FOREWORD

This is the final report of a RESEARCH project, carried out at European (EU+Norway) level, and not a consultancy project aimed at a specific set of clients. Its recommendations should be realistic but must not be interpreted as directly applicable to any specific case.

Although our consortium includes direct participation from operators, authorities and associations of both these types of entities (besides consultants, universities, and official research institutes), our research and discussions have been held with a spirit of strong intellectual independence. Thus the fact that one entity belongs to the consortium should not be interpreted as if that entity necessarily subscribes all the points of view and recommendations expressed in this report for application to its city.
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PARTNERSHIP

The ISOTOPE Project was developed by the following consortium:

**Project Co-ordinator:**

TIS - Transportes Inovação e Sistemas a.c.e., Lisbon, Portugal

**Project Manager:**

OGM - Organisation Gestion Marketing s.a., Brussels, Belgium

**Other Full partners:**

CERTU Centre d'Etudes sur les Réseaux, les Transports, l'Urbanisme et les Constructions Publiques, Lyon, France
UTP Union des Transports Publics, Paris, France
ITS University of Leeds, Institute for Transport Studies, Leeds, GB

**Associated partners:**

STIB – Société des Transports Intercommunaux de Bruxelles, Brussels (BE);
VTI – Swedish Road and Transport Research Institute, Linköping (SE);
GART – Groupement des Autorités Responsables de Transport, Paris (FR);
HFA – Halcrow Fox and Associates, London (GB);
STUVA – Studiengeselsschaft fuer unterirdische verkehrsanlagen, Köln (DE);
NEA – Transport Research and Training Education, Rijswijk (NL);
INECO – Ingenieria y Economia del Transporte, Madrid (ES);
GMPTE – Greater Manchester Passenger Transport Executive, Manchester (GB);
SIKA – Swedish Institute for Transport and Communications Analysis, Stockholm (SE);
TOI – Institut of Transport Economics, Oslo (NO);
Trans-Por – Fundo para o Desenvolvimento do Ensino Avançado e da Investigação em Sistemas de Transportes, Lisbon (PT);
ERASMUS – Erasmus University of Rotterdam, Rotterdam (NL);
University of Stockholm (SE).
GLOBAL PROJECT SYNTHESYS

The stated objectives of the ISOTOPE project were:

- To describe and compare existing legal status and organisational structures for public urban transport operations in urban areas in the European countries, and to analyse the pros and the cons of those forms in terms of effectiveness and efficiency.

- To provide a strategic approach to the development of urban public transport operations to political decisions-makers, transport planning authorities, public transport authorities and operators; this appraisal will identify how organisational structures may be improved, respecting the political, legal and doctrinal frameworks of each country, in order to determine the role of public transport in European urban areas.

The approach chosen to undertake this study divided the analytical part of the research in two parts: Economic and Political research.

In the Political research the aim was to identify the various existing organisational structures and legal frameworks and evaluate their effectiveness and appropriateness from both the social and political points of view, as well as the capacity of the existing systems to contribute to the strategic objectives of the internal market and converge towards the main European orientations.

In the Economic research the aim was to evaluate the efficiency of the different organisational systems in both demand and supply side perspectives, through the identification of variables and criteria that will allow to establish significant relationships between objective variables reflecting efficiency in production in one hand and the ones reflecting efficiency in consumption in the other hand.

To support the survey a two-parts questionnaire was created and addressed to the Authorities and Operators of the cities surveyed:

Factual questionnaire - Covering the system description and economic and financial aspects, these last ones mainly conceived to produce inputs to the Economic research;

Opinion questionnaire - Covering the different aspects of the relationship between Authorities and Operators, as well as the evolution of the systems in time considering their legal, regulatory and political aspects. This questionnaire was dedicated to produce inputs to the Political research.

The questionnaires were divided in several sections, each being devoted to a specific topic and with a specific objective:

<table>
<thead>
<tr>
<th>Factual questionnaire</th>
</tr>
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<tbody>
<tr>
<td><strong>TOPIC</strong></td>
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<td>-------------------</td>
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</tbody>
</table>

2
<table>
<thead>
<tr>
<th>General description of the system</th>
<th>1-1 Authorities</th>
<th>To provide information on Authorities main competencies and respective geographical coverage.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-2 Transport operators</td>
<td>To provide information about the capital structure and ownership; the modes currently operated and to know whether or not there is an integration in a group of companies.</td>
</tr>
<tr>
<td></td>
<td>3 Functional responsibilities</td>
<td>To provide information about the division of responsibilities experienced in the different systems.</td>
</tr>
<tr>
<td></td>
<td>1-4 Forms of relationship</td>
<td>To provide information about the type of organisational forms adopted in each system and mode.</td>
</tr>
<tr>
<td></td>
<td>1-5 Financing of public transport</td>
<td>To provide information about the sources of funds for current operation and investments mostly used.</td>
</tr>
<tr>
<td></td>
<td>1-6 Responsibilities for investment</td>
<td>To provide information on the division of responsibilities concerning financial issue in complement of the information obtained in section 1.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantitative description of the system</th>
<th>2-1 General information on Public Transport urban framework (supplied by authorities only)</th>
<th>To provide information about the local context of the transport system (population, employment, market share, etc), as well as market structure information.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2-2 Information on Public Transport market.</td>
<td>To provide market share information.</td>
</tr>
<tr>
<td></td>
<td>2-3 Information on public transport revenue and costs (supplied by operators only)</td>
<td>To provide information on operators performance and efficiency.</td>
</tr>
<tr>
<td></td>
<td>2-4 Contracted services (between Authorities and Operators)</td>
<td>To provide information to assess the actual penetration of the tendering procedures in the sector.</td>
</tr>
</tbody>
</table>

| Opinion questionnaire |
|-----------------------|------------------|-----------------|
| TOPIC | SECTIONS | OBJECTIVES |
| Policy | Political changes | To provide information about the expected evolution of the different systems in time. |
Table 1 - ISOTOPE - CITIES SURVEYED

<table>
<thead>
<tr>
<th>Country</th>
<th>Very large (A) (&gt; 2 millions inh.)</th>
<th>Large (B-C) (between 1 and 2 millions inh.)</th>
<th>Medium (D-E) (between 200,000 and 1 million inh.)</th>
<th>Small (F) (&lt;200,000 inh.)</th>
<th>TOTAL (Factual Q. / Opinion Q.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Graz*</td>
<td></td>
<td></td>
<td></td>
<td>1/1</td>
</tr>
<tr>
<td>Country</td>
<td>Region(s)</td>
<td>Cities</td>
<td>Factual Questionnaire</td>
<td>Opinion Questionnaire</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>Wallone (region)* Flandres (region)*</td>
<td>Brussels*, Charleroi*, Liège, Ghent*, Bruges*</td>
<td>7/6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
<td>Copenhagen, Aarhus, Randers, Bornholm, Odense, Vejle</td>
<td>6/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>Athens*</td>
<td>Thessaloniki</td>
<td></td>
<td>2/1</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Lyon*, Lille, Marseille*</td>
<td>Bordeaux, Toulouse*, Nantes, Nancy*, Tours, Valence, St-Etienne, Orléans*, Poitiers*, Montpellier, Dijon*, Angers, Brest, Caen, Dunkerque, Mulhouse</td>
<td>22/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td></td>
<td>Helsinki*</td>
<td></td>
<td>1/1</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>Roma*</td>
<td>Milano, Bologna, Catania</td>
<td></td>
<td>5/2</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>Dublin</td>
<td>Cork</td>
<td></td>
<td>2/0</td>
<td></td>
</tr>
<tr>
<td>Luxemburg</td>
<td></td>
<td></td>
<td></td>
<td>1/1</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td></td>
<td>Oslo*, Bergen, Drammen, Kristiansand*, Tromso</td>
<td></td>
<td>5/2</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>Amsterdam*, Rotterdam</td>
<td>Den Haag, Utrecht, Arnhem*</td>
<td></td>
<td>7/3</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>Stockholm</td>
<td>Göteborg*, Malmö, Linköping, Jönköping</td>
<td></td>
<td>5/1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>109/57</td>
<td></td>
</tr>
</tbody>
</table>

x/y = n° of cities that received Factual Questionnaire / n° of cities that also received the opinion questionnaire. The stars indicate the cities that received both questionnaires.

The Political Research addressed the following areas:

- Categorisation of political choices, legal status and organisational structures.
- Detection of potential conflicts in each category.
- Analysis of historical tensions and evolution in each category.
- Strategic evaluation - threats and opportunities, strong and weak points and innovative practices.
The research identified three main categories of legal frameworks for urban public transport:

- **Regulated, publicly owned monopolies (« the classical model »).** This is the dominant organisational form in 10 member states (AT, BE, DE, ES, LU, GR, IT, NL, PT), although there may in these states be some cities that have variations on this regulatory structure (e.g. regulated, private monopoly) or may have an alternative regulatory structure (e.g. some cities in ES have network management contracts).

- **Limited Competition Models.** This has a number of variants. The two most common are the Scandinavian model, based on minimum cost tenders at a route level and represented in three member states (DK, FI, SE), with a variant also in Norway, and the French model, based on network management contracts, which is common in FR.

- **Deregulated, Free Market Models.** This is the dominant form in GB outside London. In London, route based tendering has been implemented.

Inside these frameworks, the different forms of organisational systems have been categorised as follows, in relation with the source of the initiative (action of the actor that first proposes, undertakes or organises public transport):

The main conclusions taken from this analysis were:

- UPT performances rely on a framework involving in an appropriate way both authorities and operators. Distinct roles have to be assumed by each of these partners. The user is considered as also having to be involved in the evolution of the UPT system, e.g. in terms of the assessment of UPT performance;
• among the improvements that can be brought to the present situation, we identified the necessity of respecting basic management principles (correct definition of objectives, and existence of assessment procedures for both the authorities and the operators) and the necessity for a more systemic approach of UPT;
• a large majority of respondents expect changes in the near future, in relation with issues which are on the European orientation agenda (green papers on citizens’ network, fair and efficient pricing, public procurement); there is undoubtedly a general agreement on the priorities for the coming evolution of UPT system between authorities and operators;
• the level of satisfaction among the different organisational regimes analysed is relatively high, with a higher level of criticism in the «deregulated» regime, and a higher level of expected change in the «regulated» regime.
• In all the different legal frameworks, both the urban authorities in charge of public transport and the operators consider the present system as efficient, effective and appropriate. They accept the fact that external actors, as electors (tax payers), press, mediator or motorcar associations, have a less positive perception of the present situation.
• It appears that the UPT consumers’ perception of the situation is more positive in a « limited competitive » regime or in a « regulated » framework.

The objective of the economic research work was to apply economic analysis to urban public transport, at both a theoretical and an empirical level, in order to assess efficiency in terms of both production and consumption. Our study is the first attempt to look systematically at this issue for urban transport at the European level. In so doing we aim to identify the organisational and regulatory features of systems that are efficient in both production and consumption.

The main conclusions taken from the economic research were:

Deregulated markets have theoretical and empirical advantages in terms of efficiency of production. Regulated markets have theoretical and empirical advantages in terms of efficiency in consumption. Limited competition markets may have advantages of both. Overall, we find some support for the Citizens’ Network Green Paper’s preference for some form of limited competition model.

However, the main advantage of such models is not "to provide an environment which gives operators an incentive to raise standards whilst safeguarding system integration" (although they can do this) but in increasing efficiency in production whilst maintaining or improving efficiency in consumption. Work in WP3 suggests that in some areas, reductions in unit operating costs of up to 50% are possible. Where redundancies and wage reductions are not possible these reductions will reduce to around 15% but are still likely to be the main gain of introducing competitive tendering to commercialised but publicly owned and/or regulated operations. These cost savings could then be used to improve the quality of public transport services, the quality of other public services or to

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1 Definitions used:
Efficient : achieving the maximum output for the current level of input.
Effective : achieving the stated objectives.
Appropriate: objectives and outputs reflect real needs in the Community and are considered as priorities.
reduce taxation. In order to make such gains, it may be necessary to restructure the bus industry in many member states and to develop and enforce appropriate competition policy.

It is also worth making a number of points that should be addressed by future researchers: Firstly, our work has been affected by a number of data problems that stem from a lack of consistent data on urban transport operations at a European level. There were a large number of comparability issues that the ISOTOPE database, given its limited resources, was unable to overcome. Given the large amounts of taxpayers money that urban public transport receives it would be in the public interest for a consistent set of data to be collected so that assessments of value for money could be made. Any move to comprehensive competitive tendering would require such a database to be constructed.

Secondly, we have outlined at least three forms of competitive tendering that could be applied to urban public transport. We believe that future work should make a more detailed assessment of these three forms and explore the large number of possible variants. The link between organisational and regulatory structure should be also explored in more detail.

Thirdly, in considering the trade-off between efficiency in production and consumption it is clear that the former is more readily measurable than the latter. This may have resulted in an over emphasis on cost cutting at the expense of quality improvements. Consumer surplus (expressed as per passenger km) might be considered as a possible summary measure of efficiency in consumption.

Based on the work of these WP’s, the final part of the project was dedicated to a process of synthesis, during which we tried to develop a structured understanding of the mutual implications of several decision areas, as well as to define a process to present the recommendations deriving from our work.

Since UPT is a durable component of urban life, definitions about its regulatory system must consider not only matters of efficiency in production and consumption, but also the implications of those decisions on the capacity to influence future choices about the evolution of the system itself, arising from the distribution of information and power among the actors (authorities and operators).

To facilitate consideration of all these aspects, the production of recommendations was preceded by a systematic review of the stakeholders in the systems and their goals. Three levels are recognised: policy goals, customers’ goals, and agents’ goals.

The structure used for presentation of the project recommendations is based on the recognition that varying local conditions and constraints will make the best choices different from one city to another, and tries to successively address all the major regulatory questions of the sector, openly presenting the arguments in favour of each choice.

For an overview of the project recommendations we refer to the executive summary.
The ISOTOPE project was developed with the work of a large consortium of 18 partners during one and half year and had the support of the European Action Team of UITP and ECMR as members of the Advisory Committee of the project.

A very important and indispensable participation that deserves to be highlight was received from authorities and operators of 109 European cities who have kindly accepted to answer the questionnaires that supported our survey, some of which have also participate in our working seminars.

The fact that this was a project which had a strong need for discussion and dissemination of ideas and organisational schemes was clearly reflected in the composition of the consortium where the diversity of entities involved enabled the consortium a deep internal discussion of the political and organisational choices in analysis.

The extension of the survey undertaken and consequent work of analysis represented an workload that largely exceeded the initial estimates, and demanded for an intensive dissemination plan which allowed to share and discuss our ideas and conclusions with the “organised world of public transportat”.

The following steps were included in this dissemination plan:
- presentation of the project using common set of slides to the authorities and operators of the countries involved
- production and distribution of a presentation booklet
- intermediate seminar held in Lisbon (after 10 months work) to present and discuss the data collected in the survey
- pre-seminar held in Dresden to present and discuss the conclusions of the project
- production and distribution of a final booklet summarising the main conclusions
- final conference held in Amsterdam to present the final report of the project.
EXECUTIVE SUMMARY

1. Evolution of European urban societies, largely based on increasing purchasing powers, has led to a reduction in the percentage of people who directly depend on public transport for their motorised mobility. But the big number of cars moving in our cities has created a new type of “collective need” for the use of public transport, as it is recognised that its role is essential to fight traffic congestion and environmental aggression. This has created a new policy framework for UPT, in parallel with the pressure for reduction in subsidies, resulting from the fact that UPT is considered a merit good for minorities, directly competing for those subsidies with other merit goods.

On the supply side of the system, the biggest change is the development of efforts to improve cost efficiency, in many cases through the introduction of elements of competitive pressure, the form of which has presented some variety. More recently, there are organised efforts to promote quality of service, again with some variety of form.

2. Type of competitive pressure is the key for our main classification of regulatory regimes: “deregulated”, where operators can freely establish themselves in direct, on-street competition, “limited competition” where authorities define the transport product to be delivered and open tenders for its execution by candidate operators, and “regulated”, where a monopolistic (normally publicly owned) company is charged with the operation of the system and the only forms of competitive pressure are indirect – longitudinal analysis of its own performance and benchmarking against operators in other cities;

3. In our representation of the UPT system, we identify three levels of planning and control: strategic level (defining goals, targets and constraints), tactical level (product specification: network, timetables, type of vehicles, interconnection between modes, types of services), and operational (organising the actual production of transport), and discuss the allocation of responsibilities for execution of the corresponding tasks, as well as the nature of the (contractual) relationships between those agents;

4. We list the main types of contracts for allocation of the responsibilities and risks at the operational level: gross cost contracts, net cost contracts, and management contracts, as well as, in each case, the role and scope of bonus / penalty clauses in such contracts, and the procedures for tendering in each of those. The main types of conflicts and mechanisms for their resolution are also passed under review;

5. The issues of service integration is covered with some depth, in all its three dimensions: physical, tariff, and logical integration, and the degrees of compatibility of these requirements with each of the main regulatory regimes are discussed. (Logical integration means that the whole range of public transport services and facilities must be seen by the customers as forming a co-ordinated set. In particular this must translate into a consistent and comprehensive provision of information about all parts of that system);
6. **Continuous improvement of service** (and its impacts on revenues and costs) is identified, as well as the main components of the management system needed to achieve it, and the different approaches to it that can be taken under each of the main types of contract;

7. **Toolboxes for authorities and operators** to improve public transport are reviewed covering the perspective of both types of agents, but also the basic conditions regarding system information to allow the efficient use of toolboxes.

8. The production of recommendations is preceded by a systematic review of the stakeholders in the systems and their goals. Three levels are recognised: policy goals (representing the community at large), customers’ goals, and agents’ goals (representing authorities and operators). Then, the **key regulatory issues** are identified, and for each of them we present our recommendations (which must be perceived as directed at the “mainstream” of UPT systems, and not to any system in particular):

   a) **Who takes initiative of UPT:**
      Our research indicates that the allocation of the initiative of creation and specification of UPT is best left with the authorities, based on the fact that the “deregulated” system (where this initiative is on the side of the operators) favours economic allocative efficiency in the first place, but is in lack of instruments to ensure adequate representation of collective goals (i.e. fighting congestion in specific areas), as well as integration or stability of supply.

   b) **What is the role of Authorities, at the political and administrative level:**
      Although this is still seldom practised, there is advantage in formally separating the strategic and tactical stages in the definition of the UPT product. The strategic stage should be the object of decision by the political bodies, who must specify the policy goals and define targets to be met at each of those goals. In doing this they may be assisted by the administration for information on the supplementary measures possibly needed and on the marginal costs of improvement from the current situation towards achievement of each of those goals.

      The technical complexity of the network design process implies that higher levels of technical competence may lead to much more efficient network specifications for a given set of policy targets. It makes little sense to engage all sorts of efforts in the promotion of cost efficiency of operations, and forget that similar or larger economies could probably be obtained at the design stage, whilst preserving intact the levels of service specified at the strategic stage. For this reason we recommend that network design should be made by a professional team under control of the administrative authority (possibly under a limited tender). The strategic importance of information about demand and the need for stability in the product offered to the public recommend that operators be given a chance to improve this network design during their contract, in close cooperation with the authority.
c) What is the most appropriate territorial level of authority for Public Transport:
The basic principles here are subsidiarity and proportionality. The institution that fulfils the role of the Authority for UPT must have the representation of the communities with a direct stake in the system, and could adopt one of several forms, depending on local conditions. If there are several local communities involved, the weight of each of those should be proportional to some relevant indicator, for instance total number of inhabitants, number of inhabitants enjoying a certain level of service, or other. Direct representation of higher levels of the political power is possibly not an advantage, although there should be clear rules defining the framework for obtaining co-financing from those higher levels for heavier investment projects.

d) What other competencies should be attributed to the authority responsible for UPT:
We conclude for the advantage of including all aspects of urban mobility in the same administrative agency, which thus covers all areas related to public and individual transport, namely traffic management and parking. The integration with land-use planning and management is useful but more on a planning level, less on an operational level. For this, we suggest different administrative agencies, possibly under the co-ordination of the same political department.

e) What is the regulatory regime that represents the best choice for a fresh start:
We have stated above that the deregulated regime is prone to give higher productive efficiency, but is incapable of adequately providing the necessary integration and stability of supply (especially in the installation phase). For the choice between “limited competition” and “regulated”, it is essential to consider the level of political will and technical competence on the public side. A regulated system has less risks of total rupture, but a higher risk of complacency between authority and public company. Besides, the higher production costs it entails may imply a slower adaptation to the evolution of needs of the customers and of the city as a whole (unless there is a strong financial basis for continued public expenditure). So, if the political will and the technical competence of the authority are present, we think that a “limited competition” regime is the best choice, since the stability of the system can be maintained at lower costs and with improved prospects for permanent improvement.

f) What are the adequate (contractual) frameworks for best achievement of the goals as stated above:
In the deregulated regime, competition is done on the street, but that raises problems of integration, instability of supply and greater inequity in the levels of service, besides the fact that the policy goals of congestion relief and environmental protection are harder to contemplate. After some years, competition pressure may diminish due to the formation of oligopolies, thus possibly lowering the mid- and long term economic efficiency of such systems. Despite these disadvantages the drawback of deregulatory system can be partially recovered by giving a stronger legal protection to the quality partnerships between authorities and operators that tend to increase in this environment. In a regulated regime, direct competition is only possible at the level of sub-contract suppliers, so efficiency gains must be sought with
instruments of indirect competition. We identify two instruments, which may be applied alternatively or jointly:

- **Internal, longitudinal comparability**: the operating company compares its own performance along time, identifies trajectories of key indicators and defines targets for them;
- **External, cross-sectional comparability (benchmarking)**: the operating company compares its performance at certain moments with that of other operating companies, which presupposes a minimum of harmonisation of accounting procedures and statistic indicators. An international project for harmonisation in this domain would be very useful, since the dimension of possible comparisons would be significantly enhanced.

In the case of the “limited competition” regime, since there may be conflicting objectives between authority and operator, the need for technical and managerial competence on both sides must be stressed. In the following recommendations, we limit our comments to the key advantages of some of the points where this might be less clear:

- **In general, Gross-cost Contracts with minimum standards for production resources (vehicles, staff) and service levels, as well as incentives for quality of service, levels of patronage, and market share in key areas of the city are a solution that presents a lower risk of capture of the authority by the operator (by lowering barriers to entry of new competitors), a relatively low burden for authority, and easier mobilisation of investment resources by private companies than by local authorities. However, because the operator is reduced to a more passive role, it also reduces the opportunity to improve service to the customers;**
- **Tender for fixed network, but once in place the operator should have the right to suggest design improvements, which must be agreed upon by authority (incentive for this may be in lower production costs or bonus related to commercial performance);**
- **If city is large enough, contracts for sub-networks (this promotes regular comparability between sub-networks and creates additional competitive pressure);**
- **Information on demand gathered and managed by Authority, who must ensure level playing field between incumbent and new candidates at later tenders;**
- **With gross cost contracts, if old fleets are to be avoided, duration of the contract must allow adequate levels of depreciation of the capital goods engaged (not necessarily whole depreciation if there is a second hand market);**
- **If performance of one operator is judged very good both internally (against targets fixed in the contract) and externally (in benchmarking procedures), it may be adequate to foresee automatic extension of contract, at least for one term;**
- **Fare structure and levels decided by authority;**
- **Integration must be ensured by Authority, in dialogue with operators;**
• Policy goals like concessionary fares and employment of minorities inserted in tender conditions. Improved access to areas in need of rehabilitation inserted into network design.

9. We finish with the discussion of the scope for adaptations to these generic recommendation in two particular areas:

a) **Type of contract** (Net Cost or Management Contract instead of the base choice for Gross Cost)

**Net cost contracts** give authorities the option of specifying what they want to achieve, and are bound by contract to get it at a fixed price, leaving to the operator the “breathing space” necessary to make use of his ingenuity in reading and adapting to the wishes of the market, thus improving chances of a higher revenue. But medium-term risks impose some caution before preference is given to a net cost contract over a gross cost contract:

i) the Authority must have a solid and stable tradition of information gathering, processing and dissemination (and the will to continue so);

ii) since net cost contracts effectively lower the contestability of the market, the authority must regularly monitor performance of the operator (in what concerns ridership, cost-efficiency and quality of service really provided), and enjoy the possibility of escaping from the situation of capture by the operator. This can be made by a clause in the contract specifying that under-performance may lead to breach of contract followed by a new tender for a gross-cost contract (whereby contestability would be renewed);

iii) if network dimension and structure allow it, division in sub-networks with separate operators in each of them (imposing clauses of minimum levels of integration in the contracts) still helps inasmuch as comparability is a good source of competitive pressure;

iv) since it is desired that in net cost contracts the operator has the possibility to improve service and efficiency during the life of the contract, its duration should be longer than for the corresponding gross cost contract so that time is given for the proper understanding of the market;

Our view is that **management contracts** could be preferred to gross cost contracts if the authority perceives that the potential number of candidates to its network is very small, so that it considers that there is a substantial risk that any conflict with the operator might result in a breach of service of difficult rescue by other operators. A more interesting field of application of this type of contract would be to serve as a bridge between a regulated regime (with one monopolistic company) and a limited competition regime, with several sub-networks being contracted separately. Management contracts could serve as a basis of lower risk for the entrepreneurs in the phase of information gathering on the market, with progressive adaptation to production with performance targets, and restructuring of the companies, including introduction of their own private fleets.

a) **Special considerations for the case of rail-based systems**

The basic recommendations that can be issued in this respect are the following:
• include adoption of “open systems” design in the initial proposals in the main criteria for choice of system. This will strongly increase flexibility for future choices, thus preserving the competitive pressure element for those expansions;

• if a gross cost contract scheme is preferred, it should possibly be designed as a “network of contracts”, with different horizons for different components of the investment and service being rendered by the private side: we can imagine a 60 year contract for the construction, maintenance and right of access to infrastructure including significant parts in tunnels (based on an access fee per vehicle, with a guarantee of minimum traffic volumes), 20 to 30 year contracts for operationality of rolling stock (thus including its maintenance and refurbishment, based on effective availability of those vehicles for operation), and 10 year contracts for the actual operation of the system, in which those high capital costs would have been transformed in operating costs (access tolls and vehicle.days). The latter contract for operation could well be a net-cost contract, with an almost-fixed network and strict clauses on timetable integration with other lines. All these suppliers / partners must be bound by quality assurance clauses, through which the consequences of bad performance of one partner on the performance of other partners downstream must be adequately penalised.
SCIENTIFIC AND TECHNICAL DESCRIPTION OF THE PROJECT

1. INTRODUCTION

1.1. Evolving political settings and mission of public transport

In the last two or three decades there has been a continuous and steady change in the political setting for Urban Public Transport (UPT), caused mainly by the progressive increase in purchasing power of large segments of the population and its numerous and various consequences in terms of car ownership, urban forms, lifestyles, etc.

Although these changes have not occurred with the same intensity or at the same time in all EU countries, there are nevertheless many common features in all of them:

- most families now own at least one car, and there are even more families with at least two cars than families without a car. This facilitates mobility based on individual transport even by those who do not have a driving license, as they are driven by some other family member;
- the size and population of urban areas has increased, but many families have preferred to live in less densely populated areas, thus placing themselves out of the economically self-supported public transport market, which needs a minimum intensity of demand to be economically sound;
- not only are working hours shorter and families having a smaller number of children, but also many adults prefer to lead “singles” lifestyles, all these factors being associated with a smaller set of constraints on daily mobility, and thus with a greater randomness of travel, both in space and in time;

These evolutions raise the difficulties for public transport to serve well the mobility wishes of many members of society.

In parallel, the increased car ownership has led to recurring situations of severe congestion and environmental aggression by traffic in many urban agglomerations. In spite of all technological progress on vehicle technology and traffic control, there is still in many cities a clear excess of car traffic trying to use the available road capacity, and clearly no physical possibility of expanding that capacity by expansion of the urban space allocated to roads. New cars are getting much cleaner in terms of its exhaust gases, but the much bigger number of cars has made urban air quality a systematic issue.

These circumstances lead many to think that Urban Public Transport should be playing a larger role in the provision of urban mobility, recognising it as an indispensable element in the fight against congestion and environmental aggression.

While underground solutions are capable of a very good performance because of their independence from what is moving on the surface, the cost of tunnel construction has implied that their presence is limited, both in the number of cities that can afford them, and in the extension of the networks in most of those cities. Public transport on the
surface in most cases is not given the traffic fluidity conditions it would require to deliver good performance.

So, many people will argue that Public Transport should be more used, but is really not up to the job in what concerns their own mobility needs, which forces them to keep using their cars.

In many cases, especially during the 60’s and 70’s, public transport was considered so indispensable for the new inhabitants of larger urban areas, that the cost of its provision was almost forgotten in face of the absolute need for its existence. This has led to significant decreases in the cost-recovery ratios by the ticket revenues and subsidy increases, which have led to the well known downward spiral of public transport: to cut deficits, service cuts were made, patronage was lost, revenue decreased, leading to an even bigger deficit, etc..

In the process, many customers of UPT were literally thrown out, and production costs rigidly increased, thus creating conditions for an enduring economic efficiency in many operations. So, gradually, the political setting for UPT has been changing. The following table tries to show the main evolution between the previous and the actual main goals at this level.

<table>
<thead>
<tr>
<th>Previously</th>
<th>Currently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directly Essential for</td>
<td>Majority of citizens</td>
</tr>
<tr>
<td>Main political goal</td>
<td>Minority of citizens</td>
</tr>
<tr>
<td>Accessibility, territorial coverage</td>
<td>Contribution for congestion relief and environmental preservation (both implying stronger market shares, possibly targeted by geographical areas)</td>
</tr>
<tr>
<td>Frequently not needed, given high patronage. Then for some years, in spite of declining patronage, still good support since UPT was perceived as merit good for majority of citizens</td>
<td>Less strong, although with strong variation from country to country. UPT must compete for subsidies with other merit goods for minorities</td>
</tr>
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</table>

Authorities have had difficulties in achieving these new main political goals, possibly because there has been insufficient courage to take the measures necessary to re-establish a balanced appeal between private car and public transport for the common citizen. In the few cases where there has been clear progress in this area, these measures have generally been formatted as a complete package, including both “pull” measures in favour of public transport, and “push” measures to penalise certain uses of the private car.

These cases are followed attentively by the international community. The Citizens’ Networks Green Paper gives great attention to dissemination of “best practices”, while stating that Public Transport should ideally be a service open to all citizens in terms of accessibility to vehicles and infrastructure, affordability in terms of fares levels, and availability in terms of coverage of services.
Also the relation between the improvement of transport infrastructure and the accessibility of regions (and cities) is highlighted by the European Union Common Transport Policy.

1.2. Responses from the supply side of the system

In most countries, UPT is still considered a social need, even in Britain, where a free market system has been chosen, in which commercial services appear with the help of a considerable amount of financial compensations for social fare rebates given to specific passenger groups. In addition to this, local authorities can and do create additional social transport services to satisfy specific social needs.

“Social needs” is here used in the sense that there are some groups in society which deserve special attention because they are “captive users” of UPT for their (motorised) mobility needs, their “captivity” possibly resulting from economic factors (low income), legal constraints (age under driving permission), or physical handicaps. This attention is translated in terms of territorial coverage of the public transport network (all urban zones should be served) and of low prices. Although in many countries there are special “concessionary” fares for some groups (students, elderly, etc.), there is still a considerable number of them where the general price of public transport is quite low, possibly as a heritage of the decades when the majority of the urban population was not motorised.

As we have seen in the first section, we can also increasingly (i.e. in a growing number of cities) speak of the “collective need” for public transport, in the sense that it is important for the society as a whole that a significant part of its members use public transport for their trips, instead of travelling with their cars. This is directly and visibly related to minimising traffic congestion, but also to minimising environmental aggression, and such arguments are currently used to keep general prices of public transport low in many cases where the general level of revenue and motorisation would certainly lead to the conclusion that a “social fare” would be needed for only a small part of the population.

In many countries where UPT is considered as a social need, the concept that the Authority defines the network to be operated is very dominant, in most cases not even questioned. Similarly, the notion that UPT has external benefits that should (could) be compensated through public subsidies is generally accepted.

In most of those countries, there are efforts to reduce the deficit volumes, although two main lines of action are easily identifiable: some countries (or cities) have preferred to keep their public monopoly companies, and are promoting their efficiency through program-contracts (regulated environment), whereas others have decided to create a competitive system for the right to operate their UPT network (or sub-networks), thus placing the element of efficiency pressure on the market (limited competition). This often happens under the framework provided by what we will generally call a contract, although the terms of understanding between authority and operator do not always fall into the exact legal definition of a contract;
As it could probably be expected, progress towards cost reduction in the first group has been slower, given its stiffness, especially in the labour domain. In the second group, the first market bidding waves in each city have generally produced substantial savings, but subsequent cost reductions have been of lower amplitude;

In some cities there has also been pressure for increase of revenue, which can be obtained through increased ridership (and this through improved competitiveness versus the private car) and or through higher (less subsidised) prices. Balance improvements from this side help reduce the pressure for cost reductions which, after the first waves, might only be possible with some damage to quality of service.

Competition is playing an increasing role, although free competition is being rejected due to its instability in the transition phase, medium and long term effects of inefficiencies in consumption, and the tendency for the creation of oligopolies. Despite this some experiences have been referenced as success cases (e.g. Manchester Metrolink) where only prices are deregulated keeping the service specification and minimum quality standards to be defined by the authority. It seems that this intermediate model is showing that it is possible to keep the advantages of deregulation (productive efficiency) and introduce some degree of regulation to restore efficiency in consumption. The rigidity of the rail infrastructure certainly helps to preserve stability of supply.

Also in this field a new development are quality partnerships (as a written contract) that are being used as an instrument to improve co-operation between authorities and operators (introducing this way a light touch of regulation) in deregulated systems with the aim of assuring minimum levels of quality, e.g. UK (Manchester and Preston).

Experiences of quality partnership are also being developed in regulated systems with the aim of bringing authority and operator to a closer relationship, especially in cases where there exists some tradition of authority laxism, e.g. Portugal. Quality of service strongly depends onto the maturity of the market, but it can be pursued by means of alternative instruments, not necessarily through increased competitive pressure.

As the number of opportunities to access the market grows in several countries (both in deregulated and in limited competition environments), there is an increasing visibility of private operators in the European market, adaptable to varying rules from one city or country to another, but willing to market their services in competitive environments. Thus, the single European Union market is also beginning to be visible in this domain, as operators from one member country are starting to operate (or at least tender for operations) in other member countries. While this is still a very recent phenomenon, it is probably considered as the best opportunity for business expansion by some of the most efficient operators.

1.3. Current positions and expectations of authorities and operators

In general, we perceive a good relationship between Authorities and Operators, which is possibly not a surprise, given that people in both sides are interested in preserving their own activity. To achieve their goals, Authorities in many cases recognise that new
regulatory solutions may be necessary, which can offer better chances of success. This frequently includes not only their relationships with Operators, but also a revision of the split of competencies among several public bodies.

One of the key issues in the relationship between Authorities and Operators is the definition of a clear doctrine and rules, that allow companies to engage in stable commitments and have a better judgement of their risks.

Although competitive pressure is progressively recognised as an important factor to improve the efficiency and the quality of Urban Public Transport services, many authorities still consider that they can achieve similar levels of efficiency in their regulated environment (albeit slower), thus avoiding some of the costs and risks associated with the transition towards a limited competition regime.

Whatever the regulatory regime (regulated or limited competition), assessment of operators’ and system’s performances is gaining recognition as a key element, not only for allocative decisions within the systems (tenders, contract bonus or penalties in the case of limited competition regimes) but also for controlling efficiency gains in the regulated systems, thus sustaining political support for the current solutions.

In the cases where there is limited competition, based on tenders and contracts, there is growing awareness that the split of risks between Authority and Operator is accompanied by significant differences in information about the market. This means that when the operator has a significant involvement in the revenue risk (and in the absence of special measures taken by the authority) the information detained by the incumbent operator might constitute an overwhelming advantage not only over the Authority in the preparation of new tenders for the same contract (capture of the Principal by the Agent), but also over other candidates in those future tenders (unfair competition). Those special measures are related to a sustained effort by the authority to gather and analyse all relevant commercial information (avoiding capture) as well as making it public (avoiding too much incumbent’s advantage).

Since in all regulatory regimes there may be pressure for improved economic results, significant efforts are to be made not only on the cost reduction side, but also in the revenue increase side, and these are visible in many cities which are trying to improve service to their customers and make those services easier to use.

The job of “product specification”, “network design” or “network planning” is progressively recognised as a technical job that does not necessarily fall into the hand of the Authority, who must specify what the system should achieve, or of the Operator, who must run the services as planned, and provide a service of good (if possible increasing) quality for its customers. A third party may be called in to perform this job.

Possibly because of the changes in the political settings and of the movements visible at various levels, most local authorities and operators expect changes in the near future. We have received clear signs of interest from both sides in the results of ISOTOPE, and we hope that the way in which we present our findings will help all involved parties to find the most appropriate solution for their cases.
However we should keep in mind that just as isotopes in the chemical world are variations in the configuration of one element, similar in their bases but showing differences in some of their properties, also in UPT we have systems with a common essential basis but differences of regime and properties. This is only natural, legitimate and effective.

1.4. Approach in this research project

The approach of this project has been based on a very open elaboration process, in which the composition of the consortium reflects the recognition that there are multiple views and opinions on these issues: there are consultants, operators, authorities, research institutions, associations of operators, and associations of authorities. We have made several explicit actions for dissemination of our interim results and consultation with the organised world of Public Transport.

Besides the direct knowledge and literature sources, we have conducted a large scale survey, in which 109 cities have participated, covering both Authorities and Operators, and dealing with the issues of the system in two parts, one covering facts (their perception at least) and another covering opinions. The results of this survey have constituted the first deliverable of this project (Workpackage 1 report).

Subsequent analysis has been developed on two levels: one dealing with the social and political aspects, and another dealing with the economical aspects. Both made substantial use of the material collected in the survey. Their respective findings were included in the corresponding reports, forming the second and third deliverables of this project (reports of Workpackages 2 and 3 respectively). To avoid excessive length of this report, we do not reproduce those results here, but they form a substantial part of the foundations of our conclusions.

For the synthesis and conclusions, two types of work have been carried out and are presented as deliverables:

- An in-depth presentation of city reports, covering what we have considered as interesting cases in regulatory framework of public transport, worth a specific mention and dissemination;

- This report with conclusions from the project, largely based on the findings of the two previous analytical work packages, structured in such a way that the options and their consequences are made clearer: we first discuss the roles of each of the actors involved in the process, then develop the presentation of the instruments available for each of them to carry out their job in the most appropriate way, and finally present our conclusions and recommendations for the legal and regulatory framework of the UPT system. Because the information contained in the city reports serves as a demonstrator of many statements made in this report, we have decided to include here as an annex a “transversal” presentation of its main results, organised by themes instead of by city as in the original report. This has allowed a more fluid style of presentation of our text, avoiding repeated citations of the cities where this or that feature can be found.
From the start of this project we have decided to leave out of our analysis (and especially of our recommendations) the case of very large conurbations like Paris or London. The special circumstances raised by their dimension, in terms of complexity of perception of the mobility needs by the Authority and of co-ordination of the supply in such large scales would possibly require very detailed analysis, of little value for the remaining large set of cities in Europe whose populations require adequate urban public transport (populations ranges between 100,000 and 5 million roughly).
2. ROLES OF AUTHORITIES AND OPERATORS

2.1. Introduction

The observation of the various regulatory regimes in place in European countries show that both the scope and the level of control exercised by public authorities vary greatly from one country to another, sometimes even from one region to another.

