Systematic peak-load pricing during holiday periods: Evidence from the U.S. airline industry

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Systematic peak-load pricing during holiday periods: Evidence from the U.S. airline industry*

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Abstract

When faced with capacity constraints, firms may moderate demand by increasing prices when demand is known to be high ex-ante (i.e., systematic peak-load pricing). In this article, we examine the extent and duration of systematic peak-load pricing in the days surrounding public holidays in the U.S. airline industry. Applying two-stage least squares techniques to a unique panel of over 18 million fares, we estimate travel premiums ranging from 4.3% to 83.1% in the days surrounding national holidays and from 2.7% to 34.7% in the days surrounding federal holidays. We also find that the duration of the peak-travel period is longer for national holidays and shorter for federal holidays. Examining heterogeneity in holiday peak-load pricing, we find some evidence that travel premiums during national holidays are larger on longer-distance routes, on routes to or from slot-controlled airports, on routes to leisure destinations, and on ultra-low-cost carriers.

JEL classifications: D40, L11, L13, L93, R49.
Keywords: advance-purchase discounts, airline pricing, price discrimination, systematic peak-load pricing.

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1 Introduction

Peak-load pricing is a type of discriminatory pricing that occurs when firms charge higher prices for peak services than off-peak services in an effort to divert demand when capacity constraints cause marginal costs to be high (Borenstein and Rose, 1994; Escobari, 2009; Gale and Holmes, 1993). This type of discriminatory pricing occurs in a variety of settings, including the airport, airline, energy, golf, hospitality, and water distribution industries (Arellano and Serra, 2007a,b; Basso and Zhang, 2008; Crew et al., 1995; Czerny and Zhang, 2014; Limehouse et al., 2012; Berry and Mixon, 1999; Chong et al., 2006; Hayes and Ross, 1998). For example, in telecommunication markets, peak-load pricing improves network performance by encouraging users to shift their usage from peak to off-peak times (Courcoubetis and Weber, 2003). Similarly, increasing highway tolls during peak travel hours reduces road congestion because high usage prices induce drivers to shift their travel to off-peak hours (Keeler and Small, 1977; Braid, 1996).

In the airline industry, the source of peak-load pricing may either be stochastic or systematic. Stochastic peak-load pricing refers to demand uncertainty for individual flights that is resolved only after flight schedules have been made (Borenstein and Rose, 1994; Escobari, 2009). Given that airlines can adjust prices over time, the optimal stochastic peak-load price will reflect marginal operating costs plus a charge based on the probability that demand will exceed capacity at the time the ticket is sold and the expected shadow cost of capacity if demand ends up exceeding capacity (Borenstein and Rose, 1994). In contrast, systematic peak-load pricing refers to variation in the expected shadow cost of capacity that is due to demand fluctuations that are known at the time flights are scheduled (Escobari, 2009, 2012). In other words, under systematic peak-load pricing, airlines know in advance which periods are peak and which are off-peak.

In this paper, we provide estimates of travel premiums that occur due to systematic peak-load pricing in the U.S. airline industry. Specifically, the days surrounding public holidays are periods where travel demand is expected to be high ex-ante. For example, the Thanksgiving and Christmas holidays coincide with large volumes of passengers traveling to visit family, whereas holidays observed on a Monday (e.g., Labor Day, Columbus Day, Martin Luther King Jr. Day, and President's Day) coincide with large volumes of passengers returning home after enjoying an extended weekend.[1] Hence, we expect fewer discount tickets to be allocated to flights that depart during holiday periods due to systematic peak-load pricing.

To determine the extent of systematic peak-load pricing in the days surrounding public holidays, we exploit a unique panel of over 18 million fares for flights operated in the continental U.S. between October 1st, 2019 and February 29th, 2020. We track the price of each nonstop flight or connecting itinerary in the sixty-day period prior to departure, allowing us to flexibly control for advance-purchase requirements using days-to-departure fixed effects.

Consistent with the theory of systematic peak-load pricing, we estimate travel premiums ranging from 4.3% to 83.1% in the days surrounding national holidays (e.g., Thanksgiving and Christmas) and from 2.7% to 34.7% in the days surrounding federal holidays. Furthermore, our estimates indicate that the peak-travel period surrounding national holidays primarily extends from seven days before the holiday (18.9% fare premium) to five days after the holiday (17.8% fare premium). In contrast, the peak-travel period for federal holidays primarily extends from five days before the holiday (4.9% fare premium) to one day after the holiday (8.2% fare premium). Exploring heterogeneity in holiday peak-load pricing, we find that travel premiums during national holidays are generally larger on longer-distance routes (especially when driving is not a feasible substitute), on routes to leisure destinations, on routes to or from slot-controlled airports, and on ultra-low-cost carriers (e.g., Frontier and Spirit).

Nevertheless, due to the short time-horizon of our analysis sample (the five-months imme-

[1] National holidays are days most government and private sector employees receive off from work (e.g., Thanksgiving, Christmas, and New Year's Day). Federal holidays are days most federal and state government employees receive off from work that private sector employees may or may not receive (e.g., Columbus Day, Veteran's Day, Martin Luther King Jr. Day, and President's Day).

diately preceding the Covid-19 pandemic), readers should exercise caution when extending our results to other public holidays that are not contained in our data such as Memorial Day (last Monday in May), Juneteenth (June 19$^{\text{th}}$), and Independence Day (July 4$^{\text{th}}$). Furthermore, the Covid-19 pandemic has likely changed holiday travel patterns since the increased adoption of hybrid/remote work provides workers with additional flexibility in when and for how long they travel. For instance, it is plausible that the length of the peak-travel period during Thanksgiving and Christmas has increased as a result of the additional flexibility that hybrid/remote work offers.

The rest of this article is organized as follows. Section 2 briefly discusses previous literature on peak-load pricing, with a particular emphasis on the airline industry. Section 3 describes the fare and itinerary data collected for the empirical analysis. Section 4 presents a descriptive analysis of airline pricing and airline supply during holiday periods. Section 5 outlines the econometric model used to identify holiday travel premiums (i.e., systematic peak-load pricing). Section 6 presents the empirical results from our holiday peak-load pricing analysis. Finally, Section 7 summarizes our main findings and offers suggestions for future research.

2 Previous literature

When faced with capacity constraints, peak-load pricing is a pricing strategy used by firms to moderate demand for a good or service.[2] By increasing prices during periods of high demand and lowering them during periods of low demand, firms are able to encourage some consumers to divert their demand from peak to off-peak periods. This strategy is commonly used in markets where demand is known to fluctuate substantially over time, such as the utilities, telecommunications, and transportation sectors.

In energy markets, previous studies have established that real-time (or time-of-use) pricing

[2] For a general review of peak-load pricing theory, see Crew et al. (1995).

can effectively reduce peak demand by incentivizing consumers to shift their energy usage to off-peak hours (Borenstein, 2005). For example, Joskow and Tirole (2007) find that real-time pricing can lead to significant demand reductions during peak periods, benefiting producers by reducing the need for costly energy generation during congested periods. Similarly, in the telecommunications sector, service providers are able to encourage users to shift their usage to off-peak times by charging higher prices during peak times, thereby improving network performance (Courcoubetis and Weber, 2003). In surface transportation, charging higher tolls during peak travel times encourages drivers to shift their travel to off-peak times, thereby reducing road congestion (Keeler and Small, 1977; Braid, 1996; Small and Verhoef, 2007).[3]

In the airline industry, Gale and Holmes (1993) demonstrate that implementing advance-purchase requirements is an effective profit-maximizing pricing strategy for monopoly airlines wishing to divert demand from the peak to off-peak period. By limiting the availability of discount tickets during the peak period, individuals with low values of time are incentivized to switch from peak to off-peak flights, thereby reducing the need for additional capacity (Dana, 1999). In a related seminal study, Borenstein and Rose (1994) make an important distinction between two types of airline peak-load pricing: systematic and stochastic. Under stochastic peak-load pricing, airlines do not know in advance which periods are peak or off-peak, meaning that demand uncertainty for individual flights is resolved only after flight schedules have been made.[4] In contrast, systematic peak-load pricing refers to demand fluctuations that are known at the time flights are scheduled, implying that airlines know in advance which periods are peak and off-peak under systematic peak-load pricing.

The closest empirical study to ours that examines systematic peak-load pricing in the airline industry is Escobari (2009). Using fare data collected from Expedia.com in September 2005, Escobari (2009) estimates a reduced-form fare equation where the variable of interest is

[3] It should be noted that some studies have raised concerns about the distributional impacts of peak-load pricing. For instance, peak-load pricing may disproportionately affect low-income households, who may not have the flexibility to shift their consumption to off-peak periods (Borenstein, 2007, 2013; Cahana et al., 2022).

[4] For an example from a real case, see Piga et al. (2024).

an indicator equal to one for flights that depart two days prior to Thanksgiving (an ex-ante known peak travel day). Escobari (2009) finds a 21.9% fare premium for traveling on the Tuesday before Thanksgiving, evidence supporting the demand diverting predictions in Gale and Holmes (1993) and the systematic peak-load pricing argument in Borenstein and Rose (1994).

Our paper differs from Escobari (2009) by using more recent data collected over a seven-month period for flights departing between October 1st, 2019 and February 29th, 2020. In addition to Thanksgiving, our longer sample period allows us to estimate fare premiums over a much broader set of federal (Columbus Day, Martin Luther King Jr. Day, President's Day, and Veteran's Day) and national holidays (e.g., Christmas and New Year's). Similar to Escobari (2009), the empirical strategy we outline in Section 5 is a reduced-form fare equation where the variables of interest are dummy variables that indicate how many days prior to or after the holiday a flight departs. By examining the symmetric one-week period before and after each holiday, we are able to test whether the peak travel period for national holidays extends beyond the Tuesday before Thanksgiving that was assumed in Escobari (2009).

3 Fare and itinerary data

Fare and itinerary data were collected from a major online travel aggregator (OTA).[5] This article is not the first to analyze data from a major OTA. For example, see Escobari (2009), Escobari et al. (2019), and Luttmann (2019a), among others. Note that many previous empirical studies of U.S. airline pricing have predominantly relied on data from the U.S. Department of Transportation's Airline Origin and Destination Survey (DB1B).[6] The DB1B, released quarterly, provides a 10% random sample of all airline tickets sold for U.S. domestic travel. However, the DB1B lacks details on specific flights, exact purchase dates, and de-

[5] Major online travel aggregator websites include Expedia, Google Flights, and Kayak.

[6] For example, previous studies that have analyzed DB1B data include Berry and Jia (2010), Borenstein and Rose (1994), Borenstein (1989), Brueckner et al. (2013), Gayle and Wu (2013), Greenfield (2014), Kwoka et al. (2016), Luttmann (2019b), and Shrago (2024), among many others.

parture dates, reporting only the quarter of travel. Consequently, the DB1B cannot be used to examine holiday pricing or account for factors such as advance-purchase requirements or specific travel dates. To address these limitations, we rely on published fare and itinerary information from an OTA. However, the limitation of relying on OTA data is that there exists some uncertainty regarding whether tickets were purchased at the prices we observe.

Using an approach consistent with Luttmann and Gaggero (2024), fare quotes were collected over a seven-month period for flights departing between October 1st, 2019 and February 29th, 2020.[7] Our data covers 117 of the most densely traveled routes in the continental U.S.[8] A detailed list of these routes is provided in Appendix Table A1 and Figure 1 displays a map of these routes. As the map illustrates, our route coverage is fairly comprehensive across the continental United States.

To construct our analysis sample, daily economy-class fare quotes were collected from the OTA for one-way nonstop and connecting travel between each of the directional airport-pairs in Figure 1.[9] For each nonstop or connecting flight option on a given route, the lowest observed economy-class fare for each of the next sixty travel days was collected, allowing us track the price of an individual flight over the sixty-day period prior to departure.[10] We focus on a sixty-day window to capture leisure travelers who purchase well in advance of the departure date and business travelers who purchase closer to the date of departure. This data collection window is consistent with previous studies that rely on published fare data from

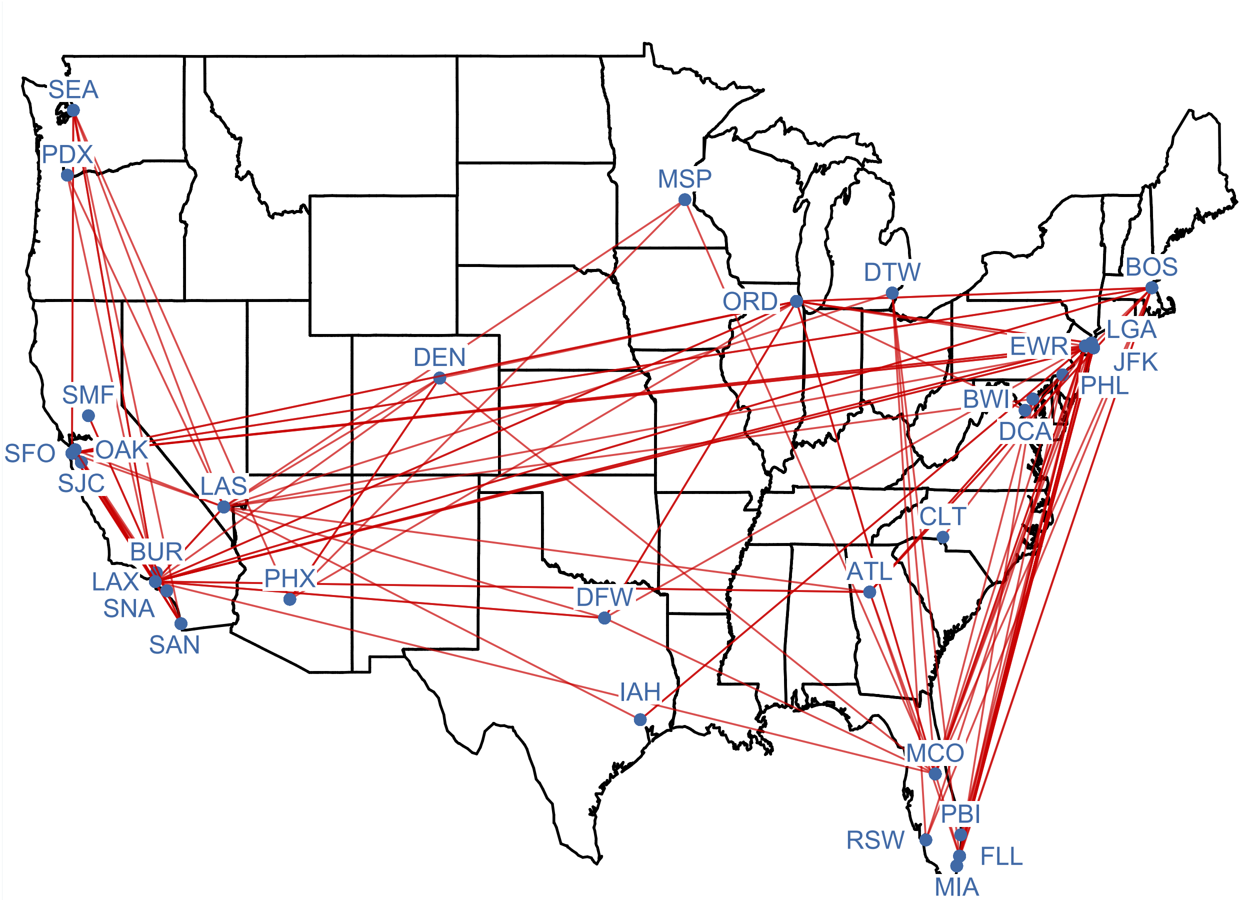
[7]Because our analysis sample ends on February 29th, 2020, the COVID-19 pandemic has a negligible impact on our results. COVID-19 was declared a national emergency in the U.S. on March 13th, 2020 and California was the first state to issue a statewide stay-at-home order on March 19th, 2020.

[8]A market in our analysis is defined as a directional pair of origin and destination airports. Hence, San Francisco (SFO)-New York (JFK) and New York (JFK)-San Francisco (SFO) are treated as separate markets.

[9]We focus on one-way trips due to difficulties in specifying trip duration. For any given departure date, there are a substantial number of roundtrip fares that could be gathered, each depending on trip duration. For example, fares for four-day trips are likely different from seven and ten-day trips. Similar articles using published fare and itinerary data also collect one-way trips due to this duration issue. Examples include Alderighi et al. (2022), Bilotkach et al. (2010), and Luttmann (2019a).

[10]For example, fare quotes for flights departing on December 31st, 2019 were collected on a daily basis between November 2nd, 2019 and December 30th, 2019. If an airline offers multiple flight options on a given day for a particular route, the lowest economy-class fare for each of the nonstop and/or connecting flight options was collected.

Figure 1: U.S. domestic routes included in our analysis sample



a major OTA (e.g., Bilotkach et al. (2015), Escobari et al. (2019), Gaggero and Luttmann (2023b), and Gaggero and Piga (2011), among others).

Our sampling procedure resulted in a unique sample of 18,110,269 observations, of which, 14,991,551 are for nonstop flights. Adopting the carrier type definitions in Bachwich and Wittman (2017) and Shrago (2024), there are three legacy carriers (American, Delta, and United), two hybrid/low-cost carriers (Alaska and JetBlue), and four ultra-low-cost carriers (Allegiant, Frontier, Spirit, and Sun Country) in our sample.[11]

[11]Fare quotes for Southwest Airlines were not available on travel aggregator websites such as Google Flights and Kayak at the time of our data collection. However, Southwest is accounted for in our empirical analysis when we construct market structure variables such as the Herfindahl-Hirschman Index or an airline's market share on a given route.

4 Descriptive analysis of fares and airline supply during holiday periods

In this section, we begin by providing descriptive statistics on the relationship between fares and holiday travel (Section 4.1). Then, we briefly comment on how airlines adjust supply (flight frequency and route entry) during federal and national holiday periods (Section 4.2).

4.1 Fares during holiday periods

Table 1 provides a detailed list of the public holidays that occur during our sample period. There are three national holidays (Thanksgiving, Christmas, and New Year's) and four federal holidays (Columbus Day, Veteran's Day, Martin Luther King Jr. Day, and President's Day). Table 1 also reports the percentage of civilian, private, and government employees that receive each of these seven holidays off from work. As the percentages in the table demonstrate, over 65% of civilian and private sector workers do not receive federal holidays off from work.[12] This characteristic may have important implications for the extent of holiday travel premiums (i.e., systematic peak-load pricing) that airlines are able to charge consumers. For instance, relative to national holidays, we expect travel premiums to be lower on federal holidays due to the fact that a large fraction of civilian and private sector employees do not receive these days off from work.

Table 2 reports the average one-way fare over the booking period by airline and holiday type. Because most consumers travel in the days surrounding the holiday (e.g., many travelers arrive at their destination in the days prior to the Thanksgiving and Christmas holidays and leave in the days following the holiday), Table 2 (and subsequent Figure 2) classifies flights that depart three, two, and one day prior to or after the national or federal holiday as holiday

[12]For example, employees of The MITRE Corporation (the current employer for one of the author's of this study) currently do not receive Columbus Day, Veteran's Day, or President's Day off from work. According to the Bureau of Labor Statistics, full-time private-sector employees receive an average of 7.6 paid federal holidays (https://www.bls.gov/news.release/ebs.t05.htm).

