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Elisabetta Ottoz, Marina Di Giacomo

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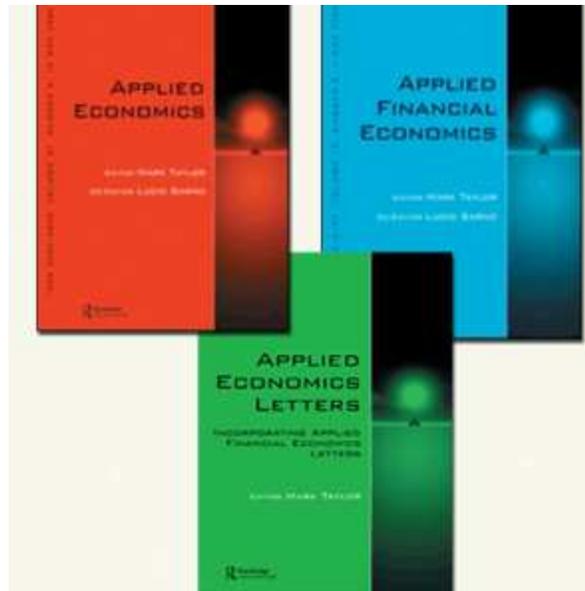
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**Diversification strategies and scope economies: Evidence from a sample of Italian regional bus transport providers**

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# 1. INTRODUCTION

Horizontal diversification has received relatively little attention in the literature, but the design of diversification policies for firms operating in regulated services is high on the agenda of European regulators. While the European Union requires the functional unbundling for vertically integrated utilities, horizontal unbundling is the object of some ongoing debate as there is no clear-cut evidence on its anti-competitive effects. In particular the diversification of a regulated firm into competitive sectors may bring about either an increase or a decrease in social welfare. If the firm diverts resources from the regulated sector to the unregulated or non-core business, customers are harmed; at the same time the presence of synergies or economies of scope in the joint production of different services can positively affect total welfare. This essential trade off can be empirically investigated<sup>1</sup>.

In this paper we assess the presence of economies of scope for local public transport (LPT) companies that undertook horizontal diversification.

In the regulated LPT industry a growing number of companies diversify their production lines and ownership structure seems to be coupled with different diversification strategies: private firms mainly supply services highly related to the LPT core business, e.g. bus renting and coaching activities, while publicly owned companies offer a large set of services, mainly car park management but also, in a few cases, waste disposal, water and sewage treatment and gas and electricity distribution. In particular, while private firms generally diversify in transport related competitive markets, publicly owned firms mainly operate in non transport related regulated markets.

The purpose of the paper is thus twofold. We evaluate the existence and dimension of scope economies for a set of firms operating in the LPT industry and we then compare cost savings stemming from the diversification in competitive *versus* regulated markets.

Our analysis advances in several dimensions the ongoing research on the LPT industry. Research on scope economies within LPT mainly deals with diversification

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<sup>1</sup> A theoretical treatment of the issue can be found in Sappington (2003) and Scarpa and Calzolari (2009).

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4 in urban and intercity transport or multi-modal operators, whereas we consider  
5 diversification in a broader connotation. In particular we consider joint production of  
6 public transport (urban and intercity) together with bus renting, coach services and  
7 other activities unrelated to the core business of the LPT firms such as gas, electricity  
8 or car parks.  
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10 We develop our empirical strategy by estimating a cost function for a sample of 40  
11 Italian bus companies observed over the period 1998-2004. The strength of this  
12 dataset is that it contains information on the diversification patterns (either transport  
13 related services and / or non-transport related services) and the ownership structure.  
14 This allowed us to deal with a notion of scope economies in LPT not limited to urban  
15 vs intercity services, while taking account of the ownership impact. As far as we  
16 know, there are no other studies on LPT investigating the diversification strategies and  
17 the scope economies of companies with different ownership structure.  
18

19 Moreover we take into account the fact that the correct assessment of scope  
20 economies requires the specification of a functional form for the cost function that is  
21 well suited for multi-product technologies. Many authors indicated the unreliable  
22 results obtained from the standard translog specification when the main object is the  
23 analysis of scope economies and cost complementarities. Findings from the standard  
24 translog and the generalized (Box-Cox) translog function model are then compared to  
25 those stemming from the separable quadratic and the composite cost function  
26 introduced by Pulley and Braunstein (1992), that appear to be more suitable for  
27 studying the cost properties of multi- product firms.  
28

29 Our results show that, for all functional forms, scope economies are sizeable for both  
30 groups of public and private firms. However, as expected, a diversification strategy  
31 close to the core business, generally practised by private firms, appears to allow for  
32 higher cost savings, suggesting this kind of strategy should be preferable to the multi-  
33 utility development pursued by public LPT firms. The empirical evidence is  
34 confirmed by a set of robustness checks that consider the potential bias stemming  
35 from measurement errors in the definition of the output for non-transport services.  
36

37 Next section briefly reviews the empirical literature on scope economies and on the  
38 functional choice for a cost model. Section 3 gives details on the different cost  
39 specifications that are estimated, while section 4 describes the dataset. Section 5  
40 presents the main estimation results and a discussion on the economies of scope and  
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4 size is given in section 6. Section 7 tackles a set of robustness checks, section 8  
5 reports some policy implications while section 9 concludes.  
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## 10 11 **2. LITERATURE REVIEW** 12