Our survey of the existing regimes covered 16 countries and showed a very wide diversity in the existing regulatory regimes. Despite this it was possible to identify the core characteristics of those regimes and aggregate them in the following three main groups (see WP3 report and City Reports):

Regulated regimes: representing the classical model dominated by public owned monopolies. This regime can be found in Austria, Belgium, Germany, Greece, Spain, Italy, Luxembourg, Portugal, Netherlands and Ireland, although in some cities variations, like the existence of private monopolies or network management contracts, can be found. The core characteristic of this group is the absence of competition for the market.

Limited competition regimes: these tendering based models have a number of variants with the most common ones being the minimum cost tenders at route level and the network management contracts. Examples of this regime can be found in France, Denmark, Finland, Sweden, Norway.

Deregulated regime: known as Free Market Models and with examples only in Great Britain outside London. In London a limited competition regime was implemented with route based tendering.

When looking at the changes that have taken place during the last decade or two in the form and extent of the interventions by public authorities, it appears clearly that market forces, in one form or another, are now playing a more important role than before. In many cases demand for regulatory reform arose from governmental concern about growing deficits which were themselves rather a symptom of more deeply rooted problems that can be associated with regulatory failure.

Conceptually, three fundamental questions can be distinguished:

• what is the most desirable functional division between transport authorities and (competing) transport operators?
• what is, thereby, the most desirable contractual form between the various actors (authorities, planners and operators) involved?
• what is, thereby, the most adequate way to find the best planners and operators; in particular, what is the place of tendering in this process?

These three fundamental questions will be discussed hereafter in the same order.
2.2. Functional division between actors

Various organisational forms are thinkable in public transport: from pure free markets, via the most indirect forms of state intervention (forms which do not determine the market outcome) to the most direct forms of state intervention (forms which actively determine the market outcome). It should be noted that these forms of intervention are concerned with the correction of market failures there where these appear. There are however more reasons to intervene on markets for public transport services: such as social policy and interventions which are part of an overall policy to solve problems elsewhere in the economy (e.g. curbing the use of the automobile).

These other aims of public intervention into markets for public transport services tend to get most attention in the public debate. Without diminishing their importance, it should however be observed that this emphasis unduly relinquishes the discussion on the sources of market failures on public transport service markets to the background. Even more so as one realises that correction of market failures is not contradictory nor contra-productive in the pursuit of particular aims, as social policy or mobility policy.

2.2.1. Competition versus regulation

If the main assumptions for perfect competition were fulfilled, then free competition would result in welfare maximisation and state intervention on such markets would be superfluous (if no other goals were present).

Several factors withdraw UPT market from the perfect competition model, among the more relevant are the fact that it can never exist an unlimited number of identical suppliers as available space acts as a restriction in a basic structural resource of the system, and also the choices in UPT market are not only price-based, at least criteria like accessibility, quality of connections, and economies of scale have an identical importance.

Economic theory shows that when the assumptions for perfect competitive markets are not fulfilled, market outcomes become inefficient. Traditionally such “market failures” are corrected by state intervention (it should be noted that this kind of intervention has nothing to do with social policy or compensation of negative externalities elsewhere in the economy).

One particularity of UPT market is that too different levels of competition coexist being the first one the competition with individual transport, and only at a lower level competition between firms (the operators of public transport).

Indirect state intervention, in which the government does not determine market outcomes but only smoothen the efficient play of market forces, suffices for some forms of market failures. Examples of indirect state intervention are the lowering of barriers of entry, introduction of standards, internalisation of externalities, correction of asymmetries of information and imposition of effective rules of competition. This type of policy find its limit in the costs of such an intervention compared to the advantages of such an intervention.
In some instances indirect state intervention is not sufficiently powerful to solve market failures. Then, direct state intervention, in which government actively determines market outcomes, can be the solution. There are basically two forms of direct state intervention: direct regulation of companies (or nationalisation) and competition for the market (tendering). Tendering is distinct from regulation in the sense that it entails a contractual (market) relationship between a principal (an authority) and an agent (a producer).

Among the factors that have to be considered in evaluating alternative forms of regulation are demand and supply uncertainty, demand and production costs, the potential for integration of complementary elements of supply by the customers, the costs of information gathering, the advantages of holding exclusive information, monitoring and enforcement costs, and the extent to which specific skills or equipment is involved.

State intervention is costly. Not only the observable costs (wages of civil servants, etc.) should be taken into account, but also the hidden costs of regulation. Regulation creates hidden costs in the way of induced inefficiencies (so called non-market failures). Imperfect competitive markets should even be preferred when the combined amount of these costs is larger than the costs caused by imperfect regulated markets.

There are two basic symptoms of regulatory failure, namely inefficiencies in production of services and failure to achieve the explicit objectives of regulation (ineffectiveness), both of which are difficult to measure. There are also costs caused by increasing fine-tuning of regulation, density of intervention, inflexibility and interference of complex regulations. Such costs reduce the scope for innovation and make structural changes in the industry difficult. Furthermore, a growing intervention density requires a growing number of control and co-ordination instruments which increases the cost of intervention. Characteristic examples of non-market failures are low efficiency of firms that are not submitted to competitive pressures, administrators who suffer from bounded rationality and opportunistic behaviour pursuing non-market objectives.

The question of the desirability of regulatory reform has to be split into three distinct parts. The first part relates to whether the existing regulation has proved appropriate to realise the desired objectives of government (effectiveness of the regulation). The second part relates to whether the existing regulation has not induced a waste of resources (efficiency of the regulation). The third part of the question concerns the appropriateness of the objectives of government themselves.

In those countries where tendering has been introduced, this has forced the authorities, if not immediately at least in the medium term, to define more clearly their policy aims, the results being a clearer steering of both public companies charged with the development of services and operators charged with the realisation of these services. In some cases it has even led to a clear definition of the reasons for the intervention of the authority in the market for passenger transport services.

If a choice is made for the introduction of comprehensive competitive tendering, it will be desirable that the functional division be determined by the economies of scale (supply side economy) and economies of network (user side economy). According to this line of thought, the realisation of services can almost always be organised at a
smaller scale level than the design of services. On the other hand, the design of services will not always have to take place at a lower scale than the policy-making (local policy aims can be incorporated in a regional public transport plan, and, conversely, local designs can translate the regional policy to local services).

2.2.2. Framework for analysing levels of planning and control

Market failures can, in many cases, be avoided by an appropriate separation of decision powers. It is generally accepted that planning and control systems within companies can be divided into hierarchically ordered types of activities which differentiate themselves according to the scope of the planning issues addressed and the planning horizon. Various words are used to denominate these hierarchical levels of planning and control activities. We will use the following denominations:

**Strategic level:**
- strategic management is involved in the formulation of general aims and in the determination in broad terms of the means that can be used to attain these.
- in short: *what do we want to achieve?*

**Tactical level:**
- makes decisions on acquiring means that can help reaching the aims, and on how to use these means most efficiently.
- in short: *what product can help achieving the aims?*

**Operational level:**
- makes sure the orders are carried out, and that this happens in an efficient way.
- in short: *how do we produce that product?*

In order to be translated to public transport, the three levels presented above have to be further detailed in terms of the specific planning and control activities they represent. Independently from the form and size of public intervention, all these activities will have to be carried out. It should also be clear that the possibilities at each level depend on the possibilities of the subordinate level. A feedback should therefore take place in practice.

Strategic, tactical and operational decisions in public transport

<table>
<thead>
<tr>
<th>Strategic level</th>
<th>Tactical level</th>
<th>Operational level</th>
</tr>
</thead>
<tbody>
<tr>
<td>General aims</td>
<td>Fares</td>
<td>Vehicle rostering</td>
</tr>
<tr>
<td>Area</td>
<td>Routes</td>
<td>Drivers rostering</td>
</tr>
<tr>
<td>Target Groups</td>
<td>Timetable</td>
<td>Personnel management</td>
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<tr>
<td>General product (service)</td>
<td>Product (service) type</td>
<td>Maintenance</td>
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<td>characteristics</td>
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<tr>
<td></td>
<td></td>
<td>Purchase of consumables</td>
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<tr>
<td></td>
<td></td>
<td>Fleet renewal management</td>
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</table>
This hierarchical structure of planning and control is a tool to describe the internal structuring of decision-making within a company. It is essentially a guideline to the establishment of an optimal chain of principal-agents relationships within the firm whose size does not allow for all decisions to be taken by the same individual.

But this hierarchical structure allows also the description of such chains of relations outside the firm. A firm would typically decide to carry out some activities by means of contracting out when the same product can be obtained more cheaply outside the firm than by producing it internally. The decision to do so should depend on the transaction costs involved and on the risks of being captured by the sub-contractor, and the general aims of the company gives an inducement to search for the most adequate (cheapest) possible sub-contractor for the desired product.

A specific analysis of each market situation remains necessary. In the context of public transport the definition by politicians of clear general (and social) aims - rather than directly defining instruments for their own sake - is very important, as well as the clear allocation of responsibilities to those authorities for the costs associated with fulfilment of their aims.

The situation can be summarised as a twofold problem. Firstly an optimum set of incentives has to be designed to force the agent, by means of a contract, to aim at realising the objectives of the principal. And secondly, a choice has to be made between the various possible agents.

The question of the optimal functional division does not play in those circumstances where markets do not fail. Services will appear out of a market process and the authority will then have the opportunity to complement these by, e.g., tendering. In this situation competing companies will on the basis of their own aims (i.e. in general profit maximisation) make decisions as to which activities will be developed in-house and which will be bought on markets. These decisions will mainly depend on the comparison of the total costs of procurement to the total costs of production. The existence of transaction costs and of economies of scale in the production of the various activities will determine these decisions, together with an analysis of risk of being captured by potential sub-contractors in the cases when their number is very low.

After a certain period of readjustments, the competitive process between companies on such markets results in an optimal organisation of the production without allowing for excessive profits, unless there is scope for predatory practice by incumbents with respect to new candidate suppliers in the market.

The question of the optimal functional division does play a role for the “social” services tendered by the authority but as the authority intervenes here only for aims which have been clearly defined, such services will mostly be developed by the authority and only the realisation of those services will be tendered.

If, on the contrary, free markets fail, then the question of the functional division will play a role right from the start as here the automatic appearance of an optimal organisation of production can not be guaranteed. In some circumstances, an indirect form of intervention will suffice to correct market failure. However, in those cases
where a more direct form of regulation is required, the structure presented above can be seen as a guideline in the organisation of a chain of principal-agent relationships.

In this situation, the authority which initiates production is the real entrepreneur. She determines her strategy, possibly also her tactics when the required expertise to do so is available to her. The tactical level could otherwise, at least conceptually, be contracted out. And finally the authority could also take care of the operational aspects, unless contracting out of this level results in a more efficient situation. The authority (as principal) assigns to operators (as agent) other aims than pure profit maximisation by means of a contract containing incentives such as to ensure that the utility maximising behaviour of the agent concurs to the realisation of the aims of the principal. These aims are supposed to be taken in accordance with welfare maximisation.

In this discussion, the border between what we have called the operational and the tactical levels seems clearly defined, even if the natural evolution of the expectations and aspirations of customers defines the need for a marketing work which is best developed very close to the operational level but with an influence on the systematic review of product specification (done at the tactical level).

The border between the strategic and the tactical levels is less clearly defined (and they have indeed been mixed in many real cases). This can lead to disagreements between transport companies and authorities as to what falls under the strategic level. In a number of cases, the origin of the problem will be found in the lack of specification or even in the absence of a definition of the aims of public transport (strategic level). When this is the case, authority and company are actually arguing about the division of the tactical level itself, rather than on the borderline between the strategic and the tactical level. It will therefore be essential that a true policy exists (strategic level) before a functional division between the strategic and the tactical level can be realised, and that the two distinct levels of competition be recognised when functional division is thought.

Incentives for optimal organisation of production appear to be weaker in situations of market failure where a decision for authority intervention has been taken than in markets which fulfil all theoretical conditions for pure and perfect competition. The solution for this problem has to be found in the creation or strengthening of the existing incentives for the intervening authority itself, such as a reinforcement of democratic control on this authority (compare this to the shareholders function in normal stock company). A direct link between powers on public transport and accountability by means of own taxation resources could also improve these incentives.

However, the mere existence of contracts linking authorities to companies is no guarantee for optimality of the set of incentives. In practice, tactical and operational freedoms of agent are more or less constrained by the contracts and often one can observe strong constraints on these sets of powers without explicit definition of broad policy aims or restrictions imposed by politicians in the pursuit of often rather unclear “social” goals. Such “contracts” can then be aimless and potentially detrimental to welfare, they can even leave the agents with the freedom to pursue their own (non-formulated) aims.

It is likely that many forms of regulation on structure (compulsory mergers) and on conduct (fares, etc.) that have been introduced since deficits first appeared in public
transport have failed because they unnecessarily bundled all sets of powers into single actors or, if not, created a mix-up of incentives. The acknowledgement that some parts of the market could have remained competitive if only the right sets of powers had been subject to regulation is something that is, unfortunately, rarely observed. Furthermore, the absence of clear aims to be achieved by public transport often results into the aim of maintaining the present level of service, which is in fact no aim but an aimless tactic.

2.2.3. Technical and Managerial Competence

In a limited competition regime there are additional requirements for technical and managerial competence on the side of the Authority: not only in most cases it must perform its technical work at the tactical level (defining the network and service characteristics that in principle best serve the clients), but it also has to specify the rules for selection of operator(s), monitor their performance, and judge on any claims they may have about their operating conditions.

This means that there will be requirements for high levels of competence in marketing and planning and organisation of public procurement processes for the correct execution of the tactical activities. On the other hand, for the selection and monitoring of operators, entrepreneurial management principles, as well as operational knowledge of traffic and transport production are also needed. Since in many cases where limited competition is being introduced, this is happening after a long period of a regulated monopoly regime, these skills are normally found in the “old” company, which effectively acted as (tactical) authority and operator at the same time.

The need for this competence is that it must be able to create and sustain an environment which is favourable enough to attract capable operators, but not so “easygoing” that those operators end up capturing the authority, providing only the service they wish, at the price they determine, and preventing other operators from entering the market.

Launching a new public transport service under limited competition in a city lacking such skills in its technical agencies may well be a risky endeavour. In such cases a probably best alternative will be to search for assistance (or “coaching”) through contracts with other cities, of not too different a dimension, already with some experience of their own.

2.3. Choice of contractual form between actors

When a choice has been made for a specific functional division between actors, adequate contractual relationships between these actors will have to be designed. This will lead to the creation of a principal-agent chain between initiating authority, designer and producer.

The most important decision here is perhaps the clear formulation of the aims of the public intervention, which stands at the basis of the principal-agent chain. Upon this follows an adequate functional division, taking into account the existence or non-existence of economies of scale, such as to minimise social costs.
One of the objectives of contracts in public transport is the distribution of competencies and responsibilities between the parties to the contract. The choice for the optimal type of contract depends on transaction costs involved, on the most efficient allocation of associated risks (some allocations are more expensive than others), and on the possible use of additional incentives to help realise the objectives of the buyer. When contracts have a limited duration (which is generally the case), the strength of relative positions at their end is also a point to consider in that choice.

Two types of on-going risks can be distinguished in the situation that an authority orders public transport services from a supplier:

**Production risk:** risk associated to the production costs of a fixed production quantity, independent of the amount of passengers.

**Revenue risk:** risk associated to the sale of transport services.

These risks can be allocated in different ways. The different possible allocations of risks give rise to the following basic classification of contracts (pure forms):

**Gross cost contract:** In this type of contract the production risk is born by a transport company while the revenue risk is born by the tendering authority. An agreed price will be paid for the production of a fixed amount of services. Revenues accrue to the tendering authority. The difference between realised production costs and anticipated production costs is for account of the firm while the difference between actual and anticipated revenues is for account of the tendering authority.

**Net cost contract:** In this contract both production and revenue risk are born by the transport company. The difference between anticipated total operating costs and revenues determines the price the tendering authority pays to the transport company. A realised difference between costs and revenues that does not correspond to the anticipated difference between costs and revenues is for account of the transport company.

**Management contract:** The management contract is the mirror image of the net cost contract because in the management contract both production and revenue risk are born by the tendering authority instead of the transport company. The manager of the transport activities receives a remuneration which is (in the pure form of this contract) independent of his achievements.

Besides these three types of contract, all kinds of variants are possible. The most interesting are the gross cost contract with revenue incentives and the net cost contract with shared revenue risk. Additional incentives for the realisation of special objectives can be added in all types of contract. For example a premium that is related to the number of transported passengers or a positive influence on the modal split. Payments can also be related to the perceived quality of the service by customers. These additional incentives fall under the heading of direct intervention because they influence what will be produced. The incentives in the different types of contract on the other hand only influence allocative and productive efficiency.
It is still worth saying that some of these variants to the three main types of contracts rely on a high capability of the authorities not only on the technical aspect but also in their ability of gathering and managing the information.

2.4. Choice of tendering method to select actors

If specific services are to be ordered by an authority, a formal tendering procedure will have to be chosen. This requires the formulation of award criteria. The success of tendering is, theoretically speaking, very much dependent on the realisation of the required theoretical conditions and on the way in which tendering is introduced. Generically speaking, more competition, when carefully introduced, leads to a reduction in inefficiency. Observation of the experience of various countries shows that there is a wide variation in the organisation of competition in public transport. Besides the enumeration of the trade-offs that have to be made here, it is not possible to give a single universal choice for a most adequate model. The optimality of each system is not only dependant on the public transport policy aims, but also on culture and on market structure (such as the number of potential competitors) at the time of their introduction.

The models presented below give a number of possible task divisions between transport authorities and transport companies. The choice of selection method may be split between no selection method (historic rights or negotiation with the authority), some form of competitive tendering and market competition. For each model, the specific place of competition as an instrument is different.

Entrepreneurship is an important element in the analysis of markets and in the achievement of allocative efficiency. A distinction has to be made between two families of models. In the first one, markets initiate the supply of services and the authority is only a watchdog which can however order (e.g. by competitive tendering) the production of socially desirable services that are not supplied by the market; In the second family of models the (transport) authority is the initiator of all services and in fact “nationalises” the markets. The authority sets objectives and criteria on the basis of which it actively searches a suitable supplier.

How much scope of decision should be taken by the (transport) authority depends on the contribution this makes to the solving of the market failure(s) and to the attenuation of transition (adjustment) problems that may occur in purely competitive situations. A determination of the causes of market failure(s) is thus required in each specific case in order to determine the optimal regulation on structure and on conduct, taking into account the structure of supply on the market.

The most appropriate supplier for the production, the design or both can then be selected by means of negotiation or tendering (contracting out or franchising) and the supplier has no other options than to do what has been contractually agreed. In such circumstances there is no self-selecting (market) incentives to guarantee the optimisation of the produced services.

The British public transport market is the example par excellence of the first family of models. The Dutch and the German systems in which exclusive concessions are granted
by the government after having received a request from a company is a second example of this family of model under a more controlled setting where a licence protects operators from forms of competition that are thought to be undesirable.

The danger with this type of model is that the obligation of co-ordination become so extensive that firms are no longer disciplined by market forces so that it then becomes necessary to discipline them by other forms of intervention. This model has in the past often resulted in the creation of (publicly-owned) regional operators which often conform themselves more to the authorities than to market demand.

France and the local public transport systems in Sweden are examples of the second family of models where all existing services result from a conscious initiative of the transport authority and where no transport company is allowed to supply transport services on its own initiative (as would be the case e.g. in Britain, but also in Holland or Germany according to the principle of the law). These models do however not necessarily imply “state production” as often varying parts of the design and production of the transport services can be contracted out or franchised to separate private or public operators according to three main variants for the tendering of the design and the production of transport services.

2.4.1. Tendering for the production of pre-determined services

This model can be sketched as follows : a regional transport company (owned by the regional authority) is charged, on the basis of policy aims specified by the regional authority, to design a public transport network (routes, timetable, fares, quality) such as to contribute to the realisation of the regional transport policy within the budget limits imposed. In order to guarantee the efficient production of the services, the regional authority requires from its regional transport company to organise the route-by-route tendering of the realisation of the pre-determined services. This model is very similar to tendering practice in Denmark, Sweden and London.

Tendering of predetermined services has proven to be an effective instrument to lower the cost of production. There where pre-determined services have been tendered in this basis, the results have been a higher productivity of both personnel and vehicles. Furthermore, most of the cost savings could be reached without wage reductions by a more efficient utilisation of inputs. These savings accrue directly to the authority through the lower need for subsidisation and/or a better public transport service. They are then available for further public transport development or for other public purposes.

Under this system, service integration is easy to realise but there are in this model only weak incentives to respond to passenger demand due to the absence of systematic competition at the tactical level. Also there is a danger for regulatory capture of the regional authority by the regional transport company. It is therefore important to note that the public transport authority itself needs adequate incentives in this model to organise the tendering of those services which correspond to market demand. Often insufficient attention is paid to this problem assuming that what the authority asks is what the public wants. Inadequate representation by the authority of true demand for public transport services results in efficient but sub-optimal (less appropriate) public transport supply.
2.4.2. Contracting of network management

This model can be sketched as follows: the technical experts of the regional transport authority are charged, on the basis of policy aims specified by the regional authority, to organise a tendering procedure for the management of the existing public transport network such as to contribute to the realisation of the regional transport policy within the budget limits imposed. The authority then negotiates a contract with the best bidders. The vehicles and other equipment are normally owned by the tendering authority and run by the winning bidder for the duration of the contract. In some cases, the realisation of some services can be sub-contracted by the winning bidder.

The main disadvantages of this model, which resembles the French practice in urban areas with however a clearer cut between the strategic and tactical levels are the limited incentives for productive efficiency, the absence of a possibility for simultaneous comparison of performances (benchmarking) of operators together with the danger for a growing asymmetry of information in favour of incumbent operators. The heavy tendering costs for bidders in proportion to the value of the contracts, together with a danger for an excessive orientation towards the private preferences of contract awarding politicians are also aspects playing against this form of contract.

It may also happen that, due to financial difficulties of the public authority, investments in expansion or requalification of the system are delayed more than they would be if a contract with investment costs on the private operator side (net cost or gross cost) includes clauses that force him to permanently ensure average values of certain parameters across the fleet (for instance age and emissions of vehicles) under certain target values, which might be pre-established (for age of vehicles) or dynamically linked to the best available on the market (for emissions).

2.4.3. Tendering of pre-determined services with re-design incentives

This model can be sketched as follows: a regional transport company (owned by the regional authority) is charged, on the basis of the regional transport policy aims, to design tendering procedures such that the behaviour of winning bidders contributes to the realisation of the regional transport policy within certain budget limits. In order to guarantee efficient production and adequate re-design of services, the regional authority requires from its regional transport company to organise an area-wise tendering of the network. Also it requires that the operators be given as much freedom to re-design the services as possible and that the regional transport company limits its design activities to the minimum which will guarantee the coherence of the regional network as a whole, even across the boundaries of the regional transport authority. In order to promote productive efficiency and to render the selection procedure as transparent as possible, the tendering itself is essentially organised on the basis of a more efficient realisation of existing services.

This model is not yet widely used although some existing models move into this direction. The possibility to tender small units without loss of integration, to compare operators’ performances simultaneously (benchmarking) and the incentives for both
productive efficiency and demand responsiveness are main positive aspects of this model. Its main danger is an excessive definition of minimum services by the authority.

Conducting the tasks at the operational level requires from an operator different skills from those required for the tactical level (design of the services). The knowledge required for conducting the operational tasks is in essence moveable as production costs are quite easily estimated even in unknown territory. This knowledge is also relatively timeless in that sense that sudden changes in technology are not to be expected and, even in that case, this knowledge would be moveable.

The knowledge required for bearing the design function is on the contrary much more locally bound and local market knowledge will be required in order to evaluate the potential of a specific area. This local knowledge grows with local experience and is thus difficult to get for entrants (potential operators). Furthermore, revenues can be influenced by external factors which are difficult to predict. Due to this a tendering of the design is less adequate as an instrument to check the knowledge or qualification of a company, also because incumbents are at an advantage compared to entrants.

Tendering of predetermined services with redesign incentives is a possible solution as an important distinction has to be made in the discussion on economic incentives for both re-design and efficiency in production. There are, on the one hand, one-off incentives in the tendering for the design, being the award criteria, and, on the other hand, the more continuous incentives which result from the economic incentives included in the contract.

As optimal response to demand can only take place in a continuous process, operators should have some contractually bounded re-design freedom and financial incentives related to performance. The drawback of the stipulation of contractual conditions is that it encourages authorities to claim an excessive level of service that diminish the scope for re-design and consequently makes an optimal supply illusory. In other words, it will be difficult to find the right balance between contractual conditions and scope for redesign. The tendering authorities have to make sure that the transport companies receive incentives for redesign that result in network alterations that are in the general interest. Financial state contributions should therefore be linked to the performance of transport companies.

As an alternative, a call for tender for network design is thinkable but would be difficult to specify as in this case a precise formulation of objectives is indispensable, and the complexity of perception of public transport networks by the public recommend that changes are made gradually. If the aims are unclear then the formulation of award criteria becomes impossible yet the choice between different designs is only possible if such award criteria are representative for the quality of a design and can be made operational.

The formulation of objectives that are representative for the quality of a network is problematic as representation and aggregation of customers’ preferences (although technically possible) may be difficult for tendering authorities, in order to award the contract objectively to the best bidder. Such a procedure then possibly leads to suboptimal networks, bidders being only interested in winning the tender, and it is not passenger needs but the awarding criteria which will be determinant. Another problem
of combined tendering of both design and realisation is the lack of dynamics as the winning design is a snapshot that determines the supply of public transport services during the length of the contract.

Furthermore, as far as the availability of market knowledge is concerned, a new bidder has the same problem as the tendering authority, he lacks the necessary information to make a sound bid. This information asymmetry between incumbent and other bidders creates barriers of entry.

One can expect that the incumbent firm makes the best informed bid and that this firm translates the informational advantage into a profit mark-up. The high cost of making a bid for a tender of both design and realisation is also a barrier of entry which can be prohibitive for small transport companies.

A separate tendering of design and realisation would be another possibility to tender on the basis of complete designs. However such tendering would cause costs that would not balance the advantages of tendering, given the high needs of information to project and evaluate network designs, and the fact that the winning designer does not incur the risks associated with the realisation of his design, which transfers to the tendering authority all the consequences of a bad design.

This is not too different from what happens in other areas of design (such as architecture or planning), and one might think of linking the payment of the designer to some kind of ex post performance-measure for the design. But it would be hazardous for a designer to agree to such a contract as the performance of his designed network depends, ex post, to a large extent on the (innovative) management quality of the winning bidder for the realisation of the services.

Internationally, a tendency can be observed to give operators more passenger-related financial incentives together with parts of the design function. Such transfer of tasks can be gradual by, e.g., concluding a contract which is additional to the minimum-cost contract resulting from a tendering of the realisation of pre-determined services. The advantage of such additional incentives is that the complexity of a multi-dimensional tendering is avoided and that both operator and authority get the opportunity to build up the necessary expertise in, respectively, network design and the design of contracts and call-for-tenders.

Yet, in those public transport cases where the design function plays a part in the tendering process, it can be observed that the difference between the systems remains relatively limited (full tendering for the design has not been encountered). Despite the differences in starting points and aims, such models tend to evolve to a similar situation: tendering where design plays a role results in no or small modifications to the existing network. This may be related to the above mentioned difficulties of perception by the public when drastic changes in the network design are made.

Furthermore, companies which receive financial incentives to re-design the services during the contract do not always receive enough freedoms to implement such changes, the result being a defective dynamism. Three reasons can be given for this: the product type, the difficulty for the authority to judge alternatives (market knowledge problem) and the defective market knowledge of potential competitors. These are also the reasons
for which it is difficult to organise a tendering for the design function. French and Dutch experiences show that a system that could combine both design and realisation, by being based on the existing network, often boils down to a simple tendering for the realisation with limited re-design incentives.

2.4.4. Limited open competition

This model can be sketched as follows: commercially viable services appear out of an autonomous market process. Fare reductions and fuel duty rebates can be given to the operators and count as income or cost reductions. This results in more services being offered on the commercial market than otherwise.

The technical services of the regional authority organise competitive tendering procedures for additional passenger transport services which are deemed necessary out of a social policy concern, for the situations where the level of passenger transport is thought insufficient on the basis of transport and social policy as formulated by the regional authority.

This model is largely inspired by the model in place in Great Britain (outside London) since deregulation. It is however different in its functioning in order to eliminate a number of drawbacks that have been observed in Great-Britain. Amongst others, a limited form of entry regulation can be added in order to promote the co-ordination of commercial services. Such a model takes an intermediate position between the British deregulation and the models currently in place in, e.g., Germany and Holland.

The main positive aspects of this model is the direct response to market demand without authority intervention and the clear separation of functions and focus of the authority on the social aspects together with the possibility for several authorities to intervene simultaneously with no or few border problems.

Its main drawbacks are the turbulence in the initial stages, with unstable supply during the market adjustment periods (which may lead former passengers to look for alternatives in other modes of mobility), the real difficulties in providing an integrated network for use by the customers, and the danger for the appearance of unfair competition practices or excessive economies of network and scale. The latter risks may possibly be well controlled by an adequate regulation of competitive practices. The following table presents the main advantages and disadvantages of the several tendering models presented:

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3. ACCESS REGIME OF OPERATORS TO THE PUBLIC TRANSPORT MARKET

3.1. Statutory linkages between authority and operator

The formal linkages between transport authority and operator are possibly the most pertinent factor that decides how public transport in cities operates and how and why the systems in different cities perform in very different manners.

Combining the authority and operator within the public administration directly forms the closest possible linkage between the two function, allowing for quick decision and implementation procedures, as well as the seamless transmission of social and political objectives into public transport operations. On the other side of this coin, such an authority / operator relationship will not allow any form of competition to stimulate service enhancements. The business strategy function that would be present in some form within a separate operating company will in most circumstances not be present and this is liable to lead to low productive efficiency.

The formation of a monopoly publicly owned company for the operation of public transport services will provide many of the benefits associated with direct integration within the transit authority and, possibly, instil some of the “business benefits” of having an operating company that is a distinct entity within the public administration rather than merely a separate department. This distinction will, in many cases, however, be somewhat blurred with senior decision making staff more likely to be politicians than public transport “professionals”. The risk umbrella that the public sector provides is also liable to encourage lax management and few incentives to control costs.

The formation of a private limited company, albeit with 100% of the equity in public ownership, may serve to create some downward pressure on costs as this form of structure may indicate a political will to privatisate non-performing public entities.

Introducing a minority private sector share holding stake may provide further incentives to control costs and improve efficiency, although risk sharing immediately becomes more difficult once a private sector partner participates in the provision of public transport services. Some aspects of a fully fledged business strategy will, in all probability, begin to appear once the private sector becomes financially involved in the undertaking.

Reducing the public sector status in the transit firm to that of a minority stakeholder within the firm providing public transport services, will allow better communication between authority and operator, whilst retaining a degree of public sector control - thus allowing the transmission of political and social objectives into public transport operations. There is a danger with this form of management structure that the authority will be “captured” by the operator due to the inside information that the “public employees” can provide.

If the operating company is of a wholly private nature, then productive efficiency is likely to be significantly higher than that found within a publicly owned company,
although this will be lower than is achievable elsewhere if the operator still enjoys a
monopoly provider position with few competitive pressures. The profit maximising
goals of a private firm will also diverge significantly from the social and political goals
of the transit authority.

The potential problems of having one monopoly supplier of public transport facilities
can be circumnavigated by employing a mixture of operators, some with private
statutes and others with public ones. Such a mix will serve to exert downward
pressure on costs for the public firms and introduce competitive pressures on private
ones to limit abuses of monopoly powers. This style of system does, however, increase
the administrative duties for the authorities in terms of monitoring operator performance
and also may create difficulties due to differential treatment of public and private sector
operators.

3.2. Operating rights

Allowing operators access rights to the entire network gives the maximum possible
scope for the network benefits associated with an integrated public transport system,
such as through ticketing, intermodal interfaces with respect to timetabling and physical
transfer. Economies of scale and scope may also be evident. If a tight contract is
negotiated between the transport authority and the operator, many of the social and
political aspirations of the authority may be met.

This type of operation does, however, imply a certain degree of monopoly in operation
of the system, which may lead to productive inefficiencies over and above any savings
that accrue from economies of scale and scope. This structure also leaves little room for
competition and, therefore, no opportunity for benchmarking between different
operators within the same city.

Dividing operating rights over a subset of the network allows these benchmarking
exercises to be undertaken in order to stimulate competitive pressures between the
different sub-networks. Once the network is, however, divided in this manner,
integrated ticketing immediately becomes more difficult. Our economic research has
indicated (see WP3 report) that optimum productive efficiency apparently occurs with
networks corresponding to approximately 100 vehicles (buses). However, it must be
stressed that this size refers to operational production units (typically depots), not to the
size of the network granted under one concession. Easier integration may well
recommend a small number of sub-networks, with possibly each one having more than
one depot.

Taking the network sub-division down to the single route level maximises the
competitive pressures within the public transport operating field. Ticketing integration
and timetable interfacing is, however, only possible when the authority or planning
company takes on this role, as it witnessed in London in the UK and in many
Scandinavian examples.

Unless operators can obtain more than one route within the network (through say, some
form of tendering exercise), economies of scale and scope are almost impossible to
realise. Although some cost saving accruing from this type of operation is also likely to
stem from reductions in the wages of public transport employees, there appears to be more significant efficiency improvements to be reached in terms of productivity.

The time limits on these operating rights also act as a significant factor in deciding the level of competitive pressure that exists within the urban public transport network.

Setting no specific time limits allows easy long term planning of investments but does not create any competition related threats that stimulate operators to keep a tight control on their costs. If the number of operators in the market is small, or a monopoly supplier is the incumbent, then these problems are exacerbated as comparison of performance becomes difficult.

Contracts of 10 years or more allow operators to fully recover investments in capital products (thus stimulating this type of investment) but little direct competition is evident, except in the last years of the contract.

Between 5 and 10 years, investment cost recovery is still possible but the shortened time horizon serves to stimulate innovation and cost control as the loss of a contract is never too far from the minds of the operator.

The benefits from these pressures do, however, need to be weighed against the additional costs incurred by the authority in periodic tendering procedures. In the rail based sector, it is likely that the authority will have to assume some responsibility regarding rolling stock replacement as the contract duration is insufficient to stimulate investment by the operator.

Short contracts of 5 years or less will create continuous competitive pressures within the operation of public transport services but tendering costs will be significant and the incentive to use old vehicles is greatly increased necessitating further contractual specifications by the tendering authority.

Such short contracts also tend to favour large operators who can easily transfer vehicles between cities and/or between routes within a given conurbation. Contracts of this duration are not normally applicable for the rail sector due to the high fixed costs of operating rail-based transport facilities.

3.3. Route protection

A monopoly operator that covers the entire route network will bring the best benefits in terms of economies of scale and intra-modal integration. Service planning will be optimal from an operational point of view but competitive pressures will be absent from the market except when tendering is employed on a reasonable frequent basis (say, at between 5 and 10 year intervals).

Restricted competition (through protection on mutual routes) can introduce significant competitive pressures through the tendering process but, by having different operators in the market, integration benefits are potentially lost.
By having **part of the network as monopoly operator and part as competitive**, routes with social services upon them can be covered by the monopoly sections whilst the benefits of competition can be brought to bear on these parts of the network that are open to competition. With a comprehensive competitively tendered sector, the monopoly sector can be bench-marked accordingly to ensure cost control and performance targets are met here as well.

If part or all of the monopoly route network is operated by an operator who also runs services in the competitive sector, cross-subsidisation to deter new entrants to the market may be a problem that authorities have to be mindful of. This issue, together with the need to monitor performance in the monopoly sector, implies that authority costs associated with policing the system need to be taken into account.

**Open competition** throughout the entire route network and between different modes will, as discussed in previous sections, act as the most effective cost controlling structure for urban passenger transport operations.

The lack of stability and fare/timetable integration, together with the potential for predatory pricing and operational behaviour by operators will generally tend to produce a pattern of services that is not in the public interest and social services are very unlikely to be provided at all under these circumstances. An advantage of this situation is that it reveals to the transport authority exactly which parts of the network are not profitable. This then allows for a more conscious subsidisation of those services which are deemed necessary out of a social policy point of view.

**Restricting competition** (e.g. through tendering) on certain parts of the route network could address some of the problems and difficulties associated with free market provision of transport services. Monitoring of the restricted routes may, however, be costly in order to ensure that the freely competitive parts of the network do not spill over into the regulated areas of the market.

The **provision of route protection for competing modes** is usually more applicable to the rail network, as bus is normally the predator in situations where destructive intermodal competition occurs. Whilst there is an economic argument for offering a degree of protection to newly established, or newly franchised rail routes, long-term protection will serve to stimulate stagnation and a lack of innovation / cost control in the rail sector.

### 3.4. Market access/exit

**Long-term prevention of entry** to the public transport market will stimulate a high degree of stability within the system, much as the monopoly operation of the system provides. As is also the case with a long-term monopoly supplier of transport services, the level of production efficiency is liable to be low with little innovation present within the decision-making areas of the operator’s business.

If the **entry to the market is regulated by the end of contract periods**, the problems of total prevention of entry are reduced, as long as the contract duration is of a reasonable length.
Tendering of services relies on the non-existence of currently valid contracts between authorities and operators or route protection for incumbents being in force. Where possible, it does allow innovation and product development to take place through the bidding process, again upon the assumption that there are bidders other than the present operator willing to bid for the new contracts.

Allowing potential new operators to suggest new products or routes allows a significant degree of innovation within the industry, keeps pressure on incumbent operators to enhance their services to forestall prospective competition, and may be used as a contractual incentive to both quality of service and users satisfaction, avoiding thus the risks of having a contract only price based that at the end state of the process might represent for the authority the acquisition of bad services.

The authority does have the added responsibility of ensuring that the prospective bidders are competent to run the suggested service to the expected standard. If the approval of the authority is not required in order to operate a new service, then the worst aspects of free market competition are liable to be present.

Regarding exit from the market, the existence of economic barriers (such as fixed or sunk costs) will prevent hit and run entry to profitable parts of a market that is competitive thereby hindering the sound functioning of the market. Whilst preserving stability in the system, it serves as a barrier to entry that may well support operators that would otherwise be forced out through inefficient behaviour.

The bus industry is less likely to be characterised by these sunk costs than the rail industry, as entry/exit costs are generally lower due to the more flexible nature of the vehicles. Here, contractual barriers specified by the authority may serve to preserve the stability of the network, although contract duration in excess of 5-10 years may introduce the inefficiencies documented earlier in this chapter.

The absence of exit barriers will provide lower entry risks and, therefore, stimulate the entry of new entrants to the market. If all contractual barriers are absent, there is a risk of unqualified, low cost operators undermining their higher quality competitors to the detriment of the user.

