



# Bet big on doubles, bet smaller on triples. Exploring scope economies in multi-service passenger transport companies



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## ABSTRACT

In this paper, using a sample of Italian bus and coach operators, we investigate the presence and the magnitude of scale and scope economies in the provision of passenger transport services. The estimates of a Composite Cost Function econometric model highlight the presence of global *scope* and *scale* economies only for multi-service operators (providing urban, intercity and for-hire bus and coach transport services) with output levels lower than the ones characterising the 'average' firm. This indicates that relatively small, specialized companies would benefit from cost reductions by evolving into multi-service firms providing urban, intercity and coach renting services. For operators of a bigger size, scope economies can be still exploited by linking urban and intercity services or by linking intercity services and coach renting, whereas the couple urban service-coach renting is associated with strong diseconomies of scope. Our results can help policymakers (that must define the boundaries of the service area to be tendered) and firms (that, as a result of the ongoing liberalization process, have increased opportunities to invest in regulated and non-regulated passenger transport activities) to make informed decisions.

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## 1. Introduction

The passenger transport industry has a pervasive socio-economic and environmental impact and is a significant contributor to the national and regional economies of most developed and developing countries. According to the European Commission, the Italian bus and coach industry (which includes all urban and sub-urban land transport modes, such as motor bus, tramway, streetcar, trolley bus, and metro) was employing in year 2,011,171,200 workers, with a turnover of about 11 EUR billion. This amounts to 8% of the turnover of the entire passenger and freight transport sector, and to 0.7% of Italy's GDP (European Commission, 2014).

The operation of public transport services has a significant impact on the budget of territorial bodies, since in most cases the revenues from end users tickets and subscriptions are not sufficient to recover the cost of providing the service. In recent years, in order to introduce more efficiency, enhance productivity and reduce huge deficits, many countries have put in place reforms in which the institutional reorganization of the industry is combined with the design of new regulatory measures that foresee specific incentives to increase efficiency. For example, the Italian

Government, faced with a situation in which bus operators were on average benefiting from subsidies as high as to cover 71% of their operating costs, introduced in the late nineties a radical reform which modified the institutional organization of the industry. In particular, the programming of the services and the management of the subsidies were shifted from the national to the regional level, and firms were required to sign formal agreements with local governments (*service contracts*) to clearly define the rules that the providers of the service must obey and to address important issues such as reimbursement and risk-sharing schemes. The above measures, together with the reliance on competitive tendering for the allotment of service concessions and the introduction of incentive mechanisms in the allocation of subsidies (e.g., through a *subsidy cap*), were supposed to improve efficiency and to enhance competition. New laws and decrees were introduced in the 2000s, and a Transport Regulation Authority was established in 2011.<sup>1</sup> However, a huge resistance movement to the reforms of local public services led to the setup of an abrogative referendum in 2011. Twenty-seven million

<sup>1</sup> The Authority, that became fully operational in January 2014, defines the schemes for tendering and the contents of the service contracts, sets the criteria to fix tariffs, contributes to define public sector obligations, sets minimum quality standards, defines minimum rights and entitlements that may be claimed by passengers vis-à-vis transport operators.

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citizens voted against the obligation of organizing call for tenders for the management of the services,<sup>2</sup> a result that involved a significant slowing down of the liberalization process.<sup>3</sup>

An effective reform of the industry cannot be implemented without a detailed analysis of the cost structure of bus and coach operators. In fact, the study of the economic and technological characteristics is a fundamental step, since it allows the identification of the proper configuration of the network and provides guidance if one wants to implement adequate regulatory interventions (if evidence is found in favor of natural monopoly) or to open the market to competition (if the empirical results show that natural monopoly conditions do not hold). Moreover, the definition of the optimal dimension of the local transport network represents a necessary starting point for an efficiency-oriented policymaker who is planning and designing the provision of the service (i.e., extension of the service areas, frequencies of buses, choice of the number of bus lines, etc.).

As stated by [Karlaftis and McCarthy \(2002\)](#) “Characteristics of the underlying production technology of firms in regulated industries have attracted considerable interest in the literature due to the vast array of valuable information provided by such analyses. Policy makers and governmental agencies may be interested in the underlying production technology in order to set pricing policies. A finding of diseconomies of scale may imply that, for example, a city can have different parts of its system operated by separated companies at a lower unit cost of output” (p.1–2).

The fact that operators are often multi-service firms, which operate in regulated markets such as urban and intercity transport and in non-regulated markets such as long distance express coach and hired coach services, is another interesting aspect that deserves careful investigation. As theoretically shown by [Calzolari and Scarpa \(2016\)](#), if multiservice firms are exploiting scope economies, it is desirable from a social welfare point of view to let them run integrated productions activities in regulated and unregulated sectors.