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14 Our study benefits from two main strands of literature: empirical studies on scope  
15 economies in the local public transport industry and analysis that consider the choice  
16 of the optimal functional form for the investigation of multi products technologies.  
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19 Research on scope economies within LPT mainly considers diversification in urban  
20 and intercity transport or multi-modal operators. Fraquelli et al. (2004a) study a  
21 sample of Italian municipal public transport companies supplying intercity and / or  
22 urban services. They find that companies operating in the intercity sector have lower  
23 costs than urban firms and that companies supplying both urban and intercity services  
24 have lower costs than specialised firms. Their estimation strategy, however, does not  
25 allow them to compute scope economies since it is based on the inclusion of a dummy  
26 variable for the type of activity in the cost specification.  
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30 Viton (1992) considers urban transport companies supplying their services in six  
31 modes (motor bus, street cars, rapid rail, etc.) and the presence of scope and scale  
32 economies is uncovered. Similarly Colburn and Talley (1992) analyse a four modes  
33 urban company and find only limited cost complementarities. Viton (1993), by  
34 estimating a quadratic cost frontier for bus companies operating in the San Francisco  
35 bay area, evaluates the cost savings deriving from the merger of the seven companies  
36 in the sample. Cost savings depend on the modes being offered and on the number of  
37 merging firms, with benefits decreasing as the number of integrated companies  
38 increases.  
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41 Farsi et al. (2007) study a sample of Swiss companies supplying urban services using  
42 three modes: trolley bus, motor bus and tramway systems. They detect global scope  
43 economies for multi-modal operators from the estimation of a quadratic cost function.  
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47 Di Giacomo and Ottoz (2010) examine the presence of cost savings from the  
48 provision of urban and intercity connections in a sample of Italian bus companies.  
49 They find only moderate global scope economies, however large cost advantages can  
50 be obtained from fixed costs savings: it seems that there is some excess capacity  
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4 among bus companies so that the joint production of urban and intercity services is a  
5 premise for the full exploitation of the available fixed inputs.  
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9 A growing literature exists on the choice of the functional form for a cost model  
10 quantifying the existence of scope economies from the simultaneous provision of  
11 different outputs. In general there seems to be a trade off among flexible functional  
12 forms satisfying all regularity conditions required for a cost function to be an adequate  
13 representation of the production technology (concave in input prices and non  
14 decreasing in input prices and outputs) and the dimension of the region over which  
15 such regularity conditions are fulfilled. Roller (1990) emphasizes that “this ‘regular’  
16 region may be too small to be able to model demanding cost concepts such as  
17 economies of scope and subadditivity”. The most popular flexible functional forms,  
18 such as the standard translog model (see Christensen et al., 1971), have a degenerate  
19 behaviour in the region which is relevant for the derivation of scope economies and  
20 subadditivity measures, (in general zero outputs levels) even if they satisfy the  
21 regularity conditions for a larger set of points (see Diewert, 1974 and Diewert and  
22 Wales, 1987).  
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34 Pulley and Braunstein (1992) and Pulley and Humphrey (1993) introduce the  
35 composite specification that, unlike the translog model, is defined in the neighborhood  
36 of zero output levels and allows for the estimation of scope economies. McKillop et  
37 al. (1996), McKenzie et al. (1997), Bloch et al. (2001), Fraquelli et al. (2004b),  
38 Piacenza and Vannoni (2004), Fraquelli et al. (2005) all adopted the composite  
39 specification for the derivation of scope economies in different industries (ranging  
40 from the banking sector to the public utilities).  
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### 50 **3. THE COST FUNCTION MODEL**

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53 Our aim is to study the cost structure of a sample of transport companies operating in  
54 the administrative region of Piedmont, in Northern Italy and data were collected by  
55 the administrative offices of the local regional government. The choice of a regional  
56 extent is justified because of its consistency with the Italian regulatory framework  
57 issued from the LPT reform process, which transferred infrastructures and  
58 organizational resources to the local authorities corresponding to the Italian regions.  
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4 In particular we are going to estimate a multi-output cost function since firms may  
5 provide a large set of services.  
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8 A stochastic cost function can be written as:  
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$$10 \quad C_{ft} = C(\mathbf{y}_{ft}, \mathbf{p}_{ft}; \theta) + v_f + u_{ft}$$

11  
12 where  $C_{ft}$  is total cost for firm  $f=1, \dots, F$ , at time  $t=1, \dots, T$ ,  $\mathbf{y}_{ft}$  is the vector of outputs for  
13 firm  $f$  at time  $t$ ,  $\mathbf{p}_{ft}$  is the vector of input prices,  $\theta$  is the vector of unknown parameters  
14 to be estimated,  $v_f$  is the firm specific time invariant error term, while  $u_{ft}$  is the  
15 remainder stochastic error term that varies over time and across companies.  
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18 Given the panel structure of the data, we are going to assume the absence of  
19 correlation among the individual specific effects  $v_f$  and the included regressors, i.e.  
20  $E(v_f | \mathbf{y}_{ft}, \mathbf{p}_{ft}) = 0$ . This assumption ensures the consistency of the pooled  
21 nonlinear estimation procedure while panel robust standard errors, that take into  
22 account the likely correlation among errors for the same individual, should guarantee  
23 robust inference.  
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26 When dealing with nonlinear functional forms, the estimation of fixed effects or  
27 random effects models is not straightforward (see Cameron and Trivedi, 2005, chapter  
28 23 for a survey) and solutions are mainly case specific. At the same time including a  
29 large set of firm specific dummy variables may lead to inconsistent estimates as the  
30 incidental problem arises (see Lancaster, 2000). Our choice of a pooled model is  
31 justified by the lower computational burden and the unreliable estimates that were  
32 obtained when trying to estimate a model where all individual dummy variables are  
33 included.  
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36 We present results for a three output cost model and section 4 gives details on the  
37 dataset construction.  
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40 We compare estimates from four different cost specifications. Baumol et al. (1982)  
41 recommend a quadratic output structure when examining scope economies, because  
42 this form allows for the direct handling of zero outputs, without any need for  
43 substitutions or transformations as in the translog models.  
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We estimate a composite and a separable quadratic cost specification that have a quadratic structure in outputs and a log-quadratic structure in input prices, but also a standard translog and a generalized translog model.

The composite specification that we consider has the following form<sup>2</sup> (see Carroll and Rupert, 1984, 1988 and Pulley and Braunstein, 1992 for more details):

$$\ln(C) = \ln\left(\alpha_0 + \sum_i \alpha_i y_i + \frac{1}{2} \sum_i \sum_j \alpha_{ij} y_i y_j + \sum_i \sum_r \alpha_{ir} y_i \ln p_r + \gamma_1 Trend + \gamma_2 Trend^2 + \lambda Dummy\right) + \left[\sum_r \beta_r \ln p_r + \frac{1}{2} \sum_r \sum_q \beta_{rq} \ln p_r \ln p_q\right] = \ln[h(\mathbf{y}, \mathbf{p})] + f(\mathbf{p}) \quad (1)$$

where  $C$  is the total cost,  $y_i$  is output  $i = T, TR, NT$ , for transport ( $T$ ), transport related ( $TR$ ) and non-transport services ( $NT$ ) respectively;  $p_r$  is the price for input  $r = L, M, K$ , for labour ( $L$ ), material ( $M$ ) and capital ( $K$ ) respectively, while  $Trend$  and  $Trend^2$  are a linear and a squared time trend respectively.  $Dummy$  stands for additional regressors that we include in some specifications.