Table 1: Public holidays during our sample period

Holiday Name	Holiday Type	Holiday Date	Day of Week	Percentage of workers with day off		
				Civilian	Private	Government
Columbus Day	Federal	Oct. 14, 2019	Mon.	-	-	-
Veteran's Day	Federal	Nov. 11, 2019	Mon.	19%	11%	70%
Thanksgiving Day	National	Nov. 28, 2019	Thu.	97%	97%	99%
Christmas Day	National	Dec. 25, 2019	Wed.	97%	97%	93%
New Year's Day	National	Jan. 01, 2020	Wed.	90%	90%	90%
M. L. King Day	Federal	Jan. 20, 2020	Mon.	32%	24%	86%
President's Day	Federal	Feb. 17, 2020	Mon.	24%	19%	58%

Notes: National holidays are days most government and private sector employees receive off from work. Federal holidays are days most federal/state government employees receive off from work that private sector employees may or may not receive. Because the departure date of flights in our sample ranges from October 1st, 2019 to February 29th, 2020, Labor Day, Memorial Day, and Independence Day are not observed in our sample. The statistics reported in the last three columns are obtained from the National Compensation Survey conducted by the U.S. Bureau of Labor Statistics in 2018 (available at `https://www.bls.gov/ebs/factsheets/holiday-profiles.htm`). The percentage of workers with Columbus Day off was not reported in the 2018 National Compensation Survey.

flights.[13]

In Table 2, each airline is classified according to its business model as either a legacy, hybrid (also known as low-cost carrier), or ultra low-cost carrier (ULCC) (Bachwich and Wittman, 2017; Shrago, 2024). In general, average economy class fares on both holidays and non-holidays are highest on legacy carriers and lowest on ULCCs. Furthermore, consistent with expectations, average fares across all carrier types are higher during national holiday periods than during federal holiday periods. Relative to non-holiday flights, the average fare premium across all carriers is 74.7% on national holidays and 15.3% on federal holidays.

Figure 2 plots the average nonstop fare per mile during the sixty-day booking period, distinguishing between flights that depart during national holiday periods (red dashed curve), federal holiday periods (blue dotted curve), and, as a benchmark, non-holiday periods (solid black curve). Four separate charts are reported: the top-left chart plots the average nonstop fare per mile across all carriers, the top-right chart plots the average nonstop fare per mile for

[13] To mitigate potential spillover effects of systematic peak-load pricing for flights that depart close to a holiday, the non-holiday subsample in Table 2 (and Figure 2 that follows) excludes flights that depart between four and seven days before or after each national or federal holiday.

Table 2: Average one-way fare by airline and holiday type

		National Holiday			Federal Holiday			Non-Holiday		
Airline	Type	Fare	Std. Dev.	Obs.	Fare	Std. Dev.	Obs.	Fare	Std. Dev.	Obs.
Alaska	Hybrid	$222	(135)	258,728	$152	(101)	327,140	$130	(88)	630,878
Allegiant	ULCC	$84	(39)	1,253	$71	(43)	1,363	$63	(29)	2,658
American	Legacy	$288	(211)	553,834	$181	(120)	828,529	$159	(96)	1618827
Delta	Legacy	$280	(162)	503,248	$189	(129)	740,146	$165	(113)	1416091
Frontier	ULCC	$164	(91)	63,457	$113	(70)	87,986	$97	(57)	169,588
JetBlue	Hybrid	$300	(143)	234,726	$200	(118)	307,277	$160	(88)	591,511
Spirit	ULCC	$182	(91)	236,675	$115	(70)	310,774	$100	(59)	574,201
Sun Country	ULCC	$219	(112)	17,372	$146	(88)	15,079	$120	(70)	28,279
United	Legacy	$272	(179)	530,317	$179	(121)	749,531	$156	(105)	1454372
Overall		$262	(172)	2,399,610	$173	(118)	3,367,825	$150	(99)	6,486,405

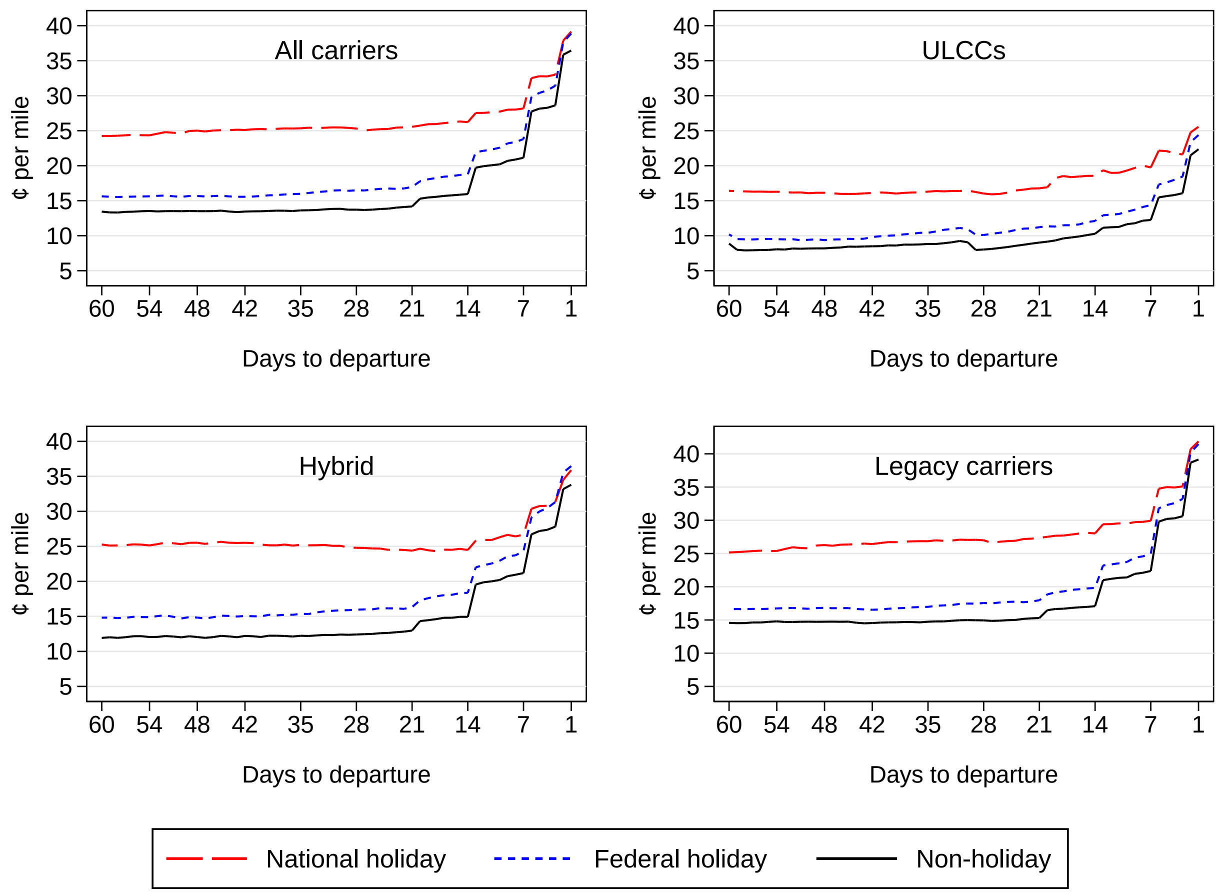
Notes: Standard deviation in parentheses. Inclusive of flights that depart on the holiday, the national (federal) holiday subsample includes flights that depart three, two, and one day before or after the national (federal) holiday. The non-holiday subsample excludes flights that depart in the seven day period before or after a national or federal holiday.

ULCCs (Allegiant, Sun Country, Spirit, and Frontier), the bottom-left chart plots the average nonstop fare per mile for hybrid carriers (Alaska and JetBlue), and the bottom-right chart plots the average nonstop fare per mile for legacy carriers (American, Delta, and United).

Examining the chart for all carriers in Figure 2 (top-left), the average nonstop fare per mile for national holidays is 10-11 cents higher than the curve for federal holidays between sixty-days and three weeks before departure. Due to a higher rate of intertemporal price increases for flights during federal holidays, this gap narrows to roughly 8 cents two weeks before departure. This gap continues to narrow until the average nonstop fare per mile for national holidays equals the corresponding curve for federal holidays a few days before departure, implying that fare premiums are similar across national holidays and federal holidays when flights are purchased a few days before departure. Notably, the booking curves for national holidays and federal holidays is less steep than the booking curve for non-holidays. This finding implies that holidays are associated with lower intertemporal price dispersion and is consistent with the findings in Gaggero and Piga (2011) and Gaggero and Luttmann (2023a).

Additionally, the charts for each of the carrier types in Figure 2 are consistent with expectations. Across the three carrier types, the average nonstop fare per mile is highest

Figure 2: Average one-way nonstop fare per mile over the booking period by carrier type



during national holidays, second-highest during federal holidays, and lowest during non-holidays. Furthermore, the average nonstop fare per mile is lowest on ULCCs, irrespective of holiday type. The booking curves for hybrid and legacy carriers are also very similar, with slightly higher nonstop fares per mile a few days prior to departure for legacy carriers. In addition, the gap between the national and federal holiday curves disappears a few days before departure for both hybrid and legacy carriers. In contrast, a small gap between the national holiday and federal holiday curves is maintained across the entire booking period for ULCCs.

4.2 Airline supply during holiday periods

To explore how airlines adjust supply (flight frequency and entry/exit decisions) during holiday periods, we rely on the U.S. Department of Transportation's Marketing Carrier On-Time Performance (OTP) dataset. In the OTP dataset, the scheduled and actual arrival and departure times for all domestic flights on U.S. carriers that account for at least one percent of scheduled passenger revenues are reported. Using these data, we classify all flights during our sample period (October 1st, 2019 through February 29th, 2020) into three distinct groups: flights in the week surrounding national holidays, flights in the week surrounding federal holidays, and flights during non-holiday periods. For each of the three groups, we calculate average weekly flight frequency for each airline and route in our analysis sample.

We find that airline entry and exit was not very frequent in our sample of 117 directional airport-pairs, suggesting that the potential endogeneity of the market structure variables that we discuss in Section 5 and Section 6.2 is not a major concern for the identification of peak-load price effects. For example, due to the Consumer Electronics Show in Las Vegas the week after New Year's, we find that Delta entered OAK-LAS and PDX-LAS while Alaska entered JFK-LAS. The only other cases of entry or exit that we observe in the week surrounding national holidays in our sample are Southwest's entry into the ATL-BOS market, Southwest's exit from the EWR-MCO and MCO-MSP markets, and Spirit's exit from the BOS-ORD and

DEN-LAX markets. In general, we find that airlines did not enter markets in the weeks surrounding federal holidays (i.e., we find no substantial difference in the set of markets airlines served across the federal holiday and non-holiday periods in our sample).

Although we find that airline entry and exit was not frequent in our analysis sample, we do find that several carriers increased flight frequency to tourist destinations in Florida during national holiday periods (perhaps to accommodate an increase in demand to these destinations over the holiday period). For example, JetBlue increased its weekly frequency in the JFK-FLL market from 7 flights during the non-holiday period to 10 flights during the national holiday period. At the same time, JetBlue reduced its frequency in the BOS-DCA market from 13 to 10 flights, suggesting a supply switch between these two routes. We also find that Delta, Spirit, and United increased weekly frequency by one to two flights in several Florida markets during the national holiday period (e.g., Delta in JFK-MCO, JFK-PBI, and LGA-MIA, Spirit in ATL-FLL, BWI-FLL, DTW-FLL, DTW-MCO, DTW-RSW, and EWR-FLL, and United in DEN-MCO, EWR-FLL, EWR-PBI, JFK-FLL, and ORD-MCO).

5 Econometric model

To determine the extent of systematic peak-load pricing during holiday periods, we estimate equation (1),

$$\begin{aligned} ln(fare)_{fadjt} \;=\;& \alpha + \sum_{i=d-7}^{d+7} \theta_i \cdot National_i + \sum_{i=d-7}^{d+7} \eta_i \cdot Federal_i + \delta \cdot HHI_{dj} + \gamma \cdot MktShare_{daj} + \\ & + \phi \cdot HubOrig_{daj} + \varphi \cdot HubDest_{daj} + \lambda \cdot DailyFreq_{daj} + \chi \cdot Connecting_{faj} + \\ & + \beta \cdot HolidayBook_t + \omega_{fd} + \tau_t + \mu_a + \rho_j + \varepsilon_{fadjt} \end{aligned} \tag{1}$$

where $ln(fare)_{fadjt}$ is the natural logarithm of the published fare measured at the nonstop flight or fight-pair (for connecting itineraries) f, airline a, directional airport-pair j, and number of days to departure $t \in [1, 60]$, level. The subscript d indicates the departure date of flight f.

The variables of interest in equation (1) are the fifteen $National$ holiday and fifteen $Federal$ holiday dummies that indicate if the departure date of nonstop flight f occurs in the seven-day period before ($d-7$, $d-6$, ..., $d-1$), the seven-day period after ($d+1$, $d+2$, ..., $d+7$), or on the day of the national or federal holiday ($d=0$).[14] The distinction between national and federal holidays allows for heterogeneity in systematic peak-load pricing across holiday types. Because travel demand is higher on national holidays than federal holidays, we expect the coefficients on the $National$ holiday dummies to be larger than the coefficients on the $Federal$ holiday dummies.

α is the regression intercept, HHI is the Herfindahl-Hirschman Index, and $MktShare$ is the airline's market share on the directional airport-pair. We compute HHI and $MktShare$ using the daily number of nonstop flights on the route (computed from the U.S. Department of Transportation's Marketing Carrier OTP dataset) to better capture the nature of competition that each airline faces on the route on a given day (Bergantino and Capozza, 2015; Gaggero and Luttmann, 2023a).

$HubOrig$ is a dummy variable that equals one if the origin airport is a hub for airline a. Similarly, $HubDest$ is a dummy that equals one if the destination airport is a hub for airline a.[15] $DailyFreq$ is the airline's daily departures (i.e., frequency) on the route.[16] $Connecting$ is a dummy that equals one for connecting itineraries. Additionally, because Luttmann and Gaggero (2024) find that fares are lower when purchased on a holiday (NOT for traveling in

[14]Referencing Table 1, there are three national holidays (Thanksgiving, Christmas, and New Year's) and four federal holidays (Columbus Day, Veteran's Day, Martin Luther King Jr. Day, and President's Day) during our sample period.

[15]The airports identified as hubs for each of the airlines in our analysis sample are provided in parentheses: Alaska (ANC, LAX, PDX, SEA, and SFO); Allegiant (LAS); American (CLT, DCA, DFW, JFK, LAX, LGA, MIA, ORD, PHL, and PHX); Delta (ATL, BOS, DTW, JFK, LAX, LGA, MSP, SEA, and SLC); Frontier (DEN); JetBlue (BOS, FLL, and JFK); Spirit (FLL, LAS, and MCO); Sun Country (MSP); United (EWR, DEN, IAD, IAH, LAX, ORD, and SFO). Not all hub airports are present in our analysis sample.

[16]This variable is treated as exogenous, based on the argument that institutional characteristics of the airline industry imply that flight frequency is determined before the airlines' choice of prices. Prices can be changed at any time by an airline, whereas flight frequency cannot be adjusted easily in a short period of time. Flight schedules, which involve crew scheduling and aircraft assignments, are developed a year before departure and are updated every three months (Ciliberto and Williams, 2010).

the days surrounding a holiday which is the focus of this paper), $HolidayBook$ is a dummy that is set to one if the fare is observed (i.e., booked) on the date of a federal or national holiday (e.g., Thanksgiving, Christmas, etc.).

ω is a matrix containing time-of-day-of-departure and day-of-week-of-departure fixed effects.[17] These fixed effects control for the average effect that the time-of-day or day-of-week-of-departure have on fares (e.g., due to differences in average demand across the time-of-day or day-of-week).[18] τ_t is the set of fifty-nine days-to-departure fixed effects that control for advance-purchase requirements. μ_a is an airline fixed effect, while ρ_j is a directional airport-pair fixed effect. Collectively, these fixed effects control for any time-invariant carrier or airport-pair-specific characteristics that affect fares.[19] Finally, ε is an error term, assumed random with zero mean.

The standard errors in equation (1) are clustered at the airport-pair level to allow for the residuals of flights on the same route (possibly of different carriers) to be correlated. This type of clustering has been adopted in several previous studies of the U.S. airline industry (Brueckner et al., 2021; Luttmann and Gaggero, 2024) and hinges on the idea that some unobserved, route-specific shocks that are common to all carriers may occur during the sample period. An example of a positive shock would be a concert or music festival that results in a large increase in passengers traveling to a particular city (e.g., a Taylor Swift concert). An example of a negative shock would be an airport authority limiting take-off and landing capacity due to scheduled or unscheduled runway maintenance.

Due to the potential simultaneity bias that results from airline entry and exit decisions, HHI and $MktShare$ are treated as endogenous variables and equation (1) is estimated using

[17] To control for the time-of-day-of-departure, the departure time for each flight is split into four periods: 12:00am-5:59am (night), 6:00am-11:59am (morning), 12:00pm-5:59pm (afternoon), and 6:00pm-11:59pm (evening).

[18] For example, business travel demand is typically higher on Mondays and Thursdays.

[19] The airline, directional airport-pair, time-of-day-of-departure, and days-to-departure fixed effects help account for (or at least proxy for) possible variation in airline marketing campaigns at both the local and national levels. However, because the time window of estimation is relatively short (i.e., five months of departures from October 2019-February 2020), we do not expect the time variation of marketing campaigns to be very large.

two-stage least squares (2SLS). We correct for this potential simultaneity bias using three instruments: (i) the Herfindahl-Hirschman Index (HHI) of the route on the same corresponding day during the previous year,[20] (ii) the airline's market share on the route on the same corresponding day during the previous year, and (iii) the distance of the route from the airline's headquarters. The last instrument reflects that the distance from an airline's headquarters impacts the marginal cost of serving the route and thus, the airline's route entry decision (Chandra and Lederman, 2018; Luttmann and Gaggero, 2024) while the first two instruments reflect that lagged market structure is correlated with current market structure. Even though unobserved cost and demand shocks may persist over time, these shocks are less likely to be correlated with previous year market structure than with current year market structure. For example, local economic conditions and airline promotions often differ from one year to the next in a given market. Furthermore, our approach of employing lagged measures of market structure to instrument for current market structure is consistent with several previous studies of the U.S. airline industry (Evans et al., 1993; Gaggero and Luttmann, 2023a; Greenfield, 2014; Whalen, 2007).

6 Results

We begin by presenting our baseline holiday peak-load pricing results (Section 6.1). We then examine how overlap in the national holiday departure dummies during the Christmas and New Year's periods affects results by performing two robustness checks (Section 6.2). These results are then followed by additional specifications that explore heterogeneity in holiday peak-load pricing for routes to leisure markets (Section 6.3), routes subject to slot-controls (Section 6.4), by route distance (Section 6.5), and carrier type (Section 6.6).

[20] By "same corresponding day", we mean that observations are matched with respect to the same day-of-week, although that may be a different calendar date across years. For example, the route's HHI on Wednesday October 2$^{\text{nd}}$, 2019 is matched with the route's HHI on Wednesday October 3$^{\text{rd}}$, 2018.

6.1 Baseline results

Table 3 presents results from estimating equation (1) using 2SLS with standard errors that are clustered at the airport-pair level. Model (1) presents results when the holiday period is defined as the three-day period before and after the national or federal holiday, model (2) the four-day period before and after, model (3) the five-day period before and after, model (4) the six-day period before and after, and model (5) the seven-day period before and after.

