Who must pay for transit services? The users (mainly)

Francesco RAMELLA

144 Via Lamarmora, 13856 Vigliano Biellese, Italy -
Fax +39 011 542883 - email : francesco.ramella@libero.it

Abstract
In the past there have been a number of arguments put forward in favour of public transport subsidization.
Public transport is subsidised for a social purpose, to provide mobility for those who can not afford private travel, and for economic and environmental reasons, to achieve producer economies of scale, user economies of scale and to lower congestion and pollution (second-best pricing).
Public expenditure for public transport differs greatly among European countries. In the main continental countries (Germany, France, Italy) expenses per capita are about four times higher than in Great Britain where deregulation has taken place during the 80's (except for London where route-based tendering has been implemented).
A comparison among these systems has been carried out in order to evaluate costs and benefits of various schemes.

Keys-words*: public transport, deregulation, subsidy, efficiency, effectiveness.*

Résumé
Dans le passé beaucoup d'arguments ont été proposés en faveur de la subvention du transport public. Le transport public est subventionné soit pour un but social, afin de satisfaire les besoins de mobilité des personnes ne disposant pas de voiture, soit pour des raisons économiques et environnementales, afin de réaliser des économies d'échelle pour les producteurs, des économies d'échelle pour les consommateurs et de réduire la congestion et la pollution. La dépense publique pour le transport en commun est très différencié parmi les pays européens. Dans les principaux pays de l'Europe continentale (Allemagne, France, Italie) les dépenses par habitant sont environ quatre fois plus hautes par rapport à la Grande-Bretagne où la déréglementation a eu lieu pendant les années quatre-vingts (à l'exception de Londres où la compétition pour le marché au niveau de chaque ligne a été mise en application). Une comparaison parmi ces systèmes a été effectuée afin d'évaluer les coûts et les avantages des divers arrangements.

Mots-clé: transport public , déréglementation, subvention, efficacité.

Introduction

The aim of this paper is to assess the benefits due to subsidization of local public transport in the main European countries in order to express an evaluation of the overall performance of each regulatory regime. The analysis is organised as follows:

1) brief description of the organisational framework for urban public transport in each country;

2) evaluation of changes in local public transport in Great Britain since deregulation with regard to network extension, service frequency, concessionary fares;

3) evaluation of the unit cost (per bus km and per passenger km), receipt and subsidy of local bus transport in each country;

4) evaluation of the trend of public transport patronage;

5) evaluation of the air quality, congestion and road casualties in British metropolitan areas since public transport deregulation and comparison with other countries;

6) conclusions.

1 Framework for urban public transport

In Italy and Germany the dominant organisational form is the regulated, publicly owned monopoly. Some cities have an alternative regulatory structure, for instance, a network management contract. Limited competition models are going to be adopted by these countries.

The French model is a variant of the limited competition model, based on network management contract with additional contractual incentives.

In London route-based tendering has been implemented, usually associated with gross cost contracts. In Britain, outside London, deregulation has taken place. Public authorities supplement the commercial routes with subsidised services that are competitively tendered.

2 Changes in local public transport in Great Britain since deregulation (network extension, service frequency, concessionary fares)

Between 1970 and 1985/86 local bus service supply outside London decreased by 22%; since deregulation it has increased by 24% (DETR, 1999a). Accessibility to bus services has changed little. In metropolitan areas 92 per cent of households lived within 6 minutes walk of a bus stop in 1996/98, slightly more than in 1985/86. A similar change has taken place in urban areas. In rural areas the proportion has increased from 74 per cent to 77% (Table 1).

Since deregulation, frequency of bus services has increased: the percentage of households with at least one service every 15 minutes was equal to 28 in 1985/86 and to 34 in 1993/95 while the proportion of households with less than one service every sixty minutes fell in the same period from 14 to 10 (Table 2).

Table 1 - Time taken to walk to nearest bus stop: 1985/86 to 1996/98 (percentage of households)

Tableau 1 - Temps nécessaire pour se rendre à l'arrêt du bus le plus proche: de 1985/86 à 1996/98 (pourcentage des ménages)

	Time in minutes 1985/86				Time in minutes 1996/98			
	6 or less	7-13	14-26	27 or more	6 or less	7-13	14-26	27 or more
Metropolitan built-up areas*	91	8	1	-	92	8	1	-
Large urban over 250K	90	8	2	-	90	9	1	-
Medium urban over 25K to 250K	90	8	1	-	91	7	2	-
Small urban 3K to 25K	81	13	3	2	82	11	4	2
Rural	74	13	7	6	77	11	6	6