By applying the Shephard's Lemma, the associated input share equation is:

$$S_r = \frac{x_r p_r}{C} = \frac{\partial \ln(C)}{\partial \ln p_r} = \left[\beta_r + \sum_q \beta_{rq} \ln p_q\right] + \left(\sum_i \alpha_{ir} y_i\right) \cdot \left(\alpha_0 + \sum_i \alpha_i y_i + \frac{1}{2} \sum_i \sum_j \alpha_{ij} y_j y_i + \sum_i \sum_r \alpha_{ir} y_i \ln p_r + \gamma_1 Trend + \gamma_2 Trend^2 + \lambda Dummy\right)^{-1} \quad (2)$$

where  $x_r$  is the derived demand for input  $r$  ( $x_r = \partial C / \partial p_r$ ).

The separable quadratic model only differs from the composite specification in the assumed restriction that  $\alpha_{ir} = 0$  for all  $i$  and  $r$ .

The generalized translog function is:

<sup>2</sup> In the following formulas we omit firm and time subscripts for notational brevity.

$$\ln(C) = \alpha_0 + \sum_i \alpha_i y_i^{(\pi)} + \frac{1}{2} \sum_i \sum_j \alpha_{ij} y_i^{(\pi)} y_j^{(\pi)} + \sum_i \sum_r \alpha_{ir} y_i^{(\pi)} \ln p_r + \sum_r \beta_r \ln p_r + \frac{1}{2} \sum_r \sum_q \beta_{rq} \ln p_r \ln p_q + \gamma_1 Trend + \gamma_2 Trend^2 \quad (3)$$

where  $y_i^{(\pi)}$  is the Box – Cox (1964) transformation of the output measure  $i$ :

$$y_i^{(\pi)} = (y_i^\pi - 1) / \pi \quad \text{if} \quad \pi \neq 0 \\ = \ln(y_i) \quad \text{if} \quad \pi = 0$$

The standard translog specification follows from the imposition of the restriction  $\pi = 0$  in equation (3).

The input share equation associated to the generalized translog specification is:

$$S_r = \frac{x_r p_r}{C} = \frac{\partial \ln(C)}{\partial \ln p_r} = \sum_i \alpha_{ir} y_i^{(\pi)} + \beta_r + \sum_q \beta_{rq} \ln p_q \quad (4)$$

Global economies of scope can be computed starting from the estimated cost functions as the difference among the sum of the costs associated to the disjoint productions and the total cost from the joint production. In the case of  $m$  outputs, global scope economies are given by:

$$SCOPE = [C(y_1, 0, \dots, 0; \bar{\mathbf{p}}) + C(0, y_2, \dots, 0; \bar{\mathbf{p}}) + \dots \\ + C(0, 0, \dots, y_m; \bar{\mathbf{p}}) - C(y_1, y_2, \dots, y_m; \bar{\mathbf{p}})] / C(y_1, y_2, \dots, y_m; \bar{\mathbf{p}})$$

where  $C$  is the total cost,  $y_i$  is output  $i$  and  $\mathbf{p}$  is the vector of input prices that are kept constant, usually at their sample median or mean level. Scope economies are detected if the value of  $SCOPE > 0$ , while diseconomies arise if  $SCOPE < 0$ .

It is also possible to compute product specific scope economies when more than two outputs are simultaneously produced:

$$SCOPE_i = [C(0, 0, \dots, 0, y_i, 0, \dots, 0; \bar{\mathbf{p}}) + C(y_1, y_2, \dots, y_{i-1}, 0, y_{i+1}, \dots, y_m; \bar{\mathbf{p}}) - C(y_1, y_2, \dots, y_m; \bar{\mathbf{p}})] / C(y_1, y_2, \dots, y_m; \bar{\mathbf{p}})$$

where the cost of producing product  $i$  only (first term in the formula of  $SCOPE_i$ ) is summed to the production cost associated to all the other outputs (second term in the formula) and then compared to the total joint production cost. If  $SCOPE_i > 0$ , it follows that there are cost savings from the joint production of product  $i$  together with all the other goods.

Finally we can calculate scope economies for different pairs of products:

$$SCOPE_{ij} = [C(0, \dots, 0, y_i, 0, \dots, 0; \bar{\mathbf{p}}) + C(0, \dots, 0, y_j, 0, \dots, 0; \bar{\mathbf{p}}) - C(0, \dots, 0, y_i, 0, \dots, 0, y_j, 0, \dots, 0; \bar{\mathbf{p}})] / C(0, \dots, 0, y_i, 0, \dots, 0, y_j, 0, \dots, 0; \bar{\mathbf{p}})$$

for products  $i$  and  $j$ , with  $i \neq j$ ,  $SCOPE_{ij} > 0$  indicates the presence of scope economies from the joint production of the two goods, given the estimated cost structure.

We are also able to evaluate the magnitude of scale economies ( $SCALE$ ):

$$SCALE = \left( \sum_i \frac{\partial \ln(C)}{\partial \ln(y_i)} \right)^{-1}$$

where the derivatives need to be interpreted as cost elasticities with respect to the  $i$ th output.

Economies of scale are present when  $SCALE$  is greater than one, while diseconomies of scale are found if  $SCALE$  is smaller than one. Neither economies nor diseconomies exist if  $SCALE$  is equal to one.

## 4. INDUSTRY AND DATA DESCRIPTION

Data come from two sources: the database owned by the administrative region of Piedmont, which yearly collects information on transport services supplied by the companies of the area and the official accounting reports of the firms.

The regional database reports data on total costs, input costs and outputs for all the companies supplying local public transport services<sup>3</sup>. We complement these data, providing information on transport activities only, with companies' annual reports. The aim is to obtain a comprehensive picture of the whole set of services and outputs that transport companies offer.

<sup>3</sup> See also Ottoz et al. (2009) for more details on the characteristics of the regional database.

