the debate regarding sustainable transport. Secondly, worldwide, passenger cableways are especially found in mountain tourism destinations because they play a positive role in promoting the modernization of traffic transportation and the development of tourism industry (Težak et al., 2011); however, literature regarding this issue is still limited. Hence, this study presents empirical evidence on the relative economic performance of this mode of transport.

Several studies employ Data Envelopment Analysis (DEA) to evaluate the efficiency of different means of transportation, such as seaports (Barros and Athanasiou, 2004; Barros, 2012), airlines (Adler and Berechman, 2001; Merkert and Hensher, 2011), railways (Yu, 2008; Graham, 2008; Movahedi et al., 2011) and public transport (Pina and Torres, 2001; Boame, 2004; Sheth et al., 2007; Kerstens, 1996; De Borger et al., 2008; Yu and Fan, 2009; Yu and Lee, 2009). However, analysing economic efficiency alone is too narrow since transport systems can also give rise to problems relating to air pollution, congestion and, in some cases, a decrease in individuals' quality of life that can create social problems. Hence, from an economic perspective, it is important to understand whether an alternative and more sustainable mode of transport can also be considered as economically efficient.

The purpose of this paper is to investigate the economic performance of a sample of cableways operating in the Autonomous Province of Bolzano (also called South Tyrol) located in the North–East of Italy near the Austria border. This geographical area makes an interesting case study. Firstly, the Bolzano Province hosts the world's oldest passenger cableway called the *Funivia del Colle*, built in 1908, it is still one of the most important tourist attractions in the South Tyrolean province. Secondly, the South Tyrolean province plays a leading role in Italy as far as the number of cableways and transport capacity is concerned. Since the 1970s, the presence of cableways in this region has been invariably connected to skiing and other outdoor recreational activities that are the most important attractions in the region. Hence, cableways greatly facilitate not only local mobility, but also other economic activities such as tourism. Cableways are at the core of alpine tourism transport system and without them a well-developed tourism industry could not exist in the alpine area with the inevitably negative impact on tourism related jobs in the surrounding alpine valleys and villages. Additionally, cableways significantly contribute to the existence of alpine agriculture in mountain environments (Weiermair et al., 2008). Thirdly, the aim of the Bolzano Province is to reduce CO_2 emissions and to achieve important and robust results both in the medium-run (before 2020) and the long-run (2050) through a policy of investment in a more sustainable transportation system, combined with ancillary tax reductions for those agents that invest in the green economy and renewable energy production.

As a further objective, the present paper pulls together two strands of literature: the economic efficiency of a more sustainable means of transport and tourism. As a novel contribution to the existing literature on transport efficiency, the cableways sector is evaluated via a DEA that is, to the best of the authors' knowledge, the first time that this non-parametric approach has been applied to evaluate the economic efficiency of this sector. Also the link between transport and tourism is investigated as in Bolzano cableways are not only used by the local population but are also used by tourists for skiing activity and other recreational activities and therefore their efficiency is not neutral to tourism development.

The rest of this paper is organised as follows. In the next section, a brief literature review is provided. In the third section, the methodology adopted is highlighted. The fourth section presents the case study and the dynamic DEA. Policy implications are drawn in the last section.

2. Literature review

Numerous studies highlight that the current transportation system is far from being environmentally sustainable (see for example OECD, 2002; European Commission, 2011). As Steg and Gifford (2005) highlight, people's quality of life is influenced by many aspects and one of the top factors is a sustainable environment that includes clear air that can be achieved with a reduction in the level of car use and a shift to less polluting means of transport. However, as Prillwitz and Barr (2011) emphasise the existing technology is still too limited and inefficient. With growing traffic volumes and the consequential increase in CO_2 emissions worldwide, behavioural changes towards more sustainable means of travel are becoming more important. This is particularly true when considering the tourism sector. In 2012, international tourist arrivals reached the milestone of one billion (UNWTO, 2013) implying critical issues in terms of global pollution. Peeters and Dubois (2010), via an automated back-casting scenario method, find that tourists alone cause 4.4% of global CO_2 emissions, with a growth projection of 3.2% per annum up to 2035. In an investigation on the attitudes for travel decisions in England and Wales, Prillwitz and Barr (2011) show that there is a contrast between daily mobility and holiday travel decision attitudes in terms of sustainability, also for those respondents who can be defined as "green travellers". Overall, the research shows that unsustainable travel patterns happen more predominantly in tourism travel than travel in the home environment. This hypothesis is also confirmed by Barr et al. (2010), who provide evidence that even those clusters of individuals who appear to be very committed to environmental action at home find it difficult to transfer this virtuous behaviour when travelling abroad and they do not tend to renounce on air transport. As further emphasised by Hares et al. (2010), tourists do not seem to consider climate change when planning their trips. This attitude can be attributed not only on the scarce awareness by travellers on the increase in the CO_2 emissions when flying, but also on the significant barriers to behavioural change. Indeed, the authors report that British respondents perceived that other means of transport such as trains or cars, in terms of price and time, cannot compete with planes, hence attribute responsibility to the failure of public transport.

From an empirical perspective, it is important to analyse to what measure each mode of transport is economically sustainable by assessing the relative economic performance, that can be considered as a benchmark for other decision making units. Table 1 provides a brief account of the most recent literature on transport DEA.

Since the seminal contribution by Chu et al. (1992), the DEA has been extensively used to analyse transport performance (see also Liu et al., 2013b). There are four main streams of research on the economic efficiency of means of transport. The most researched transport sector is the seaports. An extensive literature review on economic efficiency in seaports, analysed through the DEA, is accounted for by Al-Eraqi et al. (2010), who also evaluate the efficiency of 22 cargo seaports in the East Africa and the Middle East by employing a window DEA. Both the normal efficiency and super efficiency are computed with a panel data over the time span of 2000–2005. The findings show that the number of efficient Decision Making Units (DMU) under super efficiency is more than the number under normal efficiency. Amongst the most recent research, Barros (2012) uses a DEA approach to evaluate the efficiency of seaports in Angola, Mozambique and Nigeria from 2004 to 2010, finding Nigerian seaports to be the most efficient. Bergantino and Musso (2011) evaluate the efficiency of a panel of Southern European ports using a multi-step approach in order to disentangle managerial and exogenous factors that can affect