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The importance of spatial economics for assessing airport competition

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A B S T R A C T

This paper explores the relevance of spatial effects on airport competition. Drawing concentric circles of travel distances around it is the most commonly way to define an airport's catchment area. The characteristics of the catchment area and available substitutes are compared, and assessments of market power made. It is generally recognized that the existence of spatial competition among airports, lies within one market, although sometimes, overlapping circles are examined on the premise that competition lies within these common areas. We look at economic models of spatial competition where there is no overlapping and argue that the stylized facts inferred from economic models of spatial competition have been overlooked. After a short review of airport competition, we introduce economic models for spatial competition and look at the implications of these in the context of airport competition.

1. Introduction

The topic of airport competition has not received much attention, possibly airports have traditionally been viewed as natural monopolies in which the long-run average costs decline with higher output over the relevant section of market demand. The existence of a natural monopoly, therefore, depends on specification of the market and the position of the market demand curve, as well as the cost structure of the airport, about which we have little information.[1] There have been attempts by Morrell (2003) and others to challenge the view that airports cannot compete against each other. Their general view is that airports can compete on a range of elements, such as destination competition or location for an airline base, but they differ substantially concerning the strength of competition, the welfare effects and the rationale for regulation. Common to all papers is that competition could exist among airports that share, or are located in, a common catchment area. While we do not want to rule out that the former forms of competition exist, this paper aims at addressing the latter kind of competition. Although competition among adjacent airports or among airports in a common geographical area respectively refers to the phenomenon of spatial competition only a small minority of authors (Gillen and Morrison, 2003) have actually used models of spatial competition. Here we introduce some of those models and look at their implications with respect to airport competition.

2. Previous analysis

This paper concentrates on the spatial aspects of airport competition, although airports can compete on different elements or in different markets. The approach of Forsyth (2006), and others largely shares the same classification of the matrix of airport competition

- for a shared local market (overlapping catchment areas);
- for connecting traffic, especially for hub operation;
- for cargo traffic;
- in destination markets;
- across the board;
- in non-aviation markets; and
- with other modes of transport.

Competition for a shared local market can apply only if two or more airports have overlapping catchment areas. For example, it might be the case that a smaller airport has a sub-catchment area within the main catchment area of a bigger airport. This may be the case if a secondary airport competes with a main airport by attracting low cost carriers (LCCs).

Competition for connecting traffic exists between hub airports such as Frankfurt, London Heathrow, Schiphol Amsterdam and

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[1] The typical notion is that an airport has either an L or a U-shaped long-run cost function. If we consider that with continuing airport expansion more land is needed and that the opportunity costs of land use could be increasing, then average cost may increase at some point. Only under a U-shaped curve with sufficient demand would a market be able to sustain more than one airport. This, however, is not to say that economies of density and network effects are not present at certain airports.

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Paris Charles de Gaulle regarding transatlantic traffic. Airports may also compete for cargo demand, much of which is more price elastic than passenger traffic and can more easily shift from one airport to another. Competition for destination markets may develop because airports play an important role for the overall attractiveness of the destination it is located. Across the board competition refers to a situation when some airports, even if geographically separated, could be good substitutes for each other. This curbs their ability to set prices above marginal costs and would enable competition. The last two types of competition (in non-aviation markets and with other modes of transport) are of less relevance, since they are not directly related to competition among airports.

While Forsyth (2010) acknowledges that regional airports compete for LCC business, he remains skeptical about the strength of competition among main airports. Barrett (2004) and Starkie (2008) see several reasons why airports' market power might be constrained or might not be exploited.[2] One is that airports may operate under decreasing returns to scale. Regarding entry, Starkie sees the numerous military airfields in Europe as potential entry candidates and argues that airport substitution might be possible for connecting services and point-to-point services. He also points out the importance of spatial competition, but does not refer to a particular model of spatial economics.

3. Models of spatial economics

Neo-classical economists paid limited attention to the fact that economic interactions take place in geographic space. Starrett's (1978) spatial impossibility theorem, however, shows that perfect competition cannot exist if there are mobile producers/consumers and transportation costs, or if there are economies of scale. In other words, the neo-classical, competitive framework breaks down once we add space.