Our preferred estimates are presented in model (5) because that specification allows for the most liberal interpretation of the holiday period. In particular, it is plausible that the peak-travel period for national holidays extends up to one-week before and after the holiday given that many travelers prefer to spend an extended amount of time visiting family during Thanksgiving and Christmas. Furthermore, estimating separate effects for each of seven days before and after holidays allows us to determine if peak-load pricing effects decay in magnitude the further one is away from the holiday. For example, we expect large travel premiums to occur three days before the federal holiday (i.e., on Friday) and on the date of the federal holiday (i.e., on Monday) due to travelers enjoying an extended holiday weekend. Hence, estimating separate effects for each of the seven days before and after federal holidays allows us to test if the peak-travel period extends beyond this Friday to Monday expectation.

In our preferred specification, the coefficients on the national and federal holiday dummies are generally positive and statistically significant at conventional levels, providing evidence consistent with the theory that fares during holiday periods are higher than non-holiday periods due to systematic peak-load pricing. Interpreting the positive and statistically significant coefficients in model (5), the nonstop fare premium for traveling in the week surrounding national holidays ranges from 4.3% seven days after the national holiday to 83.1% for flights departing one day prior to the national holiday (e.g., the Wednesday before Thanksgiving or on Christmas Eve).[21] Furthermore, almost all national holiday dummies are positive and

[21] Because the dependent variable is in natural logarithm form and the *National* and *Federal* holiday variables are dummies, marginal effects are interpreted as the $100(\exp^{\beta} - 1)\%$ change in fare.

Table 3: Systematic peak-load pricing for traveling during national and federal holiday periods

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
National $d-7$									0.173***	(0.018)
National $d-6$							0.310***	(0.022)	0.318***	(0.022)
National $d-5$					0.370***	(0.024)	0.383***	(0.025)	0.383***	(0.025)
National $d-4$			0.327***	(0.022)	0.332***	(0.023)	0.337***	(0.022)	0.337***	(0.022)
National $d-3$	0.330***	(0.024)	0.248***	(0.026)	0.253***	(0.026)	0.260***	(0.025)	0.256***	(0.025)
National $d-2$	0.569***	(0.023)	0.582***	(0.023)	0.539***	(0.024)	0.537***	(0.024)	0.531***	(0.024)
National $d-1$	0.599***	(0.018)	0.599***	(0.018)	0.607***	(0.018)	0.598***	(0.019)	0.605***	(0.020)
National $d=0$	0.464***	(0.018)	0.476***	(0.018)	0.481***	(0.018)	0.491***	(0.018)	0.438***	(0.017)
National $d+1$	0.436***	(0.022)	0.464***	(0.023)	0.478***	(0.023)	0.397***	(0.025)	0.406***	(0.025)
National $d+2$	0.513***	(0.024)	0.519***	(0.024)	0.425***	(0.027)	0.437***	(0.026)	0.438***	(0.026)
National $d+3$	0.626***	(0.018)	0.560***	(0.021)	0.564***	(0.021)	0.570***	(0.022)	0.570***	(0.022)
National $d+4$			0.371***	(0.018)	0.377***	(0.018)	0.383***	(0.019)	0.379***	(0.019)
National $d+5$					0.172***	(0.019)	0.170***	(0.019)	0.164***	(0.020)
National $d+6$							0.011	(0.014)	0.018	(0.014)
National $d+7$									0.042***	(0.014)
Federal $d-7$									-0.035***	(0.008)
Federal $d-6$							-0.040***	(0.007)	-0.039***	(0.007)
Federal $d-5$					0.022**	(0.011)	0.024**	(0.011)	0.048***	(0.011)
Federal $d-4$			0.170***	(0.014)	0.172***	(0.014)	0.206***	(0.015)	0.222***	(0.016)
Federal $d-3$	0.240***	(0.016)	0.233***	(0.016)	0.274***	(0.017)	0.297***	(0.018)	0.298***	(0.018)
Federal $d-2$	0.103***	(0.016)	0.134***	(0.017)	0.142***	(0.016)	0.146***	(0.016)	0.146***	(0.016)
Federal $d-1$	0.004	(0.011)	0.053***	(0.011)	0.054***	(0.011)	0.068***	(0.010)	0.066***	(0.010)
Federal $d=0$	0.242***	(0.011)	0.262***	(0.012)	0.278***	(0.012)	0.278***	(0.012)	0.265***	(0.012)
Federal $d+1$	0.077***	(0.007)	0.079***	(0.007)	0.087***	(0.007)	0.078***	(0.007)	0.079***	(0.007)
Federal $d+2$	-0.055***	(0.007)	-0.053***	(0.007)	-0.047***	(0.006)	-0.046***	(0.007)	-0.022***	(0.006)
Federal $d+3$	-0.067***	(0.010)	-0.024***	(0.008)	-0.022***	(0.008)	0.013*	(0.007)	0.029***	(0.007)
Federal $d+4$			-0.037***	(0.011)	0.004	(0.009)	0.026***	(0.009)	0.027***	(0.008)
Federal $d+5$					-0.037***	(0.011)	-0.034***	(0.011)	-0.034***	(0.011)
Federal $d+6$							0.047***	(0.013)	0.046***	(0.013)
Federal $d+7$									-0.013	(0.009)
HHI	0.202	(0.188)	0.191	(0.187)	0.199	(0.184)	0.195	(0.182)	0.204	(0.182)
MktShare	0.225**	(0.086)	0.240***	(0.085)	0.237***	(0.085)	0.247***	(0.085)	0.250***	(0.085)
HubOrig	0.031*	(0.017)	0.032*	(0.017)	0.033*	(0.017)	0.033*	(0.017)	0.033*	(0.017)
HubDest	-0.035**	(0.017)	-0.034*	(0.017)	-0.034*	(0.017)	-0.033*	(0.017)	-0.033*	(0.017)
DailyFreq	0.006	(0.004)	0.005	(0.004)	0.005	(0.004)	0.004	(0.004)	0.004	(0.004)
Connecting	0.028	(0.021)	0.028	(0.021)	0.027	(0.021)	0.028	(0.021)	0.028	(0.021)
HolidayBook	-0.043***	(0.003)	-0.045***	(0.003)	-0.046***	(0.003)	-0.045***	(0.003)	-0.045***	(0.003)
Kleibergen-Paap χ^2 Stat.	12.946***		12.980***		12.941***		13.033***		13.035***	
Cragg-Donald F Stat.	40,170***		40,154***		40,146***		40,362***		40,262***	
Hansen J Stat.	0.182		0.286		0.313		0.413		0.420	
R^2	0.156		0.178		0.190		0.198		0.200	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: The dependent variable is the natural logarithm of fare. HHI and $MktShare$ are treated as endogenous variables and instrumented for using past-year values of HHI and $MktShare$ in addition to the distance of the route from the airline's headquarters. Ordinary least squares estimates for all models are presented in Appendix Table B1 and first-stage estimates are presented in Appendix Tables A3 and A4. Marginal effects are interpreted as the $100(\exp^{\beta}-1)$% change in fare. All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

statistically significant, implying that the entire week surrounding Thanksgiving, Christmas, and New Year's is subject to systematic peak-load pricing.

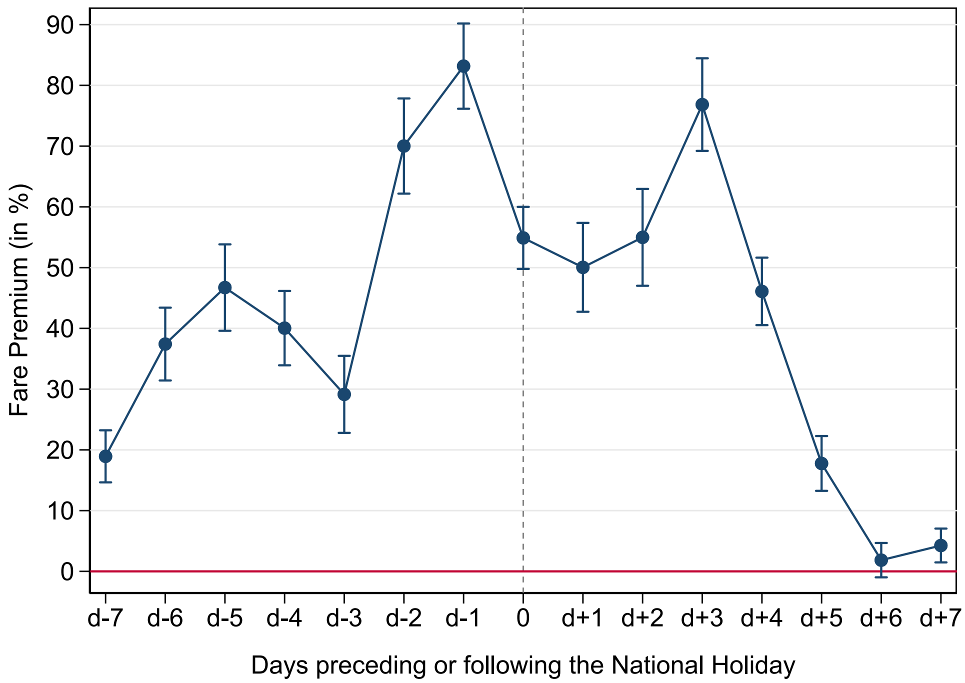
In contrast, the magnitude of the coefficients on the federal holiday dummies are smaller than the corresponding coefficients on the national holiday dummies, indicating that travel premiums are smaller during federal holidays (a finding consistent with the descriptive statistics presented in Table 2). This finding is sensible considering that travel demand is typically higher on national holidays, likely due to the fact that a large fraction of civilian and private sector workers do not receive federal holidays off from work (e.g., see Table 1).

Interpreting the positive and statistically significant coefficients on the federal holiday dummies in model (5), the nonstop fare premium for traveling in the week surrounding federal holidays ranges from 2.7% four days after the federal holiday to 34.7% for flights departing three days prior to the federal holiday (i.e., the Friday before the Monday holiday). Furthermore, because all federal holidays in our sample occur on a Monday (see Table 1), it is not surprising that the largest coefficients on the federal holiday dummies are estimated on the Friday preceding the holiday ($Federal\ d-3$) and on the day of the federal holiday ($Federal\ d=0$). In other words, most people traveling during federal holiday periods take an extended weekend by leaving on Friday and returning on the Monday holiday.

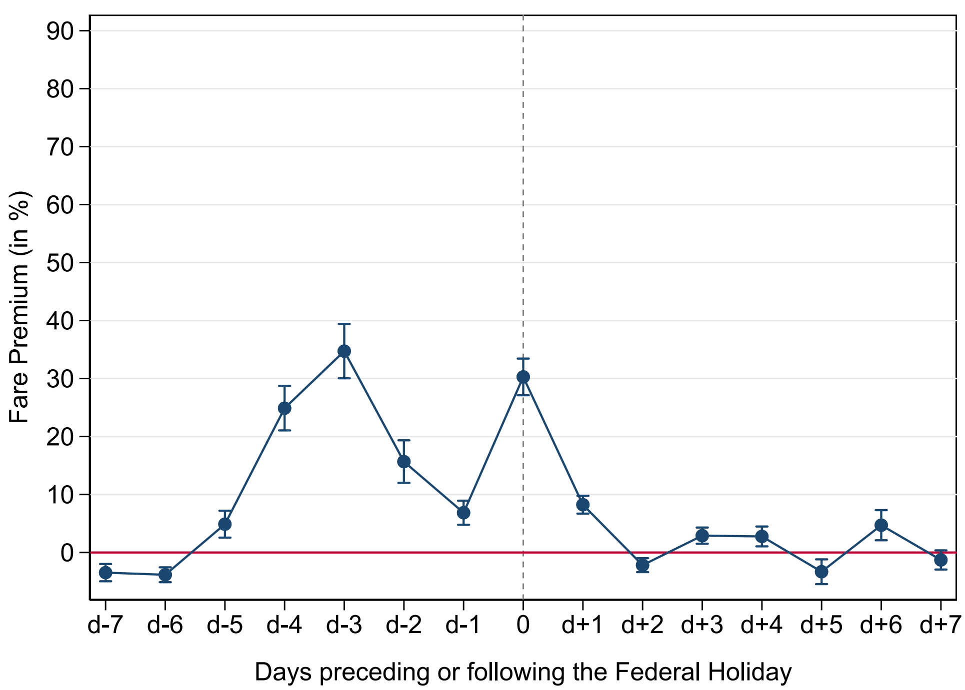
To provide a graphical illustration of the estimated holiday travel premiums, Figure 3 plots the marginal effects and associated 95% confidence intervals for each of the national holiday and federal holiday dummies estimated in model (5) of Table 3. As demonstrated in panel (a) of Figure 3, the peak-travel period surrounding national holidays primarily extends from seven days before the holiday (18.9% fare premium) to five days after the holiday (17.8% fare premium). In contrast, the peak-travel period for federal holidays primarily extends from five days before the holiday (4.9% fare premium) to one day after the holiday (8.2% fare premium). Outside of this range, the marginal effects on the federal holiday dummies are either negative (implying that the peak-travel period does not extend to those days) or relatively small in magnitude (e.g., five days before, three days after, four days after, and six

Figure 3: Estimated fare premiums during national and federal holiday periods with 95% confidence interval

(a) National Holidays



(b) Federal Holidays



days after the federal holiday).

6.1.1 Coefficients on the market structure and other control variables

As discussed in Section 5, HHI and $MktShare$ are potentially endogenous due to the simultaneity bias that may result from airline entry and exit decisions. This potential endogeneity is corrected for in Table 3 using 2SLS with the one-year lag of HHI, one-year lag of $MktShare$, and distance of the route from the airline's headquarters as instruments. However, because Gayle and Wu (2013) demonstrate that accounting for endogenous carrier entry using a structural model has a negligible impact on fares in a subsequent regression, we also present ordinary least squares (OLS) estimates in Appendix B as a robustness check. Notably, the 2SLS and OLS results are qualitatively consistent with respect to our variables of interest (i.e., the full set of federal holiday and national holiday departure dummies).

In Table 3, the coefficients on HHI and $MktShare$ are both positive as expected, but only the coefficient on $MktShare$ is statistically significant. More importantly, the diagnostic tests listed in the bottom panel of Table 3 indicate that our instruments are both strong and relevant. In particular, because we have more instruments (three) than endogenous variables (two), we are able to test if our overidentifying restrictions are valid using Hansen's J test. In all Table 3 specifications, we fail to reject the null hypothesis that our overidentifying restrictions are valid, indicating that the instruments are likely uncorrelated with the error term and are therefore correctly excluded from the main estimating equation. Furthermore, the highly statistically significant Kleibergen-Paap and Cragg-Donald statistics indicate that our instruments are strong predictors of HHI and $MktShare$.[22] Finally, as additional robustness

[22] The instruments also behave as expected in the first-stage regressions (see Appendix Tables A3 and A4). When HHI is the dependent variable, past-year HHI and past-year $MktShare$ are both positive and statistically significant while distance to the airline's headquarters is statistically insignificant. However, this insignificant coefficient is expected because the distance measure is airline-specific and may not be a strong predictor of a dependent variable that is route (and not airline) specific. In contrast, when $MktShare$ is the dependent variable, distance to the airline's headquarters plays an important role (in addition to past-year $MktShare$). As expected, the negative and statistically significant coefficient on distance to the airline's headquarters indicates that the further away a route is from an airline's headquarters, the lower its predicted market share. Finally, the negative and statistically significant coefficient on past-year HHI in the first-stage

checks, we experiment with further combinations of competition variables, by including the market share of the dominant airline on the route ($DominantMktShare$) amongst the set of regressors. The results with respect to our variables of interest, i.e., the full set of federal and national holiday dummies, remain qualitatively unchanged (see Tables C1 and C2 in the Appendix).

The coefficients on the other control variables either have the expected sign or are statistically insignificant in all Table 3 specifications. Consistent with Luttmann and Gaggero (2024), the negative and statistically significant coefficients on $HolidayBook$ indicate that airlines offer discounts (on the magnitude of 4.4% to 4.7%) to passengers who purchase tickets on a federal or national holiday (NOT for traveling in the days surrounding the holiday which is the focus of this paper). Moreover, consistent with previous literature on the hub premium, the positive and marginally significant coefficients on $HubOrig$ indicate that fares are higher (by an average of 3.1% to 3.4%) when the passenger travels on an airline that operates a hub at the origin airport (Borenstein, 1989; Lee and Luengo-Prado, 2005; Escobari, 2011; Bilotkach and Pai, 2016). In contrast, the negative and marginally significant coefficients on $HubDest$ indicate that the hub premium does not extend to flights that terminate at the airline's hub in our sample. Furthermore, the statistically insignificant coefficient on $DailyFreq$ in all Table 3 specifications suggests that daily flight frequency is not a relevant predictor of fares in our sample.

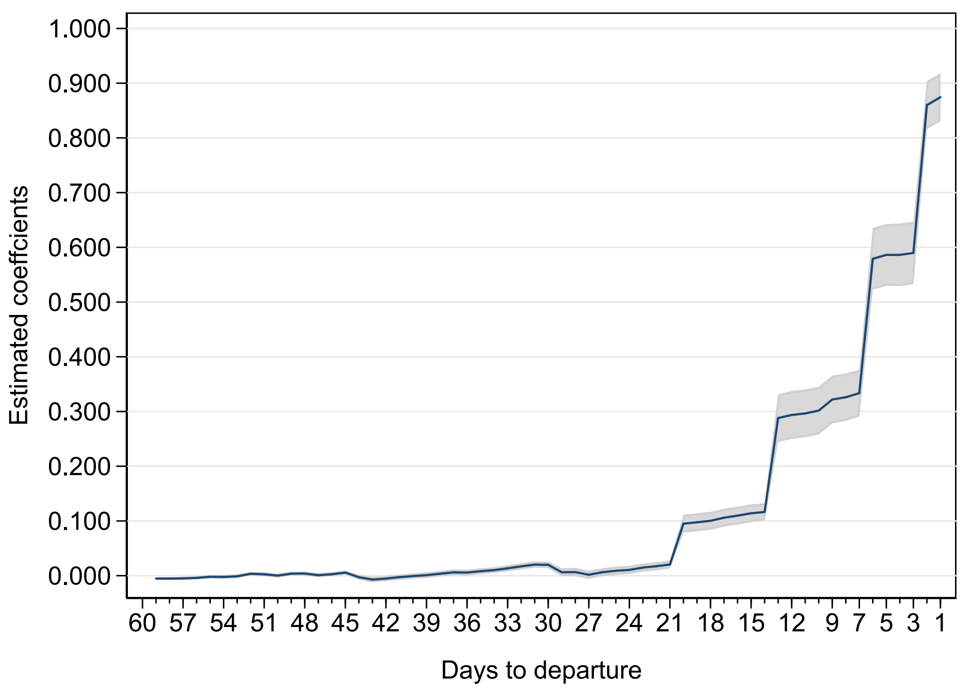
Although we expected the coefficient on $Connecting$ to be negative due to the lower quality of connecting flights relative to nonstop flights, the statistically insignificant coefficients on $Connecting$ in all Table 3 specifications indicate that fares for nonstop and connecting flights are not statistically different in our sample (after conditioning on all other included covariates and fixed effects).[23]

regression for $MktShare$ is not worrisome because it is not necessarily true that, if HHI increases on a given route, the airline's market share will also increase. For instance, the expansion of a competitor on a route increases the level of market concentration (i.e., an increase in HHI) but also, and more importantly, lowers the market shares of all other airlines serving the route.

[23]Connecting flights comprise only 17% of our analysis sample.