* Includes the built-up areas of West Midlands, Greater Manchester, Glasgow, Liverpool and Tyne & Wear

Source: DETR (1999b)

Table 2 - Frequency of local bus service: 1985/86 to 1993/95 (percentage of households)

Tableau 2 – Fréquence de service des autobus urbains: de 1985/86 à 1993/95 (pourcentage des ménages)

	1985/86	1993/95
Less frequent than one every 60 minutes	14	10
At least one every 60 minutes	20	17
At least one every 30 minutes	39	39
At least one every 15 minutes	28	34

Source: Own calculations with data from DETR (1998)

Subsidies for concessionary have slightly decreased (-13%).

97 per cent of local authorities have a concessionary fare scheme for elderly people and 48 per cent run a scheme for student. Discount fare schemes are also widely run on a commercial basis.

Previous data shows that the deregulated system satisfies the mobility needs of people who can not afford private travel (captive users).

The increase of service frequencies, with decreasing total costs and subsidies, indicates the empirical weakness of the argument for subsidization of public transport in order to achieve user economies of scale and confirm the theory of "leakage" from subsidy to cost[1].

3 Evaluation of the unit cost (per bus km and per passenger journey), receipt and subsidy of urban bus transport in each selected country

Between 1970 and 1985 the cost per bus-km in Britain metropolitan areas had increased by 25% whilst the cost per passenger journey had increased by 52% (Table 3).

Between 1978 and 1985 subsidies had increased by 41%.

[1] The operating environment facing the operator is such that the incentive to minimise costs is lower than it would be in the absence of a subsidy, and as a result services are provided at above the minimum cost (Tisato, 1995)

Table 3 – Local public transport in Britain metropolitan areas: evolution of the main parameters before and after the deregulation

Tableau 3 – Transport public dans les plus grandes villes en Grande-Bretagne: changement des principaux paramètres avant et après la déréglementation

	1970/1985	1985/1998
Bus km	-15%	19%
Passenger journeys	-30%	-42%
Cost per bus km	26%	-54%
Cost per passenger journey	52%	-5%
Receipts per passenger journey	14%	66%
Public subsidies	41%*	-49%
- concessionary fare reimbursement	32%*	-1%
- public transport support	47%*	-72%

* Between 1978 and 1985

Source: own calculation with data from DETR (1999a) and personal communication with Paul O'Hara (DETR)

After deregulation: the cost per bus-km decreased by 54% and the cost per passenger journey by 5%; public subsidies have been halved: particularly payment to operators decreased by 72% whilst concessionary fare reimbursement have remained unchanged (-1%).

A comparison of costs, receipts and subsidies of bus services in British metropolitan areas (Birmingham, Manchester, Liverpool, Sheffield, Leeds and Newcastle) and those of some selected European countries (France, Germany and Italy) has been carried out.

For Germany and France a sample of medium/large urban areas (data from European Commission, 1998) has been taken into account, while for Italy, data used for comparison are referred to all urban areas.

The following indicators have been calculated (Table 4):

1) Cost per bus km;

2) Cost per passenger km;

3) Passenger receipt (excluding fare reimbursement) per passenger km;

4) Subsidy (+indebtedness) per bus km;

5) Subsidy (+ indebtedness) per passenger km.

Table 4 - Urban bus services in Europe: main economic indicators[2] *[mEURO]*

Tableau 4 – Services de transport public urbain (autobus) en Europe: principaux paramètres économiques [mEURO]

	Germany	Italy	France	Great Britain
Cost per bus km	3,950	3,403	2,800	973
Cost per passenger km	241	220	200	114
Passenger receipts per passenger km	80	59	51	93
Subsidy (+ indebtedness) per bus km	2,376	2,321	1,950	441
Subsidy (+ indebtedness) per passenger km	145	150	139	52

Source: Own calculations with data from DETR (1999a); European Commission (1998); Ministero dei Trasporti e della Navigazione (1998a)

Cost per bus km is four times higher in Germany than in Great Britain; cost per bus km in French and Italian urban areas is 188 per cent and 255 per cent higher respectively than in Great Britain.

On average, cost per passenger km in Germany, France and Italy is twice as high as the Britain figure.

Receipts per passenger km in Britain are 16 per cent higher than in Germany and nearly 70% higher than in Italy and France.

Subsidy (+ indebtedness) per bus km in continental Europe is about five times higher than in Britain and subsidy (+ indebtedness) per passenger km is about three times higher[3].

