

# The Value of Space During a Pandemic

Max J. Hyman  
Northwestern University, United States of America  
[maxhyman2021@u.northwestern.edu](mailto:maxhyman2021@u.northwestern.edu)

and

Ian Savage  
Department of Economics, Northwestern University, United States of America  
[ipsavage@northwestern.edu](mailto:ipsavage@northwestern.edu)

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Corresponding Author:

Ian Savage  
Department of Economics  
Northwestern University  
2211 Campus Drive  
Evanston IL 60208  
[ipsavage@northwestern.edu](mailto:ipsavage@northwestern.edu)

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## Abstract:

To encourage social distancing during the COVID-19 pandemic, Delta Air Lines did not sell the middle seat on its flights that had them. In the second half of 2020 its principal rivals, American Airlines and United Airlines, continued to sell the middle seat. Analysis of U.S. Department of Transportation airline ticket data on 1,358 domestic routes finds that Delta raised its fares by 15%. Therefore, passengers paid \$23 to prevent a stranger from sitting next to them.

**Keywords:** aviation, pandemic, price discrimination

**JEL Codes:** L93

## Highlights:

- Delta Air Lines did not sell the middle seat in 2020 during the COVID-19 pandemic.
- Its principal rivals sold all seats starting in July 2020.
- Delta raised its fares by 15%.
- Passengers paid \$23 to prevent a stranger from sitting next to them.
- Delta had to operate more flights, so this was not a profit-enhancing strategy.

## 1. Introduction

The initial wave of COVID-19 infections in the United States in April 2020 led to a 95% reduction in domestic air travel compared to April 2019. To encourage fliers to feel safer aboard, some airlines stopped selling the middle seat to encourage social distancing.<sup>1</sup> Delta Air Lines (Delta) maintained this policy until April 30, 2021. Its principal rivals among the large legacy full-service network carriers, American Airlines (American) and United Air Lines (United), abandoned capacity constraints after June 2020.<sup>2</sup>

The U.S. Centers for Disease Control and Prevention identified that “exposures in scenarios in which the middle seat was vacant were reduced by 23% to 57%, compared with full aircraft occupancy” (Dietrich, 2021). Passengers concerned about contracting the virus were thus presented with a vertically-differentiated choice from July 2020 in competitive markets, and, in theory, Delta should have been able to charge more for a more desirable product (Stole, 2007). This paper explores whether, in fact, Delta was able to charge a higher fare than its rivals, and whether this was sufficient to offset the lost revenue from unsold seats. Furthermore, the results provide insight into fliers’ willingness to pay for extra space.

## 2. Data Sources

We use the 10% sample of airline tickets in the U.S. Department of Transportation’s (D.O.T.) quarterly Origin and Destination Survey, commonly known as DB1B. One-way fares on Delta, American and United are calculated for 1,358 non-stop domestic bidirectional routes for each quarter across 2018, 2019 and 2020. The analysis focuses on these three airlines because American and United offer comparable services and networks to Delta, unlike airlines such as Southwest Airlines and Spirit Airlines which have different cost structures and product attributes.

A route is included if at least one of the three legacy carriers (but not necessarily the same one) is present in all twelve quarters. There are, therefore, a minimum of 12 observations for each route and a maximum of 36 observations if all three carriers are present every quarter. The average number of observations per route is 14.3 for a total of 19,418 observations.

The analysis ends in 2020. Delta continued its policy into 2021, but the distribution of vaccines in quarter 1 of 2021 started to change fliers’ desires for extra space.

## 3. Evidence of a Price Premium

A difference-in-differences analysis is conducted on both mean and median fares. The treatment variable is Delta in quarters 3 and 4 of 2020 (when the middle seat policy is active for Delta but

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<sup>1</sup> Not all aircraft or classes of service have a middle seat, so “middle seat” is a shorthand for ensuring that passengers do not sit next to someone who was not traveling with them.

<sup>2</sup> Technically, United never withheld the middle seat but would inform passengers in advance if more than 70% of seats were booked. Alaska Airlines, JetBlue Airways and Southwest Airlines also did not sell the middle seat through December 2020.

not its rivals). A fixed effect for Delta investigates if the airline charges higher or lower fares across all time periods. Time fixed effects for each of quarters 2, 3 and 4 of 2020 represent the dynamic nature of the pandemic on the industry. Fixed effects for each route are also included, and standard errors are clustered by these routes as well.

