Review of Economics & Finance
Submitted on 25/May/2012
Article ID: 1923-7529-2012-04-43-12 Claudia Burlando, and Enrico Ivaldi

An Indicator to Measure Inequality in the Provision of Local Public Transport in Italy

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Abstract: An indicator measuring inequality in the provision of local public transport was constructed in order to compare service levels in 20 Italian regional capital cities and analyze emerging criticalities. The indicator aims at identifying the level of measurable rather than perceived public transport effectiveness. Consequently, measurable features such as network coverage (capillarity), frequency, extent of transit lanes, passenger information systems, are considered, whereas features closely tied to personal expectations and tastes (e.g. customer satisfaction/dissatisfaction) are excluded. The relevance of this method derives from the possibility of using this approach for the analysis of the sector of the LPT in other countries, allowing as a consequence, to compare the local transport sector between cities in different countries.

JEL Classifications: R42, R49, C38

Keywords: Local public transport; Factorial analysis; Inequality

1. Introduction

It is widely accepted that urban mobility generates access within a territory. In fact, an urban area's capacity to maintain the virtuous development of urbanisation economies on one hand and economic and social growth on the other is inextricably tied to mobility. Consequently, this paper seeks to examine inequality in the provision of local public transport in various Italian regional centres.

Although considerable data are available relating to the qualitative characteristics of transport services offered in regional capitals, it remains difficult to give an overall measurement of quality. This work uses deprivation indices determined by indicators extracted from various data bases (DETR 2000) that measure conditions in a territory. The concept of deprivation applied to urban mobility in terms of material resources (service levels) accounts for indirectly social resources (externalities). Moreover, highlighting the characteristics of a certain group of collective transport services, i.e. the level of collective transport services in a particular territory, deprivation measures the similarities/differences in these services with those of other urban areas.

Twenty Italian regional capital municipalities are analysed. Insufficient information meant substituting Potenza with Reggio Calabria for the Calabria region, whilst the uniqueness of Venice, regional capital of the Veneto region, meant opting for the municipality of Verona. The table below (Table 1) provides data relating to population, area and population density of the cities analysed.

Table 1. Inhabitants, Area, and Density

Regional centre	Number of inhabitants (in thousands)	Area (in km^2)	Density (in thousands / km^2)
Rome	2744	1285	2.135
Milan	1307	182	7.181
Naples	963	117	8.231
Turin	910	130	7.000
Palermo	656	159	4.126
Genoa	610	244	2.500
Bologna	377	141	2.674
Florence	369	102	3.618
Bari	320	116	2.759
Verona	264	207	1.275
Trieste	206	84	2.452
Reggio Calabria	186	236	0.788
Perugia	167	450	0.371
Cagliari	157	85	1.847
Trento	116	158	0.734
Ancona	103	124	0.831
L'Aquila	73	467	0.156
Potenza	69	174	0.397
Campobasso	51	56	0.911
Aosta	35	21	1.667

Source: Istat (Italian Statistics Institute) data at 1st January 2010.

The variables used, referred to 2010, data availability permitting, were identified in order to compare the urban areas under analysis in terms of their local public transport services. The analysis concentrates on what we term the "technical" effectiveness of the service, i.e. qualitative levels that can be measured objectively rather than perceived levels of effectiveness that cannot. The technical quality of the service is therefore examined along with aspects such as quantity and costs to the extent that these are components of quality. With regards to the technical quality of service provided, the following variables are, for instance, analysed: fleet age, frequency, speed and capillarity of service, passenger information systems, etc.; quantitative variables impacting quality include the number of vehicles, staff levels, place-km produced, appropriately weighted, etc.; cost analysis addresses both costs charged directly to users (fares, season tickets) as well as indirect costs by way of variables such as staff, raw material and fuel costs, which determine indirectly whether the transport operator can divert part of funding towards the maintenance/improvement of service levels rather than solely to covering budget shortfalls.

The index can be calculated in a variety of ways that range from the construction of an additive index based on a generally unweighted summary measure of partial variables (Townsend *et al.* 1988; Carstairs, Morris 1991; Forrest, Gordon 1991; Benach, Yasui 1999; Cadum *et al.* 1999; Valerio, Vitello 2000; Hales *et al.* 2003; Testi *et al.* 2005; Ivaldi, Testi, 2010; Testi, Ivaldi 2011) to factor analyses. We use both measures and compare results using the Spearman correlation coefficient.