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5 Our final sample is an unbalanced panel of 40 firms whose annual observations cover  
6 the period 1998-2004.  
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9 We define three broad outputs: subsidized local public transport services, non-  
10 subsidized transport related activities and non-transport services.  
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13 Local public transport comprises urban and intercity transport connections that  
14 represent the core business for all the firms in our sample. Non-subsidized transport  
15 related activities denote coach renting and tourist travelling.  
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19 Non-transport services, mainly related to regulated markets, represent a broad and  
20 varied set of productions mainly consisting of parking areas management. For two  
21 firms the activity consists of waste disposal and water treatment and for one firm it  
22 encompasses gas and electricity distribution. Information on such services comes from  
23 the companies' financial statements.  
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28 The output quantities for transport services ( $Y_T$ ) are given by vehicle-kilometres  
29 covered over the urban network and the intercity connections. Similarly the output  
30 quantities for transport related activities ( $Y_{TR}$ ) are the vehicle-kilometres, equal to the  
31 product of the number of vehicles by the total number of kilometres covered for coach  
32 renting and tourist travel organization over the year.  
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37 The output for the non-transport productions ( $Y_{NT}$ ) is obtained as the ratio of total  
38 revenues associated to such products to the consumer price index for housing, water,  
39 electricity and fuels<sup>4</sup>.  
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43 The choice of such magnitude was mainly motivated by measurement difficulties.  
44 Many output definitions have been adopted in transport studies, usually grouped into  
45 demand oriented measures (such as passengers-kilometres) and supply oriented  
46 outputs (like vehicle- kilometres or seat- kilometres). More ambiguous is the  
47 definition of a physical measure for the other two outputs. Transport related activities  
48 can in principle be measured by vehicle-kilometres or seat-kilometres as for transport  
49 services, however we expect these quantities may underestimate the actual activity of  
50 the sampled companies, as some companies may have different accounting practices,  
51 e.g. deciding to report the number of renting hours or other measures, not available to  
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<sup>4</sup> The source for price indexes is Istat, Italian Statistical Institute, [www.istat.it](http://www.istat.it). The consumption price index is town and province specific and we apply the appropriate price index according to the town and province where the company runs its business.

us. Even more demanding is the task for other non-transport services as they are a very heterogeneous category (car parks management, but also, in a few cases, electricity and gas distribution, water and sewage treatment and waste disposal), and we were not able to disentangle the information on each single activity. Total revenues were finally selected as they were readily available while index prices should control for price effects. A similar approach was followed, among the others, by McKillop et al. (1996) in their study of giant Japanese banks, Cowie and Asenova (1999) for the assessment of cost inefficiencies in the British bus industry, Silk and Berndt (2004) for marketing firms and Asai (2006) for the broadcasting industry.

Total costs for a firm are given by total production costs as they are reported by the annual company profit and loss accounts.

Three inputs are considered: labour, material and capital.

Labour price ( $p_L$ ) is calculated dividing total labour costs as they appear in the profit and loss account, by the total number of employees of the company.

Total material costs are obtained from the corresponding company account item and include raw materials, consumption and maintenance goods' purchases, energy and fuel expenses. The price for this heterogeneous input is measured by the producer price index for energy and gas, since most of the expenditures for materials are for energy and fuels.

Following Christensen and Jorgenson (1969), price for capital ( $p_K$ ) is computed as:

$$p_k = \frac{PPI(IR + D)}{(1 - T)}$$

where  $PPI$  is the producer price index for investment goods<sup>5</sup>,  $IR$  is the yearly average long term prime lending interest rate as assessed by the Italian Banking Association<sup>6</sup>, while  $D$  is the depreciation rate and  $T$  is the corporate tax rate.

$D$  is computed as the ratio of total depreciation expenses to book-valued fixed assets at the beginning of the period.  $T$  is obtained as total paid taxes divided by operating profits, as they appear in the financial statements. A similar approach for the

<sup>5</sup> Data source: Istat, Italian Statistical Institute, [www.istat.it](http://www.istat.it)

<sup>6</sup> Data available from the Bank of Italy website, [www.bancaditalia.it](http://www.bancaditalia.it)

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4 derivation of capital and material prices is followed by Adams et al. (2004) and Asai  
5 (2006).  
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9 Table 1 reports some descriptive statistics for the sample.

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11 Firms are quite heterogeneous in their operating size: standard deviations for total  
12 operating costs and total revenues are quite high and the median is always smaller  
13 than the mean. Companies are asymmetrically distributed and few very large firms  
14 share the market with many small and medium sized LPT firms. The largest firms in  
15 the sample are publicly owned and table 1 splits the sample according to ownership.  
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17 Apart from the size differences<sup>7</sup>, it is interesting to note the different production lines  
18 for the two groups of firms considering the median output levels and the revenues'  
19 shares: while publicly owned firms, mainly municipal entities, are diversified in  
20 regulated markets, such as municipal car park management and waste disposal; private  
21 companies diversify their activities in competitive transport related unregulated  
22 sectors, such as bus renting, coaching activities and tourist services.  
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31 Differences across the firms in the sample and between public and private companies  
32 are less evident when we consider the inputs: labour and capital prices as well as  
33 labour and material costs shares on total costs are characterized by smaller standard  
34 deviations.  
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39 Before estimation, all variables are normalised by their sample median levels.  
40 Moreover in order to cope with the required regularity conditions for cost functions, a  
41 number of restrictions are imposed in all models. Symmetry is ensured by the  
42 imposition of the following equalities in all cost specifications (see equations (1) and  
43 (3)):  $\alpha_{ij} = \alpha_{ji}$  and  $\beta_{rk} = \beta_{kr}$ . Linear homogeneity, requiring  $\sum_r \alpha_{ir} = 0$  for all  $i$ ;  $\sum_r \beta_r = 1$   
44 and  $\sum_k \beta_{rk} = 0$  for all  $k$ , is obtained dividing both the dependent variable (total costs) and  
45 the labour and material prices by the capital price which does not directly appear in  
46 the estimated function. The other regularity conditions (non-negative marginal costs  
47 with respect to outputs, non decreasing costs in input prices and concavity of the cost  
48 function in input prices) are checked after estimation for all sample observations. In  
49 particular we need to check that fitted costs and fitted marginal costs with respect to  
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<sup>7</sup> The largest firm in the dataset is GTT (Gruppo Torinese Trasporti), owned by the municipality of Turin.

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outputs and input prices are non-negative and that the Hessian matrix of the cost function with respect to input prices is negative semi-definite<sup>8</sup>.

## 5. ESTIMATION RESULTS

Table 2 presents the estimated parameters for the four specifications of the cost function: the standard translog, the generalized translog, the separable quadratic and the composite forms.

We simultaneously estimate the cost function and the corresponding input share equations (eq. (1) and (2) for the separable quadratic and the composite models; eq. (3) and (4) for the standard and generalized translog specifications) via a non-linear seemingly unrelated estimator. Since the three input cost share equations are linearly dependent, we drop the equation for capital price, obtaining a system of three equations for each specification. In order to control for the likely correlation among errors for the same firm, we present panel robust standard errors that should guarantee robust inference.

The first order terms for outputs are positive and statistically significant in all specifications. The second order and the interaction coefficients for outputs are less precisely estimated, the only exception being the standard translog where all squared outputs are highly significant.

First order parameters for the labour price and material price are always precisely estimated. The coefficient for labour price differs across specifications, with larger magnitudes from the composite models.

