



# Price discrimination by day-of-week of purchase: Evidence from the U.S. airline industry

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## ABSTRACT

This paper identifies a source of price discrimination utilized by airlines – price discrimination based on the day-of-the-week that a ticket is *purchased*. Using unique transaction data, we compare tickets on the same airline and route that are *purchased* on different days of the week, after controlling for the day of week of travel, the ticket restrictions, the demand characteristics of the flights, and the number of days in advance that the ticket is purchased. We find that fares are 5% lower when purchased on the weekend. We conjecture that this is a form of price discrimination. If airlines believe that weekend purchasers are more likely to be price-elastic leisure travelers, then they may offer lower prices on weekends when the mix of purchasing customers makes demand more price elastic. This conjecture is supported by the finding that the weekend purchase effect is distinctly larger on routes with a mixture of both business and leisure customers than on routes that disproportionately serve leisure customers. We illustrate that this pricing practice can have important impacts on airline profits. These results have implications for other industries that have the ability to change prices daily based upon the types of customers who purchase on a specific day.

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## 1. Introduction

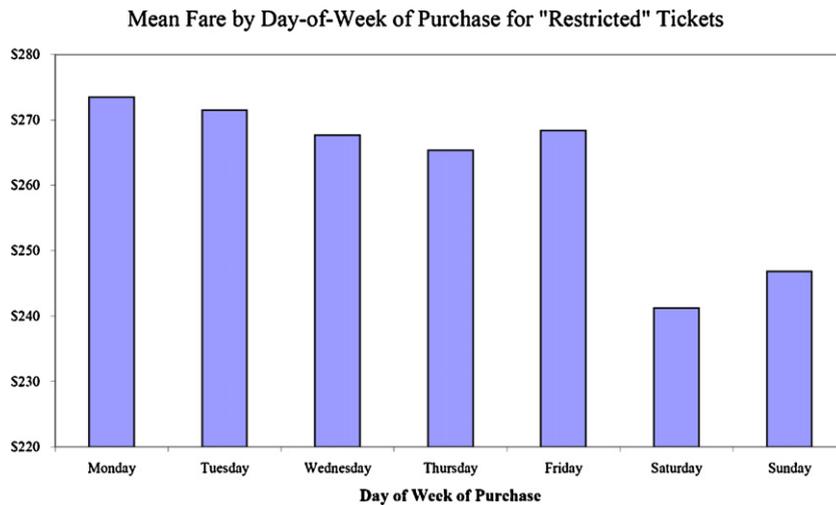
It is well-known that airlines use a variety of mechanisms to price discriminate between customers with different willingness to pay for travel. The existing theoretical and empirical literature has investigated several of these mechanisms including advance purchase restrictions, non-refundability, minimum stay requirements, and Saturday night stay requirements. Advance purchase restrictions can be used to segment consumers by their value of time (Gale and Holmes, 1993) and may be sold disproportionately to customers with low valuation (Dana, 1998). Tickets with Saturday night stay restrictions and other travel and refundability restrictions have lower fares, suggesting that ticket restrictions are used to price discriminate (Stavins, 2001; Puller et al., 2009).

However, the literature has not studied whether airlines segment customers by the day-of-week of *purchase*. In principle, this could be a valuable segmenting device. Travelers who *purchase* on the weekend (but travel any day of the week) may have different price elasticities than those who *purchase* during the week. Moreover, it would be very feasible to implement “day-of-week-of-purchase” pricing because airlines have the ability to dynamically change prices daily using sophisticated computer reservation systems. Current revenue management systems used by airlines allow revenue management analysts to reassess pricing daily during the booking process.<sup>1</sup>

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<sup>1</sup> See Belobaba (2009) for a description of revenue management systems used by major carriers.



**Fig. 1.** Motivating figure for a weekend purchase effect.

In this paper, we make a simple and straightforward contribution to the literature. We find that airlines charge lower fares for observably similar tickets based on the day-of-week of purchase, and that this phenomenon is consistent with price discrimination. This finding is important in its own right because airlines are increasingly using complex pricing schemes, and revenue management systems are becoming progressively more sophisticated. This analysis provides insights into the mechanisms of airline pricing.

Our finding also has implications for a variety of other industries in which sophisticated pricing schemes can be applied. For example, the revenue management systems developed for airlines are being deployed in other hospitality industries including hotels, rental cars, cruise lines, and trains. And more generally, the study of price discrimination by time of purchase could have implications for e-commerce. The dynamic pricing of online retail markets could take advantage of changing prices based on the demand elasticities of consumers likely to be purchasing on any given day or specific times of the day. Although the general topic of intertemporal price discrimination has received considerable attention in the literature, this is the first paper to our knowledge to empirically investigate price discrimination based on day-of-week of purchase that is independent of the actual day of consumption.<sup>2</sup>

One obstacle to identifying whether airlines price differently on specific days of the week is obtaining sufficiently detailed data in order to address various selection issues. For example, travelers purchasing on the weekend could pay less because they choose tickets with more restrictions or fly on less popular flights; such selection behavior could lead one to incorrectly conclude that airlines set different fares on weekends. One would need to control for a variety of ticket characteristics to accurately assess whether airlines price differently on weekends. The most common data used in existing airline pricing research – the U.S. Department of Transportation's Airline Origin and Destination Survey (DB1B) – do not include purchase or departure date nor ticket restrictions or load factors; thus, this dataset is not adequate to properly control for other factors that could affect pricing. Likewise, data on posted airfares gathered via web-scraping are not sufficient to address this issue unless the data contain flight times and ticket restrictions.<sup>3</sup>

We use a unique new dataset of ticket transactions to overcome many of these obstacles. Our data include individual ticket restrictions and information on the load factors of the itinerary's flights. We illustrate the general phenomenon of the weekend pricing effect in Fig. 1. This figure plots the mean fare paid by the day-of-week of purchase for a set of "restricted" tickets that involve travel on a weekday.<sup>4</sup> Fares are distinctly lower when the ticket is purchased on Saturday or Sunday. This figure uses only a small subset of the controls that we use in the formal regressions. As we show below, even after controlling for a large set of ticket restrictions and load factors, tickets purchased on weekends are sold at fares that are 5% lower than fares purchased on weekdays. We interpret this finding as differential pricing of weekend purchases.

We show that this empirical regularity is consistent with price discrimination. Routes with a larger share of business travelers are likely to have a different composition of passengers purchasing on weekends versus weekdays, creating incen-

<sup>2</sup> Of course, differential pricing based on day of consumption is widely studied in both the theoretical and empirical literature; for example, see the literature on peak-load pricing.

<sup>3</sup> One notable exception with detailed data on posted fares is Alderighi et al. (2012). A paper documenting high frequency pricing phenomena is Bilotkach et al. (2010).

<sup>4</sup> "Restricted" here is defined as a ticket that is non-refundable, is not full fare coach, and includes a travel restriction. More detailed controls for ticket restrictions and flight characteristics are included in the formal regressions below.

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