In addition, to test the validity of the index proposed, for each municipality the test variable "passengers transported/network length ratio" was used. This test variable in fact represents a possible proxy for the technical quality of the service as indications regarding preferences for collective transport rather than other alternatives (e.g. by car or on foot) are correlated to satisfaction levels and therefore the technical quality of the service.

However, this test variable has a possible drawback as overcrowding of buses or trains will be considered positively. The negative impact deriving from this limit nevertheless is contained given the fact that the use of cars in urban areas has risen in recent years with a subsequent fall in demand for public transport tracked by substantial stability in service supply levels. It follows that the average level of overcrowding during a day is contained[1]. A lack of data led to the exclusion of surveys aimed at assessing the level of customer satisfaction (which nevertheless generate subjective data) or the extent of car usage in urban areas, both of which may have determined alternative proxies.

Index results are grouped into three classes, determined on the basis of the standard deviation, in order to discriminate among different levels of the indicator (Jarman 1983; Townsend 1987; Ivaldi 2005; Ivaldi, Testi 2010). The analysis was carried out in three steps:

1. selection of indicators suitable to measure the effectiveness or technical quality of local public transport services in the regional centres chosen;
2. collection of data required for the construction of the indicators selected;
3. construction of the deprivation index and, in order to test the validity of the index proposed, use of a weighted test variable.

The results obtained allow us to identify urban areas with qualitatively lower levels of local public transport. This is followed by analysis of the findings and a discussion of their implications on transport policy.

2. Materials and Methods

In attempting to provide a quantitative evaluation of inequalities in local public transport services and bearing in mind the multiplicity of variables available that can offer a measurement of these services, it is important to recognise the difficulty in obtaining robust conclusions from one measure, which may be influenced by a variety of environmental and social factors. Consequently, the measurement of inequality in local public transport services we propose is based on a set of variables or partial indicators that conserve their multidimensional characteristics. The index therefore is constructed on the basis of currently available statistics released by local transport operators rather than those produced by *ad hoc* surveys on customer satisfaction. This approach has two advantages: first, the avoidance of additional costs and, second, the possibility of updating

[1] The contained level of overcrowding emerges from direct interviews with the transport companies examined in this study.

indices simply and continuously by basing decisions on objective and transparent data (Jarman 1983; Gordon, Pantazis 1997) provided directly by local transport operators.

A number of solutions have been developed which attempt to identify the most appropriate variables to be included in an index. The choice, however, is conditioned both by data availability and the specific aims of the index constructed (Noble *et al.* 2003; Jarman 1983; Carstairs, Morris 2000; Grasso 2002; Valerio, Vitullo 2000; Dasgupta 1999; Whelan *et al.* 2010). In the present case, after having eliminated those variables that were either incomplete or inherently unreliable, we analysed the remaining variables and identified those found on the same variable test component (Ivaldi 2005).

In order to continue with the construction of the index, it has to be decided how the indicators selected are to be combined. By far the most common approach (Jarman 1983; Townsend *et al.* 1988; Carstairs, Morris 1991; Forrest, Gordon 1993) is an additive index where a number of partial indicators are added up to produce a summary measure. This index is generally unweighted (Jarman 1983; Townsend *et al.* 1988; Carstairs, Morris 1991; Carstairs 2000; Testi, Ivaldi 2009; DETR 2000) as only in few cases are variables accorded a weight and these mostly based on exogenous judgements offered by experts (Jarman 1983) or other subjective criteria grounded on qualitative judgements rather than on objective quantitative techniques.

When variables are expressed in different units of measurement, as in the present case, before being added up they are standardised in order to avoid assigning a greater weight to one variable rather than to another (Jarman 1983; Townsend *et al.* 1988; Carstairs, Morris 1991; Testi, Ivaldi 2009; Ivaldi, Testi 2010). If initial distribution is non-normal, the variables are transformed (Osborne 2002) in particular to reduce distribution asymmetry (Bland, Altman 1996). An additive index is then produced by adding up the unweighted component variables, calculating the corresponding Z scores by subtracting from each observation the average value of the observations and dividing the result by the corresponding standard deviation (Ivaldi, Testi 2010). Due to initial non normal distribution, prior to standardisation a Box-Cox transformation was used on each variable to yield an approximately normal distribution (Box, Cox 1964). The Box-Cox power transformations are given by:

$$x(\lambda) = (x^{\lambda} - 1)/\lambda \quad \lambda \neq 0;$$
$$x(\lambda) = \ln(x) \qquad \lambda = 0$$

where the value of the parameter λ is selected by maximising the log-likelihood function $f(x,\lambda) = -n/2\ln(\sigma^2_{X(\lambda)}) + (\lambda - 1)\sum_{i=1}^{n}\ln(x_i)$, obtained by the vector of data observations $\mathrm{x} = x_1, x_2, \ldots, x_n$.