The interpretation of the first order coefficients, however, differs across the models: while they represent estimates of cost elasticities (with respect to output or input

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<sup>8</sup> In the composite specification we obtain that : a) fitted costs are always non-negative; b) fitted labour and material shares are always non-negative, c) fitted marginal costs with respect to transport services are always non-negative, fitted marginal costs with respect to transport related output are negative for 77 observations, fitted marginal costs for non-transport services are negative for 26 observations; d) the Hessian matrix of the cost function with respect to input prices is always negative semi-definite, except for 14 observations. About 60% of observations satisfy all regularity conditions under the preferred composite specification.

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4 prices) in the translog specifications, they do not have straightforward interpretation in  
5 the separable quadratic and the composite forms. We compute cost elasticities also for  
6 the last two specifications and we obtain similar magnitudes. The highest cost  
7 elasticity is found for transport outputs (0.54 under the standard translog specification,  
8 0.63 under the generalized translog, 0.68 under the separable quadratic and 0.74 for  
9 the composite model), the smallest is for non-transport services (ranging from 0.03 for  
10 the separable quadratic, to 0.15 from the standard translog) and transport related  
11 activities are in between the two (in the interval 0.07-0.19, whose limits are obtained  
12 from the composite specification and the standard translog respectively).  
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21 Cost elasticities with respect to input prices are very similar to actual input shares (see  
22 table 1 for descriptive statistics on labour and material shares). They range between  
23 0.45 (from the standard translog) and 0.52 (from the composite) for labour and  
24 between 0.18 (composite specification) and 0.19 (standard translog) for material.  
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28 The time trend parameter is always negative and significant in the last three  
29 specifications, indicating cost reductions over time. The positive second order trend  
30 coefficient, however, indicates that such cost savings diminish over time.  
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34 Table 2 also shows a number of goodness-of-fit statistics. A set of likelihood ratio  
35 tests are reported, where the restrictions imposed by the standard translog model and  
36 the separable quadratic model are tested against the unrestricted generalized translog  
37 and composite specifications respectively. The generalized translog is always  
38 preferred to the standard translog model that imposes  $\pi=0$ . The  $\pi$  parameter is  
39 significant and particularly large ( $\pi=0.4$ ), suggesting sizeable differences among the  
40 estimated economies of density and scope from the two models, with more reasonable  
41 magnitudes from the generalized translog (see McKillop et al., 1996).  
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49 The restrictions imposed by the separable quadratic model are rejected at the 5% level.

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51 The translog and the quadratic specifications are non-nested models that cannot be  
52 directly tested; however larger log likelihood and lower Akaike and Schwarz  
53 information criteria for the separable quadratic and the composite models suggest a  
54 better statistical fit. We also perform a Vuong (1989) closeness test, which is a  
55 likelihood-ratio based test that allows us to compare the two non-nested models: the  
56 generalized translog and the composite specifications. The composite model seems to  
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be preferred to the generalized translog specification as the statistics exceeds the quantile from the standard normal distribution at any significance level.

## 6. ECONOMIES OF SCOPE AND SIZE

Table 3 presents scope and density economies computed using all the estimated specifications. As expected, results significantly vary across different cost function models.

Scope economies computations based on the standard translog specification are unreliable: they are extremely large and imprecisely estimated for any sample (whole, public firms or private firms sub-samples) and for any considered sample point (first, second or third quartile). The explanation can be found in the degenerate behaviour of such cost function when outputs are close to zero (see Roller, 1990).

The generalized translog, the separable quadratic and the composite specifications, on the contrary, provide comparable results<sup>9</sup>.

Scope economies for the median firm in the sample range between 34% and 47% depending on the chosen cost function and they always are significantly different from zero.

Global scope economies for the median public firm range between -3.5% and 29% and significantly differ from zero only for the separable quadratic and composite models. Economies of scope for privately owned firms are always statistical significant and range between 31% and 46%. Global scope economies are generally lower when computations are based on the generalized translog model, while the largest estimates are from the separable quadratic function. The composite specification is in between the two.

Table 3 also reports the estimated global scope economies at the first and third quartile points. Scope economies decrease with size, especially if the generalized translog cost function is adopted or the sub-sample of public firms is considered.

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<sup>9</sup> See also Ivaldi et al. (1996); Huang and Wang (2004); Das and Das (2007) for other alternative specifications to the standard translog model when considering multiproduct technologies.

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4 Table 3 finally shows scale economies. They are always significantly different from  
5 one (except for the standard translog specification) indicating the presence of  
6 economies of size: proportionally increasing the operating size (with respect to all  
7 outputs) lowers average costs.  
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11 Our preferred specification is the composite cost function and next tables present  
12 results based on this specification only. We already mentioned the unreliable and  
13 unstable results from the standard translog specification with respect to global scope  
14 economies, that make it inadequate for our purposes. The composite specification is  
15 preferred to the separable quadratic function on the basis of the likelihood ratio test  
16 that rejects the restrictions imposed by the separable quadratic model (i.e. the strong  
17 separability between inputs and outputs). We finally performed a Vuong test for the  
18 non-nested generalized translog and composite models. The test suggests the  
19 composite model to be preferred to the generalized translog.  
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28 Table 4 presents product specific scope economies and scope economies for couples  
29 of products.  
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32 Product specific scope economies (first three rows in table 4) give a measure of the  
33 cost savings associated to the joint production when compared to the production of  
34 one output only on one side and the remaining two products on the other. Results from  
35 the composite specification give evidence of product specific scope economies that  
36 are quite similar across different outputs and are always positive and sizeable (ranging  
37 from 16% to 18%).  
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43 Pair specific scope economies are also interesting, given the different production sets  
44 supplied by public and private firms. Public firms mainly provide transport and non-  
45 transport services and scope economies associated to this pair of outputs are always  
46 smaller, particularly for public firms (9% vs 16% for the whole sample and the  
47 subsample of private companies). Private firms, that are specialized in transport and  
48 transport related activities, have quite high scope economies from this pair of outputs  
49 (20%, while for the median public firm cost savings amount to 12%).  
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## 7. ROBUSTNESS CHECKS

Differing global scope economies for the two groups of public and private firms might be the result of two different effects: the size effect, on one side, and the diversification strategy, on the other side. In general public firms are larger than private firms (see table 1) and exhibit lower global scope economies as table 3 makes clear. Moreover public firms mainly diversify in regulated industries (non-transport services), while private firms in competitive markets (transport related activities) and we are interested in the sign and dimension of the scope economies deriving from the strategic choice of diversification. In order to disentangle these effects and to check the robustness of our results, we compute global scope economies for each observation in the sample (see Farsi et al., 2008, for a similar approach). While computations from tables 3 and 4 are based on the construction of some “hypothetical” firm, characterized by a production set that alternatively coincides with the first, the second and the third quartiles for the three measures of output, we now estimate global scope economies at each actual sample point<sup>10</sup>. The distribution of global scope economies in the sample mimics the results from table 3. The median value is 30% in the whole sample, while in the sub-samples of public and private firms the median global scope economies are 12% and 35% respectively. Estimates based on the sub-sample of public firms always display lower diversification economies.

