



## **Implementing Pricing Reform in Transport – Effective Use of Research on Pricing in Europe**

### Deliverable Two

#### Identifying mode-specific issues for pricing reform

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## **Implementing Pricing Reform in Transport – Effective Use of Research on Pricing in Europe**

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**Deliverable 2:** Identifying mode-specific issues for pricing reform

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## Executive summary

This report builds upon the outcomes of the second IMPRINT-EUROPE seminar, whose aim was to identify and discuss mode-specific issues for pricing reform. This seminar is the second of a series of five that will stretch over a period of three years.

The first seminar pointed out those aspects of the implementation of pricing policies that are still unclear or needing closer examination, and those areas where an effective communication between researchers, stakeholders and policy makers should be enhanced. It was found that some of these issues assume a different relevance depending on the mode considered, while others should be dealt with in a more global perspective either because they are common to all modes or/and because they have to do with interactions between modes. A dual approach was therefore adopted in the second seminar, to address both transmodal and modal issues, with parallel sessions dealing with mode specific issues and plenary sessions covering transmodal and integrated transport pricing related issues, and drawing conclusions.

The plenary *transmodal session* aimed at stimulating the debate around those issues whose importance affects the transport system as a whole. Three main topics were addressed, namely: progress in external costs calculation, the fiscal impacts of marginal cost pricing, and the marketing of pricing reforms to the wider community (users, politicians, operators, etc.).

The *urban road transport session* allowed to highlight concrete problems linked to the implementation of pricing reforms, referring in particular to the London experience, and more in general to the implementation of wider ranges of measures aimed at improving sustainability in urban areas mobility (PROGRESS project). Moreover, valuable insights were provided on the relationships between road pricing and land use planning.

A session specially dedicated to *urban freight and public transport* was allowed to underline their relevance for the planning of integrated pricing reforms in urban areas. The papers presented highlighted the main features of, respectively, urban freight and PT, the possible options for pricing schemes, and their interactions with road pricing schemes.

The session dedicated to *air transport* focussed on the two main issues of capacity allocation via the trading of runway slots and of applying marginal cost pricing to landing charges at airports.

The debate on *interurban road* pricing was dominated by the very practical issue of interoperability between tolling systems. Distance based charging schemes were also presented and discussed.

Even more than for other modes, the debate on *intermodal and maritime transport* pricing is still very open, since with respect to other modes, neither the features of the respective markets and the structure of costs, nor their implications for pricing are well known. An overview of the most recent outcomes of research and experiences in pricing in these two areas was provided.

The *rail transport session* was dedicated to discussing paths of reform from a very practical point of view: the main barriers to the implementation of charging reforms in rail transport and the possible solutions to overcome them were reviewed, and some insights on the Swedish experience with railway charges was presented and compared to a possible marginal cost pricing scheme.

The seminar was attended by 62 delegates and the fruitful exchange of experiences, research results and policy makers' views allowed, on the one hand, to review the state of the art based on achievements so far, on the other to outline the way forward, in terms of both research and implementation.

The key issues arisen during the seminar are briefly summarised below.

The *trans-modal session* shed a light on the need of enlarging the focus on impact assessment: this means considering also economic, distributional and spatial impacts, include into the analysis the issue of revenues and deficits from pricing reforms, and take into consideration relative impacts between modes. The issue of the impacts of pricing reforms in non-EU countries was raised, with a claim to have more resources devoted to research in this field.

The strong message from the plenary sessions was that there is an urgent need to reinforce two-way communication between researchers and policy makers, also through the establishment of dedicated discussion platforms. This is essential in order to calibrate and validate research, and provide answers to basic questions such as: is research sufficiently advanced? Is the available information credible, especially when based on modelling?

Despite a general agreement on the most global issues related to transport pricing reforms, a comparative analysis of research, reforms and consensus within the single modes of transport reveals a very uneven state of advancement.

An extremely active situation was described during the *urban transport* session, when it was underlined that an increasing number of cities from European Union and the accession countries are already well into the process of rationalising and increasing the sustainability of their transport systems, notably through the design and implementation of pricing policies. The experience of cities suggests that dealing with pricing reforms in urban areas requires a pragmatic approach: starting with simple pricing schemes, although far from optimal prices, and reconsider objectives and refine schemes in the long run. Local experiences seem to be hardly transferable from one city another. Nevertheless, a strong political willingness and the presence of a champion together with a broad hearing of population can represent a great push forward in many situations. In any case, an integrated approach is necessary when designing transport reform strategies in urban areas, taking into account private, commercial and public transport, with a look to land use implications, notably those stretching in the long term.

Pricing reforms in *interurban road transport* seem to have reached a stage of maturity, both in terms of methodological tools available and of consensus among researchers, stakeholders and policy makers. Some issues in this field remain critical, e.g. that of interoperability of charging systems, but much is happening, changes in the contextual environment can create new opportunities for the implementation of pricing policy and pricing measures: a “window of opportunity” is open.

Discussion on *rail transport* focused on the highly significant issue of scarcity and allocation of railway capacity, and on possible capacity rationing means (e.g. auctioning). A strong point emerged from this session is that pricing is one of the facets of a wider policy framework (packages of measures including pricing, investment and regulation) aimed at achieving a more efficient infrastructure use and maintaining quality standards in service provision. A wide consensus emerged around the need of an independent regulator for rail transport.

Beyond the vital situation of the urban, interurban road and rail transport, other modes seem to lag behind, mainly in terms of consensus around pricing issues and actual implementation: it is the case of air transport, maritime transport, intermodal freight. In all three modes there is a great need of increasing the knowledge of current market mechanisms and pricing rules: the lack of transparency is a concrete hindrance to any kind of reform.

Concerning *air transport* the issue of capacity allocation needs to be urgently addressed through further in depth discussion and research.

Similarly, efforts have to be enhanced also on the research in *maritime and intermodal transport*: in fact the knowledge currently available of the real costs of complex freight operations is not sufficient to devise pricing reforms. Wide bottom-up research projects aimed at clarifying the basic features of the market should be privileged. Complexity and institutional issues are crucial when

dealing with intermodal and maritime sectors: an institutional platform gathering operators and policy makers, to design possible pathways of institutional reform, is forcibly needed. A more fundamental question was raised, on the actual effectiveness of pricing instruments in correcting inter-modal distortions: pricing policies impacts on demand and supply might be lower than expected in these sectors, due to the cost structure of a whole logistic chain.

Some of the questions above will be tackled in the following seminars: in particular the issues connected with how measures can be packaged and what should be the pace and phasing of reforms will be dealt with in the fourth seminar, while the perspective of the accession countries and their peculiar features and needs will form the agenda of a specific seminar, the fifth of the IMPRINT-EUROPE series.

# 1 Introduction

## 1.1 *The IMPRINT-EUROPE Thematic Network*

This is the second report of the IMPRINT-EUROPE thematic network. It reports on the proceedings and outcomes of the second of a series of 5 seminars being held under the auspices of IMPRINT-EUROPE over a 3 year period.

The IMPRINT-EUROPE thematic network brings together researchers, professionals, policy-makers and operators in order to promote the implementation of transport pricing reform based on marginal cost principles. The network encompasses both urban and inter-urban transport and all of the main passenger and freight modes. The specific objectives are:

- 1) To facilitate the exchange of experience and transfer of knowledge among scientists and practitioners in the field of pricing;
- 2) To draw together the results of previous and ongoing research in the field of pricing and to make them accessible to policy-makers, practitioners, industry and other professionals in a series of seminars and deliverables designed to assist them in developing and responding to pricing policy reform;
- 3) To identify, through critical comparative work, the prerequisites for the development of an integrated approach to implementing the European Commission's proposed pricing reforms.

## 1.2 *Policy background*

Transport pricing policy development at the European level took a major step forward in 1995 with the publication of the green paper "Towards fair and efficient pricing in transport" (CEC, 1995), which recognised the importance of pricing to reflect external costs. The policy was taken further in the white paper on "Fair payment for infrastructure use" in 1998 (CEC, 1998b). The latter put a clear case for marginal cost pricing, whilst recognising that the movement towards this target would need to be phased over a number of years, and that second best measures to achieve desired levels of cost recovery would continue to be necessary.

These Green and White papers emerged from an environment of considerable turbulence in the transport field. A range of needs at member state and European level were apparent, including the need to manage transport capacity more efficiently, to finance transport infrastructure, to improve the efficiency of the transport sector by means of institutional reform, and to remove the distortions caused by different pricing principles in different member states. The framework contained in the papers represented the Commission's endeavours to provide a comprehensive pricing principle across modes and countries that would ensure that in times of change there was an underlying scientific basis for the development of pricing in the transport market.

The most recent review of Transport Policy (CEC, 2001b) reaffirms the commitment to more efficient pricing of transport in order to internalise externalities, and announces a framework directive on pricing which will set out the principles to be followed in all modes of transport. This document also sees an important link between pricing and financing, allowing funds raised from some sectors of the industry to be used for worthwhile projects in other sectors where the result is to reduce social costs. Furthermore, A number of mode-specific pricing policy developments have emerged over the period since the Green Paper, including The "Eurovignette" directive (CEC, 1996b), a series of policy statements and directives on rail infrastructure charging (CEC, 1996;

CEC, 2001), the Directive on airport charges (CEC, 1997b) and the Green Paper on seaports and maritime infrastructure (CEC, 1997a).

Despite this flurry of activity at the level of the Commission, progress on implementation of the policy has been slow. In the rail sector, where infrastructure charging is generally a new concept resulting from the separation of infrastructure from operations, a variety of approaches to charging has been taken in the different member states. On the other modes there has been relatively little progress. The result is that research has focussed increasingly on implementation issues and understanding the barriers to progress and how they may be overcome. It is in this area that this thematic network aims to make a particular contribution.

### **1.3 The Transport Pricing Research Programme**

The European Commission has sponsored a considerable amount of research into transport pricing, feeding directly into the development of policy and enriching the academic debate throughout Europe. The Commission's Fourth Framework research programme, which ran from 1996 until 2000, included:

- Projects examining the impacts of more efficient pricing such as PETS (Institute for Transport Studies, 2000), TRENEN (Proost et al, 1998) and AFFORD (Niskanen et al, 2001);
- Projects examining acceptability issues, such as PATS (Viegas et al, 2000), PRIMA (Harsman and Wijkmark, 2000) and TRANSPRICE (Vougioukas et al, 1999); and
- Projects examining issues of cost measurement, such as ExternE (Friedrich et al, 1998) and QUITTS (ISIS et al, 1998).

As part of the fourth Framework programme, the Concerted Action on Pricing Research Integration (CAPRI) was commissioned to facilitate the exchange of information and results from research projects dealing with the pricing of transport (Nash et al, 2000). As part of CAPRI, the Commission invited all member states to nominate two experts to serve on a committee of experts, which considered and debated syntheses of research findings. Experts from some other countries (Norway, Switzerland, USA, Hungary) and organisations (ECMT, UIC) were also invited to specific meetings.

The Commission's Fifth Framework research programme, which commenced in 1998, also includes a range of transport pricing projects. These comprise:

- PROGRESS - a demonstration project on urban transport pricing;
- CUPID - a thematic network on urban transport pricing, designed to assist and link with the demonstration sites which make up PROGRESS;
- DESIRE - a project examining the design of inter-urban transport pricing schemes for heavy goods vehicles;
- MC-ICAM - a wide-ranging project examining barriers to the implementation of more fair and efficient transport pricing and how implementation should be phased; and
- UNITE - a project to develop methodologies for measuring marginal costs of transport, and to link estimates of marginal cost with the assessment of total costs as set out in transport accounts
- RECORDIT – a project focusing on intermodal transport: it investigates the current market conditions, develops a methodology for the real internal and external real costs and calculates them for three door-to-door European corridors.

- SPECTRUM – this project aims at developing a sound theoretical framework for defining combinations of transport instruments (economic, regulatory, physical) to be used to design transport policy strategies.

IMPRINT-EUROPE may be viewed as fulfilling a similar role in relation to the fifth Framework to that which CAPRI had for the fourth Framework. That is to facilitate exchange of information, dissemination of research findings and to promote inter-action between policy-making, stakeholder and research communities. In addition, the IMPRINT-EUROPE thematic network has a distinct focus on implementation and is seeking to develop recommendations relating to the implementation process. Therefore, it has strong links with all of the above-mentioned projects, perhaps the strongest of these links, though, are with MC-ICAM – which has the same focus as IMPRINT-EUROPE but is a research project – and CUPID – which is another thematic network but focuses on urban transport issues. The links with these projects have been established: substantive inputs have already been received from CUPID for the preparation of the second IMPRINT seminar, while the fourth IMPRINT seminar will be organised in conjunction with the Final Conference of MC-ICAM. More generally, the findings from CUPID and MC-ICAM will feed directly into future IMPRINT-EUROPE activities.

#### **1.4 Key outcomes of the first IMPRINT-EUROPE seminar**

The first IMPRINT-EUROPE seminar “Key Requirements for Implementing Transport Pricing Reforms” aimed at pointing out those aspects of the implementation of pricing policies that are still unclear or needing closer examination, and areas where an effective communication between researchers, stakeholders and policy makers should be enhanced. Thanks to the contribution of policy makers, researchers and stakeholders, these main issues were identified, thus providing immediate input to the design of the following seminars. They are briefly presented below:

- Pricing doctrines - in other words views on the key objectives and methods of pricing policy. These vary greatly between member countries, and even between modes in one country. What determines them and do they matter?
- Institutional issues - these are becoming increasingly important given both the range of public sector institutions involved in transport pricing and the increasing involvement of the private sector. Who sets prices and determines investment, and how can they be given incentives to set efficient prices and investment plans?
- Transport integration – in many cases, this is seen as best achieved by a very simple pricing structure with the same ticket valid on all modes. This is directly counter to the finding that more efficient pricing means more differentiation.
- Use of revenues – as always, this remains controversial, but also crucial to the successful implementation of any pricing reform.
- Sequence of implementation – given that barriers exist that prevent the simultaneous movement to optimal pricing of all modes of transport, what are the best first steps to take and in what sequence should further actions follow?
- Land use issues – these are difficult to forecast and form the basis of the most serious fears that pricing reform may actually have important counter-productive side effects
- Understanding complexity and transferability – do we really need in depth studies of every mode in every location in order to implement pricing reform, or can we find ways of transferring results from one context to another?
- Interesting politicians in marginal social cost pricing – so far economists have not been very successful in convincing politicians of the potential benefits of pricing reform. Perhaps they

need to concentrate on empirical results from cost-benefit studies rather than the prescriptions of economic theory.

- Psychology of pricing – there is little research in this field, on issues such as why people seem to find pricing perfectly acceptable in some contexts but not in others, and whether this is influenced by the form and complexity of the pricing system.
- Is marginal social cost pricing approximately right? Second best pricing, to allow for all the complications of the real world, is complex, and may be manipulated by interest groups for their own ends. Is simple marginal cost pricing a good enough approximation to the optimum to be worth implementation without too much concern for issues of second best?
- Acceptability, simplicity and implementation strategy – is it best to start with something simple but acceptable, to build up support, even if it is not on any theoretically optimal implementation path?
- "Windows of opportunity" are crucial. Revolutionary pricing reforms have been implemented, and it is important to learn how to recognise what factors make for the opportunity to do this.

## **1.5 The second seminar**

As mentioned above, the first seminar identified the main open questions for researchers, stakeholders and policy makers currently on the scene. It was found that some of these issues assume a different relevance depending on the mode considered, while others should be dealt with in a more global perspective either because they are common to all modes or/and because they have to do with interactions between modes. A dual approach was therefore adopted in the second seminar, to address both transmodal and modal issues. In practice, this second seminar featured a series of parallel sessions designed to deal with the specific issues related to each mode, while the introductory and concluding sessions aimed respectively at covering trans-modal and integrated transport pricing related issues, and drawing conclusions to feed into the following seminar.

A total of 17 papers were commissioned from leading researchers and policy makers, peer-reviewed, and presented at the seminar (the full versions of these papers are appended). The EC views and perspectives were presented both at the global level (during the plenary sessions) and at a modal level, through the active participation of EC officers to most parallel sessions.

Each session featured from two to three papers; a discussant - a policy maker in most cases - was then asked to provide introductory comments on the papers and to lead the subsequent discussion.

Altogether, a considerable number of issues were thus addressed by the presenters and discussed by participants at large. The main areas touched within each session are listed hereafter.

The plenary *transmodal session* started with a review of the state of the art on external costs calculation, and then focused on two main issues common to all modes: the fiscal impact of marginal cost pricing, and how to “sell” road pricing to users.

The *urban transport session* first addressed the complex issue of integrating land use planning and road pricing, then provided updated insights on how far are European cities with transport reforms; moreover the issue of how to integrate freight transport and public transport in urban pricing schemes was discussed.

The *air transport session* was centred on the issue of slot trading and of marginal cost based tariffs (airport landing charges).