A factor analysis can also be adopted (Stevens 1986, Dillon, Goldstein 1984) which provides a certain degree of stability in the index produced. In this case the index value is the factor score, which represents the position of each reference unit on the representation space identified by the factor extracted, which simplifies the information contained in the partial indicators.

The indicators obtained are compared by means of a variable test to estimate the goodness of the variable indicator. In our study, we use the ratio of number of passengers transported to network length as a possible approximate of customer satisfaction and therefore the technical quality of collective transport services.

The effectiveness of the indices is measured by calculating the value of the Pearson correlation coefficient between the indicators and variable test.

As regards the division of the cities under examination into groups, homogenous groupings can be used (Carstairs 2000). In order to identify classes and discriminate amongst different levels of inequality, the literature suggests either breaking down the distribution of indices on the basis of parameters (Carstairs *et al.* 1991), or alternatively using population deciles (Jarman 1984; Townsend *et al.* 1988; Cadum *et al.*1999). When a comparison between different index types is required, as in the present case, a parameter-based approach that maintains the discriminatory characteristics of distribution is recommended (Carstairs 2000).

Therefore, index distribution was divided into three classes, with class 1 identifying the cities with the highest indicator.

3. Results

A total of 29 variables emerged, although some of these were excluded due to a lack of data (e.g. punctuality/delays, vehicle saturation, off-peak frequency). The following 16 variables were inserted in the initial factor analysis: average number of employees/network length; average number of vehicles in service/network length; vehicle-km produced; number of vehicles registered in the past 5 years/network length; average commercial speed; protected (e.g. bus lanes) network length/network length; total personnel costs/network length; total fuel costs/network length; total raw material and maintenance costs/network length; peak service frequency (in minutes); hourly standard fare rate; number of place-km produced; number of passenger information panels per stop/total number of stops; cost of monthly season ticket; number of stops/network length; average fleet age.

To reduce distortions deriving from the differences in network sizes, size-related variables were compared to network length before carrying out an analysis of the principal components. Subsequent extraction and rotation algorithm tests revealed stability of the components extracted as well as the particular effectiveness of the Varimax rotation method (Kaiser 1958).

The exploratory factor analysis produced 4 variables placed on the first factor in addition to the test variable: vehicle-km produced; number of vehicles registered in the past 5 years/network length; average number of employees/network length; average number of vehicles in service/ network length (table 2).

These are movement-related variables[2]. It may said that service quality levels derive from service quantity in that these variables are indirectly linked to network capillarity and journey times. These variables are, however, less subject to subjectivity on the part of questionnaire respondents and therefore correctly placed in the first factor. Variables referring to speed and frequency are inevitably more difficult to be collected by transport operators in an objective and symmetric way, which in turn makes inter-firm comparisons difficult. However, data relating to vehicles km, number of vehicles registered in the last five years, average number of employees, average number of vehicles in service are less exposed to respondent subjectivity. Needless to say, data supplied by operators is regarded as "true and fair" and not intentionally false or misleading (alas, in some cases we were forced to eliminate a variable from our analysis when it was clear that data supplied was not reliable). Surprisingly, the variable "places km produced" appears in the fourth factor rather than in the first as predicted.

Three of the five variables placed in the second factor (total personnel costs/network length; total fuel costs/network length; raw material and maintenance costs/network length) are clearly linked, being fundamental business cost related data. They are consequently correctly correlated with each other and equally correctly not placed on the first factor as this is the factor most

[2] With the exception of the variable 'places km produced', which is placed in the fourth factor.

representative of technical quality. In this case we can see how, having inserted also business cost related data, such data are correctly correlated with each other but, being placed on a factor different from the first, they are not representative of technical quality.