Furthermore, it cannot explain why agglomerations emerge. If the competitive framework was true, we would live in a "backyard economy" where there would be no need to travel because everything would be produced in one's own backyard. Spatial models are models of imperfect competition in which sellers have some pricing power. Firms and households are spread over different regions with production and consumption taking place in a spatial setting. Even if consumers have otherwise identical preferences for any good or service, transportation costs have the effect of creating different demand elasticities in spatially separated markets. Since airports sell their products to the local community, production and consumption of airport services takes place in a spatial setting. Thus competition is likely to be imperfect, which is relevant when explaining airport competition.

3.1. Spatial economics and airports

Hotelling (1929) developed a model that is still the basic foundation of modern models. In spatial models of competition, consumers typically face different costs. The mill price is the price of the product as charged by the firm. The second is the transportation cost, i.e., the cost of traveling to the firm. Transportation costs depend on the distance traveled and transportation price per unit distance (e.g., cents per kilometer).[3] The full price, or delivered price, is the transportation cost plus the mill price. It is sometimes also referred to as free-on-board pricing,[4] since consumers have to pay the mill price at the factory gate and then pay the full transportation cost to their own consuming location (Greenhut et al., 1987).

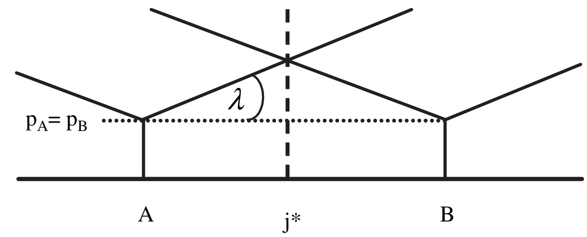

Fig. 1. A simple Hotelling model with two firms.

3.2. Explaining the model

The Hotelling model starts with a situation in which there are two firms located on a straight line segment representing geographic distance. These two firms are selling a homogeneous product to consumers who are evenly distributed along that segment. The firms are not restricted with respect to capacity and therefore they could, in principle, serve the entire market. It is further assumed that consumers buy only one product from one of the firms, or nothing at all. Hotelling assumed that prices were fixed and location was the endogenous variable. However, the model can also be adapted to encompass a situation in which locations are fixed and price is endogenous. This is more relevant to the case of airports, since airports obviously cannot readily change locations. Following Lipczynski et al. (2005), two cases can be distinguished in such a model: a collusive, or joint profit maximization, model and a non-collusive, or Bertrand competition, model. The former is used as a reference point for the case of monopoly in which one company owns two firms in two separate locations. We postulate there are two firms that jointly maximize their profits. The non-collusive model assumes that each makes its pricing decision based on the presumption that the other will keep its prices constant (Bertrand competition).

Fig. 1 depicts a typical Hotelling street with two firms, with p_A and p_B representing the mill prices charged by the two firms *A* and *B*.[5] The unit transportation costs are labeled λ and depending on the distance, the total transportation costs increase, which is shown by the diagonal lines.[6] As can be seen there is a marginal consumer (j^*), who is just indifferent between buying from firm *A* or *B*. All consumers located left of j^* will buy from firm *A*, and all consumers right of j^* from firm *B*.

The trade-off a firm faces is that if it increased its mill price[7] the marginal consumer would shift towards the firm, thus reducing the number of customers buying the firm's product, albeit with the remaining customers paying a higher price.

We have to add an assumption concerning the utility function, since one might want to bound total utility. If utility was not

[2] Starkie lists modal competition, countervailing power by airlines and the relationship between aeronautical and non-aeronautical services as further restraints of airport market power.

[3] The functional form of the transportation costs can be of considerable importance. Usually, linear transportation costs are assumed. However, a quadratic form typically ensures the existence of stable Nash equilibria in spatial models.

[4] The term is not entirely synonymous to the Incoterm, in which the buyer, or importer, pays all transportation costs up to the point where the goods are loaded onto the ship and the rest is covered by the seller, or exporter.

[5] For ease of discussion we assume symmetric prices.

[6] Since consumers can be located left and right of the firms each firm has its own funnel that represents the increasing total transportation costs which come on top of the mill price.

[7] Graphically this would mean that the firm's funnel – the diagonal lines – moves upwards.