Finally, Figure 4 displays the estimated coefficients on the 59 days-to-departure fixed effects τ_t (not reported in Table 3 for brevity) and their associated 95% confidence interval (shaded in gray). The reference category is set to τ_{60}, meaning that the coefficients on the 59 included days-to-departure dummies are interpreted relative to fares observed (i.e., purchased) 60 days before departure. The intertemporal price pattern displayed in Figure 4 is consistent with several previous studies of the U.S. airline industry (Mantin and Koo, 2009; Gaggero, 2010; Luttmann, 2019a; Luttmann and Gaggero, 2024). Specifically, fares are relatively stable until three weeks before departure, when they begin to steadily increase until the departure date. There are also four clearly defined fare hikes that occur from 21 to 20, 14 to 13, 7 to 6, and 3 to 2 days prior to departure. As discussed in Luttmann and Gaggero (2024), these four fare hikes likely reflect the expiration of discount fare classes attached to three-week, two-week, one-week, and three-day advance-purchase requirements.

Figure 4: Estimated coefficients on the days-to-departure fixed effects with 95% confidence interval



6.2 Overlap in national holiday departure dummies during the Christmas and New Year's periods

Although model (5) provides the most liberal interpretation of the holiday period, some of the national holiday departure dummies overlap across the Christmas and New Year's periods in Table 3. For example, December 26$^{\text{th}}$ occurs one day after Christmas (i.e., *National* $d+1$ equals one) and six days before New Year's Day (i.e., *National* $d-6$ also equals one). This issue of overlapping pre- and post-national holiday departure dummies also persists, although to a diminishing extent, in models (4), (3), and (2). Model (1), which employs a three-day window, is the sole model that avoids this overlap. However, the limitation of model (1) is that it does not allow us to test whether the peak-holiday period extends beyond this symmetric three-day window.

It is unclear how the issue of overlapping national holiday departure dummies in models (2)-(5) impacts the price premiums that we estimate, given that we are essentially partitioning the positive national holiday pricing effects into multiple dummies when an overlap occurs. To more formally investigate the impact that this overlap issue has on our estimates, we perform two sensitivity analyses. In the first sensitivity, we re-estimate equation (1) using a "donut" sample where we exclude flights departing during the Christmas and New Year's periods (i.e., we remove from the estimation sample flights that depart between December 18$^{\text{th}}$, 2019 and January 8$^{\text{th}}$, 2020). Results from this "donut" specification are presented in Table 4. As expected, coefficients on the affected national holiday departure dummies generally remain positive and statistically significant. For example, estimated travel premiums in Table 4 range from 8.7% seven days after Thanksgiving to 143.5% three days after Thanksgiving. In other words, we still find evidence consistent with systematic peak-load pricing in the week surrounding Thanksgiving, the sole remaining national holiday in the "donut" sample.

In the second sensitivity, we amend the national holiday departure dummies during the Christmas and New Year's periods as follows: when an overlap occurs, the national-holiday dummy that is furthest away from either Christmas or New Year's is set to 0. For instance, in the aforementioned December 26$^{\text{th}}$ example, December 26$^{\text{th}}$ is further away from New Year's (*National* $d-6$) than it is from Christmas (*National* $d+1$). Accordingly, for flights departing on December 26$^{\text{th}}$, we set *National* $d-6$ to 0 while *National* $d+1$ remains equal to 1. Results from this sensitivity are provided in Table 5. Consistent with Tables 3 and 4, the coefficients on the national holiday departure dummies are still positive and statistically significant, providing additional evidence of systematic peak-load pricing during national holiday periods. The estimated travel premiums in Table 5 range from 1.8% seven days after the national holiday to 101.0% three days after the national holiday.

6.3 Holiday peak-load pricing and tourist destinations

Our baseline results in Table 3 constrain the national holiday and federal holiday effects to be constant across different types of routes. However, because demand elasticities differ across routes (e.g., business vs. leisure), holiday peak-load pricing may also vary by route type. For example, all three national holidays in our sample occur when many parts of the United States experience cold temperatures in November (Thanksgiving), December (Christmas), and January (New Year's). As a result, we expect demand to be higher (and thus the extent of systematic peak-load pricing) for flights to warm tourist destinations in Florida during these three national holidays. The same logic also applies to the set of federal holidays that occur in November (Veteran's Day), January (Martin Luther King Jr. Day), and February (President's Day).

To determine if holiday travel premiums differ across business and leisure routes, we augment equation (1) by interacting the national holiday and federal holiday dummies with an indicator identifying a tourist destination.[24] Following Berry and Jia (2010), Las Vegas (LAS) and all airports in Florida (e.g., Fort Lauderdale (FLL), Miami (MIA), Orlando (MCO), Palm Beach (PBI), Fort Myers (RSW)) are classified as tourist destinations in our analysis sample.

[24]The tourist destination indicator is not separately identified from the airport-pair fixed effects.

Table 4: Systematic peak-load pricing for traveling during national and federal holiday periods: Excluding flights the depart during the Christmas and New Year's periods

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
National $d-7$									0.020	(0.018)
National $d-6$							0.218***	(0.028)	0.218***	(0.028)
National $d-5$					0.336***	(0.027)	0.336***	(0.027)	0.336***	(0.027)
National $d-4$			-0.013	(0.020)	-0.013	(0.020)	0.005	(0.021)	0.005	(0.021)
National $d-3$	0.070***	(0.021)	0.121***	(0.022)	0.121***	(0.022)	0.121***	(0.022)	0.110***	(0.022)
National $d-2$	0.616***	(0.025)	0.617***	(0.025)	0.640***	(0.026)	0.635***	(0.026)	0.635***	(0.026)
National $d-1$	0.689***	(0.029)	0.690***	(0.029)	0.710***	(0.029)	0.723***	(0.029)	0.723***	(0.029)
National $d=0$	0.249***	(0.024)	0.307***	(0.025)	0.306***	(0.025)	0.306***	(0.025)	0.316***	(0.024)
National $d+1$	0.350***	(0.035)	0.345***	(0.036)	0.344***	(0.036)	0.367***	(0.036)	0.367***	(0.036)
National $d+2$	0.807***	(0.035)	0.809***	(0.036)	0.840***	(0.037)	0.841***	(0.037)	0.841***	(0.037)
National $d+3$	0.873***	(0.024)	0.872***	(0.024)	0.872***	(0.024)	0.890***	(0.025)	0.890***	(0.025)
National $d+4$			0.644***	(0.023)	0.645***	(0.023)	0.645***	(0.023)	0.633***	(0.024)
National $d+5$					0.308***	(0.022)	0.302***	(0.021)	0.302***	(0.021)
National $d+6$							0.108***	(0.012)	0.108***	(0.012)
National $d+7$									0.083***	(0.016)
Federal $d-7$									-0.028***	(0.010)
Federal $d-6$							-0.020***	(0.007)	-0.020***	(0.007)
Federal $d-5$					0.065***	(0.012)	0.077***	(0.013)	0.077***	(0.013)
Federal $d-4$			0.203***	(0.016)	0.203***	(0.016)	0.203***	(0.016)	0.214***	(0.016)
Federal $d-3$	0.257***	(0.018)	0.252***	(0.018)	0.252***	(0.018)	0.274***	(0.017)	0.274***	(0.017)
Federal $d-2$	0.169***	(0.017)	0.170***	(0.017)	0.200***	(0.016)	0.201***	(0.016)	0.200***	(0.016)
Federal $d-1$	0.052***	(0.011)	0.050***	(0.012)	0.050***	(0.012)	0.068***	(0.010)	0.068***	(0.010)
Federal $d=0$	0.231***	(0.011)	0.283***	(0.012)	0.283***	(0.012)	0.283***	(0.012)	0.272***	(0.013)
Federal $d+1$	0.081***	(0.008)	0.081***	(0.008)	0.104***	(0.008)	0.098***	(0.007)	0.098***	(0.007)
Federal $d+2$	-0.025***	(0.007)	-0.026***	(0.007)	-0.005	(0.007)	0.007	(0.007)	0.007	(0.007)
Federal $d+3$	-0.052***	(0.010)	0.008	(0.007)	0.008	(0.007)	0.008	(0.007)	0.018**	(0.007)
Federal $d+4$			-0.017*	(0.009)	-0.017*	(0.010)	0.005	(0.010)	0.005	(0.010)
Federal $d+5$					0.018	(0.012)	0.018	(0.012)	0.018	(0.012)
Federal $d+6$							0.054***	(0.013)	0.053***	(0.013)
Federal $d+7$									-0.006	(0.010)
HHI	0.375*	(0.194)	0.406**	(0.185)	0.419**	(0.184)	0.434**	(0.182)	0.427**	(0.181)
MktShare	0.300***	(0.092)	0.307***	(0.091)	0.312***	(0.091)	0.316***	(0.091)	0.317***	(0.091)
HubOrig	0.031*	(0.017)	0.032*	(0.017)	0.032*	(0.017)	0.032*	(0.017)	0.032*	(0.017)
HubDest	-0.035**	(0.017)	-0.034*	(0.017)	-0.034*	(0.017)	-0.034*	(0.017)	-0.033*	(0.017)
DailyFreq	0.002	(0.005)	0.001	(0.005)	0.001	(0.005)	0.001	(0.005)	0.001	(0.005)
Connecting	0.026	(0.021)	0.024	(0.021)	0.024	(0.021)	0.024	(0.021)	0.024	(0.021)
HolidayBook	-0.047***	(0.003)	-0.047***	(0.003)	-0.047***	(0.003)	-0.046***	(0.003)	-0.046***	(0.003)
Kleibergen-Paap χ^2 Stat.	13.396***		13.382***		13.307***		13.327***		13.335***	
Cragg-Donald F Stat.	30,049***		29,955***		29,986***		30,124***		30,277***	
Hansen J Stat.	1.076		1.259		1.380		1.429		1.436	
R^2	0.113		0.132		0.139		0.140		0.141	
Observations	15,524,145		15,524,145		15,524,145		15,524,145		15,524,145	

Notes: The dependent variable is the natural logarithm of fare. Flights that depart between December 18$^{\text{th}}$, 2019 and January 8$^{\text{th}}$, 2020 are excluded from the estimation sample. HHI and $MktShare$ are treated as endogenous variables and instrumented for using past-year values of HHI and $MktShare$ in addition to the distance of the route from the airline's headquarters. Marginal effects are interpreted as the $100(\exp^{\beta} - 1)\%$ change in fare. All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table 5: Systematic peak-load pricing for traveling during national and federal holiday periods: National holiday departure dummies amended during the Christmas and New Year's periods

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
National $d-7$									0.152***	(0.017)
National $d-6$							0.308***	(0.023)	0.317***	(0.024)
National $d-5$					0.458***	(0.025)	0.477***	(0.026)	0.478***	(0.026)
National $d-4$			0.409***	(0.024)	0.425***	(0.025)	0.437***	(0.025)	0.438***	(0.025)
National $d-3$	0.330***	(0.024)	0.380***	(0.025)	0.389***	(0.025)	0.402***	(0.025)	0.406***	(0.025)
National $d-2$	0.569***	(0.023)	0.591***	(0.023)	0.609***	(0.024)	0.610***	(0.024)	0.616***	(0.024)
National $d-1$	0.599***	(0.018)	0.600***	(0.018)	0.613***	(0.018)	0.615***	(0.019)	0.622***	(0.019)
National $d=0$	0.464***	(0.018)	0.476***	(0.018)	0.481***	(0.018)	0.493***	(0.018)	0.509***	(0.019)
National $d+1$	0.436***	(0.022)	0.465***	(0.023)	0.478***	(0.023)	0.506***	(0.023)	0.517***	(0.024)
National $d+2$	0.513***	(0.024)	0.519***	(0.024)	0.555***	(0.025)	0.576***	(0.026)	0.577***	(0.026)
National $d+3$	0.626***	(0.018)	0.667***	(0.019)	0.686***	(0.020)	0.697***	(0.021)	0.698***	(0.021)
National $d+4$			0.443***	(0.019)	0.455***	(0.020)	0.465***	(0.020)	0.469***	(0.021)
National $d+5$					0.245***	(0.020)	0.246***	(0.021)	0.251***	(0.021)
National $d+6$							0.069***	(0.012)	0.079***	(0.012)
National $d+7$									0.018*	(0.010)
Federal $d-7$									0.002	(0.009)
Federal $d-6$							-0.023***	(0.007)	-0.021***	(0.008)
Federal $d-5$					0.022*	(0.011)	0.029**	(0.011)	0.045***	(0.011)
Federal $d-4$			0.170***	(0.014)	0.172***	(0.014)	0.200***	(0.014)	0.216***	(0.015)
Federal $d-3$	0.240***	(0.016)	0.233***	(0.016)	0.272***	(0.016)	0.301***	(0.017)	0.303***	(0.017)
Federal $d-2$	0.103***	(0.016)	0.133***	(0.017)	0.160***	(0.016)	0.165***	(0.016)	0.165***	(0.016)
Federal $d-1$	0.004	(0.011)	0.063***	(0.012)	0.066***	(0.012)	0.085***	(0.011)	0.086***	(0.011)
Federal $d=0$	0.242***	(0.011)	0.275***	(0.012)	0.293***	(0.012)	0.294***	(0.012)	0.302***	(0.012)
Federal $d+1$	0.077***	(0.007)	0.079***	(0.007)	0.096***	(0.007)	0.095***	(0.007)	0.097***	(0.007)
Federal $d+2$	-0.055***	(0.007)	-0.054***	(0.007)	-0.048***	(0.007)	-0.041***	(0.007)	-0.025***	(0.006)
Federal $d+3$	-0.067***	(0.010)	-0.024***	(0.008)	-0.022***	(0.008)	0.006	(0.007)	0.022***	(0.007)
Federal $d+4$			-0.038***	(0.011)	0.002	(0.010)	0.031***	(0.009)	0.033***	(0.009)
Federal $d+5$					-0.020*	(0.012)	-0.015	(0.012)	-0.015	(0.012)
Federal $d+6$							0.066***	(0.012)	0.067***	(0.012)
Federal $d+7$									0.024***	(0.008)
HHI	0.202	(0.188)	0.227	(0.187)	0.240	(0.183)	0.247	(0.179)	0.246	(0.180)
MktShare	0.225**	(0.086)	0.239***	(0.085)	0.244***	(0.085)	0.249***	(0.085)	0.251***	(0.085)
HubOrig	0.031*	(0.017)	0.033*	(0.017)	0.033*	(0.017)	0.034*	(0.017)	0.034*	(0.017)
HubDest	-0.035**	(0.017)	-0.034*	(0.017)	-0.033*	(0.017)	-0.032*	(0.017)	-0.032*	(0.017)
DailyFreq	0.006	(0.004)	0.005	(0.004)	0.004	(0.004)	0.004	(0.004)	0.004	(0.004)
Connecting	0.028	(0.021)	0.027	(0.021)	0.026	(0.021)	0.026	(0.021)	0.026	(0.021)
HolidayBook	-0.043***	(0.003)	-0.044***	(0.003)	-0.044***	(0.003)	-0.044***	(0.003)	-0.044***	(0.003)
Kleibergen-Paap χ^2 Stat.	12.946***		12.978***		12.934***		12.985***		13.015***	
Cragg-Donald F Stat.	40,170***		40,052***		40,037***		40,272***		40,228***	
Hansen J Stat.	0.182		0.293		0.394		0.447		0.459	
R^2	0.156		0.178		0.193		0.199		0.200	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: The dependent variable is the natural logarithm of fare. When the values of two National holiday departure dummies overlap during the Christmas and New Year's periods, the dummy furthest away from the national holiday is set equal to 0. For example, December 26$^{\text{th}}$ is further away from New Year's (*National d - 6*) than it is from Christmas (*National d + 1*). In this instance, *National d - 6* is set equal to 0 while *National d + 1* remains equal to 1 for flights that depart on December 26$^{\text{th}}$. HHI and $MktShare$ are treated as endogenous variables and instrumented for using past-year values of HHI and $MktShare$ in addition to the distance of the route from the airline's headquarters. Marginal effects are interpreted as the $100(\exp^{\beta}-1)$% change in fare. All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

In lieu of presenting a lengthy table of coefficient estimates for the thirty additional interaction terms, Figure 5 plots the marginal effects and associated 95% confidence intervals for non-tourist (blue dots) and tourist destinations (green triangles). Panel (a) displays the marginal effects for national holidays while panel (b) displays the marginal effects for federal holidays.

For national holidays, travel premiums are generally larger for flights to tourist destinations in the seven-day period prior to the holiday. This relationship then flips as flights to non-tourist destinations become more expensive in the seven-day period following the national holiday (i.e., people returning home).

For federal holidays, travel premiums to tourist destinations are larger between five days before and two days before the holiday in addition to three days after and four days after the holiday. In contrast, travel premiums to non-tourist destinations are larger between one day before and one day after the federal holiday. We believe these findings are sensible given our hypothesis that most people traveling during federal holidays are enjoying an extended three or four-day weekend. In other words, people traveling during federal holidays are more likely to travel to a tourist destination several days before the holiday (e.g., on the Thursday or Friday) and return home to their non-tourist market in the days surrounding the Monday holiday (e.g., on Sunday, Monday, or Tuesday).

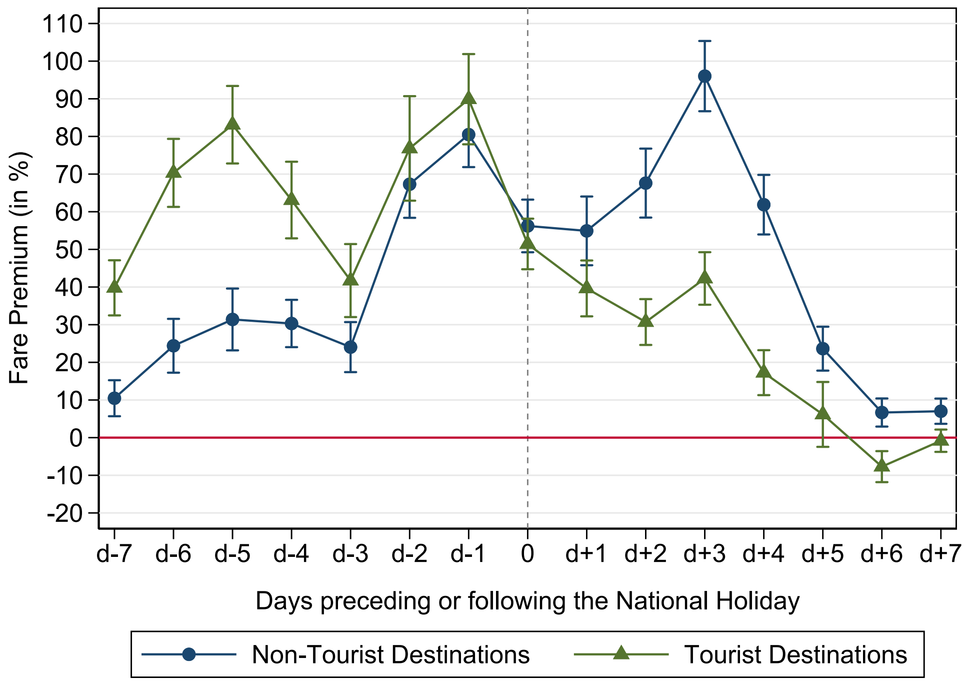
6.4 Holiday peak-load pricing and slot-controlled airports

Given that peak-load pricing occurs when capacity constraints cause marginal costs to be high (Borenstein and Rose, 1994; Escobari, 2009), travel premiums during holiday periods may be larger at airports that are capacity constrained. In the U.S., it is difficult for airlines to schedule additional flights at John F. Kennedy (JFK), Laguardia (LGA), and Washington National (DCA) due to slot controls.