Table 2. Exploratory factor analysis - Rotated Component Matrix(a)

	Components			
Items	1	2	3	4
Vehicles km produced	0.859	-0.202	0.006	0.101
Number of vehicles registered in last 5 years/network length	0.819	-0.178	0.079	-0.052
Number of passengers carried/network length VARIABLE TEST	**0.816**	**-0.255**	**0.404**	**-0.053**
Average number of employees/network length	0.684	-0.232	0.613	0.117
Number of vehicles in service/network length	0.677	-0.203	0.628	0.163
Total personnel costs/network length	-0.123	0.918	-0.295	-0.147
Total fuel costs/network length	-0.146	0.905	-0.314	-0.163
Raw material and maintenance costs/network length	-0.183	0.869	-0.326	-0.164
Peak service frequency (minutes)	-0.280	0.721	0.511	-0.053
Hourly standard fare	0.242	-0.612	0.096	-0.213
Number of stops/network length	0.175	-0.168	0.795	-0.022
Monthly season ticket (in Euros)	-0.079	-0.285	0.747	0.215
Length of protected network (in km)/network length	0.367	-0.163	0.696	0.251
Average commercial speed (in km/h)	-0.476	0.124	-0.618	-0.126
Number of places km produced	0.055	-0.143	-0.012	0.909
Number of passenger information panels at stops/ number of stops	0.096	0.004	0.256	0.857
Average fleet age	0.341	0.022	-0.302	-0.365

Notes: Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization. - a Rotation converged in 7 iterations.

The variables expressed in the third factor are number of stops/network length; cost of monthly season ticket; protected network length/network length; average commercial speed, whilst those in the fourth factor are number of place-km produced; number of passenger information panels per stop/total number of stops; average fleet age. Despite being closely linked to the technical effectiveness of the service offered, these variables do not appear in the first factor owing to the higher degree of subjectivity in the answers. In order to discover the reasons for this, interviews and in some cases visits to the operators in question were carried out, which revealed that the methods of extracting data varied from operator to operator. As a result, comparison between variables was not possible. The principal differences in data extraction amongst operators regarded: commercial speed; the role and measurement of passenger information systems at stops, which in some cases included those either no longer activated or currently under construction; the role and measurement of the protected network, which in some cases included the entire transport network in kilometers instead of the distance in kilometers effectively protected, e.g. bus lanes.

Priority in the choice of variables to be used in the indicator should be given to those that appear in the first component and which have a positive value (Ivaldi 2005). It should be observed how these four variables represent those with reduced subjective content and which therefore have the greatest degree of homogeneousness with each other from operator to operator.

The index therefore is made up of the following variables: vehicle km produced; number of vehicles registered in the last five years/network length; average number of employees/network length; number of vehicles in service/network length. The index was calculated firstly by using an additive measure that added the variables up. As we have seen, owing to the lack of homogeneousness in the way the variables are measured, the variables were standardized. The z-score for each variable was therefore calculated, obtained by subtracting from each observation the average value of distribution and dividing the result by its standard deviation. The overall index is made up as a result by the sum of the four unweighted z-scores.

Table 3 illustrates the index of inequality in local public transport for each regional centre.

Table 3. Index of inequality in local public transport

City	Additive index	Factor index
Milan	9.96	2.25
Rome	6.57	1.52
Naples	5.49	1.38
Palermo	4.59	1.10
Bologna	4.12	0.93
Turin	2.29	0.53
Verona	-0.17	0.01
Genoa	-0.42	-0.10
Trieste	-0.47	-0.11
Florence	-1.17	-0.28
Ancona	-1.63	-0.37
Cagliari	-2.42	-0.56
Bari	-2.84	-0.66
Trento	-2.92	-0.69
Reggio Calabria	-3.88	-0.92
L'aquila	-4.04	-0.94
Aosta	-4.14	-0.97
Perugia	-4.32	-1.02
Campobasso	-4.61	-1.08

The index has a zero average and standard deviation of 4.19; this value is due to correlation amongst the variables making up the index. As expected, the distribution of the indicator is not perfectly normal with a degree of positive asymmetry (Pearson's asymmetry index: 0.92).

By using a factor analysis of the variables previously extracted, it is possible to have an alternative measure of comparison with the additive index that produces as an index of inequality the factor score, which represents the position of each regional capital in the space of representation identified by the factor extracted, which in turn synthesises information taken from the partial indicators (Ivaldi 2005; Michelozzi *et al.* 1999). This indicator shows positive asymmetry (Pearson's asymmetry index: 0.76, zero average and a standard deviation of 0.97.