We also compute global scope economies for different dimensional classes. In particular we identify four classes (small, medium-small, medium and large) according to the number of employees and we compute the median scope economies for each group of companies<sup>11</sup>. Scope economies decrease with size and lower economies are found for public firms, in all classes.

We finally assess the robustness of our results to two issues: (i) differences in the cost structure of public and private firms; (ii) the definition of the output for non transport services. Table 5 shows results from the estimation of two composite models. In column (1) we report the base case model where we also include a dummy variable

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<sup>10</sup> However input prices are always kept at the sample median level for all firms. Details are available upon request from the authors.

<sup>11</sup> Details available upon request from the authors.

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(*dummy-public*) that equals one for publicly owned firms and zero for private companies. Point estimates turn out to be very similar to those already discussed in section 5. The dummy for public firms is positive but not significantly different from zero, suggesting that the cost structure for the two sets of firms is very similar, at least in terms of the intercept of the cost function.

In the second column of table 5 we present the results from a composite specification where we drop the output measure for non transport services and introduce a dummy variable (*dummy-non-transport*) that takes value one if the firm in that year declared to supply unrelated services and zero otherwise. The main advantage with respect to our preferred specification is that we avoid the non physical measure of the output and can thus check for the robustness of our results. The main drawback is that we are not able to measure global scope economies with respect to the provision of the three outputs. Some coefficients lose precision (e.g. the transport related output) and the log-likelihood and the two information criteria suggest lower statistical fit for this model. The dummy for public firms is now positive and significant. Similarly the dummy for non transport services is positive and significantly different from zero. Once we control for ownership, producing unrelated services increases total costs. In the last two rows of table 5 we also compute global scope economies. Scope economies as computed from the first model are comparable to those from our preferred specification (29%). From the second model we can only compute scope economies between the two included outputs and they amount to 37%. When the dummy for non transport services is set equal to one, scope economies increase to 42%. We argue that these magnitudes are not easily comparable to those obtained from a full three-output cost function, as some sort of model misspecification may be present. However cost elasticities from the two-output model are very similar to those from the preferred specification, suggesting that these magnitudes are quite stable across specifications.

## 8. POLICY IMPLICATIONS

An analysis that considers the effect of horizontal diversification on total welfare is beyond the scope of this paper. Our focus is on the presence of synergies, in particular in the form of cost savings, from the joint production in the LPT industry and other,

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4 regulated or competitive, industries. On the whole, the evidence points to the presence  
5 of sizeable global scope economies for the median firm in the sample, and cost  
6 savings from the joint production reduce as the operation scale increases.  
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10 Two points have been highlighted: the role of ownership and the nature, either related  
11 or unrelated to the core LPT activity, of diversification on such cost synergies.  
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14 We split the whole sample of firms according to the ownership: publicly owned  
15 (mainly municipal) companies, and private firms. The two groups of firms differ both  
16 in the operation scales and in the diversification strategies. Privately owned firms are  
17 small and mainly diversify in non-subsidized transport related services, while publicly  
18 owned firms operate at a larger scale and provide services in regulated markets.  
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22 We find that firms providing non-transport services in regulated markets (publicly  
23 owned companies) always display lower scope economies (and in some cases also  
24 diseconomies), for any considered sample point and for any cost specification.  
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28 The result that firms diversifying in transport related activities have high cost savings  
29 is expected. However also LPT companies diversifying in non-core businesses enjoy  
30 scope economies, even if smaller. The possibility to share inputs across different lines  
31 of businesses always ensures some form of cost savings.  
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35 In general, horizontal diversification should be allowed as far as cost savings are  
36 considered. In particular, diversification in industries related to the core business  
37 should be encouraged, as it encompasses larger scope economies as compared to non  
38 transport related diversification. In this way, the policy maker might, in principle,  
39 obtain that the reduced costs are passed, at least partially, to the customers in the form  
40 of lower prices or lower subsidies.  
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## 50 51 **9. CONCLUDING REMARKS**

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53 This study gives evidence on the presence of cost savings from the joint production of  
54 transport services, transport related activities and other non-transport productions  
55 using different functional forms.  
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4 As expected, scope and density economies differ according to the chosen cost model,  
5 but they are always present. Global scope economies, for the median firm in the  
6 sample, amount to 34% under the preferred composite specification.  
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10 We split the whole sample of firms according to diversification strategy: private firms,  
11 mainly diversifying in competitive transport related services, and public firms  
12 providing non-transport services in regulated unrelated markets. Regardless of the  
13 functional form and the method used, scope economies appear sizeable for both  
14 groups but higher for firms diversifying in industries or sub-industries that are close to  
15 the core transport activity.  
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19 As scope economies appear to be decreasing with firms' size we calculate them at each  
20 sample point, so as to compare homogeneous dimensional classes, in order to exclude  
21 the possibility that the lower scope economies of public LPT companies merely  
22 depend on their larger dimension: results remain unaltered.  
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29 Applying the usual caveat, the analysis, then, suggests that, from a social point of  
30 view, horizontal diversification of LPT firms in non related activities should be  
31 fostered with caution, as it encompasses smaller scope economies as compared to  
32 transport related diversification.  
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For Peer Review

TABLE 1: Descriptive statistics for the samples of publicly and privately owned companies.

	11 public firms, 49 obs.			29 private firms, 135 obs.		
	Mean	Std. dev.	Median	Mean	Std. dev.	Median
Total operating costs (th. Euro)	22,725.86	62,704.37	10,013.16	3,962.12	3,315.54	2,422.29
Total revenues (th Euro)	23,332.88	65,183.99	9,718.74	4,194.22	3,467.14	2,651.03
Share of total revenues from transport (%)	48.20	33.75	52.13	58.93	21.59	57.88
Share of total revenues from non-transport (%)	44.82	37.80	34.53	8.20	15.42	1.51
Share of total revenues from transport related (%)	6.98	12.67	3.45	32.87	20.36	32.75
$Y_T$ (vehicle-kilometres)	4,517,011	1.36e+07	1,404,906	1,513,367	1,626,780	989,512
$Y_{NT}$ (revenues/CPI)	67.43	99.38	13.65	3.07	6.95	0.47
$Y_{TR}$ (vehicle-kilometres)	84,817.25	140,354.3	0	604,624.7	580,762.9	479,697
Labour price $p_L$ (th. Euro)	42.49	61.69	33.93	33.21	8.31	33.75
Material price $p_M$ (price index)	123.38	9.92	124.30	118.36	13.53	124.10
Capital price $p_K$	30.05	23.42	26.18	35.98	19.77	29.19
Labour share	0.50	0.13	0.53	0.43	0.08	0.42
Material share	0.19	0.13	0.14	0.18	0.05	0.18
Total cost of personnel (th. Euro)	11,534.70	33,574.90	3,555.44	1,842.11	1,747.94	1,064.00
Number of employees	351.12	1,017.88	94.00	55.79	52.71	34.00
Total cost of materials (th. Euro)	3,311.56	6,777.43	1,165.80	734.87	648.08	471.87