Results are in Table 1. Estimates for mean and median fares are similar. The median fare was \$199. In all time periods, Delta charged about \$10 more.<sup>3</sup> The pandemic led to a considerable drop in fares of \$40 in quarter 2 of 2020 and \$60 to \$70 later in the year. Delta charged \$23 more when, unlike its rivals, it was not selling the middle seat. The regression predicts that in quarter 4 of 2020, Delta charged a fare of \$170 compared with \$147 if it had not adopted the policy, representing a premium of 15%.

#### **4. Variation of Price Premium by Market Power**

A second analysis examines if the premium fare varied with Delta's market power. Theory suggests that the premium should fall when Delta has a greater market share. When Delta is the dominant (or only) airline in a market, it caters to a broader array of passenger tastes than when it is not the dominant airline. Extracting too high of a premium may lead those passengers with lower valuations of space not to travel. When Delta faces more competition, there is a separating equilibrium because Delta's middle seat policy coexists with airlines selling the middle seat. Therefore, Delta can specialize by charging a higher premium to those passengers with higher valuations of space.

The 1,358 routes are divided into four groups based on the average of Delta's market share in quarters 3 and 4 of 2020. Market share is calculated by the proportion of tickets issued by Delta in the DB1B 10% sample relative to all tickets sold and not just to those sold by the three legacy airlines. The first and largest group is the 878 routes where Delta is not present. The other groups are: 91 routes where Delta has a small market share of greater than zero but less than 33%, 121 routes where it is greater than or equal to 33% but less than 67%, and 268 routes where it is greater than or equal to 67%.

Analyses of mean fares are shown in Table 2. Consistent with theory, the premium from blocking the middle seat falls with market share. Delta charged \$27 (19%) more in markets where it had a small market share and Delta was more of a niche firm, \$22 (15%) more in middle share markets in which there may be active competition, and a statistically insignificant \$8 (4%) more in markets it dominated.

Also consistent with theory, Delta charged more across all time periods in markets where it is more dominant. Delta's price was not statistically different than that of American or United in markets where it had a small share, but it was \$12 more in middle-share markets and \$25 more in markets it dominated.

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<sup>3</sup> This may be an artifact of the types of routes Delta operates rather than a pure price premium.

## 5. Costs of the Policy

The policy was costly for Delta. In April and May 2020, passenger demand was low enough that blocking the middle seat did not matter. Eventually, however, Delta had to operate additional flights to ensure that it could meet recovering passenger demand and keep the middle seat open.

Figure 1 shows the monthly load factor (percentage of seats occupied) on domestic scheduled services for the legacy airlines in 2019 and 2020.<sup>4</sup> Prior to the pandemic, all three airlines had similar load factors in the 80% to 90% range. By April 2020, despite a drastic reduction in the number of flights operated, load factor declined to just 15%. Yet, by early summer, American's load factor rebounded above 60%, and United achieved similar levels by early Fall. In contrast, Delta's load factor remained below 50%.

Figure 2 shows the monthly available seat miles (ASM) on domestic scheduled services for the legacy airlines in 2019 and 2020. A 150-seat aircraft flying 1,000 miles results in 150,000 ASMs. This figure illustrates why Delta's load factor remained depressed compared to American's and United's. All three airlines drastically reduced their schedules in April and May 2020 (with American to a lesser degree than Delta or United). Then, in June, American and Delta started adding back service, with United being less aggressive. American eventually pulled back service, whereas Delta continued to add more flights. Therefore, Delta's lower load factor was achieved by restoring more flights than its rivals.<sup>5</sup>

## 6. Conclusion

During the COVID-19 pandemic, passengers paid \$23 to prevent a stranger from sitting next to them. While Delta charged a 15% price premium, the middle seat policy required Delta to operate more flights. In the second half of 2020, Delta's load factor was 44% compared to 66% at American and 58% at United. Delta's middle seat policy implied that its per-seat-sold costs were approximately 50% higher. From a short-term financial perspective, blocking the middle seat was not a profit enhancing strategy. This conclusion harks back to American's 2004 abandonment of its four-year-old "More Room Throughout Coach" experiment where rows of seats had been removed to give passengers 3" to 5" more legroom.

So, what might explain Delta's decision? It is possible that Delta hoped to attract some customers from American or United, and that these customers would transfer their allegiances after sampling Delta's product. There might have been supply-side considerations, too. By furloughing fewer staff and placing less aircraft into long-term storage, Delta would be able to ramp up service more quickly than its rivals as the pandemic waned. Indeed, American ran into capacity problems in summer 2021 (Sider, 2021).

