Airline on-time performance and its effects on consumer choice behavior

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Abstract

Perhaps, owing to the unavailability of delay data on passengers’ flight routing, a challenge in air travel demand estimation is the examination of consumer response to flight delay within an origin-destination framework. An interesting but unanswered question is: how does air travel delay at various airports along a given itinerary affect consumer choice behavior? Using a methodology that enables us to match airline on-time performance data to passenger itinerary and estimating a discrete choice demand model, this paper finds that increases in flight delay negatively impact the likelihood of choosing a product and that welfare costs of delay to consumers may be substantial. These results are robust across different measures of on-time performance and irrespective of market hauls.

1. Introduction

Following the passage of the Airline Deregulation Act in 1978, airlines have found it increasingly difficult to stand out in an industry where competition is fierce and product differentiation is multi-dimensional (Gursoy, Chen and Kim, 2005). Airlines are generally known to compete on prices, however, flight on-time performance (OTP) has become a source of competitive advantage as passengers’ expectations concerning on-time arrival/departure have increased in recent years.

The importance of OTP to consumers can be exemplified by the congressional action that was taken in 1987 after unflattering media coverage of massive flight delays in the U.S. airline industry. The action taken by the U.S. Congress grants the Bureau of Transportation Statistics (BTS) the authority to track and archive departure and arrival information of flights operated within the U.S. Air carriers that meet one percent or more of total domestic traffic are mandated to disclose delay information. However, airlines that do not meet this traffic threshold can still voluntarily release their flight OTP (Mayer & Sinai, 2003).

A 2001 report published by the Office of Aviation Enforcement and Proceedings after the flight on-time disclosure rule of 1987, shows that the airline industry’s OTP is still far below satisfactory levels with cancellations, delays and missed connections topping consumers’ list of complaints. Furthermore, the BTS reported that in 2014 about 23.02 percent of domestic flights were delayed—an increase from 14.69 percent in 2012.

Flight delay has always received much attention from researchers. Studies that have examined the cost of delay show that increasing flight delays end up costing billions of dollars not only to airlines and their passengers but also to society at large (Ball et al., 2010). In 2010, a comprehensive study sponsored by the Federal Aviation Administration (FAA) on the financial impact of delay, estimates the total cost of flight delay to be approximately $31.2 billion for the year 2007 alone. A breakdown of this total direct cost of delay shows that $8.3 billion is borne by airlines in terms of increased spending on crews, fuel and maintenance. Passengers bore $16.7 billion in the form of lost time from flight delay, cancellations and missed connections while delay spillovers on the economy amounted to $4 billion. The remaining $2.2 billion emanates from lost demand. In addition, delay creates other problems including short tempers among frustrated travelers and negative spillover effects on industries that are dependent on or connected to the airline industry (Ball et al., 2010).

Table 1 contrasts delay cost estimates in 2007 from Schumer and Maloney (2008) and Ball et al. (2010). Table 1 shows a significant difference across TDI (Total Delay Impact) and JEC (Senate Joint Economic Committee) cost estimates. The discrepancy is the result of differences in estimation methods. Specifically, the JEC estimates direct costs based on total flight time and indirect costs based on a broad macroeconomic impact multiplier but does not account for costs associated with lost demand. The TDI, on the other hand,
incorporates costs borne by passengers due to flight cancellations and missed connections, among other costs and also includes lost demand.

Given the above, a natural and interesting and yet unanswered question is how much do consumers really value OTP? To answer this question, we examine the consumer welfare effects of OTP. We measure the monetary value that consumers place on OTP by estimating a discrete-choice model of demand.

To correctly measure the extent to which passengers value OTP, we control for observable (to the researcher) product characteristics and other measures of product quality. We perform some robustness checks by re-estimating the demand model using different measures of OTP and different market haul lengths.

Contrary to previous air travel demand models that have only focused on flight segments, we model demand based on origin-destination markets. Estimating air travel demand from an origin-destination basis rather than segment by segment, in addition, non-stop flights represent only about 18 percent of total itineraries in our dataset and an origin-destination framework would allow for the imperfect substitution among non-stop and intermediate-stop products.

In addition to incorporating delay measures within an origin-destination framework, a unique feature of this study is that we measure the OTP effects on demand at every airport of the passenger’s itinerary. This allows us to examine how consumer choice behavior responds to changes in OTP at different airports of the origin-destination itinerary.

Other things equal, we find that increases in air travel delay at the various airports along the itinerary negatively impacts the consumer’s utility. The ideal product for a typical passenger is one that is cheap, nonstop, not code-shared, offered by a low-cost carrier (LCC) and is likely to be on-time. These findings are robust to all measures of OTP and regardless of market hauls. We also find that, on average, consumers are willing to pay $1.38, $1.07 and $0.91 per minute late in order to avoid delay at their final destination in short-, mid- and long-haul markets, respectively. On shorter-haul distances, consumers prefer LCCs over full-service carriers (FSCs) but prefer FSCs over on-longer-haul distances.