Constant changes in the economic, social and environmental systems also require adaptation in the transportation structure. To that respect, coach services can represent an essential complement of regular transit systems ([Talley, 2007](#)). They can contribute to the development of a capillary network, in that they can be easily interconnected with other modes of transport. Unlike scheduled transport services purely geared to predetermined destinations on fixed and authorized routes,<sup>4</sup> hired coach travel is typically characterized by non-scheduled times and non-fixed routes. Given these characteristics, this service is mainly addressed to occasional users, as it occurs, for example, in the tourism sector. Conversely, long distance coach transport plays a crucial role in connecting the most dispersed part of the countries to major destinations. As a result of the liberalization process undergoing in most countries ([European Commission, 2009](#)), express long distance coach transport is growing exponentially so as to directly compete with railways and airlines services.<sup>5</sup>

<sup>2</sup> Article 23-bis of decree-law no. 112/2008, which was abrogated as a result of the popular vote, outlined the public tender as a preferential model to manage local public services. In-house provision was admitted only as an exception, after having verified the existence of particular socio-economic conditions that made it impossible to resort to the market.

<sup>3</sup> The main concern of referendum organizers was to fight against the privatization process in the water sector. However, the abrogative effect was widespread to all local public services, including passenger transport.

<sup>4</sup> The [European Commission \(2009\)](#) identifies as “special regular” coach services such as school and employee transport services, which operate on defined routes and at defined times, but provide for the carriage of specific types of passengers to the exclusion of others.

<sup>5</sup> See, for example, [Beria et al. \(2014\)](#) for Italy, [Chen and Soo \(2009\)](#), for Taiwan, [Aarhaug and Fearnley \(2016\)](#), for Norway, and [Walter et al. \(2011\)](#), for Germany.

Despite its increasing importance, coach renting activities received only little attention in the literature. In order to fill this gap, this paper analyses the cost function of a sample of Italian transit firms which are providers, in combination or as specialized units, of urban, intercity and for-hire transport services in the years 2008–2012. Given the presence in the sample of specialized, two-output and three-output firms, we can investigate the presence of economies of scope for multi-service firms. From a methodological point of view, we differ from the standard literature, which uses the Translog Cost Function or the Generalized (Box-Cox) Translog Cost Function, and we test the advantage of using the Composite Cost Function model introduced by [Pulley and Braunstein \(1992\)](#), which appears to be well suited to analyse the cost properties of multi-product firms.

The remaining of the paper is organized as follows. [Section 2](#) shortly reviews the relevant empirical literature. [Section 3](#) develops the Composite Cost Function model upon which is based the subsequent econometric analysis. [Section 4](#) illustrates the main characteristics of our sample and shows some descriptive statistics concerning the variables included in the cost model. [Section 5](#) presents the results of our estimates and [Section 6](#) concludes.

## 2. Literature review

Early studies on the analysis of costs in the transportation literature were mainly focused on the effects of diversification among different transit modes (such as motor-bus, rapid-rail, streetcar, trolley-bus, etc.) within the same urban area. [Colburn and Talley \(1992\)](#), for example, by analysing four modes of transport in urban systems find evidence of the presence of limited cost complementarities. [Viton \(1993\)](#), by investigating the processes of aggregation between different suppliers, show that cost savings resulting from mergers depend on the transport modes of the companies as well as on the number of firms involved in the merger. More recently, [Farsi et al. \(2007\)](#), exploring multi-modal transport systems, show that economies of scale and scope exist, and are therefore in favor of integrated multi-mode operations as opposed to unbundling.

In order to estimate scale and scope economies, which are key structural elements to define the technology behind an industry, the most popular method is to use a multi-output specification of the cost function. While scale economies are due to decreasing marginal costs and to the sharing of fixed costs, scope economies can be due to the use of similar equipment such as wires, overhead line, similar skills such as driving, management and network maintenance, and synergies in advertising, scheduling and ticketing.

As for scale economies, [Gagnepain et al. \(2011\)](#) report that a significant number of empirical studies are in line with a U-shaped average cost curve, exhibiting increasing returns to scale for smaller operators and decreasing return beyond a certain output level. As an example, [Cowie and Asenova \(1999\)](#) estimate that small companies (with a bus fleet of less than 200 vehicles) experience some economies of scale. Looking at a set of medium and large Italian municipalities, [Cambini et al. \(2007\)](#) find evidence of economies of scale in most cases, suggesting that operators should operate on the entire system of urban network, without fragmentation of the service. They also argue that mergers between operators of neighboring urban centers or between suppliers of urban and intercity transit services would be desirable in order to reduce operating costs.

In the literature, there are relatively few studies tackling the issue of the horizontal integration between urban and intercity services. [Fraquelli et al. \(2004\)](#) investigates the existence of scope economies by using in the estimation a set of dummy variables to

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