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## Competition between multiproduct airports

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### ABSTRACT

We study airport competition when some types of commercial services, such as car parking or car rental, may be offered at the time of air ticket purchase through the Internet, in order to stimulate aviation demand. We find that airports set a lower aviation charge than they would have levied in the absence of concession services, when they are competing in online offers. Nevertheless, when only one airport pursues online offers, that facility sets a higher aviation charge than it would have levied in the absence of concession services, as long as profits from retail earned at the facility on the day of travel remain low enough. The Nash equilibrium of the game is such that both airports offer concession services online. This is welfare enhancing. Nevertheless, facilities might be caught in a Prisoner's Dilemma.

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### 1. Introduction

Commercial revenues have been growing faster than aeronautical revenues after airport privatization and commercialization (Graham, 2009; Morrison, 2009). At some medium to large sized United States and European Union airports commercial business represents 75–80% of the total revenues (ATRS, 2012).<sup>1</sup> In fact, airport side profits have turned out to be an important tool to ensure the ability of airports to finance the significant capital expenditure needed. Accordingly, commercial strategies have been structured to meet new factors influencing revenues such as changes in consumer behavior and the power of digital media (Belardini, 2013).

Airports increasingly make use of their websites or mobile apps to sell commercial services directly to customers – e.g., car parking, hotels, car hire and, sometimes, shopping or lounge access – or support the distribution of services offered by their partners (Halpern and Graham, 2013; Halpern and Regmi, 2013). This allows airports to react to the threat of Internet shopping, a major competitor in terms of product variety and ease of purchase (Graham, 2009). For instance, airports offer online discount programs to raise buyers' switching

costs and address the lack of customer loyalty due to the fact that competitors are just a click away. SITA (2013a) reports that, by the end of 2016, 63% of airports surveyed will offer ancillary services through mobile apps. In the same vein, SITA (2013b) shows that purchasing additional travel services via smartphone is considered more important than ticket purchasing to the majority of travelers surveyed and that 39% of the passengers interviewed would definitely buy ancillary services using a mobile.<sup>2</sup>

Empirical evidence shows that e-commerce is a growing trend in airport management. In 2011, Schiphol Airport attributed the 15.5% increase in long term car parking and the 5% increase in short term car parking to the growing number of reservations via the web (Schiphol Airport Group, 2011). Similarly, Aeroports de Paris points out the success of their online car parking offer: starting in 2010, parking at Paris Orly airport can be booked online up to six months in advance and 50,000 customers used this service in 2010 (Aeroports de Paris, 2010). Airport Information Management Solutions (AIMS) has built a new e-commerce platform, that sells flight tickets and commercial services, for Macau International Airport. Similarly, Airport Direct Travel (ADT) provides pre-booking reservation solutions and e-commerce platforms to Birmingham, Manchester, Belfast, Geneva, Glasgow, Leeds, London Luton and Stockholm Skavsta airport. Even airlines, whose websites are among the main platforms through which

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<sup>1</sup> One of the main reasons is that commercial operations tend to be more profitable than aeronautical operations (Jones et al., 1993), owing partly to the locational rents enjoyed by airports and partly to prevailing regulations and charging mechanisms (Czerny, 2006; Starkie, 2002; Yang and Zhang, 2011; Zhang and Zhang, 2010). In the remainder of the paper we will use the terms “commercial” and “side” interchangeably in reference to “services”, “profits”, “revenues”, “charges” and “prices”. The same applies to the terms “aviation” and “core”.

<sup>2</sup> ACI (2009) recognizes that airport operators should accelerate the adoption of e-commerce, which can be a means to enhance and/or exploit new business opportunities. Duty Free News International (2013), based on interviews with retail managers of key German airports (including Frankfurt, Munich, Hamburg and Berlin), highlights the importance of a Retail theater involving social media, e-commerce, mobile commerce and digitization, among the 20 most relevant strategic factors of success in side business.

travelers reserve their flight, have been boosting commercial sales online. For instance, Ryanair offers the opportunity to reserve car parking at airports online at the time of ticket purchase.<sup>3</sup>

Airport e-commerce strategies reduce the time lag between the purchase of the air ticket and the purchase of commercial services. Indeed, when the airport offers transportation and commercial services online, customers can observe both prices at the time of ticket purchase and decide whether to buy the flight and commercial services, the travel ticket only or nothing. In other words, e-commerce enables customers to decide whether to travel, or not, by taking into account the surplus they would gain from commercial consumption.<sup>4</sup>

The objective of this paper is to provide a simple framework for the analysis of airport demand, airport pricing behavior, and airport incentives to engage in e-commerce, when facilities compete. Indeed, the ability to observe the full range of prices at the time of ticket purchase allows airports to compete for passengers through both aviation and side services. On the contrary, airports would have been monopolists in commercial services and competitors on the aviation side, if they were only able to observe the price and mix of commercial services at the airport – once locked into the facility because the air ticket had already been purchased. The literature used to abstract away from the effects of airport competition in both sides of the business, since, for most passengers, the purchase of air tickets and the purchase of commercial services were well separated in time. In view of the changes in the competitive environment, it would be useful to have an analytical framework that addresses such issues rigorously.