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<sup>4</sup> Unlike the ticket analysis data, Figures 1 and 2 cover flights directly operated by the carrier and do not include its regional partners.

<sup>5</sup> While some larger aircraft previously used on international service were redeployed to domestic service, there was not a large change in the average seats per flight operated, so the expansion of ASMs was primarily due to the operation of more flights.

## Appendix: Data Preparation

On each route, mean and median fares are calculated from “single coupon” tickets, meaning that only non-stop passengers are included. The fare on a route is a combination of the price of one-way tickets, half the price of round trips, and the prorated portion of tickets where passengers connect to other domestic destinations. Tickets with a dollar value that the D.O.T. flags as not “credible” are excluded. Service on some routes is provided by a mixture of both Delta and regional affiliate aircraft under the Delta Connection brand. The middle seat policy applied to both. A ticket is classified as a Delta fare if Delta is listed as the ticketing airline. The same is true for American and United with their American Eagle and United Express brands, respectively.

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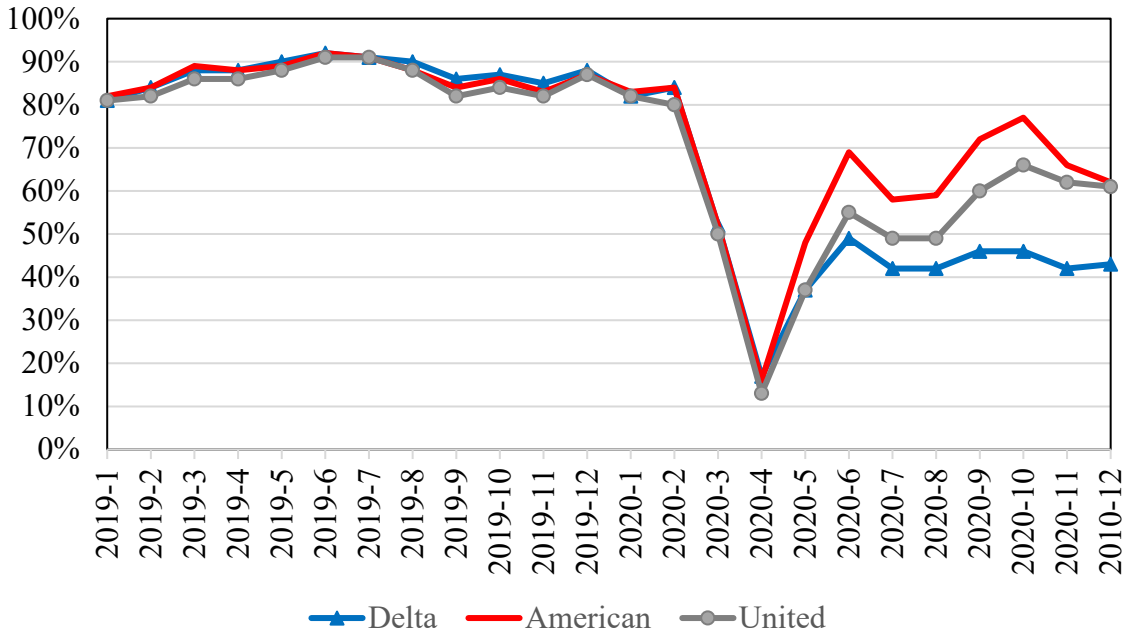
**Table 1: Regressions on Quarterly One-Way Fares with Route Fixed Effects, 2018 to 2020**

Dependent Variable	Mean Fare		Median Fare	
	Coefficient	t-statistic	Coefficient	t-statistic
Constant	216.10	287.95	198.75	303.06
Delta Air Lines Dummy	7.65	3.09	9.97	4.74
Pandemic Dummy 2020Q2	-41.24	30.06	-37.80	24.18
Pandemic Dummy 2020Q3	-64.75	49.60	-68.64	48.24
Pandemic Dummy 2020Q4	-62.57	49.35	-61.67	43.31
Delta Dummy 2020Q3 and 2020Q4	23.36	14.87	22.44	15.84
Observations	19,418		19,418	
Groups (routes)	1,358		1,358	
Adjusted R <sup>2</sup>				
Within groups	0.3716		0.3204	
Between groups	0.0073		0.0039	
Overall	0.1084		0.1031	
Predicted Delta Fare in Quarter 4, 2020				
Blocking Middle Seat	\$184.56		\$169.49	
Selling Middle Seat	\$161.19		\$147.05	
Price Premium	14.5%		15.3%	