The *interurban session* dealt with the interoperability of tolling systems and presented the recent Dutch experience in road tolling design.

The *intermodal freight* and *maritime session* attempted to shed light on the complexities of cost and price formation mechanisms in intermodal and maritime transport systems, and their implications for pricing; recent experiences on environmentally differentiated charges for ships were presented and discussed.

The *rail session* focused on barriers to implementing pricing reforms and possible means of overcoming them, further providing updated insights on the Swedish experience in pricing rail infrastructure use.

## **1.6 Reading guide**

As previously mentioned, this report summarises the main contents of the second IMPRINT seminar: the papers and the outcomes of the discussion are presented according to the outline of the seminar itself, and are therefore organised in a first section dealing with *trans-modal issues* (section 2) and in 6 successive sections (sections 3 to 8) addressing respectively:

- Urban road passenger transport
- Urban road freight and public transport
- Air transport
- Interurban road transport
- Intermodal freight and maritime transport
- Rail transport

## 2 Trans-modal issues

This session aimed at stimulating the debate around those issues whose importance affects the transport system as a whole. Three main topics which were highlighted during the first seminar as requiring further attention were addressed, namely: progress in external costs calculation, the fiscal impacts of marginal cost pricing, and the marketing of pricing reforms to the wider community (users, politicians, operators, etc.). This section is organised under the headings of these three topics.

### 2.1 Recent progress in the measurement of external costs and implications for transport pricing reforms

The paper presented by Gunnar Lindberg, from the Swedish National Road Transport Research Institute (VTI), examines the main methodological and empirical achievements of recent research on external costs, cost category by cost category.

Concerning the estimation of *infrastructure costs*, maintenance costs and network expansion costs must be addressed separately. The former arise from wear-and-tear of the existing infrastructure (roads, railways, airports, ports), while the latter are geared to issues of scarcity and congestion. In many countries infrastructure management reforms have increased the quality of the available information, with data being recorded at a more disaggregated level: with micro data at hand, econometric techniques can be more readily and effectively applied to estimate the marginal cost of wear-and-tear. The cost structure for rail and road follows a parallel pattern: low standard networks are characterised by higher marginal maintenance costs while high standard networks by lower marginal maintenance costs; the thicker pavements on high standard roads and the higher quality tracks on high standard railways tend to be less subject to wear and tear, and hence require less maintenance, than do the pavements and tracks on low standard networks. Moreover marginal costs are generally below average cost. The preliminary conclusion whereby the marginal cost is highest on low standard networks implies that European road taxation legislation limiting user charges only to motorways and similar roads will lead to higher overall transportation costs in Europe. A number of national studies exist on rail track costs, suggesting that the similarities between countries are considerable but not systematic: there is a need for further research on this topic. Few published studies are available on airfield wear-and-tear and we cannot judge on the magnitude and structure of this cost component. For inland waterways and maritime transport the infrastructure maintenance cost is in general small.

According to the author, a robust methodological background exists for what concerns the estimation of *congestion* and *scarcity costs*: the most challenging issue remains that of applying the available methodologies to the design of concrete pricing schemes and policy packages. The question of *scarcity* (mainly affecting rail, airports and ports infrastructure) is currently dealt with mainly through non-market instruments. Efficiency is not the main concern when applying such instruments, and not always a necessary outcome: a more promising method to reach efficiency in allocating the infrastructure use rights is slot auctioning, that will reveal the information on the value of scarcity. This price formation mechanism will provide information on where capacity needs to be expanded and on when the revenues from slot pricing will increase the infrastructure operator revenues. This principle has already proved to work in rather complex networks, within field experiments.

The question of *congestion* is geared to that of road infrastructure capacity, and is currently approached mainly with detailed transportation models. In the same way as for scarcity costs, the

congestion cost provides information on the desirable expansion of the transportation capacity. To ensure that congestion pricing is increasing welfare, the use of revenues is crucial: however, no predetermined rule exists whereby revenues from congestion pricing should exclusively be used to expand the capacity of that same mode.

Estimating external marginal *accident costs* is a complicated affair: theory has only recently been developed, and the relevant empirical functions are difficult to identify, also considering that ethical questions are at stake. Moreover, splitting costs into their internal and external components is not straightforward. Additional studies on the risk function must be carried out in order to differentiate marginal costs both by vehicle and by road type.

A large proportion of the European Union research effort was devoted to the development and application of the impact pathway approach for *environmental costs* estimation (the ExternE model). The result is a common methodology that has been applied in almost 10 different countries and for all modes of transport. Results are robust, although not free from uncertainty. The ExternE method has proven to be a solid methodological framework in the long term (ExternE was presented in 1995).

Recent research highlighted some interesting features common to external costs estimations for all categories: first, new estimates yield lower marginal cost values than previously thought and, secondly, the costs are extremely variable between different vehicles, times of day etc. Some reasons: marginal cost analysis turns out to yield values below the average cost in many cases. As many previous studies are based on average costs, it is quite obvious that the new studies will present lower cost values. Secondly, past policies to curb transport costs have in the meantime affected the magnitude of external costs. Thirdly, in many countries more detailed datasets are available, which makes it possible to examine detailed subcategories of vehicles etc.

As the marginal cost falls below the average cost in many cases, the question of cost recovery also becomes important. First, it should be acknowledged that congestion/scarcity pricing would generate revenues that will improve the cost recovery ratio. However, in other areas cost recovery will be difficult to achieve with only marginal cost pricing. Nevertheless, the knowledge on marginal cost is vital, as all efficient deviations to ensure cost recovery take the estimate of the marginal cost as their starting point.

The progression towards a more detailed cost assessment has implications for the pricing policy, as it allows transport policy formulation to move from a macro perspective to a micro perspective. More emphasis should be given to intra-modal efficiency (that is to market efficiency within a mode) rather than to inter-modal efficiency (that is, efficiency in the whole transport system, taking into account all modes). Pricing reforms should improve the overall efficiency of the transportation system. Given the huge differences in marginal costs between, for example, different technologies of road vehicles, a pricing regime that encourages the use of better technology within a given mode is more efficient than a shift between modes through a rough average cost pricing. If a modal shift occurs within such a differentiated pricing structure, it will be from the dirtiest technology of a given mode to the cleanest technology of another mode.

## **2.2 Implementing Value Pricing for U.S. Roadways**

Edward C. Sullivan, from the California Polytechnic State University (USA), concisely summarises the major success and failure factors of road pricing schemes, drawing from the U.S. experience with the Value Pricing Pilot Program (VPPP). The paper does not describe the whole set of experiments included in the VPPP, but rather concentrates on those featuring flexible mechanisms typically associated to marginal costs pricing (such as toll variations with the time of day). It should be noted that VPPP also includes projects addressing other aspects of perceived road costs, such as

projects aimed at converting fixed costs into variable, e.g. shared urban vehicles and distance-based insurance fees.

One of the most important determinants of the success of a pricing scheme is the parallel implementation of an effective marketing of how the scheme will work and of which benefits can be drawn from its implementation. This improved awareness on procedures and benefits will greatly help people to perceive the pricing scheme as a choice and not as an inexplicable imposition by the authorities, thus increasing acceptance and consensus around value pricing experiences. Together with effective market instruments, the presence of strong institutional figures favouring the scheme implementation is a major success factor. In particular:

1. Marketing techniques and the quality of public relations are essential, requiring wide-ranging communication campaigns, e.g. through media, press and slick advertising materials. All efforts must be made to induce a more positive attitude towards tolls (as achieved by VPPP through the introduction of the 'value pricing' concept, in replacement of the usual 'congestion pricing' wording).
2. Project advertising and public relations should emphasise the benefits to be gained by travellers, primarily time savings, improved reliability, the opportunity to pay less, and in some cases highlighting that pricing creates superior travel options not previously available.
3. Benefits should be explained to the public in simple, tangible terms, and evidence of their existence must be made clear after implementation.
4. Within VPPP, traveller participation in variable pricing schemes has generally been optional: users were given the choice to ignore the "new" pricing methods.
5. Although critics were given opportunities to be heard, proponents had the perseverance and authority to pursue their goals to fruition. Some projects were thus made possible thanks to the presence of strong leadership and authoritative institutions willing and able to make potentially controversial decisions (this was particularly evident in the I-15 HOT Lanes in San Diego and in the Lee County Toll Bridges in Florida).
6. Many projects within VPPP greatly benefited from the availability of federal pilot program funding that constituted an incentive to local authorities to overcome difficulties.

Learning from experiences of unsuccessful attempts of implementing long lasting marginal cost based pricing schemes, it appears that several factors contributed to such negative outcome:

1. The presence of influential project adversaries, typically arguing that MC-based pricing hurts poor people and benefits the rich.
2. The perception that the new pricing proposals are introduced by public authorities to extract more money (taxes) for facilities already paid for, while additional revenues are not needed.
3. The concern that the promised benefits are not likely to actually occur or, if they do, would not be of sufficient magnitude to warrant the action taken.
4. Concern over uncertain technological practicality of implementing the proposed pricing systems (for instance, a greater diffusion of HOT lanes is limited by the inability to enforce vehicle-occupancy dependent and distance-based electronic toll collection without extensive deployment of enforcement personnel equipped with transponder targeting technology).

Based on these experiences, the author draws an ideal set of measures aimed at further expanding MC-based road pricing implementation in the U.S.

1. Placing emphasis on how new road pricing methods can enrich the array of available travel options, by creating multiple standards of service for different market segments, and through funding new service options or new infrastructure with the toll revenues thus generated. Two outstanding examples of market segmentation are the SR 91, I-15 and the Houston projects that encompassed complex menus of options for users. Higher levels of market segmentation could be envisaged, also to respond to social policy needs (toll discounts, subsidies, reserved road space, etc.)
2. Taking actions to reassure local communities that new road pricing methods do not create windfalls for budgets of public agencies. In the U.S., this may require reducing some taxes to achieve a zero-sum tax result. This may take the form of transportation tax rebates for persons willing to reduce their roadway use, especially in congested periods.
3. A national effort aimed at developing data and public information to address the perception that MC-based pricing is regressive in providing greater benefits to wealthy compared to low income people.
4. Efforts to expand use of HOT lanes, introducing pricing permits for the utilisation of excess capacity of existing or proposed High Occupancy Vehicle (HOV) facilities, including HOV lanes along freeways, HOV bypass of freeway ramp meters, and exclusive HOV/bus lanes on urban streets.
5. Efforts to attract private capital to transportation projects including HOT lanes and new toll facilities. MC-based pricing of new capacity should help generate sufficient revenue to attract private capital, even though revenue might be insufficient to fully fund a given project. Public-private joint ventures can yield an ideal balance, where each partner brings its particular strengths to create a successful project.

### **2.3 The fiscal impact of marginal cost pricing: the spectre of deficits or an embarrassment of riches?**

This paper was presented by Rana Roy and draws on recent and on-going research on the fiscal impact of marginal cost pricing to show that the full application of marginal cost pricing across all modes of inland transport is likely to lead to a very large net surplus of revenues over infrastructure costs. In particular, this paper builds upon the UIC/CER study, *Infrastructure Cost Recovery under Allocatively Efficient Pricing* (Roy 1998), the UIC/CER/EC study *Revenues from Efficient Pricing* (Roy, 2000) and the current ECMT-EC, scheduled for delivery to Ministers in early 2003, which extends and updates the Revenues study as well as testing the results against a range of assumptions, especially in regard to infrastructure capacity

The author maintains that theoretically, a net deficit cannot be excluded. Marginal cost pricing will generate deficits where average costs are greater than marginal costs, as a result of the high fixed cost of infrastructure provision being attended by the low marginal cost of its use – the pre-eminent example being rail. And it will generate surpluses where average costs are less than marginal costs, as a result of the relatively low fixed cost of infrastructure provision being attended by the high marginal cost of its use – the pre-eminent example being congested urban roads. The net outcome will depend on the relative weight of these cases in the given circumstance.

Empirically, in contemporary Europe, the surpluses resulting from the correction of urban road congestion far outweigh any deficits resulting from the application of marginal cost pricing elsewhere in the system. Congestion pricing is a market-clearing rent for scarce space: where space is scarce, the rent will need to be high if it is to clear the market.

In the long run, new investment to expand capacity will reduce revenues from congestion at the same time as raising the cost of infrastructure provision: hence, the net surplus will fall. But whereas cost-benefit analysis might well justify expansion of capacity in many a setting, it would not mandate a massive road-building programme in and through our cities: hence, the conclusion holds.

Assuming infrastructure capacity as given, modelling results for the three largest EU member-states indicate that, after stripping out VAT revenues, tax revenues under marginal cost pricing would stand at or above 150% of the costs of infrastructure provision in all modes of inland transport. This translates into a surplus of around €20 billion per annum for the UK – well above the margin we should allow for to take account of the effects of new investment. Relative to the base case, tax revenues inclusive of VAT would increase by around 50% – which, co-incidentally, also translates into an increase of around €20 billion per annum for the UK.

According to Rana Roy, the danger is indeed that this abundance of surplus may embarrass decision-makers into proposing far more limited and partial schemes for pricing reform. Proposals for fiscally neutral reforms understate by orders of magnitude the extent of price correction required. They would fail to deliver de-congestion on the roads and they would suppress the generation of additional funds for new investment. Rather than shy away from the embarrassment of riches that marginal cost pricing promises, the challenge is to develop the decision rules required to use these riches wisely.

## **2.4 The discussion**

The discussant and the attendants agreed that a number of critical issues concerning the implementation of transport pricing reforms, ranging from more methodological to more practical and technical questions are still open. These issues directly address both researchers and policy makers: the research community, since additional efforts are needed to firmly establish a sound and coherent methodological framework, by shedding further light on a variety of methodological issues still unresolved, and the world of policy makers and of real life implementation, since more empirical data are necessary for assessing impacts and fine tuning policy implementation.

These issues are presented in turn hereafter:

- Is enough data available on impacts, values and responses?
- What will be the size of the surpluses and deficits caused by the pricing reform?
- Are we sufficiently advanced with the study of costs of provision (supply functions)?
- The issue of capacity constraints and scarcity rents: is it an issue applicable to rail as well as road?
- Optimisation of prices should proceed jointly with the optimisation of capacity for all modes.
- The case for restricted application of transport pricing - to specific lanes, roads and modes – has to be studied more in-depth in its features and consequences.

It was underlined that, irrespective of the mode of transport, the implementation of whatever pricing policy has to be preceded by a comprehensive analysis of the impacts, from an economic, distributional, spatial and technical perspective. The assessment of impacts must be widened as to include the issue of surpluses and deficits deriving from pricing reforms: this is a crucial argument, since their magnitude and the approach adopted to handle them is likely to affect the acceptability of reform policies.

The balance between *economic efficiency gains or losses* must be measured considering all variables affected by the price variation: among them, the effects on demand and on the value of user and external benefits, changes in user and supplier costs, the effects on services and infrastructure providers, and finally incentives to investments. Moreover, relative impacts between modes must be assessed, taking into account relative prices and relative elasticities.

*Distributional impacts* are very often neglected, whereas they raise a number of highly sensitive issues: for instance the motorist's right to roads free at point of use that is transferred to the charging authority through pricing, and the recognition of communal rights to environmental benefits. Winners and losers from price reforms, including public transport prices reform, must be identified, both on a geographical basis (advantaged/disadvantaged areas) and on an income basis. The reform of infrastructure use prices has to be devised in relation to the whole system of transport taxes and subsidies that should adjust in consequence. This will allow avoiding overcharging not justified by diverging uses of infrastructure.

The *spatial impacts* of pricing reform implementation must be carefully considered: the initial transport patterns are likely to be modified in the short term in terms of trip length, time of day and origin-destination choice, while more long term effects are expected on land use (reduction of attractiveness of areas with high levels of activity, revaluation of peripheral and regeneration areas). Spatial side effects of phased implementation should also be considered, such as traffic diversion of traffic to less suitable routes due to a partial application of the new system.

Beside these aspects, there is a need for increased knowledge of the effects of transport pricing on suppliers (provision costs), while the knowledge of impacts on demand is well advanced.

To recap, it may be concluded that:

- Whatever the mode concerned, a correct analysis of possible impacts from pricing reform must be as comprehensive as possible, explicitly including economic impacts, distributional impacts and spatial impacts (both short and long term). The same can be said for what concern the final assessment of efficiency gains or losses that should include all variables affected by the price variation.
- Increasing the number of practical experiences is crucial to validate research outputs.
- Optimisation of prices should proceed jointly with the optimisation of capacity for all modes
- Magnitude of surpluses and deficits from pricing reforms and the approach adopted to handle them is likely to affect the acceptability of reform policies.

### **3 Urban road passenger transport**

During the urban road session valuable insights were provided on the relationships between road pricing and land use planning. Moreover, this session allowed to highlight concrete problems linked to the implementation of pricing reforms, referring in particular to the London experience, and more in general to the implementation of wider ranges of measures aimed at improving sustainability in urban areas mobility (PROGRESS project). This section is organised under the heading of the three papers presented.

