Residential parking in vibrant city districts

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ABSTRACT

Living downtown can be advantageous because it enables convenient access to a variety of shopping and leisure activities, but a major disadvantage is the difficulty of finding a parking spot. We formally model the trade-off between privileged parking for residents and economic vitality in terms of the product variety available in a vibrant city district and identify situations in which assigning on-street parking spaces to residential parking constitutes an optimal policy, both from a welfare and a resident perspective. However, we demonstrate that privileged parking for residents is unlikely to result in a first-best allocation of on-street parking spaces, if an efficient level of economic vitality is to be ensured at the same time.

1. Introduction

Downtown areas and other vibrant districts of European cities are often both commercial and residential areas. Residents, a variety of retail stores and restaurants, and visitors from outside the district all add to the vibrancy. For car drivers, the downside of living in, working in, or visiting such a district is the struggle to find an individually suitable parking spot. Because many downtown areas and their surrounding districts of European cities were developed when car ownership was not nearly as common as it is nowadays, residents often lack sufficient private parking capacity, so that they are dependent on public parking spaces. Residents usually experience a high disutility from searching for a parking spot in "their" neighborhood and from possibly not being able to park close to their homes, so they often favor parking regulations that privilege them. However, residents of vibrant city districts normally also enjoy the variety of stores and restaurants in their neighborhood and they know that non-resident customers are relevant to the variety offered and that parking policies such as the establishment of resident parking areas can influence their visits negatively.

Still and Simmonds (2000) report results from both attitudinal studies and land-use/transport models supporting the argument that the economic vitality of urban centers is sensitive to the provision of parking. They emphasize the concerns local authorities often have when deciding on parking policies: retailing is important to local residents, and maintaining the economic vitality of urban centers also depends on shoppers from outside as well.

A non-resident visits a vibrant city district to shop, if the associated private benefit exceeds the associated private cost. In a setting where more shoppers add to variety that also benefits other people, but also induce a parking cost increase, due to more competition for a suitable parking spot, either too many or too few non-residents might visit the district at an unregulated (free on-street parking) equilibrium, depending on the magnitude of the overall external effect.

Assuming the absence of further market distortions, the available parking capacity is allocated in such a way that the aggregate parking costs of those who park in the district are minimal and the number of non-resident shoppers is optimal in the first best solution. We will show that parking fees/subsidies and self-selection may lead to the first best solution in a model with two types of consumers (residents and non-residents) and two parking facilities (on-street and a parking lot). For several reasons, however, the first best solution might not be feasible. Parking subsidies may provoke undesired behavior, such as visits by non-residents

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wishing to earn the subsidy, but with no intention to shop. Furthermore, self-selection through second degree price differentiation may be impossible if the residents and/or the non-residents differ in their preference for product variety and their cost of using the available parking facilities. Besides, if it is optimal that residents pay for parking in theory, it is unlikely that they do so in reality, either because of their lobbying efforts or because of urban development plans.

If residents have privileges on public parking capacities, municipalities apply some kind of a residential parking policy. In Germany, for example, there are basically two different residential parking policies: the residents are either exempted from paying the usually charged parking fees or they are exclusively entitled to use a specific share of on-street parking spaces, such as all parking spaces on one side of the road. In both cases, the residents need a residential parking permit that is issued by the municipal road traffic departments for an administrative fee of about €30 per annum.[1] Important to note is that such a permit gives a special parking right to the holder, but does not guarantee that there will be a parking space available.

In a partial equilibrium analysis, we discuss a residential parking policy according to which a certain share of on-street parking spaces is reserved for residents as an alternative to the first best policy that might prove elusive. We reveal under which circumstances assigning on-street spaces to residential parking would be rational in principle. Furthermore, taking into account that there is a trade-off between parking privileges for residents and economic vitality in terms of the product variety offered and valued by residents and visitors, we determine the optimal share of residential parking spaces. Additionally, because parking policies are decided on a local level and local voters are residents (Arnott, 2011), we further analyze the optimal share of on-street spaces allocated to residential parking from the resident perspective only and we find that it exceeds what is optimal from the welfare perspective. With regard to meeting the two objectives of minimizing the aggregate parking costs of those who park in the district and ensuring an optimal number of non-resident shoppers, such a residential parking policy is certainly inferior to the first best policy.

