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# Regulating on-street parking - evidence from Danish data

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## **Abstract**

Around the world, cities use a range of types of policy to organize the parking market, e.g. physical planning, parking fees, restrictions on the maximum duration for on-street parking, introduction of parking permits, etc. This paper deals with the parking pricing.

A small but rapidly growing scientific literature analyzes parking. The economic literature has gathered around the idea that parking should be priced at its opportunity cost, just like any other commodity.<sup>1</sup> Small and Verhoef (2007) point to the fact that parking is underpriced in many urban areas. The main consequence of underpricing is cruising for parking and cruising for parking is a pure loss from the perspective of the society (Shoup, 2005; Calthrop and Proost, 2006). This problem is actually so large that Arnott and Inci (2006) finds that cruising for parking should optimally be eliminated. This is in the first best situation done by setting the parking fee large enough to eliminate cruising for parking without having excess supply of parking spaces, and in the

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<sup>1</sup> Most research available on parking policy is concerned with the effects on travel behaviour, on the optimal pricing of parking, or on the cost and benefits of parking policy (Van Ommeren et al., 2012; Chu, 2011; Barter, 2010; McCahill and Garric, 2010; Arnott and Inci, 2006).

second best situation where parking fees cannot be set optimally by increasing the number of parking spaces to eliminate the cruising for parking; again without having excess supply of parking spaces. Moreover, Arnott et al. (1991) finds that a spatially differentiated parking fee is necessary to induce the optimal parking pattern. Finally, Arnott et al. (2005) identify a potential triple dividend from pricing parking (reduce the search for parking, reduce congestion and the use of parking revenues to lower other taxes). So, parking pricing can be used as a part of package of transport regulating measures to internalize congestion and local environmental issues. On the other hand, hourly parking fees may to some extent result in shorter parking durations and thus increase traffic congestion by increasing parking turnover (Arnott and Inci, 2006). Glazer and Niskanen (1992) show that the impact of parking fees on congestion depends largely on the characteristics of the drivers in the relevant region. So, parking pricing may also increase traffic congestion. Therefore it is difficult in practice to find the correct amount of parking fees and parking spaces to eliminate cruising for parking and avoid excess supply of parking spaces. In order to determine optimal set of parking fees and optimal supply of parking spaces it is necessary to find demand elasticity with respect to prices for parking in the area of interest. In this paper the focus is on the demand elasticity for parking.

Although the parking issues are treated in the literature the subject still deserves attention and is underresearched and there is hardly any empirical work.<sup>2</sup> One exception is van Ommeren et al. (2012) who estimate the cost of cruising for parking in Amsterdam. This paper adds to the literature by empirically analyzing the demand for on-street parking in Copenhagen based on detailed census data for on-street parking in different parts of the city of Copenhagen for period 2008-2011 where different price levels and other parking restricting methods are used. The panel dataset used includes 6 counts (September 2008, April 2009, September 2009, April 2010, September 2010, and April 2011) of on-street parking in the area of Copenhagen including the number of legal

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<sup>2</sup> As also noted by Ison and Rye (2006) "*it is fair to say that not enough is known as to how individuals respond to both the introduction of a parking policy or how parking policy impacts on the provision of alternative modes of transport.*"

parking spaces and the number of occupied parking spaces for more than 700 streets. In Copenhagen the alternatives of off-street parking is limited, so it is reasonable to consider only on-street parking. The focus is on the proportion of parking spaces occupied. This is of interest as it is fundamental to know when and where there is excess demand for parking (which will introduce cruising and other externalities) or excess supply (which is very costly). The paper also deals with the general cost of parking consisting of direct cost (a parking fee) and an indirect cost. The last term reflects the searching costs (cruising) and these are increasing in the occupancy rate. Taking these two effects into account implies that the demand for parking will be more price elastic when the occupancy rate is relatively low (the search cost are low) whereas it will be less price elastic when the occupancy rate is relatively high (increasing the price lowers the demand which in turn reduces the search cost so altogether the total cost will not change much). The empirical results are in line with this. In many streets in Copenhagen the occupancy rate is very high and in fact close to 100% and the estimation results suggest that car drivers in Copenhagen only react slightly to increases in parking fee (DKK/hour).

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