**Table 2: Market Share Regressions on Mean Quarterly One-Way Fares with Route Fixed Effects, 2018 to 2020**

Delta Market Share	Less than 33%		33% to 67%		Greater than 67%	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	189.99	80.30	201.47	110.82	193.16	18.68
Delta Air Lines Dummy	2.02	0.48	11.80	4.28	25.09	2.42
Pandemic Dummy 2020Q2	-30.47	6.14	-37.24	10.48	-44.63	17.99
Pandemic Dummy 2020Q3	-55.21	10.37	-71.56	14.08	-52.79	3.43
Pandemic Dummy 2020Q4	-53.31	8.81	-67.14	14.29	-45.27	2.92
Delta Dummy 2020Q3 and 2020Q4	26.83	4.74	21.97	5.37	7.73	0.50
Observations	1,931		2,230		3,242	
Groups (routes)	91		121		268	
Adjusted R <sup>2</sup>						
Within groups	0.2140		0.4581		0.4412	
Between groups	0.0007		0.0093		0.0074	
Overall	0.0657		0.1713		0.1088	
Predicted Delta Fare in Quarter 4, 2020						
Blocking Middle Seat	\$138.70		\$146.13		\$172.98	
Selling Middle Seat	\$165.52		\$168.10		\$180.70	
Price Premium	19.3%		15.0%		4.5%	

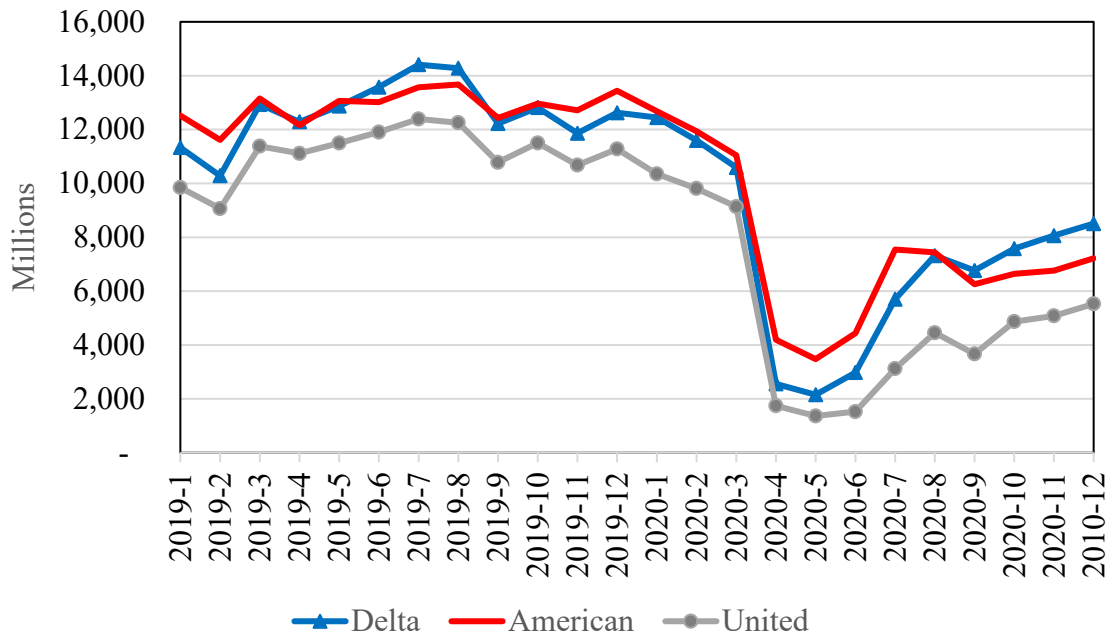
**Figure 1: Monthly Load Factor (Percent of Seats Occupied) on Domestic Scheduled Services, 2019 to 2020**



*Source:* U.S. Department of Transportation; U.S. Air Carrier Traffic and Capacity Summary by Service Class (Database T1) for flights operated directly by the airline.



**Figure 2: Monthly Available Seat Miles on Domestic Scheduled Services, 2019 to 2020**



*Source:* U.S. Department of Transportation; U.S. Air Carrier Traffic and Capacity Summary by Service Class (Database T1) for flights operated directly by the airline