4 Evaluation of the trend of public transport patronage

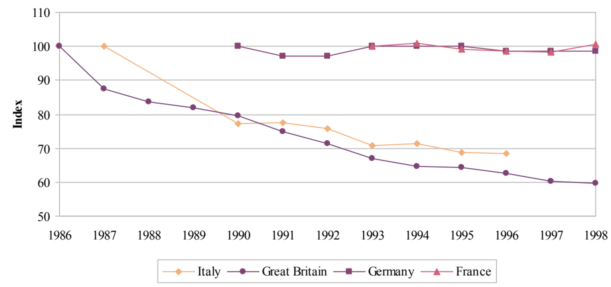
In British metropolitan areas, since deregulation, there has been a strong decline in bus services patronage: between 1986 and 1998 the number of passenger journeys decreased by 40 per cent. A similar change occurred in Italy where the number of passenger km of the bus services in the urban areas decreased by 32 per cent between 1987 and 1996. In Germany (all local public transport services) and France (all services in urban areas with more than 100.000 citizens, excluding Paris) patronage during the last decade has remained unchanged (Figure 1).

[2] Cost per passenger km in Great Britain is lower than the sum of receipts and subsidies because companies earn a profit; the difference between cost per passenger km and the sum of receipts and subsidy in France, Germany and Italy, is equal to the other (non-traffic) revenues.

[3] A comparison carried out between an Italian (ATAF, Firenze) and a British company (First Mailine, Sheffield) which operates in similar urban areas (about the same average speed - 15,81 km/h vs. 15,79 - and number of vehicle used during the peak hour - 350 vs. 353 -) gives a picture broadly similar to that referred to the countries as a whole. In Florence: 1) cost per bus km is 300% higher; 2) cost per passenger km is 48% higher; 3) receipts per passenger km are 52% lower; 4) subsidy + indebtedness per passenger km is 401% higher (Ramella, 2002).

Figure 1 – Urban bus services in Europe: patronage*

Figure 1 – Services des tranport public urbain en Europe: fréquentation moyenne



* data for Germany are referred to the whole local public transport sector

Source: Own calculations with data from DETR (1999a); European Commission (1998); Ministero dei Trasporti e della Navigazione, (1998a); Ministero dei Trasporti e della Navigazione (1998a)

5 Evaluation of the air quality in British metropolitan areas since 1992[4]

Subsidization of public transport is usually deemed desirable as a measure to improve the air quality trough a reduction of private cars travel.

But, which role may public transport play in order to achieve this aim?

According to the WHO (1999), PM_{10} (particulate matter with an aerodynamic diameter of less than 10 mm) is an excellent indicator of the health-relevant air pollution mixture.

Long term evolution of PM_{10} in European urban areas shows a strong improvement. In Paris the winter mean concentration of PM_5 between 1956 and 1998 decreased from 180 $\mu g/m^3$ to 30 $\mu g/m^3$ in 1998 (AIRPARIF, 1999).

In British metropolitan areas annual mean concentration of PM_{10} decreased by 5-7% each year between 1992 and 2000 and the air quality standards provided for the European directive 30/99 (24 hour mean not to exceed 50 $\mu g/m^3$ more than 35 times a year, annual mean not to exceed 40 $\mu g/m^3$) are already fulfilled (Figure 2 and Figure 3).

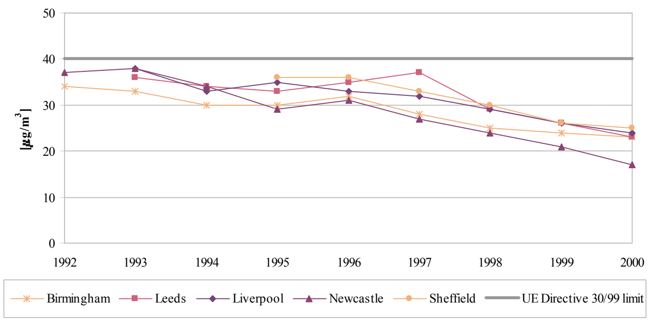
Previous data clearly show that the leading factor in shaping the air quality has been (and will be) technological improvement of vehicles whilst any realistic change of the modal split between car and public transport may have only a minimal impact[5].

