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Urban road pricing: a comparative study on the experiences of London, Stockholm and Milan

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Abstract

Urban road pricing schemes have been designed in order to reduce externalities generated by traffic. Main impacts regard: time loss due to congestion, local pollution, noise, contribution to climate change caused by emissions of GHGs, pavement costs and road damages, increase in accidents risks, extra-fuel consumption, decrease in quality of life. Moreover road pricing schemes generate public revenues.

The paper performs a comparative evaluation of the three main experiences of urban road pricing in Europe: London (in operations since 2003), Stockholm (in operations since 2007, after a period of trial in 2006) and Milan (in operations since 2008, with a shift from pollution to congestion charge in 2012). Since their launch, the schemes have been adjusted in terms of amount of charge, area of application and other features.

The schemes have been able to reduce negative externalities generated by traffic, such as accidents, congestion and emissions, up to different levels. A comparative analysis of the three schemes is provided. Determinants of differences in the effectiveness of the schemes are evaluated with a particular focus on elasticity of use of private vehicles to charge.

The results can be useful to design well targeted congestion charge schemes and to assess their efficacy.

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1. The ratio of urban road charging

Negative externalities generated by mobility have been studied by economists since the XIX century (Newbery, 1998 and 1990). Main categories of externalities regard environmental impacts, accidents and congestion.

Environmental impacts refer to local air quality degradation due to traffic emissions – causing health consequences, reduction of life expectancy, reduction of real estate values and damages to cultural heritage, noise – causing health consequences, stress and reduction of real estate values, contribution to global climate change through CO_2 emissions.

Accidents involve material damages to vehicles and injuries and deaths to people.

Congestion is responsible for loss of time, economic productivity decrease, extra fuel consumption and frustration.

Externalities are particularly relevant in urban contexts, where there is a high density of people living, working and moving and a high relative scarcity of space (CE Delft, 2008).

Externalities can vary with respect to three main aspects: place where they are generated, time and type of vehicle (CE Delft, 2011) – Tab.1.

Mobility in dense, high populated and attractive areas, like city centres or main commuting roads, generates higher levels of congestion and other externalities than in scarcely populated and isolated areas.

Mobility in peak hours generates higher levels of congestion and other externalities than in daytime off-peak and night hours.

Private motorized traffic generates higher emissions than public transportation (on per capita basis) and non-motorized modes. Trucks give a higher contribution to congestion than cars and motorbikes.

Table 1. Transport marginal extern costs in urban and non-urban areas in Europe in year 2008 (Euro/1.000 km) – our elaboration on CE Delft (2011).

	Urban area	Non urban area	Difference
Car	87	44	49,4%
Motorbike	271	106	60,9%
Bus	44	24	45,5%
Train	19	12	36,8%

Road users impose (in different measure externalities to other road users) and bear (in different measures) externalities from other road users. So mobility is characterized by reciprocal externalities and congestion can be considered a “club good” (McKinnon, Sharon, Browne, Whiteing, 2010). But road users also impose unilateral externalities to residents. Recent studies assess the relevance of health consequences on people resident in proximity of congestioned areas and roads (Invernizzi et al., 2011).

Externalities generated by mobility are not limited to environmental impacts, accidents and congestion and include pavement costs and road damages, loss of house values, decrease in quality of life, environmental and social impacts in the production of fuels and in the construction of road infrastructures, social effects of transport infrastructure barriers, like roads and rails (Delucchi, 2000; Danielis, 2001).

Estimates of externalities generated by mobility in urban areas vary depending on the specific factors described. An average estimation for European cities amounts to 55,4 euros/year per person (CE Delft, 2008).

Overall in European cities, the adverse impact of traffic resulting in air pollution, noise, greenhouse gas emissions, delays and traffic accidents causes an economic damage amounting to 100 billion € each year, corresponding to about 1% of the EU’s GDP (European Commission, 2007; Erdmenger and Frey, 2010)

Externalities can be treated in various ways. Economics instruments have been proven particularly effective at this purpose. In the case of urban mobility, park pricing has been widely introduced in cities and road pricing schemes have been introduced in a limited number of cities.

As Gervasoni and Sartori (2007) put in evidence, different tolling schemes have been designed, with diverse goals and functioning mechanisms: Road Tolls, Value Pricing, High Occupancy Tolls, Travel distance based charging, Travel time based charging, Road Space Rationing, Cordon-based charging, Zonal schemes, Satellite-based road pricing schemes.

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