3.5. Contractual arrangements

The existence of contracting throughout the urban transport industry provide the potential for high quality public transport with innovation incentives, so long as penalty (for poor performance) and bonus (for good performance) clauses are specified in the industry. The stringency of the contract needs to be carefully controlled in order that potential entrants are effectively motivated and yet not discouraged by the required conditions. Authority involvement under these circumstances is restricted to specification of standards of performance rather than exactly how services are provided - this removal of political influence may be viewed as unacceptable by certain authority personnel. An extension of the penalty clause aspect of the contract to the authority as well as the operator may provide an alternative to the more traditional form of operator
oriented clause contract. This, in effect, serves to provide a degree of operator protection from poor authority performance.

The absence of a legal contract reduces the administrative overheads associated with the public transport services but, depending upon the operational structure of the industry, may lead to operator abuse of their position.
4. ALLOCATION OF RISK AND CONFLICT RESOLUTION

4.1. Types of risk and their allocation

This chapter will examine the type of risks encountered in Urban Public Transport (UPT) operations and the parties upon whom the risk finally falls upon. The findings can be applied to any mode of UPT although particular examples may be quoted to highlight certain relationships.

The term ”risk” can be interpreted as the “chance of loss or gain”. In any business operation there is always an unknown element that applies to the operation, be it endogenous or exogenous. That element is known as risk and can take various forms, for example, the risk of operational cost over-runs or revenue under-runs.

For urban public transport five types of risk can be identified, and will be discussed below:
- Production Risk
- Revenue Risk
- Financial Risk
- Planning Risk
- Environmental Risk

In general, risks should be allocated to the party which is in the best position to avoid their occurrence or to absorb their consequences. This should normally be transcribed in the contractual terms, but quite frequently there are unexpected losses which may come from an unforeseen source, and some form of conflict arises when making an ex-post allocation of those consequences.

Production risk

Production risk covers all areas of activity that have an incidence in the production of transport and its cost. In some cases the “operator” also has to construct some infrastructure or deliver new vehicles (in the more complex cases, the operator really is a concessionaire consortium, including different companies from different technical areas), while in others it is only procuring the resources, organising transport production and doing it (just operation).

The scheme below illustrates the major areas of risk in this domain. The key concepts here are availability of resources when they are needed and at the expected cost.
Production risk is one of the areas that operators more traditionally have accepted, since it correspond to doing their job, and knowledge of their professional environment should normally provide them with better knowledge and assessment of risks than the authorities. This is so in all regulatory regimes we have studied, except (on a limited scale) for management contracts in the limited competition regime.

Still, two types of risk must be distinguished here, because of their very different consequences for the public: loss of production and cost over-runs. In the first case, as long as there is some form of contract between operator and authority, authorities will normally demand some form of guarantee and impose penalties in the contracts, since service is not being provided. In the latter case, that is normally left with the operator, since the public is being served. The operator, however, may want to stipulate that he has the right to some form of compensation if his cost over-runs are caused by actions of the authority (road works that force excessive detours, etc.).

Whatever the regulatory regime, there is a growing trend for the transport companies to impose long-standing guarantees on their suppliers (vehicle or equipment suppliers, civil works contractors, etc.) so that the risks of non-performance are supported by the suppliers and not by the users. More recently, and when applicable, these operationality guarantees are even being substituted in some cases by contracts for operation (or at least maintenance) of the sub-system provided by each of the suppliers.

An interesting example may be taken from the recent Rail Privatisation in the UK: the production risk applicable to suburban services is shared between Railtrack (the infrastructure authority) and the train operator. The risk is allocated between both parties via a contract that sets out agreed penalties to be paid in the event of operational problems. These penalties are linked to performance by Railtrack, e.g. if signalling is responsible for 5% of services running late then Railtrack must pay the operator an agreed amount of compensation. However, if poor punctuality is the fault of the operator then no penalty payments are triggered. Conversely, there are also contracts in place to reward good performance by Railtrack.
In addition to contracts covering production risk there is also a risk relationship between the rail operator and the local authorities who support these services. Under this, the operator bears the full risk of operating costs, whilst the local authority bears the full risk for revenue flows.

**Revenue Risk**

Revenue risk is mostly related to patronage and tariffs, although some operators may also have other types of revenue, namely from publicity in vehicles or fixed installations (stations and interchanges for instance).

Many factors influence patronage, mainly the evolution of mobility patterns and the modal split between public and private transport (and between public transport operators if there are several competing for the same connections). It is not obvious in what direction patronage will change if there are positive evolutions of purchasing power, because that will on one hand increase mobility, but on the other also increase motorisation, which probably would play against the market share of public transport.

Certainly, among the factors that influence patronage we must also count quality of service and appropriateness of the service to the needs of the customers. That is why it is important to have the operators (directly or indirectly) engaged in this risk.

But apart from “pull” measures to attract customers through improved service, “push” measures are needed to restrain their use of the private car. And this is exclusively in the hands of the authorities, possibly more than one for each city.

Another element of great importance for revenue is the price customers have to pay for the service, that is to say, fare structure and levels. In times of relatively high affluence, only small groups in society face exclusion through the price, and this is cared for through concessionary fares. But even for the mainstream users, not only the level of price paid, but the simplicity of buying and using the transport titles of their greatest convenience is paramount in the decision to use public transport regularly. This is even more critical in the cases where integration is needed, that is for the users who do not have a direct connection from origin to destination.

Even in the deregulated regime in the UK we find application of the concept of concessionary fares, in which the authority pays the operator the part of the price not paid directly by the user. But apart from this element, all remaining revenue risk in that regime is born by the operator, who in compensation has the right to abandon unprofitable services.

In the other regimes, where stability and integration of supply is considered essential, revenue risk can only be accepted by operators to a limited extent, since the potential damaging effect of some measures taken by the authorities is enormous.
In the discussion about revenue risk another factor has to be present, namely the marketing efforts needed to succeed, and the information capital acquired in the process. This information is vital both for continuous (or discrete) improvement of the service and for knowledge of the market potential of each part of the city. An authority who believes it has the duty of seeing that its citizens get the service they need (and not only what the operators think is adequate) must not be in an inferior position to an operator in this vital area of market information. Also, if there are limited duration contracts, it must see that (as much as possible) incumbent and new candidates are playing on a level field.

So, even if it would look acceptable that revenue risk be born mainly by the operator, the detention of some key variables by the authorities and the critical role of possession of information support the option that in the general case this risk is born by the authority, albeit with inclusion of bonus / penalty clauses in the contract. Those bonus and penalties should probably be allocated on the basis of patronage and level of customer satisfaction, rather than on revenue, since that would have a too strong influence from any changes in the fare structure and levels.

However, in a system with a stable policy regarding public transport, technically competent authorities, and ingenious operators available on the market, the transfer of the revenue risk to the operator’s side might provide the incentive to significant increases of the energy invested in searching for improved service to customers. The key concern here must be preservation of knowledge of the market and customers’ needs by the authority, without which a situation of capture of the latter by the operator might occur after only a few years.

Financial risk
By financial risk here we mean the risk attached to the money costs and revenues of the operation. Whenever there is installation of a new system, exposure to changing conditions of financing schemes (like interest rates), as well as to changes in currency exchange rates if there are international suppliers are probably the dominant factors. But even on a running basis, it is increasingly common that companies will finance their capital assets with sophisticated instruments, which have risks of their own. Also, on the revenue side, if there are significant sales of monthly or longer-validity titles, the value obtained by adequate management of those sums makes an important part of the financial balance of the companies.

Figure 4.3 - Financial Risk

![Financial Risk Diagram]

- Interest rates and similar
- Currency exchange rates
- Distribution of sales across transport titles
- Financial remuneration of short-terms surpluses

In the general case, these risks are taken by the purchaser of the capital assets on the first group and by the operator in the second group.

Planning Risk

Public transport operators face planning risks from three sources: First, town planning can alter passengers’ origins and destinations away from routes served by a given operator, especially for rail based UPT. Secondly, road planning which could enhance UPT operations (bus priorities) or downgrade them (better roads encouraging car usage). Thirdly, UPT planning which again may benefit UPT if the construction of new rail stations is given the go-ahead, or may hinder UPT if plans are dropped. What is clear is that the effect of planning risk will feed into both production and revenue risks, although generally with some time lag.

Figure 4.4 - Planning Risk
Although it could be said that this risk (or rather its effects on production and revenue risks) should be wholly on the side of the authorities, the time-delay between stimulus and response and the complexity of the necessary procedures for estimation of the impacts have made it so that these risks are always absorbed by the operator. The best action possible normally is to be attentive and try to persuade the authorities to adapt their plans in such ways that UPT operations are not too much hurt.

**Environmental Risk**

Environmental risk is becoming an ever increasingly important issue to UPT operators as the issue of environmental damage raises its profile in European countries. The risk of paying penalties for environmentally unfriendly vehicles is increasing, leading to more investment in low emission buses and in LRT. This risk is especially applicable to the countries where many bus operators operate aged vehicle fleets.

The source of the risk is associated with sudden changes in public perception that may lead politicians to introduce sudden and drastic changes in the regulation for acceptable vehicles. The consequences will then be on the production side, either with the compulsory purchase of cleaner vehicles (maybe refurbishment of older ones), or with the submission to fines (and loss of reputation) for breach of the new regulations.

Figure 4.5 - Environmental Risk

Here again, the risk is generally taken on by the operators, although there are some examples where national governments have given a hand by providing subsidy for fleet renewal in periods of introduction of tougher environmental regulations. The best action
for operators in these cases really is to obtain a period of some years for progressive renewal of their fleet, but even then there may be some losses resulting from earlier sales of capable vehicles, whose market value has gone down because they no longer comply with the rules (at least at EU level).

4.2. Conflict types and Conciliation mechanisms

Conflicts can arise in many aspects of urban public transport. They may be internal (industrial relations) or external (between an authority and an operator) and will vary in their magnitude of importance. In Figure 4.6 the main types of conflict have been identified and will be discussed below.

Figure 4.6 - Conflict Types

a) Responsibilities
Conflict arises here when responsibilities are not clearly defined from the outset. For example within an authority it maybe unclear who is responsible for UPT planning. Alternatively, there maybe confusion between an operator and an authority as to whom is responsible for the marketing of UPT services. What is clear is that when there is an interface (internal or external) then there is the potential for responsibilities to become blurred and confused.

b) Finance
Here conflicts can arise regarding the distribution of costs and revenues. For example, in the UK, although rare, local authorities might dispute with operators the amount of concessionary revenue they receive. In other countries there are regular disputes concerning allocation of revenues among operators participating in an integrated tariff scheme.

c) Objectives To Reach
These types of conflict result when opposing objectives clash and can be very difficult to resolve. For example, in a contract between authority and operator, the proposal by the authority for targets to be reached and thresholds that activate bonuses and penalties may be judged by the operator too unbiased.

d) Fare Policy
These types of conflicts are related to the previous point and are similarly difficult to resolve. An authority may want to raise fares without revising the thresholds for patronage bonus, and the operator may find this very unfair, because he expects a significant fall of patronage just because of the fare increase.
e) Performance
In many cities satisfaction with performance can differ between operators and authorities. What one party considers rather good another may be considered only fair by the other. They may be looking at different aspects of performance, but they may even be looking at the same aspects through different instruments.

f) Other
Other areas of conflict can be of great variety, and especially include all the areas of risk that were mentioned in the previous section with longer delay for occurrence: planning, environment, etc. This wide area of conflict sources is critically important when dealing with long term contracts, since it is almost inevitable that one or two such risks will materialise.

Conciliation can be defined as the appeasement of parties in conflict with one another. The possible conciliatory paths include:
• Recourse to the Contract and its interpretation.
• Bilateral negotiation followed by agreement.
• Recourse to another (higher) authority.
• Recourse to a third party.

In the UK the contractual path has been taken for tendered bus and rail services. So far it appears to have been successful and actually prevents conflicts arising because roles and responsibilities are defined beforehand.

In general, contracts should include provision for remedy covering all the risks that may be foreseen at the outset. Experience and knowledge from one project helps design a better contract in the next, and it must be recognised that some of the challenges facing the UPT sector currently are rather new, so a lot of effort must still be made at each new project.

It seems a reasonable approach to have a three level structure of risk management in the contracts:
• for the relatively common risks, try to provide rules as clear as possible so that there should be no discussion about the course of action if any of these risks materialise;
• for risks which can be identified but have a magnitude or arising circumstances of very hard prediction, define a private (in the sense of internal to the contracting parties) structure for conciliation and possible arbitration
• for the risks which cannot even be identified at the outset, there is only the possibility of leaving doors open for bilateral negotiation, followed by recourse to the public judicial system. Since this third level is the least desirable for both parties (you cannot hedge against unidentified risks and courts always take long to decide on complex issues), two cautionary steps may be taken when designing the contracts:
  • include in the contract some general principles governing the relationship (soft clauses) and not only hard clauses. They might be of great help in the future to decide on the fairest course of action to take;
  • if the contract covers a long period (several decades), it may well be that some risks that cannot be included in the second level at the beginning of the contract (for sheer ignorance about future developments of society) could be included there at a later stage. So a sage decision would be to foresee the possibility of revision
of the risk management clauses after the first and the second thirds of the contract expire.
5. SYSTEM INTEGRATION

5.1. Definition

Integration in public transport stands for the situation that several services to the customer are structured in combination with each other. It can be considered within the framework of a door to door concept with regard to a journey. Integration can be regarded as a quality aspect and as an element of the network design. Integration has various aspects: the physical integration, the tariff integration and the logical integration.

Integration resulted from the ISOTOPE survey as one of the foreseen issues in the structure of public transport in the near future both for operators and authorities. All parties recognise this has been one of the weakest aspects of public transport in most cities, especially when compared with individual transport which enjoys a totally integrated road network.

5.2. Objectives

5.2.1. Main objective

In most cases the main objective of integration is to offer a more attractive and easier services to use to the public. Although in most cities the majority of trips are made without any transfer, integration represents important added value because it helps reduce the burden always associated with each transfer. This burden involves not only physical discomfort and uncertainty about another waiting time, but frequently also some tariff penalty (another ticket) and also the need for additional collection of information (rarely is complete information about the downstream mode available at the point of entry in the upstream mode). And, once it is impossible to provide direct trips for all connections, this may help keep in (or conquer to) public transport a significant number of clients.

Integration should lead to a higher level of use of the public transport system, and by that to a rise in market share and congestion relief. It may also help reduce production costs through a better fit between the levels of supply and demand on each part of the network.

5.2.2. Other objectives

The objective in relation to subsidies and cost efficiency can be different in different situations:

- In case the main target is growth of patronage, this can either lead to an increase of the necessary subsidies (when there is very low cost coverage and the marginal passenger is not profitable) or to a decrease of those subsidies (in cases where the marginal passenger is profitable or in case of an intended shift towards modes with a relative high cost coverage)
When cost efficiency is the main objective, integration can be introduced by just avoiding duplicating services. Minimising subsidies will be an objective here too. This relates to situations where many passengers are not benefiting from the integration.

An implication of integration under most regimes is the creation of a management burden for the authority. This applies especially in case of tariff integration, where authorities are faced with the revenue allocation problem. Another possible consequence of integration is an increased scope for apparent cross-subsidisation of services, although it may be argued that when two services feed into each other (and have a significant number of people who use them jointly) they become a single entity and the concept of cross-subsidisation no longer applies to such cases.

5.3. Aspects of integration

5.3.1. Physical integration

The physical aspect can be divided into the integration within the public transport system and the integration with other modes.

Integration within the public transport system concerns network design, interchange stations and timetables. These three elements together make an integrated service in physical terms. This can be realised either within one mode or using various modes.

Physical integration within one mode has as its main objective to create good access to the system and good connections where direct relations are not appropriate. A well known form of integrating timetables is the provision of an all services transfer at regular intervals at a central transfer point. In many European cities this is used in evening and night services, times where intervals between services are large. In smaller cities this practice is often used all day. A second example of timetable integration is the provision of a combined service on a common stretch of several lines, thus offering a combined lower interval between services.

Integration also implies the creation of safe, user-friendly transfer stations, and guarantee of transfers. This guarantee has been introduced in several cities lately, by offering free taxi services in case of failures.

The physical integration between public transport modes implies the creation of a structure where each mode has its role in the system, making use of its strong points. The typical case is the integration between rail modes and the bus network in a way that the rail mode serves the main streams of passenger and the bus covers territory with lower density of demand. In this concept bus routes are transformed from routes directly to the city into feeder routes. For the passenger this implies at least one transfer. The higher speed and reliability of the railway must make this transfer worthwhile.

There are several elements that are of influence on the validation of the improvement:

• travel times of both modes
• quality of the interchange
• access to the rail network in the destination area

In general the transfer is more beneficial for the passenger in case of:
• a high quality rail mode (frequency, speed and access to the inner city)
• a better quality of the interchange station
• integrated time tables
• a more congested road system
• a larger distance between the transfer station and the city centre
• intensive concentration of activities in the inner-city (close to railway stations)

Nevertheless all passengers make their own evaluation and every change of routes will be evaluated negatively by some passengers. Also passenger attitudes towards transfers change from country to country.

In practice several models are used:
a) a strict feeder model without duplicating services
b) as a), extended with direct services in busier relations at busy times (like express peak services)
c) maintaining parallel services on a limited scale aiming to give a better access to the inner-city
d) competition between direct routes and feeder routes.

A more strict feeder regime is driven by the cost efficiency argument. Especially in case the rail line has spare capacity the argument of protection of infrastructure is applied. It must be realised that in case of a too strict feeder regime there will be many passengers who will not evaluate the service as an improvement and may transfer to their private cars. An example here is the inner-city bus services in cities with metros. Where these inner-city services have been reduced to routes connecting inner city with metro stations, patronage mostly has gone down. Passenger with short distance trips are not well served any more.

Wherever traffic flows are heavier it is appropriate to offer parallel services in case a passenger group benefits from this. Advantages of the parallel services are:
• avoiding transfer for people who have a strong negative attitude to it (handicapped people, people carrying suitcases etc.)
• giving direct relation to areas in the city that are not within walking distance from the rail station.

Studies have been made by the EU and the UITP on the functional aspects and lay out of interchange stations.

Integration with other (non-public transport) modes can be seen in various forms. In the first place there is a possibility for integration with taxi and shared taxi systems. This is offered for instance in evening and Sunday services where a conventional bus is not cost efficient. A second form is integration with transport for special groups (handicapped, elderly etc.) Examples exist of integration of demand responsive pick up and stop to door systems with public transport. This kind of services is important from a social point of view.
A third form of integration is between public transport and the private car and the bicycle. Here the interchange station is the key element. Physical elements are access to the interchange station, safe parking places and short walking distance between parking places and public transport.

5.3.2. Tariff integration

Integration of the tariff system contributes to an easy use of the system. Moreover it is an instrument to avoid unjustified tariff differences in case of transfers. In classical systems, and because of high transaction costs to treat it otherwise, transfers normally implied a subsequent payment for the next stage of the trip. Within integrated systems the benefits (for the system) provided by physical integration should not be counteracted by a tariff penalty on the passenger since basically the passenger is travelling the same distance as he would have done in a situation with a direct service.

Tariff integration can be done for the frequent traveller (integrated passes) as well as for the less frequent traveller (integration of multi-ride and single tickets). Integrating passes can be considered as the first stage.

Elements of integrated tariff systems are:
- combined ticket / through ticketing
- integrated price calculation
- integration of the selling points network

A combined ticket without integrated price calculation is the most simple form, however this form does not justify the needs in a feeder situation. A special case is the integration between regional transport and local (flat fare) transport. There are several models here implying more or less integration. In these models there is a trade off between fairness and complexity.

Integration of tariffs has as an implication that revenues have to be allocated towards modes and operators. This process is more important in case the operator is responsible for the magnitude of the revenues (as is in net cost contracts) or there is an incentive for the operator on revenues or ridership. Use of modern ticket systems on the basis of magnetic or chip technology can contribute here with a substantial reduction in transaction costs.

Tariff integration with other modes can be seen in the form of Park and Ride, tariff integration and in the form of integration with (shared) taxi systems. The objective here is to ease the use for the passenger who only has to buy one ticket for his door-to-door journey.

5.3.3. Logical integration

Achieving logical integration means that the system should be perceived as one, with a unified set of concepts and language in its communication towards the users. Of the
three types of integration mentioned, it is the subtlest and most difficult to achieve in its plenitude.

The logical aspect contains the integration of information. Information must be available on services and on tariffs. It may be available at home, at a stop (station) and in vehicles and can be provided by several types of communication (in written form, oral form) using several media (like telephone and computers). Information can be static (the route network, the timetable) and dynamic (current situation, disruptions).

Logical integration has as its main objective to inform the passenger on its possibilities and options and to make the barriers to utilisation as low as possible. Logical integration is a strong element to achieve the full benefits of physical and tariff integration. In situations of logical integration, information should be available on the whole journey a passenger wants to make. Integration within the public transport system is one level, integration with other modes is a second step. Information should allow the passenger to make his choice between modes and transfer points, including dynamic information on congestion and parking places.

The whole concept of logical integration is still beginning to develop. It can be developed towards and important instrument in the promotion of public transport.

5.4. Achieving integration under different market regimes and organisational frameworks

In the ISOTOPE survey it was regarded that in the ideal system authorities should be responsible for integration aspects like interoperability and fare system.

5.4.1. Integration in the regulated regime

Within the regulated regime operator and authority often have blurred frontiers in their duties. It is the formal responsibility of the authority to make the overall planning, but in practice parts of this are delegated to the operator. This is also the case with planning of integration, where the knowledge on service details often is available only within the operating company.

So in theory the regulated regime is very well fit for achieving an integration and some nice examples can be found here (e.g. Hamburg, Munich, Zurich). In situations where integration is less successful within the classical model the main causes are the lack of interest of the authority in promoting public transport and the incapability of the operator to make innovative proposals. Also the objective of minimising subsidies can play a negative role here.

Within the regulated regime the element of incentives in subsidies on ridership has been introduced in some cases. An example here is the Netherlands, where the operators get subsidies in relation to the number of passenger kilometres. In this case the allocation of revenues within the integrated tariff system is very important.
5.4.2. Integration in the limited competition regime

Within this regime the responsibility for integration is in the hands of the authority. Since there is a contractual relation for a limited time between operators and authority, the interest of both parties on the long term is different. Nevertheless, operators can contribute to achieve integration by using their knowledge and innovative potential in proposing plans. This can be done either in a separate contract on network design, within a tendering procedure on network basis, or by an additional contract of transfer of know-how on top of an operational contract.

It is obvious that the potential for contributions by the operator is dependent on its structure and size: a small operator having a contract in a line by line tender on price competition cannot be expected to have the same know-how compared to a large company with the capability for designing systems. The principles described here can lead to a physically integrated network, to be operated by one or more operators. A quite different instrument is the use of incentives for operators in case of growth of patronage. This may result in voluntary integration schemes identified by the operators themselves. The city of Rouen can be regarded as an example where the main operator has taken initiatives of integration due to this incentive.

Tariff integration brings about the problem of allocation, which is more important here compared to the classical model, especially in case of net cost contracts with several sub-networks contracted separately. The main aspects that justify this integration difficulties when net cost contracts exists lies in particular in the revenue sharing aspect and in the management of the network design changes that are requested by each operator for its advantage.

Logical integration is under the responsibility of the authority. However the actual provision of information can be contracted out, either towards an operator or to a third party. Contracting this to one operator in a system with several may result in provision of biased information to customers, so it should be avoided.

5.4.3. Integration in the deregulated regime

Basically all integration here is subject to the private interests of each provider in the market. A contribution authorities can make is the creation of central facilities, like bus stations. However operators are not forced to use them. A form of co-operation between authorities and operators can be established in partnership agreements, which are voluntary agreements. Here the authority promises facilities in exchange for improved services by the operators. These agreements could include aspects of integration. However, due to the voluntary character this instrument is relatively weak.

In practice operators are optimising their own network. This implies that integration as a tool for promoting public transport use by the authority is hardly possible. The main objective for tendering additional services is a social one: providing transport for people without other possibilities in case a commercial service is not offered.

Operators themselves can decide to integrate their services driven by commercial reasons. An example here is Hong Kong where the metro company contracts bus
companies for feeder services. It is doubtful whether the conditions for this win-win situation are frequently present within the European circumstances.

Logical integration is also a task for the authority. In practice some British authorities publish combined timetables.

The lack of possibilities for physical and tariff integration can be regarded as one of the weakest points of the deregulated model and forms a barrier for a development towards integrated networks.

5.5. Evaluation

One of the side effects in introducing competition is that it makes integrated systems more difficult. This is especially the case in the deregulated regime. In the regime with limited competition there are good possibilities for an integrated approach. However it has to be organised, possibly using the innovative know-how available within operating companies. In the regulated regime the framework favours an integrated approach, however this is not always realised.

Integration, both within the public transport system as with other modes must be regarded as a very important aspect in promoting the use of public transport. By introducing competition one should have special attention on how to keep and improve system integration since it helps win and keep customers.
6. CONTINUOUS IMPROVEMENT OF URBAN PUBLIC TRANSPORT

6.1. Definition

By “continuous improvement” of urban public transport, we consider the need for continuous adjustment of the service design and of the organisation in charge of providing the service, in order to maintain or increase its value. Innovation in service and management is generated by continuous improvement systems. Continuous improvement refers to two dimensions, the first one external to UPT system, and the second one, internal to UPT system.

The value of UPT refers to the fact that it is defined and provided in strong relation with the characteristics of its environment. For instance, the value of school transport results from the fact that the capacity of the vehicles corresponds to the number of children to transport, and that the service provides good connections in time and in space between living places of the children and the schools.

The environment of UPT is complex. We find the market (existing and potential), with its characteristics, the policy in its multiple dimensions, the equipment industry, the economical activity, the service sector in general, the climate, the physical characteristics of the area, the other modes and their characteristics, etc. Each of these elements may suffer changes. To maintain the value of UPT, it is essential to keep track of those changes, in order to adapt UPT design and/or provisions when changes in this environment would reduce the value of the service provided, and affect its market efficiency or its cost efficiency.

On the other hand, it may happen that deviations appear between the service as it was specified and the service as it is actually delivered to the users. This may result from external causes (a demonstration on the streets may interrupt the service) or from organisational causes (due to staff problems, one useful information is not delivered on time to the customers).

There may be deviations that concern only the organisation, in cases where the correspondence between service provided and service specified is kept. In such a case, the deviation has no impact on the user, but rather on the volume of resources necessary to provide the service. For instance, the number of stand-by drivers may be higher than normal due to inefficiencies in management. All services will be delivered, but with higher unit costs.

6.2. Basis of continuous improvement

6.2.1. Continuous improvement and management

Continuous management is not an hazardous process. It requires a management system based on:

- continuous monitoring of public transport as it is provided, in comparison with service specifications;
- continuous monitoring of UPT environment characteristics;
• continuous recording of achievements in order to compare results with objectives;
• decision-making process, in order to start adaptation if it appears that the result of monitoring calls for change to maintain or improve the value of the service provided;
• adaptation process;
• control of the adaptation, to check if the expected improvement is achieved or not.

6.2.2. Continuous improvement and level of decision

The responsibility for the process described in the figure involves authorities and/or operators depending of the existing organisational framework, and the level of responsibility which is considered (strategic, tactical, operational).

Service specifications are defined on the basis of the characteristics of the general and local environment. These specifications are executed by operating companies, who must adapt their organisation to achieve efficient production, and equip themselves accordingly. Service provided by them may then be compared with specifications, and a feedback mechanism is launched, with consequences on the specification of service or on the organisation providing it.

From UPT specifications to monitoring : continuous improvement process
Thus, the planning authority has a passive role of monitoring the service provided, and may come to the conclusion that the value of the service provided is not satisfactory with regard to its global objectives.

The planning authority may then:
• propose a partnership for improvement of service to the operators;
• tender for a specific (additional) service;
• come to the conclusion that the regulatory framework does not permit achieving its objectives (and just regret it, if it is imposed by national law).

On the other hand, operators may reach the limit of their capacity to improve the value of the service and further improvement will need to be conducted in partnership with the authority (for instance if the traffic conditions reduce the attractiveness of the service).

Such partnership must result in a win-win situation,
• on the side of the authority by a completion of political objectives (increased environmental protection, higher mobility capacity in the area, reduced pressure for new roads or roads extension investment, ...);
• on the side of the operator, by a better financial performance (higher price / more passengers for better service).

One key issue in such a contract is the exchange of information between authorities and operators once market information is considered by operators as confidential and strategic.

In the regulated regime, the authority and the operator(s) have converging interest for continuous improvement (except if costs of achieving it are too high). The initiative may thus be taken either by the authority or by the operator although there may exist some confusion in the responsibility for improvement, and market pressures for improvement may meet or may not meet reaction, without any influence on the authority/operator.

On the contrary, in deregulated or limited competition system, financial pressure or competitive pressure will stimulate the response to any potential improvement resulting in increased value.

In deregulated systems, the absence of response will push a potential entrant to try improved services, while in limited competition systems, at contract renewal period, if the terms of reference give room for it, competitors will tend to propose more market oriented / cost-efficient services (and design of service).

The regulated regime calls for a formalised continuous improvement system, and management contracts are a convenient way of doing it. But the absence of financial incentives / penalties mechanisms increase the need for a strong personal commitment to continuous improvement at the level of the authority and the operator staff.

In the limited competition model, the tendering and the contracting process are the main tools to stimulate the existence of continuous improvement systems:

tendering process: these stages can be identified:
• specifications definition of service to provide and propose contract
• publicity (call for proposals)
• evaluation and selection
  *contracting process:*
• negotiation of the contract
• operations under contract and their assessment
• end / renewal of the contract

The type of contract and its specifications are key issue for effective systems:

• type of contracts:
  • *in gross cost contracts* the authority supports the revenue risk. In order to gain the co-operation of the operator in continuous improvement processes, the contract must foresee the existence of such processes and establish the corresponding bonus in case of success;
  • *in net cost contract*, the operator(s) fully benefit(s) from revenues increase generated by improvement, and from cost reductions in production. Operator(s) should play a key role, but must do so under co-ordination of the authority, to ensure integration;
  • *in management contract*, the operator is bound with the performance objectives defined in the contract. The pressure for improvement going further than the stated objectives is a function of the incentive/penalty scheme and the competitive pressure at the renewal of this contract.

### 6.5. Tools for continuous improvement system

#### 6.5.1. Management tools

The main management tools for continuous improvement are:

• total quality management systems (EFQM model, ISO 9004/2)
• strategic awareness
• benchmarking
• monitoring /measurement systems (internal /external)
• penalties / incentives schemes
• staff training
• financial resources

These tools can be applied at strategic, tactical and operational levels, certainly more easily at the operational level. Here for instance, benchmarking of service provided on different bus lines, or in different stations, will stimulate staff to improve day to day service. Also, on the tactical level, the effectiveness of different networks (provision of accessibility versus vehicle.kms produced) is also possible, although the algorithmic complexity makes it much less common.

An important management tool for continuous improvement is “listening to the customer”. This may be done by the initiative of the operator or included in some form of agreement with the authority. Different organisational possibilities exist, but caution should be exerted to ensure representativeness of the customers being “listened to”: for instance through random sampling is certainly better than self-selection.
6.5.2. Contract design

The specifications for a continuous improvement system should be part of the tendering specifications. The authority may specify the tools which are foreseen, or limit its specifications to the fact that such a system should be proposed by potential operators. At that stage, the authority should specify what will be its own responsibility and what are its expectations in this respect.

In their proposals, operators may then describe the system they wish to propose, also describing their expectations towards the role, responsibilities and involvement of the authority.

The contract should then specify:
- objectives of continuous improvement;
- tools and responsibilities, including measurement /monitoring programs;
- consequences of the measures, including financial incentives/penalties;
- control of these results;
- recourse procedure in the case of non application of the contract.

This specification of services by the authority in the tendering procedures should stimulate operators and authorities to cover all operational/tactical fields of interest by the continuous improvement system:
- transport (including access / exit by users)
- connections (inside UPT / with other modes)
- information to customers (static / real time)
- fares and sales systems
- environmental impact (in a broad sense, including impact on model split).

The agreed system must be enforced. There must be a specific allocation of monitoring responsibilities, related to the level of enforcement and the evaluation of the system in itself.

The level of publicity

The level of publicity given to the continuous improvement process is to be considered as well, as it is a tool to increase the pressure for result. This publicity may be centred on the market (citizen, users), the working forces involved (operators / authority / other bodies involved in UPT production), the political bodies (elected bodies, executive bodies). Publicity should address not only the existence of the systems (e.g. guarantee of service) but also the results of the process.

Renewal of contract

The question here is how the time limit of the contract influences the continuous improvement system. In short term contracts (3-6 years), there may be different type of barriers to improvement:
• financial barrier, if the remaining contractual duration generates a high financial risk (is too short for amortisation of investments);
• “competitive” barrier: the operator may prefer to wait for the tendering procedure before introducing improvement, in order to benefit from competitive advantage;
• political barrier: the introduction of improvement may be delayed by election period, during which the authority may prefer to stabilise the existing situation.

Whatever the specific causes, short contracts create additional difficulties for the effective introduction of continuous improvement systems. If they are properly designed, contracts with somewhat longer duration may include provision for this type of on-going adjustment in co-operation between authorities and operators.
7. A TOOL BOX FOR OPERATORS AND AUTHORITIES TO IMPROVE THE PERFORMANCE OF THE TRANSPORT SYSTEM

7.1. Definitions

We have seen in the previous chapters that the relationship between transport authorities and operators has, as its ultimate objective, the provision of a public transport system to achieve a set of objectives. Many elements of the relationship influence what is provided and what can be achieved and can be influenced by authorities, by operators or by both parties. These are the policy levers or instruments which are available to authorities and operators.

This section of the report aims to present in a structured way the main policy levers identified in the ISOTOPE study and analyses the way in which they work to influence the service which is provided. There is therefore a toolbox of policy levers (available to each party. Those "tools" (levers) may be defined as:

- a catalyst to make easier and quicker a (chemical) reaction producing the anticipated results,
- a lubricant to loosen an assembled mechanical device and make it work properly and smoothly,
- in the ISOTOPE field of investigations, any type of means available to operators and/or authorities to help them perform their duties more efficiently.

7.1.1. Toolboxes for Authorities

Several levers are at the disposal of authorities to promote the achievement of better performance of their city's public transport services. Examples are: creating scope for maintaining some (competitive) pressure on operators through more stringent objectives in contracts; periodic auditing of the results of the UPT system; comparison with other cities' experience and achievements; and periodic competitive tendering with scope for imaginative improvement.

Another approach for systematic progress is to detect and promote continuous improvement processes. One of the aspects relates to contracts and their "systemic" content, which includes:

- a continuous adjustment of the public transport service in all its components (pricing, selling channels, packaging, competitive advantages, etc.);
- a permanent review by actors of goals and achievements, bonus/penalties schemes for operators;
- possibly rewards to planning authorities (which may differ from the transport authority) in terms of finance against effective “push” measures constraining individual transport.
7.1.2. Toolboxes for Operators

As to operators, those levers are clearly time related:

- **short term**: adjustment of the public transport service and use of the relevant tools. The methods, know how, the exchange of experience are the basics requested by the authorities and provided by the professionals;

- **medium term**: an advisory role towards the authority in order to foster progress in actual market-related terms, and not in terms of day to day politically efficient measures, would be of interest for both parties. It means more freedom at action for the operator and the availability of information related to city planning and development;

- **long term**: access to information plays an essential role in the bidding capacity of an operator, in both quantity and quality, it is not possible to enter the market without the minimum information enabling to run computer models and build reliable business plans. To make information available to all, each market agent as to contribute.

In short, the professional approach of the operator is guaranteed by the individual (or the group's) tool box. The continuous improvement is fostered by a common understanding on some degrees of freedom granted by the authority. The safeguard is ensured by the dissemination of information improving the equity of opportunities among partners and competitors.

7.1.3. Creating basic conditions for an efficient use of the toolboxes.

Irrespective of the regulatory system in force improvement and monitoring requires the availability of basic information and of the relevant tools to process it on both authorities’ and operators’ side.

In many instances, the intended action is stopped by the absence of both the information and the tool. The following discussion intends to highlight the main items, which should be made available to all stakeholders of the public transport service and not merely to the authority or the operator's business, aggregated in three main groups:

- Information on mobility patterns
- Information on town (or area) planning
- Information on management tools and methods

**Information on mobility patterns**

Surveys on customer/passenger satisfaction, schedule and timetable reliability, lost kilometres due to traffic congestion, fare evasion measurement, correlation patronage-turnover of shopping centres, etc., are items normally followed by the operator to monitor his business and not known by the authority unless they are included as a contractual obligation of producing performance development reports. This lack of information on the Authorities’ side is often one of the most relevant factors of the system inefficiency.
Detailed travel time surveys are available through the modern telematics tools facilitating a dialogue with drivers in order to minimise the consumption of manpower, it may also be used to optimise the traffic along the routes of the surface network. In general, this information is retained by the operator since the authority considers that it has not to interfere with operational matters. Travel time is, however, an important dimension of service quality offered to the passengers and is of extreme importance for the assessment of the mobility conditions in the city. Furthermore, such information is of interest to any competitor when tendering and should be available on request also for this reason.

Complete origin-destination surveys should be made every 3 years, route by route, providing its loading curve and the derived indicators (average distance travelled, use of the offered capacity, possibly comfort indicators such as seated-partly seated trips in percentage). Such surveys may be used (if transfers to other routes are surveyed) to redesign the network and adjust the itineraries. Together with some heavy surveys that are usually conducted at regular but long intervals, such as is the case of census (e.g. every 8 years in France) or of the mobility behaviour ones normally led by the authorities, they provide high value information on public transport and its efficiency and effectiveness as an alternative mode, and can also be used as a basis for modelling techniques, an important tool in research studies.

Information on town (or area) planning

This information is mainly related to a proper organisation of transport (not a goal in itself) in relation with town planning, since mobility patterns are heavily influenced by the growth and distribution effects of the urban area. In this respect, several dimensions have to be considered and integration between several policies (e.g. land-use, environment, security, etc.) should be the main tool for town planners to achieve the “sustainable city” model.

This involves also a multi-modal (including non-motorised modes) approach that normally requires the use of expensive tools (e.g. simulation models, etc.). Such tools are very costly and require continuous updating of the basic data (population and employment through census, traffic measurement and conditions — not limited to peak-hours surveys —, behaviour of car drivers and public transport passengers, evolution of dwelling conditions, etc.). They may therefore only be maintained at authority level but have to be fed by all agents of the system.

This approach requires the transparency on data usage by all bodies concerned, including by operators and consultants. Law in most countries prohibits the dissemination of data on individuals in order to protect their private life. One solution may be found in delegating to an university institute or a research centre the duty to store and maintain the detailed data base and to publish aggregated data on a standard — sharing the territory in so many zones, for example — or customised basis, an example of this practice can be found in Montreal.

Information on management tools and methods
An analytical accounting scheme is a tool for continuous improvement of the economic performance of the network, and provides information related to internal management methods, useful for operators’ own use (e.g. benchmarking purposes) but also very relevant to authorities (specially on the costs of operations). The sharing of this basic information may be used for a better and deeper dialogue between authorities and operators, enabling the assessment of any improvement of productivity.

The sharing of know-how (e.g. statistics, modelling techniques, surveys and other sources of information enabling to improve the transport service, research studies normally ordered by the authority and with results and conclusions not disseminated to the operators) in a co-operative way, as opposed to a competitive one based on a restricted access to the data (only those who collected the information or those who ordered the study).