[4] Data for previous years do not exist

[5] It seems reasonable to draw a similar conclusion with reference to noise pollution. On the other hand, a different modal split between private car and public transport could, in theory, lead to a significant reduction of CO_2 emissions. But the empirical evidence shows the following: the existence of a high-quality collective transportation system, both at the local and national level, does not cause any significant reduction of private car utilisation (except for limited areas in city centres) as confirmed by comparing the annual distances driven in automobiles per inhabitant in Europe (EU15) with that of the Netherlands and Switzerland, countries that probably have the two best collective transportation networks on the continent. In 1995, slightly fewer than 10.000 kilometres in the Netherlands and over 9,500 km in Switzerland were recorded, in comparison with the 10.454 km driven in Europe.

Figure 2 – Annual mean concentration of PM_{10} in British metropolitan areas between 1992 and 2000

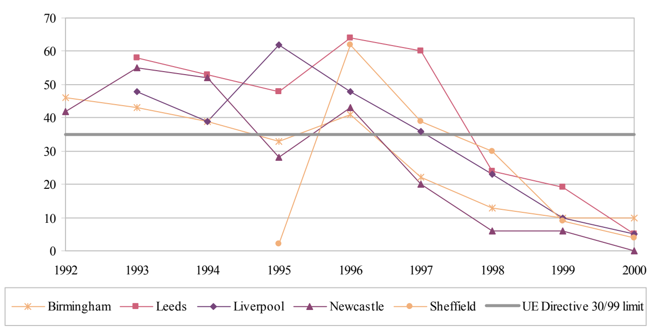
Figure 2 – PM_{10}, moyenne annuelle dans les plus grandes villes en Grande-Bretagne de 1992 à 2000



Source: own calculation with data from Department for Environment, Food and Rural Affairs (2001)

Figure 3 – Periods with 24 hour mean concentration of PM_{10} > 50 µg/m³ in British metropolitan areas between 1992 and 2000

Figure 3 – PM_{10}, moyenne journalière: dépassements de 50 µg/m³ dans les plus grandes villes en Grande-Bretagne de 1992 à 2000



Source: own calculation with data from Department for Environment, Food and Rural Affairs (2001)

6 Evaluation of road casualties and congestion in British metropolitan areas since public transport deregulation and comparison with other countries

Is subsidization of public transport useful in order to lower congestion and road accidents?

Road accidents. First of all it should be noted that in Europe the mortality rate, that is the ratio between number of people killed and number of passenger km, has decreased between 1970 and 1996 fourfold.

Moreover the present situation is not uniform: the mortality rate in the United Kingdom (six people killed per one billion passenger km) is about half the rate in Germany, France and Italy (between eleven and thirteen people killed per one billion passenger km).

Between 1986 and 1998, in British metropolitan areas, the number of passenger km by private car increased by 32% (Great Manchester and Merseyside) and 78% (Tyne and Wear) while the number of passenger journeys by bus decreased by an average of 40%.

In the same period the number of people killed per passenger km decreased by a minimum of 61% (Great Manchester and Merseyside) and a maximum of 72% (Tyne and Wear). The ratio between number of people killed and population declined on average by 50%. A similar trend has been registered for the number of people seriously injured.

Table 5 - Road casualties in British metropolitan areas: changes over 1986-1998

Tableau 5 – Accidents de la route dans les plus grandes villes en Grande-Bretagne: évolution de 1986 à 1998

	West Midlands	G. Manchester and Merseyside	South and West Yorkshire	Tyne & Wear
Number of passenger km in 1986 [million]	13,133	20,200	18,226	4,321
Number of passenger km in 1998 [million]	18,971	26,567	26,197	7,688
Percentage change over 1986-1998	44%	32%	44%	78%
Population in 1986 [thousand]	2,651	4,081	3,386	1,143
Population in 1998 [thousand]	2,628	3,986	3,417	1,116
Percentage change over 1986-1998	-1%	-2%	1%	-2%
Killed in 1986	191	302	331	77
Killed in 1998	96	154	162	38
Seriously injured in 1986	3,260	3,297	3,535	971
Seriously injured in 1998	1,966	1,615	1,919	423
Percentage change of killed per passenger km over 1986-1998	-65%	-61%	-66%	-72%
Percentage change of killed per population over 1986-1998	-49%	-48%	-52%	-49%
Percentage change of seriously injured per passenger km over 1986-1998	-58%	-63%	-62%	-76%
Percentage change of seriously injured per population over 1986-1998	-39%	-50%	-46%	-55%

Source: Own calculations with data from DETR (1999c), DETR (2000)

These data show that any reduction of road casualties achievable by a modal shift from private cars to public transport through subsidisation of the latter would be minuscule if compared to the results achieved as a result of technology (improvement of car safety) and an effective road safety policy like the British one.

