Maverick Firms And Competition: Evidence from the Attempted JetBlue-Spirit Merger *

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Abstract

In 2024, the attempted merger between JetBlue Airways and Spirit Airlines was blocked following a lawsuit brought by the Department of Justice. This paper estimates the counterfactual effects from this merger. I find minimal impacts to average market prices under more favorable simulations and negative impacts to the average market fare of under 5% under the worst case scenario. Furthermore, I analyze the change in the overall distribution of fares had the merger been completed. I find that even under the assumptions most favorable to pro-competitive effects from merger, I estimate that over 35 markets in both the three years before and after the pandemic would have had their minimum fares increase by over $60. This represents a large increase in fares for highly price-conscious consumers, aligning with the judgment which prevented the merger. JEL Classification: L4, L41

Keywords: airlines; mergers

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1 Introduction

In 2024, a proposed merger between JetBlue and Spirit became the first merger within the American aviation sector to be blocked following trial. This merger would have seen the largest ultra-low cost carrier acquired by a low-cost carrier. Spirit had, over the course of the 2010s, pioneered the ultra-low cost carrier business model and acted as a maverick firm which competed vigorously for budget conscious travelers. As such, understanding the counterfactual effects of this merger allows for an increased understanding of the role of maverick firms in promoting competition.

The estimation of the effects of this merger is complicated by two factors - JetBlue's Northeast Alliance (NEA) with American Airlines and the COVID-19 pandemic. Under the NEA, JetBlue and American Airlines coordinated on setting routes to and from airports serving the Boston and New York City metropolitan areas (Boston Logan International Airport, Newark Liberty International Airport, John F. Kennedy International Airport, and LaGuardia Airport) between 2020 and 2023. This agreement would be found to be anti-competitive following trial in 2023. Due to this agreement, JetBlue operated in different markets than it otherwise would have, inhibiting the understanding of the counterfactual world where the merger had been approved.

Concurrent with this anti-competitive conduct, the aviation industry was dealing with the ramifications of the COVID-19 pandemic on consumption patterns. While air travel levels would return to 2016 levels by the second quarter of 2021, less price-conscious business travel had dramatically decreased due to the increased prevalence of telecommunications use for meetings and has only recently recovered to pre-pandemic patterns. Leisure travelers, traditionally more price sensitive than business travelers, were observed to be behaving less price sensitively than normal by airlines, possibly owing to acquired savings during the travel slowdown.

To resolve the issues presented by these factors, I estimate the counterfactual price effects of the merger on markets within the three years before the pandemic and the three years after the second quarter of 2021. While each period of analysis is separately flawed (the pre-pandemic period has normal routing but inaccurate demand patterns while the post-pandemic period has adversely impacted routing with normal demand patterns), the net picture of the merger is clear. I estimate anti-competitive price increases dominating fares at the lower end of the fare distribution, with estimated minimum fare increases of over $80 following the merger in over thirty-five markets under the assumptions most favorable to the merger's efficiencies, regardless of the sample period used. This contrasts with the mixed picture of the merger's effects on average fares, with average fares estimated to not change in the pre-pandemic markets and increasing on average by about 4% in the post-pandemic markets.

The difference between these estimated effects for the average and minimum market fares speaks to the degree that Spirit's competitive impacts focused on the price constrained travelers. In line with previous research, Spirit's competitive effects are strongest at the low-end of the fare distribution and so careful analysis of the heterogeneity across markets must be undertaken to properly understand the effects of its existence.

With these findings outlined, the rest of the paper is organized as follows: Section 2 briefly summarizes the literature on airline mergers and role of low-cost carriers and ultra-low cost carriers within the industry; Section 3 details on the American air travel market, the Northeast Alliance, and the JetBlue-Spirit merger; Section 4 elaborates on my data sources and presents summary statistics; Section 5 contains my analysis of the Northeast Alliance and the JetBlue-Spirit merger; finally, Section 6 summarizes the findings of this paper and examines their implications for antitrust policy going forwards.