Gathering and processing all this information is costly and requires an organisational structure that is hardly impossible to be supported by a firm especially if it is a private one. Alternatively if a mobility observatory could be created, all information will be available to all competitors when a tender is launched, and the simple fact of enabling all taxpayers to know the results of the public money expenditure in transport would act as a pressure to improve the efficiency of the system.

7.2. Working with Toolboxes

The relationship between the agents of the system is based in the chain authority-planner-operator, and within this framework some tools act to improve efficiency, effectiveness or appropriateness of the transport system. If the "tools" already mentioned are "levers", we now consider the "forces" applied to them as the acting tools to be discussed.

The description shall refer to "tactical level " and to the "operational level" following the structural approach to UPT systems that was presented in previous chapters. Tactical level involves "what service can help to achieve the strategic aims" : it includes both the production side (vehicles, routes, timetables) and the selling side (fares, image, additional services).

The operational level involves the field of "how to produce that service": on the production side (infrastructure management, vehicle rostering and maintenance, drivers rostering and management, etc.) and on the selling side (selling the services, the "driver-seller", providing information on the services, etc).

The extent to which each element in the tool box is used in a particular situation depends critically on the circumstances in the city or region concerned. In describing the levers, we give examples from particular cities, but this doesn’t mean that the described tool would fit all systems and regimes.

Consequently there are some general recommendations which emerge from this analysis:
• In deciding which levers to use, it is essential to identify clearly all the impacts and outcomes they might have;
• These impacts and outcomes then need to be related to the objectives being pursued by the authority and operators;
• The policy levers need to be used in such a way as to ensure that the objectives of each party are consistent with each other and not in conflict.
• Information plays an essential role in the potential of most tool to influence the improvement of public transport systems.

By describing the levers and analysing their effects, this section of the report is seeking to contribute to that process.

**Tools at Tactical Level**

• **Service design review.** The actual service and planned one differ for obvious reasons: the measurement of discrepancies may lead to a real improvement if the tools are properly used and the results co-ordinated among operator and authority.

There is a case for the "laboratory-buses" measuring all data related to traffic and transport on a bus line and of the computer aided traffic management systems, when they exist for public transport networks. Their day to day results are supplying data for quality management as well as for operational improvements.

• **Revenue based service design.** The revenue of the line is of immediate importance for its economic performance. Planning tools usually optimise costs rather than patronage or revenue: planning direct lines, diversions or flexible itineraries at certain hours, employing high capacity vehicles on the most heavily loaded lines may lead to a real improvement of quality for passengers and better revenue for the operator. Tied to a tariff policy favouring peak-hours market share, those methods may also cope with political environmental goals.

However a remark is required: in general it is not possible to apply the same approach during off-peak hours since the market share of public transport is comparatively high and demand lower than economically viable.

• **Technical specification of the system :** in order to promote innovation, bidders may be allowed to propose alternative specifications to those proposed by the authority. This can, however, be a source of complication in evaluating bids and in many cases a compliant bid is also required. Allowing for flexibility in the course of the contract period is also a potential source of improvement: it acts in parallel with allocating an advisory role to the operator.

• **Specifications of Quality of service:** the reference is the contract and the setting of objectives and of bonus-penalty clauses. The mechanism will work properly if measurement is really and honestly made by one party, and checked by the other party. Unfortunately such clauses act more as a deterrent and the few quality indicators relate mainly to equipment (age, capacity, cleanliness of the vehicle, etc.) and not to the service as such.
• **Technical licensing of operators**: the registration of transport operators is the most common way of opening the market to them. However, procedures really used are frequently far more constraining than the necessity to have the basic knowledge in legal, technical and administrative transport matters. The conditions imposed by the authorities to draw the short list of operators finally authorised to bid may be very constraining, especially in the case of larger contracts: the main one is to have experience of the same kind and importance of business, which leads to favouring the incumbent operator. Those conditions need to be measurable enough to ascertain that they cannot be judged as discriminatory measures.

• **Financial incentives**: clauses of this nature appear often in contracts, always as bonus-penalty schemes for operators, only operators. Very few contracts considered sharing this incentives by both authorities and operators.

• **Duration of operations rights**: authorities can maintain pressure on operators and reduce contract duration but public service quality may in turn suffer from too many and frequent changes of operator. The duration of the contracts varies around 6 years for large network contracts (e.g. Lyon 6 years, Lille 5 years) and may be reduced to 3 years for smaller size ones. The contract duration is acting as an incentive to do well if reasonably long, the hope being that a successful contract period shall be followed by another one. On the contrary, not being renewed is considered as a commercially adverse situation. It is less the case if tendering is made on basis of routes or sub-networks.

• **Duties of the operator at contract’s termination**: in order to limit the risks that a newcomer would have to buy new rolling stock, for example, at a cost and possibly a late delivery risk, some countries oblige by law to transfer the equipment at the end of the contract to the authority at an agreed value (or according to an agreed way of valuing it).

• **Fare structure**: this tool is very often underestimated by those who set the tariffs: a price is not only a value, it is also a "sign" on the relative importance attached to goods or services availability. Among others: the relation between the price of a flat single ticket and usual commodities such as bread or cigarettes, the relation with the price of car parks (on the street, in garages), freedom to travel free, on a marginal cost basis, with season tickets and, on the contrary, managing one's travel costs through smart multimodal cards. There are also threshold values beyond which prices are suddenly dear and cause adverse effects if attained. As a tool in itself, other research projects are dedicated to the study of the systemic effects of tariffs structure, which is far beyond the purpose of the ISOTOPE project. However fare evasion could possibly be considered under this item;

• **Promotion of public transport**: the authority usually considers public transport as a public service and its involvement in its promotion looks natural. On the other hand the operator is selling a service, at the same time as it is produced, and feels entitled to use market research to improve his achievements in terms of income from passenger revenue, of market share etc. There are two ways to consider promotion:
  • promotion to users and tax payers by the elected bodies or their representatives;
• promotion of public transport, as a marketable service, by the operator to actual and potential customers according to goals set by the authority.

Institutional promotion is partly made by authorities through their transport achievements. It is not considered one of their duties to promote the service itself unless they deny any professional skills on the operator's side. It is mostly advisable to grant the operator full responsibility on minor product/market adjustments and on overall promotion aimed at the maximisation of the positive external effects (such as less pollution, less noise, less space consumption).

• Static information : in this field, one finds posted information at stops and signs on the street related to transport, park and ride, car parks facilities. At stops it is usually the operator's duty to maintain an adequate information according to the quality standards requirements elaborated in close co-operation with passengers. This means that some intermodal information (e.g. detailed district map to ease the end walking part of the trip) and geographical aspects (e.g. main traffic generators such as hospitals, administrations, schools, etc.) are available. Time table indications at stop generalise and in a few cases are on-line with the traffic control computer. This information releases pressure on uncertainty on timetables felt by passengers waiting at stops or in the stations.

• Non-traffic revenue : this source of income is minor but important in itself : advertisement at stops, or on board the vehicles, revenue from shops in stations or in multimodal exchange centres are commonly found. It may be the duty of a committee to set the rules. Within those limits, freedom should be left to operators to get resource from advertisement and other business.

Profit originating from developments built along lines (rail, light rail, underground) can hardly be considered as they are mainly part of concession contracts and related to investment incentives.

• Managing interchanges : market forces do not necessarily provide the services needed and a continuous dialogue needs to be established on the structure of the network between authority, planner and operator. This enables the introduction of objectives such as social, city planning, environment ones and to supplement the commercial network.

One may create an advisory or a co-ordination body dealing with all transport matters : it is in general a city's transport committee co-ordinating all the aspects but mainly those related to infrastructure or land use.

• Integration of urban public transport. Integration is mostly welcome by passengers for whom transparency in travel pattern choice is important. All tools fostering the integration foster public transport use and satisfy the need for social and environmental effectiveness.

However some disadvantages may appear from the authority's point of view and tools exist to overcome those difficulties :
⇒ Physical design of the intermodal exchange points is certainly to be directed by the authority: it is the “window” of its policy and the safeguard of it in the long term, with a structuring effect on the city. As examples of multimodal centres:

- Perrache in Lyon, designed by the Communauté Urbaine de Lyon (motorway, car park, rail, underground, city buses, taxis, regional and international coach lines),
- Gare de Vaise, designed according to Organising transport Authority in Lyon requirements and those of Communauté Urbaine for the urban integration (car park, regional rail, underground, city buses, regional coach lines).

Alternatively the specifications of the intermodal exchange centre have to be mentioned in the specifications of the development in which it is integrated. In all cases, one point needs clarification: the sharing of the operating costs of the interchanges among the users.

⇒ Distribution of passenger revenue: the difficulty arises from the lack of an accurate (i.e. accounting) measurement of the real use of each of the integrated lines. One solution is to survey the usage of the lines and to compute a fee representing the operator’s share. Another alternative is to agree on a contractual basis as does the Verkehrsverbünde in Germany: the figures are regularly updated according to surveys conducted by the common operators’ organisation.

⇒ Market and route protection: integration means that the operator has to adhere to a service scheme, the rules of which are set and may be controlled by an authority or agreed upon by all operators. If no authority exists, either regulation freezes the situation and forbids any overlap of activity among transport operators or some confusion may appear and break the integration arrangements, unless all operators realise the advantages of integration and produce a bottom up agreement in this direction.

Tools at operational Level

- Links with traffic management: a common language for operator and traffic manager is found in practice through most of the modern computer aided systems: the data base, if fairly used, provides all information needed to optimise the public transport traffic, i.e. minimise number of (traffic-related) stops between commercial stops. It supplies also objective figures enacting an objective discussion on conflicts.

- Dynamic information: it is the result of an investment by authority, or on behalf of it: elasticity to quality improvement of the service (at a cost) has not been proved economically, at least for the current types of information and forms of its delivery. It is possible to inform passengers quickly and accurately, mainly in integrated networks.

- Performance monitoring: it is achieved through contractual clauses as already mentioned, but such approach needs to be relayed at line level through the first level of supervision. Therefore it is directly linked to the management organisation of the operating company.
• **Customer satisfaction** : it is part of the performance monitoring. The proper tools are to be assessed, to reduce the bias: the answer is in general known (in most cases with a majority of "yes, we are satisfied") but not the specific content nor the meaning of the question.

• **Handling of complaints and suggestions** : in spite of the relative value of the number of complaints as an indicator, it is one of the spontaneous measurements of the user's reactions. In fact one needs to enter into a real dialogue with users and non-users: hidden factors shall appear and enable management to really improve the service. It needs in-depth market research studies.

• **Control of the revenue** : as an issue, it is as old as public transport itself. When the revenue is the property of the operator, the control is possibly best, also on fare evasion. In other cases, procedures and imagination (against the imagination of cheaters) are to be sharpened.

### 7.3. Discussion on confidentiality

A discussion on confidentiality is now possible. The information is basically part of the operator's business value. Economics based on monetary values justify confidentiality. However, some information is open: it may be included without theoretical difficulties into the observatory of mobility, such as, for example, the economic results of the company which are compulsorily available to shareholders or to the personnel.

The information pertaining to the city, as those figures derived from census or mobility surveys are of utmost interest, as they are disaggregated and very rich in content. However, they are linked to individuals and therefore close to privacy. In some instances (e.g. France), they have to be aggregated in zonal results avoiding making individual results directly or indirectly available. In some other cases (e.g. Canada) they are included in geographical data bases and maintained at postal code level — rather precise in Canada — by official institutes or universities for research purposes. The access to the data bases is available to outsiders for action or consultation through adjusted customised sets of zonal results.

The main difficulty to overcome, beyond the regulatory constraints, lies in the ownership of the data: since the main cost item is the collection, the data cannot be available without charging its cost or arranging a contractual exchange agreement among partners of the same city. Alternatively the cost of the observatory is to be borne by an authority: in this case, the confidentiality of the data is left to the appreciation of their owners and to their goodwill. This is the case of many sets of data, even in regulated systems.

It is extremely difficult to disclose data to outsiders, since transport and environmental issues are in the political field - good or bad results may be used to judge policies. A large number of authorities maintain a confidentiality on data for the simple reason that without the possibility of measurement of their achievements, policies are considered reasonably good at all times.
8 - CONCLUSIONS

After having discussed in the preceding chapters some of the main points in the field of the legal and regulatory framework of UPT, we will, in this final chapter, try to present a structure on which the main regulatory decisions in this field could be based.

We have seen that the variety of existing choices is rather wide across Europe, and that must be for good reasons: On one hand there is a considerable inertia of the systems themselves (possibly due mainly to the large dimension of some undertakings and the general interest in their good performance), but on the other hand there is also a very complex set of (mutually interrelated) goals underlying their existence and operation, which brings with it many possibilities of assignment of different priorities to those goals.

This chapter starts with the identification of the main stakeholders and their goals, and then goes on to produce an organised list of the main issues in the definition of the legal and regulatory framework, addressing in each of its points the main items of the discussion, and issuing our recommendations at that level.

8.1. Stakeholders and their goals in the UPT system

For the definition of a legal and regulatory framework for UPT it is useful to construct a structure representing the set of stakeholders in the system, along with the interests (goals or constraints) of each of them in this system. The essential components of the legal and regulatory system can then be designed according to the weight attributed to the interests of each of these stakeholders.

For this we will consider three levels of relationship with the system:

a) The policy level, which must consider the adequate representation of all segments of society;

b) The customers’ level, which represents the very raison-d’être of the system, its direct demand;

c) The agents’ level, which represents the interests of the entities who actually define and produce the service;

There are direct relations between the policy level and the two other levels: the fact that this sector is perceived as having the possibility of specific political interventions, leads both customers and agents to see the policy makers as a possibility of recourse when their bilateral relations are running in conditions they may consider as undesirably negative. So, for instance, good service to the customers is of direct interest to them (and in the commercial interest of the agents), but must also be considered as an indirect interest to the policy makers. And similarly, fairness in the relations between the authorities and operators is very important to the policy makers.

So, on the policy level, we will be mentioning only the aspects that go beyond the representation of the mass of customers and of the agents of supply. And within this scope we can identify five different areas of specific concern:
### STAKEHOLDERS AND INTERESTS AT POLICY LEVEL

<table>
<thead>
<tr>
<th>Represented Segment and Specific Goals</th>
<th>Operational Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>♦ Citizens in general</td>
<td>♦ Allocative efficiency of resources</td>
</tr>
<tr>
<td>⇒ Welfare Maximisation</td>
<td>♦ Higher market shares for public transport, possibly targeted by zones.</td>
</tr>
<tr>
<td>⇒ Congestion relief</td>
<td>♦ Use of cleaner vehicles;</td>
</tr>
<tr>
<td>⇒ Environmental Protection</td>
<td></td>
</tr>
<tr>
<td>♦ Tax Payers</td>
<td>♦ Higher cost efficiency of operators,</td>
</tr>
<tr>
<td>⇒ Low subsidy volumes</td>
<td>♦ Measures that help capture the full revenue potential of the service</td>
</tr>
<tr>
<td>♦ Lower Income Groups</td>
<td>♦ Concessionary fares for some groups</td>
</tr>
<tr>
<td>⇒ No exclusion through price</td>
<td>♦ High transaction costs may impose lower general prices</td>
</tr>
<tr>
<td>♦ Minorities</td>
<td>♦ Employment Opportunities</td>
</tr>
<tr>
<td>⇒ Easier social integration</td>
<td></td>
</tr>
<tr>
<td>♦ Urban areas needing rehabilitation</td>
<td>♦ Especially improved accessibility</td>
</tr>
<tr>
<td>⇒ Attraction of businesses and employment</td>
<td></td>
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</tbody>
</table>

Some of these goals may be at least partly contradictory, which implies that choices have to be made. The first three segments may be considered as having a direct and strong impact on the formulas chosen for the legal and regulatory framework, whereas the latter two can possibly be addressed at the level of adjustments to the framework resulting from that choice.

### STAKEHOLDERS AND INTERESTS AT CUSTOMERS LEVEL

<table>
<thead>
<tr>
<th>Represented Segment and Specific Goals</th>
<th>Operational Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>♦ Passengers</td>
<td>♦ Adequate territorial coverage and network design</td>
</tr>
<tr>
<td>⇒ Good Accessibility (in space and in time)</td>
<td>♦ Timetables in agreement to demand peaks and hours of activities</td>
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<tr>
<td>⇒ Ease of Use</td>
<td>♦ Good information at planning and utilisation moments</td>
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<tr>
<td>⇒ Attractive Service</td>
<td>♦ Physical and Tariff integration</td>
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<td></td>
<td>♦ Stable network and timetable</td>
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<td></td>
<td>♦ Quality specifications and guarantee</td>
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<td>♦ Continuous monitoring and adaptation of quality specifications</td>
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Even if the customers are at the centre of the public transport system, they are not directly represented in the relations between the agents, who supposedly act to satisfy these interests. So, the satisfaction of the interests of customers must be seen as the main goal of both types of agents, subject to which they will try to satisfy their own.

Preservation and expansion of the set of customers through provision of value for money is normal in any business. In the case of UPT, since the specification and
definition of the service is frequently done not directly on the market place (between provider and client) but indirectly, mainly through indication of the authority, listing of the main goals of the customers is important since the relations between the agents must be built in such a manner that these goals are not impinged upon, and on the contrary become the centre of the stimulus for their performance.

**STAKEHOLDERS AND INTERESTS AT AGENTS LEVEL**

<table>
<thead>
<tr>
<th>Represented Segment and Specific Goals</th>
<th>Operational Goals</th>
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<tbody>
<tr>
<td>♦ Authorities</td>
<td>• Relations with operators must be designed so that the gains of control are not overcome by the costs of the controlling structure.</td>
</tr>
<tr>
<td>⇒ Avoid excessive burden</td>
<td>• When in open competition, avoid excessive asymmetry of conditions for incumbent</td>
</tr>
<tr>
<td>♦ Operators</td>
<td>• Relations with authority must be clear and desirably under contract</td>
</tr>
<tr>
<td>⇒ Fair conditions of access to market / operations in market</td>
<td>• Operator must enjoy some marketing degrees of freedom and participate in the resulting gains</td>
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<tr>
<td>⇒ Conditions for stable commitment</td>
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<td>⇒ Conditions for innovation</td>
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In a first instance, the role of (administrative) authorities in their relation with operators is to ensure an organised representation of the interests at the two other levels: the policy level and the client level. Both these interests must be present when the system is designed, and when the performance of the system is monitored. This monitoring must serve as a verification of compliance of the operator(s) with the agreed services, but also as an instrument for detection of needs of adjustment in the service that is being provided.

But there is another role that is very important in the cases where there is scope for competition among operators, either for getting into the market, or directly in the market. In both cases (and with different instruments), the authorities must ensure that competition among those operators is fair.

### 8.2. Recommendations on the key regulatory issues

In this point, we address in succession a series of issues that form the backbone of a legal and regulatory framework for UPT in any city. For each of these issues we try to point out what is at stake, as well as the main options available, we briefly recap their weaknesses and strengths (deeper discussion has been made in the preceding chapters), and we make explicit recommendations.

Inevitably, these recommendations do not go into detail (this would frequently have to be done in accordance with the general legislation of each country), and some of them are contingent on higher choices. We have nevertheless always tried to point out what is the orientation thought more appropriate at each level.
a) Who takes the initiative of UPT

All European countries recognise that UPT is a service of collective interest, beyond its function for satisfaction of individual needs, this collective interest being sometimes (not always explicitly) expressed in a set of goals at the policy level, probably not too different from the one presented above.

Even if that is not always the case in the published legal texts, most of these European countries presently favour that the initiative of creation and improvement of UPT services should be in the hands of the State, although the level of administration where this function is exerted varies from country to country.

The most visible difference at this level occurs in the “deregulated” system existing in Great Britain (outside London), where private companies have the right of initiative to create and continuously adapt their transport services, and the authorities can only act to promote the coverage of the social needs not spontaneously offered in the market.

For this matter of initiative, it may be said that both the “regulated” and the “limited competition” systems give structural priority to the attributes of Integration and Stability of supply (and seek cost efficiency through other instruments), whereas the “deregulated” system emphasises productive efficiency and assumes allocative efficiency (although in practice this rarely happens) in the first place, and is in lack of instruments to ensure integration or stability of supply. For these reasons, we favour the allocation of the initiative of creation and specification of UPT to the authorities.

b) What is the role of Authorities, at the political and at the administrative level

Even in the “deregulated” system, Authorities have a normative role in defining what should be achieved by the Public Transport System, although there they act only in addition to what has been offered by free initiative of the operators. In all other countries, there is a strong normative role played by the Authorities.

There are however rather wide variations in the style of performance of this role: sometimes the authority simply defines the service that has to be delivered, thus combining the strategic and tactical levels of intervention in one single step, and sometimes these two steps are separated, the strategic part being carried out by the political bodies, and the tactical part by the administrative bodies. In some more recent examples (e.g. Helsinborg-Malmö), the Authority only decides on the strategic level, and leaves the tactical decisions (network and timetables essentially) for the operator.

We see an advantage in formally separating the strategic and tactical stages in the definition of the UPT product. The strategic stage should be the object of decision by the political bodies, who must specify the policy goals and define targets to be met at each of those goals. In doing this they may be assisted by the administration for
information on the supplementary measures possibly needed and on the marginal costs of improvement from the current situation towards achievement of each of those goals.

Although everybody recognises that network design is difficult to optimise, it is reasonably simple to design a network using common sense and achieving “average” levels of efficiency. On the other hand, the decision to extend or reinforce public transport service to an urban area is always seen by politicians as susceptible of providing some voting feed-back, and thus this is a power that political bodies like to preserve under their control.

The technical complexity of the network design process implies that higher levels of technical competence may lead to much more efficient network specifications for a given set of policy targets. It makes little sense to engage all sorts of efforts in the promotion of cost efficiency of operations, and forget that similar or larger economies could probably be obtained at the design stage, whilst preserving intact the levels of service specified at the strategic stage. For this reason we recommend that network design should be made by a professional team under control of the administrative authority (possibly under a limited tender, and foreseeing performance incentives in the contract). The strategic importance of information about demand and the need for stability in the product offered to the public recommend that operators be given a chance to improve this network design during their contract, in close co-operation with the authority.

While a good network design may be seen as an instrument to ensure good accessibility to customers at lower costs, there are other aspects of the quality of service to the customers that strongly depend on the performance of a normative authority.

Key among these factors of service quality is the integration of services in all its three dimensions: physical, tariff, and logical. Full integration is possibly one of the decisive factors on the fight for market share, as it may be essential for attracting for public transport citizens who could choose to drive their cars. For this purpose, integration must be achieved not only within the UPT system but at the wider Urban Mobility system, thus including also the interface between public transport and the private means of mobility (cars, motorcycles, bicycles).

For these reasons, administrative authorities must see the achievement of high levels of integration on all three dimensions as part of their job at the tactical level. This may impose some constraints on the relationships between authorities and operators, as well as generate some additional costs on the operational stage.

c) What is the most appropriate territorial level of authority for Public Transport

Many different formulas exist in the cities studied in this project for the representation of the Authority. There are cases where this is directly done by the general administration responsible for transport at the national, regional or local level, but also
some cases in which authorities have been specially created with powers in the area of UPT. Frequently these new authorities have a statute of public institutes and gather in their constitution representations from various levels of the general political system, namely regional and local.

As a matter of principle, local authorities should be in the first line of responsibility for this sector, and in the majority of countries this is what happens with the relatively small towns that have public transport. But as the size of the conurbation grows, the need for UPT frequently goes beyond the administrative borders of the central city, and other communities start having strong interests in the process. Since the redefinition of administrative borders is always a very troublesome process, it is easier (and possibly fairer in many cases, since other aspects of community interest may still be well managed at the purely local level) to create a new entity with the specific role of representation of the authority of the various local communities involved. The formulas for allocation of the weight of representation of the different communities are varied.

Whenever the conurbation plays a strong role as regional or national capital, serving important flows of citizens travelling there from those areas, it is usual to find a more direct engagement of the higher level of power, either totally assuming this role, or by some form of participation in the financing of investments.

The basic principles here are subsidiarity and proportionality. The institution that fulfils the role of the Authority for UPT must have the representation of the communities with a direct stake in the system, and could adopt one of several forms, depending on local conditions. If there are several local communities involved, the weight of each of those should be proportional to some relevant indicator, for instance total number of inhabitants, number of inhabitants enjoying a certain level of service, or other. Direct representation of higher levels of the political power is possibly not an advantage, although there should be clear rules defining the framework for obtaining co-financing from those higher levels for heavier investment projects.

d) What other competencies should be attributed to the authority responsible for UPT

We have already mentioned the critical role played by integration of UPT at all three levels, physical, tariff and logical, and we have stressed that this integration must be understood as encompassing the whole urban mobility system, not just the public transport system. This means that there is a strong need for articulation with the private car, especially when we are dealing with park-and-ride systems.

But the need for integration if present also at the policy level. We have mentioned the goals of congestion relief and environmental protection, and indicated that (targeted) market share of public transport is an important operational goal in that respect. It is known from experience in many cities around the world that control of market share between individual and public transport includes “pull” measures that correspond to improvement of service quality in public transport, but also “push” measures that either raise or simply better demonstrate the difficulties of access in individual transport to
certain areas at certain times. This is almost impossible to achieve in a sustained manner if there are two different authorities in charge of individual and of public transport.

But we should go further in the arguments: provision of access to all urban areas in equitable terms implies some form of planning in the allocation of space for individual and public transport, not only in the space consumed by circulation but also by parking. In this respect, all new construction, densification or rehabilitation of urban areas must be checked in terms of its compatibility with the prevailing mobility policy and resources.

This is normally done during the preparation of a general urban plan, but several countries currently have mandatory preparation of urban mobility (or urban displacement) plans, in which the land use (existing and planned) and the mobility plans are mutually adjusted, taking into account not only the resources but also the prevailing trends of activity patterns of the population.

From these interactions, we conclude for the advantage of including all aspects of urban mobility in the same administrative agency, which thus covers all areas related to public and individual transport, namely traffic management and parking. The integration with land-use planning and management is useful but more on a planning level, less on an operational level. For this, we suggest different administrative agencies, possibly under the co-ordination of the same political department.

**e) What is the regulatory regime that represents the best choice for a fresh start**

In what follows, we deal with an (almost totally) artificial problem, since not many European cities are currently starting public transport operations. By fresh start we want to express that we are looking at this issue without considering the transition costs that inevitably come to the surface when there is a change of regime. In short, we are looking at what should be the target regime, recognising that the point of departure may imply that the costs of transition are higher than the additional costs of staying within the current regime and try to improve the performance of the system as much as that regime allows.

We have stated above that the deregulated regime is prone to give higher productive efficiency, but is incapable of adequately providing the necessary integration and stability of supply (especially in the installation phase). For the choice between “limited competition” and “regulated”, it is essential to consider the level of political will and technical competence on the public side. A regulated system has less risks of total rupture, but a higher risk of complacency between authority and public company. Besides, the higher production costs it entails may imply a slower adaptation to the evolution of needs of the customers and of the city as a whole (unless there is a strong financial basis for continued public expenditure).
So, if the political will and the technical competence of the authority are present, we think that a “limited competition” regime is the best choice, since the stability of the system can be maintained at lower costs and with improved prospects for permanent improvement.

f) What are the adequate (contractual) frameworks for best achievement of the goals as stated above

The recognition that significant improvements in cost efficiency of UPT operations could be made has been one of the driving forces for changes of the regulatory framework in many European countries over the last decade. Our economic research clearly indicates that there is a strong influence of the regulatory regime on the productive efficiency of the system: discounting all other factors, the “deregulated” system achieves highest cost efficiency, and the “limited competition” system comes next. Part of the cost advantage of the deregulated system implemented only in the UK - over the limited competition system probably has to do with lower labour costs (hourly rates and payment of non-driving hours). (see report of Workpackage 3).

This is in line with what we already stated above in the point dedicated to the right of initiative: the deregulated system assumes cost efficiency as its main objective, and the results in practice show that this is achieved better than in the other regulatory regimes, despite the fact that it did not manage to solve the serious problems of inefficiency in consumption that arose during the transition to deregulation (and that are not yet solved), neither the risk of oligopolistic concentration that presently come to surface, thus jeopardising competition levels. In the remaining group of systems with initiative of the authority, the presence of an element of competition also produces undeniable effects at this stage. But competition by itself is a factor of productive efficiency, not of increased ridership.

Since the regulated regime also has shown its merits in what concerns consumption efficiency (see Workpackage 3 report), the question really is how to best promote efficiency within each of the regulatory frameworks (and how to judge whether the achieved results are good enough).

In the deregulated regime, competition is done on the street, but that raises problems of integration, instability of supply, and greater inequity in the levels of service, besides the fact that the policy goals of congestion relief and environmental protection are harder to contemplate. After some years, competition pressure may diminish due to the formation of oligopolies, in which case conditions will exist for a reduction of productive efficiency.

In general, the most effective type of instrument to promote cost efficiency is some form of competitive pressure, which might be of a very different nature according to the general regulatory regime. We will be looking in particular to forms of direct
competition and of indirect competition through comparability. In general terms we refer to competitive pressure.

In a regulated regime, direct competition is only possible at the level of sub-contract suppliers, so efficiency gains must be sought with instruments of indirect competition. We identify two instruments, which may be applied alternatively or jointly:

- Internal, longitudinal comparability: the operating company compares its own performance along time, identifies trajectories of key indicators and defines targets for them;
- External, cross-sectional comparability (bench-marking): the operating company compares its performance at certain moments with that of other operating companies, which presupposes a minimum of harmonisation of accounting procedures and statistics. An international project for harmonisation in this domain would be very useful, since the dimension of possible comparisons would be significantly enhanced.

The first option is easier to implement, but has the difficulty of judgement whether improvements are quick and large enough. In any case, we believe it is a necessary procedure for this type of regime, and it should be subject to contract with the corresponding authority whenever possible. After a short number of years of experience, it should also be complemented by the introduction of the second instrument. The contract with the authority would then foresee a revision of the internal targets in relation with the achievements of the other networks being analysed.

We cover next the case of limited competition regimes, which are becoming the norm in many European countries. The variety of options make the presentation of (inter-related) recommendations more difficult if we wish to preserve readability. We have opted to start by a presentation of what we believe are the “mainstream” conditions, identifying in sequence some circumstances which may recommend to adopt a different choice in one or more of the points. In particular, the general recommendations are aimed at bus systems, and part of the later discussion addresses the adaptations recommended for rail systems.

In the case of the “limited competition” regime, since there may be conflicting objectives between authority and operator, the need for technical and managerial competence on both sides must be stressed. The movement of industrial concentration that is observed in this industry at European level is leading to a situation where local authorities are facing operators with large market information, contract experience, risk sensibility, … which in turn creates some asymmetry of competence in favour of (global) operators over (local) authorities. In the following recommendations we avoid repeating the arguments presented above, limiting our comments to the key advantages of some of the points where this might be less clear:

- In general, Gross-cost Contracts with minimum standards for production resources (vehicles, staff) and service levels, as well as incentives for quality of service, levels
of patronage, and market share in key areas of the city are a solution that presents a lower risk of capture of the authority by the operator (by lowering barriers to entry of new competitors), a relatively low burden for authority, and easier mobilisation of investment resources by private companies than by local authorities. However, because the operator is reduced to a more passive role, it also reduces the opportunity to improve service to the customers;

- Tender for fixed network, but once in place the operator should have the right to suggest design improvements, which must be agreed upon by authority (incentive for this may be in lower production costs or bonus related to commercial performance);
- If city is large enough, contracts for sub-networks (this promotes regular comparability between sub-networks and creates additional competitive pressure);
- Information on demand gathered and managed by Authority, who must ensure level playing field between incumbent and new candidates at later tenders;
- With gross cost contracts, if old fleets are to be avoided, duration of the contract must allow adequate levels of depreciation of the capital goods engaged (not necessarily whole depreciation if there is a second hand market)
- If performance of one operator is judged very good both internally (against targets fixed in the contract) and externally (in benchmarking procedures), it may be adequate to foresee automatic extension of contract, at least for one term;
- Fare structure and levels decided by authority;
- Integration must be ensured by Authority, in dialogue with operators;
- Policy goals like concessionary fares and employment of minorities inserted in tender conditions. Improved access to areas in need of rehabilitation inserted into network design.

This list should not be understood as the recommendation of the ideal system, even in the limited scope of the “limited competition regimes”. Local circumstances, particularly in what respects to availability of technical competency by the authority or enough candidate operators, may well dictate different choices, and there are still many degrees of freedom when we consider each of these questions in detail.

In general, we think that choosing operators just on the basis of the lowest price bid to produce public transport according to a simple definition of a network and timetable by the authority presents a substantial risk of ending up with a low quality service. This implies that, whatever the contractual form chosen, there must be minimum standards of service and that, if proper resources and qualifications are available for the necessary measurements, contractual incentives should be present aimed at the quality of service produced and at customer satisfaction.

These contracts should constitute tense partnerships and not simple supplier-purchaser service sales. Besides the legitimate economic goals of both parts, there is a common interest in preserving and nurturing the basis of their relationship, that is, providing good public transport service to the customers and to the community as a whole.

This principle is also applied in a growing number of cases at the lower level of relationships between the transport operator and its industrial suppliers (vehicles and other equipment), which are becoming partners along the life of the contract and not just spot suppliers of those equipments. Also, especially in the (more expensive) rail based systems, banks are becoming partners during the project, not just money lenders.
The first step in this evolution is that these partners must be responsible for the operationality of their system during their life cycle, not just their supply at its beginning. This may be translated into a system of guarantees, or even deeper into a contract for provision of maintenance that ensures that operationality. The concept may even extend to periodic refurbishment and updating, especially in the case of long contracts. Another extension of interest in the case of some specialised sub-systems (ticketing and sales are one example) is that those partners go from supply and operationality to actual operation of those sub-systems.

The two main types of adaptations to these “mainstream” recommendations to be covered at this point are those related to the following points:

- **Type of contract (Net Cost or Management Contract instead of the base choice for Gross Cost)**

Net cost contracts would seem to be the ideal choice for authorities in the short term since they have the option of specifying what they want to achieve, and are bound by contract to get it at a fixed price, leaving to the operator the “breathing space” necessary to make use of his ingenuity in reading and adapting to the wishes of the market, thus improving the chances of obtaining a higher revenue.

But the medium-term risks resulting from a very dominant possession of information by the operator, as well as the practical difficulties for the authority to impose adaptations of the network design during the life of a contract impose some caution before adopting this form of contract. Our recommendation is that some side conditions should be satisfied before preference is given to a net cost contract over a gross cost contract:

i) the Authority must have a solid and stable tradition of information gathering, processing and dissemination (and the will to continue so);

ii) since net cost contracts effectively lower the contestability of the market, the authority must regularly monitor performance of the operator (in what concerns ridership, cost-efficiency and quality of service really provided), and enjoy the possibility of escaping from the situation of capture by the operator. This can be made by a clause in the contract specifying that under-performance may lead to breach of contract followed by a new tender for a gross-cost contract (whereby contestability would be renewed);

iii) if network dimension and structure allow it, division in sub-networks with separate operators in each of them (imposing clauses of minimum levels of integration in the contracts) still helps inasmuch as comparability is a good source of competitive pressure;

iv) since it is desired that in net cost contracts the operator has the possibility to improve service and efficiency during the life of the contract, its duration should be longer than for the corresponding gross cost contract so that time is given for the proper understanding of the market;

In the case of management contracts, their main advantage is avoidance of rupture of availability of the main resources (staff, resources) at the end of contracts. This could be important in situations when the replacement opportunities for those vehicles are scarce, but that is hardly the case any more in the EU today, given the high number
of tender and contracts being started each year. The continuity of employment of staff is generally solved by inclusion of constraints in that direction in the new tenders.

But the frequently difficult situation of local authorities with respect to investment (and the legal constraints many of them face when trying to use modern financing instruments) constitute a risk of lack of modernisation of the systems, as they are kept functioning over the years.

Our view is that management contracts could be preferred to gross cost contracts if the authority perceives that the potential number of candidates to its network is very small, so that it considers that there is a substantial risk that any conflict with the operator might result in a breach of service of difficult rescue by other operators. A more interesting field of application of this type of contract would be to serve as a bridge between a regulated regime (with one monopolistic company) and a limited competition regime, with several sub-networks being contracted separately. Management contracts could serve as a basis of lower risk for the entrepreneurs in the phase of information gathering on the market, with progressive adaptation to production with performance targets, and restructuring of the companies, including introduction of their own private fleets.

- Special considerations for the case of rail-based systems (light-rail, underground, suburban rail)

The case of rail based systems has a few main characteristics that impose qualitative changes in the way it is approached by the authorities. These differences with respect to bus systems are largely shared by light rail systems and traditional suburban rail systems:

- the capital intensity of this mode is much higher, both at the infra-structure and the vehicle levels. This imposes that any contract placing investment costs on the operator side must have much longer duration than in the case of buses;
- there is a much smaller degree of transferability of physical assets from one city to another, as many systems have been custom-designed to take into account special wishes of the authorities or of the (then) operating companies. This imposes special care when dealing with the ownership of these assets;
- the rigidity of its network is much higher, and even desired adaptations of timetable in one line have to be co-ordinated across the network. This implies a strong hand in the control of product specification and of its execution;

The authorities may still prefer to let the physical assets on the operator’s side for the life of the contract, albeit a longer one. The currently prevailing trend is for long term contracts (15 to 30 years, possibly even more if there are substantial extensions of underground construction), with the consortia on the operating side including significant participation of the suppliers of the main capital items.

The main difficulties with this type of contract come from the difficulty of correctly forecasting the evolution of transport demand over an horizon of several decades. This raises great difficulties in estimation of revenues (thus favouring gross cost contracts) but also in the management of the degrees of freedom for future expansion or adaptation of the system, since a “closed system approach” at the beginning might be cheaper and
even work very properly, but effectively create insurmountable barriers for other suppliers in the future tenders for expansion. This difficulty of managing the long-term on the operating side and the short-term on the amortisation of the investments is probably on the basis of the scheme adopted for the privatisation of British Railways, with three different types of entities active on the market: Railtrack (infrastructure), Rolling Stock leasing companies, and franchise operators.

The basic recommendations that can be issued in this respect are the following:

- include adoption of “open systems” design in the initial proposals in the main criteria for choice of system. This will strongly increase flexibility for future choices, thus preserving the competitive pressure element for those expansions. This approach is the same as taken by the interoperability committees working at European level, and corresponds to the maximisation of value for money in future purchases;
- if a gross cost contract scheme is preferred, it should possibly be designed as a “network of contracts”, with different horizons for different components of the investment and service being rendered by the private side: we can imagine a 60 year contract for the construction, maintenance and right of access to infrastructure including significant parts in tunnels (based on an access fee per vehicle, with a guarantee of minimum traffic volumes), 20 to 30 year contracts for operationality of rolling stock (thus including its maintenance and refurbishment, based on effective availability of those vehicles for operation), and 10 year contracts for the actual operation of the system, in which those high capital costs would have been transformed in operating costs (access tolls and vehicle.days). The latter contract for operation could well be a net-cost contract, with an almost-fixed network and strict clauses on timetable integration with other lines. All these suppliers / partners must be bound by quality assurance clauses, through which the consequences of bad performance of one partner on the performance of other partners downstream must be adequately penalised.