Since transport economists recognized that parking is a crucial element of urban transportation, parking has received increasing attention in the economic literature. Willson (1995) and Shoup (1999, 2005) discuss planning standards such as minimum parking requirements with regard to urban sprawl, automobile use, and the accompanying social costs. Furthermore, many publications address cruising for on-street parking in downtown areas, both in isolation and in the context of general traffic congestion as well as both in the absence and in the presence of an private off-street market (e.g., Glazer and Niskanen, 1992; Arnott and Rowse, 1999, 2009; Anderson and de Palma, 2004; Shoup, 2005; Calthrop and Proost, 2006; Arnott and Inci, 2006). These studies recommend parking fees that reflect the social cost of parking as an efficient solution, at least if there is no off-street market. In the presence of an off-street market, adjusting the on-street parking fee to the off-street price is found to be beneficial in case of an inelastic parking demand, since it reduces cruising for parking. This positive effect is empirically observed by van Ommeren et al. (2012) for the Netherlands, where parking fees on- and off-street are quite similar. To overcome the opposition of different parties that arises when the introduction of, or an increase in, on-street parking fees is discussed, Shoup (2005, p. 398) proposes the implementation of

benefit districts where the parking revenue "is spent to clean the streets, plant street trees […] and ensure public safety." In this context, he also addresses residential parking by contrasting the establishment of pure residential parking districts with a parking policy that "taxes foreigners living abroad", while residents park for free. van Ommeren et al. (2011) emphasize the inefficiencies that can result from such a policy. For the residents of Amsterdam, they estimate a marginal willingness to pay of about €10 per day for an on-street parking permit and find that it exceeds the actual tariff for a permit considerably, but that it is lower than the parking fee that non-residents pay, which implies an inefficient use of parking spaces. In a recent contribution, van Ommeren et al. (2014) estimate that each underpriced residential parking permit in fact induces an annual welfare loss of about €275 in Dutch downtown shopping districts. They state that the welfare loss mostly results from a loss in non-residents' consumer surplus because non-residents with a higher willingness to pay for on-street parking than residents are crowded out to more expensive garage parking spaces. To the best of our knowledge, however, residential parking has not yet been analyzed in the context of the trade-off between the minimization of aggregate parking costs of those who park in the district and the value attached to product variety offered in a city district that accommodates both residents and different types of businesses.

2. Model

We consider a city's vibrant residential and commercial district located at 0 on a [0,1] interval. The residents are homogeneous and their number is fixed and normalized to 1. The number of stores located in the district is denoted by s. Outside the district, a number of non-residents equal to the number of residents lives uniformly distributed on a [0,1] interval (Fig. 1).
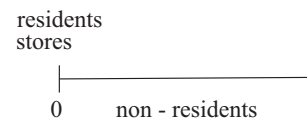

Fig. 1. Spatial model structure.

Stores and product variety: Each store offers one variant of a differentiated product. Although products are heterogeneous, we assume that each store sells a unit of its product at the exogenously given price τ. We further assume that the stores have a homogeneous cost structure. Marginal cost is zero, but each store incurs an entry cost $\epsilon = E(s)$, which rises the more stores enter the district ($\epsilon' = dE/ds > 0$), at either a constant or an increasing rate ($\epsilon'' \geq 0$). Such an assumption can be justified by the district's limited spatial capacity and the ensuing difficulties in finding an adequate location the more stores enter.

Both residents and non-residents value product variety and each resident and each non-resident who visits the district buys one unit of each product offered. The number of visiting non-residents is denoted by v, so that the profit function of each store i is

$$\Pi = \Pi_i(v, E(s)) = \tau \cdot [1+v] - E(s). \tag{1}$$

A store i operates in the district if $\Pi \geq 0$. For the marginal entrant, $\Pi = 0$ holds, so that there is no more entry as soon as $\tau \cdot [1+v] = E(s) = \epsilon$ applies. By means of the inverse function of $\epsilon = E(s)$, $s = E^{-1}(\epsilon)$, we find the zero-profit number of stores to be a function of the number of visitors

$$s(v) = E^{-1}(\epsilon) = E^{-1}(\tau \cdot [1+v]) \tag{2}$$

with $ds/dv = \tau \cdot [E^{-1}]' = \tau/E' > 0$ and $d^2s/dv^2 = -\tau \cdot E''/[E']^3 \leq 0$.