#### **3.1 *The Integration of Road Pricing with Land Use Planning***

In this paper, David Banister (Bartlett School of Planning, University College London) explores the role that road pricing might have in contributing to achieve the EU objectives in the area of sustainable mobility, especially in relation to its impacts on land use and urban shape developments, focusing primarily on urban passenger transport.

The direction and intensity of the effects of the introduction of a cordon pricing scheme such as the London one are not totally clear based on the current state of knowledge: valuable research exists on issues like equity, acceptability, boundary effects and environmental benefits, while a lack of both theoretical and practical developments makes it far more difficult to assess the effects of road pricing on land use, both in the short and in the long term. An issue of equity concerning road pricing arises if we move from estimating average welfare gains to analysing the distribution of these gains, as the net effect on different income groups will greatly depend on their demand elasticity. Concerning acceptability, a pre-requisite for pricing schemes acceptability is certainly that revenues are reinvested in the transport system. Additional barriers to acceptance are geared to the peculiar relation of dependency that most vehicle owners establish with their car, and more generally to the car-ownership oriented lifestyle characterising most of contemporary Europe. Those factors result in a natural resistance to decreasing the number of trips even in presence of road pricing.

The introduction of a cordon pricing scheme is likely to induce a shift on the distribution of pressure from charged to uncharged areas (boundary effects) under a number of forms: relocation of economic activities, fall of land values and rent levels in charged areas and other structural changes that might reduce the necessity of road pricing. A heavy demand for parking around the cordon is also a probable outcome and will lead to the need of implementing accompanying measures such as park and ride or park and taxi schemes. The entity of net environmental benefits is still unclear as the reduction in car use has to be balanced with the increased speed of vehicles inside the cordon and the alternative use to which “non used” cars will be shifted. In the preliminary study for the London implementation, it was concluded that there was no significant effect on air quality.

Summing up, the rationale for introducing a cordon pricing scheme is not completely clear, according to Banister. It has moved away from the pure form of road pricing that charges the road user the full social costs imposed to a means to reduce congestion in the city centre. It is also seen as a means to raise revenue for investment in public transport, and as a means to reduce the environmental costs of transport. It is now also seen as a critical element in providing sustainable transport for sustainable cities. There must be limitations to the potential role for road pricing in all its forms, and these limits should be clearly stated.

Concerning the impacts of road pricing on land use, the current state of empirical data availability only allows to present a statement of research methodology. The London pricing scheme implementation will be a very helpful field test in this sense. Short term impacts on land use are

likely to be variable, both in terms of location and intensity. For business within the cordon area the most likely reaction is a more efficient route planning, while relocation is a less likely option. The net effect might be a reduction in transport intensive activities within the cordon. Workers will loose from the higher price and from the use of public transport, more crowded and expensive, but those willing to pay might benefit by the decrease in congestion. On the other hand, current public transport users may perceive a loss of service quality as public transport becomes more crowded, but quality and reliability should improve as delays are reduced and as additional investment takes place. For other travellers (e.g. shoppers and theatre visitors), there will be little change as most of them already use public transport or enter the priced area after the cordon charging scheme ends or at the weekend. For suppliers, their transport costs will rise, but these increases can be passed on to the customer or even recouped through better reliability and time savings. They may also reschedule and reroute services to reduce the number of vehicles crossing the cordon. The longer term impact of road pricing on land use is expected to be small (perhaps insignificant) within the overall dynamics of city development. The evaluation of such impacts is highly uncertain, with significant variations across business, space and time, and possibly opposed triggering effects on centralisation or decentralisation. Elements of the transport, geographic and economic arguments all need to be placed in the context of the city dynamic, and the crucial role that proximity has in determining location. This is due to a variety of reasons: first of all, transport costs as a proportion of total production costs in many industries are relatively small, and other factors such as the availability of skilled labour, suitable sites, government grants, and the quality of the environment may all be more important than transport. Decreases in transport costs may not be reflected in cheaper prices to consumers. On the other hand, within a service based economy, there are many possible adaptations that can be introduced to adjust for increases in travel costs, through e.g. rescheduling or increasing the numbers of transactions carried out remotely.

Analysing the phenomenon of geographic concentration, which results from the interaction between increasing returns, transport costs and demand, one is led to consider that “it may pay to concentrate (production) at the location with higher costs but better access”. This suggests that increasing transport costs may help concentration (in Central London), provided that accessibility overall is increased. This means that the benefits from the time savings (including reliability) must be greater than the additional costs imposed (through congestion charging).

The benefits from a change in transport costs are a combination of the consumer surplus and land rent, but it is often only the changes in rent levels that can actually be measured. With congestion charging in London, there may be a shift in demand for commercial property as businesses with their own premises may relocate to release increased capital value. But here the changes in transport costs have to be balanced against other changes in the national (and local) economy, the business itself and technology. It is only through careful monitoring of the property market (both commercial and residential) that the effects of increased (or decreased) capitalisation and value can be assessed.

The more general issue here is whether congestion charging will impact on urban development through encouraging infill, higher densities, mixed uses and compact development patterns. Urban economic theory implies that there would be an increase in density around the main attractors as prices increase, but this in turn might lead to more congestion and encourage development elsewhere so that the spatial structure becomes less concentrated. This is the process of dynamic adjustment at work. It should also be noted that land use changes far more rapidly than the physical urban built form, through changes of use, subdivision of property, and the reuse of redundant buildings.

In the end, it is when all these elements operate in combination that more interesting outcomes may occur, particularly in the longer term. But equally, these effects are harder to conceptualise over the longer term, when the patterns of land use can change.

### **3.2 A state of the art of the Progress project – The Rome experience**

The paper presented by Maurizio Tomassini (STA, Rome) describes the features and preliminary results of a road pricing scheme implementation in the city of Rome, and provides some insights on the modelling approach behind this experience.

The City Council traffic policy follows the guidelines of the Europe Council Program “For a durable and sustainable urban development”, and is therefore aimed at achieving two main objectives:

- ⇒ Improve mobility conditions while increasing circulation safety, decreasing air and noise pollution, and safeguarding citizens health;
- ⇒ Retrain urban spaces, by rationalising public space use and preserving historical and architectural heritage.

These goals are acknowledged and embedded in the strategy adopted by the City Administration, and illustrated in the Mobility Integrated Program (*PROIMO – Programma Integrato della Mobilità*), a long term instrument whose ambition is of balancing modal split through the adoption of specific measures to decrease private car use and shift a significant proportion of mobility demand to public transport, both by reinforcing PT supply and by promoting alternative means of transport.

The ambitious long term program includes a set of measures ranging from the extension and improvement of the existing public transport network (metro, tram, rail), to the implementation of a radial road system served by intermodal nodes at the periphery in order to foster the shift from private to public transport at the centre, to the establishment and enforcement of public transport priority on radial axes. This will be accompanied by the redesign and development of the road network, and by a set of complementary restrictive measures on traffic regulation and management, namely the differentiation of parking fares, and an access control system to the historic centre to be implemented together with road pricing policies.

A policy of restricted access and parking fees has been in place in the city of Rome since the beginning of the last decade, enforced thanks to the physical presence of police officers. The enforcement of an automatic access control system is very recent, due to the former lack of a proper regulatory framework (national authorities have shown extreme caution with this experiment – the first in Italy - and the authorisation process proved very long); specific legislation (law 193/99) was finally issued, laying down the legal basis to authorise the assessment of access violations in the absence of police officers and by means of an automatic control system.

Starting from October 2001, an access control to LTZ (Limited Traffic Zone), with a flat rate Road Pricing scheme, and enforced through the automatic control system across 22 entrance gates, is in place in the area east of the river Tiber (4.6 km<sup>2</sup>), while the access control in the western sector of the city centre is still operated on site by the municipal police. The technical equipment (identified as the IRIDE system), results from the integration of an access control system (SIRIO by Elettronica Santermo S.p.A.), which takes care of the identification of car plates, and a transponder (vehicle to ground) system (TVU, Autostrade SpA), based on the automatic toll collection system previously applied to motorway users (TELEPASS).

Though a full performance assessment of the scheme is premature, some preliminary remarks can be made when observing the immediate reactions of users. An average daily decrease in traffic of 10% was recorded, accounting for a traffic reduction as high as 20% during the hours the system is actually operational: this takes the form of a significant reduction of traffic during the morning peak while the evening peak traffic has remained unchanged. These lower volumes of traffic flows mainly correspond to the reduction of illegal traffic entering the LTZ, which fell from 36% to 18% within the two months following the activation of the gates.

The implementation of the road pricing scheme has also generated a large amount of data on traffic flows, that were then used to feed a traffic assignment model (produced *ad hoc* by STA). Complementary information to feed the model was gathered through extensive survey activities such as interviews with different categories of users (for the demand model calibration) and on-field measurements and counts (for the supply model calibration and for the verification of the simulation results). Simulations were used to assess different possible evolution scenarios of the current system: a pricing scheme based on per-trip fares has thus been identified as the most sensible option to be implemented as the next step within the PRoGRESS project. In fact, also according to the simulation results, maintaining the current pricing levels together with the current access restrictions is likely to bear no significant effect on the overall modal split *thus producing very limited benefits for the mobility system*. On the other hand, the level of fares to be applied in a pure road pricing scenario (whereby the access to the LTZ would be fully liberalised) in order to maintain the overall traffic at the present levels, *would be too high to be socially and politically accepted*. Ultimately, a balanced scheme has been tentatively identified, combining low fare, restricted traffic during the day, and higher fares, liberalised access in the period 18.00-22.00 (applicable to week days and specific holiday periods).

In the long-term, the Rome pricing scheme encompasses the widening of the time window for access restriction, the application of time-based pricing, and the extension to additional users categories of the access permits into the LTZ. A further innovation is the adoption of ceilings (number of trips or/and total circulation time), differentiated by user category, to be applied to all traffic within LTZ. Such a scheme is still under discussion and could bear major effects for specific categories such as, in particular, freight movers and distributors.

### **3.3 The Central London Congestion Charging Scheme - from conception to implementation**

This paper presented by Michèle Dix (Transport for London, UK) outlines the history of congestion charging policy in London, from its conception as a possible demand management tool in the 1964 (the Smeed report), through to the central London congestion charging scheme currently on the verge of implementation (following a public consultation at the end of 2001, and the final decision of the Mayor of London in February 2002) to A number of research programmes have been commissioned in the UK to investigate the issues surrounding congestion charging over the years. However, no implementation took place so far owing to a variety of reasons (expected enforcement difficulties, pressure from the road lobby, fear of the adverse impacts that may be caused by congestion charging).

The London experience was marked by four major factors that ultimately allowed proceeding with the implementation of the pricing scheme, namely:

- i. The commissioning of the Road Charging Options for London (ROCOL) report;
- ii. The passing of the 1999 GLA Act (amended by the Transport Act 2000);
- iii. The successful election of a Mayor who made a manifesto commitment to introduce a congestion charging scheme in central London;
- iv. Setting up a project team dedicated to implementing the Mayor's election promise.

The ROCOL report identified all of the possible scheme options including geographical coverage, technology and timescale of each option. It concluded that an area licensing system, enforced by Automatic Number Plate Recognition (ANPR) technology with a £5 daily charge, could have a significant impact on traffic conditions in central London, reducing traffic by around 12%.

Improvements would be seen in terms of journey speed, reliability and economic benefits of reducing congestion would help businesses.

The Greater London Authority Act was passed by parliament in 1999. This Act signalled a real political will to introduce congestion charging. As well as giving London a unique local government structure consisting of an elected Mayor and Assembly, the Act (amended by the Transport Act 2000) also gave the Mayor the powers to introduce congestion charging schemes in Greater London.

In May 2000, Ken Livingstone won the race for Mayor of London on the basis of a manifesto which included a promise to introduce a congestion charging scheme in central London. The strong political backing and high profile of the proposed congestion charging scheme have ensured the set up of a dedicated congestion charging team committed to fulfilling the Mayor's election promise.

From July 2000, the congestion charging team at Transport for London (TfL) Street Management developed the scheme design and laid the foundations to procure the necessary technology and services to introduce it. Following a public consultation process which lasted 18 months in total, the Mayor decided to confirm the Scheme Order (the document providing the legal basis for the scheme) and go ahead with congestion charging for central London.

The proposed charging scheme will cover 21 square km at the very heart of central London (area bounded by the Inner Ring Road); the standard fee will be £5 per vehicle per day (weekly or monthly tickets are also available), though some categories of vehicles are eligible for a 100% discount. Drivers using a vehicle in the central zone will pay the charge in advance or on the day of travel, will thus be assigned a registration number that will be entered into a database, to be maintained by TfL. Drivers can pay the charge and notify their vehicle registration numbers at retail outlets, by post or phone or over the internet. No permits or equipment has to be displayed in the vehicle. The scheme will be enforced using Automatic Number Plate Recognition (ANPR) technology.

A range of complementary measures was also designed to accompany the implementation of the congestion charging scheme, namely: improvements to the bus and rail service, improvements to the underground, traffic management measures. These measures aim at making alternatives to car travel easier, cheaper, faster and more reliable.

The money raised from congestion charging must, by law, be spent on improving London's transport system providing further benefits to Londoners and visitors to the city. Congestion charging will generate additional net revenues conservatively estimated at about £130m annually. This will enable substantial investment including: further bus network improvements to offer a real alternative to the car; safety and security schemes to improve personal safety and reduce transport-related crime and fear of crime; accelerating road and bridge maintenance programmes to benefit motorists.

An extensive program of impact monitoring will be put in place, covering operational and transport impacts together with other impacts such as those on households, different social groups, businesses, schools, public services, tourism, leisure and the environment.

Congestion charging is expected to reduce traffic in central London by up to 15% - to levels experienced during the summer holidays - and time spent in queues will be reduced by 20%-30%. Outside the zone, there may be some increases (up to 5%) in traffic on orbital routes but traffic will decrease (by 5-10%) on radial routes into the centre of the capital.

In summary, the main lessons learnt from the London experience seem to be that the following factors are important:

- ⇒ It is time to dare translating the theory into practice

- ⇒ Presenting congestion charging as part of an overall strategy
- ⇒ Informing the public on how the scheme will work
- ⇒ Improving public transport
- ⇒ Implementing traffic management measures

The Mayor and TfL have made a great deal of progress towards achieving their goal of implementing the central London congestion charging scheme by early 2003. The scheme design is based upon robust research which has carefully analysed the advantages and disadvantages of the different implementation options. Political backing and the legislation to introduce the scheme has been secured. Now the Scheme Order is confirmed, the congestion charging project team are putting the theory of congestion charging into practice.

### **3.4 The discussion**

The discussion that took place within this session greatly benefited from the presence of representatives of cities already on the way of implementing transport pricing reforms, that is London, Rome and Oslo. A broad consensus was reached among attendants on the main lessons to be learned from these on-going experiences, that can possibly serve as valuable suggestions to other cities willing to start with similar reforms.

From a methodological point of view, one of the key issues for debate among researchers and policy makers was the concrete applicability of the marginal cost pricing principle in urban areas, at least in the short run: constraints are heavy, both because the complexity of urban transport systems makes cost computation difficult, and because local policy makers strongly feel the weight of concerns such as raising revenues, coping with elections, defend standards in quality of service for public transport, etc.

In this respect, the attendants seemed to agree that dealing with pricing reforms in urban areas requires a pragmatic approach: dogmatism should be avoided as far as possible, and starting with simple pricing schemes, although far from optimal prices, seems to be the only viable solution. Objectives can then be reconsidered, and schemes refined in the long run.

The attempt to identify critical success factors from the developments presented at the seminar convinced the attendants that local experiences are hardly transferable from one city another: at a first glance, each case seems to be unique. Nevertheless, a strong political willingness and the presence of a champion together with a broad hearing of population can represent a great push forward in many situations, despite differences among cities.

As far as possible, policy definition and technological development have to run in parallel. The mutual influence that transport planning and land use planning have especially in urban areas should not be underestimated. It is a complex relationship, whose impacts span from the short to the long period. We do not currently have an exact knowledge of long term impacts, only intuition about concentration or dispersion effects is available.

Several remarks or questions turned around the particular treatment reserved to residents and taxis within pricing schemes: is this distinction really justified, and consistent with the different kinds of objectives being pursued (acceptability, search of equity, simplicity for efficiency)? This question remained open.

Summing up, a broad consensus was reached in the following areas:

- From a methodological point of view the concrete applicability of the marginal cost pricing principle in urban areas, at least in the short run, is still a challenge.

- A pragmatic approach is needed, allowing flexibility in the translation of theory into practice: starting with simple pricing schemes, although far from optimal prices, seems to be the only viable solution. Fine-tuning of objectives and schemes can come in the long run.
- Overcoming the problem of political acceptability might be easier when a strong political willingness exists, or where there is the presence of a champion.
- Further research is needed on the issue of long term implications of pricing policies, especially in relation with land use planning; to this purpose, a close monitoring of implemented schemes is necessary.