This formulation gives the authority the possibility to launch new tenders at the end of term of each type of contract with greater freedom for the design of those new tenders. Expansions and adaptations of existing networks are much easier to organise (although there is a bigger number of contracts), since it will be clear whether option should be made for an adaptation of an existing contract or a tender for new contracts.

It also facilitates concentration of interests of the most relevant partners of the consortia in the parts of the supply where their competence is most needed, which will prevent some of the most significant difficulties occurring in the formation and life of consortia under the single long-term contract formula currently adopted in most cases.

**CLOSING REMARKS:**

It is our belief that the elements presented in this report make it possible to use these suggestions as recommended practice, as they seem to constitute a robust set which allows adequate representation of all the identified goals. Their formulation also has the flexibility to incorporate additional requests from either side, authority and operators, in the name of better service to the customers and sustainability of the system and its providers. It is important to stress that city size (and dimension of the staff of the
administrative agency in charge) also influence the choices, since smaller markets are more contestable than big ones, and some regulatory alternatives have higher demands on the role of authorities than others.

It is much more difficult to present general recommendations with respect to the most adequate transition from a certain type of regulatory regime today into a preferred one tomorrow. The main risks of each type of change have been identified, and also in this direction we hope that the information presented in this report may be of help for decision makers. But clearly there must be a specific study on each specific case, as one of the main goals of these UPT systems has to be stability of supply and of public perception of that supply, as these might be jeopardised by a less careful transition process.
ANNEX 1

TRENDS EMERGING FROM THE CITY REPORTS
TRENDS EMERGING FROM THE CITY REPORTS

Through the presentation of a number of « practices of interest » in European urban public transport which cover the various regulatory regimes, several trends can be identified for what concerns legislation, co-operation, competition and contracting.

This document does not therefore give an exhaustive view of the content of the city reports, but highlights for cities operating in a wide variety of organisational frameworks what has been the evolution of the urban public transport sector during the last decade or two.

In terms of legislation, a move away from the classical licensing system can be observed. Furthermore, legislators are searching for the most adequate competitive tendering model in order to guarantee transparency and objectivity.

An interesting tendency that arises from the city reports is that competition is playing an increasing role in the last decade or two, free competition is usually rejected but managed (tendered/negotiated) competition is implemented or envisaged. It can also be stated that competition can play at two different levels: that of the planning and that of the operation.

The cities that were analysed in the city report provide good examples of these tendencies.

1.1 Legislation

A move away from the classical licensing system

In a number of cities that have been studied, a move away from the classical licensing system can be observed.

In Brussels, the law of 1990 stipulates that the Region of Brussels Capital was allowed to approve the creation of an autonomous public company responsible for organising and operating public transport in the Region. The elaboration of a «Management Contract» between the Legal Authority and the Operator and its content are stipulated in the law of November 1990.

Up till now there has been no intention of the authority to introduce competition with companies from the private sector by introducing tendering procedures.

In Cologne, the relationship between the transport operators and the authority is regulated through a licensing system. Recently, the organisational and legal structure of the state railway in Germany has changed: at the end of the existing contracts, competition can take place. For the remaining public transport, for the « self-financing » services, the system of concessions is still applied. For the « non-self financing » services, a tendering procedure takes place, or else a compensation is paid to the operator because the authority imposes the provision of public service in certain circumstances.
In Copenhagen where, a route-by-route competitive tendering system replaced in 1989 the licence system in the bus sector. Furthermore, a law revision of 1994 stipulated that all routes will have to be submitted to tendering procedures before the 1st of July 2002. The railway services are not yet subject to tendering procedures.

The Reorganisation Act of 1987 split up into four companies the national statutory company providing public transport within the Republic of Ireland, which has given more autonomy over operational and commercial decisions to the new companies. The bus and suburban rail services in Dublin are provided by subsidiary companies of this national company.
The government is however considering legislation to allow private operators to operate new bus services where there is an unmet demand (this potential entry would however be highly regulated).

In Greater Manchester and Preston, the Transport Act of 1985 allowed bus operators to compete freely in the provision of commercial local bus services. Furthermore, the Transport Act of 1993 separated the British Rail into an infrastructure company and 25 independent train operating companies (which receive their specifications via a franchise agreement).

Since April 1994, the Norwegian law allowed the introduction of competitive tendering of public transport services. The choice is given to the county authorities: they can continue with the old concessions or terminate them by putting services out on tender.

In Kristiansand, the operator’s contract was traditionally based on a concession. From January 1998, a part of the operation will be based on competitive tendering.

In Maastricht, the operators are required to hold a licence in order to be able to supply public transport services. It is however foreseen under the public transport law, that there will be a competitive tendering situation not later than 2005 for urban transport.

In Madrid, since 1985, the transport authority concentrates all the competencies from all levels of government and entities with responsibilities in the field of urban, metropolitan and regional transport. The transport operators comprise public operators which depend on the authority as far as the provision of the service is concerned and acts in a direct delegation regime; Spanish railways which has a contract with this transport authority in what concerns services run within the Region of Madrid ; and the private companies running suburban services, for which the authority is in charge of proceeding with the contracting, and in some cases tendering-procedures.

In the Malmohus Region, a law which came into force in 1989 gave the transport authorities the right to operate scheduled road passenger transport services without a licence, or to enter into a contract with an independent operator holding the necessary professional qualifications to operate passenger transport services. This led to the introduction of competitive tendering by transport authorities in order to select transport operators. All existing licences for the operation of passenger transport services were therefore abolished after a transition period of four years.

In Setubal, the old framework stipulates that the operating of public transport should be either done directly by public service companies owned by local or central administration or by concessions given without previous tendering. Since March 1990,
the framework law for land transport, which has not yet been regulated, introduces some
deregulation in the market of public transport. Furthermore, it stipulates that all
operators are free to enter and explore the market and the authority should give an equal
treatment to all operators.

*Legislators are searching for the most adequate competitive tendering model in order to
  guarantee transparency and objectivity*

In France, since the law of January 1993 on prevention of corruption and provision of
openness in economic life and public procedures, the delegations of public services are
submitted to a tendering procedure. This brought a uniform procedure throughout the
country.
In Lyon, the management of the network as a whole was since 1986 submitted every 6
years to competitive tendering (the last tender was launched in 1992).
In Rouen, a contract signed in 1991, ending in 2024 (or perhaps sooner in 2009) relates
to the concession of the building and operation of the network.

In Copenhagen, in order to be as objective as possible while selecting the operators, the
public transport authority and public transport planner introduced a quality incentive
system in the tendering process.

### 1.2 Competition

*Competition is playing an increasing role in the last decade or two*

It appears in the city reports that several concerns were arising such as cost-inefficiency
(Copenhagen), innovation and quality (Greater Manchester and Preston), efficiency
(Helsingborg), development of the service and quality aspects (Kristiansand), quality
(Setubal), the introduction of competition was therefore seen as a solution to these
problems.

In Brussels, the latest years have seen the introduction of competitive pressure through
benchmarking. Indeed, the second «management contract» (1996-1999) foresees that
the operator should reach comparable performances as those of the most competitive
European operators (taking into account the specificity of each of the concerned cities).

Since the deregulation of the bus and coach market in 1986 as a result of the 1985
Transport Act, bus services in Greater Manchester and Preston have been provided
mainly, by privately owned commercial bus companies. Bus operations are in both
towns dominated by two firms.

In Setubal, in spite of the introduction of the framework law for land transport, which
introduces deregulation in the market of public transport, the urban transport is totally
provided by one private bus operator.

*Free competition is usually rejected but managed (tendered/negotiated) competition is
  implemented or envisaged.*

Several cases of tendered competition have arisen among several European cities.
In Copenhagen, service and fares integration could be maintained while some level of competition was introduced. Furthermore, bidding by relatively small local operators has been made easier thanks to a very detailed and limited dimension calls for tender and contracts. The creation of an oligopoly has therefore been avoided, and the level of competition has been maintained.

In Helsingborg, a negotiated procedure led to the tendering of the operation of its urban network.

Under the Dutch transport law of 1988, the municipalities became free to choose the local operator, but in the case of Maastricht this has not yet led to a competitive allocation of licences for urban public transport.

*Competition can play at two different levels: that of the planning and that of operation. The second is much easier to organise and control.*

In Copenhagen, competition plays at the level of the realisation and not at the level of planning (the larger operators would however like to receive more power in terms of service planning).

In Helsingborg, no competition has been introduced in the field of the network planning, but the operator has received the planning functions by additional contracting.

In France, the tendering files specify the coherence of the network which will be submitted to tendering. In its offer, the operator must specify the means that will be used, together with the related costs (or the needed lump sum) that would enable him to reach the running balance.

In many tenders, it is specified that the operator is intitled to propose different structures of service than the ones initially planned (it could for example aim at extending the lines). This enables therefore the operator to prove its capacity of innovation.

*Competitive tendering has led to significant gains in productive efficiency*

The route-by-route tendering system in Copenhagen has led to substantial gains in terms of productive efficiency. Indeed, this tendering system focuses on the efficiency of the utilisation of the inputs. The production costs of one bus-hour has been reduced while the quality of service has improved.

Production costs have been reduced in the Malmöhus Region by the introduction of the tendering of the realisation of the services.

*Competition in itself has not yet led to significant gains in ridership*

In the case of Copenhagen, only a small increase in ridership can be observed, but it should be noted that competition here is essentially aimed at cost reduction.

Gains in public spending are often re-invested in other sectors of public intervention. Savings resulting from the introduction of the tendering system in Copenhagen have indeed been transferred for other local public spending.
1.3 Co-operation

*Forms of co-operation between authorities, authorities and operators and between operators can be observed.*

In *Brussels*, the authority undertakes to conclude mobility contracts with the municipalities which are in charge of the management of the traffic, together with the parking control.

Furthermore, a co-ordination of the operator’s supply of Brussels with the supply of other regional companies of transport has been planned. The National Railway Company depends on federal policy, a specific co-operation has therefore been implemented in order to make use of both means of transport easier for its passengers.

In *Cologne*, like in most other conurbations in Germany, the main objectives of transport associations and co-operation are the establishment of a common fare policy and tariff system through ticketing between different systems and/or operators, a co-ordination of timetables, together with a co-ordination of lines and routes.

The authority and planner in *Copenhagen* has to co-operate with the national railway company and the light railways in order to establish a common public transport plan for the Capital Region.

In *Greater Manchester* and *Preston*, Quality Partnerships have taken the form of unofficial agreements between operators and local authorities to co-operate with each other in order to improve urban public transport. These partnerships can take many forms but generally the authority will invest in new infrastructure or provide bus priorities and in return, the bus operators will invest in new buses.

In *Helsingborg*, an additional contract regulating the relations between the transport authority and the operator stipulates that the operator should co-operate with the regional public transport services in the planning of the services.

In *Kristiansand*, following the initiative of the transport department, representatives of the authority, the company, the bus drivers and the users co-operate through a « quality group ». This group has indeed been established in order to define and assess the public transport’s quality.

In *Setubal*, the framework law for land transport of 1990, not yet regulated, mentions that transport policy should be integrated with other national policies, namely land-use, regional development, urbanisation, life quality, environment protection, etc.

1.4 Contracting

*An evolution towards a clearer definition and separation of tasks between authorities and operators can be observed. Furthermore, tasks and risks are increasingly established in contractual relationships.*
In Brussels, since 1991, the relationship between the authority and the operator is regulated through a « Management contract ». This contract defines objectives and results for each function of the operator. Furthermore, commitments are described for both parties and delays are also defined.

In Helsingborg, since 1992, a basic contractual relationship exists between the transport authority and the operator. Since 1994, additional contracts have been elaborated in order to handle over the planning responsibility to the operator.

In Kristiansand, the transport committee in the county council passed in 1994 a new model for the relation authority-operator. As mentioned above, tendering will be introduced from January 1998, contracts will therefore have to specify the responsibilities of each party. In the present situation with net costs contracts, the present operator is responsible for the ticket revenue.

In Lyon, the contract established between the authority and the operator stipulates the specifications of the service in terms of routes, frequencies and duration of service.

In Madrid, a framework contract exists between the authority and the local bus company and between the authority and the underground system. These framework contracts regulate the relationships between the two parties and establish the commitments of the company in terms of the quality, quantity and costs of the services supplied, together with the commitments of the authority in terms of financing of operating and investment costs.

As for suburban services, they are run by private companies through gross cost contracts.

In Rouen, the concession contract brings an involvement of the authority and operator, indeed, objectives are stipulated and contractual commitments are made.

The establishment of contractual relationships is forcing the authorities to be more precise in terms of policy aims or in terms of services to be produced.

A wide variety of mobility/transport plans (which are very different in terms of aims, means and initiating actors) can be found among the cities that were studied in the city reports.

Indeed, there is no standardisation among the cities in terms of policy aims.

In Brussels, a mobility plan was introduced beginning of the nineties in order to reduce the needs in terms of use of cars, while increasing the general accessibility of the towns’ centres and orientating the location of the activities in these centres.

In Cologne, a public transport plan gives a framework for the future development of public transport.

In Copenhagen, the authority is responsible for the elaboration of a plan which is required to give guidelines for the creation, routing and timetables of routes.

In Lyon, the transport plan contains measures related to parking, underground, light rail, constraints on car use and improvement of the quantity and quality of public transport.
In *Madrid*, the relationship between the Central Government and the authority is regulated through a framework contract. In order to reach the objectives that are fixed in this contract, the functions which the authority commits itself to undertake are described.

In the *Malmohus Region*, the transport authority adopts a transport plan in order to promote a sufficient level of passenger transport service. These decisions are based on local political priorities and local financing.

*Contracts between authorities and planners or operators tend to include more and more economic incentives.*

In *Brussels*, the introduction of competitive pressure through benchmarking can be described as a non-financial incentive/penalty scheme.

In the case of *Copenhagen*, in order to improve the services provided, quality incentives have been included in the contracting procedures (these quality incentives can relate to the fulfilment of the contractual requirements, but also to the passengers’ perception of the service provided).

In *Kristiansand*, the actual system with net cost contracts, operators are responsible for the ticket revenue. This is considered as giving the company direct incentives to improve their performance towards the users.

In *Madrid*, in order to encourage the operator to fulfil the objectives defined, the framework contract establishes an incentive system based on the fulfilment levels of the operator in terms of hours vehicles, service quality and fraud control.

Contracts with bus suburban operators include also a financial incentive system based exclusively on production.

On the other hand, the contract between the Central Government and the Transport Authority (which is also the planner) establishes a certain amount of subsidy per passenger transported.

In the *Malmöhus Area*, an agreement is signed between the transport authority and the transport planning company which is charged to realise the aims of the transport policy of the authority. Financial incentives related to the number of passengers transported are given. Furthermore, twice a year, a survey is organised in order to measure the degree of satisfaction of the passengers. Following the results of this enquiry, operators can receive a bonus, but can also see their contract cancelled. A penalty scheme has also been introduced.

In *France*, incentives have also been introduced in contracts, and this for a wide variety of risks taken by the operator. For instance, if the operator is only in charge of the production risk, contracts will also stipulate an objective in terms of incomes which will be sanctioned by a penalty if not reached. A bonus will on the contrary be given to the...
operators who have reached a higher level (this level will in the future represent the target that should be reached by the operator).

In the case where no risk is taken by the operator (« management contracts »), a penalty/bonus system is integrated to the payment of the operator. This system will be based on objectives in terms of minimisation of the subsidies and/or level of quality of service.

Furthermore, concerning contracting, we may also state that in many cases political aims still remain extremely vague or are not even stated in an operational or enforceable way. Even when aims are clearly stated there is still a lack of monitoring of the realisation of the aims.
ANNEX 2

ECONOMIC RESEARCH (WORK PACKAGE 3)
ECONOMIC RESEARCH (WORK PACKAGE 3)

EXECUTIVE SUMMARY

Introduction

The objective of this work is to apply economic analysis to urban public transport, at both a theoretical and an empirical level, in order to assess efficiency in terms of both production and consumption. Our study is the first attempt to look systematically at this issue for urban transport at the European level. In so doing we aim to identify the organisational and regulatory features of systems that are efficient in both production and consumption.

Our starting point is an admittedly simplified classification of three broad types of regulatory structure in urban public transport in Europe.

1. Regulated, publicly owned monopolies (‘the classical model’). This is the dominant organisational form in 10 member states (AT, BE, DE, ES, LU, GR, IE, IT, NL, PT), although there may be in these states some cities that have variations on this regulatory structure (e.g. regulated, private monopoly) or may have an alternative regulatory structure (e.g. some cities in ES have network management contracts).

2. Limited Competition Models. This has a number of variants. The two most common are the Scandinavian model, based on minimum cost tenders at a route level and represented in three member states (DK, FI, SE), with a variant also in Norway, and the French model, based on network management contracts.

3. Deregulated, Free Market Models. This is dominant form in GB outside London. In London route based tendering has been implemented.

Theoretical research

Our theoretical analysis has been based on two broad methodologies: Principal-Agent Analysis (PAA) and Micro-Economic Simulation Models (MESMs). Our key finding from PAA is that private firms are likely to be more effective in maximising profits due to incentives provided by take-over constraints, bankruptcy constraints, shareholder monitoring and lack of interference from politicians and civil servants. Management Employee Buy Outs (MEBOs) are likely to be transient phenomena unless restrictions are made to selling the business on. MESMs suggest that public intervention is required to maximise welfare due to user economies of scale (user benefit from increased service levels) and second best arguments (subsidy required to offset the impact of congestion, accidents and environmental pollution by cars). In a case study it is shown that profit maximisation can reduce net economic benefits by between 44% and 54% compared to perfect planning. Our conclusion from this part of our work is therefore that deregulated firms are potentially efficient in terms of production but not in terms of consumption. Regulated firms are potentially efficient in terms of consumption but not in terms of production.
Other key findings from our theoretical research include the following.

Firstly, distinction should be made between three functional levels: the strategic level (what do we want to achieve?), the tactical level (what product can help achieve the aims?) and the operational level (how do we produce the product?).

Secondly, there are a number of issues concerning contract specification and selection method (competition-for-the-market). PAA suggests that competitive tendering may be the most appropriate selection method for operational level decisions but may be less appropriate for tactical and strategic level decisions where experience acts as a barrier and external factors are important. In terms of contract specification, PAA suggests net subsidy contracts should be more efficient than full cost contracts but this assumes perfect knowledge and/or risk neutrality, neither of which are likely to apply in real life situations. Empirical evidence is therefore required.

Thirdly, there are a number of issues concerning open access (competition-in-the-market). MESMs suggest that in certain instances competition may increase net social benefit, where it leads to new products (e.g. the Arlanda Airport Rail Link, Manchester Metrolink) or new pricing structures. However, our MESMs also suggest that competition may reduce net social benefit where it leads to duplication of services or excessive price wars. Again empirical evidence is required.

**Empirical research**

This work was based on the ISOTOPE quantitative database which consisted of data on 207 public transport operators from 108 cities. The emphasis was on the development of performance indicators and elasticity estimates. A summary of the key indicators for bus and rail based systems is given by Table E1.

<table>
<thead>
<tr>
<th></th>
<th>Bus</th>
<th>Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Recovery Ratio</td>
<td>0.51</td>
<td>0.37</td>
</tr>
<tr>
<td>Fare per Pass Km (Ecus)</td>
<td>0.08</td>
<td>0.11</td>
</tr>
<tr>
<td>Mean load (Pass)</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>Cost per Pass Km</td>
<td>0.24</td>
<td>0.47</td>
</tr>
<tr>
<td>Wage Rate (Ecus per annum)</td>
<td>29437</td>
<td>33564</td>
</tr>
<tr>
<td>Non staff cost per Vehicle Km</td>
<td>1.27</td>
<td>5.3</td>
</tr>
<tr>
<td>Revenue per Vehicle Km</td>
<td>1.28</td>
<td>1.85</td>
</tr>
<tr>
<td>Cost per Vehicle Km</td>
<td>2.6</td>
<td>7.48</td>
</tr>
<tr>
<td>Vehicle Km per Staff</td>
<td>17336</td>
<td>11241</td>
</tr>
</tbody>
</table>

Table E1 indicates that bus systems have a much higher cost-recovery ratio and vehicle km per member of staff than rail systems and much lower cost per passenger km, wage rates, non staff cost per vehicle km and cost per vehicle km. By contrast, rail systems can charge higher fares per passenger km (reflecting advantages in terms of speed) and have higher mean loads (reflecting the use of larger vehicles). Nonetheless, rail costs per passenger km are 96% higher than those of bus, whilst revenue per passenger km is
only 38% higher than bus. This may suggest that there is some inefficiency in consumption in that high fare: high quality rail systems are being used in situations where lower fare: lower quality bus systems may be more appropriate. However, it should be noted that our sample excludes the European Union’s largest cities (London and Paris) where rail may be most appropriate.

In Table E2 we make some comparisons for bus systems between the three regulatory forms we have identified. Our results indicate that regulated markets may be effective in terms of consumption in that load factors are 62% higher than those in deregulated markets and 127% higher than those found in limited competition markets. This may not however indicate efficiency. It may indicates that too few bus services are being produced at too low fares.

The financial effectiveness of deregulated systems is also evident. On average, they cover 85% of costs, compared to 47% for both limited competition and regulated markets. Again this does not necessarily signify efficiency. It may indicate that subsidies are too low in deregulated markets.

In terms of cost efficiency, the costs per vehicle km for deregulated systems are 52% less than those for regulated systems and 36% lower than those for limited competition systems.

In terms of labour productivity, the best performance is posted by the limited competition systems where vehicle kms per member of staff is 8% higher than in deregulated markets and 18% higher than in regulated markets, although this may reflect variations in input prices.

Overall, there is some support for the hypotheses that regulated markets are efficient in terms of consumption, deregulated markets are efficient in terms of production and limited competition markets are somewhere in between.

Table E2: Comparison of Key Indicators for Urban Bus Services

<table>
<thead>
<tr>
<th></th>
<th>R/TC</th>
<th>PK/VK</th>
<th>VK/SN</th>
<th>TC/VK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deregulated GB</td>
<td>0.85</td>
<td>16.7</td>
<td>17,987</td>
<td>1.44</td>
</tr>
<tr>
<td>Limited Comp.</td>
<td>0.47</td>
<td>11.9</td>
<td>19,383</td>
<td>2.26</td>
</tr>
<tr>
<td>Regulated</td>
<td>0.47</td>
<td>27.0</td>
<td>16,387</td>
<td>2.97</td>
</tr>
</tbody>
</table>

R = Revenue, TC = Total Cost, PK = Passenger Kms, VK = Vehicle Kms, SN = Staff Numbers

Macro-economic considerations related to the Maastricht agreement, should lead to reductions in public transport subsidy levels. However, there is no sign of such convergence at present. Analysis of the finances of urban public transport in 52 cities in the early 1990s, failed to indicate any convergence in terms of financial performance. Although relative subsidy went down in 25 cities, it remained stable in 13 and actually increased in 14 cities.
Table E3: Summary of Quality Indicators

<table>
<thead>
<tr>
<th></th>
<th>Regulated</th>
<th>Limited Comp.</th>
<th>Deregulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>-</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Network Design</td>
<td>0/+</td>
<td>0/+</td>
<td>-</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>0</td>
<td>0/+</td>
<td>-</td>
</tr>
<tr>
<td>Convenience</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Environmental</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Speed</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Security</td>
<td>0/+</td>
<td>0/+</td>
<td>-</td>
</tr>
<tr>
<td>Affordability</td>
<td>+</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Delivery</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Customer Opinions</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
</tbody>
</table>

+- = Positive performance, - = Negative performance, 0 = Neutral performance

An important issue relates to the quality of output. The three broad organisational forms were assessed in terms of 10 quality indicators, the first eight of which relate to strategic and tactical functions, and the last two of which relate to operational functions. The results are summarised by Table E3. Our results are qualitative but what they suggest is that regulated systems have advantages of affordability but low fares may result in inadequate investment and low levels of supply. These results may reflect the political context rather than the organisational structure. By contrast, deregulated regimes may perform well in terms of supply indicators but less well in terms of most other indicators. Models of limited competition may have quality advantages, particularly if contracts include appropriate incentives. The opinion surveys seem to confirm the perceived efficiency and effectiveness of limited competition models.

Econometric analysis was undertaken in order to determine elasticity estimates. Due to data limitations, and despite the use of additional data collected by Wunsch, this work was limited to bus systems. A translog model of operating costs was developed based on 56 observations. This model indicated an elasticity of cost with respect to vehicle kms of 1.16 and an elasticity of costs with respect to line km of 0.25. This suggests for the average system mild diseconomies of both density (return to density of 0.86) and scale (return to scale of 0.71). Our model suggests that the optimal fleet size is around 100 vehicles. It is interesting to note that large bus companies are emerging in Europe based on subsidiary companies of around 100 vehicles. These companies are attempting to simultaneously have the advantages of being big (which allows purchasing power in terms of fuel, vehicles and capital and may allow economies of scale in terms of marketing) and being small (which allows operating costs to be minimised). Our translog model also indicates a labour input elasticity with respect to price of -0.34, a capital input elasticity with respect to price of -0.18 and an elasticity of substitution between capital and labour of unity. This indicates strong substitutability between capital and labour. The last key finding of our translog model is that cost for Great Britain are 56% below those of the rest of Europe, even when output and input prices are held constant.

A log-linear model of demand was also developed based on data for the bus systems in 89 cities. This indicated an elasticity of demand with respect to fares of -0.50 for small cities and -0.34 for large cities. The corresponding elasticities of demand with respect
to service were 0.33 and 0.49. The model indicated higher than average levels of demand in German and Swiss cities and lower than average levels of demand in France.

Empirical analysis of tendering suggest that cost reductions of between 10% and 20% can be achieved if there is no restructuring, whilst reductions of 35% or more can be achieved if there is also restructuring (fragmentation and privatisation). Studies in Great Britain indicate that minimum cost contracts may reduce subsidy by 13% compared to minimum subsidy contracts provided there is strong competition. Evidence from Sweden suggests cost plus contracts may increase costs by 18% compared to fixed cost contracts. Swedish data also suggests that moving from one bid per contract to two reduces costs by 12%, moving from one bid to three reduces costs by 17% and moving from one bid to four bids reduces costs by 20%.

British data indicates that vehicle size and age specifications may increase subsidy by 5-10%, whilst Swedish data suggests that including penalties for late running increases costs by around 30%.

**Conclusions**

Deregulated markets have theoretical and empirical advantages in terms of efficiency of production. Regulated markets have theoretical and empirical advantages in terms of efficiency in consumption. Limited competition markets may have advantages of both. Overall, we find some support for the Citizens’ Network Green Paper’s preference for some form of limited competition model. However, the main advantage of such models is not "to provide an environment which gives operators an incentive to raise standards whilst safeguarding system integration" (although they can do this) but in increasing efficiency in production whilst maintaining or improving efficiency in consumption. Work Package Three's work suggests that in some areas, reductions in unit operating costs of up to 50% are possible. Where redundancies and wage reductions are not possible these reductions will reduce to around 15% but are still likely to be the main gain of introducing competitive tendering to commercialised but publicly owned and/or regulated operations. These cost savings could then be used to improve the quality of public transport services, the quality of other public services or to reduce taxation. In order to make such gains, it may be necessary to restructure the bus industry in many member states and to develop and enforce appropriate competition policy.

**Further Work**

Finally, it is worth making a number of points that should be addressed by future researchers. Firstly, our work has been effected by a number of data problems that stem from a lack of consistent data on urban transport operations at a European level. There were a large number of comparability issues that the ISOTOPE database, given its limited resources, was unable to overcome. Given the large amounts of taxpayers money that urban public transport receives it would be in the public interest for a consistent set of data to be collected so that assessments of value for money could be made. Any move to comprehensive competitive tendering would require such a database to be constructed.

Secondly, we have outlined at least three forms of competitive tendering that could be applied to urban public transport. We believe that future work should make a more
detailed assessment of these three forms and explore the large number of possible variants. The link between organisational and regulatory structure should be also explored in more detail.

Thirdly, in considering the trade-off between efficiency in production and consumption it is clear that the former is more readily measurable than the latter. This may have resulted in an over emphasis on cost cutting at the expense of quality improvements. Consumer surplus (expressed as per passenger km) might be considered as a possible summary measure of efficiency in consumption.

Fourthly, some of our simulation work raised important issues. The Arlanda study indicate that further information is needed on the extent to which public transport improvements can abstract demand from the car and the extent to which it can generate brand new trips. The Manchester study indicated the need for more detailed data on the variation of network capital and operating costs for both passenger and vehicle kms.
CHAPTER 1
NATURE AND CONTENTS OF THIS REPORT

The objective of this work package is to apply economic analysis to urban public transport, both at an empirical and a theoretical level, in order to assess efficiency in terms of both production and consumption. By efficiency in production, we mean producing a given level of output at minimum cost. By efficiency in consumption, we mean that outputs and prices are set so as to maximise economic efficiency.

This final report is an upgraded version of the interim report presented to the seminar on "Facts and Opinions on Urban Public Transport in the European Union" in Lisbon on 3-4 October 1996 and is structured as follows.

In section 2, we consider the relevance of economic theory to organisational and regulatory issues in urban public transport. We begin in section 2.1 by developing a classification of regulatory structures and, in section 2.2, we go on to analyse how principal-agent theory may explain some of the success of privately owned firms in urban public transport. In section 2.3, we show how principal-agent theory may also be used to design contracts between the public and private sector. In section 2.4, we assess the role of public and private sector bodies in urban public transport. In section 2.5, we go on to use competition simulation models to assess the impact of new services in Stockholm and Manchester.

In section 3, we consider the role of empirical analysis in addressing organisational and regulatory issues in urban public transport. We use the ISOTOPE database developed by Work Package One, supplemented by other documentary databases. In section 3.1, we develop some partial factor productivity measures, whilst in section 3.2 and 3.3 we examine financial indicators and quality indicators. In section 3.4 and 3.5, we examine operator costs and demand respectively. Lastly, in section 3.6, we consider the role of franchising, using data from a variety of sources.

We end in section 4 by drawing a series of conclusions from both our theoretical and empirical work and make some recommendations for further work.
CHAPTER 2
THEORETICAL RESEARCH

-----------------------------------------------------------------------------------------------------

2.1 Classification of regulatory structures

Work undertaken by van de Velde and Van Reeven (1996) suggests that there are three fundamental questions:

- What is the most desirable functional division between authorities, planners and operators?
- What is the most desirable contract form?
- What is the most adequate method to select operators?

These questions will be considered in turn.

2.1.1 Functional divisions

It is generally accepted that planning and control systems within companies can be divided into hierarchically ordered types of activities which differentiate themselves according to the scope of the planning issues addressed and the planning horizon. Anthony (1965) was probably the first to introduce a framework in which planning and control processes are divided into three hierarchical activities. Anthony (1988, p. 30-40) defined them as follows (although the boundaries of these processes are not totally sharp):

- Strategic planning is the process of deciding on the goals of the organisation and the strategies for attaining these goals.
- Management control is the process by which managers influence other members of the organisation to implement the organisation's strategies.
- Task control is the process of assuring that specific tasks are carried out effectively and efficiently.

Various words are used to denominate these hierarchical levels of planning and control activities (see, e.g., Hellriegel and Slocum, 1986). In our work we will use the following definitions:

- **Strategic level**: strategic management is involved in the formulation of general aims and in the determination in broad terms of the means that can be used to attain these - in short: *what do we want to achieve?*
- **Tactical level**: makes decisions on acquiring means that can help reaching the aims, and on how to use these means most efficiently - in short: *what product can help achieving the aims?*
- **Operational level**: makes sure the orders are carried out, and that this happens in an efficient way - in short: *how do we produce that product?*

2.1.2 Contract form
One of the objectives of contracts in public transport is the distribution of responsibilities between the parties to the contract. An important element is the allocation of financial risks between buyer and seller because some allocations can be more expensive than others. Also, the addition of financial incentives can help realise the objectives of the buyer.

Two types of risks can be distinguished in the situation that a governmental agency orders public transport services from a supplier:

**Production risk**: risk associated to the production costs of a fixed production quantity, independent of the amount of passengers.

**Revenue risk**: risk associated to the sale of transport services.

These risks can be allocated in different ways. The different possible allocations of risks give rise to the following distinction of contracts:

**Gross cost contract**: In this type of contract the production risk is born by a transport company while the revenue risk is born by the tendering authority. An agreed price will be paid for the production of a fixed amount of services. Revenues accrue to the tendering authority. The difference between realised costs and anticipated costs (the price) is for account of the firm while the difference between actual and anticipated revenues is for account of the tendering authority.

**Net cost contract**: In this contract both production and revenue risk are born by the transport company. The difference between anticipated total operating costs and revenues determines the price the tendering authority pays to the transport company. A realised difference between costs and revenues that does not correspond to the anticipated difference between costs and revenues is for account of the transport company.

**Management contract**: The management contract is the mirror image of the net cost contract because in the management contract both production and revenue risk are born by the tendering authority instead of the transport company. The manager of the transport activities receives a remuneration which is independent of his achievements.

Besides these three types of contract, all kinds of variants are possible. The success of contracts will be determined by the incentive structure including those incorporated in the contract (basic incentives) and those provided by other regulatory instruments (additional incentives), for example provided by competition policy. In addition, a distinction should be made between discrete incentives (e.g. the award of a contract) and continuous incentives (e.g. performance bonuses or penalties).

### 2.1.3 Choice of selection method
The choice of selection method may be split between no selection method (based instead on historic rights), selection methods based on negotiation, some form of competitive tendering and market competition. Important questions concern ensuring reasonable selection costs, choosing bids that vary in service quality the treatment of non-compliant bids and the publication of information in order to ensure fair competition (Van de Velde and Sleuwaegen, 1996).

2.1.3.1 Difference between tendering and franchising

Both in a tendering and in a franchising process several potential operators bid for the right to operate in a certain area for a specific time period according to clearly defined contractual rules.

We define the main difference between tendering and franchising to be the larger scope for the operators (winning bidder) to modify the product or production size under a franchising agreement. Also, on average, a franchising agreement will impose more risks on the operator than a tendering contract.

In short, in a tendering situation the operator produces what has been asked for. While in a franchising situation, the operator behaves more like an entrepreneur while still following a number of ground rules which have been agreed upon at the letting of the contract.

2.1.3.2 Difference Between Contracting and Tendering/Franchising

The difference between contracting and tendering/franchising resides in the selection procedure used by the principal who selects the agent.

In a tendering/franchising procedure the agent is selected according to a competitive procedure which respects a number of objectivity rule. In a contracting situation the agent is selected according to the private preferences of intuition of the principal.

2.1.4 Integration of the three dimensions

Based on allocation of risks, four types of competitive tendering can be envisaged (see Table 2.1.1):

- Subsidy contracts result in the operator taking both the revenue and the production cost risk. This is the dominant form of tendering used for socially necessary services in the English Metropolitan (big city) areas.
- Cost contracts result in the operator taking the production cost risk and the authority the revenue risk. This is the dominant form of tendering used for socially necessary services in the English Shire (small city and rural) areas.
- Hybrid contracts where risks are shared between operators and authorities. Examples include Adelaide (Australia) and Helsingborg (Sweden).
- Management contracts where risks are borne by the authority. This form is common in France but often complemented with additional contractual incentives.

Table 2.1.1 Risk and contract types
Based on this analysis and analysis of the types of bodies responsible for strategic, tactical and operational functions, four forms of market organisation can be identified as providing alternatives to the classic, regulated model:

- The Scandinavian model - essentially based on a mixture of minimum subsidy and minimum cost contracts at a route level (also London)
- The French model - based on network management contracts with additional contractual incentives
- The Adelaide model - intermediate contracts where operators have some freedom to develop services
- The Market Competition model, which accounts for 85% of bus services in Great Britain, outside London.

These four models are represented by Tables 2.1.2 to 2.1.5 respectively.

These forms of market selection may form part of a deregulatory progression i.e. the Scandinavian model is an initial step, the Adelaide model is a second step and the market competition model is a third (and final) step.

An important issue is whether theoretical analysis of these organisational forms can prescribe which are optimal (in an economic sense). Such analysis suggest that competitive tendering is unlikely to be adequate at the tactical level because local
experience will act as a barrier to entry and external factors are difficult to forecast (although planning authorities do often make use of external contractors, such as consultants). At an operational level competitive tendering of some form should be adequate, although even here there may be constraints where the incumbent lacks market discipline and there are few potential entrants. Theoretical analysis is less useful in determining what types of competitive tendering are optimal. Here empirical research is likely to be more fruitful.
Table 2.1.2: Tendering for the Production of Pre-determined Services
(The Scandinavian Model)

<table>
<thead>
<tr>
<th>Actor</th>
<th>Regional Authority (RTA)</th>
<th>Regional transport company (RTC)</th>
<th>Bus companies</th>
<th>Rail, metro or tram companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Political body</td>
<td>Regional transport department</td>
<td>Publicly owned regional company</td>
<td>Privately owned companies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>management contract with RTA</td>
<td>contract with RTC after tendering</td>
</tr>
<tr>
<td>Relation</td>
<td>under democratic control</td>
<td>hierarchically controlled by the political body</td>
<td>contract with RTC after negotiation</td>
<td>Publicly or privately owned companies</td>
</tr>
<tr>
<td>MODE OF TRANSPORT</td>
<td>ALL</td>
<td>ALL</td>
<td>BUSES</td>
<td>RAIL</td>
</tr>
<tr>
<td>Strategic</td>
<td>Transport policy</td>
<td>Standards of accessibility (Social) standards of mobility (suggestions)</td>
<td>(suggestions)</td>
<td></td>
</tr>
<tr>
<td>Social policy (discussion)</td>
<td>(discussion)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactical</td>
<td>Fares</td>
<td>(suggestions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routes</td>
<td>(suggestions)</td>
<td></td>
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<tr>
<td>Timetable</td>
<td>(suggestions)</td>
<td></td>
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</tr>
<tr>
<td>Vehicle type</td>
<td>(suggestions)</td>
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<tr>
<td>Operational</td>
<td>Vehicle rostering</td>
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<tr>
<td>Personnel rostering</td>
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<tr>
<td>Personnel management</td>
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<tr>
<td>Vehicle maintenance</td>
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</tr>
<tr>
<td>Actor</td>
<td>Regional Authority (RTA)</td>
<td>Regional transport company (RTC)</td>
<td>Bus companies</td>
<td>Railway companies</td>
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</tr>
<tr>
<td>Type</td>
<td>Political body</td>
<td>Regional transport department</td>
<td>Private network manager / transport company</td>
<td>Privately owned companies</td>
</tr>
<tr>
<td>Relation</td>
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<td>hierarchically controlled by the political body</td>
<td>contract with RTA after tendering</td>
<td>contract with RTC after tendering</td>
</tr>
<tr>
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<td>ALL</td>
<td>BUS</td>
<td>TRAIN</td>
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<tr>
<td>Strategic</td>
<td>Transport policy Social policy (discussion) Standards of accessibility (Social) standards of mobility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactical</td>
<td>(Min. standard) (Min. standard) (Min. standard) (Min. standard)</td>
<td>Fares</td>
<td>Routes</td>
<td>(suggestions)</td>
</tr>
</tbody>
</table>
Table 2.1.4  Tendering of Pre-determined Services with Re-designing Incentives
(The Adelaide Model)

<table>
<thead>
<tr>
<th>Actor</th>
<th>Regional Authority (RTA)</th>
<th>Regional transport company (RTC)</th>
<th>Bus companies</th>
<th>Rail, metro or tram companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Political body</td>
<td>Regional transport department</td>
<td>Publicly owned regional company</td>
<td>Privately owned companies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>management contract with the RTA</td>
<td>contract with RTC after tendering</td>
</tr>
<tr>
<td>Relation</td>
<td>under democratic control</td>
<td>hierarchically controlled by the political body</td>
<td>contract with RTC after negotiation</td>
<td>contract with RTC after negotiation</td>
</tr>
<tr>
<td>MODE OF TRANSPORT</td>
<td>ALL</td>
<td>ALL</td>
<td>BUS</td>
<td>RAIL</td>
</tr>
<tr>
<td>Strategic</td>
<td>Transport policy Social policy (discussion) Standards of accessibility (Social) standards of mobility (suggestions) (suggestions)</td>
<td>Fares (Min. standard) (Min. standard) (Min. standard)</td>
<td>Routes Routes</td>
<td>Timetable Timetable</td>
</tr>
<tr>
<td>tactical</td>
<td>Fares</td>
<td>(Min. standard) (Min. standard) (Min. standard)</td>
<td>Routes Routes</td>
<td>Timetable Timetable</td>
</tr>
<tr>
<td>Operational</td>
<td>Fares</td>
<td>(Min. standard) (Min. standard) (Min. standard)</td>
<td>Routes Routes</td>
<td>Timetable Timetable</td>
</tr>
</tbody>
</table>
Table 2.1.5  Free Competition, Market Based Model
(The British Model)

<table>
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<th>Actor</th>
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<th>Regional Authority (RTA)</th>
<th>Transport companies</th>
</tr>
</thead>
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<tr>
<td>Type</td>
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<td>Political body</td>
<td>Regional transport department</td>
</tr>
<tr>
<td></td>
<td>in competition on the free market</td>
<td>under democratic control</td>
<td>hierarchically controlled by the political body</td>
</tr>
<tr>
<td>Relation</td>
<td></td>
<td></td>
<td>Privately owned companies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>contract with RTA after tendering</td>
</tr>
<tr>
<td>MODE OF TRANSPORT</td>
<td>ALL</td>
<td>ALL</td>
<td>ALL</td>
</tr>
<tr>
<td>Strategic</td>
<td>General Aims</td>
<td>Transport policy</td>
<td>Social policy</td>
</tr>
<tr>
<td></td>
<td>Area</td>
<td>(discussion)</td>
<td>(discussion)</td>
</tr>
<tr>
<td></td>
<td>Target groups</td>
<td>Standards of accessibility (Social)</td>
<td>standards of mobility</td>
</tr>
<tr>
<td></td>
<td>General product features</td>
<td>Fares</td>
<td>Fares</td>
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<td></td>
<td>Fares</td>
<td>Routes</td>
<td>Routes</td>
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<td></td>
<td>Routes</td>
<td>Timetable</td>
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<td>Timetable</td>
<td>Vehicle type</td>
<td>Vehicle type</td>
</tr>
<tr>
<td>Tactical</td>
<td>Vehicle type</td>
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<td>(Min. standard)</td>
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<td>Personnel rostering</td>
<td>Personnel rostering</td>
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<td></td>
<td>Personnel rostering</td>
<td>Management</td>
<td>Management</td>
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<tr>
<td></td>
<td>Personnel management</td>
<td>Vehicle maintenance</td>
<td>Vehicle maintenance</td>
</tr>
</tbody>
</table>
2.1.5 The positive and negative effects of each model

1) The Scandinavian model

Positive Effects:
• Strong incentives to productive efficiency.
• Service integration is easy to realise.