To determine if holiday travel premiums differ across slot-controlled and non-slot-controlled airports, we augment equation (1) by interacting the national holiday and federal holiday

Figure 5: Estimated fare premiums during holiday periods for non-tourist and tourist destinations with 95% confidence interval

(a) National Holidays



(b) Federal Holidays

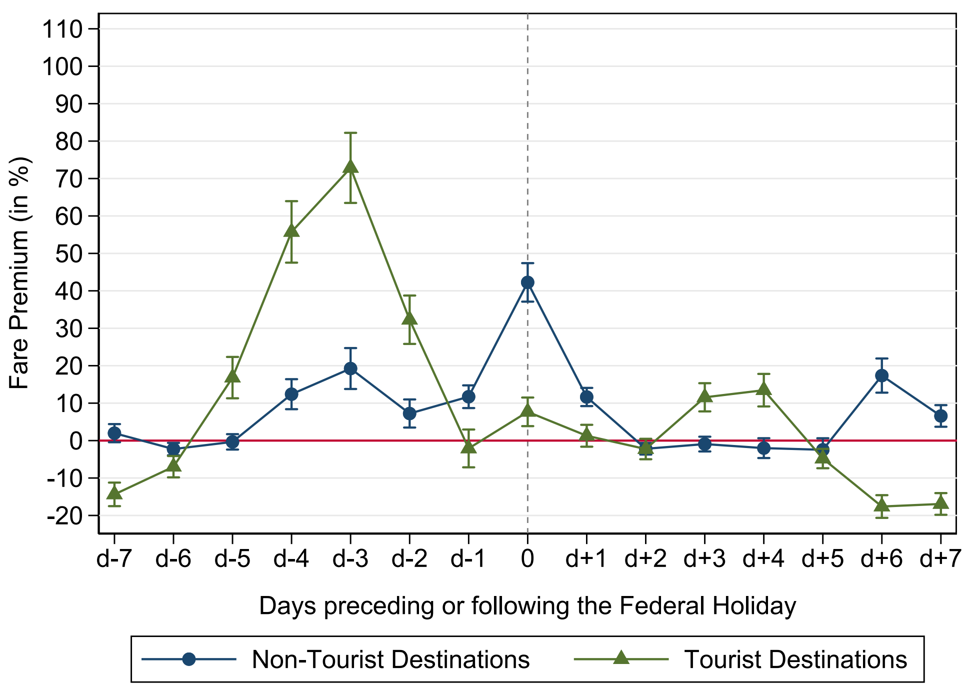
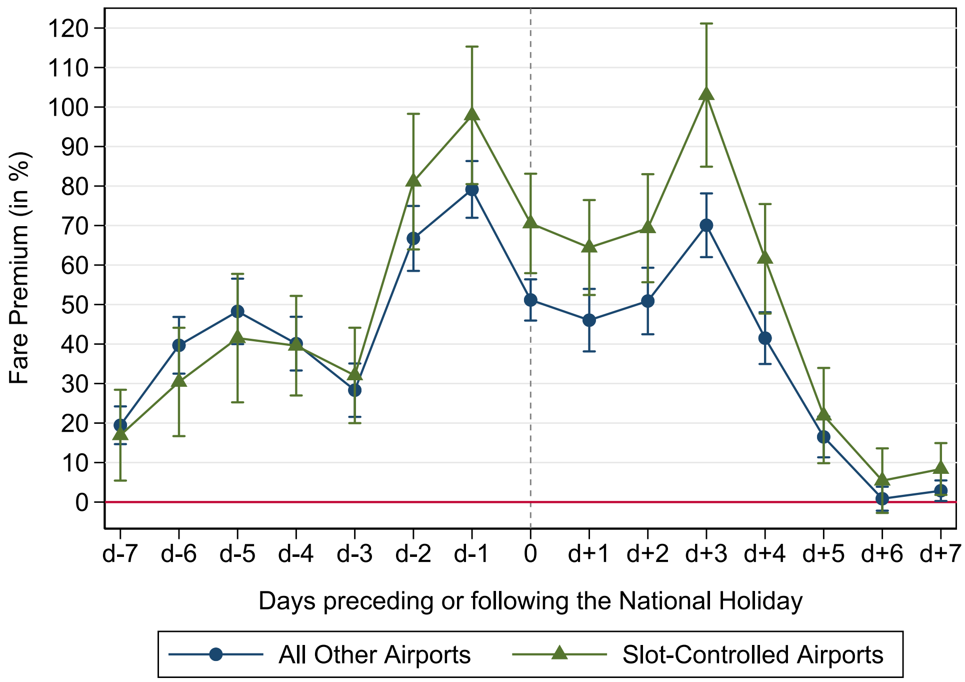
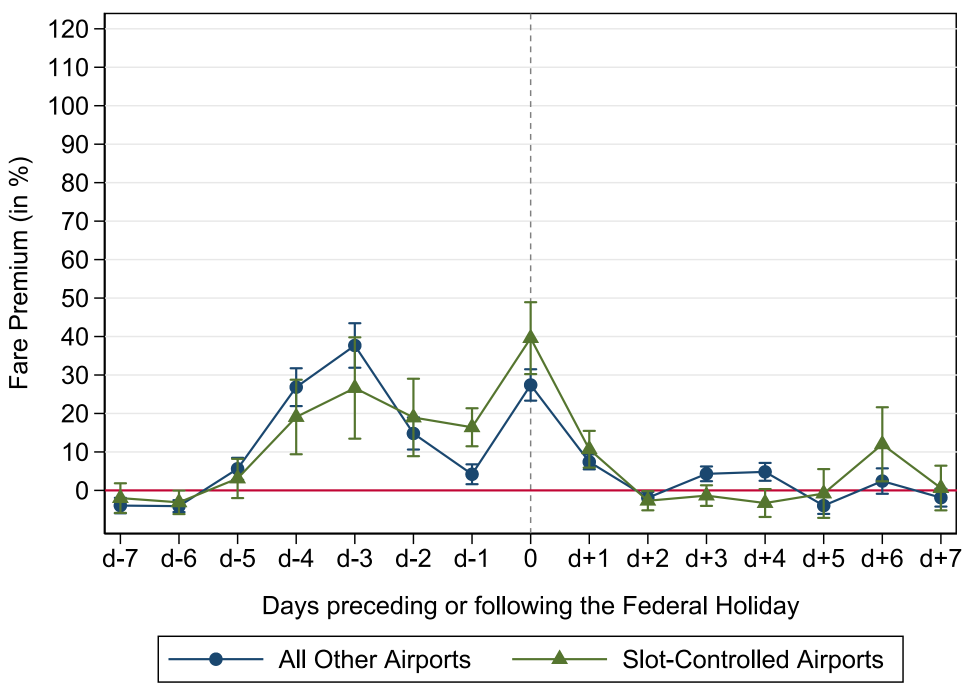


Figure 6: Estimated fare premiums during holiday periods for slot-controlled and non-slot-controlled airports with 95% confidence interval

(a) National Holidays



(b) Federal Holidays



dummies with an indicator specifying if the origin or destination airport on the route is slot-controlled (i.e., if the origin or destination airport is JFK, LGA, or DCA).[25] Figure 6 plots the marginal effects and associated 95% confidence intervals from this augmented specification for non-slot-controlled (blue dots) and slot-controlled routes (green triangles). Panel (a) displays the marginal effects for national holidays while panel (b) displays the marginal effects for federal holidays.

There is some evidence that travel premiums are larger on routes to or from slot-controlled airports during national holidays. In particular, the marginal effects for slot-controlled airports are noticeably larger than the corresponding marginal effects for non-slot-controlled airports between one day before the national holiday and four days after the national holiday. Outside of this six-day range, the confidence intervals for slot-controlled and non-slot-controlled routes overlap, implying no difference in average fare premiums.

In contrast, travel premiums during federal holidays are generally not larger on slot-controlled routes given that almost all confidence intervals in panel (b) of Figure 6 overlap. The sole exception is for flights that depart one day before the federal holiday. In this instance, travel premiums are larger on routes where at least one endpoint airport is slot-controlled.

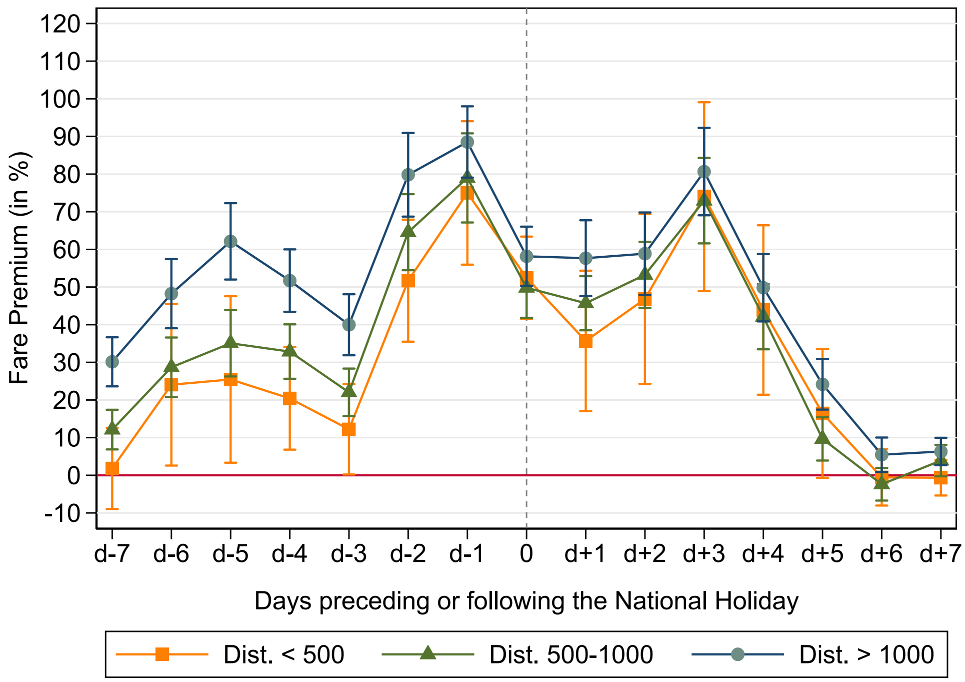
6.5 Holiday peak-load pricing and route distance

Since there are no feasible alternatives to air travel on long-haul routes, airlines may be able to extract additional holiday fare premiums from passengers when alternative travel modes (e.g., driving) are not potential substitutes. To investigate this possibility, we split routes into three groups: (i) routes less than 500 miles where driving is a potential substitute, (ii) routes between 500 and 1,000 miles where driving is a possible but unlikely substitute, and (iii) routes over 1,000 miles where driving is not a feasible alternative. Then, we augment equation (1) by interacting the national holiday and federal holiday dummies with indicators for routes between 500 and 1,000 miles and routes over 1,000 miles (i.e., routes less than 500

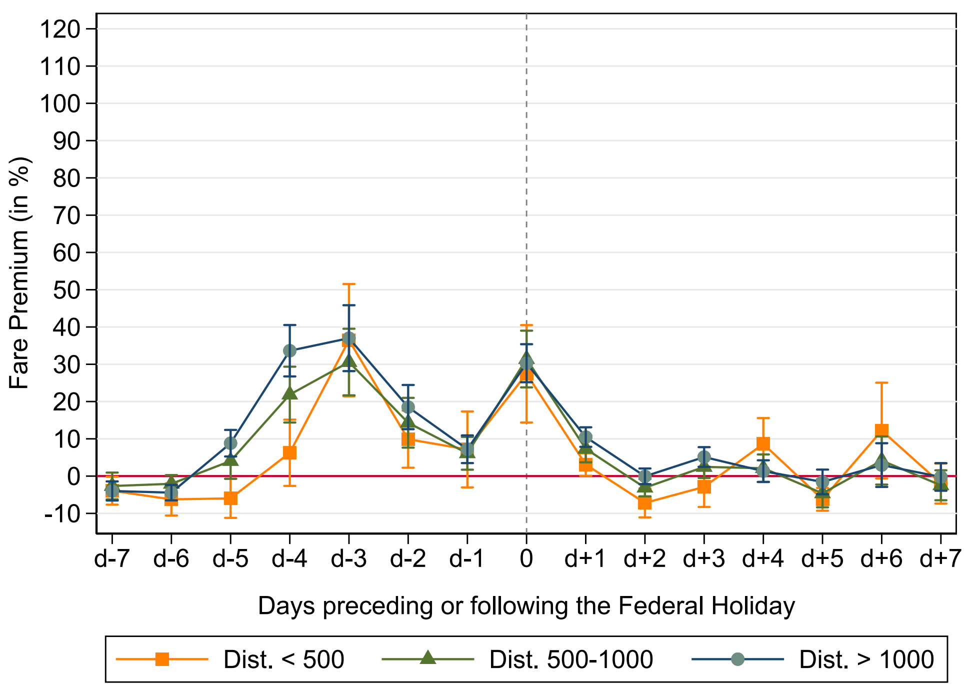
[25] The slot-control indicator is not separately identified from the airport-pair fixed effects.

Figure 7: Estimated fare premiums during holiday periods by route-distance with 95% confidence interval

(a) National Holidays



(b) Federal Holidays



miles are the omitted group).[26] Marginal effects and associated 95% confidence intervals from this augmented specification are plotted in Figure 7 for routes less than 500 miles (orange squares), routes between 500 and 1,000 miles (green triangles), and routes greater than 1,000 miles (blue dots). Panel (a) displays the marginal effects for national holidays while panel (b) displays the marginal effects for federal holidays.

As expected, fare premiums during national holidays are largest on routes greater than 1,000 miles and smallest on routes less than 500 miles. Furthermore, confidence intervals for routes less than 500 miles and routes over 1,000 miles do not overlap from seven days before to two days before a holiday in panel (a) of Figure 7, implying that travel premiums are larger on routes over 1,000 miles for flights that depart in the week before a national holiday. However, this pattern does not extend to federal holidays. In particular, the overlapping confidence intervals in panel (b) of Figure 7 indicate that travel premiums during federal holidays generally do not differ with route distance.

6.6 Holiday peak-load pricing and carrier type

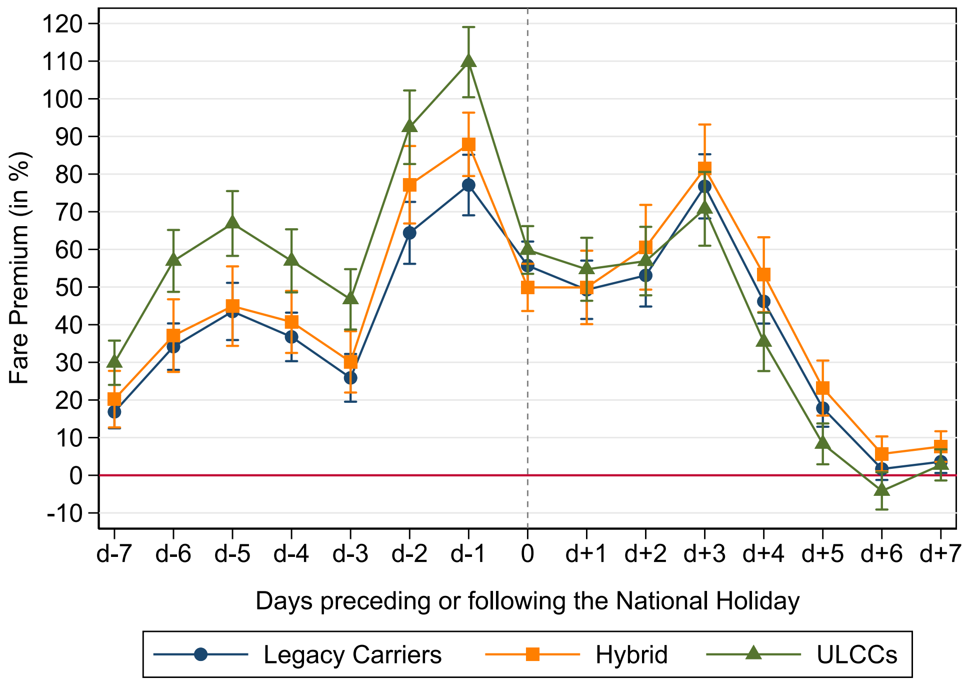
Given that legacy, hybrid, and ULCCs operate different business models, the extent of holiday travel premiums may differ by carrier type. In particular, markups over cost tend to be highest on legacy carriers and lowest on ULCCs, implying that ULCCs may have more room to increase fares during high demand periods. To explore this possibility, we augment equation (1) by interacting the national holiday and federal holiday dummies with indicators for hybrid carriers and ULCCs (i.e., legacy carriers are the omitted group).[27] Marginal effects and associated 95% confidence intervals from this augmented specification are plotted in Figure 8 for legacy carriers (blue dots), hybrid carriers (orange squares), and ULCCs (green triangles). Consistent with previous figures, panel (a) displays the marginal effects for national holidays while panel (b) displays the marginal effects for federal holidays.

[26] The distance group indicators are not separately identified from the airport-pair fixed effects.

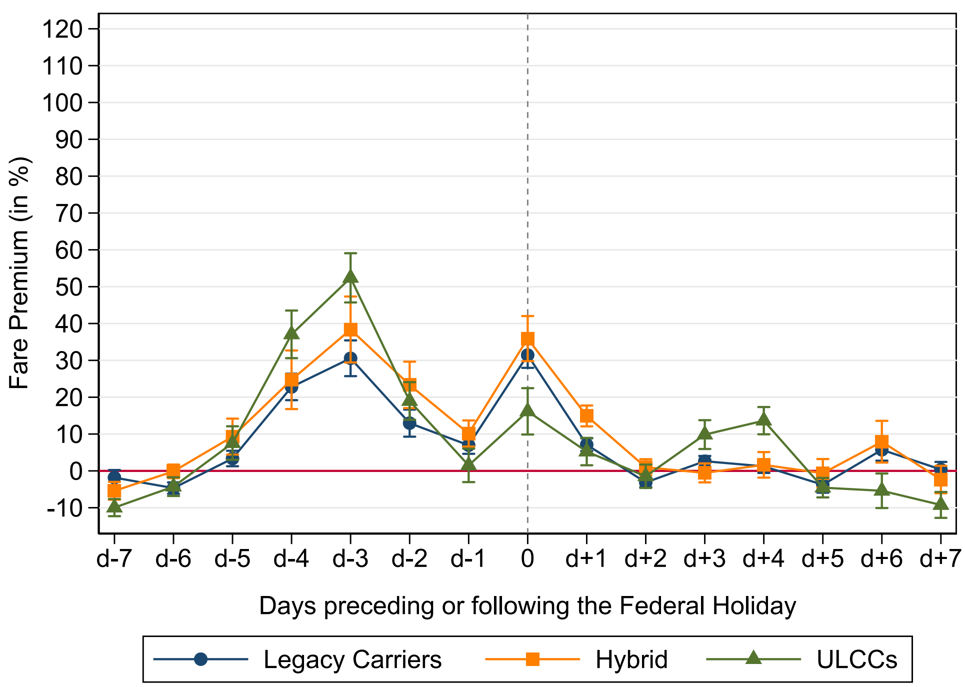
[27] The carrier type indicators are not separately identified from the airline fixed effects.

Figure 8: Estimated fare premiums during holiday periods by carrier type with 95% confidence interval

(a) National Holidays



(b) Federal Holidays



Although some of the hybrid and ULCC confidence intervals overlap, percentage fare premiums are largest on ULCCs and lowest on legacy carriers in the week prior to a national holiday. However, in the week following a national holiday, we cannot reject the null hypothesis that holiday travel premiums are equal across carrier types due to the overlapping confidence intervals for legacy, hybrid, and ULCCs.