## **4 Urban road freight transport and public transport**

This session was meant to underline the often underestimated issues of urban freight transport and public transport pricing, and their relevance for the planning of integrated pricing reforms in urban areas. Both papers highlight the main features of, respectively, urban freight and PT, the possible options for pricing schemes, and their interactions with road pricing schemes. This section is organised under the heading of the two papers.

### **4.1 Integration of Freight in Urban Pricing Schemes**

The author, Dieter Wild from PTV AG, underlines at the outset the fundamental role that freight transport plays in the overall activity of a city: urban freight deliveries cannot be substituted – goods have to be moved to their final destination – and can hardly be reduced through optimisations in the relevant parts of the logistic chains. Furthermore, shifting urban goods transports to other non-road modes, as e.g. via tubes or rail-based approaches would require major investments and could only achieve limited results. As a result, the design and implementation of pricing schemes in urban areas need to take account of the characteristics of the urban freight delivery sector and of the reactions of the involved users and operators. The rationale for introducing (or modifying) a pricing system is manifold: financing infrastructure use and/or provision, charging external costs, reducing negative transport impacts, reducing congestion through influencing demand. The paper analyses the relevance of each item for urban freight transport stakeholders.

Freight transport stakeholders are generally ready to understand and accept the recourse to urban pricing schemes for infrastructure financing, provided revenues are not directed towards investments in infrastructure that is not relevant for – or, even worse, forbidden to - freight transport operators. Improved road surfaces, new urban ITS installations or a new link reducing travel times are appreciated especially by commercially active stakeholders, on the grounds that such measures induce a reduction in equipment or/and operation costs, and may contribute to improve the working conditions of drivers. Consistently, acceptance levels are much lower when authorities cannot make a transparent case of how the additional income is or will be spent: commercial players are continuously striving to optimise their business and are thereby extremely attentive to cost drivers and cost relationships.

The justification through external costs charging is on the other hand less accepted, mainly because the link between individual transport movements and the external costs that subsequently arise is not clearly perceived within the freight transport community, and the tariff is likely to be seen as an additional tax; moreover, while there is an immediate benefit deriving from infrastructure oriented charging (e.g. the provision of a new link), external costs charging is not perceived as bearing any immediate positive effect for freight transport users and actors.

The argument of reducing negative transport impacts is in general better accepted, provided that all transport modes (cars, public transport etc.) are addressed, but the acceptance or non-acceptance must be examined on a case by case basis, as it largely depends e.g. on the way the pricing scheme is introduced, the planning horizon (and the time allowed to adjust), the price sensitivity and possible related incentives.

In general, it can be said that in contrast with the traditional instruments of freight traffic control in urban areas, such as e.g. access limitations related to vehicle size, which only allow a binary reaction (allowed-forbidden), pricing allows for a more flexible approach to influencing local transport fleets and the gradual shift towards innovative technologies.

Freight transport must be seen more as a victim than as a source of congestion. Congestion affects the collection and distribution of goods in urban areas by making the transport planning process less reliable, by decreasing the number of operations per day and per vehicle, and by increasing average travel times (ultimately leading to more km driven per consignment). The costs and quality of the freight delivery services are negatively affected, with less reliable ETA (estimated time of arrival) for consignees/consignors, increases in the unproductive time of vehicles and drivers (leading to additional costs), and therefore additional capacity requirements (in vehicles and drivers time) as compared to the free flow.

Moreover, no real substitution options are available for freight transport, whether in mode or in volume. Demand is hardly elastic and therefore any demand based pricing scheme for freight transport is either useless or leads to unwanted effects (on these grounds, urban freight transport differs from interurban, since intermodal transport alternatives exist, allowing to shift traffic to non-road modes, to reduce avoidable long-distance trips and to change logistics concepts on the basis of a fairer and more efficient pricing).

The BESTUFS project makes a point of repeatedly stressing that insufficient attention is paid to the important role of urban freight transport, both from city administrations and from citizens. Indeed it is extremely important that local authorities gain additional and better knowledge of the freight collection and delivery processes and of their interactions with the vitality of cities. The relevance for citizens is also straightforward: especially in urban areas, private citizens are in fact the end users of the transport chain (shippers and/or consignees), ultimately paying for the transport costs.. Charging urban freight transport without any compensation inevitably leads to higher goods (transport) prices to be paid by the citizens. This has several negative side effects: small retailers in city centres experience a further loss of competitiveness compared to large retail outlets in the vicinity of the cities; urban sprawl is favoured, while shopping visitors from outside the city find it less attractive and turn to other shopping areas, resulting in an overall decrease in city competitiveness; the operational effects on freight transport business should also be carefully analysed, since the implementation of a pricing scheme is likely to impose additional constraints, such as e.g. the additional cost for the access equipment, the access procedures and the accounting processes; the acceleration of transport equipment renewal cycles; also, restrictions on vehicle types or operation entail changes in the transport planning optima and can increase environmental impacts; new and probably more complex private freight transport pricing schemes are needed.

In conclusion, Wilde argues that the introduction of fair and efficient transport pricing schemes in the urban freight sector can only be successful if basic prerequisites are met, namely:

- ⇒ A clear justification of the objectives
- ⇒ The harmonisation of freight transport taxation and pricing in Europe
- ⇒ The full transparency of both income sources and revenue use

## **4.2 Urban public transport pricing schemes - The context and options**

Decisions on fares can seek to achieve a wide range of objectives, including profit maximisation, relatively simple maximising of use of public transport, broad social and economic objectives and to a limited extent attempts to maximise overall benefits. According to Richard Smith, this rather complicated web of objectives might induce in policy makers a resistance to change and to possibly create 'losers'.

Marginal social cost pricing is not an evident issue in decision-making concerning public transport fares, and indeed any cost consideration is often absent (perhaps partly because the network is often seen as fixed). This might be due to the fact that the wide range of objectives a public transport

service has to pursue includes many factors that are not currently tackled within the quantification of marginal social costs. These include social, equity, and land use considerations, that are often key priorities of the politicians involved in setting fares.

In setting fares, decision makers have extensive knowledge of the likely impact on public transport use, but have much less understanding of the external impacts and in particular a disaggregated knowledge of these effects. Decisions tend to be dominated by budget constraints, concern over equity and short term political priorities. A multitude of options exists for fare structures, but few of these options entail a significantly differentiated structure reflecting, though partially, marginal social costs: a remarkable exception is the fact that often peak and central area travels attract higher fares and these are perhaps the markets with highest marginal social costs.

However fares decisions are more dominated by marketing and communication issues and the desire for an operationally simple structure (both for marketing reasons and because highly differentiated fare structures can have significant operational costs due to increased transaction times and increased fraud). The resulting fare structures inevitably mask differences between cost structures. New technology should be helpful in reducing the marketing barriers to more differentiated fares, through for instance *smartcard* systems that in principle offer the opportunity to match fares much more closely to marginal social costs; in practice, however, the public transport pricing policy is currently going towards targeting specific markets rather than balancing fares to marginal costs, and towards creating more integrated products.

In a pricing context the priority of public transport authorities would be the introduction of road user charging fully reflecting costs of road use. Until this is done, refining the charging structure of public transport can be seen as a second-order concern. In fact the split public-private transport will adjust following a change in public transport fares structure, and the passenger shift from one mode another will only approximate the one that could derive from an optimal pricing strategy involving both private and public transport. However, it can be argued that maximising public transport use may be an adequate proxy.

Smith concludes that further research is necessary to help clarifying the methodological framework and the policy implications of social marginal cost pricing of urban public transport, in particular for the following aspects:

- There needs to be an analytical framework incorporating the wider factors that are critically important to the urban public transport decision maker: in fact there are various key impacts that are not, and perhaps cannot be captured by standard economic theory, such as social, equity and land-use considerations;
- Predictive, modelling tools are needed that enable each city to see in practice the impact of pricing on the basis of marginal social cost – while global estimates have been presented, each city needs to know at least the direction and broad scale of changes that would result;
- There is a need to understand the implications of second-best solutions and identifying the optimum within constrained conditions: in the case of urban public transport, it means what is the right fare policy in the absence of road user charges that fully reflect marginal social costs. Equally important, however, is understanding the impact on benefits of public transport pricing that might perhaps only on average reflect marginal social costs;
- Greater clarity is needed on the pace and priority for change. Partial implementation or a particular phasing of marginal social cost pricing may actually worsen the position – for example charging for the full cost of peak rail provision without equivalent charging on the road network.

There is a clear understanding that marginal social cost pricing for road use must be closely related to distance and specific traffic (and perhaps road) conditions to be fully effective, and simple

averages will not be sufficient. This may be less true for public transport. That is, it may not be necessary, in order to achieve an outcome relatively close to the optimum, to base public transport fares on the marginal social costs that are exactly appropriate to different situations. Some averaging of marginal social cost, for the purposes of setting simple fares, may be acceptable. If overall fares levels approximate to overall marginal social costs of provision then many of the benefits associated with a more 'pure' marginal social cost pricing scheme may be realised. Alternatively if this is not the case then differentiating pricing for fairly broad categories such as peak (direction?) or city centre travel – with high marginal social costs – and off-peak and suburban – with low marginal social costs – might be adequate. Understanding the impact of different levels of aggregation is essential in identifying practical options for increasing the role of marginal social cost pricing in public transport

simple That is, it may not be necessary, in order to get close to the optimum, to base public transport fares on the marginal social costs that are exactly appropriate to different situations. Some averaging of marginal social cost, for the purposes of setting simple fares, may capture most of the benefits of a more 'pure' marginal social cost approach. This would involve Even more fundamentally there is a need for an integrated approach to road user charging: policy decisions about fuel tax, parking and direct road user charges cannot be separated from public transport decisions. There will also need to be greater integration of funding decisions and greater flexibility to tackle the potentially large changes in financial results and to deal with the impact on private sector providers. In any case, without popular support and clear evidence of significant benefits decision makers are unlikely to change from their present pragmatic solutions.

### **4.3 The discussion**

During this session it was strongly advocated that an integrated approach to transport pricing reforms is necessary in urban areas. In order for a strategy to be effective, all components of the urban transport system have to be taken into account (private, commercial, public transport) both because of their potential for reform and because of the mutual impacts of change. In particular, more attention should be devoted, also by researchers, to urban freight transport and public transport. In fact the existing pricing system for urban freight transport and public transport doesn't necessarily reflect social marginal cost and introducing social marginal costs for individual car use will have a direct effect on public transport demand and through lower traffic intensities an indirect effect on freight transport. Another indirect effect could be that consumers will change their trip destinations (other work places, other shopping facilities) and in this way influence especially urban freight transport in the long term.

Most participants subscribed the recommendation that when urban transport pricing reforms are implemented, also substantial attention needs to be given to other modes than the car: the industry often have the feeling that public transport and freight transport exigencies are not taken in the due account.

It was highlighted that initial effects of pricing reforms applied to freight transport might be smaller than expected, due to the fact that demand of commercial transport is rather inelastic. Longer term effects are likely to occur instead, such as changes in land use, in shopping patterns of consumers, creation of new logistic services.

The discussion highlighted that the number of differences among urban areas and nations make it difficult to devise a unique solution to the problem of pricing transport services. More than in other segments of transport market, in urban areas there is a need of an integrated approach to pricing in order to increase efficacy of the strategy and to avoid distorted effects.

It should also be noted that short term constraints are heavier at the local level. Political short term objectives of local authorities make the price setting vulnerable: this applies both to already priced transport and even more to the introduction of pricing schemes for previously unpriced infrastructure use.

To recapitulate, the outstanding issues stemming from this session are the following:

- An integrated approach to transport pricing reforms including all components of urban transport system is necessary in urban areas.
- Concerning freight transport, long term effects of pricing on retailing and distribution should be investigated more in depth.
- In the field of public transport there is a general resistance to reforming fare levels and structure: marketing and communication issues often have a prevailing influence in the decision making process.

## 5 Interurban road transport

The interurban road session was dominated by the very practical issue of interoperability between tolling systems. Distance based charging schemes were also presented and discussed. This section is organised under the heading of the two papers presented.

### **5.1 Tolling Heavy Goods Vehicles on European Roads: From a diverse set of solutions to Interoperability?**

This paper, presented by José Viegas from TIS.PT is based on work carried out in the DESIRE research project of the European Commission's 5th Framework Program, dedicated to the identification of preferred schemes for inter-urban tolling of Heavy Goods Vehicles (HGV's) in the EU.

A brief overview of the main forms of tolling in existence and the main technological approaches used for tolling operations is provided: the pricing schemes considered more relevant to interurban freight transport are the distance-dependent area pricing (DAREA), the distance-dependent network pricing (NET), and the driving permit (PERM). Technically speaking, electronic fees collection (EFC) systems are currently in place in Europe through three main kinds of equipment: Dedicated Short Range Communication (DSRC), Autonomous Systems, Automatic Vehicle Identification (AVI). In general, it is recognised that no individual system can be considered as a universal best approach to inter-urban road pricing for HGV in Europe. This is not only due to legislative reasons, but also to the different objectives characterising the introduction of interurban road pricing schemes (IRPS), which directly affect the choice of the preferred technical solution. In the long term, however, and despite the wide range of currently available options, the issue of convergence of technological equipments (interoperability) needs to be forcibly addressed.

A variety of situations, as observed in the different countries studied within the project, is reviewed, and preliminary conclusions are drawn on past experiences and likely evolutions. It appears that national decisions concerning IRPS are strongly determined by financial needs, given both present constraints in public budgets and increasing costs in road maintenance, upgrading and investment; Thus, he argues that financial constraints in fact do matter to select pricing criteria that are in general set to cover average road infrastructure costs. The implementation of HGV pricing to internalise environmental costs beside infrastructure costs will likely generate a surplus revenue (except for regions with low traffic volumes). Revenue maximisation (cost effectiveness) is also a key concern in both decisions concerning spatial extension / configuration of road networks (DAREA vs NET) and when decisions are at stake to substitute vignettes (PERM) with distance based systems for HGV charging. It seems therefore that traffic functional patterns have a modest influence on IRPS design and development. Viegas argues that the principle of short run social marginal cost is definitely not an issue of concern in current practice, mainly because objectives other than efficiency maximisation are higher on the agenda of governments (one for all, generation of revenues).

Drawing from the large number of national experiences studied within DESIRE, it is possible to outline the basic features of a preferred IRPS: in the short term, it appears that NET is the most sensible starting point, due to a variety of reasons such as its long tradition, legal compatibility with the present EU legal framework (the implementation of a DAREA is currently forbidden by Directive 99/62 on "charging of HGV for the use of certain infrastructures"), ease of control and the possibility of allowing service differentiation. In a longer term perspective, the most relevant criteria to be taken into account in order to design a likely evolution are *financial needs* (mostly in

connection with the issue of expanding/maintaining the motorway network) and *density of road network*. Concerning the latter, density determines whether network pricing will cause undesired detour traffic: a NET scheme involves a high risk of inducing high levels of detouring traffic to free access roads, which normally run closer to urban areas, thus strongly increasing external costs. DAREA, together with accompanying measures such as traffic itinerary and/or time restrictions, might represent the appropriate option in this case.

Recognising that various background conditions have led to legitimately different choices, but also that interoperability of each vehicle across regional and national borders is a natural request in international freight transport, the issue of the path towards interoperability is finally discussed. It is recognised that the dominant perspective in designing a pricing scheme is still domestic: the reason might be that political difficulties for approval of these schemes at national level have been so strong that the policy package presented for parliamentary approval generally has to be very well tuned to the prevailing balances of power, thus leaving the issue of interoperability to a later stage in order to avoid increasing the complexity of the decision making process. A first step towards a greater integration of technical equipment has been made through the adoption of the European (CEN) standard for electronic toll collection based on DSRC (that involves tolled motorways in Portugal, Spain, France and Italy). Nevertheless, the author argues that the issue of cross-Europe interoperability, seen as an instrument of completion of the European single market, will not become a reality before the HGV's tolling is politically accepted by accession countries.