Negative Effects:
• Weak incentives to respond to passenger demand due to the absence of systematic competition at the tactical level.
• Danger for regulatory capture of the regional authority by the regional transport company.

2) The French model

Positive Effects:
• Easy integration of services.
• Easy transfer of personnel and installations.

Negative Effects:
• Limited incentives for productive efficiency.
• No possibility for simultaneous comparison of performances.
• Huge tendering costs for bidders.
• Danger for growing asymmetry of information.
• Danger for an excessive orientation towards the private preferences of contract awarding politicians.

3) The Adelaide Model

Positive Effects:
• Possibility to compare transporters’ performances simultaneously.
• Small units can be tendered without loss of integration.
• Incentives for both productive efficiency and demand responsiveness.

Negative Effects:
• Danger for excessive definition of minimum services by the authority.

4) The British Model

Positive Effects:
• Direct response to market demand without authority intervention.
• Clear separation of functions and focus of the authority on the social aspects.
• Possibility for several authorities to intervene simultaneously.
• No or few border problems.

Negative Effects
• Danger for the appearance of unfair competition (need for an adequate regulation of competitive practices)
2.2 Principal-Agent Theory and Commercial Public Transport Services

The Principal-agent (P-A) problem is: “... a situation in which a principal (or group of principals) seeks to establish incentives for an agent (or group of agents) who take decisions that effect the principal, to act in ways that contribute maximally to the principal’s own objectives”. (Vickers and Yarrow, 1988).

The P-A problem arises whenever a firm/organisation (whether private or public) is managed and owned by different sets of people with non converging objectives and the presence of asymmetric information. The principal (the owner of the firm) wants to induce the agent (the firm’s manager) to act in his (the principal’s) interests, but because of asymmetric information the agent is not fully informed about the circumstances and the behaviour of the agent. There is a monitoring problem.

Faced with this problem the crux of P-A theory is therefore what is the optimal incentive scheme for the principal to enforce for the agent? For a full discussion of P-A theory see Rees, 1985, for now the following discussion will suffice.

There are two versions of the basic P-A model, the first assumes that the agent can observe the state of the world when choosing his actions and the other assumes he can’t. Both models have the following constructions:

- **P** - is the utility function of the principal.
- **ã** - is the agent’s action.
- **G** - is the utility function of the agent.
- **Ø** - is the state of the world.

The principal cannot observe either ã nor Ø, but is able to observe the outcome x(ã, Ø), the agent’s action given Ø, and makes his own action (payment to agent), denoted ý, a function of the observed outcome.

Therefore the problem facing the principal is to choose ý(x), the incentive scheme for the agent. He faces two constraints whilst choosing, firstly, that the agent will behave selfishly and secondly, the incentive scheme must be sufficiently attractive for the agent to participate.

If the agent cannot observe Ø at the time of his actions then he will choose ã to maximise his expected utility given ý(x). If the agent is risk neutral then the optimum incentive scheme takes a simple form with the principle receiving a ‘flat payment’ from the agent regardless or what occurs. However, if the agent is risk averse then the principal must offer some insurance for bad states of the world. This will dull the agent’s incentives, since he gains only part of the benefit resulting from extra effort on his part. The agent may therefore use the asymmetry of information to reduce his overall effort.

If the agent can observe Ø before taking his action then the agent’s strategy given the incentive scheme ý(x) will then be a function of a(Ø) since the best action will depend upon circumstances. As before, the principal must also ensure that the incentive arrangement is sufficiently attractive for the agent to want to take part in it. The basic model can be applied to a wide variety of relationships but will vary in terms of the external constraints and pressures applied to both the principal and the agent.
For an urban transport firm providing commercial services, the owners’ (the principals’) objective is to maximise their expected financial return (profit) from the company. The principal’s problem, as outlined earlier, is to ensure that the optimal incentive scheme is in place to ensure that its agents (its managers and other employees) carry out this objective.

P-A theory suggests that the problem facing the principal is that the agents’ utility is likely to be a function, principally, of income and effort. Other secondary variables might include the firm’s sales revenue, growth rate and the level of managerial discretion (all of which can be equated to power and prestige). Given the presence of asymmetry of information, it is clear that the agents will have an incentive to pursue their own objectives at the expense of the principals.

The theory however suggests that private firms are more effective in enforcing an optimal contract because they have a number of incentive mechanisms that do not exist for public firms. In particular, these include:

- Shareholder Monitoring - Particularly when share ownership is concentrated.
- Take-over Constraint - Assuming that take-overs are triggered by a management team not maximising expected profits and not for other reasons, e.g. increasing a firm’s power or reducing a firm’s tax liabilities (King, 1986).
- Bankruptcy Constraint - Bankruptcy leads to the loss of control of a firm by the management and is akin to a take-over in that respect. The tightness of the constraint will largely depend upon the differences between the maximised expected value of the firm’s debt level. The effectiveness of the constraint increasing the lower the difference.

Moreover, public firms are affected by:

- Politicians’ incentives - Primarily electoral success and secondary upon income, power, effort etc.
- Civil Servant’s Incentives - Based upon their department size, effort and prestige.

At the extreme, where the firm is owner-managed the P-A problem should not exist. A case study of a British bus firm has been undertaken. This firm was privatised in October 1988 as an Employee Share Ownership Programme in which eight senior managers held 51% of the shares and employees held 49%. It was sold on to a stock exchange listed bus group (or plc - public limited company) in May 1994, see Figure 2.2.1 for a diagrammatic relationship.

**Figure 2.2.1. The Evolving P-A Relationships**

| (1) | Principal | Agent |
Initially, there was a steady increase in operating profits rising from 4.5% of turnover in 1987-88, when still in public ownership, to 9.0% in 1990-91 (see Table 2.2.1). This however fell back to around 6% in 1992/3 and 1993/4 and may explain the take-over of the company in 1994. Under the new owners (FirstBus) profits are believed to have increased to a reported 15% in 1995-96.

Whilst shareholding has become more dispersed, during the period under examination, the take-over constraint has tightened (under the ESOP any take-over required 68% of shareholders to agree), whilst under the ESOP it seems likely that both managers and employees will have had some non-profit related objectives, e.g. working conditions. It certainly is evident that in Great Britain most ESOP’s have been relatively short lived, with there being strong incentives to sell due to favourable initial sale prices and inadequate claw back provisions (Wright et al., 1992). This suggests that the P-A relationships in ESOPs and similar forms of management employee buy-outs may not be sustainable in a commercial environment.

In conclusion, the case study could be said to support the initial suggestions that private firms are more effective in achieving the principal’s objective of maximising profit. Whether they are quite so effective in optimising other criteria, such as social welfare, is possibly another matter.

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</tr>
<tr>
<td>Ownership Type</td>
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<td>ESOP</td>
<td>ESOP</td>
<td>ESOP</td>
<td>ESOP</td>
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<tr>
<td>Turnover</td>
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<td>£30.1 million</td>
<td>£74.5 million</td>
<td>£83.3 million</td>
<td>£79.2 million</td>
<td>£80.0 million</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>£2.7 million</td>
<td>£1.6 million</td>
<td>£4.1 million</td>
<td>£7.5 million</td>
<td>£4.9 million</td>
<td>£5.0 million</td>
</tr>
<tr>
<td>Retained Profit</td>
<td>£-1.1 million</td>
<td>£188,000</td>
<td>£177,000</td>
<td>£2.16 million</td>
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<td>£2.4 million</td>
</tr>
<tr>
<td>Op. Profit : Turnover</td>
<td>0.045</td>
<td>0.053</td>
<td>0.055</td>
<td>0.090</td>
<td>0.062</td>
<td>0.063</td>
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<tr>
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<td>2 bus operators</td>
<td>3 bus operators</td>
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<td>none</td>
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</tr>
</tbody>
</table>

2.3 Principal-agent theory and contracted public transport services

Muren (1996) analyses three contractual forms: full cost (= minimum cost contracts), net cost (= minimum subsidy contracts) and contracts with measured service quality included as an explicit variable. The objective is to minimise costs subject to a minimum level of service. Using an analytical framework associated with Lewis and Sappington (1991) and Laffont and Tirole (1993), it is shown that under the full cost contract the operator must make some profit even after a competitive bidding process, otherwise it would pay the operator to cut service quality. By reducing the length of contract periods this profit, which is a transfer from the authority to the operator, can be reduced. The net cost contract gives, in principle, a possibility to achieve the desired level of service quality with a lower profit accruing to the operator. This is because the operating firm loses in two ways if it cuts quality of service: it will not get its contract renewed and it will lose fare revenues. The net cost contract thus gives the operator stronger incentives to produce quality of service. However, if there is high variation in the number of passengers, the net cost contract may require compensating the operator for taking the risk. Such compensation reduces the relative advantage of the net cost contract over the full cost contract. The incentive contract with quality made explicit in the contract resembles the net cost contract in that it is risky for the operator. These contracts may be useful to the extent that it is possible to find variables that are easy to measure and for which the operator can predict the effect of investment in service quality with relative certainty.

Another important area of theoretical study is the application of auction theory to explain bidding strategies (see Kennedy, 1995 for a useful summary). In particular, at least two types of auctions are possible. Independent value auctions occur where bidders have different valuations for the good being auctioned. For example, a bus company will require lower amounts of subsidy if the contract fits in well with existing work or can be easily served from an existing depot compared to a bidder for whom these characteristics do not apply. In such a case, the bid will increase (i.e. the amount of subsidy will decrease) as the number of bidders increases. Common value auctions occur where all bidders have the same valuation of the good being auctioned but are uncertain about the value of that good. In such auctions, they may increase their bids as the number of bidders increases in order to win the auction but if they do this they may run the risk of the winner's curse. In other words, they may over-estimate the value of the good being auctioned and pay more for it than it is worth. To avoid the winner's curse, bidders may be particularly cautious when there are a large number of bidders.
The two effects cancel out and in a common value auction bid price is not expected to vary with the number of bidders. It may be expected that revenue from a given bus service with fixed fares would have a common value for bidders.

A number of other aspects of auction theory may be worth considering. Vickrey auctions award contracts to the highest bidder based on the price of the second highest bidder. This is believed to reduce strategic bidding and could have a role in public transport. A two stage bidding process with separate bids based on price and quality could be considered (referred to in the literature as the Brook's Law procedure). Menu auctions are also possible, whereby, for example, bidders make bids for routes separately and in various combinations. This enables bidders to exploit economies of scope but also allows scope for strategic behaviour.

2.4 The role of the public and private sector

Jansson (1994a) highlights four main arguments for public intervention in public transport.

(i) The user economies of scale argument for a single route which is associated with Mohring (1972) and arises because as usage of public transport increases so will the benefits to existing users through increased frequencies and greater network density.

(ii) The intra-marginal demand argument. Private operators will invest, at the margin, where profits are highest. Investments will be concentrated on elastic markets and, except in cases of perfect price discrimination, will reject investments in inelastic markets where the main benefit will be to existing users.

(iii) The user economies of scale argument for a network. There may be a number of benefits of operating an integrated network (Cottham, 1986). The main effect is that the frequency and price of one route will effect the frequency and price and hence user benefits on rival (competing and complementary) routes. This will need to be taken into account if the objective is to maximise net economic benefit (i.e. benefit to producers, consumers and society as a whole).

(iv) The second-best argument for public intervention. This is the most common argument for public intervention and states that where car and public transport are competing modes (i.e. substitutes), if car is priced below marginal social cost then public transport should also be priced below marginal social costs. The first best solution is, of course, to ensure that car covers its marginal social cost.

These four features provide an argument for public intervention in terms of financial support, but not necessarily in terms of public planning and operation. Gwilliam (1987) lists a number of other reasons including operator economies of scale, public good characteristics, merit good characteristics and information imperfections.

Jansson analyses the first three of these effects for a single corridor which initially consists of one operator providing a service along the corridor’s entire length. Subsequently, a second operator enters the market but only supplies services on the corridor's inner section (this may be thought of as a form of cream skimming). The analysis assumes that the market is otherwise protected from both actual and potential competition. His simulation results are presented in Table 2.4.1. This analysis indicates that welfare maximisation without a budget constraint is the optimal result, but this assumes lump-sum subsidy. If the shadow price of public funds is greater than 1.21...
(and there is some evidence to suggest that this is the case), then welfare maximisation subject to a break-even constraint is the optimal policy. Compared to this policy, profit maximisation by one operator leads to a 150% increase in fares, a 33% decrease in service levels and a 37% decrease in net social benefit. Where a second operator enters on part of the route, net social benefit reduces by a further 17%. This is because those travelling along the entire length of the route disbenefit from the reduced frequency offered by the incumbent (an example of the Mohring effect in reverse).

**Table 2.4.1 Private v Public Sector Analysis : Simulation Results**

<table>
<thead>
<tr>
<th>Price per km</th>
<th>Frequency</th>
<th>Demand</th>
<th>Consumer Surplus</th>
<th>Producer Surplus</th>
<th>Net Social Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.3</td>
<td>792</td>
<td>7920</td>
<td>-2520</td>
<td>5400</td>
</tr>
<tr>
<td>4</td>
<td>4.9</td>
<td>486</td>
<td>4860</td>
<td>0</td>
<td>4860</td>
</tr>
<tr>
<td>10</td>
<td>3.3</td>
<td>218</td>
<td>2180</td>
<td>860</td>
<td>3040</td>
</tr>
<tr>
<td>10</td>
<td>2.6</td>
<td>158</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2.3</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2.6</td>
<td>158</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2.4.2 Strengths of Argument against Private Sector Responsibility**

<table>
<thead>
<tr>
<th>User Economies of Scale</th>
<th>Local and Regional Transport</th>
<th>Long-distance Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Strong</td>
<td>Weak</td>
</tr>
<tr>
<td>Intra-Marginal Demand</td>
<td>Strong</td>
<td>Strong</td>
</tr>
<tr>
<td>Network Effects</td>
<td>Strong</td>
<td>Strong/Weak</td>
</tr>
<tr>
<td>Second-Best Effects</td>
<td>Strong</td>
<td>Weak</td>
</tr>
</tbody>
</table>

Jansson goes on to consider the role of these effects for local and regional public transport on the one hand and long-distance public transport on the other. His findings are summarised in Table 2.4.2. It is concluded that the free market solution in the public transport sector will not imply optimal solutions. The arguments for public sector involvement are, however, greater for urban and regional transport than long-distance transport. Furthermore, the user economy of scale arguments will be strongest for urban, regular services where passengers turn up at stops at random rather than use timetables (see also Jansson, 1993 and Tisato, 1995). Similarly, network effects and second-best effects are likely to be greatest in urban areas with their denser public transport networks and greater levels of road congestion, accidents and pollution. Furthermore, intra-marginal effects may be weaker in those long distance sectors where price discrimination is practised (e.g. airlines, railways).

Although the analysis suggests that free markets are not optimal i.e. that private sector responsibility is limited, it does not prove that the public sector is necessarily more efficient. Particular problems relate to inappropriate public choices concerning investments, prices and frequencies which may lead to inefficiencies in consumption (see, for example, Nilsson, 1991) and the lack of incentives for both planners and
operators which may lead to inefficiencies in production (see, for example, Kim and Spiegel, 1987). Given the short-comings of both total public and total private responsibility for public transport, particularly in urban areas, it is recommended that competitive tendering may be beneficial.

Jansson (1996) extends his analysis to assess the impact of first best pricing for private transport (through introducing road pricing). From a case study of Stockholm, he concludes that the current second best prices for both public and private transport result in higher than optimal levels of congestion, accidents and environmental degradation, lower than optimal public transport services (and lower than optimal prices) and an excess burden on the economy due to the large amounts of subsidy required. Introducing a first best policy of central area road pricing, public transport fare increases and service improvements leads to net benefits of almost SEK900m (around 125m ECUs) per annum. The main gainers are taxpayers, the economy as a whole (through reduced externalities and excess burden), business motorists, bus users within the inner city and lorries. The main losers are private motorists and public transport users to and from the inner city. The implication of this work is that some form of public control may be required for both public and private transport, at least in terms of finances.

2.5 Competition - simulation models

2.5.1 Stockholm - Arlanda airport

In this section competition between public and private operators on the link between Stockholm city and the Arlanda airport is discussed. The purpose of this case study is to study competition between different operators.

In Sweden the state railway has been divided into a railtrack authority (Banverket) and an operating state monopoly, Statens Järnvägar (SJ). Since 1 July 1996, there is free competition on the rail network for goods transport, but passenger transport services are still monopolised for long distance services. The line Central Stockholm-Arlanda airport which will be operated from 1999 is the only long distance service line with competition for SJ. The distance between the city terminal in central Stockholm and Arlanda airport is approximately 40 km. The city terminal is where the national rail lines, many long distance coaches and local buses, underground lines and meet.

The purpose of the study is thus to analyse competition between a) ordinary (subsidised) public transport service, that is the regional public transport authority Stockholm Transport’s (SL) network of commuter trains, underground and buses, b) airport shuttle buses operated by Flygbussarna AB, a "company" owned by SL, c) commercial state owned Swedish State Railways (SJ) services and d) commercial private train services (A-train). Consequences are described in terms of user benefits and losses, producer gains or losses plus external effects. Specifically it is of interest to consider the incidence for business travellers and private travellers respectively.

In 1995 about 3.4 million trips were made on the Arlanda shuttle buses (including working trips) of which 2 million refer to the bus from the city terminal. Some
companies at the airport subsidise their employees for use of the airport shuttle to get to/from work, implying that about 400 000 trips on the shuttle buses are works trips. In this analysis we do not consider these trips, since the magnitude of them and the choice of mode depends on the employers policy. According to existing forecasts, in 2005 about 6,6 million long-distance travellers will travel by public transport to Arlanda airport, thereof 67% are business travellers and 33% private travellers. About 12,8 million travellers use taxi or private cars. We assume fixed public transport demand.

The values of time used are recommended by the Swedish Institute for Transport and Communications Analysis, SIKA, for national infrastructure planning. Business travellers are assumed to have the value of time (VOT) 140 SEK/hour. Private travellers are assumed to have the value 70 SEK/hour. Note that the fairly high value refers to long-distance travel, which is used here, assuming that passengers value time the same for the long-distance part of the journey as for the access to the airport.

In the case **Base_B** passengers going to Arlanda airport can choose between two public transport alternatives: the shuttle airport buses and SL’s local network with commuter trains connected to a local bus to Arlanda. The travel time between the Central station and the airport is about 60 minutes using the SL network and 40 minutes going by airport shuttle bus. The number of departures is adjusted to the increased demand (compared to the frequency today). It may be that the current pricing policy of Flygbussarna AB is not optimal from a welfare point of view. Case **Base_Bm** (for Base modified) thus assumes that the pricing policy of the city-Arlanda bus is changed so that total revenue exceeds total cost by some 10%. Even though this price structure may not be optimal, it is probably closer to the optimum than the current situation. In the analysis changes are related to the two base cases.

From 1999 there will be competition from the private consortium operating a shuttle train (called A-train) between the Central station in Stockholm and Arlanda airport. The travel time between the Central station and the airport will be approximately 20 minutes and the trains are assumed to run every 15 minutes. This case is called **case BA** (for Bus and A-train). **Case BrA** (for Bus reduced and A-train) assumes that the frequency for the bus service from the city terminal are reduced by 42%, due to lower demand.

It is expected that the private railway A-train will enjoy competition from the Swedish State Railways (SJ). This situation will be simulated in **case BAS** (Bus, A-train and SJ-trains). Compared to the A-train the SJ services would have the advantage to be connected to the national railway system. There have been discussions on whether the shuttle bus service should be allowed to compete with A-train and SJ-trains from the city terminal. For this reason a situation is simulated where the shuttle bus services from the city terminal are abandoned. This case is called it is considered **BaAS** (for Bus abandoned, A-train and SJ-trains).

<table>
<thead>
<tr>
<th>Case</th>
<th>Operator</th>
<th>Dep. per h</th>
<th>time (min)</th>
<th>Fare (SEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base_B</td>
<td>SL commuter train and bus</td>
<td>4</td>
<td>60</td>
<td>10 per route</td>
</tr>
<tr>
<td></td>
<td>Bus city-Arlanda</td>
<td>12</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

Table 2.5.1 **Cases**
<table>
<thead>
<tr>
<th>Code</th>
<th>Service Description</th>
<th>Frequency</th>
<th>Distance (km)</th>
<th>Cost per KM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base_m</td>
<td>SL commuter train and bus</td>
<td>4</td>
<td>60</td>
<td>10 per route</td>
</tr>
<tr>
<td></td>
<td>Bus city-Arlanda</td>
<td>12</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>BA</td>
<td>SL commuter train and bus</td>
<td>4</td>
<td>60</td>
<td>10 per route</td>
</tr>
<tr>
<td></td>
<td>Bus city-Arlanda</td>
<td>12</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>A-train city-Arlanda</td>
<td>4</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>BrA</td>
<td>SL commuter train and bus</td>
<td>4</td>
<td>60</td>
<td>10 per route</td>
</tr>
<tr>
<td></td>
<td>Bus city-Arlanda</td>
<td>6</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>A-train city-Arlanda</td>
<td>4</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>BAS</td>
<td>SL commuter train and bus</td>
<td>4</td>
<td>60</td>
<td>10 per route</td>
</tr>
<tr>
<td></td>
<td>Bus city-Arlanda</td>
<td>12</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>A-train city-Arlanda</td>
<td>4</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>SJ train Central station-Arlanda</td>
<td>1</td>
<td>22</td>
<td>1 class 90, 2 class 60</td>
<td></td>
</tr>
<tr>
<td>SJ train Södertälje-Arlanda</td>
<td>3</td>
<td>22</td>
<td>1 class 195, 2 class 120</td>
<td></td>
</tr>
<tr>
<td>BaAS</td>
<td>SL commuter train and bus</td>
<td>4</td>
<td>60</td>
<td>10 per route</td>
</tr>
<tr>
<td>A-train city-Arlanda</td>
<td>4</td>
<td>20</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>SJ train Central station-Arlanda</td>
<td>1</td>
<td>22</td>
<td>1 class 90, 2 class 60</td>
<td></td>
</tr>
<tr>
<td>SJ train Södertälje-Arlanda</td>
<td>3</td>
<td>22</td>
<td>1 class 195, 2 class 120</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.5.1 summarises the cases, with number of departures and riding time and fares from the city terminal in Stockholm to Arlanda. Generally the full prices for business trips are reduced with respect to VAT (12%) and another 30% to take into account discounts and the companies’ profits due to improved transport services, implying that prices are reduced by 38%:

- The average fare paid by private travellers using SL’s public transport services is SEK 10 per route. For business trips the price after tax deduction is SEK 6.2 per route used.
- According to existing information the A-train fare is assumed to be SEK 90, including VAT 12% for private travellers. For business trips the price after 38% tax deduction is SEK 55.
- The above mentioned extra fee of SEK 15 for the passengers going to/from Arlanda to the private consortium has been taken into account.

The costs per vehicle kilometre for the airport buses are assumed to be SEK 20/vehicle km. The operating costs for the A-train and the SJ-train include infrastructure user fees of SEK 6.4 per train kilometre based on 200 seats. The investment costs for the track funded by the Swedish National Rail Administration (Banverket) are SEK 2 000 million excluding VAT. Since social costs shall be valued at consumer prices average indirect tax of 23% is added. The annual cost is then SEK 108 million per year assuming 60 years life length and a 4% real interest. The investment costs of SEK 1 000 million for the terminal at the airport are shared between the operators. These costs are joint costs (SEK 54 million per year) occur irrespective of whether A-train, SJ-trains or both use the terminal. It is assumed that the passengers who use SJ services to/from the Arlanda airport have to pay a fee of SEK 15 per passenger to the private Arlanda shuttle train consortium to cover the investment costs for the Arlanda train terminal.
The external costs for air pollution, exhaust gases, accidents and road maintenance, as recommended by the Swedish Institute for Transport and Communications Analysis (SIKA) are used in the calculations. The total external costs for the different modes are: bus 3.59 SEK/vehicle km per bus, train (four carriages assumed) 0.20 SEK/vehicle km and private car 0.64 SEK/vehicle km. It is assumed that the state receives SEK 0.37 less taxes per (unleaded) car kilometre when travellers shift from private car to public transport and car. 1.3 passengers per car are assumed.

In the base situation (Base_B) the airport shuttle bus from the city terminal is the most important mode. It is used for 78% of the 6.6 million trips (5.1 million trips) in 2005. The percentage increases to 82% when the fare for the airport shuttle bus is decreased from 60 SEK to 35 SEK (in Base_m). Only about 0.5 million travellers use the airport shuttle buses going from other places in Stockholm. When the A-train is introduced (case BA) the airport shuttle bus going between the Central station and Arlanda are loses about over 3 million passengers of their 5.1 million passengers. (in case B). This is due to the fact that 75% of the business travellers go by A-train to Arlanda. Only 1% of the private travellers choose the A-train.

When the airport buses reduce the frequency of the airport shuttle bus from 12 to 6 departures per hour and direction (in case BrA), 14% of the private travellers use the A-train. The number of trips performed on the local SL network to Arlanda is relatively constant in all cases. More than half of the private travellers and 30% of the business travellers go by SJ when their trains services are introduced (in case BAS). 50% of the business people stay on the A-train. If the airport shuttle does no longer have access to the city terminal (in case BaAS), nearly three quarters of the private travellers choose the SJ-train.

<table>
<thead>
<tr>
<th>Trips total</th>
<th>Base_B</th>
<th>Base_m</th>
<th>BA</th>
<th>BrA</th>
<th>BAS</th>
<th>BaAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus city</td>
<td>5 179 942</td>
<td>5 442 103</td>
<td>2 017 511</td>
<td>1 329 054</td>
<td>1 043 511</td>
<td>0</td>
</tr>
<tr>
<td>Bus other</td>
<td>502 050</td>
<td>521 515</td>
<td>402 764</td>
<td>302 491</td>
<td>365 281</td>
<td>332 006</td>
</tr>
<tr>
<td>SL</td>
<td>921 767</td>
<td>640 141</td>
<td>715 423</td>
<td>928 139</td>
<td>408 264</td>
<td>411 303</td>
</tr>
<tr>
<td>A-train</td>
<td>0</td>
<td>0</td>
<td>3 468 061</td>
<td>4 044 075</td>
<td>2 289 419</td>
<td>2 848 598</td>
</tr>
<tr>
<td>SJ-train</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2 497 284</td>
<td>3 011 852</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6 603 759</td>
<td>6 603 759</td>
<td>6 603 759</td>
<td>6 603 759</td>
<td>6 603 759</td>
<td>6 603 759</td>
</tr>
</tbody>
</table>

The business travellers benefit most from the introduction of A-train to Arlanda. This is due to their high value of time (140 SEK/h compared to 70 SEK/h) and due the fact that business people make two thirds of all travellers. The average weighted time for the business trips decreases by 4 % or SEK 10 when the A-train is introduced (compared to case B). For the private travellers the introduction does not mean an improvement in generalised costs at all.

Both business and private travellers are best off in case BAS when both A-train and SJ-trains are operated. The private travellers can improve their average weighted time by 16%, while the weighted time for the business people is reduced by 10%. The differences are slightly smaller when comparing case BaAS where the airport shuttle bus is no longer allowed to go to/from the city terminal with case B. When using
Base_Bm as base case (where the shuttle bus fare is nearly halved) only the cases BAS and BrAS where the two rail operators offer their services are experienced as service improvements.

Table 2.5.3  Consumer surplus in SEK per year

<table>
<thead>
<tr>
<th></th>
<th>private</th>
<th>business</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base_m -Base_B</td>
<td>35</td>
<td>67</td>
<td>102</td>
</tr>
<tr>
<td>BA - -Base_B</td>
<td>0</td>
<td>47</td>
<td>48</td>
</tr>
<tr>
<td>BrA - Base_B</td>
<td>-8</td>
<td>38</td>
<td>30</td>
</tr>
<tr>
<td>BAS - Base_B</td>
<td>54</td>
<td>114</td>
<td>168</td>
</tr>
<tr>
<td>BaAS - Base_B</td>
<td>52</td>
<td>103</td>
<td>155</td>
</tr>
<tr>
<td>BA - Base_m</td>
<td>-34</td>
<td>-20</td>
<td>-54</td>
</tr>
<tr>
<td>BrA - Base_m</td>
<td>-43</td>
<td>-29</td>
<td>-72</td>
</tr>
<tr>
<td>BAS - Base_m</td>
<td>20</td>
<td>46</td>
<td>66</td>
</tr>
<tr>
<td>BaAS - Base_m</td>
<td>17</td>
<td>36</td>
<td>53</td>
</tr>
</tbody>
</table>

The overall revenues are highest in case BAS when airport shuttle bus, A-train and SJ-trains are offering their services (+47% compared to case B). In this situation the Flygbussarna reduced their revenues by about 80%. Taking into account also the operating costs including infrastructure user fees the following development for the producer surplus can be expected.

Table 2.5.4  Operators’ producer surplus (incl. terminal investments) in SEK per year

<table>
<thead>
<tr>
<th></th>
<th>Bus city</th>
<th>A-train</th>
<th>SJ-train</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base_m -Base_B</td>
<td>-92</td>
<td>0</td>
<td>0</td>
<td>-92</td>
</tr>
<tr>
<td>BA - -Base_B</td>
<td>-138</td>
<td>19</td>
<td>0</td>
<td>-120</td>
</tr>
<tr>
<td>BrA - Base_B</td>
<td>-108</td>
<td>60</td>
<td>0</td>
<td>-48</td>
</tr>
<tr>
<td>BAS - Base_B</td>
<td>-63</td>
<td>33</td>
<td>-43</td>
<td>-74</td>
</tr>
<tr>
<td>BaAS - Base_B</td>
<td>-113</td>
<td>30</td>
<td>-22</td>
<td>-105</td>
</tr>
</tbody>
</table>

In terms of operators’ surplus best results are achieved when the airport buses, A-train and SJ offer their services. The surplus is larger compared to the modified base with reduced fares for the airport buses (Base_m) than compared to the situation today (Base_B). The losses are caused by the assumption of fixed demand. If the amount of travellers increase with 15% which is probably realistic the operators could cover their costs. SJ’s bad result is due to the assumption that SJ has to pay 15 SEK per passenger have to the A-train consortium to cover the terminal investment costs.

The monetary value for the external costs is about SEK 22 million per year for the airport shuttle buses leaving every five minutes to/from Arlanda and SEK 0.5 million for the A-train or SJ-trains leaving four times per hour. Compared to the actual situation with only buss services to Arlanda the external costs are halved ( SEK 11 million per year) when the number of bus departures is halved in case BrAS. The
external costs are lowest in case BaAS where both trains are operating and the airport buses are abandoned from the city terminal.

In the cases with trains operating the investment costs of SEK 2000 million for the track funded by the state - the Swedish National Rail Administration (Banverket) are included. The costs per year are SEK 108 million assuming 60 years life length and a 4% real interest. The total welfare includes consumer and producer surplus, state surplus and external costs. When comparing the two base cases, the total welfare is slightly higher in case Base_m (+ SEK 10 million). This is due to the fact that trips are transferred from the local SL-network to the airport buses.

Table 2.5.5 Total welfare (in SEK per year)

<table>
<thead>
<tr>
<th></th>
<th>Consumer surplus</th>
<th>Producer surplus</th>
<th>State surplus</th>
<th>External effects</th>
<th>Total welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base_m -Base_B</td>
<td>102</td>
<td>-92</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>BA - Base_B</td>
<td>48</td>
<td>-120</td>
<td>-108</td>
<td>0</td>
<td>-180</td>
</tr>
<tr>
<td>BrA - Base_B</td>
<td>30</td>
<td>-48</td>
<td>-108</td>
<td>11</td>
<td>-115</td>
</tr>
<tr>
<td>BAS - Base_B</td>
<td>168</td>
<td>-74</td>
<td>-108</td>
<td>-1</td>
<td>-115</td>
</tr>
<tr>
<td>BaAS - Base_B</td>
<td>155</td>
<td>-105</td>
<td>-108</td>
<td>21</td>
<td>-37</td>
</tr>
</tbody>
</table>

Taking into account consumers and producers benefits and losses, the external costs and the state’s track investment costs the total welfare worsens compared to the actual situation with the airport buses and the SL-network in all cases. The introduction of the A-train and the SJ-train is the case that means the smallest change in terms of total welfare (- SEK 15 million). This is caused by the annual investment costs of SEK 108 million and the operators’ losses.

2.5.2 Manchester

A 216 zone model based on the hierarchical logit model has been developed to determine the impact of extending the Metrolink (tram system) in Manchester (Halcrow Fox, 1996A). Table 2.5.6 carries out some sensitivity analysis using this model. The results indicate that LRT (i.e. Metrolink demand) is less sensitive to fare and service quality charges than bus demand but increased bus competition can lead to significant reductions in LRT revenue. Table 2.5.6 also indicates the importance of trade-offs between producers and consumers. The success of the Manchester Metrolink scheme does though illustrate once again that there may be scope for increasing welfare through introducing new competitive services, particularly if the market is heterogeneous enough to permit product differentiation (see, for example, Preston, 1993).

Four further scenarios were tested as follows:
1. An integrated public transport system with a flat fare that operates throughout the network (as in Brussels);
2. An integrated structure but with a distance related fare structure based on zones (as in Rotterdam);
3. A network in which frequencies are doubled but route km held constant; and
4. A network in which frequencies are held constant but route km are doubled.
Their results are given by Table 2.5.7. It can be seen that integration of services provides benefits in terms of making public transport more attractive relative to car based travel, in particular by lowering fares, with public transport demand increasing by between 8% and 11%, whilst fares are reduced by between 17% and 33%. However, this leads to reductions in revenue of between 11% and 27% and therefore these policies are not commercially viable. Increasing frequencies and/or network coverage boosts patronage significantly (by between 9% and 22%) but never by an amount whereby the increases in revenue offsets the increases in operating costs. These policies are therefore not commercially viable either. The main conclusion to come from this analysis is that there is no "golden rule" for increasing the fortunes of urban public transport. All the scenarios tested involve trading off one aspect of public transport against another - for example, reduced subsidy usually implies higher fares and lower market share. However, this analysis does make the nature of the trade-offs explicit, thus allowing the policy maker to have a clearer idea of the choices that they may have available to them.

