



# **Differentiation of infrastructure charges – potential and impacts**

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## **1. Special issue introduction**

This special issue of *European Transport* contains a selection of six papers that are all based on the findings of the DIFFERENT project. DIFFERENT was a two-year project, co-funded by the European Commission's DGTREN under the Sixth Framework Programme of Research.

DIFFERENT started from the premise that in the European Union, levels and structures of transport infrastructure charges vary strongly across transport modes and countries. In the presence of unsolved difficulties in funding transport investment and serious concerns about the envisaged application of marginal social cost pricing, any convergence is slow. Furthermore, existing charging regimes are often far from internalising external costs and rarely based on efficiency principles. In this situation, differentiation of existing charges appeared to be a sensible intermediate step that merited dedicated research based on four building blocks: economic theory and behavioural theory provide the foundations, while the main pillars are empirical research based on case studies and modelling work.

The first of the six papers, by *Jasper Knockaert, Christos Evangelinos, Piet Rietveld and Bernhard Wieland* starts with an explanation of the economic theory, in particular the concepts of normative and positive theory, but then continues to explore the empirical evidence to establish how different factors affect infrastructure pricing as described by theory; these factors are: aims of the pricing scheme, user demand, cost structure, the cost of price differentiation, but also political factors. To this end information was collected from 27 case studies, and a cross-case analysis was carried out based on a number of hypotheses that were drawn from the theoretical framework. Testing for the hypotheses using the case study information allowed identifying how key aspects of the theory of price differentiation are dealt with in the setting of actual implementations and helped establishing an overview of the current state of differentiated infrastructure charging. One of the key conclusions of the paper is that

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lobby activities are a major explanatory variable for the differentiated charging structure.

The second foundation of the DIFFERENT project, behavioural theory, is the basis for the paper by *Lars Rößger, Jens Schade and Terje Tretvik* and applied here in the context of freight operators. While it is often argued that behavioural aspects are only important for passengers, and freight operators will base their decisions on purely rational aspects, the authors found here that a positive attitude is also for this group an important factor for prospective success and effectiveness of a pricing scheme. This finding was based on 18 telephone interviews with hauliers operating in an urban environment and questionnaires filled in by 17 involved in interurban transport. More generally, the results show that a global index of acceptability of differentiation elements is particularly strongly correlated with the likelihood of future behavioural changes in the medium term as well as in the long term.

The case studies used for the empirical work in DIFFERENT covered all four transport modes: waterborne, air, rail and road; however, of the four remaining papers in this issue, two address road user charges and two rail charges.

The first one of the papers related to road charging, by *Davide Fiorello and Angelo Martino* focuses on charges for motorways, with some alternative options also charging on national roads. The two test beds used are the Brenner Corridor, which has mainly through-traffic and no capacity problems, and the Padana region with two motorways with mainly local traffic and high levels of congestion. For the Brenner Corridor, an “environmental” differentiation of charges leads to an increase of travel time in all tested scenarios, because part of the traffic shifts onto the ordinary roads, with an overall worsening of congestion. The best results here were achieved when truck motorway tolls were reduced and, at the same time, goods vehicles were tolled on ordinary roads, since this caused a cross-shift of cars from the motorway to the ordinary roads and vice-versa for goods vehicles and, as a result, both segments benefited from less congestion and reduced travel costs. For the Padana region it was found that total costs for travellers exceeded the benefits and, furthermore, that pollution was increased in all scenarios. Hence, the key recommendation in this paper is to fully investigate the overall network effects before introducing any charge on part of the network.

The second paper concerning road user charges, by *Peter Bonsall and Mike Maher*, is also based on modelling work, but compares the effects of motorway charges, urban road charges and schemes that combine both in metropolitan areas, where both road systems are closely interwoven. A wide range of scenarios was modelled for a network that was loosely based on the City of Edinburgh, covering strategies including full charging on all roads, on motorways only, on motorway access roads, on urban roads only, and at cordons. One key finding was that introducing charges on motorways has much lower benefits than charges on congested urban roads. Furthermore, independent of the type of road, charges linked to congestion turned out to be much more beneficial than per kilometre charges. The highest benefits overall could be achieved with “first best” charges, i.e. charges that reflect the social marginal cost of each vehicle on each link. However, when implementation costs are taken into account, the best performing scheme was a cordon charge combined with a per-km charge for use of motorways outside the cordon.

Within the first of the two papers related to rail charges *Bryan Matthews, Christos Evangelinos, Daniel Johnson and David Meunier*, focus, more specifically, on rail freight. The paper starts by summarising some findings from the very limited existing

literature on the effects of differentiated charging schemes, before continuing to investigate how users react to different charging schemes in the real world through 25 stakeholder interviews as well as observation of reactions in the British and French freight market and of the take-up of the Channel Tunnel. Furthermore, the effect of changes in rail access charge regimes on rail and road traffic in Britain have been modelled. In the real world, the relationship between charging structure, and even overall charging level, and demand for rail transport has been impossible to prove conclusively, in part due to problems accessing relevant data. However, the modelling indicated that different structures of access charges could incentivise rail traffic at least to some extent for longer transport distances.

The final, and second paper related to rail, comes from *David Meunier and Emile Quinet*; while focussing on just one transport mode they, at the same time, complete the circle back to economic theory. They explore the optimal infrastructure charges where the infrastructure manager sells the use of the infrastructure to operators, who act in an imperfectly competitive market and provide services to a downstream market made up of an infinite number of end users; thereby they focus in particular on Short-Run Marginal Cost Pricing. Following on from explaining the general concepts that apply in this situation, the authors then simulate a range of scenarios. In general, they established that in cases of imperfect competition the optimal tariff is highly dependent on the specificities of the situation, including the level of the cost of public funds, the nature of competition and the demand functions. More poignantly, they found that in many cases marginal cost pricing leads to non-negligible welfare losses. However, the final conclusion from this paper, as already implied in others before, is that more research is needed to fully explain the relationship between infrastructure charges, user reaction and overall impacts.