



The effect of road pricing on traffic composition: Evidence from a natural experiment in Milan, Italy



Marco Percoco

PAM and Dondena Center, Università Bocconi, via Rontgen 1, 20121 Milano, Italy

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ABSTRACT

This paper aims to estimate the effect of road pricing on the composition of traffic. By considering the case of Milan, where a charge to enter the city centre was introduced in 2008, and by relying on an unexpected and temporary suspension of the tax, we analyse the effect of the policy on flows of vehicles classified by type of engine. We have found that a road pricing scheme shifted users from Euro 0–3 vehicles (i.e., those vehicles particularly polluting according to the European Emission Standards classification and produced before 2000–2001) to liquefied petroleum gas, bi-fuel and hybrid vehicles. However, the environmental benefits of the policy were limited by a substantial increase in the usage of motorbikes. This evidence calls for a consideration of the behavioural reactions of road users when making ex ante evaluations of the social profitability of road pricing schemes.

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1. Introduction

The internalisation of external costs of transportation is one of the most relevant issues policy makers and scholars have been dealing with in recent years. Congestion and air pollution are among the most relevant sources of externalities in urban centres and they are increasingly tackled through the adoption of road pricing schemes. The London Congestion Charge, introduced in 2003 and then modified to extend the treated area, is probably the most well-known and studied example (Banister, 2003; Givoni, 2012; Ison and Rye, 2005; Prud'homme and Bocarejo, 2005; Quddus et al., 2007; Santos and Bhakar, 2006; Santos and Fraser, 2006; Santos and Shaffer, 2004). Other examples of such policies are Hong Kong (Ison and Rye, 2005), Singapore (Santos, 2005), Stockholm (Eliasson et al., 2009), several Norwegian cities (Ieromonachou et al., 2006), and Milan (Percoco, forthcoming; Rotaris et al., 2010).

The effectiveness of these measures has received little attention and most of the studies argue there have been limited benefits from road pricing in terms of social welfare variation (Mackie, 2005; Prud'homme and Bocarejo, 2005; Raux, 2005) or pollution abatement (Eliasson et al., 2009; Percoco, forthcoming).

In this paper we study the effect of road pricing in Milan on traffic composition in the city centre. The rationale for analysing this type of outcome relies on the dependence of the effectiveness of those policy instruments on the types of vehicles circulating in the charged area and also on the behavioural responses of road users. Secondly, the best road pricing schemes may provide users

with incentives to use certain types of vehicles to avoid the payment of the charge or to pay less (this is often the case in reality). Therefore, the outcome of the policy crucially depends on the extent of this behavioural response. To the best of our knowledge, empirical evidence on this point is very limited. By using stated preferences surveys, Ubbels and Verhoef (2008) and Vrtic et al. (2010) have highlighted the relevance of behavioural responses of Swiss and Dutch car users respectively when evaluating road pricing options.

This paper contributes to the literature on the empirics of road pricing by estimating the effect of the congestion charge in Milan (the so-called Area C) on flows of several typologies of vehicles classified on the basis of engine type. By using daily data for 2012 and adopting a regression discontinuity framework, we estimate the effect of road pricing by exploiting an exogenous variation in its application created by a 50 day suspension imposed between 25 July and 17 September 2012 due to a ruling by the Council of State after protests by parking owners in the centre of the city. By observing the changes in the composition of traffic during those 50 days in comparison with the preceding and following days during which the charge was applied, we can infer the impact of Area C on traffic flows in Milan. In other words, as we are unable to study the effect of the introduction of road pricing because of the lack of data before January 2012, we make use of the aforementioned natural experiment of its temporary suspension to infer the impact of the charge.

Through our econometric analysis, we found that the introduction of the charge shifted users from Euro 0–3 vehicles to bi-fuel and hybrid vehicles. However, the environmental benefits of the policy are reduced by a substantial increase in the usage of

E-mail address: marco.percoco@unibocconi.it

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