In the final three rows of Table 2.5.7, we have made some very crude estimates of changes in welfare, based on the assumption of linear demand curves and that in the base case operations are breaking-even. The percentages in these rows refer to total revenue. Thus in the flat fare scenario producer surplus reduces by 27% of total revenue, whilst consumer surplus increases by 35% of total revenue. Thus society is better off by an amount equal to 8% of total revenue, assuming that there are no external costs and benefits. In reality there may be some external benefits in terms of reduced congestion, accidents and environmental pollution, although these are likely to be relatively small. However, this assumes 11% increase in traffic can be carried with a zero increase in operating costs. In reality an increase in operating costs would be expected that would eradicate most if not all of the welfare gain. A similar situation exists with the distance related fare, although here society is only better off by an amount equivalent to 7% of total revenue, with patronage only increasing by 8%. By contrast doubling frequency is welfare inefficient, leading to a reduction equivalent to 28% of total revenue. Doubling network coverage, is more welfare efficient with an increase equivalent to 9% of total revenue. However, this would also imply substantial increases in capital costs as the LRT network would need to be doubled. In simplistic terms, the above suggests that price reductions in Manchester might lead to improvements in welfare but that service increases would not lead to improvements. This may in turn indicate that in Manchester fares and frequencies are too high: a price:output combination that is believed to be typical of many competed markets (see, for example, Evans, 1987).
<table>
<thead>
<tr>
<th>Change in Output</th>
<th>Bus fare down 50%</th>
<th>Bus wait time down 50%</th>
<th>Bus interchange time down 50%</th>
<th>LRT fare down 50%</th>
<th>LRT feeder fare down 50%</th>
<th>LRT wait time down 50%</th>
<th>LRT interchange time down 50%</th>
<th>All down 50%</th>
<th>All fares down 50%</th>
<th>Flat PT fares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus passenger kms</td>
<td>79.4%</td>
<td>65.7%</td>
<td>4.2%</td>
<td>-36.4%</td>
<td>-12.8%</td>
<td>-31.3%</td>
<td>-11.9%</td>
<td>13.9%</td>
<td>0.4%</td>
<td>40.6%</td>
</tr>
<tr>
<td>LRT passenger kms</td>
<td>-11.3%</td>
<td>-8.7%</td>
<td>-0.6%</td>
<td>17.8%</td>
<td>4.5%</td>
<td>13.4%</td>
<td>4.3%</td>
<td>23.7%</td>
<td>15.0%</td>
<td>-7.2%</td>
</tr>
<tr>
<td>Total PT Passenger kms</td>
<td>3.0%</td>
<td>3.0%</td>
<td>0.2%</td>
<td>9.2%</td>
<td>1.8%</td>
<td>6.4%</td>
<td>1.8%</td>
<td>22.2%</td>
<td>12.7%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Bus revenues</td>
<td>-12.3%</td>
<td>28.3%</td>
<td>2.1%</td>
<td>-7.6%</td>
<td>-28.4%</td>
<td>-5.3%</td>
<td>-1.0%</td>
<td>-34.7%</td>
<td>-44.0%</td>
<td>8.8%</td>
</tr>
<tr>
<td>LRT revenues</td>
<td>-11.3%</td>
<td>-8.5%</td>
<td>-0.6%</td>
<td>-40.3%</td>
<td>4.3%</td>
<td>14.1%</td>
<td>4.2%</td>
<td>-37.2%</td>
<td>-41.8%</td>
<td>-</td>
</tr>
<tr>
<td>Total PT Revenues</td>
<td>-11.6%</td>
<td>1.4%</td>
<td>0.2%</td>
<td>-31.5%</td>
<td>-4.6%</td>
<td>8.8%</td>
<td>2.8%</td>
<td>-36.5%</td>
<td>-42.4%</td>
<td>10.2%</td>
</tr>
<tr>
<td>PT mode share (number % points)</td>
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<td>1.9%</td>
<td>0.1%</td>
<td>4.2%</td>
<td>0.7%</td>
<td>3.0%</td>
<td>0.7%</td>
<td>11.1%</td>
<td>6.0%</td>
<td>-5.0%</td>
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<tr>
<td>Consumer surplus for existing bus users (mins)</td>
<td>6.7</td>
<td>6.4</td>
<td>0.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13.4</td>
<td>6.7</td>
<td>-0.7%</td>
</tr>
<tr>
<td>Consumer surplus for existing LRT users (mins)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>9.8</td>
<td>1.8</td>
<td>6.3</td>
<td>1.8</td>
<td>19.8</td>
<td>11.6</td>
<td>0.1</td>
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<tr>
<td>Bus revenue per passenger km</td>
<td>-51.1%</td>
<td>-22.5%</td>
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<td>45.3%</td>
<td>-17.9%</td>
<td>37.8%</td>
<td>12.3%</td>
<td>-42.7%</td>
<td>-44.3%</td>
<td>-22.7%</td>
</tr>
<tr>
<td>LRT revenue per passenger km</td>
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<td>0.2%</td>
<td>0.0%</td>
<td>-49.3%</td>
<td>-0.3%</td>
<td>0.6%</td>
<td>-0.1%</td>
<td>-49.2%</td>
<td>-49.4%</td>
<td>-3.2%</td>
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</table>
Table 2.5.7  Final Manchester Model Tests

<table>
<thead>
<tr>
<th></th>
<th>Integrated PT and Flat Fare</th>
<th>Integrated PT and Distance Related Fare</th>
<th>Doubling of Service Frequency</th>
<th>Doubling of Network Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus Passenger Kms</td>
<td>-8.7%</td>
<td>-13.4%</td>
<td>+18.2%</td>
<td>-33.5%</td>
</tr>
<tr>
<td>LRT Passenger Kms</td>
<td>+14.2%</td>
<td>+11.4%</td>
<td>+6.7%</td>
<td>+32.4%</td>
</tr>
<tr>
<td>TOTAL PASSENGER Kms</td>
<td>+10.6%</td>
<td>+7.5%</td>
<td>+8.6%</td>
<td>+22.0%</td>
</tr>
<tr>
<td>Bus Revenue</td>
<td>-2.7%</td>
<td>-15.8%</td>
<td>+16.2%</td>
<td>-2.0%</td>
</tr>
<tr>
<td>LRT Revenue</td>
<td>-35.5%</td>
<td>-9.4%</td>
<td>+7.4%</td>
<td>+34.4%</td>
</tr>
<tr>
<td>TOTAL REVENUE</td>
<td>-26.6%</td>
<td>-11.1%</td>
<td>+9.8%</td>
<td>+24.5%</td>
</tr>
<tr>
<td>Bus Operating Costs</td>
<td>0.0%</td>
<td>0.0%</td>
<td>+50.0%</td>
<td>+50.0%</td>
</tr>
<tr>
<td>LRT Operating Costs</td>
<td>0.0%</td>
<td>0.0%</td>
<td>+50.0%</td>
<td>+50.0%</td>
</tr>
<tr>
<td>TOTAL OPERATING COST</td>
<td>0.0%</td>
<td>0.0%</td>
<td>+50.0%</td>
<td>+50.0%</td>
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<tr>
<td>Bus operating subsidy</td>
<td>+0.3%</td>
<td>+2.0%</td>
<td>+30.7%</td>
<td>+31.8%</td>
</tr>
<tr>
<td>LRT operating subsidy</td>
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<td>+1.5%</td>
<td>+31.9%</td>
<td>+29.8%</td>
</tr>
<tr>
<td>TOTAL SUBSIDY</td>
<td>+4.0%</td>
<td>+1.7%</td>
<td>+31.5%</td>
<td>+30.4%</td>
</tr>
<tr>
<td>PT MODE SHARE</td>
<td>+4.2%</td>
<td>+3.5%</td>
<td>+4.4%</td>
<td>+11.7%</td>
</tr>
<tr>
<td>Change in Producer Surplus</td>
<td>-26.6%</td>
<td>-11.1%</td>
<td>-40.2%</td>
<td>-25.5%</td>
</tr>
<tr>
<td>Change in Consumer Surplus</td>
<td>+34.9%</td>
<td>+17.9%</td>
<td>+11.9%</td>
<td>+34.3%</td>
</tr>
<tr>
<td>CHANGE IN WELFARE</td>
<td>+8.3%</td>
<td>+6.8%</td>
<td>-28.3%</td>
<td>+8.8%</td>
</tr>
</tbody>
</table>
CHAPTER 3
EMPIRICAL RESULTS

3.1 Partial factor productivity and cost efficiency indices

Following the work of Mackie and Nash (1982) a series of indicators have been developed for urban public transport operations in Europe. The analysis was based on the ISOTOPE database developed by Work Package 1. Although this database is relatively comprehensive for bus it is less so for rail modes. Similarly, although coverage is good for some countries e.g. Spain and Sweden it is less so for others. Furthermore, the data affected by a number of outliers, which have had to be excluded.

Due to reasons of commercial confidentiality, the results are aggregated by geographic area and are presented in Table 3.1.1 for bus and Table 3.1.2 for rail-based modes (LRT/Tram, Underground and Suburban Rail). The results for bus are described below. It should be noted that our data has been aggregated to a city level with a number of cities having a number of operators. There are a maximum of 34 cities in our bus database:

- The average cost:recovery ratio is 0.51, with the highest results for the British Isles and Spain (somewhat surprisingly) and the lowest measures for Italy/Greece, France and the Benelux countries. This ratio may be thought of as the main financial productivity measure.
- The average revenue per passenger kilometre is 0.074 ECUs (at market exchange rates). France and the Nordic countries have the highest average revenues at around 0.154 ECUs, with Spain the lowest at around 0.035 ECUs.
- The average loading figure is 22 passengers. The loading for Spain is double this at around 48 passengers, high figures can also be seen for both Portugal and Italy/Greece. This measure may be thought of as a measure of commercial productivity but is likely to be affected by population density, car ownership etc.
- The average cost per passenger km is 0.24 ECUs and is highest for France and the Nordic countries and lowest for Portugal, Spain and the British Isles at 0.1 or less.
- The average staff costs are 29,437 ECUs per full time employee, with the highest wage/salaries being earned in the Benelux countries and the lowest in Spain.
- On average the non staff costs per vehicle km are 1.28 ECUs, with the highest costs being recorded for Germany and the Nordic countries and the lowest for Spain and the Benelux countries.
- Revenue per vehicle km averages 1.28 ECUs and is highest for France and is lowest for the Nordic countries.
- Total cost per vehicle km averages 2.24 ECUs and is highest for Germany and Italy/Greece but lowest for the British Isles and the Nordic countries.
- Lastly, vehicle kilometres per member of staff, which is a measure of staff productivity, averages 17,336 per annum, being highest for the Nordic countries and lowest for Spain.
### Table 3.1.1  Productivity Indicators - Bus

<table>
<thead>
<tr>
<th>Country</th>
<th>R TC</th>
<th>R PK</th>
<th>PK VK</th>
<th>SC PK</th>
<th>NSC VK</th>
<th>VK SN</th>
<th>SN PK</th>
<th>TC VK</th>
<th>VK SN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benelux</td>
<td>M</td>
<td>0.277</td>
<td>0.046</td>
<td>16.1</td>
<td>0.17</td>
<td>47990</td>
<td>0.53</td>
<td>0.8</td>
<td>2.94</td>
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<td>SD</td>
<td>0.117</td>
<td>0.017</td>
<td>2.35</td>
<td>0.017</td>
<td>8826</td>
<td>0.29</td>
<td>0.34</td>
<td>0.27</td>
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<td>Ob</td>
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<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>France</td>
<td>M</td>
<td>0.253</td>
<td>0.151</td>
<td>14.0</td>
<td>0.68</td>
<td>31491</td>
<td>1.26</td>
<td>1.9</td>
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<td>0.179</td>
<td>0.144</td>
<td>6.71</td>
<td>0.925</td>
<td>4143</td>
<td>0.47</td>
<td>2.6</td>
<td>0.97</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Germany &amp; Austria</td>
<td>M</td>
<td>0.332</td>
<td>0.083</td>
<td>16.4</td>
<td>0.25</td>
<td>37121</td>
<td>1.84</td>
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<tr>
<td>Italy &amp; Greece</td>
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<td>0.3</td>
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</tr>
<tr>
<td>Portugal</td>
<td>M</td>
<td>0.61</td>
<td>0.053</td>
<td>32.1</td>
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<td>4.68</td>
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<td>1</td>
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</tr>
<tr>
<td>Nordic</td>
<td>M</td>
<td>0.686</td>
<td>0.154</td>
<td>9.7</td>
<td>0.47</td>
<td>28209</td>
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<tr>
<td>Spain</td>
<td>M</td>
<td>0.831</td>
<td>0.035</td>
<td>47.5</td>
<td>0.043</td>
<td>12833</td>
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<tr>
<td>British Isles</td>
<td>M</td>
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<td>0.077</td>
<td>16.7</td>
<td>0.1</td>
<td>16500</td>
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<td>1.42</td>
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<td>Average</td>
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<td>0.08</td>
<td>22</td>
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<td>29437</td>
<td>1.27</td>
<td>1.28</td>
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</tr>
</tbody>
</table>

Key:  
- **R** = Revenue per annum (ECUs)  
- **PK** = Passenger kms per annum  
- **SC** = Staff costs per annum (ECUs)  
- **NSC** = Non Staff Costs per annum  
- **na** = None available  
- **TC** = Total Costs per annum (ECUs)  
- **VK** = Vehicle kms per annum  
- **SN** = Staff Numbers  
- **Ob** = Observations  
- **SD** = Standard Deviation
Table 3.1.2  Productivity Indicators - Rail based modes

<table>
<thead>
<tr>
<th>Country</th>
<th>R TC</th>
<th>R PK</th>
<th>PK VK</th>
<th>TC PK</th>
<th>SC SN</th>
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<th>R VK</th>
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<th>VK SN</th>
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<td>15.4</td>
<td>0.219</td>
<td>0</td>
<td>1.34</td>
<td>0.2</td>
<td>1.8</td>
<td>9877</td>
</tr>
<tr>
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<td>4</td>
<td>1</td>
<td>2</td>
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<td>3</td>
<td>2</td>
<td></td>
</tr>
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<td>France</td>
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<td>0.199</td>
<td>36819</td>
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</tr>
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<td>0.012</td>
<td>55</td>
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<tr>
<td>British Isles</td>
<td>0.61</td>
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<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.37</td>
<td>0.111</td>
<td>40.1</td>
<td>0.47</td>
<td>33564</td>
<td>5.3</td>
<td>1.85</td>
<td>7.48</td>
<td>11241</td>
</tr>
</tbody>
</table>

Key:  
R = Revenue per annum (ECUs)  
PK = Passenger kms per annum  
SC = Staff costs per annum (ECUs)  
NSC = Non Staff Costs per annum  
na = None available  
TC = Total Costs per annum (ECUs)  
VK = Vehicle kms per annum  
SN = Staff Numbers  
M = Mean average  
SD = Standard Deviation  
Ob = Observations

The results for rail-based systems are more tentative, given the non-availability of data and the diversity of systems (trams, underground railways and suburban railways). Nonetheless some useful comparisons can be drawn with the bus systems in our data:

- The average cost-recovery ratio for rail, at 0.37, is only two-thirds that of bus, whilst the revenue per passenger km for bus (0.08 ECUs) is around 70% that of rail (0.11 ECUs).
- The mean loads are nearly twice that for rail (40) as for bus (24).
- Average cost per passenger km for rail is, at 0.47 ECUs, roughly twice that of bus.
• Staff Costs at 33,564 ECUs per full time employee per annum, are around 14% higher than those for bus.
• Non-staff costs per vehicle km, at 5.3 ECUs, are more than four times higher for rail systems than for road. This reflects that rail systems have greater responsibilities for their track, traffic management systems and terminals than road based public transport systems.
• The receipts per vehicle km, at 1.85 ECUs are around 45% more than for bus systems.
• The total cost per vehicle kms for rail, at 7.48 ECUs is almost three times that for bus.
• The staff productivity, in terms of vehicle kms per member of staff at 6,957 is only 65% of that achieved by bus operators.

3.2 Cost and financial indicators

HFA produced a report for DG VII on the organisation and operation of urban public transport in the then 12 Member States of the Community (HFA, 1994). This work included the construction of fare box ratios (fares divided by operating costs) for a sample of 15 cities and is shown by Table 3.2.1. This work has been updated and extended to 52 cities and is shown by Table 3.2.2 (see also Halcrow Fox, 1996B). It should be noted that subsidy definition may not be consistent across cities in Table 3.2.2. For example, in the UK the fuel tax rebate that operators receive from central Government has not been included nor have concessionary fare reimbursements (which are subsidy to users not operators). Similarly, the subsidy received from the "versement" in France does not seem to be included.

Of the 52 cities in Table 3.2.2, 14 have seen a relative increase in subsidy levels, 13 have seen subsidy levels remain stable and 25 have seen relative declines in subsidy levels. Where subsidy levels have been increasing, this may be due to unfavourable external factors, principally economic recession, rising car ownership and decentralisation of urban activities. Where subsidy levels have been decreasing there are two principal causes. Firstly, declining operating costs due to tendering. In the 1990s the Scandinavian countries have introduced tendering with some marked reductions in relative subsidy levels (e.g. Gothenburg down 23%). In other Scandinavian cities, subsidy reductions have been achieved by fare increases as part of a policy to commercialise urban public transport operations. A policy of commercialisation has also been undertaken by STIB in Brussels which has resulted in the cost recovery ratio increasing from 28% to 33% between 1982 and 1995. The main causes have been a 13% reduction in staff, a 3% reduction in vehicle kms and a 3% increase in passenger journeys.

Secondly, increasing revenue due to pro-public transport subsidies. This is particularly associated with the French system of "versement" coupled with private sector operators running network contracts. For example, relative subsidy levels have declined by 27% in the Lille region and 14% in Nantes, although elsewhere in France relative subsidy levels have been either stable or have increased. Alternative data for the Netherlands supplied by NEA suggests that for eight Dutch cities (Amsterdam, Rotterdam, Den Haag, Utrecht, Groningen, Nijmegen, Maastricht and Dordrecht) the average subsidy requirement has fallen from over 70% of operating costs to 56% between 1986 and
1994. This has been achieved through substantial increases in revenue, in response to pro-public transport policies mentioned, coupled with a 10% increase in operating costs.

Anderson (1993) notes, on the basis of Scandinavian evidence, that the process of change is almost impossible to bring about unless there is a strain on public budgets. It is possible that the conditions required for European Monetary Union within the Community will create these pressures. However, the present situation sees a divergence in the cost and financial indicators for urban public transport in European cities rather than a convergence. Many European cities are making efforts to promote public transport rather than cut costs. It is understandable why such a policy is popular with decision makers but it appears less effective than tendering in financial terms. There may be valid micro-economic reasons for such policy divergence, but it is possible that in the near future macro-economic considerations will promote convergence towards more overt cost cutting policies.

Table 3.2.1  Farebox Ratios in Different European Cities

<table>
<thead>
<tr>
<th>City</th>
<th>Country</th>
<th>Operating Costs (Ecus 000)</th>
<th>Fare Revenues (Ecus 000)</th>
<th>Farebox Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antwerp</td>
<td>Belgium</td>
<td>51,257</td>
<td>21,110</td>
<td>0.41</td>
</tr>
<tr>
<td>Liege</td>
<td>Belgium</td>
<td>43,714</td>
<td>18,711</td>
<td>0.43</td>
</tr>
<tr>
<td>Brussels</td>
<td>Belgium</td>
<td>222,953</td>
<td>77,862</td>
<td>0.35</td>
</tr>
<tr>
<td>Aarhus</td>
<td>Denmark</td>
<td>41,409</td>
<td>29,733</td>
<td>0.72</td>
</tr>
<tr>
<td>Copenhagen</td>
<td>Denmark</td>
<td>227,517</td>
<td>122,691</td>
<td>0.54</td>
</tr>
<tr>
<td>Marseilles</td>
<td>France</td>
<td>109,446</td>
<td>72,467</td>
<td>0.66</td>
</tr>
<tr>
<td>Hamburg</td>
<td>Germany</td>
<td>398,775</td>
<td>239,683</td>
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</tr>
<tr>
<td>Dublin</td>
<td>Ireland</td>
<td>134,338</td>
<td>144,511</td>
<td>1.08</td>
</tr>
<tr>
<td>Milan</td>
<td>Italy</td>
<td>494,834</td>
<td>148,363</td>
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</tr>
<tr>
<td>Luxembourg</td>
<td>Luxembourg</td>
<td>25,534</td>
<td>8,932</td>
<td>0.35</td>
</tr>
<tr>
<td>Den Haag</td>
<td>Netherlands</td>
<td>125,972</td>
<td>37,539</td>
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<tr>
<td>Barcelona</td>
<td>Spain</td>
<td>243,507</td>
<td>128,465</td>
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<td>Seville</td>
<td>Spain</td>
<td>47,228</td>
<td>24,880</td>
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<tr>
<td>Valencia</td>
<td>Spain</td>
<td>50,065</td>
<td>32,647</td>
<td>0.65</td>
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<td>London</td>
<td>UK</td>
<td>1,333,860</td>
<td>1,272,198</td>
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### Table 3.2.2 Subsidy and Commercial Income Rates as Percentages of Total Operating Cost

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<tr>
<th>City</th>
<th>Country</th>
<th>Subsidy as % of operating costs</th>
<th>Commercial income as % of operating costs</th>
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<tbody>
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<td></td>
<td></td>
<td>93/94</td>
<td>94/95</td>
</tr>
<tr>
<td>Vienna</td>
<td>Austria</td>
<td></td>
<td></td>
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<td>Belgium</td>
<td>47.7</td>
<td>47.7</td>
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<td>Belgium</td>
<td>58.8</td>
<td>58.8</td>
</tr>
<tr>
<td>Charleroi</td>
<td>Belgium</td>
<td>65.1</td>
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</tr>
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<td>Belgium</td>
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<td>68</td>
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<tr>
<td>Copenhagen</td>
<td>Denmark</td>
<td>61.6</td>
<td>61.6</td>
</tr>
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<td>46</td>
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<td>Grenoble</td>
<td>France</td>
<td>46.5</td>
<td>33.5</td>
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<td>France</td>
<td>49</td>
<td>52</td>
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<td>France</td>
<td>41.3</td>
<td>36.7</td>
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<td>France</td>
<td>51.2</td>
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<td>France</td>
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<td>53</td>
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<td>Germany</td>
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<td>Berlin</td>
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<td>Germany</td>
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<tr>
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<td>Greece</td>
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<td>64</td>
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<td>Italy</td>
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<td>Norway</td>
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<td>Lisbon</td>
<td>Portugal</td>
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<td>32</td>
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<td>Amsterdam</td>
<td>The Netherlands</td>
<td>77.5</td>
<td>77.5</td>
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<td>Den Haag</td>
<td>The Netherlands</td>
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<td>The Netherlands</td>
<td>80</td>
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<tr>
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<td>UK</td>
<td>28.3</td>
<td>21.6</td>
</tr>
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<td>Leeds/Bradford</td>
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<td>27</td>
<td>27</td>
</tr>
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<td>UK</td>
<td>23.4</td>
<td>25.6</td>
</tr>
<tr>
<td>Newcastle</td>
<td>UK</td>
<td>30</td>
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</tr>
</tbody>
</table>


Note: Commercial income relates to off-vehicle income related to leasing of property, advertising & ancillary activities

### 3.3 Quality indicators
Based on our earlier, theoretical work, four main organisational forms could be assessed:

(i) The Classical, regulated model
(ii) The Scandinavian model of contracting out of operations
(iii) The French model of contracting out of planning and operators within guidelines established by Government
(iv) The deregulated, competitive model.

**Table 3.3.1 Evaluation of forms of organisation**

<table>
<thead>
<tr>
<th></th>
<th>Classical</th>
<th>Scandinavian</th>
<th>French</th>
<th>Deregulated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long-term vision</strong></td>
<td>Government</td>
<td>Government</td>
<td>Government</td>
<td>Government (limited)</td>
</tr>
<tr>
<td><strong>Network planning</strong></td>
<td>Government, based on proposals from transport companies</td>
<td>Government</td>
<td>Transport company, within government guidelines</td>
<td>Market</td>
</tr>
<tr>
<td><strong>Market mechanism in network planning and set-up of timetable</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Concession appointed by government</td>
<td>Concession in competition</td>
<td>Concession in competition on network basis</td>
<td>Market</td>
</tr>
<tr>
<td><strong>Market mechanism in operation</strong></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The characteristics of these four organisational forms are summarised by Table 3.3.1. A series of ten quality indicators have been detected. The first eight relate to the quality of network design and planning, whilst the last two relate to the quality of operation.

1. Supply measures such as vehicle kms, seat/place kms, route kms and vehicle kms per route km (density). In the classical model and the Scandinavia model, supply is under pressure. This is also true for the French model, except in certain cities where new modes have been introduced (tramways and VAL systems). With deregulated urban markets, supply is stronger. For example, in Great Britain vehicle kms have increased by 24% (Mackie, Preston and Nash, 1995) since deregulation. However, these increases are concentrated on busy routes and times and as a result there gaps in provision which need to be filled by tendering.

2. Network design and quality indicators. These may include percentage of passengers with direct route, average transfer times, the ratio of public transport distance to crow-fly distance, existence of integrated ticketing and schedule efficiency. It is believed that deregulated systems score poorly for these
indicators, whilst the Scandinavian model also has relatively little incentive to improve these measures.

3. Effectiveness indicators such as journeys, trips, passenger kilometres and mode-split. It is believed that in deregulated systems lack of integrated supply can lead to decreases in effectiveness. For example, demand has decreased by 27% since deregulation in Britain, although the trend is also generally negative for the other three forms.

4. Comfort and Convenience indicators such as percentage of low floor buses, percentage of passengers seated, quality of stops, cleanliness, quality of available information, age of vehicles.

5. Environmental indicators such as the percentage of vehicle kms realised by environmental friendly techniques.

It is believed that deregulated systems score poorly on categories 4. and 5., whilst in the other three models there may be a quantity/quality trade-off but scope exists for Governments to set quality standards.

6. Indicators of the quality of supply in terms of speed. Other measures include percentage of route kilometres with exclusive rights of way and percentage of traffic lights where public transport has priority.

7. Indicators of safety and personal security. An indicator of personal security may be provided by the percentage of stations that are staffed. Staffing levels come under particular pressure in deregulated regimes. This is also a problem area for the other organisational forms, although there have been some important initiatives developed under the French model.

8. Indicators of affordability such as average fare level per km, concessionary rates etc. Low tariffs are mostly found with the classical model (e.g. in Italy) but this may also result in low quality due to insufficient funds for investment. Within the French model, the transport company often has the opportunity to use tariff differentiation as a marketing instrument, whereas in the Scandinavian model tariffs are set by Government. Deregulation may lead to large increases in prices (e.g. up 17% in Great Britain).

9. Indicators of service delivery such as reliability (percentage of timetable trips cancelled), punctuality (percentage of timetable trips delayed by 5 minutes or more) and failures (e.g. escalators, ticketing systems, information). Contractual systems may provide incentives so as to improve service delivery.

10. Indicators of customer opinion. Attitudinal surveys may be undertaken to develop a quality index based on several items (e.g. Copenhagen). These surveys may be repeated amongst the same group of users to form a panel of data. Creation of a client platform/focus groups may also be useful.
From the ISOTOPE factual database we were able to produce a series of quality indicators for the following modes of bus, tram/LRT, underground and suburban rail. The following indicators were used:

- Vehicle kilometres per head of population (VK/P)
- Vehicle kilometres per route kilometre (traffic density VK/RK)
- Route kilometres per km² (network density RK/A)
- Passenger kilometres per head of population (PK/P)
- Mean Speed in the Peak (MSP)
- Mean Speed in the Off-Peak (MSO)
- The proportion of route kilometres that are bus lanes (RK/BL)

As in section 3.1 the database was relatively comprehensive for bus but far less so for the other rail based modes. Despite this Quality Indicators have been produced for all four modes and presented as a series of four tables. Due to reasons of commercial confidentiality, the results are aggregated by geographic area and presented as mean averages (M), standard deviations (SD) and the number of observations (Ob). All the measures are per annum.

The results for bus are presented in Table 3.3.2 and are as follows:

- The average number of vehicle kms per capita is 32.3 kms, this compares with the highest figure for the Nordic countries at 62 kms and the lowest for Spain and France at around 17-20 kms.
- The average number of vehicle kms per route km is 37,722 kms. The highest is for the British Isles at almost 65,000 kms, suggesting a frequent service concentrated on a small network. France has the lowest figure at around 20,000 kms, followed by the Nordic countries with around 22,500 kms.
- Route kms per area km² averages out at 2.87 kms with the highest figures being posted by Portugal (7.87 kms) and Spain (4.76 kms), however, the high standard deviation for the last two would suggest that the data maybe somewhat unreliable. The lowest figure is posted by the Nordic countries at 0.46 kms. This reflects the low population densities in Nordic cities.
- Passenger kms per capita averages out at 355 kms. The highest figures are for Portugal and the British Isles at 729 kms and 659 kms respectively, whilst the lowest figures are for Italy and Greece at 58 kms and France at 68 kms. We suspect that the French figures for passenger kms actually refer to passengers. If the mean trip length in France is 5 kms this would increase the French figure to 340 passenger kms per capita, which is close to the average. We think the same problem may exist with the Italy and Greece data. This problem will have affected all our results for France, Italy and Greece where passenger kms are part of the index.
- The average mean peak speed by bus operators averages out at 17.6 kms per hour (kph), with the highest speeds being recorded by the Nordic countries (25.1 kph) and the lowest by Portugal at (10.9 kph).
- The mean off-peak speed is recorded at 20.8 kph around 3 kph faster than the mean off-peak speed. The highest speed is recorded again by the Nordic countries at 29.4 kph and the lowest by Portugal at 10.9 kph.
- The average percentage of route kms that are bus lanes is 2.25%. The lowest figure is recorded by the British Isles at 0.44% and the highest by the Nordic countries at 3.67%.
Table 3.3.2 Quality Indicators - Bus

<table>
<thead>
<tr>
<th>Country</th>
<th>VK P</th>
<th>VK RK</th>
<th>RK A</th>
<th>PK P</th>
<th>MSP</th>
<th>MSO</th>
<th>BL</th>
</tr>
</thead>
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<td>Benelux</td>
<td>24.39</td>
<td>37944</td>
<td>1.13</td>
<td>225</td>
<td>21.6</td>
<td>21.9</td>
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<tr>
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<td>20791</td>
<td>0.45</td>
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<td>1.64</td>
<td>1.59</td>
<td>0.4</td>
</tr>
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<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>France</td>
<td>20.88</td>
<td>19688</td>
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<td>68</td>
<td>16.47</td>
<td>17.37</td>
<td>2.58%</td>
</tr>
<tr>
<td>SD</td>
<td>5.94</td>
<td>10698</td>
<td>0.48</td>
<td>25.6</td>
<td>3.86</td>
<td>3.17</td>
<td>1.89</td>
</tr>
<tr>
<td>Ob</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Germany &amp; Austria</td>
<td>31.77</td>
<td>40760</td>
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<td>376</td>
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<td>1.59</td>
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<td>10698</td>
<td>0.48</td>
<td>25.6</td>
<td>3.86</td>
<td>3.17</td>
<td>1.89</td>
</tr>
<tr>
<td>Ob</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Italy &amp; Greece</td>
<td>31.7</td>
<td>43449</td>
<td>4.01</td>
<td>58</td>
<td>14.86</td>
<td>17.72</td>
<td>3.4%</td>
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<td>30.1</td>
<td>0.97</td>
<td>2.19</td>
<td>3.9</td>
</tr>
<tr>
<td>Ob</td>
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<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Portugal</td>
<td>36.81</td>
<td>na</td>
<td>7.87</td>
<td>729</td>
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<td>14.75</td>
<td>2.93%</td>
</tr>
<tr>
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<td>na</td>
<td>9.86</td>
<td>304</td>
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<td>2.75</td>
<td>2.52</td>
</tr>
<tr>
<td>Ob</td>
<td>3</td>
<td>na</td>
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<td>3</td>
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</tr>
<tr>
<td>Nordic</td>
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<td>22510</td>
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<td>567</td>
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<td>9.51</td>
<td>1.91</td>
</tr>
<tr>
<td>Ob</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Spain</td>
<td>17.16</td>
<td>34856</td>
<td>4.76</td>
<td>157</td>
<td>11.35</td>
<td>14.4</td>
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</tr>
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<td>1.67</td>
<td>0.8</td>
</tr>
<tr>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>British Isles</td>
<td>33.97</td>
<td>64844</td>
<td>1.18</td>
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<td>19.5</td>
<td>28.5</td>
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<td>SD</td>
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<td>4.75</td>
<td>11.99</td>
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<td>3</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

The results for tram and light rapid transit are presented in Table 3.3.3 and are as follows:

- The average vehicle kms per capita is around 10.7 kms which is three times lower than for bus. The lowest figure is recorded by the British Isles at 1.6 kms and the highest by Germany at 37 kms.
- The average number of vehicle kms per route kms has an average figure of around 154,000 kms, around four times that for bus. The highest recorded figure is for France with around 445,000 kms, although the high standard deviation suggests that the figure for Germany may be more appropriate at 203,079 kms. The lowest figure posted is that for the Benelux countries at around 75,000 kms.
- Route kms per area km² averages out at 0.342 kms, with the highest figure being recorded by Germany at 0.383 kms and the lowest by the British Isles at 0.021kms.
- Passenger kms per capita has an average figure of 208 kms, with the highest figure being recorded by Germany (743 kms) and the lowest figure by the British Isles at 16.1 kms.
- The mean average off-peak speed is greater than the peak speed by around 3 kms. The lowest speeds are recorded by Italy & Greece and the highest by France.
The results for the underground are presented in Table 3.3.4 and are as follows:-

- Vehicle kms per capita for the underground has an average figure of around 18.07 k.ms, nearly, twice that for tram and around 55% of bus. The highest figure is recorded by the Nordic countries and Germany at 32 kms and 31 kms respectively, whilst the lowest is recorded by France at 7.55 kms.
- The average number of vehicle kms per route kms is around 467,000 kms, significantly higher than for both bus and tram. The highest figure being recorded by Portugal at 752,000 kms, whilst the lowest is that for the Nordic countries at 152,000 kms.
- Route kms per area km² has an average figure of 0.087 kms, with the highest figure being recorded by the Benelux countries at 0.173 kms and the lowest from the Nordic countries at 0.021 kms.
- Passenger kms per capita is 510 kms, the highest figure being recorded by Portugal at 868 kms, and the lowest 125 kms by Italy/Greece.
- The average peak and off-peak speeds are basically the same at around 29 kms per hour, considerably higher than for both bus and tram.
Table 3.3.4 Quality Indicators - Underground

<table>
<thead>
<tr>
<th>Country</th>
<th>VK</th>
<th>VK</th>
<th>RK</th>
<th>PK</th>
<th>MSP</th>
<th>MSO</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 11.23</td>
<td>266998</td>
<td>0.173</td>
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<tr>
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<td>3</td>
<td>3</td>
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<td></td>
</tr>
<tr>
<td>France</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 7.55</td>
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<tr>
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<td>na</td>
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<td>1</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 5.79</td>
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<tr>
<td>SD 3</td>
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<td>3</td>
<td>3</td>
<td>3</td>
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<td></td>
</tr>
<tr>
<td>M 17.82</td>
<td>745753</td>
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<td>125</td>
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<tr>
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<td>2</td>
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<td></td>
</tr>
<tr>
<td>Portugal</td>
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<td>M 8.94</td>
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</tr>
<tr>
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<td>1</td>
<td>1</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Nordic</td>
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<td></td>
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</tr>
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</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Ob 1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>Ob 2</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>British Isles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M na</td>
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</tr>
<tr>
<td>SD na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Ob na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>18.07</td>
<td>466628</td>
<td>0.087</td>
<td>510</td>
<td>29.9</td>
<td>29.6</td>
</tr>
</tbody>
</table>

The results for suburban rail are presented in Table 3.3.5. This is the mode with the least coverage available, the results are as follows:-

- The average number of vehicle kms per capita is 10.5 kms, a figure similar to that for trams. The highest figure recorded is that for Germany at 18.8 kms, with the lowest being recorded by the British Isles at 2.82 kms.
- The average number of vehicle kms per route km is around 148,000 kms. The figures range from 23,382 kms (British Isles) up to 341,500 kms for Germany.
- Route kms per area km² averages 0.12 kms, below that for bus and tram but higher than for the underground. The highest figure recorded is that for Portugal at 0.2 kms and the lowest is that for the Nordic countries at 0.056 kms.
- Passenger kms per capita, averages 372 kms per annum, a similar figure to that for bus. The lowest figure is for the British Isles at 56 kms and the highest for Germany at 845 kms.
- The mean peak and off-peak speeds are quite similar at 45.2 and 48.3 kph respectively. These speeds are the highest of all the modes examined.

Table 3.3.5 Quality Indicators - Suburban Rail

<table>
<thead>
<tr>
<th>Country</th>
<th>VK</th>
<th>VK</th>
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<th>PK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The ISOTOPE opinion survey of authorities and operators has also provided some useful data (see Tables 3.3.6 to 3.3.9). The main findings were:

- In terms of efficiency and effectiveness (Table 3.3.6), the results for the classical model were mixed, the models with limited competition (France and Scandinavia) were believed to be both efficient and effective, whilst the deregulated system was not believed to be effective.

- Table 3.3.7 indicates that authorities regard the deregulated systems as difficult to manage, the French system encourages both innovation and cohesion between authorities and operators, the Scandinavian system has led to improvements, whilst the classical system has limited innovation and in some countries (e.g. Portugal) has led to a lack of clarity concerning the responsibilities of operators and authorities.

- Table 3.3.8 indicates that although most groups are believed to be satisfied with the classical and limited competition models, only operators in the United Kingdom are considered to believe that deregulation has had a positive effect.

- Table 3.3.9 shows that in both the classical and deregulated models quality management and control is believed to be the responsibility of the operator. In the French and Scandinavian models there is a greater tendency for the roles to be fulfilled by the authorities through minimum service standards, community impacts etc. Fare policy is generally considered to be the task of the authorities.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>RK</th>
<th>A</th>
<th>P</th>
<th>MSP</th>
<th>MSO</th>
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<td>na</td>
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</tr>
<tr>
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<td>1</td>
<td>2</td>
<td>na</td>
</tr>
<tr>
<td>Italy &amp; Greece</td>
<td>M</td>
<td>na</td>
<td>na</td>
<td>na</td>
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The ISOTOPE opinion survey of authorities and operators has also provided some useful data (see Tables 3.3.6 to 3.3.9). The main findings were:

- In terms of efficiency and effectiveness (Table 3.3.6), the results for the classical model were mixed, the models with limited competition (France and Scandinavia) were believed to be both efficient and effective, whilst the deregulated system was not believed to be effective.

- Table 3.3.7 indicates that authorities regard the deregulated systems as difficult to manage, the French system encourages both innovation and cohesion between authorities and operators, the Scandinavian system has led to improvements, whilst the classical system has limited innovation and in some countries (e.g. Portugal) has led to a lack of clarity concerning the responsibilities of operators and authorities.

- Table 3.3.8 indicates that although most groups are believed to be satisfied with the classical and limited competition models, only operators in the United Kingdom are considered to believe that deregulation has had a positive effect.

- Table 3.3.9 shows that in both the classical and deregulated models quality management and control is believed to be the responsibility of the operator. In the French and Scandinavian models there is a greater tendency for the roles to be fulfilled by the authorities through minimum service standards, community impacts etc. Fare policy is generally considered to be the task of the authorities.
Table 3.3.6 Opinion of the authorities on efficiency and effectiveness

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Table 3.3.7  The opinion of the authorities and operators on the current system
(answers given by authorities)

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<td>Impact on efficiency</td>
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<td>Impacts on level of patronage</td>
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<td>Impacts on the cohesion between authority and operator</td>
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Table 3.3.8  The opinion of various groups on the current system (answers given by authorities)

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Table 3.3.9  Who should be the decision makers in quality aspects (answers given by the authorities)

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<table>
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3.4 Operating cost analysis

The aim of this work was to examine the relationship between costs and outputs, input prices and measures of organisational and regulatory factors. This work was based on combining the 188 observations from the ISOTOPE database with 56 observations from the database compiled by Wunsch (1996A,B). This gave a combined data set of 244 cross sectional observations. The variables considered were: operating cost, vehicle kilometres, line kilometres, wage rate and vehicle price. In the event only 49 observations contained all five variables, with this figure increasing to 75 observations if only four variables (excluding line kilometres) were considered. This is because our data set is affected by both missing and extreme values. Our analysis was limited to bus services as an insufficient number of observations were available to undertake analysis for rail modes. A correlation matrix for the independent variables was examined. This indicated that there were no problems of multicollinearity. More details of this work are provided by Perez-Perez, 1996.