The remainder of the paper is structured as follows. The following section reviews the literature. Section 3 describes our data sample. Section 4 discusses the research methodology and estimation procedure used to analyze the demand effects of OTP. We present and discuss the results in section 5, while concluding remarks are gathered in Section 6.

2. Literature review

The relationship between service quality and customer behavior has been studied in various service industries including the airline industry. These studies have applied service quality theories and methods indiscriminately and have sometimes failed to refine the theories so that they fit specific situations (Oh & Parks, 1997).

Measuring service quality can be a challenge for empirical work because it may consist of both tangible and intangible features.

A very popular model that is generally applied across service industries to measure intangible elements of service quality is SERVQUAL. The SERVQUAL model identifies ten areas of service quality, which were later collapsed to five elements: reliability, assurance, tangibles, empathy and responsiveness—that make up a new acronym RATER. This service quality model quantifies these key elements through surveys where customer expectations are compared to their perception of received service. Despite its popularity and wide application, the SERVQUAL service quality model has been critiqued on both theoretical and operational grounds (Buttle, 1996; Nybeck, Morales, Ladhari, & Pons, 2002).

In the airline industry, tangible elements of service quality can be evaluated in order to make direct inferences about service quality. Some of these elements are quantifiable factors such as the number of connecting services, the amount of layover time required over an itinerary (Youssef & Hansen, 1994), airline safety (Rose, 1990) or airline on-time performance (Forbes, 2008; Prince & Simon, 2009, 2014; Rupp & Sayanak, 2008; Tierman, Rhoades and Wagespack, 2008), among others. Prince and Simon (2014) examine incumbent airlines’ response to entry and entry threats by Southwest Airlines. They found that incumbent airlines improve their OTP when facing entry and entry threats by Southwest Airlines.

Recently, some studies have been exploring the link between airline mergers and product quality. For instance, Prince and Simon (2015) find minimal short-run impact of mergers on OTP but significant long-run post-merger OTP improvements, generally after three to five years. Rupp and Tan (2016) investigate the impact of mergers on OTP, travel time, and flight cancellations but focus solely on the product quality at de-hubbed airports (when an airline ceases hub operations) after a merger. Chen and Gayle (2013) investigate how the Delta/Northwest and Continental/United mergers affect the directness of the itinerary routing.

Forbes (2008) and Bratu and Barnhart (2005) are closely related previous works that have studied passenger itinerary data to gain a better understanding of how flight delays impact passengers. Forbes (2008), for instance, exploited an exogenous legislative change in takeoff and landing restrictions at LaGuardia Airport to examine the effect of air traffic delays on airline fares. She discovered that prices dropped by $1.42 on average for each additional minute of flight delay and that the price response is asymmetric, with larger responses in more competitive markets.

Bratu and Barnhart (2005) use passenger booking and flight operations data from a major US airline to develop an alternative metric for passenger delay. The metric accounts for missed connections and flight cancellations. They found that, after factoring in missed connections and flight cancellations, the average passenger delay is two-thirds longer than the official statistics. It is conceivable that, to optimally reduce flight delay, airlines could spread their flights more evenly throughout the day. However, such an endeavor would come at considerable cost since consumers have strong preferences on travel departure times.2 It is in this spirit that Borenstein and Netz (1999) and Encaoua, Moreaux and Perrot (1996) have come to the inference that demand peaks and competition between carriers drive the clustering of flights around the same departure times.

Other studies have used flight frequency (Brueckner, 2004; Brueckner & Girvin, 2008; Brueckner & Luo, 2014; Brueckner & Pai, 2009; Färe, Grosskopf and Sickles, 2007; Girvin, 2010).

Table 1
Comparison of delay cost estimates in year 2007 ($ billions).

<table>
<thead>
<tr>
<th></th>
<th>TDI</th>
<th>JEC</th>
</tr>
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<tbody>
<tr>
<td>Cost to Airlines</td>
<td>8.3</td>
<td>19.1</td>
</tr>
<tr>
<td>Cost to Passengers</td>
<td>16.7</td>
<td>12.1</td>
</tr>
<tr>
<td>Indirect Impact on Economy</td>
<td>4.0</td>
<td>9.6</td>
</tr>
<tr>
<td>Cost from Lost Demand</td>
<td>2.2</td>
<td>n.a.</td>
</tr>
<tr>
<td>Total Cost</td>
<td>31.2</td>
<td>40.8</td>
</tr>
</tbody>
</table>

TDI: Total Delay Impact; JEC: Senate Joint Economic Committee.

[Source] Ball et al. (2010) and Schumer and Maloney (2008).

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1 SERVQUAL was founded by Zeithaml, Parasuraman and Berry (1990).
2 We thank an anonymous referee for pointing this out.

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