DIFFERENT
User Reaction and Efficient DIFFERENTiation of Charges and Tolls

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Deliverable 3.1 First Survey of Theory on Differentiated Charging; Formulation of Hypotheses and Methodological Framework

Executive Summary

The objective of this deliverable is to develop a theoretical framework for the analysis of differentiated pricing schemes in transport markets. The scope of the study is limited to the contribution of economic theory; a subsequent deliverable will focus on the behavioural theory. The background economic theory is documented in a previous deliverable and is used as a starting point here to define hypotheses for the further analysis in the DIFFERENT project.

Economic theory provides a contribution along two main lines. The first contribution concerns the formulation of the optimal framework (the *normative* approach) for transport charges differentiation. It is reached pursuing economic efficiency, a concept derived from welfare economics, according to which transport charges (prices) should be equal to marginal social costs in order to obtain maximum social welfare. According to this theory, prices should be equal to marginal social cost (throughout the economy) to achieve this goal.

The second contribution of economics addresses various difficulties in the application of the marginal cost concept, due to technological, institutional and political reasons, leading to deviations from first-best pricing rules, i.e. towards second-best pricing approaches. This approach moves from a normative approach (how transport charges should be in order to ensure welfare maximization) towards a *positive* approach (how transport charges actually are in order to take account of several constraints).

The normative approach focuses in a first step on how pricing schemes should be defined as a function of the price setting agents, their aims, resource cost structures and general demand properties. The aims of the agents involved can range from the very general (e.g. *economic efficiency* which comes down to welfare maximisation) to the very case specific (e.g. profit maximisation). Sometimes, an aspect of welfare is considered only (e.g. the environment), but the focus can also be limited to subgroups of the users (e.g. equity).

Cost structures enter the game where large economies of scale exist. Such a situation is frequently observed in transport markets which typically require robust infrastructure investment (roads, ports, airports as well as rail infrastructure). Such a situation is likely to result in monopolistic tendencies, and marginal cost pricing will lead to deficits. Another resource cost related issue is the implementation of an institution to collect the differentiated price. Such an institution comes at a significant cost, so that as a result a simplified pricing scheme may be preferable.

Demand side parameters play an important role in the determination of optimal pricing schemes when significant differences exist in price elasticities over consumer subgroups. Also the existence of barriers to competition can induce differentiated pricing schemes.

Taking the different parameters together results in a *first-best* scheme that is typically highly differentiated along many behavioural dimensions.

In a second step the normative framework focuses on behavioural responses to a differentiated pricing scheme. The point here is that the degree of differentiation may have an impact on the efficiency of the pricing scheme as well as on its acceptability. As the scheme becomes more and more complex, a significant decision making cost is experienced by the user. Taking into account this decision cost leads to an optimal degree of differentiation that is lower than what a first-best outcome suggests. Other considerations regarding behavioural responses include how acceptability may depend on misunderstandings on who is actually paying the bill as well as which exemptions exist - exemptions that typically have an adverse effect on the effectiveness of the price measure. Elasticities can provide indicative and useful answers to the questions about the effectiveness of a policy measure. However,

policy makers must realise that *the* elasticity of some measure does not exist: elasticities of travel demand very much depend on the contexts.

The normative approach has been illustrated in past research by modelling exercises which mainly focus on pricing schemes motivated by traffic congestion and to a lesser degree environmental damage by emissions. The suggested modelling frameworks allow simulating different pricing scenarios featuring varying degrees of differentiation. A measure of relative efficiency can be obtained by comparing welfare increases (or another objective variable) to a first-best optimized scenario.

The bottleneck model provides a simple representation of peak load congestion and has received much attention in literature. Significant welfare gains are obtainable even with a rather simple tolling scheme.

For transport emissions simulation of the degree of detail requires a more elaborate modelling framework (including stock composition which requires for a dynamic modelling setup). Past research indicates that state-of-the-art vehicle technologies have a rather small external emissions cost which limits the potential welfare gain of differentiated pricing. Moreover, the current level of fuel taxes is too high to allow for further reduction of CO_2 emissions in a cost-efficient way in road transport markets (in fact these taxes could be considered as a severe market distortion), further limiting the potential of environmental pricing schemes.

The positive approach describes the impact of policy makers and interest groups on the differentiated price structure. Special Interest Groups (SIGs) are interfering in the political field in order to gain as many advantages as possible for their members. Theoretical contributions in this field focus on the provision of information and campaign contributions.

Past research indicates that for the transport sector, SIGs will certainly interfere in the political process in favour of their members. Their main concern is (according to the existing research) to achieve a certain degree of regulation, which guarantees the skimming of rents. This means that most of the SIG's activities are concentrated on imposing regulation and hence a certain price level. Laffont's contribution to the modelling literature indicates that when a pricing policy is already implemented the activities of the SIGs will centre not only on the tariff *level*, but also on the tariff *structure*, that is on the type of differentiation.

A policy-maker maximizes his personal utility but at the same time she/he takes into account also normative elements such as consumer surplus or more general welfare. SIGs will try to influence the political process and so to implement a policy according to their own preferences. SIGs favour of course regulation, but they will also try to affect the price level and/or the price structure.

The increasing number of well informed citizens, however, induces policy makers to be very careful. For the SIGs, the job becomes more difficult and more refined ways of influencing the policy makers are developed in order to still enhance the welfare of their members.

An overview of the DIFFERENT case studies provides a state-of-the-art of the implementation of differentiated pricing schemes. The overview is based on information collected through a factsheet form that is based on the methodological framework developed.

The factsheet allows identifying the different dimensions of each case study which are relevant for success or failure of the different cases. These factsheets are however only a preliminary presentation of the case studies which will receive more attention in a next step in the DIFFERENT project when the different cases will be analysed.