It is expected that interoperability may be reached within some 10 years, when there will be joint pressure from the demand side (hauliers) and from the supply side (technology suppliers - GNSS / Galileo and UTMS suppliers). At that moment, a possible path of convergence could be the following:

- progressively, all schemes based on toll plazas will be applied only to non equipped vehicles;
- NET and DAREA schemes can co-exist in different regions of the same country, without the need for two on-board units (but possibly accepting them for some years);
- rather quickly all new vehicles will be equipped with GNSS and UTMS capabilities (justified for safety and security reasons and navigation help, as well as for charging), thus discarding in a relatively short time span the problem of non equipped vehicles;

## **5.2 Pay per kilometre - Progress report<sup>1</sup>**

The Dutch National Traffic and Transport Plan (NVVP) describes how the government intends to handle the growth of mobility, while improving accessibility, the quality of living environment, and safety. The overall strategy involves shifting burdens from vehicle ownership to vehicle use and environmental impacts. Olga Teule from the Dutch Ministry of Transport explained how replacing (part of) the existing vehicle tax by a kilometre charge is one of the instruments for achieving this goal. The kilometre charge is more efficient (improved accessibility and quality of the living environment) and fairer (the user mainly pays when the vehicle is driven). A similar policy approach can also be found in the countries surrounding the Netherlands, although with a prevailing emphasis on goods transport by road. The Netherlands are frontrunners in applying a charge per kilometre to private vehicles. The paper presented primarily reflects the current thinking and describes how a kilometre charge could be introduced, while the detailed design of the system will require further elaboration in collaboration with private, governmental organisations and interest

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<sup>1</sup> At the moment of writing this report, the Dutch km charging scheme is no longer in place: it was stopped in the summer of 2002 due to a major change in the political situation following the elections of May 2002.

groups. The choices made by the Dutch Government are discussed in individual chapters. In elaborating the kilometre charge system, there are a number of starting points. For example, government income will not rise (the overall burden placed on the community of road users will remain unaltered) and all exemptions in the current system will in principle continue to apply. The intended system of kilometre charges makes it technically possible to differentiate rates according to time and location, and the introduction of differentiated charges is planned for after 2006. Additional decisions will also be made for what concerns the further internalisation of environmental costs.

The kilometre charge is intended as a tax which will apply to all Dutch motor vehicles, when used in the Netherlands. The reform will affect the motor vehicle tax (mrb), the tax on private motor vehicles and motorcycles (bpm) and the euro vignette for heavy trucks. Duties could also be (at least partly) included in kilometre charges, resulting in increased solidity of the charge system and a reduction of negative border effects. According to model calculations, welfare maximisation would be achieved by shifting an overall volume of taxation income estimated in 4.5 billion euro annually. This entails, among others, that only one-quarter of the bpm will be made variable, partly in order to avoid market disruption and to ensure that control is maintained over the purchase of vehicles.

As a result of the kilometre charge, accessibility and the quality of the living environment will improve. Model calculations indicate that car kilometres and emissions will be reduced by approximately ten percent, and the number of hours of traffic congestion per 24 hour period will fall by one-quarter, as compared with the situation in 2020 if no kilometre charge were to be introduced. Anyone driving a private car less than approximately 18,000 kilometres per year will find themselves better off; anyone driving more will be worse off, unless they drive less (behaviour effect). Social wealth will increase considerably. A more detailed calculation of the scale of costs and income is being further investigated within an extensive social cost and benefit analysis. This analysis will include the results of the future market consultation.

Kilometre charging calls for an entirely new technical system for collecting tax. Every vehicle must be fitted with a device, the mobimeter, which registers the number of kilometres driven, and calculates the tax payable; the user will then send the amount payable to the collecting organisation, thus protecting his/her privacy. A market study was carried out, demonstrating that businesses consider it technically feasible to equip the first vehicles with mobimeters in 2004. They also suggest that by 2006, kilometre charging and the additional services could be operational throughout the Netherlands.

Based on the generalised (compulsory) adoption of the mobimeter, the market for additional, innovative services will rapidly develop, ranging from the reservation of parking spaces and dynamic route planning, through to automatic breakdown assistance. In order to facilitate introduction of kilometre charges, a close collaboration must be established with all market players, both for the development of the mobimeter and in view of the provision of additional services, which should contribute to the co-financing of the whole kilometre charging system. In this context, it is expected that market players will require a strong commitment from the government to the introduction of the kilometre charge. To this end, the government intends to establish an open standard.

### **5.3 The discussion**

The presentations and the discussion that followed confirmed that much is happening in the field of interurban road transport pricing: changes in the contextual environment create new opportunities, for the implementation of pricing policy and pricing measures, open a window. Windows of opportunity exist on different levels: the European guideline to abolish the purchase tax on vehicles

opens a window, because the European countries somehow want to compensate for this loss of income. The implementation of kilometre charging in Germany indicates a decline of the Eurovignette and this can induce other countries to review their heavy goods vehicles charging policy. Windows also exist on a local level: for example, a road administrator is planning to close an entry to a highway because it causes too much traffic through a city centre. This causes an uprising from the inhabitants of the city, who want to keep the entry available. A window of opportunity opens: if the inhabitants are willing to purchase a permit, measures can be implemented to give only the permit keepers access to the highway.

A particularly delicate issue is that of interoperability. Especially the representative of the International Road Transport Union (IRU) stressed this. But all participants subscribed that in this respect an important role for the European Union is foreseen. Major decisions in this area have so far been procrastinated, but will soon become unavoidable, also in relation with the need of enhancing the integration of the common market following the entrance of the NAS in the EU. The question of how to push member states towards investments in compatible installations was explicitly discussed: is there a need for common standards or might it be sufficient to rely on regulatory interventions aimed at preventing misuse?

The description of the features and expected performance of the Dutch Pay per Km scheme (a km based scheme applied to private cars, that differentiates charges according to weight and environmental performance and that is open to possible future further differentiations – time and location) stirred a great deal of interest among participants. Considering the expected results in terms of acceptance, improvements of accessibility and reduction of environmental impacts, the question was raised why other countries are not willing (or able) to follow the same path. A real answer was not given.

One possible answer is in the current lack of a European level framework: the Dutch road pricing scheme, for instance, only applies to domestic vehicles and not to foreign cars, confirming that the logic behind such schemes is indeed still focused on the national perspective, and that a European-wide approach is needed.

To sum up, the main critical issues raised are:

- The issue of interoperability remain critical: decisive actions are needed to avoid the risk of non compatible charging systems across the EU, all the more in the current context of EU enlargement. A step up in policy formulation and adoption is urgently needed to prevent the implementation of a patchwork of non interoperable systems
- A EU legislative framework is still lacking – implemented or planned schemes are still focused on a national perspective.

## 6 Air transport

The session dedicated to air transport focussed on the two main issues of capacity allocation and of applying marginal cost pricing to airport landing charges. This section is organised under the heading of the two papers presented.

### 6.1 Secondary Markets for Runway Capacity

The current regulatory framework for the allocation of runway slots in the EU neglects the positive effects of market mechanisms. In fact allocation of scarce runway capacity is regulated through administrative procedures such as the *grandfather rule* (European Council Regulation No. 95/93). Beside the primary market, a secondary market for slot allocation exists (redistribution of slots among airlines and others), where re-allocation of capacity may in principle be performed through administrative or market oriented price mechanisms (slot exchange – barter trade – or monetary trade). However, whether slot exchanges accompanied by monetary side payments are allowed or not is a controversial issue. Officially this trading is considered illegal in Europe, except for a recent decision of the British court – 1999. It is important to draw the distinction between slot trading and pure congestion pricing in the aviation sector. Slot trading is primarily a means of allocating capacity at airports and deals more with the scarcity nature of runway slots than it does congestion, where as congestion pricing seeks to reflect the additional costs due to delays or expected delays associated with increased utilization of runway and other airport capacity.

Achim I. Czerny and Henning Tegner (Workgroup for Infrastructure Policy, Berlin University of Technology) seek to show in this paper that, despite the current regulatory framework and the European Commission view on the issue, slot trading is an efficient way to organize markets for runway capacity. The opinion of the efficiency of slot trading is based on the analysis of the market for runway slots at the four slot-constrained US Airports: in fact the trading of runway slots is often rejected with reference to its development in the US, but they argue that the analysis of the US market for runway slots does not reveal evidence of market failure. On the contrary, there is evidence of an increase in the overall efficiency of the market due to slot trading. Even the high passenger fares of slot-constrained airports compared to unconstrained airports can reflect an efficient allocation of scarce airport capacity to passengers. If passenger demand is large compared to the availability of airline services, then passenger fares have to increase to reach a market clearing level. Moreover, the resulting windfall profits for the airlines are primarily a problem for equity and not for allocation.

To address the concerns of the European Commission about the concentration of slot holdings, slot trading should be combined with a strict application of competition law.

During the next years the slot constraints at Chicago O'Hare and the airports in New York will be completely replaced by a first-come-first-serve allocation of runway capacity. If passenger demand is low enough compared to the capacity of the respective airport, this model will produce an efficient result. However, if passenger demand is too high, then congestion costs are expected to increase until a non-optimal level. The experiences with slot exemptions to new entrant carriers at LaGuardia have already confirmed this conjecture. Moreover, compared to slot trading, congestion pricing is not expected to change much with reference to the competition issue.

## **6.2 A marginal costs pricing scheme for airport operations and externalities**

In his paper, based on a work carried on within the project MC-ICAM, Yossi Berechmann from Tel Aviv University proposes a new pricing scheme for airports, aimed to correct inefficiencies such as delays, environmental nuisance, accidents and congested facilities. These inefficiencies are generally characterized by economists as unchecked operational and demand related externalities leading to waste of resources that amount to a significant financial and social burden on communities, local governments, the airlines and passengers. Operational externalities include congestion and delays, safety externalities include accidents, congestion and delays, while environmental externalities include noise, air and water pollution. The sources of these inefficiencies are varied, with the most important being the existence of a limited airport capacity with respect to demand (the author recalled that airport capacity includes runway, terminal, apron, air traffic control and gates capacity), and the market structure itself, specifically air transportation demand features (including traffic pattern and peak/off-peak daily and seasonal demand pattern).

Operational externalities can also depend on the technological infrastructure and the airframe characteristics and operating conditions, that could 'extend' the existing capacity of at least one third (through head-up displays on aircrafts, grooved, cement runways and a reduction in distance between aircraft movements). Of course, operational conditions (whether an airport is a hub or not) greatly affect the magnitude of congestion and delays. For what concerns safety, all the above mentioned factors are relevant, but it is worth adding that an additional driver is air traffic control behaviour, that could assure for instance safer distances between ACM.

A set of factors has to be added while searching for environmental externalities drivers: in fact, beside demand profile and volume and technological infrastructure, factors such as population area and density, aircraft characteristics (age, noise level, etc.), ground traffic patterns assume a big relevance.

The current pricing structure in airports, that includes airport tariffs and handling services tariffs, is determined through a variety of different mechanisms: in general airport tariffs do not reflect management and operating costs, and do not differentiate according to externalities but mainly according to e.g. aircraft technical features or duration of infrastructure use. Concerning handling services, they are in general privatised and prices are set through negotiation on a one-to-one basis. The author proposes a new short term pricing scheme based on marginal costs aimed at correctly pricing externalities, thereby internalising them. This scheme includes peak and off-peak charges, congestion charges, noise charges. The model does not include air pollution, accidents and ground traffic congestion: this is because air pollution should be dealt with longer term models and not only at airports but also en-route, while a methodology for charging accidents requires more in-depth studies, and the incorporation of ground traffic costs implies using multi-modal analysis.

Berechman presents the results of model runs based on data for the Schipol airport in Amsterdam, whereby in order to reduce congestion slightly, peak period charges should remain at their current level while off-peak charges should fall in order to raise social welfare. The demand pattern could thus become more uniform and the airport infrastructure could be used more efficiently.

He suggests that an effective application of the proposed pricing scheme encounters a series of barriers, of institutional, acceptability and technological nature. The strongest is the lack of transparency concerning the formula used to compute the current level of prices. An institutional change leading to more complete information is a pre-requisite for pricing reform and for a reduction of monopolistic power in certain airports. Moreover, a certain degree of harmonisation on pricing methodologies and rules is necessary among EU member states, in order to avoid distortions of competition. The role of an international body (such as EUROCONTROL) could prove necessary to ensure smooth adjustment during peaks. Another issue is the tendency of airlines to

create monopolies using hub airport market power: while leading to a reduction in airline costs, hub monopolies hinder competition, which in turn does not allow a lowering of fares. This could be fought through regulations aimed at cutting excess airline profits for entrant airlines (e.g. lower airport fees), but the compliance of such regulations with EU and national laws should be preventively checked. The airports themselves could hardly be interested in more complicated fare structures either because of the difficulty in passing on such complexity to users and airlines or because the reform could result in additional operating burdens (e.g. wider data collection). Technology does not currently appear to be a major barrier, since charging systems are already in place; technological innovation might nevertheless be necessary to collect and compute delay and scarcity data.

### **6.3 The discussion**

A remarkable outcome of the intense discussion was that no argument was found whereby negative effects might occur with the introduction of slot trading and that the speakers found their approaches in a way complementary because slots are most interesting during peak times and the introduction of charges tries to incentivise a smooth pattern of demand, so as to reduce peaks and troughs, via charges being higher during periods of high demand and lower at times of lower demand.

A variety of questions were raised which should be analysed in future workshops.

- Is there any motivation for airports to improve infrastructure, or are the interests of the shareholders best served by the considerable earnings resulting from high congestion charges?
- A coordinating agency is needed at EU level to introduce slot allocation for all airports, but how can this be implemented in practice?
- Is there enough knowledge of the market mechanisms in the air transport sector, including competition between carriers, airports, and authorities?
- Also, landing rights in the EU for flights originating outside the EU are still discussed bilaterally.

Another issue raised during the debate concerned the attempt to integrate climate change effects into the model of airport charges, that confronted us with a more general perspective: how much can we concentrate on a maybe solvable problem as slot allocation neglecting the big window of environmental impacts, e.g. the greenhouse effect? This means that we would have reached the basic point of discussion in transport pricing, if it was legitimate to start with a focus on wear and tear costs of infrastructure and concentrate then on the negative external effects (e.g. environmental damage). The discussion then turned to how transport pricing can be marketed to politicians and population, that is a concrete problem for later implementation issues. It was said that if one insists on the fact that it is necessary to shed a light to general aspects like the global warming effect in every discussion on specific aspects, the focus could suddenly change to the question of whether this effect really exists or not and who has the scientific proof for it. It must be communicated to the environmental lobbyists that starting the analysis of transport pricing issues with a focus on infrastructure use aspects does not imply that environmental aspects are neglected or ignored. The problem could rather be that entrepreneurs are more interested in discussions focusing on their business and helping to understand the mechanisms of their day-to-day work, and they might not feel global environmental problems as directly relevant for them. The effect of concentrating discussion on those global aspects might induce in the industry the idea that their concrete needs are not taken into account by policy makers planning implementation strategies (of which all

stakeholders in air transport could benefit). For the future workshops on air transport we should opt for concentrating on concrete implementation recommendations and setting the environmental questions as a background.

To summarise, the main points highlighted were the following:

- Recent studies provide some evidence on the possible role of more differentiated airport charges in managing congestion (e.g. marginal cost based charges, aimed at correctly pricing and thereby internalising externalities would involve peak period charges remaining at their current level while off-peak period charges would fall).
- The issue of scarcity and allocation of airport capacity needs to be forcibly addressed: various options are possible in this respect, including slot trading, but additional, in depth discussions are needed.

## 7 Intermodal freight transport and maritime transport

Even more than for other modes, the debate on intermodal and maritime transport pricing is still very open, since with respect to other modes, neither the features of the respective markets and the structure of costs, nor their implication for pricing are well known. The papers presented provide an overview of the most recent outcomes of research and experiences in pricing for these two modes. This section is organised under the heading of the three papers presented.

### 7.1 Pricing of intermodal transport: lessons learned from RECORDIT

In his paper, Andrea Ricci (ISIS Rome, Italy) addresses pricing issues specifically related to intermodal transport, whereby an intermodal chain is recognised to be more than the juxtaposition of a series of modal activities. Intermodal transport is in fact defined as a sequence of activities involving modal haulages, transshipments and terminals, and requiring the intervention of a variety of operators, whose roles partially overlap and compete. This entails an inherent complexity of the cost and price formation mechanisms, and an overall lack of transparency resulting both from the technical difficulty to establish a reliable and effective accounting framework, and from the high level of competition currently observed between operators. Specific obstacles to cost valuation and pricing are also related to the choice of the units of measure, whereby intermodal traffic is usually assessed with reference to the Loading Unit concept, rather than in terms of vehicles moved.

Intermodal transport has attracted a growing interest from both the EU (cfr. the last CTP) and national transport policy makers, mainly because promoting intermodal transport entails massive shifting of freight movement from road to more environmental friendly modes (rail, waterways, short sea shipping). In order to foster and accompany this shift, policies and actions aimed at both increasing the productivity and efficiency of the intermodal sector and at reducing the imbalances between intermodal and road must be designed and implemented.

The RECORDIT project (Real Cost Reduction of Door-to-door Intermodal Transport) is briefly presented, with particular reference to its pricing-relevant objectives:

- designing an original accounting framework for intermodal transport through a highly detailed representation of the sequence of activities carried out for the production of door-to-door transport services;
- documenting the value of individual cost items (both internal and external) based on the detailed, bottom-up analysis of three intermodal trans-European corridors and their all-road competing alternatives (the three corridors are the *Genova-Manchester*, the *Patras-Gothenburg* and the *Barcelona-Warsaw*);
- identifying those cost items (drivers) that play a major role in determining the performance of intermodal services.