The evidence for holiday travel premiums that differ by carrier type on federal holidays is also mixed. In general, confidence intervals for the three carrier types overlap in panel (b) of Figure 8, indicating that percentage fare premiums during federal holidays do not differ across legacy, hybrid, and ULCCs. However, there are a few exceptions. In particular, holiday travel premiums are lower on ULCCs for flights that depart on the federal holiday and higher on ULCCs for flights that depart three or four days after the federal holiday.

7 Conclusion

Peak-load pricing occurs when firms charge high prices in an attempt to divert demand when capacity constraints cause marginal costs to be high. In this article, we examined the practice of airlines charging high prices during periods where demand is known to be noticeably higher than average. This practice is known as systematic peak-load pricing. In our setting, we identify the days surrounding public holidays as periods of ex-ante high demand. In particular, public holidays such as Thanksgiving and Christmas are known to generate large volumes of passengers who travel to visit family. Other holidays that occur on a Monday (e.g., Martin Luther King Jr. Day and President's Day) are known to generate large volumes of passengers who travel for an extended three or four-day holiday weekend.

To examine the extent and duration of holiday peak-load pricing in the U.S. airline industry, we exploit a unique panel of over 18 million fares for flights operated in the continental U.S. between October 1st, 2019 and February 29th, 2020. Because we track the price of each nonstop flight or connecting itinerary in the sixty-day period prior to departure, we are able to flexibly control for advance-purchase requirements using days-to-departure fixed effects.

Consistent with the theory of systematic peak-load pricing, we estimate travel premiums ranging from 4.3% to 83.1% in the days surrounding national holidays (e.g., Thanksgiving and Christmas) and from 2.7% to 34.7% in the days surrounding federal holidays (e.g., Columbus Day and President's Day). Furthermore, our estimates indicate that the peak-travel period surrounding national holidays primarily extends from seven days before the holiday (18.9% fare premium) to five days after the holiday (17.8% fare premium). In contrast, the peak-travel period for federal holidays primarily extends from five days before the holiday (4.9% fare premium) to one day after the holiday (8.2% fare premium). Exploring heterogeneity in holiday peak-load pricing, we find evidence that fare premiums during national holidays are generally larger on longer-distance routes (especially when driving is not a feasible substitute), on routes to or from slot-controlled airports, on routes to leisure destinations, and on ULCCs such as Spirit and Frontier.

To our knowledge, our study is the first to empirically quantify the magnitude and duration of systematic peak-load pricing in the U.S. airline industry across different holiday types, market types, and carrier types. This type of peak-load pricing is expected to occur theoretically but has not previously been quantified to the extent that we do in this study. As a result, our findings should not only be of interest to consumers of air travel, but also to transportation economists and airline practitioners.

The findings from our heterogeneity analysis should be of particular interest to airline yield managers. For example, yield managers tasked with increasing profits may be able to carefully analyze their airline network to identify specific routes where fare premiums could be increased during national holiday periods (e.g., on routes to or from slot-controlled airports or on long-haul routes). However, due to the five-month time-horizon of our data, readers should be wary of extending our results to other holidays that are not contained in our analysis sample such as Memorial Day (last Monday in May), Juneteenth (June 19$^{\text{th}}$), and Independence Day (July 4$^{\text{th}}$). Additionally, the Covid-19 pandemic has likely changed travel patterns during holiday periods since the increased adoption of hybrid/remote work provides workers with additional flexibility in when and for how long they travel. For instance, it is possible that the length of the peak-travel period during national holidays such as Christmas and New Year's has increased as a result of the additional flexibility that hybrid/remote work offers.

The analysis presented in this article offers some interesting avenues for future research in industries that employ revenue management techniques. For example, future work could extend the present analysis on systematic peak-load pricing to other markets where public holidays coincide with periods of high demand such as the cruise line, car rental, hotel, or passenger railway markets. The analysis in this article could also be extended to airline markets outside of the U.S. where the competitive landscape and the set of public holidays differ (e.g., the Australian, Canadian, Chinese, or European airline markets).

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Appendix A: Supplementary Tables

Table A1: List of directional airport-pairs included in the empirical analysis

Origin	Destination	Origin	Destination	Origin	Destination
ATL	BOS	EWR	RSW	OAK	LAS
-	FLL	-	SFO	-	LAX
-	LAS	FLL	EWR	ORD	BOS
-	LAX	-	JFK	-	DCA
-	LGA	-	LGA	-	DEN
-	MCO	IAH	EWR	-	DFW
BOS	ATL	-	LAS	-	FLL
-	DCA	JFK	FLL	-	LAS
-	FLL	-	LAS	-	LAX
-	LAX	-	LAX	-	LGA
-	MCO	-	MCO	-	MCO
-	MIA	-	MIA	-	MIA
-	ORD	-	PBI	-	PHX
-	RSW	-	SFO	-	SFO
-	SFO	LAS	LAX	PDX	LAS
BWI	FLL	LAX	ATL	-	LAX
-	LAS	-	BOS	PHL	FLL
-	MCO	-	DEN	-	MCO
CLT	LGA	-	DFW	-	DEN
DEN	LAS	-	EWR	SAN	SFO
-	LAX	-	JFK	-	SJC
-	MCO	-	LAS	-	SMF
-	PHX	-	MCO	SEA	LAS
DFW	LAS	-	OAK	-	LAX
-	LAX	-	ORD	-	PHX
-	LGA	-	SEA	-	SAN
-	MCO	-	SFO	-	SFO
-	ORD	LGA	ATL	SFO	BOS
DTW	FLL	-	FLL	-	EWR
-	LAS	-	MCO	-	JFK
-	MCO	-	MIA	-	LAS
-	RSW	-	ORD	-	LAX
EWR	FLL	MCO	EWR	-	ORD
-	IAH	MIA	LGA	-	SAN
-	LAX	MSP	LAS	-	SEA
-	MCO	-	MCO	SJC	SAN
-	MIA	-	PHX	-	SNA
-	ORD	-	RSW	SMF	SAN
-	PBI	OAK	BUR	SNA	SJC

Table A2: Descriptive statistics and brief description of the variables included in the analysis

Variables	Description	Mean	Std. Dev.	Min	Max
Fare	One-way airline fare, in U.S. $	176.74	128.45	15.00	4,118
National $d-7$	Dummy=1 if the flight departs 7 days before the national holiday	0.020	0.139	0.000	1.000
National $d-6$	Dummy=1 if the flight departs 6 days before the national holiday	0.021	0.143	0.000	1.000
National $d-5$	Dummy=1 if the flight departs 5 days before the national holiday	0.020	0.139	0.000	1.000
National $d-4$	Dummy=1 if the flight departs 4 days before the national holiday	0.019	0.137	0.000	1.000
National $d-3$	Dummy=1 if the flight departs 3 days before the national holiday	0.020	0.140	0.000	1.000
National $d-2$	Dummy=1 if the flight departs 2 days before the national holiday	0.020	0.140	0.000	1.000
National $d-1$	Dummy=1 if the flight departs 1 day before the national holiday	0.018	0.134	0.000	1.000
National $d=0$	Dummy=1 if the flight departs on the national holiday	0.017	0.128	0.000	1.000
National $d+1$	Dummy=1 if the flight departs 1 day after the national holiday	0.019	0.135	0.000	1.000
National $d+2$	Dummy=1 if the flight departs 2 days after the national holiday	0.020	0.139	0.000	1.000
National $d+3$	Dummy=1 if the flight departs 3 days after the national holiday	0.019	0.137	0.000	1.000
National $d+4$	Dummy=1 if the flight departs 4 days after the national holiday	0.020	0.141	0.000	1.000
National $d+5$	Dummy=1 if the flight departs 5 days after the national holiday	0.021	0.142	0.000	1.000
National $d+6$	Dummy=1 if the flight departs 6 days after the national holiday	0.019	0.138	0.000	1.000
National $d+7$	Dummy=1 if the flight departs 7 days after the national holiday	0.020	0.139	0.000	1.000
Federal $d-7$	Dummy=1 if the flight departs 7 days before the federal holiday	0.027	0.163	0.000	1.000
Federal $d-6$	Dummy=1 if the flight departs 6 days before the federal holiday	0.026	0.160	0.000	1.000
Federal $d-5$	Dummy=1 if the flight departs 5 days before the federal holiday	0.027	0.163	0.000	1.000
Federal $d-4$	Dummy=1 if the flight departs 4 days before the federal holiday	0.028	0.166	0.000	1.000
Federal $d-3$	Dummy=1 if the flight departs 3 days before the federal holiday	0.028	0.165	0.000	1.000
Federal $d-2$	Dummy=1 if the flight departs 2 days before the federal holiday	0.023	0.151	0.000	1.000
Federal $d-1$	Dummy=1 if the flight departs 1 day before the federal holiday	0.025	0.158	0.000	1.000

Continuing

Table A2 cont.

Variables	Description	Mean	Std. Dev.	Min	Max
Federal $d = 0$	Dummy=1 if the flight departs on the federal holiday	0.027	0.163	0.000	1.000
Federal $d + 1$	Dummy=1 if the flight departs 1 day after the federal holiday	0.027	0.163	0.000	1.000
Federal $d + 2$	Dummy=1 if the flight departs 2 days after the federal holiday	0.027	0.162	0.000	1.000
Federal $d + 3$	Dummy=1 if the flight departs 3 days after the federal holiday	0.028	0.164	0.000	1.000
Federal $d + 4$	Dummy=1 if the flight departs 4 days after the federal holiday	0.028	0.164	0.000	1.000
Federal $d + 5$	Dummy=1 if the flight departs 5 days after the federal holiday	0.023	0.150	0.000	1.000
Federal $d + 6$	Dummy=1 if the flight departs 6 days after the federal holiday	0.026	0.160	0.000	1.000
Federal $d + 7$	Dummy=1 if the flight departs 7 days after the federal holiday	0.028	0.164	0.000	1.000
HHI	Route Herfindahl index, $\sum_{a=1}^{n} \text{MktShare}_a^2$	0.240	0.231	0.001	1.000
MktShare	Airline's market share, obtained with the number of daily nonstop flights on the route	0.352	0.236	0.000	1.000
HubOrig	Dummy = 1 if the origin airport is a hub for the examined airline	0.621	0.485	0.000	1.000
HubDest	Dummy = 1 if the destination airport is a hub for the examined airline	0.520	0.500	0.000	1.000
DailyFreq	Number of daily departures on the route by the observed airline	6.532	4.439	0.000	19.00
Connecting	Dummy = 1 in case of connecting flight	0.172	0.378	0.000	1.000
HolidayBook	Dummy = 1 if the fare is published on a federal or national holiday	0.068	0.253	0.000	1.000
Instruments					
Past-year HHI	Past-year value of HHI	0.237	0.223	0.001	1.000
Past-year MktShare	Past-year value of MktShare	0.346	0.235	0.000	1.000
Distance HQ	Distance of the route from the airline's headquarters, in 1,000s miles	0.659	0.588	0.000	2.465
Number of observations 18,110,269.					

Table A3: First-stage estimates for Table 3: Dependent variable HHI

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Past-year HHI	0.085***	(0.024)	0.085***	(0.024)	0.085***	(0.024)	0.085***	(0.024)	0.085***	(0.024)
Past-year MktShare	0.041***	(0.010)	0.041***	(0.010)	0.041***	(0.010)	0.041***	(0.010)	0.041***	(0.010)
Distance HQ	-0.005**	(0.002)	-0.005**	(0.002)	-0.005**	(0.002)	-0.005**	(0.002)	-0.005**	(0.002)
National $d-7$									-0.019**	(0.008)
National $d-6$							0.016**	(0.007)	0.014**	(0.007)
National $d-5$					0.006	(0.009)	0.007	(0.009)	0.007	(0.009)
National $d-4$			-0.008	(0.008)	-0.007	(0.008)	-0.009	(0.008)	-0.009	(0.008)
National $d-3$	-0.010	(0.010)	-0.008	(0.010)	-0.008	(0.010)	-0.012	(0.010)	-0.012	(0.010)
National $d-2$	-0.003	(0.010)	-0.003	(0.010)	-0.003	(0.009)	-0.004	(0.009)	-0.004	(0.010)
National $d-1$	-0.008	(0.010)	-0.008	(0.010)	-0.007	(0.010)	-0.008	(0.010)	-0.009	(0.010)
National $d=0$	-0.013	(0.011)	-0.013	(0.011)	-0.010	(0.011)	-0.010	(0.011)	-0.001	(0.011)
National $d+1$	-0.018*	(0.010)	-0.018*	(0.010)	-0.018*	(0.010)	-0.022**	(0.010)	-0.023**	(0.010)
National $d+2$	-0.003	(0.009)	-0.002	(0.009)	-0.003	(0.009)	-0.003	(0.009)	-0.003	(0.009)
National $d+3$	-0.002	(0.007)	-0.000	(0.007)	0.001	(0.007)	-0.002	(0.007)	-0.002	(0.007)
National $d+4$			-0.008	(0.009)	-0.008	(0.009)	-0.011	(0.009)	-0.012	(0.009)
National $d+5$					0.001	(0.008)	0.001	(0.008)	0.000	(0.008)
National $d+6$							0.005	(0.008)	0.003	(0.008)
National $d+7$									-0.015*	(0.008)
Federal $d-7$									-0.002	(0.010)
Federal $d-6$							-0.002	(0.007)	-0.003	(0.007)
Federal $d-5$					0.015*	(0.008)	0.015**	(0.008)	0.011	(0.008)
Federal $d-4$			-0.003	(0.007)	-0.003	(0.007)	-0.001	(0.007)	-0.004	(0.007)
Federal $d-3$	0.020***	(0.006)	0.022***	(0.006)	0.023***	(0.006)	0.024***	(0.006)	0.024***	(0.006)
Federal $d-2$	-0.009	(0.009)	-0.010	(0.009)	-0.008	(0.010)	-0.009	(0.010)	-0.009	(0.010)
Federal $d-1$	0.006	(0.006)	0.005	(0.006)	0.005	(0.006)	-0.001	(0.007)	-0.001	(0.007)
Federal $d=0$	-0.001	(0.008)	-0.001	(0.008)	-0.001	(0.008)	-0.001	(0.008)	-0.002	(0.009)
Federal $d+1$	0.001	(0.006)	0.001	(0.006)	0.001	(0.006)	0.001	(0.006)	0.001	(0.006)
Federal $d+2$	0.012	(0.008)	0.012	(0.008)	0.015*	(0.008)	0.016*	(0.008)	0.012	(0.008)
Federal $d+3$	0.003	(0.006)	0.002	(0.007)	0.002	(0.007)	0.004	(0.007)	0.001	(0.007)
Federal $d+4$			0.010	(0.007)	0.011	(0.008)	0.012	(0.008)	0.012	(0.008)
Federal $d+5$					0.006	(0.007)	0.005	(0.007)	0.005	(0.007)
Federal $d+6$							-0.023**	(0.010)	-0.023**	(0.010)
Federal $d+7$									-0.001	(0.008)
HubOrig	0.007	(0.005)	0.007	(0.005)	0.007	(0.005)	0.007	(0.005)	0.007	(0.005)
HubDest	0.004	(0.004)	0.004	(0.004)	0.004	(0.004)	0.004	(0.004)	0.004	(0.004)
Connecting	0.026***	(0.006)	0.026***	(0.006)	0.026***	(0.006)	0.026***	(0.006)	0.026***	(0.006)
HolidayBook	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)
DailyFreq	-0.002**	(0.001)	-0.002**	(0.001)	-0.002**	(0.001)	-0.002**	(0.001)	-0.002**	(0.001)
R^2	0.579		0.579		0.579		0.579		0.579	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table A4: First-stage estimates for Table 3: Dependent variable $MktShare$

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Past-year HHI	-0.006**	(0.003)	-0.006**	(0.003)	-0.006**	(0.003)	-0.006**	(0.003)	-0.006**	(0.003)
Past-year MktShare	0.714***	(0.036)	0.714***	(0.036)	0.714***	(0.036)	0.714***	(0.036)	0.714***	(0.036)
Distance HQ	-0.006	(0.006)	-0.006	(0.006)	-0.006	(0.006)	-0.006	(0.006)	-0.006	(0.006)
National $d-7$									0.001	(0.002)
National $d-6$							-0.002*	(0.001)	-0.002*	(0.001)
National $d-5$					0.000	(0.001)	-0.000	(0.001)	-0.000	(0.001)
National $d-4$			-0.006***	(0.001)	-0.005***	(0.001)	-0.006***	(0.001)	-0.006***	(0.001)
National $d-3$	0.003	(0.002)	0.002	(0.002)	0.002	(0.002)	0.002	(0.002)	0.001	(0.002)
National $d-2$	0.006**	(0.002)	0.006**	(0.002)	0.006***	(0.002)	0.006***	(0.002)	0.005**	(0.002)
National $d-1$	0.011***	(0.002)	0.011***	(0.002)	0.011***	(0.002)	0.010***	(0.002)	0.010***	(0.002)
National $d=0$	0.025***	(0.004)	0.025***	(0.004)	0.025***	(0.004)	0.025***	(0.004)	0.026***	(0.004)
National $d+1$	0.012***	(0.003)	0.011***	(0.003)	0.011***	(0.003)	0.012***	(0.003)	0.012***	(0.003)
National $d+2$	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)	-0.001	(0.002)
National $d+3$	-0.005***	(0.001)	-0.004***	(0.001)	-0.003***	(0.001)	-0.004***	(0.001)	-0.004***	(0.001)
National $d+4$			0.001	(0.001)	0.001	(0.001)	0.001	(0.001)	0.000	(0.001)
National $d+5$					-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)
National $d+6$							0.005***	(0.001)	0.005***	(0.001)
National $d+7$									-0.002**	(0.001)
Federal $d-7$									-0.002***	(0.001)
Federal $d-6$							-0.000	(0.001)	-0.001	(0.001)
Federal $d-5$					0.003***	(0.001)	0.004***	(0.001)	0.004***	(0.001)
Federal $d-4$			-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)
Federal $d-3$	-0.001	(0.001)	-0.002**	(0.001)	-0.002***	(0.001)	-0.002***	(0.001)	-0.002***	(0.001)
Federal $d-2$	0.002**	(0.001)	0.001*	(0.001)	0.002**	(0.001)	0.002**	(0.001)	0.002**	(0.001)
Federal $d-1$	0.002**	(0.001)	0.002**	(0.001)	0.002**	(0.001)	0.002*	(0.001)	0.001	(0.001)
Federal $d=0$	0.001**	(0.001)	0.001**	(0.001)	0.001**	(0.001)	0.001**	(0.001)	-0.000	(0.001)
Federal $d+1$	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)
Federal $d+2$	0.001***	(0.001)	0.001***	(0.001)	0.002***	(0.001)	0.003***	(0.001)	0.002***	(0.001)
Federal $d+3$	-0.003***	(0.001)	-0.003***	(0.001)	-0.003***	(0.001)	-0.003***	(0.001)	-0.003***	(0.001)
Federal $d+4$			-0.004***	(0.000)	-0.004***	(0.000)	-0.004***	(0.000)	-0.004***	(0.000)
Federal $d+5$					0.002**	(0.001)	0.002**	(0.001)	0.002**	(0.001)
Federal $d+6$							-0.002***	(0.001)	-0.002***	(0.001)
Federal $d+7$									-0.004***	(0.001)
HubOrig	0.031***	(0.011)	0.031***	(0.011)	0.031***	(0.011)	0.031***	(0.011)	0.031***	(0.011)
HubDest	0.015**	(0.006)	0.015**	(0.006)	0.015**	(0.006)	0.014**	(0.006)	0.014**	(0.006)
DailyFreq	0.013***	(0.001)	0.013***	(0.001)	0.013***	(0.001)	0.013***	(0.001)	0.013***	(0.001)
Connecting	-0.021***	(0.004)	-0.021***	(0.004)	-0.021***	(0.004)	-0.021***	(0.004)	-0.021***	(0.004)
HolidayBook	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)	-0.000	(0.000)
R^2	0.956		0.956		0.956		0.956		0.956	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Appendix B: OLS Analysis