Notes: See the text for the definition of the output measure  $y_T$ ,  $y_{NT}$ ,  $y_{TR}$  and the input prices  $p_L$ ,  $p_M$ ,  $p_K$

TABLE 2: Estimation results. Dependent variable: natural logarithm of total operating costs, normalized by the capital price. Cluster robust standard errors in parenthesis, 184 observations.

<i>Dependent variables</i>	<i>Standard Translog</i>	<i>Generalized Translog</i>	<i>Separable quadratic</i>	<i>Composite</i>
$Y_T$	0.540*** (0.08)	0.627*** (0.06)	1856.899*** (216.33)	2043.259*** (203.69)
$Y_{NT}$	0.145*** (0.03)	0.057*** (0.02)	78.021*** (16.41)	119.828*** (18.90)
$Y_{TR}$	0.194*** (0.06)	0.115** (0.04)	184.559* (111.60)	193.919** (92.46)
$Y_T^2$	0.277*** (0.07)	0.001 (0.04)	86.334 (73.64)	81.773 (65.40)
$Y_{NT}^2$	0.021*** (0.01)	0.009 (0.01)	0.608** (0.29)	-0.195 (0.20)
$Y_{TR}^2$	0.033*** (0.01)	0.118** (0.04)	76.655** (27.52)	87.872** (30.43)
$Y_T Y_{NT}$	-0.011 (0.02)	-0.046 (0.03)	-2.629 (11.30)	-4.947 (9.33)
$Y_T Y_{TR}$	0.026 (0.02)	-0.074 (0.06)	-82.519 (118.12)	-167.867 (107.94)
$Y_{TR} Y_{NT}$	-0.007 (0.01)	0.005 (0.02)	-17.022 (17.43)	-22.695** (11.16)
$Y_T \ln p_L$	0.015 (0.02)	0.016 (0.01)		-469.886*** (120.20)
$Y_{NT} \ln p_L$	-0.001 (0.00)	-0.001 (0.00)		-34.098*** (8.74)
$Y_{TR} \ln p_L$	-0.002 (0.00)	-0.003 (0.01)		-120.787*** (20.91)
$Y_T \ln p_M$	-0.005 (0.01)	-0.010 (0.01)		-47.771 (155.82)
$Y_{NT} \ln p_M$	0.001 (0.00)	0.002 (0.00)		4.270 (7.91)
$Y_{TR} \ln p_M$	0.000 (0.00)	0.006 (0.01)		13.024 (18.09)
<i>Trend</i>	-0.063 (0.35)	-0.430** (0.19)	-826.619** (261.08)	-834.657*** (214.10)
<i>Trend</i> <sup>2</sup>	0.010	0.287	538.526**	611.399***

	(0.35)	(0.19)	(228.83)	(178.23)
$\ln p_L$	0.450***	0.451***	0.455***	0.746***
	(0.01)	(0.01)	(0.02)	(0.05)
$\ln p_L^2$	-0.002	0.000	-0.006	0.084
	(0.04)	(0.03)	(0.03)	(0.05)
$\ln p_M$	0.188***	0.185***	0.190***	0.190**
	(0.01)	(0.01)	(0.01)	(0.07)
$\ln p_M^2$	-0.006	0.035*	0.022	0.018
	(0.02)	(0.02)	(0.02)	(0.02)
$\ln p_L \ln p_M$	0.022	0.003	0.022	0.016
	(0.02)	(0.02)	(0.02)	(0.04)
Constant	7.804***	7.903***	631.380**	418.375**
	(0.17)	(0.07)	(215.28)	(191.20)
$\pi$		0.443***		
		(0.09)		
Cost funct. $R^2_{adj}$	0.99	0.99	0.99	0.99
Lab. share eq. $R^2_{adj}$	0.96	0.96	0.95	0.97
Mat. share eq. $R^2_{adj}$	0.86	0.87	0.86	0.87
LogL	295.07	370.93	402.21	427.84
AIC	-544.13	-693.86	-770.42	-809.68
BIC	-470.19	-616.70	-715.76	-735.73
LR test [p-value]	151.73 [0.0] 1 d.f.		51.26 [0.00] 6 d.f.	
Vuong Test Statistics	118.43			

Notes:

- All estimates performed by the routine `nlshr` for Stata 10.1, using an iterative Feasible Generalized NLS estimator.

- The subscripts for the output variables are  $T$  for transport services,  $TR$  for transport related activities and  $NT$  for non-transport services. The subscripts for the input prices are  $L$  for labour and  $M$  for other variable inputs (i.e. raw materials and fuels).

- In the estimation of the standard translog specification, zero output levels are substituted by the value 0.00001.

- Standard errors are robust to heteroschedasticity of unknown form and to the likely presence of intra cluster correlation. Each cluster is represented by a different firm (40 clusters - firms in all specifications).

-  $R^2_{adj}$  is the centered adjusted  $R^2$ , LogL is the value of the log-likelihood function, assuming errors are i.i.d. Normal. AIC and BIC are the Akaike and Schwarz Bayesian information criteria respectively

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4 - LR test is the likelihood ratio test over the restricted specifications. The standard translog specification  
5 is the restricted model for the generalized translog ( $H_0: \pi=0$ ), while the separable quadratic model is the  
6 restricted specification for the composite model ( $H_0$ : all interactions among input prices and output  
7 measures are zero).  
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10 - Vuong test statistics is the Vuong (1989) closeness test. The null hypothesis is that the composite  
11 model and the generalized translog model are the same. The null is rejected at any significance level in  
12 favour of the composite model.  
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14 - Significance levels: \* 10%; \*\* 5%; \*\*\* 1%.  
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TABLE 3: Global scope and density economies. Asymptotic standard errors in parenthesis.

