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Airline delays, congestion internalization and non-price spillover effects of low cost carrier entry

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ABSTRACT

This paper develops an econometric model of flight delays to investigate the influence of competition and dominance on the incentives of carriers to maintain on-time performance. We consider both the route and the airport levels to inspect the local and global effects of competition, with a unifying framework to test the hypotheses of 1. airport congestion internalization and 2. the market competition-quality relationship in a single econometric model. In particular, we examine the impacts of the entry of low cost carriers (LCC) on the flight delays of incumbent full service carriers in the Brazilian airline industry. The main results indicate a highly significant effect of airport congestion self-internalization in parallel with route-level quality competition. Additionally, the potential competition caused by LCC presence provokes a global effect that suggests the existence of non-price spillovers of the LCC entry to non-entered routes.

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1. Introduction

The present paper develops an empirical model to inspect some of the determinants of flight delays and to test their relationships with airline competition and airport dominance. Airline delays have become a constant reality in the modern commercial air travel industry globally. Passengers are now increasingly familiar with flights having light to moderate delays as part of their journey routine. Additionally, episodes of intense flight disruptions due to severe weather conditions, strikes or congestion are observed periodically in many places such as the Eastern and Western United States, Europe, and China, among others. Flight delays and cancellations may not only be stressful to passengers and airlines but are also costly. Moreover, there are costs associated with keeping delays to low rates, and therefore, the motivations to engage in on-time performance also depend on the economic incentives of carriers.

In 2013, in the UK, a congestion charge was under consideration by the government to reduce congestion at both Heathrow and Gatwick to encourage passengers to fly from other London airports like Luton and Stansted.¹ Such an initiative reveals how authorities and operators regard managing congestion and its consequent flight disruptions under a scenario of no airport expansion in the near future. A strand of the airline literature has addressed this issue by inspecting the global effects

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of airport concentration and dominance on flight delays. Following Daniel (1995), the literature has investigated the *hypothesis of airport congestion internalization*, meaning that a dominant airline could naturally internalize the costs associated with congestion delays that its aircraft impose without the need of a congestion toll – Brueckner (2002), Mayer and Sinai (2003), Daniel and Harback (2008), Rupp (2009), Zhang and Zhang (2006), and Ater (2012).

In addition, in 2014, a report from the Federal Aviation Administration, noted that the absence of competition for many routes might be a source of increased rates of airline flight delays and cancellations.² They suggest that competition and service quality may be positively related and therefore more frequent and longer flight delays are likely to be observed on less competitive routes. These findings are in accordance with another strand of the literature on airline delays that investigates the *hypothesis of the competition-quality relationship*. Pioneered by Suzuki (2000), this literature has many recent econometric papers investigating the local, route level determinants of delays, such as Mazzeo (2003), Rupp et al. (2006) and Greenfield (2014). More recently, some articles in this literature have inspected the impacts of the entry of low cost carriers (LCCs) on the on-time performance in the market, as per Rupp and Sayanak (2008), Castillo-Manzano and Lopez-Valpuesta (2014), Bubalo and Gaggero (2015) and Prince and Simon (2015).

This paper aims to investigate some of the competition-driven incentives of major carriers to keep few records of flight delays, both locally in the market – the *route level* – and globally – the *airport level*. Most papers in the airline delays literature have addressed the subject by focusing on one of these levels in an isolated way. We present a unifying framework to test both the airport congestion internalization hypothesis and the market competition-quality relationship hypothesis in a single econometric model. We examine the role of route and airport concentration metrics as key competition determinants of delays. Another contribution of the paper lies in the modeling of a dynamic pattern of delays after entry by means of time decomposition into its short-run and long-run effects.

Our primary interest is on the impacts of the entry of LCCs on the odds and average magnitude of flight delays of incumbent FSCs. We investigate the local and global impacts of entry and therefore test the effects of LCC presence on the congestion internalization and local flight service quality of FSCs. We consider the application to the case of the Brazilian airline industry in the period 2002–2013.³ Our econometric framework addresses the important issue of endogeneity of market structure regressors. Since Greenfield (2014), we have that the magnitude of bias in the estimation of a flight delay equation may be considerable, and therefore, practitioners must implement an instrumental variables approach in such a framework. We consider instrumentation all of the market structure variables and discuss the effect of not accounting for endogeneity.

This article is divided as follows: Section 2 presents the conceptual model employed as well as the main hypotheses to be tested; Section 3 presents the empirical model development; Section 4 presents the econometric model and results; Section 5 performs some robustness checks. Finally, the conclusions are presented.

2. Theoretical framework

In this section we present our conceptual model along with the main hypotheses investigated in the paper.

2.1. Airport level determinants of delays: congestion internalization

The emergence of hub-and-spoke networks is a phenomenon of the post-deregulation period in the US airline industry that has spread to most airline markets in the world. With the formation of hubs, a few carriers gained dominant position over a set of airports as part of their pro-hub-and-spoke network design strategy. The literature has observed that an airport's dominant airline could have stronger incentives to address congestion than smaller carriers and would therefore naturally internalize the costs associated with its self-imposed flight delays (Daniel, 1995; Brueckner, 2002). This literature focuses on the role of peak/off-peak allocation of flights and passengers at an airport to inspect the incentives to manage congestion and avoid flight delays by dominant carriers. In such situations, congestion tolls aimed at mitigating externalities from flight delays would either not be needed or only be needed in less dominated airports.⁴ Recent studies include Mayer and Sinai (2003) and Ater (2012). Based on this strand of the literature, our first hypothesis in the conceptual model is presented below.

H₁ (*Airport congestion internalization*). Airport concentration generates higher incentives for major airlines to engage in congestion internalization.

Regarding H₁, most of the empirical papers that utilize econometrics find a negative relationship between airport concentration and flight delays. Brueckner (2002) presents rudimentary evidence based on a sample of 25 US airports in 1999; the results are confirmed by Mayer and Sinai (2003) and Ater (2012), who employ panel data disaggregated at the

² Office of Inspector General – Federal Aviation Administration (2014). *Reductions in competition increase airline flight delays and cancellations*. Audit Report, n. CR-2014-040, April, 23.

³ Huse and Oliveira (2012) investigate the impact of Gol's entry on the prices of FSCs, with special focus on the dynamics and the smoothing effect of product differentiation of price responses.

⁴ "One might expect dominant airlines to fully internalize delays of their own aircraft even without congestion pricing." – Daniel (1995, p. 333). Ater (2012) explains that dominant airlines may use the length of their flight banks aiming at managing delays: "With wider banks, flights will interfere less with one another, reducing delays" (p. 197).

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