Let us now consider congestion.

A modal shift from private cars to public transport is often deemed desirable in order to lessen congestion. But is this idea correct?

Assuming that every person moving had the same value of time, an improvement of mobility would be obtained through a reduction of the average journey time of people travelling by car and of people using public transport, that is an increase of the average speed.

With reference to this principle the change occurring in the British urban areas with a population of more than 250,000 (excluding London) between 1985/86 and 1993/95 has been analysed (data from DETR, 1998).

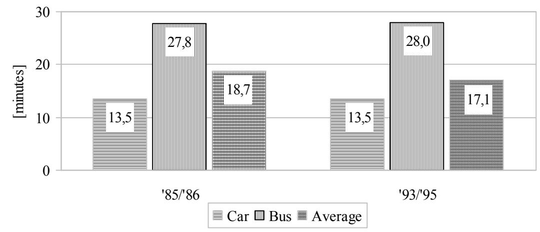
Taking into account all the journeys (except those longer than 10 miles), an increase of the average distance from 5.9 to 6.1 km has been calculated while the average "door to door" travel time decreased from 18.7 to 17.1 minutes (an average speed increase of 13.2%). This improvement has been due to the shift from the slower mode (public transport) to the faster one (car) (Figure 4).

A similar trend emerged with reference to commuting journeys whose average time decreased by 6 per cent (an average speed increase of 12.8%) (Figure 5).

It is interesting to note that, with reference to the whole of Great Britain (excluding London), the average travel time by car (20 minutes) and by bus (29 minutes) remained almost unchanged between 1975/76 and 1996/98.

Figure 4 - Average time ("door to door") of journeys in British urban areas with a population of over 250,000 ('85/'86 and '93/'95)

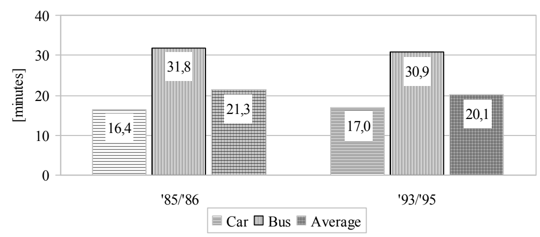
Figure 4 – Durée moyenne ("door to door") des déplacements dans les villes britanniques avec plus de 250000 habitants ('85/'86 et '93/'95)



Source: Own calculations with data from DETR 1998

Figure 5 - Average time ("door to door") of commuting journeys in British urban areas with a population of over 250,000 ('85/'86 and '93/'95)

Figure 5 – Durée moyenne ("door to door") des déplacements au travail dans les villles britanniques avec plus de 250000 habitants ('85/'86 et '93/'95)

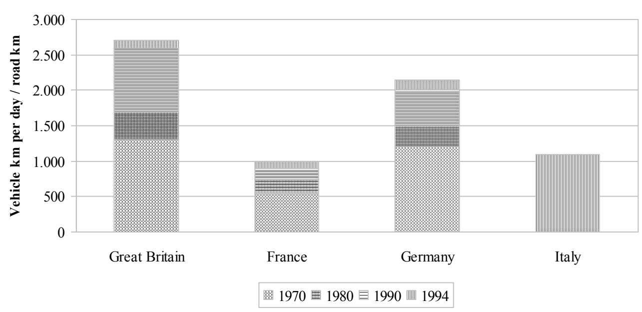


Source: Own calculations with data from DETR 1998

This evolution has taken place during a period of low investment for the extension of the road network. According to the ECMT (1999), the present ratio between traffic (in terms of vehicle km) and road extension in Great Britain is higher than that of France, Germany and Italy: this indicator has increased by 60% from 1980 to 1994 (Figure 6).

Figure 6 - Traffic/road extension ratio in some European countries: change over 1970 – 1994 [vehicle km per day / road km]

Figure 6 – Circulation routiere /extension des routes dans quelques pays européens: variation de 1970 à 1994 [véhicules-kilomètres journaliers / routes-km]



Source: ECMT (1999)

A change similar to that of the British urban areas has occurred in Paris. Here, between 1976 and 1991, the average speed of all journeys increased both for public transport (+10%) and for private cars (+5%). Due to the modal shift from public transport to private cars the overall increase (public and private transport together) has been higher (+12%) that that of each mode (Prud'homme, 1999).

The above data shows that subsidisation of public transport in order to increase the average speed of journeys through a modal shift from private to public transport seems not to be a policy that works.