Intermodal transport is found to be consistently cheaper than all-road solutions, and its external costs significantly lower, thereby confirming the high potential of intermodal transport in increasing the sustainability of the transport sector. It is worth mentioning that despite these results the competitiveness of intermodal transport is severely undermined by the poor performance in terms of trip duration (which is from 70% to 400% longer than all-road in the three corridors analysed).

For price setting purposes, RECORDIT has carried out a comparison between social costs (internal + external) and taxes and charges currently paid. The evidence from the three corridors analysed does not lead to uniform conclusions, owing to a high level of variability of results in relation to corridor-dependent parameters: a clear undercharging situation for both road and intermodal is

observed only in one case, while the other corridors and segments show contradictory patterns. The level of coverage of external costs strongly varies also between countries. This confirms the need for a price-setting approach that allows to adequately reflecting the specific characteristics of each route.

This extreme variability must also be taken into account when assessing the possible evolution of transport demand as a consequence of pricing reforms: in fact both direct (intra modal) and cross elasticities appear to vary considerably across routes, and any assumption about an average elasticity for intermodal transport might prove misleading.

Further research and policy initiatives can be envisaged to facilitate the pricing reform process, in particular concerning three areas:

- Reducing the current level of uncertainty and information gaps on the level, structure and formation of current prices, through extended sensitivity analysis and statistical elaborations; though the RECORDIT data set represents a valuable starting point for a detailed assessment of intermodal costs at the European level, generalisation is not straightforward, and resources have to be invested in additional bottom-up corridor studies to enhance the current dataset and increase the meaningfulness of the variability analyses, as basic prerequisites for more reliable transferability and generalisation exercises.
- There is a need for further impact studies of current reform measures on prices, costs and intermodal market shares: the RECORDIT project has developed a tool (Decision Support System, DSS) to simulate of the impact of policy packages (e.g. geared to those outlined in the new CTP), providing useful, though fairly gross, insights on their potential effectiveness and efficiency.
- Actions should be taken in order to achieve a reasonable level of completeness and symmetry of information for all those operating in the intermodal sector: the current state of data availability and transparency is very poor, due to the multiplicity of operators, the partial overlapping of the services they supply, and the resulting strong level of competition; transparency could greatly benefit from the establishment of a public-driven platform for information gathering, and subsequent sharing, aimed at avoiding highly aggressive market behaviours that, in the short term, induce protective information handling approaches. The development of EDI based solutions and of GALILEO will also help to gather a sensible amount of quantitative information, overcoming the barrier of the complexity of intermodal chains crossing national borders.

## ***7.2 Port pricing issues - Considerations on economic principles, competition and wishful thinking***

This paper prepared by H. Meersman, E. Van de Voorde and T. Vanelslander (UFSIA, University of Antwerp) deals with the issue of pricing for port calls and port services. At the outset, it recognises that ports are extremely heterogeneous environments, and the ‘port product’ is complex, due to the large number of players acting and services provided within any given port. A port can be seen as a chain of consecutive links, while the port as a whole may itself be seen as a link in a global logistic chain. Demand for port calls, port transshipment and supplementary services is derived from demand for the goods involved and is thus a function of economic growth, industrial production and international trade.

Despite the competition existing between goods handlers, port authorities and regions or countries, the overall demand for port services is generally inelastic, due to the fact that total port costs are a small share of total costs associated with a logistic chain. A bigger elasticity exists, on the other

hand, for what concerns specific ports, since the possibility of replacing one port with another is very high.

A large number of actors are involved in the market of port calls (government, port management, shippers, forwarders, agents, shipping companies, trade unions, etc), targeting a multiplicity of often conflicting objectives. The relative weight of these players has greatly changed over time, also affecting the role of port authorities, which appear to be increasingly concerned about finding ways of participating as more active market players.

During the last decades, port management has shown a continuous trend towards greater autonomy and a stronger presence of private investments in goods handling. Another remarkable feature is the shift towards capital-intensive production, both in ports and in port industry.

Concerning competitive conditions, that underwent a steady and continuous improvement, they should correctly be verified taking into consideration not individual ports, but logistic chains, as competition is also affected by factors external to the port performance itself, including connections with the hinterland.

The existing literature on port pricing takes into account three cost components of total port call costs: cargo handling, the time in port, port dues and charges. Recent theoretical developments confirm the need of a system of prices reflecting (or recovering) social opportunity costs and uphold that the principle of long-run marginal costs seems to best suit the features of port pricing than short-run marginal costs. Given the heterogeneity of ports institutional and competitive conditions, there is no unique approach to port pricing. The main principles recognised in port literature are (1) cost-based pricing; (2) methods for cost recovery; (3) congestion pricing; (4) strategic port pricing; (5) and commercial port pricing, which is applied in privatised ports. A detailed analysis of the proposal that can be found in literature is available in the full paper. Some questions are still open: what is the importance of port pricing with respect to total logistic chain costs? Which is the real cost structure of a port call and transshipment? Is there indeed evidence of economies of scale? And if there is, does it apply to both port infrastructure and cargo handling equipment? Further research is needed on these issues.

Empirical research on actual pricing strategies by and within ports is relatively limited (a recent exception is the EC funded project ATENCO). A survey of the prevailing pricing practices in Europe carried out within the ATENCO project reveals substantial differences between the respective funding and pricing practices. This diversity is deeply rooted in different legal and cultural traditions. It is also a consequence of differences in terms of port management style and the related issues of competencies and degree of autonomy. Cautiousness is needed in formulating general statements from this research, both because of the great differences in the institutional assets and market conditions between ports and the fact that port actors might find convenient to provide biased information.. However some of the conclusions are worth mentioning: it seems that all port authorities included in the research are in favour of the adoption of overall full cost recovery within the port sector, together with the adoption of “user pays” principles, provided that a certain flexibility can be guaranteed and that a similar policy can be applied also to hinterland transport pricing. However, the survey highlighted that, quite surprisingly, port authorities do not expect this to induce major consequences on the level of prices.

The empirical research on demand elasticities resulted in substantially divergent measures of the elasticities among the various ports and goods categories. Irrespective of the methodology applied in estimating them, it seems very hard to interpret these figures meaningfully, and the only conclusion that can be drawn is that if the elasticities were correct, a change in price occasioned by alternative pricing schemes would, in the case of container transshipment, have fundamentally different consequences for the ports considered.

Summing up, conclusions on the practice of port pricing can hardly be formulated, given the difficulty in outlining a unique typology into which all ports will fit. It appears that the ports that ‘preach’ full cost recovery do not pass on historical costs, which may be considered as a form of covert subsidising. Thus, research based on port pricing behaviour is by no means methodologically sound. Empirical research has, so far, been rather limited and there are doubts as to the accuracy of the model-based findings.

The calculation of the marginal costs of a port call, despite what is commonly believed, includes more than what is paid to the port authority or port management for the use of its services. In fact, these dues are most of the time fixed arbitrarily on the basis of comparisons with other ports or experience from the past, without explicit connections with the underlying costs. A complete analysis of marginal costs in port operations must in fact include the following categories (irrespective of who pays for them): (i) costs for provision of infrastructure, (ii) costs associated with use of the transport mode, (iii) costs for supplying port services, and (iv) external costs (an estimation of marginal costs for the port of Antwerp is provided in the paper)

This contribution, which includes a brief overview of the most important scientific literature on port pricing and available empirical data, provides further confirmation that the picture is rather confusing. Ports, i.e. port authorities and port-based concerns (goods handlers, agents, etc), often go it alone when it comes to pricing. Outlining a typology of port pricing schemes is therefore more or less impossible. Even ports that preach the full cost recovery approach appear to engage in subsidising, if only by their failure to pass on historical costs. From a methodological point of view, research into pricing behaviour within ports certainly has some way to go. An acceptable methodological framework is absolutely indispensable for meaningful empirical research. We are, therefore, still quite far removed from the possibility of developing recommendations for how to implement transport pricing reform based on the principle of marginal cost pricing. Nevertheless, at the request of the European Union, a first step has been made in the calculation of the marginal cost of an average port call. This material may constitute the basis for a meaningful debate on the implementation of a pricing approach that is grounded on the marginal cost principle.

### ***7.3 Environmentally differentiated fairway charges in practice – the Swedish experience***

The paper presented by Henrik Swahn from the Swedish Maritime Administration describes the experience of the Swedish Maritime Administration with a system of environmentally differentiated charges for ships. Maritime fairways, navigational aids, pilotage, search and rescue operations as well as ice-breaking in Swedish waters, have since many years been 100 % financed by means of fairway charges. The charging bases have varied over the years, but at present charges are based on gross tonnage (GT) and the volume of goods loaded and unloaded at Swedish ports. In addition, pilot assistance is partly charged according to the pilot service provided. A similar charging system exists in Finland but in most other EU-countries the corresponding facilities and services are organisationally and financially tied to the ports.

For long there has been a certain concern about the absolute level of emissions to air generated by maritime transport - especially sulphur and nitrogen oxides - albeit sea transport in many cases is efficient also from an environmental point of view. Therefore the Swedish Maritime Administration, the Swedish Ship owners association and the Swedish Ports’ and Stevedores’ Association in 1996 agreed to enact vigorous measures to reduce these emissions by 75 % within few years. All the parties took specific actions. The Swedish Maritime Administration and to some extent the ports decided to implement a system of environmental differentiation of the current charges. The objective of the differentiation was to create incentives to use low sulphur oil and to

take measures to reduce NOx emissions from ships' engines. The differentiated fairway charging system was supplemented by a system giving certain financial support to the installation of cleaning equipment or clean-burn technology.

The 1998 system is based on two charging components. The first one, which is environmentally differentiated (the differentiation with respect to sulphur in the ships' bunker fuel is straightforward, while for NOx-emissions the differentiation scheme is slightly more complicated), is based on the gross tonnage (GT) of the ship. This portion of the due is charged a maximum of 18 times a year for passenger ferries or railway ferries and a maximum of 12 times a year for each individual cargo ship. The second component remains based on the amount of goods loaded/unloaded in Swedish ports and is not affected by the differentiation. The differentiation aims at establishing an incentive for ship owners to reduce emissions of sulphur and nitrogen oxides, while not *per se* altering the total sum of SMA charges for all ships calling at Swedish ports taken together. Thus the scheme is supposed to be income neutral for the Swedish Maritime Administration.

The differentiated fairway and port charges have now been in operation for more than three years, and it is possible to draw at least tentative conclusions on their operation and effects. The system is widely diffused in Sweden: about 25 major ports have introduced environmentally differentiated port dues, and by December 2001 about 30 ships introduced NOx-reducing measures (25 commercial vessels obtained an NOx certificate); on January 2001, 1043 ships were registered for continuous operations with low sulphur bunker oil. Since the system has been in operation, substantial reductions of emissions of sulphur and nitrogen oxides have been attained for maritime transport calling at Swedish ports. According to a recent estimate (SMA Annual Report 2001) the differentiated charging system for Swedish fairways and ports has helped to induce substantial decreases of maritime emissions of NOx and SOx. The overall emission reduction in the areas of the Baltic Sea and the North Sea has been estimated at 50 000 tons for SOx and 27 000 tons for NOx (calculated as NO<sub>2</sub>): that is, the reduction of sulphur emissions, corrected for traffic growth, was about 30% of the total sulphur emissions from maritime transport in foreign relations, while for NOx the reduction was estimated to be a little less than 10%. It is worth underlining that a consistent evaluation of the effects of the differentiated fairway and port dues at an aggregate level will only be possible when the new system for emission statistics introduced in 2000 will provide consistent time series of emissions from maritime transport to/from Swedish ports as well as between them.

An analysis of abatement costs of emissions highlights that the ship owners' perceived real abatement cost are influenced by the extension of the area in which emissions are considered harmful. A limitation of the extension of the emission sensitive areas will also limit the scope for emission abatement measures to ships mostly active within these sensitive areas, provided those measures are to be justified from a socio-economic point of view.

Altogether, it appears that the aspirations of an environmentally efficient fairway charging policy must be aligned to the political recognition of the emission problem. The key issue in the international maritime sector is that most ships will operate both in areas which are sensitive for emissions and in areas considered non sensitive. An efficient policy should aim at creating incentives for reduction of maritime emissions until the cost of the marginal measure is equal to the marginal damage cost in the recognised sensitive areas.

It is of course important that the emission problems are properly recognised, thus helping to establish realistic borders for emission sensitive areas. Abatement measures should be stimulated for ships, which are operating frequently enough in the sensitive areas. One solution would be to establish an emission charge equal to (the constant) marginal damage cost. Most frequent ships would have an abatement cost per unit well below this level. The abatement cost will then define the net cost increase for these ships. It is unavoidable, however, that such a cost increase may influence competitive conditions between ports and routes in different countries. Another way

would be to stick to a differentiation scheme for fairway charges to provide incentives for emission abatement measures. For frequent ships (mostly ferries) the present NO<sub>x</sub>-differentiation of the GT part of the fairway dues will cover about half the abatement cost. The GT based differentiation will give a constant and uniform yearly accumulated discount amount for all ships making 18 calls or more, which implies that if cleaning technology has constant returns to scale, about half of the abatement cost will be covered for all these ships.

For the ships in the lower range of call frequency, however, the cost of the abatement measure will exceed the marginal damage cost level and therefore not be justified (if only emissions in Swedish waters are considered). This restriction is not at present reflected in the differentiation scheme, which would cover about half the abatement costs for all ships calling 18 or more times despite the fact that abatement measures for ships with low calling frequencies may not be cost efficient.

The significant reductions of NO<sub>x</sub> emissions during the existence of the differentiation scheme could probably be ascribed to the combined effect of incentives created by differentiated fairway and ports dues and the environmental concern of ship owners and shippers. For SO<sub>x</sub>, emissions have been reduced for many reasons, including the formulation of SO<sub>x</sub> control areas, lower maintenance cost for better fuels, often synonymous with low sulphur fuels. However the reimbursement of SEK 0,9/GT is also a positive factor despite the fact that the reimbursement normally amounts to only a minor fraction of the abatement cost.

Widening areas of concern for maritime emissions to the territorial waters of several countries would widen the range of ships included in a cost efficient emission abatement programme. For the abatement measures to actually take place, it is however necessary that suitable economic incentives be in operation. The Swedish experience has shown that environmentally differentiated fairway and port charges is one way to consider.

A major review of the Swedish system for fairway charges is currently going on. The purpose of this review is to investigate how the system could become more aligned to the principles of social marginal cost pricing and how still stronger incentives for environmentally friendly maritime transport could be introduced into the charging system. This document will also contain a short discussion on the scope of the differentiated charging systems within a possible new charging framework, considering the differentiated system's success during the years it has now been in operation.

## **7.4 The discussion**

During the discussion it was remarked that a common feature to both intermodal and maritime transport is the great complexity of the system, which is in turn – at least partly – responsible for the lack of transparency of the price setting mechanism: both intermodal freight and maritime transport markets are characterised by the presence of many players, and often strong market powers (in this sense the maritime transport market can be assimilated to that of air transport). This is one of the reasons why the real cost structure of transport activities and services is not well known yet. The attendants agreed that the body of knowledge accrued so far is not sufficient to outline any pricing reform: research must go ahead to deepen the basic knowledge on the cost structure of logistic chains, privileging wide, bottom-up research projects aimed at clarifying the basic features of market (prices, demand and supply patterns).

Attention must be paid to institutional aspects, all the more so in systems as complex as the intermodal and maritime ones: the question of infrastructure ownership and of the role of existing actors, that are often driven by very different and somewhat diverging objectives, needs to be addressed. The attendants advocated the creation of an *institutional platform* gathering operators and policy makers to design possible pathways of policy reforms, as an option that can no longer be

postponed. A particular attention during the debate was paid to the question of ports ownership and of the role of port authorities.

Beside the need for improved knowledge, the attendants raised the issue of the actual efficacy of pricing instruments to correct inter-modal distortions (and push the balance towards less polluting modes): due to the small share of transport costs on the total logistic costs of a chain, the worth of the impact on demand and supply still remains to be measured, and might turn out to be lower than expected (this aspect affects both intermodal and maritime transport sectors, since maritime transport is by definition connected to a logistic chain). Packages of measures should be designed and implemented within a wide and coherent policy framework, defined at a European level; this framework should create incentives for modal shifts to logistic chains.

A particular issue of concern is the impact that interurban transport pricing reforms in the EU are likely to have on peripheral countries (impact on transit traffic, risk of discrimination of non-EU traffic, etc.): all participants agreed that more resources should be dedicated to studying this particular aspect.

