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The impact of road pricing on housing prices: Preliminary evidence from Milan

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ABSTRACT

Road pricing is increasingly used as an economic tool to decrease the burden of transport externalities. Following the examples of several cities worldwide, on 2nd January, 2008, the city of Milan introduced a charge for accessing the city centre with the aim of curbing air pollution and congestion. The aim of this paper is to evaluate empirically the effect of such a charge on the housing market. By applying a difference-in-differences methodology, I find empirical support for a decrease in housing prices in the coverage area.

1. Introduction

Excessive growth in transport and mobility has been a universally observed phenomenon in both developed and developing countries, especially in large cities, in which traffic has been considered a by-product of development. Failure to internalize externalities has resulted in an increase in pollution and congestion, which have been tackled through the adoption of road pricing schemes.

The instrument of road pricing aims to achieve a reduction in congestion and impacts on the environment caused by car usage through the management of demand for road space. It is intended to ensure that each road user takes into account the impact of his or her journey on other road users and on the public and internalizes these effects. The primary economic motivation for introducing road pricing is that it enhances economic efficiency, which is effected by the change in travel behaviour as users balance the social costs charged to them against the utility represented by transportation. As a result, only those who value transportation highly enough will be willing to pay the levy (Fiorio and Percoco, 2007; Percoco, 2014a).

In general, road pricing is a Pigouvian tax intended to internalize either pollution or congestion, although once implemented, interactions between those two sources of externalities may emerge. After the introduction of road pricing schemes in cities such as Singapore, London and Stockholm, among others, the tax has been experimentally implemented in Milan, one of the most congested and polluted cities in Europe.

Despite the fact that it is served by a relatively large network of public transportation, the metropolitan area of the city of Milan is characterized throughout by high traffic levels and consequently by congestion and air pollution. With 0.61 cars per inhabitant, Milan is one of the cities with the highest car concentration in the world (WHO, 2011). Moreover, the daily average concentration of environmental particulate matter is constantly above the limit set by the European Union (50 $\mu g/m^3$).

In order to solve problems of congestion and pollution, the Municipality of Milan introduced in January 2008 an urban road pricing scheme for the city centre: Ecopass (a PASS to improve the air quality of the city (ECO)). This intervention was a pilot project consisting of an area-wide charge, designed on the model of the London congestion charge, for vehicles entering the 8 km^2-wide area of the city centre between 07:30 a.m. and 07.30 p.m. (from Monday to Friday).

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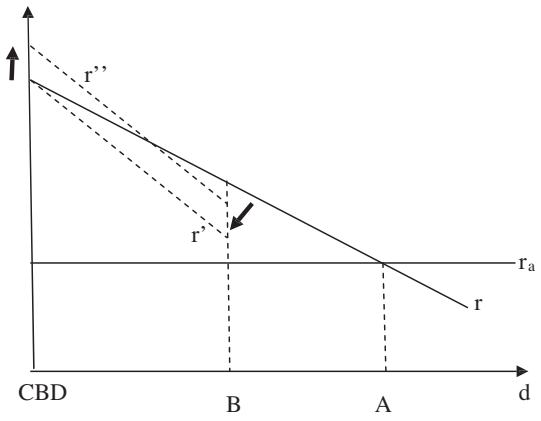

Fig. 1. Road pricing in the monocentric city model.

Despite the increasing popularity of such schemes, few studies have made an attempt at evaluating causally the impact of road pricing (Givoni, 2012). In this paper, we make a first attempt at evaluating the effect of the Ecopass in Milan on the real estate market, as reflected in housing prices. The rationale behind this research hypothesis lies in the reactions of housing prices to changes in transport cost and environmental quality, both effects produced by road pricing. By exploiting the spatial and temporal variation in the implementation of the Ecopass and through the estimation of difference-in-differences models with several spatial counterfactuals, we have found that the Pigouvian tax significantly reduced housing prices within the area subject to pricing.

The remainder of the paper is organized as follows: In Section 2, we present the theoretical rationale behind the possible effect of road pricing on housing prices. In Section 3, we present the Milan case. Section 4 presents the data, while methodology and results are given in Section 5. Section 6 concludes.

2. The effect of road pricing on housing prices

Free access to public roads often results in misallocation of resources, such as time, or adversely impacts the quality of the environment. To address this market failure, the introduction of a corrective tax, whose value is exactly equal to the monetary value of the cost imposed by each driver on other drivers, confronts each traveller with the social cost of his behaviour (Rouwendal and Verhoef, 2006).

The London congestion charge, introduced in 2003 and then modified to extend the coverage area, is probably the best known and most 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). Other examples of such a policy are found in Singapore (Santos, 2004), Stockholm (Eliasson et al., 2009), several Norwegian cities (Ieromonachou et al., 2006) and Milan (Percoco, 2013; Rotaris et al., 2010).

In this paper, we aim to estimate the effect of an increase in transport cost induced by road pricing on housing prices. In order to highlight the theoretical rationale behind this research hypothesis, let us consider the simple model of a monocentric city in which the housing rent, r, is a decreasing function of the distance, d, from the Central Business District (CBD), as shown in Fig. 1 (Kraus, 2006).

In order to make our framework resemble reality more closely, let us introduce an opportunity cost for land, r_a, which can be considered to be the alternative to housing development. In Fig. 1, the built environment, i.e., the city, has size A. It should be mentioned that the slope of the rent function in Fig. 1 is given by transport cost, as we assume that housing rent reacts to changes in distance to CBD depending on accessibility and generalized transport cost. Let us now assume that, because of congestion externalities, transport costs are under-valued in the area between CBD and B and suppose that the government introduces a congestion charge within that area. This policy intervention will result in a decrease in the housing prices in the area within B as function r will rotate to r' because of an increase in the magnitude of the slope. However, it must be noted that the introduction of road pricing will also produce an improvement in the quality of the environment and this will result in an upward shift of the rent function within B, which in Fig. 1 is depicted as a parallel shift of r' to r''. The aim of this paper is to estimate whether the net effect on housing prices of those two opposite impacts is positive or negative.

3. The Milan road pricing scheme[1]

Milan has one of the highest rates of car ownership in Europe. More than half of the population use private cars and motorcycles, a proportion ranking second only to Rome, placing it among the highest in the world (Percoco, 2010). The city

[1] This section relies on Percoco (2014b).