The index constructed using a factor analysis confirmed the findings produced by the additive measure. Sensitivity analysis reveals that the two methods used in variable selection and index construction produce practically identical results. An indication of this is how factor index and additive index ranks coincide, with the Spearman test producing a correlation coefficient of value 1. Indicator validation however is required. The measure chosen to do this was that provided by the variable "number of passengers transported/network length". Both indicators recorded a Pearson value of 91%. In both cases, the indicator proposed presents therefore a high degree of correlation (near the maximum value it can have) with the measure of service use.

In table 4 and figure 1, the regional capitals are grouped into 3 homogeneous classes on the basis of the standard deviation of the distribution of the indicator. To identify three homogeneous categories, the value $+2/3\sigma$ was used as cut off. The analysis was carried out using the additive index but similar results are obtained, albeit with fewer extreme classes, using a factor index.

The classes identify different levels of technical quality which, in turn, distinguish three classes, with class 1 identifying the cities with the highest service levels.

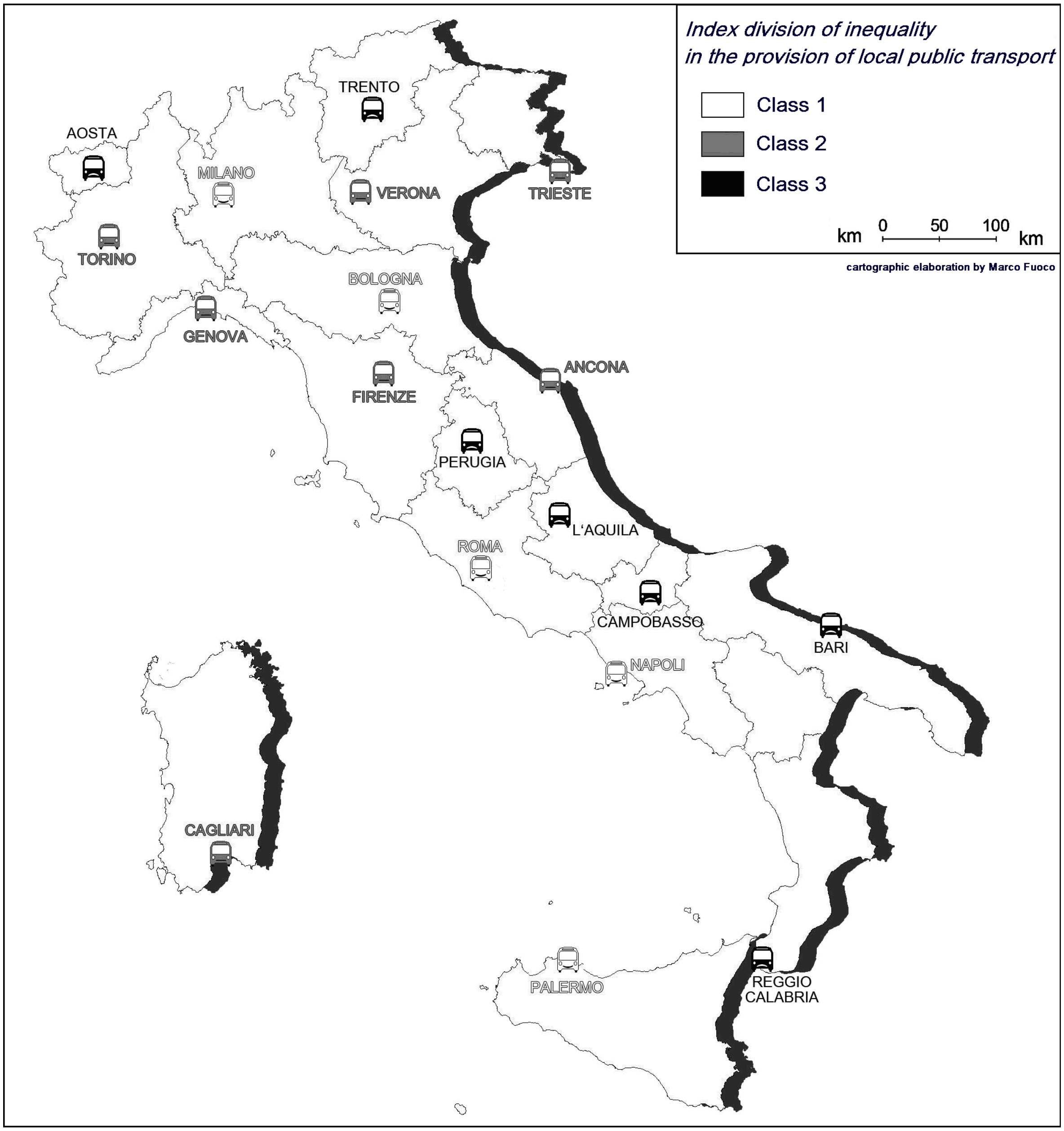

Figure 1. Map showing the index division of inequality in the provision of local public transport