The main concluding points are briefly summarised below:

- The available knowledge of the real costs of complex freight operations is not sufficient to devise pricing reforms. Research must go ahead, privileging bottom-up research projects aimed at clarifying the basic features of the market.
- An institutional platform gathering operators and policy makers, to design possible pathways of institutional reform is needed to cope with complexity and institutional issues typical of the intermodal and maritime sectors.
- Major impacts are expected in non-EU countries as a result of pricing reforms: more resources should be devoted to assessing e.g. the effects on transit traffic, the risk of discrimination of non-EU traffic, etc.
- Are pricing instruments effective in correcting inter-modal distortions? Transport costs only account for a small share of total costs of a logistic chain, therefore pricing policies impacts on demand and supply might be lower than expected

## 8 Rail transport

The rail transport session provided at first an overview of the main barriers to the implementation of charging reforms in rail transport and of possible solutions to overcome them. Secondly, a comparison between an existing system of railways charges (the Swedish one) and a possible marginal cost based charging system was presented and discussed. This section is organised under the heading of the two papers presented.

### ***8.1 Implementing rail infrastructure charging reform - barriers and possible means of overcoming them***

Chris Nash and Bryan Matthews from the University of Leeds (UK) trace in this paper the development of the Commission's policy on rail infrastructure charges through to Directive 2001/14, which stipulates that prices should be based on marginal social cost, but provides for non discriminatory mark ups to meet financial constraints and other departures from marginal cost pricing in the case of distortions in the pricing of other modes of transport.

National governments have, in many cases, sought to pursue their own programmes of railway industry reform over the past two decades: currently, there is a diversity of approaches in terms of charging, institutional agreements and competitive structures all over Europe. Good examples of this wide range of choices are Britain, Sweden and Germany: Britain currently has marginal social cost based variable charges, but also fixed charges for franchisees; Sweden rail infrastructure is charged through something approaching pure marginal social cost pricing while Germany has a pricing regime which is closer to average cost pricing.

Difficulties generally arise not only in deriving and developing railway infrastructure charging policy, but also in implementing policy once it has been agreed. Barriers to implementation may come in a number of different forms, relating to the industry in general (irrespective of the member state or region involved), or more country-specific (more linked to the institutions, finances or philosophy). Moreover, barriers may be perceived or actual: the source of perceived barriers is often the fact that research is not effectively feeding through to the policy-making community.

The paper traces through a series of barriers to marginal social cost pricing and considers ways of overcoming them. The barriers identified are:

1. Problems of measurement: accurate, disaggregated estimates of the various components of external costs are not always available, especially concerning congestion and scarcity costs.
2. Complexity of tariffs: tariff complexity arises as a result of marginal social cost varying widely across space and time, as it does in the railways sector; the danger is that the tariffs become so complex that they are then difficult to understand and interpret, resulting in the incentive underpinning them being masked.
3. Financial implications: in rail industry economies of traffic density (i.e. short run marginal cost of infrastructure use is below average cost) means that pricing at the marginal cost will result in a financial deficit (there is evidence from Sweden and Finland suggesting that marginal wear and tear costs recover less than 20% of total maintenance and renewals costs). The key question determining whether and to what extent this is a barrier to the implementation of marginal social cost pricing is whether governments are willing and able to provide the necessary subsidies to cover the financial deficits.

4. Equity: it is generally felt that it is unfair to provide subsidies to the rail industry because rail users tend to come from higher income groups; this leads to various forms of mark up over marginal cost so as to minimise subsidy levels in many countries.
5. Technical efficiency: concern regarding technical efficiency is a further reason why governments might be unwilling to use subsidy to cover financial deficits in the rail industry. That is, there is a fear that subsidies lead to technical inefficiency by relieving railway managers of hard budget constraints.
6. Fair competition within the rail sector
7. Fair competition with other modes
8. Acceptability on behalf of train operators and infrastructure managers
9. Acceptability on behalf of end users and the general public.

Different ways of overcoming these barriers are exposed, mainly drawing from the British experience. For what concerns measurement of congestion and scarcity costs, Railtrack succeeded in modelling and testing long time series of delay data, testing out a tariff differentiated by track sections and time of day: the concern about demand reaction induced the Regulator to simplify the structure and halve the price. Concerning the cost of scarcity, several solutions are proposed: auctioning of slots, successive price settings and demand adjustments, or identifying sections of infrastructure where capacity is constrained and to charge the long run average incremental cost of expanding capacity. Given the difficulties with all these approaches, it may be thought that the best way of handling the issue is to permit direct negotiation between operators and the infrastructure manager over the price and allocation of slots, including investment in new or upgraded capacity. However, British experience of this approach is that it is complex and time consuming. An independent regulator is certainly needed but their job is far from easy.

The complexity of tariffs should not be an overriding problem in the case of rail infrastructure or services: even if there is evidence in Britain that at least freight operators experienced difficulties in understanding the new charging regime, this problem might be less heavy for train operating companies, who have the suitable technical tools. Nevertheless the degree of complexity of existing tariffs in the rail sector suggests that the result can still be tariffs which vary in time and space and which reflect variations in marginal social cost reasonably accurately.

With regard to financial implications, Britain's approach has been to adopt a two-part tariff charging regime for infrastructure use, designed to cover infrastructure costs and provide a financial return on the assets. Nevertheless, government still provided subsidy to the industry but this was, initially, channelled entirely through the franchised passenger operators and specific grants for freight facilities.

The real issue concerning the relationship between subsidies and technical efficiency is whether to give the subsidies to the infrastructure manager or the train service provider. After having started with the latter approach, Britain has currently moved to a position where the SRA both contributes to the cost of investment and towards current operating costs, and arguably that gives it more control on efficiency than if it were paying subsidies indirectly.

With regard to fair competition within the industry, Britain's approach for passenger services has been to focus much more on competition for the market, via tendering for train operating franchises, than on competition in the market, via open access operations. However, for freight operations in Britain, where there is open access, all operators now pay according to the same tariff, based only on marginal cost. This is possible because of the willingness of the government to subsidise rail freight in order to increase the rail market share and remove some of this traffic from road.

On acceptability, the big issue in Britain has always been commuter fares, and in terms of one of the biggest remaining distortions this is the area to look at. Both the franchise agreement and the decision not to pass on all congestion costs in variable access charges tend to hold commuter fares down. This means that charges are below marginal social cost and that it is difficult for train operating companies to fund investment to cater for additional peak traffic from revenue; indeed they have an incentive to discourage growth in this area.

Thus, measurement problems should be gradually relieved as estimates of marginal cost improve. Second best reasons for subsidy because of charging regimes on other modes may also be gradually reduced by reform of charging on other modes. It is difficult to see measures that will ease other constraints, particularly financial and equity ones. It is likely that rail infrastructure charges in many countries will continue to need mark ups above marginal social cost for these reasons, and that the argument between two part tariffs and Ramsey pricing (i.e. essentially basing mark-ups on the willingness to pay of the traffic concerned) will continue; despite evidence that, with a complete reform of transport pricing, governments would be well able to fund the deficits arising from marginal social cost-based rail track charges out of the surpluses arising from marginal social cost-based urban road charges (Roy, 2002).

No country other than Britain includes congestion costs in its tariffs, and no country includes pure scarcity costs. Scarcity costs remain a priority for further research. However, we believe that measurement problems can be gradually overcome over time, and second best reasons for subsidy will gradually reduce as prices on other modes are reformed. The crucial issues in achieving marginal social cost pricing for rail infrastructure relate to the desire for rail infrastructure managers to cover their total cost, or a greater proportion of costs than implied by marginal cost pricing, from charges, and the consequent need for two part tariffs or for tariffs differentiated according to willingness to pay.

## ***8.2 Pricing the use of Sweden's railways; are charges in line with marginal costs?***

Jan-Eric Nilsson (Swedish National Road and Transport Research Institute - VTI) presented the current structure of Swedish charges for infrastructure use, and contrasted it against the norm of marginal cost pricing. The paper first provides a brief historical background on the reform that the sector underwent from 1988 on, and continues describing the past and the existing pricing schemes, checking them against marginal cost pricing. It then provides some insights on current experiments concerning congestion charging, a component of marginal costs often discussed but rarely addressed in real life, and concludes with a discussion on possible institutional changes.

The 1988 organisational reform operated a vertical separation of the previously state owned rail monopolist in an infrastructure manager (Banverket – the Swedish National Rail Administration) and a service operator (Statens Järnvägar - SJ). The 1988 reform was pushed by several reasons, one of them being the growing deficit of the rail sector: the new pricing scheme, further adjusted during the '90s, was not based on a full cost recovery principle, because of the fear that this requirement would have pushed industry to abandon substantial and no longer profitable parts of the network (the continuity of the network was a priority). A multi-part tariff was thus established, with a fixed annual charge per vehicle – varying with the vehicle type - and a variable component based on gross ton km or train km etc.; this regime was then modified in 1999, due to several political and budgetary reasons. The new tariff excludes the fixed component and is only related to infrastructure use; it does not differentiate between network and vehicles type, therefore no geographical or vehicle-related costs differences are taken into account. The current tariff is composed of the following items: a trackage fee (per gross ton km, passenger and freight), an information fee (per

gross ton km, passenger), an accident charge (per train km, passenger and freight), a diesel charge (per litre diesel), a shunting charge (per shunted car), plus a charge for using the Öresund bridge (per passage, freight). A systematic comparison of these items with the different components of marginal costs is illustrated in the paper.

Concerning *infrastructure use charges*, a Swedish study on data provided by the Swedish National Rail Administration (whose results were confirmed by a similar Finnish research) demonstrates that there is a very low variation in spending with changes in traffic load. It seems therefore that marginal wear and tear costs from train traffic is low, and that the current charge for infrastructure use (trackage fee) is not way off the mark (this applies to freight fees, while passenger fees are higher due to a Swedish-Danish agreement on the Öresund bridge). What makes the level of infrastructure charges sensibly lower than it should be to allow an efficient use of infrastructure is that the variation in future reinvestment due to a variation in traffic load (infrastructure has to be renewed due to climate conditions and to use) is not accounted for. At present it is not possible to verify if other components of actual charges such as the surcharge on passenger services for using the Öresund bridge allows to recover the loss. The shunting charge seems to be more driven by a marginal costs based logic, since shunting cars generates wear on switches and other installation, but the level chosen seems to be based on a poor empirical background.

External costs are partially internalised via accident charges and diesel trains charges. Accident charges are currently based on average rather than on marginal costs, while recent studies provide indications that additional traffic decreases accident risk. In this sense current charges would appear higher than efficiency claims would require, but this conclusion is outweighed by the consideration that a number of accidents categories are currently excluded by the accident charge due to legal and procedural reasons. Altogether, it is realistic to believe that the current level of accident charges well approaches the optimal one.

The diesel fee appears to be a very rough way of internalising environmental externalities, both because its level was never adjusted after the first introduction of the charge in 1988 (mainly for regional policy reasons – much diesel traffic is operated in remote parts of the country) and because environmental costs of electric trains are simply not accounted for. Marginal environmental externalities seem therefore to be sensibly under priced. An assessment on the impacts on efficiency of possible realignments of the current environmental charges should take into account the impacts of non-electrified secondary railways and whether a similar charge for trucks on adjacent rural roads is in place.

A conclusion seems to be that current charges are lower than it would be economically efficient: nevertheless, governments have multiple objectives, and efficiency concerns are accompanied by regional policy, safety and environmental benefits concerns. A more appropriate way to raise this issue would be to ask whether the current pricing strategy has been efficient *given the existing policy constraints*.

Scarcity is currently not taken into account within the charging system. This should however be corrected, since an average cost based approach in a large network is likely to send incorrect signals and to depress demand at large rather than inducing operators to adjust their wishes.

The paper then describes a work-in-progress attempt of modelling and testing an auctioning mechanism for allocating track capacity: it is a desk-top test involving a number of operators interested in running train services who are asked to articulate their demand a bit more than they do with present techniques. In particular, they have to describe the ideal departure-arrival pattern and also define feasible deviations from the ideal departure for each and every service they want to operate. In addition, they need to specify a value or a bid function over these departure times. Demand data of this nature is fed into an optimisation programme that establishes the value-maximising solution to all wishes. Operators are informed about what departure time they are allocated – if any – and what they would have to pay in order to run their train accordingly; they

may then revise their demand specification. The process goes on as long as anyone would want to make changes of their demand scheme, thus providing a solution to the capacity allocation problem and generating a set of prices. This optimisation technique seems to have worked well (in the sense that changes of demand specifications generate the expected consequences for prices and priorities), and both the tool and the logic of the process prove to be user friendly. There are good reasons to believe that the mechanism could be applied to increasingly complex situations. An interesting feature of an auctioning mechanism is that it would not allow shifting the burden of the new cost over to passengers or freight customers. The reason is that the auctioned price would be a fixed cost for the operators, not part of their cost for running the system. The congestion price would therefore have to be paid out of the operator profits.

In conclusion the willingness to step away from a cost recovery perspective, which often seems to be an obstacle against marginal cost pricing, does not raise the same concern in Sweden, as it does in several other countries. Sweden's railway sector is rather organised so that it is feasible to introduce charges that comply with an efficiency-enhancing structure. The country's problem in this context seems to be that charges have been cut by more than it would be efficient. The present paper thus concludes that the price for infrastructure use should be raised in order to take all social marginal costs into account, in particular adding marginal reinvestment costs and scarcity costs.

### **8.3 The discussion**

The session chair began by acknowledging that different countries find themselves at different stages in the railway reform process and may have different approaches to implementing reform, but highlighting that the European Commission wishes to promote consistent implementation and harmonisation of rail infrastructure charging regimes throughout the EU. Following the two papers, Heike Link, the workshop discussant, began by highlighting the need to view pricing as part of the wider policy framework for achieving a better railway system and put forward four key questions:

- What is the appropriate institutional arrangement?
- What is the best approach to competition?
- What is the best charging regime?
- What regulation should there be?

To this, the session chair then added a further set of key questions:

- Should we harmonise cost calculation methods?
- Should environmental components be compulsory within rail infrastructure charges?
- Is there a good case for cross financing rail from the charging revenues raised from other modes?
- Is rail a worthy recipient of major subsidy?

Initially, the issue of scarcity pricing was raised as a means of ensuring an efficient allocation of scarce railway capacity. There appeared to be general agreement amongst the group that current capacity allocation and charging practices did not necessarily ensure that 'best' use is made of rail capacity. In fact, it was suggested that the social costs associated with scarcity could be quite large for particular parts of the network where there are several competing – often conflicting – demands from train operators. Several members of the group expressed interest in Nilsson's work on auctioning. However, two or three of the group members highlighted potential practical difficulties in setting up appropriate auctioning systems, e.g., the number of parties who might need to be involved in the auction and the acceptability associated with governments, interested in pursuing

social objectives, having to bid against commercially-driven train operators for paths. They cautioned against the Commission putting auctioning forward as the way to deal with the scarcity issue and recommended that alternative means of dealing with the issue be investigated further. Nilsson argued that until auctioning of train paths was implemented somewhere, we would be unable to know how important the practical concerns might be.

Secondly, the issue of objectives was raised. In their paper, Nash and Matthews argued that the most important objective is to achieve efficient use of the rail infrastructure. However, a number of contributors stated that it was important not to lose sight of the need to produce an efficient transport system. Whilst we should definitely aim to make efficient use of the infrastructure we have, we should be trying to ensure that what we have is tailored to the services we are trying to provide. There appeared to be general agreement that providing an efficient transport system was an (perhaps the) important objective and that pursuit of this objective would require investment and regulation, as well as pricing. It was strongly argued that we need to look at pricing, investment and regulation as a package. One contributor highlighted that the Commission is implementing a package of reforms precisely along these lines; efficient infrastructure charging, CBA mandated investment and, perhaps not explicitly enough, independent regulation.

Concern was expressed by one contributor that we were focusing on short run, rather than long run, marginal cost pricing. From a business perspective, he argued that the railway should generate revenues to fund investment and long run marginal cost pricing would offer the scope to do this. However, it was highlighted that there are so many ways of expanding capacity to different degrees, to different qualities, with different costs associated with them all, that it is extremely difficult – if not impossible – to calculate a tariff based on long run marginal cost. The obvious alternative means of accounting for the costs of investment is to let people negotiate about the enhancement investment, and who is going to pay for it; but this can be enormously complicated where there are several train operators involved.

The related question arose as to whether or not development of the rail network is actually the responsibility of the state. It was argued that, both in practice and in an efficient regime, the government ends up paying more than 50% and, therefore, the state cannot avoid its responsibility. It was further argued that if it is seen as sensible that the users contribute, it is actually more efficient to do that via the prices to end-users than via the infrastructure charges. The further related question of whether there should be cross-financing of rail from revenues from other modes was also raised. It was argued that, within the context of short run marginal cost pricing and CBA mandated investment, cross financing makes good sense.

Surprise was expressed that so much attention appeared to be being given to ensuring efficient use of the rail infrastructure, where as ensuring a ‘level playing field’ – ensuring that charges, and more generally the terms of competition, were comparable across the different modes – seemed to be receiving much less attention. This was re-enforced by another contributor who stressed the importance of getting the relative prices of rail and of road ‘right’. Another contributor acknowledged that relative prices and a ‘level playing field’ are important issues but suspected that these were better dealt with via the prices to end-users – i.e. rail fares - than infrastructure charges. For the infrastructure charges, he argued that it is important to give incentives to train operators to make best use of the network and that this is achieved through infrastructure charges based on short run marginal social cost.