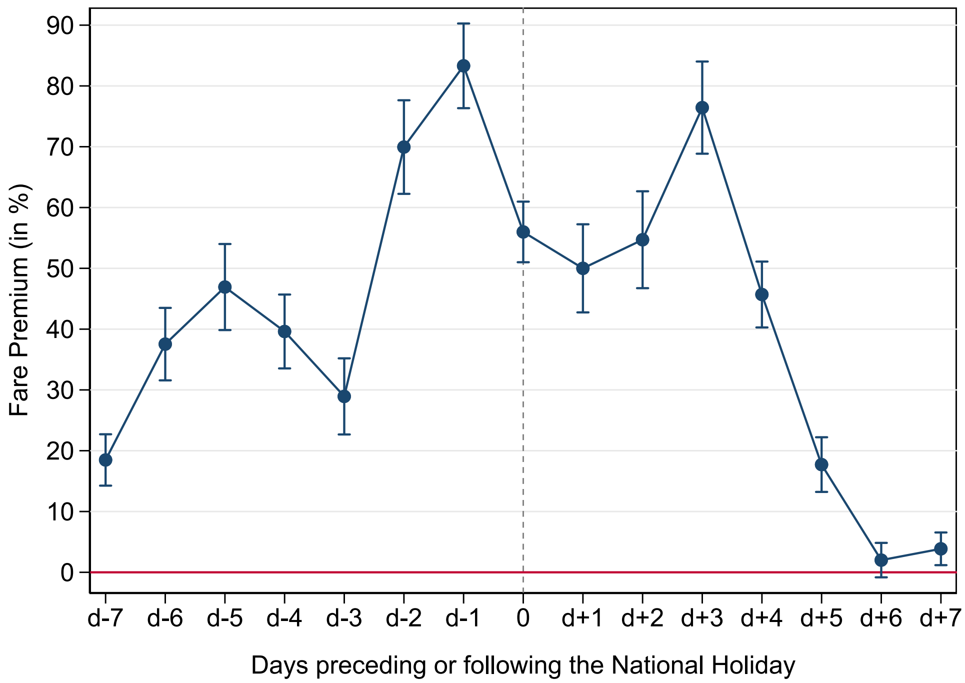
Table B1: Ordinary least squares estimates

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
National $d-7$									0.170***	(0.018)
National $d-6$							0.311***	(0.022)	0.319***	(0.022)
National $d-5$					0.372***	(0.024)	0.384***	(0.025)	0.385***	(0.025)
National $d-4$			0.324***	(0.022)	0.329***	(0.023)	0.334***	(0.022)	0.334***	(0.022)
National $d-3$	0.328***	(0.024)	0.247***	(0.026)	0.252***	(0.026)	0.258***	(0.025)	0.254***	(0.025)
National $d-2$	0.569***	(0.023)	0.582***	(0.023)	0.539***	(0.024)	0.537***	(0.023)	0.530***	(0.023)
National $d-1$	0.600***	(0.018)	0.601***	(0.018)	0.609***	(0.018)	0.599***	(0.019)	0.606***	(0.019)
National $d=0$	0.468***	(0.017)	0.480***	(0.017)	0.486***	(0.017)	0.496***	(0.017)	0.445***	(0.016)
National $d+1$	0.436***	(0.023)	0.465***	(0.023)	0.478***	(0.023)	0.397***	(0.025)	0.405***	(0.025)
National $d+2$	0.511***	(0.024)	0.518***	(0.024)	0.424***	(0.027)	0.436***	(0.026)	0.436***	(0.026)
National $d+3$	0.623***	(0.018)	0.558***	(0.021)	0.563***	(0.021)	0.568***	(0.022)	0.568***	(0.022)
National $d+4$			0.369***	(0.017)	0.375***	(0.018)	0.381***	(0.019)	0.376***	(0.019)
National $d+5$					0.172***	(0.019)	0.170***	(0.019)	0.163***	(0.019)
National $d+6$							0.013	(0.014)	0.020	(0.014)
National $d+7$									0.038***	(0.013)
Federal $d-7$									-0.036***	(0.007)
Federal $d-6$							-0.040***	(0.006)	-0.039***	(0.007)
Federal $d-5$					0.026**	(0.011)	0.027**	(0.011)	0.050***	(0.011)
Federal $d-4$			0.169***	(0.013)	0.171***	(0.014)	0.206***	(0.015)	0.221***	(0.016)
Federal $d-3$	0.243***	(0.016)	0.236***	(0.015)	0.278***	(0.017)	0.300***	(0.017)	0.301***	(0.017)
Federal $d-2$	0.102***	(0.016)	0.134***	(0.017)	0.142***	(0.016)	0.145***	(0.016)	0.145***	(0.016)
Federal $d-1$	0.006	(0.011)	0.055***	(0.011)	0.057***	(0.011)	0.069***	(0.010)	0.067***	(0.010)
Federal $d=0$	0.242***	(0.011)	0.262***	(0.012)	0.278***	(0.012)	0.278***	(0.012)	0.264***	(0.012)
Federal $d+1$	0.077***	(0.007)	0.079***	(0.007)	0.087***	(0.007)	0.078***	(0.007)	0.079***	(0.007)
Federal $d+2$	-0.053***	(0.007)	-0.051***	(0.007)	-0.045***	(0.006)	-0.043***	(0.006)	-0.020***	(0.006)
Federal $d+3$	-0.067***	(0.010)	-0.024***	(0.008)	-0.022***	(0.008)	0.013*	(0.007)	0.028***	(0.007)
Federal $d+4$			-0.037***	(0.011)	0.005	(0.009)	0.027***	(0.008)	0.028***	(0.008)
Federal $d+5$					-0.036***	(0.011)	-0.032***	(0.011)	-0.032***	(0.011)
Federal $d+6$							0.043***	(0.011)	0.042***	(0.011)
Federal $d+7$									-0.014*	(0.008)
HHI	0.031*	(0.019)	0.036*	(0.019)	0.034*	(0.019)	0.031	(0.020)	0.033*	(0.020)
MktShare	0.103	(0.077)	0.115	(0.076)	0.113	(0.075)	0.123	(0.075)	0.123	(0.075)
HubOrig	0.045**	(0.017)	0.046***	(0.017)	0.046***	(0.017)	0.047***	(0.017)	0.047***	(0.017)
HubDest	-0.026	(0.017)	-0.025	(0.017)	-0.024	(0.017)	-0.024	(0.017)	-0.023	(0.017)
DailyFreq	0.011**	(0.004)	0.010**	(0.004)	0.010**	(0.004)	0.009**	(0.004)	0.009**	(0.004)
Connecting	0.021	(0.020)	0.021	(0.020)	0.020	(0.020)	0.020	(0.020)	0.020	(0.020)
HolidayBook	-0.042***	(0.003)	-0.045***	(0.003)	-0.046***	(0.003)	-0.045***	(0.003)	-0.045***	(0.003)
R^2	0.506		0.518		0.526		0.530		0.532	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: The dependent variable is the natural logarithm of fare. Marginal effects are interpreted as the $100(\exp^{\beta}-1)\%$ change in fare. All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Figure B1: OLS estimated fare premiums during national and federal holiday periods with 95% confidence interval

(a) National Holidays



(b) Federal Holidays

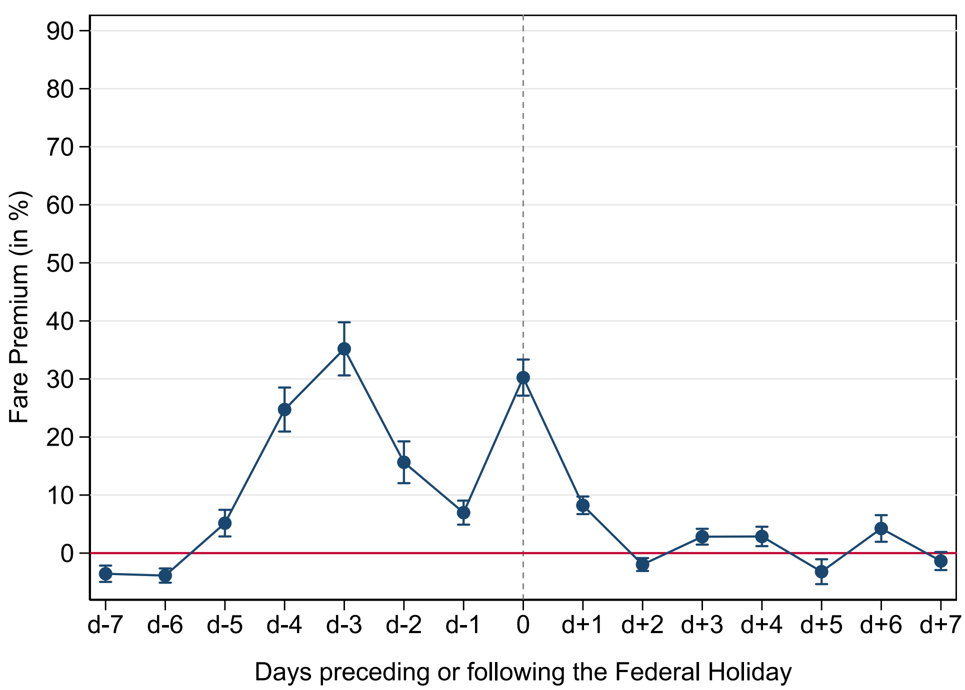
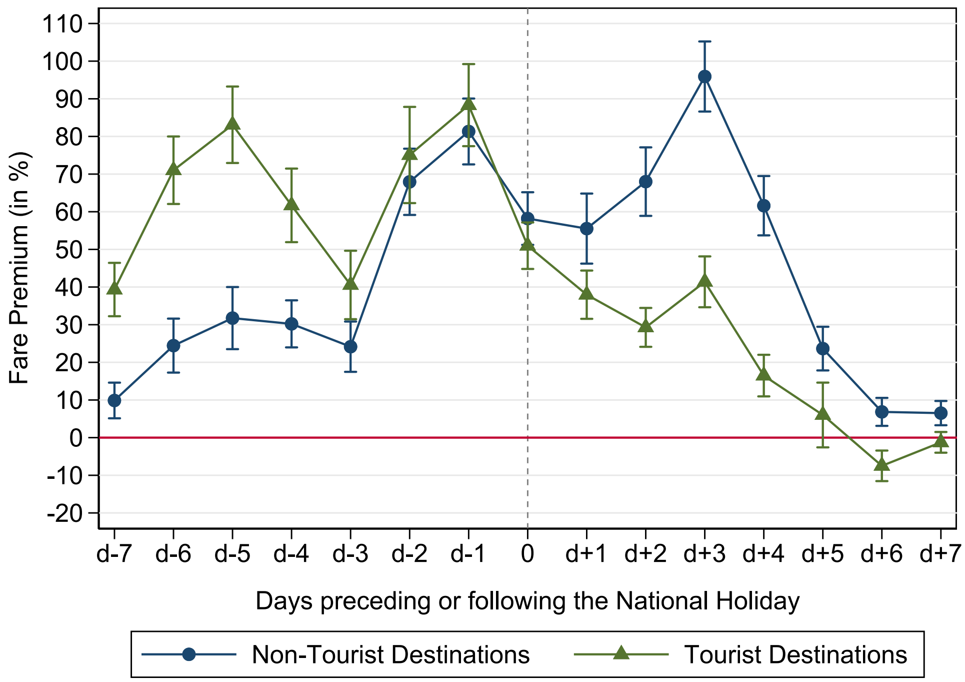


Figure B2: OLS estimated fare premiums during holiday periods for non-tourist and tourist destinations with 95% confidence interval

(a) National Holidays



(b) Federal Holidays

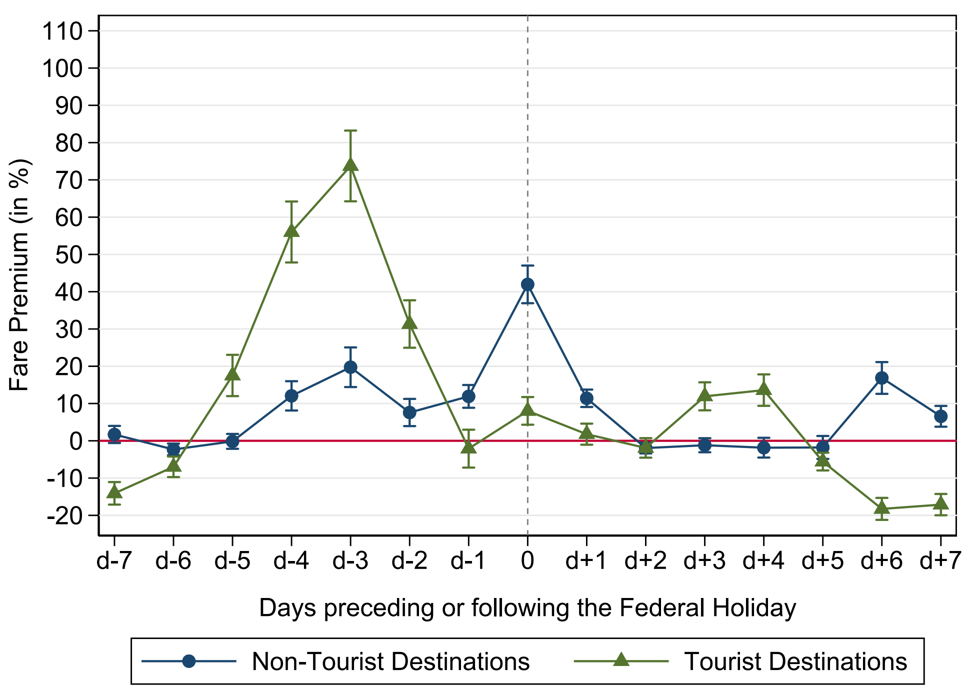
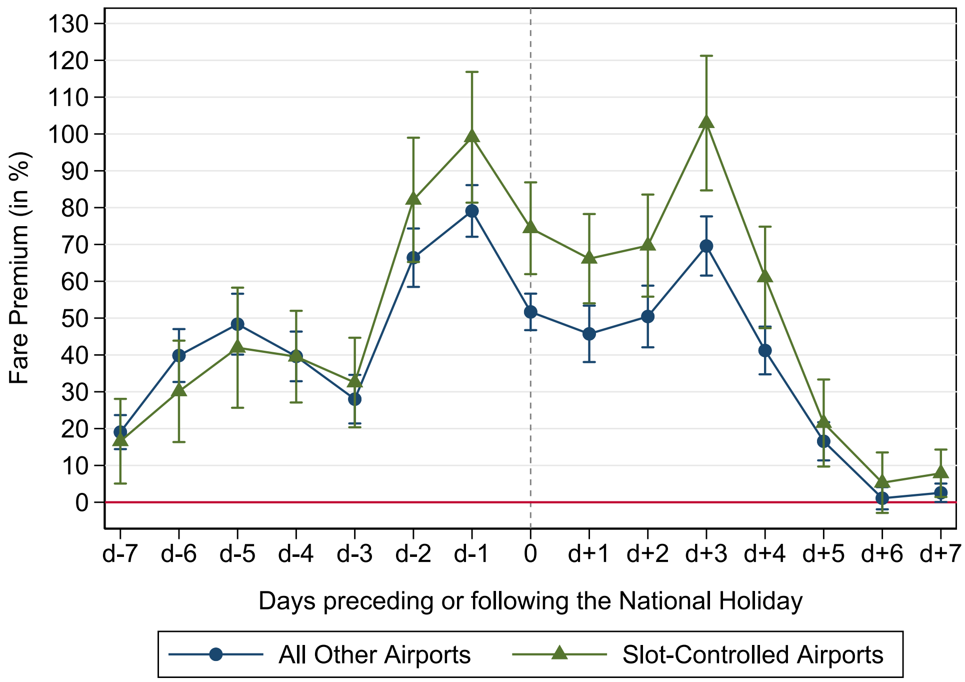


Figure B3: OLS estimated fare premiums during holiday periods for slot-controlled and non-slot-controlled airports with 95% confidence interval

(a) National Holidays



(b) Federal Holidays

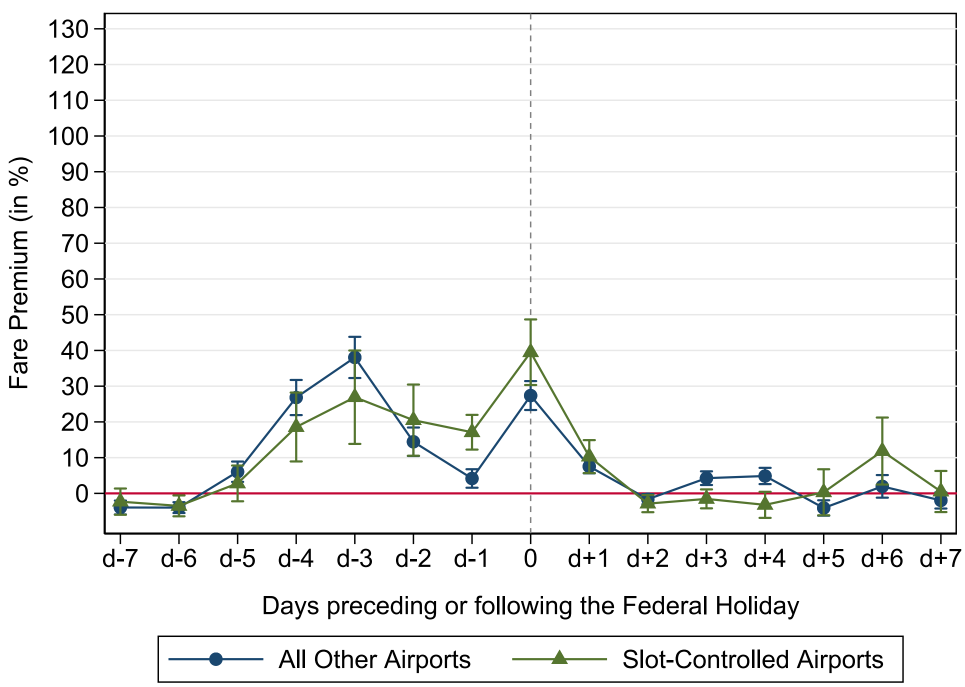
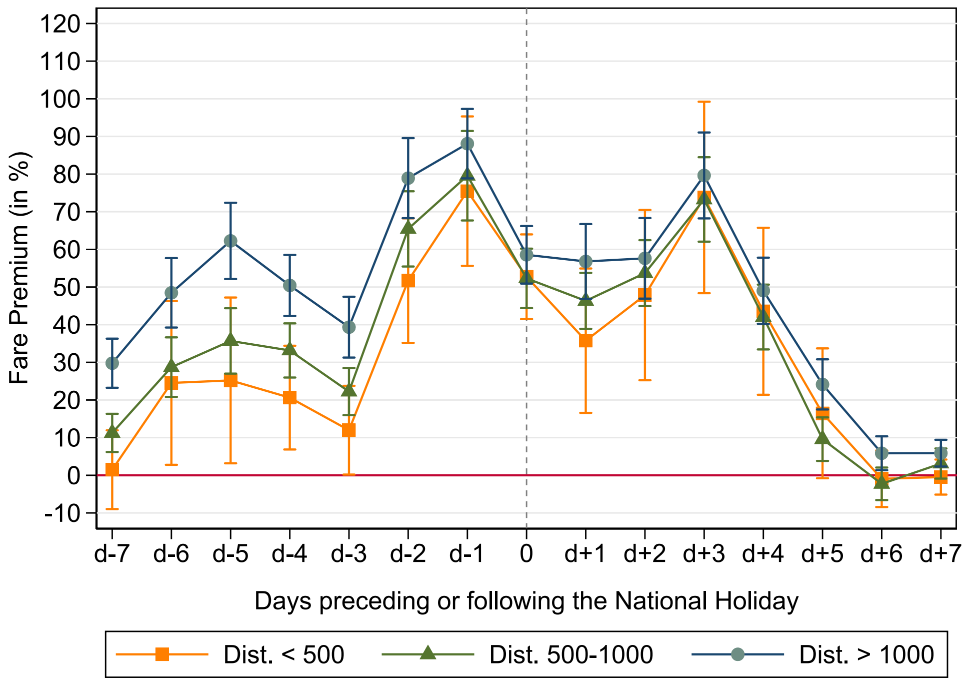