Table 4. Index division of inequality in the provision of local public transport

Index class	City
Class 1	Milan, Rome, Naples, Palermo, Bologna
Class 2	Turin, Verona, Genoa, Trieste, Florence, Ancona, Cagliari
Class 3	Trento, Bari, Reggio Calabria, L'Aquila, Aosta, Perugia, Campobasso

4. Discussion and Conclusions

On the basis of the analysis carried out, three inter-related aspects emerge: (1) the performance of what we refer to as the "technical" quality of local public transport in Italy; (2) the extent and quality of political awareness regarding collective urban transport and its impact on service quality; (3) the Italian legislative context in which the local public transport sector operates.

1. As regards performance in technical quality, the analysis of Italian regional centres reveals different levels of service, and places only five cities in band 1, with seven cities both in band 2 and band 3. In particular, Rome, Naples, Palermo and Bologna recorded the highest levels in the effectiveness (technical as opposed to perceived) of the service provided. In intermediate band 2, seven cities record service levels inferior to those of the top five: Turin, Genoa, Florence, Verona. Trieste. Cagliari and Ancona. The poorest performing cities measured on the basis of the indicators selected are positioned in band 3: Reggio Calabria, Perugia, Trento, L'Aquila, Campobasso and Aosta.

Geographically, no qualitative differences emerge between the north and south of Italy, the latter generally viewed as the economically most problematical area of the country. In fact, both areas have cities placed in the first and third classes. Instead, size in terms of number of inhabitants and area (km^2) appears to be of greater significance. In fact, with some exceptions, the largest cities are those with the highest qualitative performances, confirming the fact that where consolidated policies in support of local public transport are in place allied to restrictions on the use of private cars, service levels improve[3] (Canali *et al.* 2000). A vicious cycle of congestion that negatively impacts collective transport is more likely in cities with no effective urban mobility policy: the greater the use of the motor car, initially justified by the inherent characteristics of this form of transport – comfort, flexibility, capillarity, speed – determines a fall in the demand for public transport, a reduction in service and a subsequent worsening of quality (both measurable and perceived), which leads to a further fall in market share. Such a vicious cycle is accentuated by the fact that increased levels of private transport create greater congestion which proportionally has a more damaging effect on public transport[4] (Musso, Burlando 1999), unless equipped with suitable infrastructure to contrast the impact of private transport. In brief, medium-sized cities, where there

[3] A study carried in 2000 investigating the relationship between government (central and local) mobility policies and the size of urban areas reveals significant differences in the number of policies applied in large cities and medium-sized centres. In particular, the analysis concluded that the quantity and quality of mobility-related measures applied in large cities is markedly greater than in smaller ones. In fact, larger cities have a range of policies that are in general more innovative and which are applied synergically. For more details, see Canali, Musso, Burlando, Pelizzoni (2000).

[4] Congestion negatively affects collective transport more than private transport owing to (i)itinerary rigidities that prevent route optimisation on the basis of traffic conditions; (ii) waiting times at stops, which being a function of the ratio between the average space occurring between two successive vehicles and their speed, will clearly increase with a decrease in vehicle speeds; (iii) delays in timetabled services and subsequent reductions in the reliability and quality of the service offered. The result is that congestion, normally caused by private transport, penalises individual transport to a lesser extent in comparison to collective transport, which in turn acts as further incentive to use private forms of transport. The effect of this is a reduction in local public transport revenues against a backdrop of rising costs due to increased fuel consumption and above all longer driving times for the same route. The effect for the transport operator is a reduced capacity to cover running costs through service-generated revenues; a reduction in the effectiveness of the service offered also negatively impacts business management efficiency. See Musso, Burlando (1999) chapter 9.

are proportionally fewer problems of movement from one place to another and where private transport is the primary mobility solution[5], pay a high price for the limited attention given to public transport in the form of lower technical quality levels. In large cities, where congestion, pollution and negative externalities are urgent issues, local government has long given priority to the development of effective strategies for the organisation of mobility. Local public transport in Italy's largest cities in fact has a higher level of technical quality due to, on one hand, greater attention on the part of local government and the subsequent application of a set of mobility-dedicated measures and, on the other, proportionally less dependence on private transport, which alleviates the vicious cycle described above.