The contribution of the paper is threefold. First, we look at airport competition in aviation and side services. We study airport demand and the effect of the supply of commercial services on the demand for aeronautical services and we examine whether the two sided nature of the airport business curbs market power on the aviation side. Second, we study airport entry strategies to determine whether airports have an incentive to offer commercial services online at the time of ticket purchase. Third, we examine the implications of the e-commerce strategies on social welfare.

Three branches of literature are related to the subject of this paper.

The first relates to the effect of complementarity between aviation and side services on the pricing behavior of airports. Since commercial operations depend greatly on the passenger throughput of an airport, the aviation charge may be reduced to induce a higher volume of passengers and increase the demand for commercial services (Starkie, 2002). Oum et al., (2004), Yang and Zhang (2011) and Zhang and Zhang (1997, 2003, 2010) confirm this effect analytically

under the assumption of one way complementarity between aviation and side services, that is the demand for flights does not depend on the supply of airport commercial services. Conversely, Czerny (2006) takes into account the effect of the supply of airport commercial services on the demand for flights and that there is a two sided complementarity between aviation and commercial services. In his setting, some individuals may choose to fly only if commercial services are available. He finds that a monopolistic profit-maximizing airport would reduce the commercial charge and raise the aeronautical charge. Czerny (2013a) assumes that only the supply of car rental-type services may stimulate demand for flights, since their consumption may be strongly related to traveling activities, while the demand for food and beverage-type concession services is independent of flying. He finds that the aeronautical charge at a congested monopolistic airport is socially excessive when commercial services are priced at marginal costs. However, Czerny (2006) and Czerny (2013a) abstract away from airport competition. In parallel but independent work, Czerny (2013b, unpublished) develops a spatial model of airport competition with core and side businesses. Again, Czerny (2013b) assumes two sided complementarity between core and side services. He shows that side services can exert a negative effect on aviation charges.

Our contribution differs from Oum et al. (2004), Yang and Zhang (2011) and Zhang and Zhang (1997, 2003, 2010) as we assume a two sided complementarity between aviation and side services. In doing so, we share the approach proposed by Czerny (2006, 2013a, 2013b). We extend existing literature on two sided complementarity between aviation and side services as we study airport competition, as opposed to Czerny (2006) that focuses on the price cap regulation of a monopolistic airport, and Czerny (2013a) that compares the behavior of a private and a public monopolistic airport. Furthermore we complement Czerny (2013b) as we investigate whether airports have an incentive to offer some types of commercial services online at the time of ticket purchase and thus stimulate the demand for flights through the side business.

A second branch of literature studies the welfare neutrality of commercial services. D'Alfonso et al. (2013) and Zhang and Czerny (2012) include a portion of the surplus from commercial services in the social welfare function. This reconciles two approaches in literature: if the portion is equal to 1, all of the surplus from commercial activities is counted into social welfare (Yang and Zhang, 2011; Zhang and Zhang, 2003, 2010); if the portion is equal to 0, the surplus from concession activities is excluded (Czerny, 2011). In our formulation, we assume that commercial services sold online generate extra surplus. These services mostly include car rental, car parking or hotel reservations, which, following Czerny (2013a), are welfare enhancing as they are strongly related to travel activities. On the other hand, following D'Alfonso et al. (2013), we account for a portion of the surplus from retail services in the social welfare function.

A third branch of literature explores multiproduct price competition and product line rivalry. Verboven (1999), based on Mussa and Rosen (1978), finds that a lower mark-up for add-ons is set when there is full consumer information on prices, compared to the case in which the base product is advertised and premium product price information is available at the shop only. Ellison (2005) combines Hotelling horizontal differentiation with vertical differentiation. Mark-ups on products vary depending on marginal utility of income and full customer information on prices reduces profits. Thisse and Vives (1988) show that spatial price discrimination is a dominant strategy for two competing firms, but puts the firms into a Prisoner's Dilemma.<sup>5</sup>

<sup>3</sup> Airports and airlines now use various agreements – such as commercial revenue sharing – to internalize the positive demand externality between aviation and concession services (D'Alfonso and Nastasi, 2014; Zhang et al., 2010). For instance, Ryanair cooperates with the leading airport parking company Better Choice for Parking (BCP) and, in its negotiations with some airports, it asked for parking revenue sharing as a condition of offering the service to them. On the one hand, such agreements make airlines internalize the positive effect of passenger throughput on commercial services. On the other hand, the airport benefits from the positive externality of concessions sold on the airline websites.

<sup>4</sup> Take the example of a traveler that is interested in a car reservation, while planning a fly-and-drive trip (or that needs to reach the final destination when landing at a secondary airport). If she finds out that the air ticket price is higher than what she is willing to pay, she may still decide to travel if she is offered a very convenient car rental rate at the time of ticket purchase. On the contrary, she might not buy the ticket if she would have to wait until the day of departure (or the arrival at the destination airport) to be informed about the car rental rate. The same might happen if she would have to incur high searching costs to get this information. A similar logic can be applied taking the example of car parking, which is needed when a traveler prefers to access the airport by her own car due, for instance, to an inconvenient flight schedule.

<sup>5</sup> Extensions of their work have shown that equilibria also exist when firms adopt different spatial pricing policies (De Fraja and Norman, 1993). Some results for non spatial models of differentiated product markets can be found in Corts (1998), Laffont et al. (1998) and Winter (1997).

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