It was re-emphasised that we do have charging systems in a number of countries across Europe and that this represents progress in the process of railway reform. The difficulty, it was suggested, is not how to implement rail infrastructure charging but how to ensure that a harmonised approach to charging is pursued throughout the EU. The task force, set up by the Commission to look at ‘best practice’ in rail infrastructure charging was noted as a very useful contribution to facilitating the

development of a harmonised approach and interest was expressed in learning more about its findings when they become available.

In summing up, the chair highlighted the following key issues:

- There is a need to recognise that there is a diversity of charging systems throughout Europe and barriers to implementing more efficient charges are different in different countries;
- Efficient use is the over-riding objective for infrastructure charges but we should not lose sight of other objectives, particularly the over-arching one of providing an efficient transport system;
- There is a vital role for a rail regulator;
- We need to consider rail within the bigger picture. As such, relative prices and a level playing field are crucial issues, as are investment and regulation;
- There will be a need for phased implementation but we need to ensure phasing does not endanger compatibility between countries and modes;
- The scarcity issue needs further research.

## 9 Conclusions

The second IMPRINT-EUROPE seminar aimed at fostering the debate among stakeholders, policy makers and researchers on the issues of transport pricing reforms: some of these issues assume a different relevance according to the mode considered, others should be dealt with in a more global perspective either because they are common to all modes or/and because they have to do with interactions between modes. The second seminar combines a macroscopic point of view (trans-modal issues) with a microscopic one (modal issues). The fruitful exchange of experiences, research results and policy makers' views allowed, on the one hand, to review the state of the art based on achievements so far, on the other to outline the way forward, in terms of both research and implementation.

The *plenary session* aimed at highlighting the key points of the process of pricing reforms from a global perspective. Those turned out to be primarily open issues, rather than policy conclusions to be readily fed into transport strategy formulation: a major contribution of this session was, in fact, to point the most critical areas to both researchers and policy makers. The strong message from the plenary sessions was that there is an urgent need to reinforce two-way communication between researchers and policy makers, also through the establishment of dedicated discussion platforms. This is essential in order to calibrate and validate research, and provide answers to basic questions such as: is research sufficiently advanced? Is the available information credible, especially when based on modelling? Given the current status of research and implementation, it emerged that the way forward is twofold: research, and in particular the analysis of the impacts of reforms, must proceed in parallel with implementation, in order to create a virtuous cycle in which research and policy making mutually feed each other.

The main conclusions are summarised below:

- Comprehensive analysis of impacts (I) – impact assessment must explicitly include: a) economic impacts (considering all the variables affected), b) distributional impacts (some very delicate issues have to be dealt with – transferral of rights from users to authorities, communal rights to environmental benefits, etc. – winners and losers must be identified across the whole system), and c) spatial impacts (both in the short and in the long term, also considering spatial impacts of phased implementation)
- Comprehensive analysis of impacts (II) – relative impacts between modes must be assessed taking into account relative prices and relative elasticities
- Impacts, values and responses – is research sufficiently advanced? Is the available information credible, especially when based on modelling? Increasing the number of practical experiences is crucial to validate research outputs.
- Surpluses and deficits from pricing reforms – their magnitude and the approach adopted to handle them is likely to affect the acceptability of reform policies.
- Optimal prices vs optimal capacity - Optimisation of prices should proceed jointly with the optimisation of capacity for all modes; research is needed in this field, mainly through multimodal modelling enabling to assess impacts in a global perspective
- Costs of provision – there is a need of increased knowledge of the effects of transport pricing on suppliers, while the knowledge of impacts on demand is well advanced
- The issue of the impacts of pricing reforms in non-EU countries was raised. The effects on transit traffic, the risk of discrimination of non-EU traffic are only few examples of major expected impacts: more resources should be devoted to assessing these and other related issues.

Despite a general agreement on the most global issues related to transport pricing reforms, a comparative analysis of research, reforms and consensus within the single modes of transport reveals a very uneven state of advancement.

Pricing reforms in *interurban road transport* seem to have reached a stage of maturity, both in terms of methodological tools available and of consensus among researchers, stakeholders and policy makers. In this area much is happening that could help seize the opportunity for implementing pricing reforms, especially on the technological side: a “window of opportunity” is open. The main points of discussion are recapped below:

- Interoperability is still a critical issue: a decisive step up in policy formulation and adoption is urgently needed to prevent the implementation of a patchwork of non interoperable systems.
- A EU legislative framework is still lacking – implemented or planned schemes are still focused on a national perspective.

A similar “window of opportunity” is also open for what concerns *urban transport*: several experiences (London, Oslo, Rome, the PROGRESS cities) were presented at the seminar, confirming that an increasing number of cities, spread all over Europe and the accession countries, are already well into the process of rationalising and increasing the sustainability of their transport systems, notably through the design and implementation of pricing policies. Although it seemed clear that no models exist that could be easily transferred from one city another, a broad consensus was achieved on the following issues:

- From a methodological point of view the concrete applicability of the marginal cost pricing principle in urban areas, at least in the short run, is still a challenge. A pragmatic approach seems to be the most effective one, starting with simple pricing schemes, although far from optimal prices. Fine-tuning of objectives and schemes can come in the long run.
- The focus must be kept on the links between transport policies and land use, a complex relationship that has both short and long term implications. Little is known concerning the latter: a close monitoring of implemented schemes will therefore be very important.
- A great help to the overcoming of the problem of political acceptability could come from the presence of a strong political willingness, or of a champion
- Policy definition and technology have to run in parallel
- An integrated approach taking into account all components of the urban transport system (private, commercial, public transport) is necessary both because of their potential for reform and because of the mutual impacts of change
- More attention should be devoted, also by researchers, to freight transport (long term effects of pricing on retailing and distribution could be significant) and public transport (in this field there is a general resistance to reforming fare level and structure: marketing and communication issues often have a prevailing influence in the decision making process).

Discussion on *rail transport* focused on the highly significant issue of scarcity and allocation of railway capacity. The following issues were pointed out as relevant:

- Scarcity costs can be quite substantial. Auctioning was widely discussed, but numerous concerns regarding its implementation remain.
- Pricing has to be seen as one of the facets of a wider policy framework: coupling the objectives of achieving a more efficient infrastructure use and maintaining quality standards in service provision requires the adoption of wide packages of measures including pricing, investment and regulation.
- A wide consensus emerged around the need of an independent regulator for rail transport.

Beyond the vital situation of the urban, interurban road and rail transport, other modes seem to lag behind, mainly in terms of consensus around pricing issues and actual implementation: it is the case of air transport, maritime transport, intermodal freight. In all three modes there is a great need of increasing the knowledge of current market mechanisms and pricing rules: the lack of transparency is a concrete hindrance to any kind of reform.

Concerning *air transport*, the discussion developed around two main issues:

- The issue of scarcity and allocation of airport capacity needs to be forcibly addressed and possible options (such as for instance slot trading) further discussed
- An issue still open for debate is that of the possible effects of more differentiated airport charges (recent studies deal with the impacts of marginal cost based charges)

*The maritime and intermodal transport* sectors are complex systems, where many are the methodological issues still open, and where efforts in research on basic features of the market should be enhanced before devising any pricing reform. In particular, the issues that gathered a wide consensus among attendants are listed below:

- Research must go ahead, privileging bottom-up research projects aimed at clarifying the basic features of the market.
- An institutional platform gathering operators and policy makers is needed to design possible pathways of institutional reform and to cope with the complexity of institutions and objectives of the intermodal and maritime sectors players.
- More resources should be devoted to assessing possible impacts of pricing reforms in non-EU countries (e.g. the effects on transit traffic and the risk of discrimination of non-EU traffic)
- A more fundamental question was raised, prompting answers from both policy makers and researchers: are pricing instruments effective in correcting inter-modal distortions? In maritime transport, transport costs only account for a small share of total costs of a logistic chain: pricing policies impacts on demand and supply might therefore be lower than expected.

The modal heterogeneity outlined above also reflects on the ultimate effectiveness of this second seminar in fostering exchanges between policy makers, researchers and stakeholders. In fact, while some of the sessions benefited from a well balanced presence of policy makers, researchers and stakeholders, for others it proved more difficult to attract and involve representatives of the industry: this was a major issue mainly for air transport, maritime and intermodal freight transport. As a result, both the focus and the outcome of the discussion for these modes are clearly oriented towards methodological and analytical aspects, although valuable inputs from the implementation side were provided in the papers presented (the RECORDIT project, dealing with intermodal freight transport, that saw a significant number of operators involved, and the Swedish environmentally differentiated fairway charges scheme). This is clearly a further sign that modal transport markets have so far achieved varying degrees of maturity in terms of their capacity of undergoing reforms, and that major additional efforts must be made to seek the active involvement of stakeholders into the debate.

Some of the questions above will be tackled in the following seminars: in particular the issues connected with how measures can be packaged and what should be the pace and phasing of reforms will be dealt with in the fourth seminar, while the perspective of the accession countries and their peculiar features and needs will form the agenda of a specific seminar, the fifth of the IMPRINT-EUROPE series.

## References

- Banister, David (2002), “The integration of road pricing with land use planning”, Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Baumol, W J and Bradford D F (1970), “Optimal Departures from Marginal Cost Pricing”, *American Economic Review*.
- Berechman, Yossi (2002), “A Marginal Costs Pricing Scheme for Airport Operations and Externalities”, presentation held at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Institute for Transport Studies (2000), CAPRI Final report, Funded by the EC 4<sup>th</sup> Framework Programme, University of Leeds.
- Commission of the European Communities (1995), “Towards Fair and Efficient Pricing in Transport”, Brussels.
- Commission of the European Communities (1996), “White Paper. A Strategy for Revitalising the Community’s Railways”. COM (96)421 FINAL, Brussels.
- Commission of the European Communities (1997a), “Green paper on seaports and maritime infrastructure”, COM(97) 678 final, Brussels.
- Commission of the European Communities (1997b), “Proposal for a Council directive on airport charges”, COM(97) 154 final, Brussels.
- Commission of the European Communities (1998), “Fair Payment for Infrastructure Use: A Phased Approach to a common transport infrastructure charging framework in the EU”, COM(98) 466, Brussels.
- Commission of the European Communities (1999a), “Final Report on Estimating Transport Costs”, High Level Group on Infrastructure Charging
- Commission of the European Communities (1999b): “Options for charging users directly for transport infrastructure costs”, High Level Group on Infrastructure Charging
- Commission of the European Communities (2001a), “Directive on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification”, Brussels.
- Commission of the European Communities (2001b) “European Transport Policy for 2010: time to decide”, COM 2001 (370), Brussels.
- Czerny, Achim I and Tegner Henning (2002), “Markets for runway and airspace capacities”, Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Dix, Michèle (2002), “The Central London Congestion Charging Scheme - From Conception to Implementation”, Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels

- Eliasson, Jonas. (1998), "Mathematical models for analysing land-use and transport policies". KTH, Stockholm
- Friedrich R, Bickel P and Krewitt W, eds. (1998), "External Costs of Transport", Institute of Energy Economics and the Rational Use of Energy (IER), Stuttgart.
- German Scientific Advisory Council on Transport (2000) "Fair Payment for Infrastructure Use: Outline of an Alternative Approach to the European Commission's White Paper",
- Glazer A, Link H, May AD, Milne DS and Niskanen E (2001), "Barriers to transport pricing", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Goodwin PB (2001), "Transport pricing and broader economic and environmental objectives" Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Harrington, Winston, Krupnick, Alan J. and Alerini, Anna (2001), "Overcoming public aversion to congestion pricing" in *Transport Research Part A* 35, pp. 93-111. Elsevier Science Ltd
- Harsman and Wijkmark (2000), "Pricing Measures Acceptance", PRIMA - Final report for publication, Brussels.
- Harsman B (2001), "Acceptability of Urban Road Pricing", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Herry M (2001), "Barriers to Pricing Reform in Inter-Urban Transport", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Institute for Transport Studies (2000), PETS - Pricing European Transport Systems, Final report for publication, Brussels.
- ISIS et al (1998), "QUITS – Final Report", Funded by the EC 4<sup>th</sup> Framework Programme, Brussels.
- Ison, S. (2000), "Local authority and academic attitudes to urban road pricing: a UK perspective in Transport Policy", pp. 269-277, Elsevier Science Ltd.
- Jan Eric Nilsson (2002), "Pricing the Use of Sweden Railways; Are Charges in line with Marginal Costs?", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Johansson, Börje and Forslund Ulla M. (2000), "Road pricing as a traffic management tool" in Bång, Karl-Lennart (ed) *Traffic in major cities: Problems and prospects*, KTH, Stockholm
- Jones, Peter. (1998), "Urban road pricing: public acceptability and barriers to implementation" in Button, Kenneth J. and Verhoef Erik T. (eds) *Road Pricing, Traffic Congestion and the Environment*. Edward Elgar, Cheltenham, UK - Northampton, MA, USA
- Kendzia, Daniel (2001), "Reforming prices in inter-urban transport", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Langmyhr, Tore (1997), "Managing equity: The case of road pricing", in *Transport Policy*, Vol. 4, No. 1, pp. 25-39. Elsevier Science Ltd.

- Lindberg, Gunnar (2002), "Recent progress in the measurement of external costs and implications for transport pricing reforms", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Lindblom, Charles E. (1977), "Politics and markets: The world's political economic systems", Basic Books, Inc. New York
- Lindsey, C. R. and E. T. Verhoef (2001) "Traffic congestion and congestion pricing", in D. A. Hensher and K. J. Button (eds.) (2001) *Handbook of Transport Systems and Traffic Control*, Handbooks in Transport 3 Elsevier / Pergamon, Amsterdam, forthcoming.
- Nash CA and Matthews B (2001), "Why reform transport prices?", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Nash CA and Matthews B (2002), "Implementing Rail Infrastructure Charging Reform - Barriers and Possible Means of Overcoming Them", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Niskanen, E. et al. (2001) "AFFORD, Final Report", Funded by the EC 4<sup>th</sup> Framework Programme, VATT Finland
- Proost Stef, van Dender Kurt, et al. (1998), "TRENEN - Final Report", Funded by the EC 4<sup>th</sup> Framework Programme, Leuven.
- Quinet E (2001), "European pricing doctrines and the EU reform", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Ricci A and Fagiani P (2001), "Reforming prices in Urban Transport", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Ricci, Andrea (2002), "Intermodal transport pricing – lessons from RECORDIT", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Rietveld, Piet and Verhoef, Erik T. (1998), "Social feasibility of policies to reduce externalities in transport" in Button, Kenneth J. and Verhoef Erik T. (eds) *Road Pricing, Traffic Congestion and the Environment*, Edward Elgar, Cheltenham, UK - Northampton, MA, USA
- Rouwendaal, J., De Palma, A., De Borger, B., Lindsey, R., Niskanen, E., Pels, E., Proost, P., Shepherd, S., Van Dender, K., Verhoef, E. T. (2001) "Relevant Optima: First- best and Second- best", MC-ICAM Deliverable 2.
- Roy, Rana (1998), Infrastructure Cost Recovery under Allocatively Efficient Pricing, UIC/CER Economic Expert Study: Final study report, London, March 1998, published by the UIC, Paris, 1998
- Roy, Rana (2000), "Revenues from Efficient Pricing: Evidence from the Member States", UIC/CER/European Commission DG-TREN Study: Final study report, edited by Rana Roy, London, November 2000, published by the UIC, Paris, 2001
- Roy, Rana (2002), "The fiscal impact of marginal cost pricing: the spectre of deficits or an embarrassment of riches?", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels

- Sansom T (2001), "What policy-makers require from Transport Pricing Research", Paper presented at first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Smith, Richard (2002), "Urban public transport pricing schemes. The context and options", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Sullivan, Edward (2002), "Implementing Value Pricing for U.S. Roadways", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Swahn, Henrik (2002), "Environmentally differentiated fairway charges in practice - Swedish experience", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Teule, Olga (2002), "Pay per kilometre. A Progress Report", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Tomassini, Maurizio (2002), "The PROGRESS project - The city of Rome scheme", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Van de Voorde, Eddy (2002), "Port Pricing Issues. Considerations on Economic Principles, Competition and Wishful Thinking", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Verhoef ET (2001), "Key implementation issues from the economic perspective", Paper presented at the first IMPRINT-EUROPE seminar, 21-22 November 2002, Brussels
- Viegas et al. (2000), "Socio-economic principles for price acceptability", PATS deliverable D2, Funded by the EC 4<sup>th</sup> Framework Programme, TIS.PT Lisbon.
- Viegas, José (2002), "Tolling Heavy Goods Vehicles on European Roads: From a Diverse Set of Solutions to Interoperability?", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels
- Wild, Dieter (2002), "Integration of freight in urban pricing schemes", Paper presented at the second IMPRINT-EUROPE seminar, 14-15 May 2002, Brussels