2. An aspect related to public transport performance is the importance given to the question of urban collective mobility by local government. Our analysis of the Italian context reveals overall similarities in funding levels across regional centres. Lower levels of technical quality coincide with municipalities where less is spent on local public transport. It is likely therefore that low technical quality levels stem from, in addition to managerial incapacity, scarce attention to the problem and limited implementation of measures aimed at raising public transport performance. Such measures have been widely discussed in the literature and can be summarised as follows[6]:

- separation of collective transport from private transport and restrictions on the latter in order to break the vicious cycle whereby an increase in private transport determines a worsening in the qualitative level of local public transport;

- increase of intermodality aimed at favouring positive interdependencies between private and public transport;

- infrastructure policies (local public transport dedicated infrastructures including low cost initiatives such as traffic separators for bus lanes);

- innovation in vehicles, services, information technologies, payment systems;

- quality monitoring and control.

Increased political focus on the issue of urban mobility will have a positive effect on local public transport in terms of performance: greater attention to collective transport will create an awareness of the need for a synergic approach in applying the measures outlined above which will in turn shift the emphasis onto government (central and local) rather then the local transport operator as the key player in governing the complex systems of both public and private mobility. With this in mind, greater collaboration is required between government (ultimately responsible for policy decisions in the area of urban mobility) and transport operators, particularly in those cities with the lowest levels of technical quality.

3. A further key element is the legislative setting in which Italian local public transport operates and in particular the current state of reforms started more than 15 years ago. For decades local public transport in Italy has suffered from financial unsustainability allied to an inability to address and respond in quantitative and qualitative terms to the needs of the mobility demand side. The application, albeit belated, of the underlying principles contained in Legislative decree 422/1997 would go some way towards containing (as well as other things) service ineffectiveness. A case in point is the fact that a conduit for improvements is the elimination foreseen by the reform of a

[5] Reference is made here to motorised transport and not to alternatives such as travelling by bicycle or on foot which, due to shorter average distances, may be an attractive alternative. It should be noted, however, that these forms of transport are less feasible in urban areas where the average age of the population is high. In this case, public transport is the more convenient form of transport.

[6] For details regarding the measures, see Musso, Burlando (1999), chapter 8.

protectionist system that effectively prevented transport operators from failing. Legislative decree 422/1997 outlined an extremely innovative institutional and management framework that represented a significant break with the past. Its main features were:

- the transfer of legislative responsibility from central government to regional and local levels. By bringing decision making closer to transport users, the services provided should respond more effectively to the mobility needs of the local community;

- the introduction of tender procedures that sought to discourage the concession of transport services by local government to firms controlled by local government itself. Such practices create monopolistic conditions in which the transport operator, being exempt from market discipline, i.e. the risk of failure, has little incentive to seek operational efficiency.

The overriding aim of the Decree was to reduce the sector's inefficiency and ineffectiveness. However, the liberalisation of local public transport, which has been the subject of heated debate for over 15 years, has yet to come about. Clear, definitive and binding legislation is required in order to bring order to a sector in serious difficulty. The aspects identified at points 2 and 3 above show that the causes for the failure of so many major Italian cities to reach the top performance band (band 1) do not lie exclusively with transport operators. In fact, these cities' poor performance levels can be cogently attributed also to the absence of a coherent approach to mobility at local government level plus a legislative scenario characterised by a plethora of ill-conceived and often contradictory measures.

What emerges from the present work is the need for the periodic production of business data by transport operators to be used in the construction of performance indices. Consistent with the role of planning and control envisaged by the reforms mentioned above, government should determine a method of data collection and index construction that is uniform for all operators. Homogeneousness in these areas will allow for an efficient analysis of transport operators' performances rather than analytical inefficiencies inherent in the present situation. In fact, the marked differences in data collection methodologies lead to scarce comparability of data and excessive collection costs (initial analyses often have to be integrated by interviews regarding single items of data). Without the changes outlined here, a reduction in inequality in local transport services in Italy is not on the immediate horizon.

Although if it is extremely difficult to obtain homogeneous data, future work may lead to use this method for the analysis of the LPT sector in other countries allowing therefore, to carry on comparisons between different cities in different countries.

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