But, since the value of time is not equal among different people, could subsidisation be justified in terms of efficiency? In other words, would it be worthwhile to subsidize people with a "low" value of time in order to make them use public transport so that people who have an "high" value of time could move faster achieving this way a net benefit?

The answer depends upon cross-price elasticity between public and private transport.

Hensher (1986) found the cross-price elasticity to be less than 0.1, and often lower.

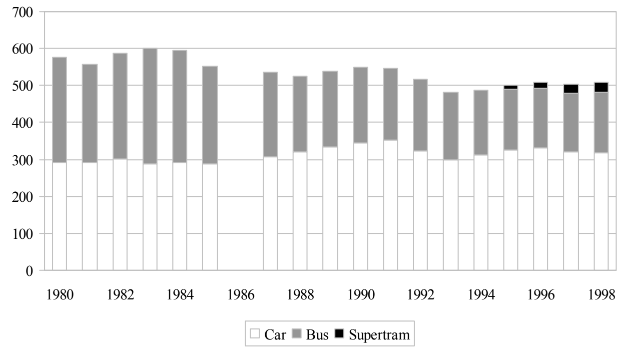
Two recent cases clearly confirm this figure.

The first one is the construction of a tramway system in Sheffield (UK). This system, built in the first half of the nineties, is made up of three sections which join up in the city centre. The overall extension of the system is 30 km. The project cost was about 450 million Euros (constant prices).

According to the analysis carried out by Sheffield City Council, since 1994, when the tramway began running, there has been no decrease of the number of people crossing the central area cordon by car, while there has been an increase of people entering and exiting the city centre (an increase of 22,000 persons between 1994 and 1998 where there had been a decrease by 64,000 unit between 1985 and 1994) (Table 6).

Table 6 - Persons crossing Sheffield central area cordon by vehicle type 1980-1998 (average weekday 0700 – 1900 hours) [thousand]

Table 6 – Personnes qui traversent le cordon autour du centre ville à Sheffield pour chaque mode de transport 1980-1998 (jour moyen de 0700 à 1900 heures) [milliers]



Source: Sheffield City Council Planning, Transport and Highways Service (2000)

Gerondeau (1999) shows similar data with reference to the subway built in Toulouse (France) which started operating in 1993 and whose cost was about 500 million Euros.

Due to the new infrastructure, patronage of public transport has increased by 30 per cent. But the number of journeys by private cars has not changed by as much. Before the building of the subway, public transport had a share of 20 per cent of motorised journeys. So the increase of public transport has been equal to 6% of the journeys within the metropolitan area. Only a quarter of the additional passengers of public transport has been attracted away from private cars, the other ones being "new" journeys due to the increase of supply. Therefore road traffic decreased by a minuscule 1 per cent.

7 Conclusions

This paper has tried to find out if the present level of subsidization of urban public transport in some selected European countries could be deemed worthwhile on the ground of the theoretical arguments that have been put forward in the past in favour of this kind of policy.

As reference the case of Great Britain, where public transport has been deregulated since 1986, has been analysed.

It has been found that:

1) Efficiency (cost per vehicle km) of public transport in British metropolitan areas is on average 3.5 times higher than in Germany, France and Italy;

2) Effectiveness (cost per passenger km) is about twofold in British metropolitan areas;

3) Subsidization per passenger km is three times lower in Britain metropolitan areas.

It has been showed that a different modal split between private and public transport could bring minimal benefits in terms of air quality improvement as the largely predominating factor in the development of emissions is represented by the reduction of unit emissions obtained thanks to technological evolution.

The UK as a whole shows a mortality rate for road accidents that is about half that of Germany, France and Italy. In British metropolitan areas, that is the places where public transport patronage has declined most after deregulation, the number of people killed or seriously injured has dramatically decreased. These figures show that any eventual shift from private cars to public transport would make possible little gain in terms of safety if compared to those achievable through technological improvement and road safety policy. Moreover the benefit would be almost completely internalised by people changing their mode of transport.

Congestion. In British urban areas the modal shift from public transport to private cars has brought about an increase in the average speed of motorised journeys. On the other hand even large investments in public transport do not lead to an appreciable decrease in journeys by private cars.

The empirical evidence shows that subsidization of public transport seems to be worthwhile only on social grounds and that the aim of satisfying the mobility needs of people without access to a car can be fulfilled with much lower levels of subsidization than the present ones in Germany, France and Italy.

Further research could be carried out in order to better understand how the differences of taxes among countries affect the cost of services and to quantify the potential role of public transport in lowering noise pollution.

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