	<i>Std. translog</i>	<i>Generalized translog</i>	<i>Separable quadratic</i>	<i>Composite</i>
Global Scope Economies:				
<i>Whole sample</i>				
1 <sup>st</sup> quartile	2.69e+09 (1.58e+10)	0.599 <sup>**</sup> (0.123)	0.871 <sup>***</sup> (0.194)	0.635 <sup>***</sup> (0.216)
Median	3.23e+09 (1.82e+10)	0.353 <sup>**</sup> (0.196)	0.472 <sup>***</sup> (0.136)	0.338 <sup>***</sup> (0.126)
3 <sup>rd</sup> quartile	2.33e+09 (1.30e+10)	0.022 (0.194)	0.306 <sup>***</sup> (0.112)	0.258 <sup>***</sup> (0.084)
<i>Public firms sample</i>				
1 <sup>st</sup> quartile	3.18e+09 (1.81e+10)	0.358 <sup>***</sup> (0.143)	0.753 <sup>***</sup> (0.170)	0.479 <sup>***</sup> (0.166)
Median	2.30e+09 (1.30e+10)	-0.035 (0.150)	0.286 <sup>***</sup> (0.098)	0.176 <sup>***</sup> (0.077)
3 <sup>rd</sup> quartile	4.12e+09 (2.28e+10)	-0.416 (0.268)	0.097 (0.109)	0.110 (0.096)
<i>Private firms sample</i>				
1 <sup>st</sup> quartile	2.30e+09 (1.35e+10)	0.703 <sup>***</sup> (0.201)	0.813 <sup>***</sup> (0.197)	0.597 <sup>***</sup> (0.212)
Median	2.73e+09 (1.55e+10)	0.313 <sup>**</sup> (0.194)	0.464 <sup>***</sup> (0.133)	0.346 <sup>***</sup> (0.125)
3 <sup>rd</sup> quartile	2.09e+09 (1.18e+10)	0.062 (0.178)	0.332 <sup>***</sup> (0.105)	0.284 <sup>***</sup> (0.093)
Global scale economies	1.137 <sup>***</sup> (0.118)	1.251 <sup>***</sup> (0.123)	1.275 <sup>***</sup> (0.100)	1.185 <sup>***</sup> (0.082)
P-value of the test on unit scale economies	[0.12]	[0.02]	[0.00]	[0.01]

Notes: Global scope economies are evaluated for a hypothetical firm with the first quartile, median and third quartile level of each output in the whole sample and in the sub-samples of public and private firms respectively. Input prices are always kept at the sample median value. In the computation of

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scope economies for the standard translog model, zero output levels are substituted with 0.00001. Scale economies are computed for the median firm in the sample.

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TABLE 4: Estimated product specific scope economies: composite specifications. Asymptotic standard errors in parenthesis.

	Whole sample	Public firms	Private firms
$SCOPE_T$	0.183 <sup>***</sup> (0.062)	0.093 <sup>**</sup> (0.044)	0.195 <sup>***</sup> (0.063)
$SCOPE_{NT}$	0.156 <sup>***</sup> (0.066)	0.093 <sup>**</sup> (0.044)	0.151 <sup>***</sup> (0.065)
$SCOPE_{TR}$	0.186 <sup>***</sup> (0.062)	0.083 <sup>***</sup> (0.036)	0.197 <sup>***</sup> (0.063)
$SCOPE_{T,NT}$	0.161 <sup>***</sup> (0.066)	0.093 <sup>**</sup> (0.044)	0.164 <sup>***</sup> (0.068)
$SCOPE_{T,TR}$	0.189 <sup>***</sup> (0.064)	0.123 <sup>***</sup> (0.053)	0.198 <sup>***</sup> (0.064)

Notes: All magnitudes are evaluated for the hypothetical median firm in the sample, scope economies for public and private firms are evaluated for the hypothetical median public and private firm respectively. Input prices are always kept at the sample median value.

TABLE 5: Estimation results for composite specifications. Dependent variable: natural logarithm of total operating costs, normalized by the capital price. Cluster robust standard errors in parenthesis, 184 observations

Dependent variables	(1)	(2)
$Y_T$	1944.682*** (173.55)	1609.104*** (269.39)
$Y_{NT}$	109.187*** (14.16)	
$Y_{TR}$	224.427** (80.29)	41.263 (200.15)
$Y_T^2$	77.398 (53.60)	175.365** (79.98)
$Y_{NT}^2$	-0.085 (0.16)	
$Y_{TR}^2$	69.210** (29.35)	174.547** (84.66)
$Y_T Y_{NT}$	-7.370 (7.62)	
$Y_T Y_{TR}$	-112.907 (98.22)	-61.806 (210.41)
$Y_{TR} Y_{NT}$	-12.166 (11.88)	
$Y_T \ln p_L$	-603.117*** (164.94)	-64.057 (130.67)
$Y_{NT} \ln p_L$	-41.177*** (10.94)	
$Y_{TR} \ln p_L$	-137.829*** (25.93)	-53.770** (26.53)
$Y_T \ln p_M$	-66.476 (152.16)	-76.249 (69.77)

$Y_{NT} \ln p_M$	3.045	
	(8.31)	
$Y_{TR} \ln p_M$	9.075	7.153
	(18.97)	(13.02)
<i>Trend</i>	-686.790**	-2957.180**
	(233.73)	(1068.74)
$Trend^2$	489.531**	2174.921**
	(194.85)	(802.44)
$\ln p_L$	0.817***	0.506***
	(0.08)	(0.06)
$\ln p_L^2$	0.123**	-0.021
	(0.06)	(0.03)
$\ln p_M$	0.200**	0.206***
	(0.07)	(0.03)
$\ln p_M^2$	0.017	-0.019
	(0.02)	(0.02)
$\ln p_L \ln p_M$	0.021	0.047**
	(0.04)	(0.02)
<i>Dummy - Public</i>	446.120	4979.991**
	(328.69)	(2411.07)
<i>Dummy - Non - Transport</i>		205.024**
		(71.67)
<i>Constant</i>	346.218**	1803.321**
	(175.21)	(732.03)
<i>Cost funct. R<sup>2</sup>adj</i>	0.999	0.996
<i>Lab. share eq. R<sup>2</sup>adj</i>	0.971	0.959
<i>Mat. share eq. R<sup>2</sup>adj</i>	0.871	0.864
<i>LogL</i>	432.94	285.54
<i>AIC</i>	-817.88	-533.08

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<i>BIC</i>	-740.72	-472.00
<i>Global scope economies</i>	0.288**	0.374***
	(0.123)	(0.133)

Significance levels: \* 10%; \*\* 5%; \*\*\* 1%

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