Figure B4: OLS estimated fare premiums during holiday periods by route-distance with 95% confidence interval

(a) National Holidays



(b) Federal Holidays

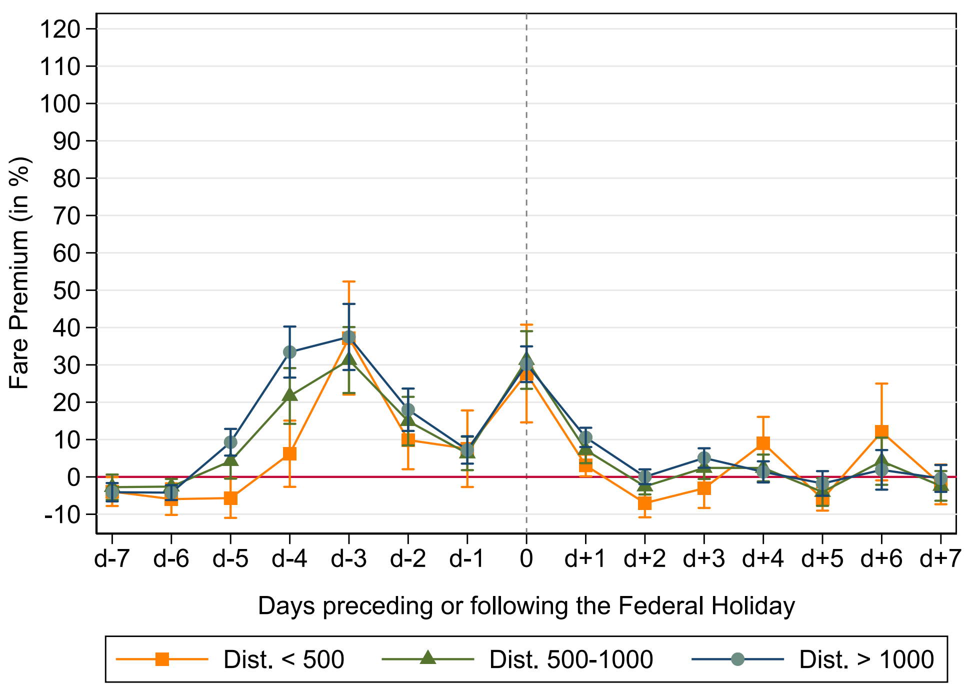
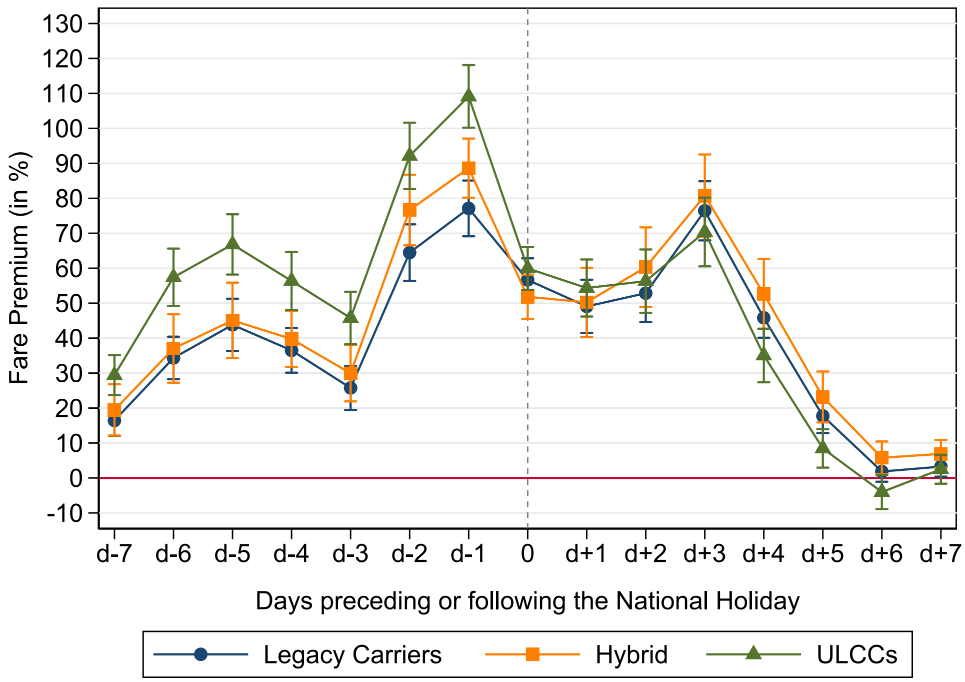
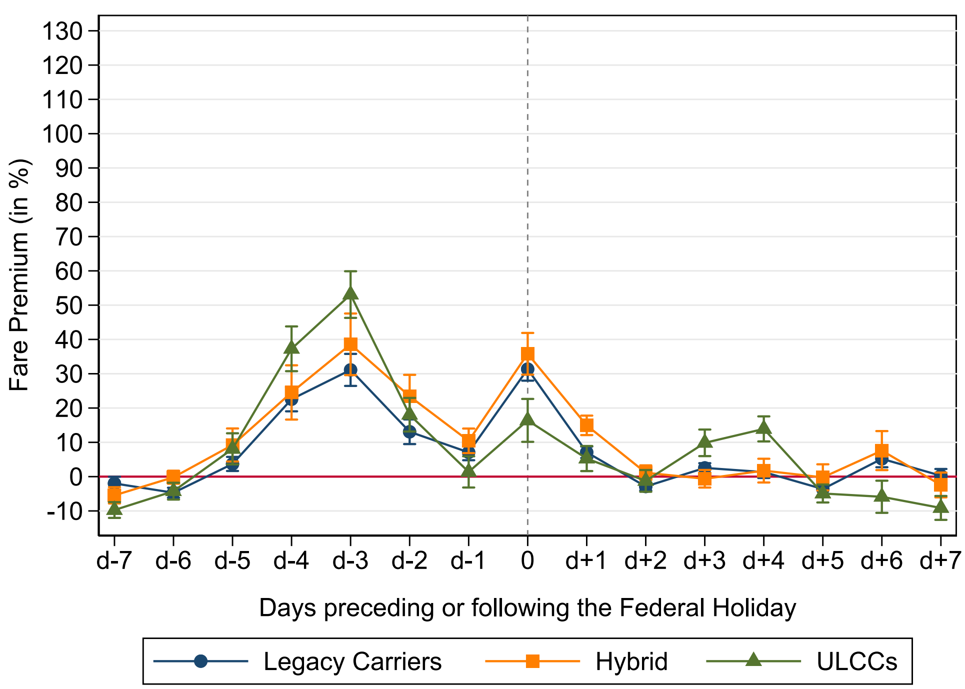


Figure B5: OLS estimated fare premiums during holiday periods by carrier type with 95% confidence interval

(a) National Holidays



(b) Federal Holidays



Appendix C: Robustness checks with competition variables

Table C1: Systematic peak-load pricing for traveling during national and federal holiday periods (competition variables: HHI, $DominantMktShare$, and $MktShare$)

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
National $d-7$									0.175***	(0.018)
National $d-6$							0.309***	(0.022)	0.317***	(0.022)
National $d-5$					0.370***	(0.024)	0.383***	(0.025)	0.383***	(0.025)
National $d-4$			0.327***	(0.022)	0.332***	(0.022)	0.337***	(0.022)	0.337***	(0.022)
National $d-3$	0.331***	(0.024)	0.248***	(0.026)	0.254***	(0.025)	0.261***	(0.025)	0.257***	(0.025)
National $d-2$	0.570***	(0.023)	0.583***	(0.023)	0.540***	(0.024)	0.539***	(0.024)	0.533***	(0.024)
National $d-1$	0.599***	(0.018)	0.600***	(0.018)	0.608***	(0.018)	0.599***	(0.020)	0.606***	(0.020)
National $d=0$	0.465***	(0.019)	0.477***	(0.019)	0.482***	(0.019)	0.493***	(0.019)	0.440***	(0.018)
National $d+1$	0.438***	(0.024)	0.465***	(0.024)	0.479***	(0.024)	0.399***	(0.026)	0.409***	(0.026)
National $d+2$	0.514***	(0.025)	0.520***	(0.025)	0.426***	(0.027)	0.439***	(0.027)	0.439***	(0.027)
National $d+3$	0.626***	(0.018)	0.560***	(0.021)	0.565***	(0.022)	0.571***	(0.022)	0.571***	(0.022)
National $d+4$			0.372***	(0.018)	0.377***	(0.019)	0.385***	(0.020)	0.381***	(0.020)
National $d+5$					0.172***	(0.019)	0.170***	(0.019)	0.163***	(0.020)
National $d+6$							0.011	(0.014)	0.018	(0.014)
National $d+7$									0.042***	(0.014)
Federal $d-7$									-0.036***	(0.008)
Federal $d-6$							-0.040***	(0.007)	-0.039***	(0.007)
Federal $d-5$					0.022*	(0.012)	0.023**	(0.011)	0.047***	(0.012)
Federal $d-4$			0.170***	(0.014)	0.172***	(0.014)	0.207***	(0.015)	0.223***	(0.016)
Federal $d-3$	0.239***	(0.017)	0.233***	(0.016)	0.273***	(0.017)	0.296***	(0.018)	0.297***	(0.018)
Federal $d-2$	0.103***	(0.016)	0.134***	(0.017)	0.143***	(0.016)	0.146***	(0.016)	0.147***	(0.016)
Federal $d-1$	0.004	(0.011)	0.053***	(0.011)	0.055***	(0.011)	0.068***	(0.010)	0.067***	(0.010)
Federal $d=0$	0.242***	(0.011)	0.262***	(0.012)	0.278***	(0.012)	0.279***	(0.012)	0.265***	(0.013)
Federal $d+1$	0.077***	(0.007)	0.079***	(0.007)	0.087***	(0.007)	0.078***	(0.007)	0.079***	(0.007)
Federal $d+2$	-0.055***	(0.007)	-0.054***	(0.007)	-0.048***	(0.007)	-0.047***	(0.007)	-0.023***	(0.007)
Federal $d+3$	-0.068***	(0.010)	-0.024***	(0.008)	-0.022***	(0.008)	0.013*	(0.007)	0.028***	(0.007)
Federal $d+4$			-0.038***	(0.010)	0.003	(0.009)	0.025***	(0.009)	0.026***	(0.009)
Federal $d+5$					-0.037***	(0.011)	-0.034***	(0.011)	-0.034***	(0.011)
Federal $d+6$							0.048***	(0.013)	0.047***	(0.013)
Federal $d+7$									-0.013	(0.009)
HHI	0.243	(0.221)	0.219	(0.220)	0.247	(0.219)	0.260	(0.212)	0.278	(0.211)
DominantMktShare	-0.069	(0.206)	-0.041	(0.203)	-0.078	(0.198)	-0.110	(0.196)	-0.127	(0.195)
MktShare	0.226***	(0.086)	0.240***	(0.085)	0.238***	(0.085)	0.250***	(0.085)	0.252***	(0.085)
HubOrig	0.031*	(0.017)	0.032*	(0.017)	0.032*	(0.017)	0.032*	(0.017)	0.032*	(0.017)
HubDest	-0.036**	(0.017)	-0.034**	(0.017)	-0.034**	(0.017)	-0.034*	(0.017)	-0.034*	(0.017)
DailyFreq	0.006	(0.004)	0.005	(0.004)	0.005	(0.004)	0.004	(0.004)	0.004	(0.004)
Connecting	0.028	(0.021)	0.028	(0.021)	0.027	(0.021)	0.027	(0.021)	0.027	(0.021)
HolidayBook	-0.043***	(0.003)	-0.045***	(0.003)	-0.046***	(0.003)	-0.045***	(0.003)	-0.045***	(0.003)
Kleibergen-Paap χ^2 Stat.	8.855***		8.873***		8.841***		8.891***		8.889***	
Cragg-Donald F Stat.	18,921***		18,915***		18,882***		19,023***		18,961***	
Hansen J Stat.	0.177		0.285		0.305		0.399		0.402	
R^2	0.155		0.177		0.188		0.195		0.197	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: The dependent variable is the natural logarithm of fare. HHI, $DominantMktShare$, and $MktShare$ are treated as endogenous variables and instrumented for using past-year values of HHI, $DominantMktShare$, and $MktShare$ in addition to the distance of the route from the airline's headquarters. Marginal effects are interpreted as the $100(\exp^{\beta}-1)$% change in fare. All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Table C2: Systematic peak-load pricing for traveling during national and federal holiday periods (competition variables: *DominantMktShare* and *MktShare*)

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
National $d-7$									0.170***	(0.018)
National $d-6$							0.313***	(0.022)	0.321***	(0.022)
National $d-5$					0.371***	(0.024)	0.384***	(0.025)	0.385***	(0.025)
National $d-4$			0.325***	(0.022)	0.330***	(0.023)	0.335***	(0.022)	0.335***	(0.022)
National $d-3$	0.327***	(0.024)	0.246***	(0.026)	0.251***	(0.026)	0.257***	(0.025)	0.253***	(0.025)
National $d-2$	0.567***	(0.022)	0.581***	(0.022)	0.538***	(0.023)	0.536***	(0.023)	0.530***	(0.023)
National $d-1$	0.597***	(0.018)	0.597***	(0.018)	0.605***	(0.018)	0.596***	(0.019)	0.603***	(0.019)
National $d=0$	0.460***	(0.018)	0.472***	(0.018)	0.478***	(0.018)	0.488***	(0.018)	0.437***	(0.017)
National $d+1$	0.432***	(0.023)	0.460***	(0.023)	0.474***	(0.023)	0.392***	(0.025)	0.401***	(0.025)
National $d+2$	0.512***	(0.024)	0.519***	(0.025)	0.425***	(0.027)	0.437***	(0.027)	0.438***	(0.027)
National $d+3$	0.625***	(0.018)	0.560***	(0.021)	0.564***	(0.021)	0.570***	(0.022)	0.570***	(0.022)
National $d+4$			0.369***	(0.018)	0.375***	(0.018)	0.381***	(0.019)	0.377***	(0.019)
National $d+5$					0.172***	(0.019)	0.170***	(0.019)	0.164***	(0.019)
National $d+6$							0.012	(0.014)	0.019	(0.014)
National $d+7$									0.039***	(0.013)
Federal $d-7$									-0.036***	(0.007)
Federal $d-6$							-0.040***	(0.006)	-0.040***	(0.006)
Federal $d-5$					0.025**	(0.011)	0.027**	(0.011)	0.050***	(0.011)
Federal $d-4$			0.169***	(0.013)	0.171***	(0.014)	0.206***	(0.015)	0.222***	(0.015)
Federal $d-3$	0.244***	(0.016)	0.238***	(0.015)	0.279***	(0.017)	0.302***	(0.017)	0.303***	(0.017)
Federal $d-2$	0.101***	(0.015)	0.132***	(0.016)	0.141***	(0.016)	0.144***	(0.016)	0.144***	(0.016)
Federal $d-1$	0.005	(0.011)	0.053***	(0.011)	0.055***	(0.011)	0.068***	(0.010)	0.066***	(0.010)
Federal $d=0$	0.242***	(0.011)	0.261***	(0.012)	0.277***	(0.012)	0.278***	(0.012)	0.264***	(0.012)
Federal $d+1$	0.078***	(0.007)	0.079***	(0.007)	0.087***	(0.007)	0.079***	(0.007)	0.079***	(0.007)
Federal $d+2$	-0.053***	(0.007)	-0.051***	(0.007)	-0.044***	(0.006)	-0.043***	(0.006)	-0.020***	(0.006)
Federal $d+3$	-0.067***	(0.010)	-0.024***	(0.008)	-0.021***	(0.008)	0.014**	(0.007)	0.029***	(0.007)
Federal $d+4$			-0.035***	(0.011)	0.006	(0.009)	0.029***	(0.008)	0.030***	(0.008)
Federal $d+5$					-0.036***	(0.011)	-0.033***	(0.011)	-0.033***	(0.011)
Federal $d+6$							0.043***	(0.011)	0.041***	(0.011)
Federal $d+7$									-0.013	(0.008)
DominantMktShare	0.049	(0.220)	0.064	(0.218)	0.041	(0.218)	0.016	(0.223)	0.007	(0.225)
MktShare	0.235***	(0.086)	0.248***	(0.085)	0.247***	(0.085)	0.260***	(0.084)	0.263***	(0.084)
HubOrig	0.032*	(0.018)	0.034*	(0.018)	0.034*	(0.017)	0.034*	(0.018)	0.034*	(0.018)
HubDest	-0.034*	(0.018)	-0.033*	(0.017)	-0.033*	(0.017)	-0.032*	(0.017)	-0.032*	(0.017)
DailyFreq	0.006	(0.004)	0.004	(0.004)	0.004	(0.004)	0.003	(0.004)	0.003	(0.004)
Connecting	0.033	(0.022)	0.033	(0.022)	0.033	(0.022)	0.033	(0.022)	0.034	(0.022)
HolidayBook	-0.043***	(0.003)	-0.045***	(0.003)	-0.046***	(0.003)	-0.045***	(0.003)	-0.045***	(0.003)
Kleibergen-Paap χ^2 Stat.	24.885***		24.910***		24.907***		24.906***		24.908***	
Cragg-Donald F Stat.	1,607,430***		1,610,182***		1,609,904***		1,610,279***		1,611,092***	
Hansen J Stat.	0.242		0.357		0.389		0.499		0.511	
R^2	0.159		0.180		0.193		0.201		0.203	
Observations	18,110,269		18,110,269		18,110,269		18,110,269		18,110,269	

Notes: The dependent variable is the natural logarithm of fare. *DominantMktShare* and *MktShare* are treated as endogenous variables and instrumented for using past-year values of *DominantMktShare* and *MktShare* in addition to the distance of the route from the airline's headquarters. Marginal effects are interpreted as the $100(\exp^{\beta}-1)\%$ change in fare. All specifications include airline, airport-pair, time-of-day-of-departure, day-of-week-of-departure, and days-to-departure fixed effects. The regression constant is included but not reported. Standard errors are clustered at the airport-pair level. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.