A translog model of the following form was estimated:

\[
\ln C = \alpha_0 + \alpha_V \ln VK + \alpha_L \ln LK + \beta_i \ln P_i + \beta_k \ln P_k + \\
\frac{1}{2} \delta_{vv} (\ln VK)^2 + \frac{1}{2} \delta_{lk} (\ln LK)^2 + \frac{1}{2} \gamma_{11} (\ln P_i)^2 + \frac{1}{2} \gamma_{kk} (\ln P_k)^2 \\
+ \gamma_{ik} \ln P_i \ln P_k + \varphi_{vl} \ln VK \ln LK + \rho_{vl} \ln VK \ln P_i + \rho_{vk} \ln VK \ln P_k + \\
\rho_{11} \ln LK \ln P_i + \rho_{kk} \ln LK \ln P_k + \psi DV
\]

where

- \( C \) = Operating cost per annum
- \( VK \) = Vehicle kilometres per annum
- \( LK \) = Line kilometres per annum
- \( P_l \) = Price of labour
- \( P_k \) = Price of vehicles
- \( DV \) = Dummy Variable (= 1 if city in Great Britain, 0 otherwise)

The following models were tested:

(I) No restrictions
(II) Homogeneity of degree one in input prices
\( \beta_i + \beta_k = 1; \gamma_{11} + \gamma_{kk} = 0; \gamma_{ik} = 0; \rho_{vl} + \rho_{vk} = 0; \rho_{11} + \rho_{kk} = 0 \)
(III) Homotheticity (separability of inputs from outputs)
\( \rho_{vl} = \rho_{vk} = \rho_{11} = \rho_{kk} = 0 \)
(IV) Linear separability test
\( \gamma_{ik} = 0 \)
(V) Homogeneity and unitary elasticity of substitution (Cobb-Douglas)
\( \delta_{vv} = \delta_{lk} = 0; \gamma_{vl} + \gamma_{vk} = 0; \gamma_{ik} = 0; \varphi_{vl} = 0; \rho_{vl} = \rho_{vk} = \rho_{11} = \rho_{kk} = 0 \)

Statistical tests, based on the log-likelihood ratios, supported models II and IV. As model IV is a special case of model II, model II was used for further analysis. This
model is given by Table 3.4.1. One important finding was that we were unable to support a hypothesis of Cobb-Douglas production technology - a finding which is consistent with other studies (see, for example, Berechman, 1993, Table 5.2).

It should be noted that of the 15 parameter values estimated, only five are significant at the 5% level although this reflects the small number of degrees of freedom available. However, the model exhibits excellent goodness of fit, with 98% of variation being explained.

Table 3.4.1 Preferred Translog Model of Operating Costs

<table>
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<th>Parameter Value</th>
<th>Standard Error</th>
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<tbody>
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<td>$\alpha_o$</td>
<td>-13.276 19.67*</td>
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<tr>
<td>$\alpha_v$</td>
<td>2.91 2.63*</td>
</tr>
<tr>
<td>$\alpha_l$</td>
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<td>$\beta_l$</td>
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<td>$\beta_k$</td>
<td>2.45 2.07*</td>
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<td>$\delta_{vl}$</td>
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<td>$\gamma_{lk}$</td>
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</tr>
<tr>
<td>$\phi_{vl}$</td>
<td>0.232 0.087</td>
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<tr>
<td>$\rho_{vl}$</td>
<td>0.236 0.135*</td>
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<td>$\rho_{vk}$</td>
<td>-0.236 0.135*</td>
</tr>
<tr>
<td>$\rho_{ll}$</td>
<td>-0.336 0.088</td>
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<tr>
<td>$\rho_{lk}$</td>
<td>0.336 0.088</td>
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<tr>
<td>$\psi$</td>
<td>-0.829 0.269</td>
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$R^2$ 0.984  
$R^2$ 0.980  
Log Likelihood 11.27  
* Not significant at the 5% level

From this model, we can estimate the returns to density as:

$$RTD = \left[ \frac{\partial \ln C}{\partial \ln VK} \right]^{-1} = 0.86 < 1$$

This suggests that there are diseconomies of density i.e. decreasing returns to density. This may occur because the densest networks are the most congested. This could be due to external factors, in particular speed. This variable was tested but was insignificant and reduced the plausibility of the overall model.

We can also estimate the returns to scale as:
RTS = \left[ \frac{\partial \ln C}{\partial \ln VK} + \frac{\partial \ln C}{\partial \ln LK} \right]^{-1} = 0.71 < 1

This suggests that there are diseconomies of scale i.e. decreasing returns to scale. This may arise because as firms get larger they become more difficult to manage efficiently and become prone to x-inefficiency.

Our results therefore suggest that, on average, European bus operators produce too many vehicle kilometres and too many line kilometres, but any reduction in vehicle kilometres should be greater than the reduction of line kilometres. However, our results suggest that size is not too important, given the wide confidence intervals around our parameter values both our RTD and RTS estimates are insignificantly different from one. We are unable to reject the hypothesis of constant returns to scale with this model. It should be noted that with a slightly different version of the above model, we omitted line kilometres as a variable and calculated a returns to scale with respect to vehicle kms of 0.33 and with respect to passengers of 0.74. This model again exhibits decreasing returns to scale, particularly where vehicle kms is the output.

We were able to calculate the Allen’s partial elasticity of substitution from this model using the following general formulae:

\[ \sigma_{ij} = \frac{\gamma_{ij} + S_i S_j}{S_i S_j} \quad \text{and} \quad \sigma_{ii} = \frac{\gamma_{ii} + S_i^2 - S_j}{S_i^2} \]

Assuming \( S_l \) (labour’s share of costs) = 0.7, and \( S_k \) (capital’s share of costs) = 0.3 then the following results are obtained:

\[ \sigma_{ik} = \sigma_{ik} = 1 \]
\[ \sigma_{ii} = -0.490 \]
\[ \sigma_{kk} = -0.600 \]

The own and cross price elasticities of factor demand can then be estimated using the general formula:

\[ E_{ij} = \sigma_{ij} S_i \]

This gives the following results:

\[ E_{ik} = 0.7, E_{kl} = 0.3, E_{iu} = -0.343, E_{kk} = -0.180 \]

In contrast to some, but by no means all, of the studies summarised by Berechman (op. cit., Table 5.3), we find relatively strong substitutability between capital and labour. This may reflect different manning arrangements and the use of different sized vehicles. We also find the demand for labour to be relatively inelastic, but greater (in absolute terms) than the findings summarised by Berechman (op. cit., Table 5.4) who found an average elasticity of -0.10. Similarly, we find capital to be relatively inelastic, but in
this case our results are similar to the mean of the elasticities studied by Berechman (-0.2).

One other important finding is the dummy variable parameter estimates. These were tested for individual countries and groups of countries. The only dummy variable which had a significant coefficient was that for Great Britain which suggests that, all other things being equal, operating costs for bus systems in Great Britain are 56% below those of the rest of Europe. This seems a large difference until it is noted that operating costs per bus km have decreased by 42% in Great Britain since deregulation.

Given the conclusions about data quality made above, it would obviously be dangerous to draw definitive conclusions but there does seem to be a suggestion that cost efficiency reduces with operator size. Our calculations indicate that the mean fleet size in our sample is around 300 vehicles. There is evidence to show that there are only limited economies of scale in the production of passenger transport services by bus. While economies of scale exist at relatively small production scales (up to 50 buses), these seem most often to be exhausted at around 100 buses (see Figure 3.1). This is at the bottom end of the optimal range postulated by Berechman (op. cit.) of between 100 and 500 vehicles. The extent to which such economies of scale can be realised depend on particular local market situations (network size and shape).

Besides this type of economies of scale which are related to production with given inputs, there are other economies related to decreasing input prices with increasing production size (vehicle price, fuel price, etc.). There does not seem to be diseconomies of scale here.

The difference between the first type of economies of scale (production) and the second type (input price) is that the first one requires a bundled production, i.e. production at one place, while the second type of economies of scale can be achieved even if production is not at one place, i.e. scattered all over a country or even internationally.

**Figure 3.1 Bus Average and Marginal Cost**

The above suggests that reforms that fragment the bus industry, such as competitive tendering at a route level, would not necessarily reduce cost efficiency and might

Source: Perez-Perez, 1996, p49.
promote it. Similarly, restructuring of publicly owned bus companies might be best undertaken in units of 100 vehicles or so (i.e. at the depot level).

The consequences of this production structure is that passenger transport companies tend to evolve towards the formation of large groups of relatively small companies organised as profit centres. This structure can be observed in all countries where competition has been introduced (Sweden, Denmark, France and Great Britain). Such re-agglomerations may also be for a number of reasons that our model has not taken into account:

- Larger companies may be able to lower input prices through the bulk purchase of fuel and vehicles and have access to cheaper finance
- Larger companies can spread fixed costs (e.g. marketing, administration, training) over a greater range of outputs
- Larger companies may, through the long purse hypothesis, be better able to withstand competition and be more able to engage in predation.

None of these features is a technological return to scale but they do reflect economies of scale.

It is useful to reflect on the consistency of our results with those of other studies. Berechman (op. cit.) provides an extremely useful review of transit cost elasticities and he reports on nine applications of translog models including five European examples (DeBorger, Belgium, 1984; Pettreto and Viviani, Italy, 1984; Button and O’Donnell, Great Britain, 1985; Gathon, Europe, 1989; de Rus, Spain, 1989). For the bus industry he finds short run economies of capital stock utilisation, related to excess vehicle capacity, and some evidence of economies of scope. We have been unable to investigate these effects. Berechman also finds evidence of large scale economies of traffic density and constant scale economies, whereas we find mild diseconomies of both density and scale. For bus systems, the cost implications of network size are probably limited, although the demand implications are probably more important but we were unable to measure them. A number of other studies have been undertaken including those of Wunsch, Europe, 1996a; Jorgensen, Pederson, Solvoll, Norway, 1995; Kerstens, France, 1995; Fazioli, Filippini and Prioni, Italy, 1993; Filippini, Maggi and Prioni, Switzerland, 1992 and Talvitie and Backstrom, Finland, 1989.

It would have been possible to derive total factor productivity indices in the manner suggested by Talvitie and Sikow, 1992 or Preston, 1997. However, there were concerns that the results would be unduly affected by data quality and it was therefore decided not to undertake analysis of this type.

We have not been able to calibrate cost models with the ISOTOPE and Wunsch rail data sets but we were able to undertake some simple analysis with data collected by Kilburn (1994) for 14 cities in four EU countries. This suggested there were substantial economies of density with the elasticity of costs with respect to train km (holding network km constant) ranging from 0.21 to 0.94. Savage (1995) similarly found increasing returns to density for mass rail transit systems in the US, which confirmed the earlier work of Pozdena and Merewitz (1978) but failed to find diseconomies of density for the largest systems as Viton (1980) had. Savage also found constant returns
to scale and suggested that the larger systems could be fragmented without leading to unit cost increases.

3.5 Demand analysis

The aim of this work is to examine the relationship between demand and fare levels, service levels and city size and to see if it is affected by organisational and regulatory factors. The combined Wunsch and ISOTOPE database was again used but due to missing values and outliers, the usable sample size was only 89 observations of which 34 were from Wunsch and 55 were from ISOTOPE. Again the analysis is limited to bus operations and is reported in more detail by Perez-Perez, 1996.

Three model forms were investigated: the linear, the log-linear and the semi-log/negative exponential. It was found that the log-linear model gave the best fit and has the following form:

\[
\ln Q = \alpha + \beta \ln F + \gamma \ln VKM + \delta \ln POP
\]

where

\begin{align*}
Q & = \text{Passengers per annum} \\
F & = \text{Mean fare per trip (in ECUs)} \\
VKM & = \text{Vehicle kms per annum} \\
POP & = \text{Population}
\end{align*}

The model has the advantage the elasticities are given directly by the parameter values i.e. the fare elasticity is given by \(\beta\) and the service elasticity by \(\gamma\). A series of statistical tests were undertaken to ensure zero mean of the disturbance, no multicollinearity, homoscedasticity, non autocorrelation, no simultaneity and normality. These hypotheses were accepted with the exception that a White test indicated that the model was affected by heteroscedasticity and hence it was re-estimated using weighted least squares, using as weights the residuals of the original ordinary least squares estimation. It was also found to be appropriate to segment the sample into small cities (population below 500,000) and large cities (population above 500,000). The results in terms of elasticities are given by Table 3.5.1.

Table 3.5.1 suggests an unweighted fare elasticity of -0.42 and a service elasticity of 0.41. This indicates that demand is inelastic and accords well with the work of others (TRRL, 1980, Goodwin, 1992, Berechman, op cit., Table 2.9). Analysis has been taken to see if these values vary by country but they were found to be relatively stable.

<table>
<thead>
<tr>
<th>Table 3.5.1 Price and Service Elasticities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>(Standard errors in brackets)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elasticity</th>
<th>Small</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Our explanation for the difference in the elasticities between small and large cities is as follows. The lower fare elasticity in large cities reflects the greater degree of captivity to public transport due to longer journey distances (making walking less attractive) and greater congestion and parking problems (making car less attractive). This assumes that bus fare charges move in line with other public transport modes. In other words, the fare elasticities in Table 4.11 are conditional on all public transport modes having the same proportionate fare charge - which is probably realistic for most of the cities studied.

By contrast, demand is more service elastic in big cities than small cities, because of the competition from other public transport modes. In this instance, the elasticities in Table 4.11 may be thought of as ordinary elasticities rather than conditional elasticities. Another factor may be that service (and hence time) is valued more highly in large cities, due to higher income levels. The implied values of service are 0.54 ECUs per bus km in small cities and 1.44 ECUs in large cities.

<table>
<thead>
<tr>
<th>Country</th>
<th>No of obs</th>
<th>No of Residuals</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>20</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Great Britain</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>11</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>9</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Others*</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>46</td>
<td></td>
</tr>
</tbody>
</table>

* Austria, Denmark, Finland, Greece, Ireland and Sweden

Analysis of residuals, given by Table 3.5.2 indicate that there may be some systematic variation between countries. The incidence of positive residuals (where actual demand is greater than forecast demand) are recorded. This indicates, all other things being equal, those cities where demand in higher than average. It can be seen that all countries have some good performing cities, with Switzerland and Germany performing particularly well. By contrast, France performs less well. The higher than average levels of demand in Switzerland and Germany may be related to the production pattern based on co-ordinated, clock-faced timetables. This production pattern is also the norm in the Netherlands but in that country competition from the bicycle is intense. Table 3.5.2 does suggest that planned networks may have some advantages in terms of
demand. However, it should be noted that our model does not take into account the price, level of service and availability of competing modes, particularly the car. A proxy variable, market share, was tested but was found to be statistically insignificant. The variation in Table 3.5.2 may be partly due to variation in the competitiveness of the car due to fiscal policies, traffic management policies etc.

3.6 Franchising analysis

A number of countries in Europe have experimented with contracting-out, tendering, franchising of bus services. In work so far, we have analysed some of the data on this issue in the ISOTOPE factual database and reviewed the progress and key empirical findings in two areas: Nordic countries and Great Britain.

3.6.1 Results from the ISOTOPE database

Certain sections of the ISOTOPE factual questionnaire namely, sections 2.3.6 and 2.4, asked the respondents questions concerning tendering. These were divided into two sections, directed at operators and authorities respectively. From the answers a series of measures have been developed for both parties and are presented in Table 3.6.1 and Table 3.6.2. Unfortunately, sufficient information was only available in both sections for bus.

In Table 3.6.1 five measures are presented with regard to the operator:

1) the percentage of lines being operated under tender/sub-contract.
2) the percentage of vehicle kms operated under tender/sub-contract.
3) the average number of sub-contracts/tenders held by the operator.
4) the average duration of sub-contracts/tenders held by the operator.
5) the average duration of sub-contracts/tenders held by the operator.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>OPERATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of lines under sub-contract/tender</td>
</tr>
<tr>
<td>Benelux</td>
<td>34.6%</td>
</tr>
</tbody>
</table>
The following points can be drawn from Table 3.6.1:-

- Around 33% of the average European bus operators bus lines are operated under sub-contract/tender. The figure is highest for the Nordic countries at around 63% and lowest for Portugal at around 14%.

- The average number of vehicle kms operated under tender is around 23%, again the Nordic countries operate most vehicle kms (56.4%), with the least being operated by the British Isles. The figures for France and Spain appear to be low considering the percentage of lines under tender, but may indicate an emphasis on network contracts.

- The average number of sub-contracts/tenders operated by each operators is around 16, however, the average number per country ranges from 53 for the British Isles to 2 for the Nordic countries. From the percentage of vehicle kms operated this would suggest that sub-contracts in the British Isles are on a route by route basis, whilst in the Nordic countries they are more on a network basis.

- The average duration of sub-contracts/tenders operated by each operator is around 6 yrs. Contracts are on average highest in Spain at around 20 years and lowest in Portugal at around 1 year.

In Table 3.6.2 a further four measures are presented with regard to Authorities:

1) the percentage of contracts awarded by the authority by type, either full or net subsidy.

2) the average number of bids received per contract tendered, from private and public bus operators.

3) the number of contracts awarded by authority to either private or public firms.

4) Average length of contract awarded in years.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>AUTHORITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of contracts awarded by type</td>
</tr>
<tr>
<td>France</td>
<td>20%</td>
</tr>
<tr>
<td>Germany &amp; Austria</td>
<td>39%</td>
</tr>
<tr>
<td>Italy &amp; Greece</td>
<td>27.3%</td>
</tr>
<tr>
<td>Portugal</td>
<td>14%</td>
</tr>
<tr>
<td>Nordic</td>
<td>63%</td>
</tr>
<tr>
<td>Spain</td>
<td>30%</td>
</tr>
<tr>
<td>British Isles</td>
<td>na</td>
</tr>
<tr>
<td>Average</td>
<td>32.6%</td>
</tr>
</tbody>
</table>

Source: ISOTOPE database.
<table>
<thead>
<tr>
<th></th>
<th>Full</th>
<th>Net</th>
<th>Privat e</th>
<th>Public</th>
<th>Privat e</th>
<th>Public</th>
<th>Yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>65%</td>
<td>35%</td>
<td>3</td>
<td>2</td>
<td>2.4</td>
<td>1.5</td>
<td>9</td>
</tr>
<tr>
<td>Nordic</td>
<td>90%</td>
<td>10%</td>
<td>3</td>
<td>1.5</td>
<td>6</td>
<td>3.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Spain</td>
<td>100%</td>
<td>-</td>
<td>1.5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>14.15</td>
</tr>
<tr>
<td>British Isles</td>
<td>20%</td>
<td>80%</td>
<td>2.4</td>
<td>0</td>
<td>421</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Average</td>
<td>69%</td>
<td>42%</td>
<td>2.8</td>
<td>2.0</td>
<td>108</td>
<td>2.6</td>
<td>7.67</td>
</tr>
</tbody>
</table>

Source: ISOTOPE Database.

- On average around 69% of the contracts awarded by authorities to bus operators are full cost contracts, the rest being net subsidy. Spain and the Nordic countries award nearly all their contracts as full costs, 100% and 90% respectively, whilst the British Isles authorities award on average around 80% of their contracts as net subsidy.
- On average each contract attracts around 3 bids from privately owned bus operators and up to 2 bids from publicly owned bus operators. However, neither Spain nor the British Isles attract any bids from the public sector, a reflection of the largely privately owned fleets operating in both countries.
- On average, without Spain and the British Isles inclusion, the number of contracts awarded by each authority to operators is around 4.2 to private operators and 2.6 to public operators. From a country perspective it can be seen that the average British authority awards a very high number of contracts each year, and all to private operators.
- The average contract length is around 8 years, with the longest contract length being around 14 years in Spain and the shortest around 3 years in the British Isles.

### 3.6.2 Nordic Countries

#### 3.6.2.1 Sweden

Jansson (1994B) has reviewed the early stages of comprehensive tendering in Sweden, where tendering has been gradually introduced since July 1989. The progress of tendering was monitored in 25 countries. Initially, around 32% of operations were tendered (February 1990), with this expected to reach 68% in the near future. Cost savings from the initial rounds of tendering varied from 0 to 45%, with an average of around 12%. The composition of the market changed in that municipals’ shares declined from 37 to 35% and the state owned companies’ (Swebus and Postbus) shares declined from 35 to 31%. The gainers were the independent private firms whose shares increased from 27 to 34%, although their numbers decreased slightly (from 653 to 627).

One of the features of tendering in Sweden is the diversity of contract forms concerning payment method, tendering method, responsibility for supervision of operations, vehicles and depots, quality requirements, award criteria, contract length, monitoring and sanctions. Research is ongoing to determine whether contract specification has systematic effects on contract price and quality.

Later work in Sweden has been undertaken by Pyddoke (1996) who notes that the share of tendered bus kilometres has increased from 8% in 1988 to 70% in 1995. During this period costs have decreased by 10% where bus contracts were competitively tendered. Empirical analysis has been undertaken 106 contracts let in 1994. Most contract lengths varied from between 1.5 to 3 years, whilst the majority of the contracts were cost
indexed (87%), had penalties for cancellations ((70%) and had age (82%), size (70%) and environmental (74%) requirements. All of the contracts were of a gross cost form or of a cost plus form or both. The findings from the preferred model were as follows:

- Competition reduces costs. A competition index of the following form was used:
  \[ \text{CI} = \sum_{i} \frac{1}{i} \]
  where \( i \) = the number of bids.
  The estimated coefficient implies that moving from one to two bids reduces costs by 12%, moving from one to three bids reduces costs by 17% and moving from one bid to four bids reduces costs by 20%.
- The elasticity of costs per bus km with respect to buses per bus km is -0.12 and with respect to routes per bus km is -0.13. The implies an elasticity of costs with respect to vehicle kms of 1.25 i.e. there are some diseconomies of scale. This result is consistent with that in section 3.4. This is probably an indicator of diseconomies of density. The largest contracts will be in the congested urban areas with correspondingly lower speeds. The fact that costs decrease when the number of buses and, particularly, the number of routes increase may be suggesting the existence of economies of scope.
- Cost per km are 16% lower in sparsely populated areas where speeds will be high and peakiness of demand low.
- Cost plus type contracts appear to be 18% more expensive per km than fixed costs contracts (although this result is not statistically significant).
- Including penalties for late running increases costs by 32% (although this result is not statistically significant).

Jansson (op. cit.) also reviews tendering in Copenhagen where costs reduced by around 10% between 1989 and 1992. A feature of the initial Copenhagen model was that the municipal operator was not allowed to bid. Around 20 bids per contract were attracted compared to the 3 to 5 bids per contract in Sweden. Another important feature of the Copenhagen model is the quality measuring system that has been developed in order to provide operators’ financial incentives. This is based on 16 points, 11 related to passenger perception and 5 on objective measurements. Every 3 months, the best operator receives a bonus of 1% of the contract sum.

3.6.2.2 Finland

In Finland, tendering is limited to the Helsinki Metropolitan Area Council (YTV) which is responsible for public transport between Helsinki, Espoo, Vantaa and Kaunianinen. Tendering has cut subsidy costs by 29%, allowed ticket prices to be reduced by 8% and mileage to increase by 3% (YTV, 1996).

Although 23 independent firms participated in the tender rounds, the actual number of firms operating services decreased from 10 to 6, leading to concerns that in the long term concentration will reduce competition and increase costs. This is a concern in a number of Nordic countries.

3.6.2.3 Norway
In Norway the background for introducing competitive tendering to public transportation was different from Denmark and Sweden. Except in the Oslo-region, the private right companies were holding concessions and having the full responsibility for planning, operation, marketing, information, sales, fare box revenue, etc. The county authorities are according to the law, responsible for concessions and approval of fare systems and level, time schedules and subsidies. The relationship between authorities and operators was on a net cost basis. Until 1981 the subsidy was paid by the state to the operating company. From 1981 to -86 the counties got a lump sum grant for public transport from the state. From 1986 the counties were financed on a more general basis and free to allocate their funds among the following activities: transportation, secondary education and health care.

From 1986 a system of «normal costs» for bus operation was developed as a basis for the counties to negotiate with their concession holders over subsidy (normal cost - fare box revenue). This emerged as the pressure on budgets became harder. Legal practice had given the concession holders a strong position. It was very rare if anyone lost a concession or went bankrupt. In this period, tendering processes came on the political agenda for supply of a variety of public goods and services. From 1991 the act of transportation introduced competitive tendering and from the spring of 1994 the amendments passed the parliament.

The act of transportation has a clause that gives the operators the right of redemption if more than 20% of their production is put out on tender within 1 year or more than 50% within 5 years from the first tender. This clause is in action until 8 years after the law came into action.

As a consequence the state has cut their transfers to the counties by 140 mill NOK for 1995. This equals an estimated saving of 10% on total cost on 20% of route production. Further cuts came in 1996 (54 mill) and is proposed for 1997 (54 mill).

From 1987 to 1994 total cost per vehicle km of bus operation is reduced by 5% and fare revenue per vehicle km is increased by 9% in real terms (Frøysadal and Hagen 1996). Overall patronage is stabilised at approx. 12 passenger km per vehicle km. The subsidy rate is reduced from 36.5% to 27% over the same period. These figures are national. In Bergen (the second largest city in Norway) the subsidy rate is reduced from 32% in 1990, to 9% in 1995. In Trondheim (the third largest city in Norway) the subsidy rate is reduced from 25% in 1990 to 6.5 in 1995 (Stangeby and Norheim 1995).

In this period and until today we have seen an accelerating tendency toward concentration in the Norwegian bus industry. Mergers due to the redemption clause are rare but buy-outs and co-operation among individual companies through chains is something we have seen weekly over the last two years. The largest group is controlled by the Norwegian State Railways with 1400 buses.

However tendering have not yet become the usual way to establish the contractual relationship between operators and authorities in Norway as expected. An assessment of the tendering process in Oppland county points out some explanations for this (Johansen and Stenstadvold 1996). One reason for this seems to be the companies right to claim redemption if more than 20% of their route production are tendered out in a single year. In a situation with many small companies this makes it difficult for
authorities to find areas that easily can be defined for tender and isolated with respect to users benefit and fare-box revenue without exceeding the 20%.

Another reason might be the tradition with net cost contracts. Due to this the authorities have less information than in the other Scandinavian countries. Obviously competitive tendering is much easier to implement with full cost contracts. For full cost contracts the authorities need more operational information and competence than with the traditional net cost contracts. This implies that more resources have to be used in the responsible public authorities. Their budgets are tightened over the last years and it is thereby hard to buy the competence needed.

In some of the larger cities the subsidies to public transport have declined to near zero over the last few years, due to fare increases and cost reductions. In these areas tendering process could be beneficial from the passenger’s view but since subsidy is low, the incitements to test the market by tendering is weak.

Several counties have established agreements with their operators to increase efficiency over a period of 2-5 years. The operators agree to cut costs and subsidy. On the other hand the authority will not use tendering for the specified period.

The only urban area where a small bus network (15-20 buses) is tendered out in Norway so far is Lillehammer in Oppland county. In this case the authority has taken over the responsibility for fare revenue, marketing and information. Adjusted for costs associated with these responsibilities, the cost reduction is estimated to 20%. The service was improved by better buses (low-floor, low emission) and improved information from day 1 (15 November 1995) of the new operator. This led to improved patronage by 30%, increased fare revenue by 20% and in turn increased frequency of the service by 5%. The success depends as much on careful planning and good practice from the county authority, as on the tender itself. (Johansen and Stenstadvold 1996).

3.6.3 Great Britain

The impact of competitive tendering on bus services in Great Britain is reviewed by Mackie and Preston (1996, pp 81-85, 169-172). Two systems of tendering are in place in Great Britain: a system of comprehensive tendering in London and a system of tendering for socially necessary services outside London. Initial tendering in London, reviewed by Glaister and Beesley (1991) indicated that over a five year period costs for tendered routes had decreased by 16% (when administrative and supervisory costs are taken into account), compared to a 20% decrease in London Buses Limited’s (LBL) overall unit costs (which included substantial non tendered service). Glaister and Beesley also found that the use of combination bids had the potential to distant the market. Kennedy (1995) finds that costs had reduced by 25% by 1992, although tendering was only one element of a complex set of policies that included LBL restructuring and privatisation. Mackie, Preston and Nash (1995) find that by 1994 unit costs in London had come down by 35% and subsidy by 47%, with there being some evidence that privatisation was a major spur to cost reductions. Kennedy’s work was also important in that it found that although contract prices (based on minimum costs) did not vary with the number of bidders, they did vary with the variance of bids,
suggesting that, at least in the early stages of the process the winner’s curse (or the risk of it) affects bid prices.

Outside London, the situation is more complex because the tendered network has important interactions with the commercial network. Subsidy levels have decreased by 35% but this masks a move from blanket subsidies to subsidies targeted at users. Revenue support has decreased by 60% (Mackie and Preston, op cit., p 161). There is some evidence that it was competition in the tendered market (where independents have a much greater market share than in the commercial market) which acted as the main spur to cost reduction programmes introduced by the major incumbent operators.

Some important work has been undertaken by White and Tough (1993, 1995) that indicates that minimum cost tenders require around 13% less subsidy than minimum subsidy tenders because they attract a greater number of bidders and they find that bid price reduces with the number of bids for minimum cost tenders but not for minimum subsidy tenders. This result differs from that of Kennedy in London but this may be because there is a greater degree of certainty for costs in the Shire counties that White and Tough studies than in London. Mackie and Preston in analysing winning bids in West Yorkshire based on minimum subsidy found that prices did not vary with the number of bidders. They suggest that minimum cost tenders, particularly in areas unaffected by traffic congestion and labour shortages, may have features of an independent value auction in that bid price varies with the number of bidders. In such cases, it is important to sustain a high number of bidders. By contrast, minimum subsidy tenders may have some of the feature of a common value auction in that bid price is not affected by the number of bidders but may be affected by the variance of bids.

Pickup et al. (1991, chapter seven) provide some additional evidence that longer tenders attract lower prices and that vehicle size and age specifications may increase costs by 5 - 10%.

3.6.4 The Netherlands

Tendering has been limited to two experiments in rural areas. Bidders were asked to suggest a better network for the same amount of subsidy as the present operator. In Limburg this resulted in an American company (Vancom) winning with 30% more bus-km for the same subsidy. In Sealand, the incumbent won the contract with 15% more bus-km than the year before. Despite the dominance of a national operator (VSN - with a 98% market share), five serious bids were received for each tender. This approach may be criticised for being based on a coarse supply oriented set of selection criteria with unclear incentives, but it did illustrate that competition was feasible in the Netherlands (Van de Velde, 1995).
CHAPTER 4
CONCLUSIONS

There is a large number of organisational and regulatory forms in practice in urban public transport in Europe. The key distinctions are between the classic regulated publicly owned monopoly, the deregulated free market and models of limited competition based on competitive tendering and other forms of contract. However, this threefold distinction is a simplification and there are a large number of further subdivisions, particularly for the limited competition models.

Our theoretical work, based primarily on principal-agent theory, suggests the following. Competitive tendering may be most appropriate for operational functions, may be possible for tactical functions but is not appropriate for strategic functions (section 2.1). Private firms tend to be more effective than public firms in maximising profits because they are better incentivised through shareholder monitoring and bankruptcy and takeover constraints, whilst they are less prone to political interference. Management Employee Buy-Outs tend to be transient phenomenon unless restrictions are made to selling the business on (section 2.2). Competitive tendering based on minimum subsidy and quality incentives should be more efficient than minimum cost methods, but this assumes either perfect knowledge or risk neutrality. Given that firms are likely to possess imperfect knowledge and be risk averse, the determination of the most appropriate contract form becomes an empirical issue (section 2.3). Given various micro-economic features of the urban public transport market, most noticeably user economies of scale and the related concepts of network benefits and intra-marginal demand, there may be arguments for public intervention in terms of finance, if not in terms of planning and operation. Competition may reduce net economic benefit if it merely leads to a duplication of services (section 2.4) or leads to price wars, but can increase welfare where it leads to the development of new products or pricing structures (e.g. Arlanda airport rail link, Manchester Metrolink, moves away from high fares - section 2.5). The overall conclusion is that the private competitive organisation may have advantages in terms of efficiency in production but the public regulated organisation may have advantages in terms of consumption. However, both perfect competition and perfect planning are elusive concepts. In particular, public regulated firms may make inappropriate public choices in terms of investments, prices and output levels due to political intervention. Competitive tendering may provide an appropriate middle ground, particularly for urban services, where user economies of scale are most important. User economies of scale are less important for interurban services where free market solutions may be more appropriate.

In terms of empirical work, our work on partial productivity and other indices for the bus market may be summarised by Table 4.1. Due to data problems and the well known dangers of comparing partial indicators, these results need to be treated with caution. However, in terms of cost recovery it can be seen that deregulated markets have a much better performance (covering 85% of costs) than either markets with limited competition or regulated markets (who both cover 47% and 54% of costs respectively). In terms of staff productivity, we find productivity in deregulated markets 38% higher than in regulated markets and 5% higher than in limited competition markets. A familiar pattern also emerges when we consider unit costs. Costs in deregulated
markets are 36% lower than in markets with limited competition, which in turn have costs 25% lower than regulated markets.

When we consider loads, the pattern is reversed. Regulated markets have mean loads that are around double those of both deregulated and limited competition markets (section 3.1). This again suggests that although deregulated systems may be efficient in terms of production, regulated systems are more efficient (or, at least, more effective) in terms of consumption.

The evidence presented in section 3.1 also suggests that there may be excessive use of rail-based systems, whose average costs per passenger km are around twice those of bus, whilst revenues per passenger km are less than double those of bus. This may reflect an inefficiency in consumption of regulated systems (i.e. excessive consumption of rail services at the expense of bus services).

<table>
<thead>
<tr>
<th>Table 4.1: Comparison of Key Indicators for Urban Bus Services</th>
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<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Deregulated GB</td>
</tr>
<tr>
<td>Limited Comp. DK,FR,FI,NO, SE</td>
</tr>
<tr>
<td>Regulated AT,BE,DE,ES, GR,IT,LU,PT, NL</td>
</tr>
</tbody>
</table>

Macro-economics considerations related to the Maastricht agreement should put pressure on member states to reduce subsidy levels to urban public transport. There is however no sign of such convergence at present, and some evidence of divergence (i.e. subsidy reductions are greatest in those areas with already low levels of subsidy) (- section 3.2).

An important issue relates to the quality of output. In section 3.3, the three broad organisational forms were assessed in terms of 10 indicators. The results are summarised by Table 4.2. Our results are qualitative but what they suggest is that regulated systems have advantages of affordability but low fares may result in inadequate investments and low levels of supply. By contrast, deregulated regimes may perform well in terms of supply indicators but less well in terms of most other indicators. Models of limited competition may have quality advantages, particularly if contracts include appropriate incentives. These results may though reflect the political context as much as the organisational structure. The opinion surveys seem to confirm the perceived efficiency and effectiveness of limited competition models.
Our econometric analysis has been limited by data problems but we have been able to develop a translog cost model, which suggests that the average European bus network exhibits mild diseconomies of both density and scale. From a cost efficiency point of view, operators are producing too many line km and, particularly, too many vehicle kms. The optimal firm size may be around 100 vehicles. It may be sensible, from a cost point of view, to unbundle bus companies into a series of smaller companies based on individual depots. There also appears to be a high degree of substitutability between labour and capital as well as relatively high input price elasticities, particularly for labour. Only operators in Great Britain have costs statistically different from those elsewhere, being some 56% lower (section 3.4).

This evidence is consistent with that presented in Table 4.1 and suggests that the cost difference between Great Britain and the rest of Europe can not be attributed to scale effects and input prices. This work confirms the advantage of deregulated systems in terms of efficiency in production. Work has subsequently been undertaken to examine the causes of the 40% plus reduction in bus costs per km that has occurred in Great Britain since deregulation. Around one third of this cost reduction can be attributed to reductions in the work force. If this redundant labour can not be usefully redeployed, then some 13% of the cost reduction benefits are lost. A further third of this cost reduction is due to reductions in wage rates and fuel prices. To the extent that these are transfers a further 13% of the cost reduction benefit is lost. Thus under some extreme circumstances, it may be argued that only cost reductions of around 13% may be achieved. These are the types of savings being achieved in Scandinavia where redundancies and wage cuts are not the norm.

We have also developed a constant elasticity demand model, which indicates that the average fare elasticity is -0.4 and the service elasticity is 0.4, although there are important differences between small and large cities (section 3.5). The model also indicates that, all other things being equal, demand is greatest in regulated markets, particularly in Germany and Switzerland, although this may also reflect greater control of bus's main competitor, the car. This again suggests the possibility of efficiency in consumption.

Empirical work on tendering (section 3.6) suggests that cost reductions of between 10% and 20% are possible where the industry is not simultaneously restructured, increasing to 35% in London after restructuring (fragmentation and privatisation). Evidence is

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**Table 4.2: Summary of Quality Indicators**

<table>
<thead>
<tr>
<th></th>
<th>Regulated</th>
<th>Limited Comp.</th>
<th>Deregulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td></td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Network Design</td>
<td>0/+</td>
<td>0/+</td>
<td>-</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Convenience</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Environmental</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Speed</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Security</td>
<td>0/+</td>
<td>0/+</td>
<td>-</td>
</tr>
<tr>
<td>Affordability</td>
<td>+</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Delivery</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Customer Opinions</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
</tbody>
</table>

+ = Good Performance - = Poor Performance 0 = Neutral Performance.
also beginning to emerge on the effectiveness of different forms of contracts. In particular, it appears that minimum cost contracts may require 13% less subsidy than minimum subsidy contracts in cases where there is plenty of competition for contracts. However, concentration of the industry may be particularly problematic for these type of contracts.

Overall, we find some support for the contention in the Green Paper, the Citizen's Network, that "the concession system - where services are subject to open tender but within a defined operational framework - is well suited to providing an environment which gives incentives to operators to raise standards whilst safeguarding system integration". However, there are a number of different concession/tendering schemes available. Furthermore the main gains of competitive tendering are unlikely to be from increasing efficiency in consumption but from improving productive efficiency. Our work suggests that in some areas unit cost reductions of up to 50% are possible - although reductions of 15% may be more feasible in cases where wage reductions and redundancies are not possible. In order to make such gains, it may be necessary to restructure the bus industry in many member states (principally by fragmenting dominant operators) and to develop anti-trust legislation sufficiently so as to prevent mergers and other practices primarily designed to limit competition.

Finally, it is worth making a number of points that should be addressed by future researchers. Firstly, our work has been affected by a number of data problems that stem from a lack of consistent data on urban transport operations at a European level. There were a large number of comparability issues that the ISOTOPE database, given its limited resources, was unable to overcome. Given the large amounts of taxpayers money that urban public transport receives it would be in the public interest for a consistent set of data to be collected so that assessments of value for money could be made. Any move to comprehensive competitive tendering would require such a database to be constructed.

Secondly, we have outlined at least three forms of competitive tendering that could be applied to urban public transport. We believe that future work should make a more detailed assessment of these three forms and explore the large number of possible variants. The link between organisational and regulatory structure should be also explored in more detail.

Thirdly, in considering the trade-off between efficiency in production and consumption it is clear that the former is more readily measurable than the latter. This may have resulted in an over emphasis on cost cutting at the expense of quality improvements. Consumer surplus (expressed per passenger km) might be considered as a possible summary measure of efficiency in consumption.

Fourthly, some of our simulation work raised important issues. The Arlanda study indicate that further information is need on the extent to which public transport improvements can abstract demand from the car and the extent to which it can generate brand new trips. The Manchester study indicated the need for more detailed data on the variation of network capital and operating costs with both passenger and vehicle kms.
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