2 Literature Review

This paper analyzes the counterfactual effects of the JetBlue-Spirit merger. To accomplish this, it draws from and contributes to the economic literature analyzing the merger-induced consolidation within the aviation industry during the twenty-first century. It additionally furthers the understanding of the role of low-cost carriers and ultra-low cost carriers within the aviation industry in promoting competition through the analysis of more recent data which includes the period following the COVID-19 pandemic.

Since the turn of the century, mergers have led to increased consolidation within the aviation industry. The existing literature is divided on the net price effects of these mergers, due to differences of merger characteristics and methodology. To understand the impact of different methodologies on the estimated pro- or anti-competitive price effects, consider Luo (2014) and Carlton et al. (2019). These papers estimated pro-competitive effects of the Delta-Northwest, United-Continental, and American-US Airways mergers by using a differences-in-differences inference design which did not allow for dynamic realization of effects and instead relied on the determination of pre- and post-period. This methodology would be challenged in Fan (2020) which found evidence for price increases following the United-Continental merger through the adoption of a model which allowed for dynamic price effects. This found evidence consistent with prices rising following merger announcements rather than completion, which reduced the estimated effects in the prior literature. Research has additionally been conducted using structural modeling to recover firm marginal costs and markups to analyze the effects of these mergers. Bet (2021b) found evidence for increases in markups resulting from the United-Continental, Southwest-AirTran, and American-US Airways mergers but not the Delta-Northwest merger while estimating limited efficiency gains across all of these mergers. Ciliberto et al.

(2021) estimated the effects of the American-US Airways merger using a structural model which allowed for dynamic entry into markets, and estimated price increases of around 5% for duopoly markets consolidated by the merger. Within this paper, structural modeling is used to assess the counterfactual effects of the JetBlue-Spirit merger.

In contrast to these papers focused on mergers of legacy carriers, this paper focuses on a proposed (but ultimately uncompleted) merger between a low-cost and an ultra-low cost carrier. As part of this analysis, it simulates the merger of these two airlines and finds evidence of heterogeneous fare increases following the merger. Recently, Ciliberto et al. (2021) and Li et al. (2022) have used simulations of legacy carrier mergers to examine the implications of models that account for route entry decisions. I discuss the ramifications of these papers on the assumption of exogenous market structure for this paper in detail in Section 5.

Past research has identified strong competitive effects from low-cost carriers, such as Southwest, on incumbent firms within a market (Morrison, 2001; Goolsbee and Syverson, 2008). Spirit in particular has been linked to increases in fare dispersion of existing airlines through the introduction of 'basic economy fares'. This has resulted in large reductions in fares for the cheapest fares on routes that it operates in (Shrago, 2024).

Finally, my paper touches upon the literature examining the role of low-cost and ultra-low cost carriers within the aviation industry. While this literature has predominantly focused on the ability of Southwest, the largest low-cost carrier, to lower prices within a market (e.g. Windle and Dresner (1995); Morrison (2001); Goolsbee and Syverson (2008)), there has been movement in recent years to examine the effects of other low-cost carriers, such as JetBlue and Spirit, on prices. One example of this strand of literature is Shrago (2024) which found that Spirit entry into a market was responsible for lower prices for the cheapest fares but minimal effect on average fares. In addition to my paper's analysis of the pricing effects of an unrealized merger between an ultra-low cost and low-cost carrier, it reports stylized facts about the changing role of low-cost and ultra-low cost carriers in the late 2010s and early 2020s.

3 Setting

Within this section, I establish key facts about the aviation industry in the United States in Subsection 3.1, then I discuss the context of the proposed JetBlue-Spirit merger and Northeast Alliance in Subsections 3.2 and 3.3 respectively.

3.1 United States Aviation

The American aviation industry is primarily comprised of three types of carriers: legacy carriers, low-cost carriers, and ultra-low cost carriers. Beyond pricing differences, each category of firms is defined by differences in their operations. As such, it is worth spending time on these differences, as they inform later analyses within this paper. Legacy carriers are those firms that operated in the industry before fare deregulation in 1978. Following a series of mergers in the last few decades, Delta, American, and United are the only legacy carriers still operating today. These carriers operate hub-and-spoke route networks which require customers to connect through a centralized hub to reach smaller destinations. One consequence of this is that these firms operate a larger variety of aircraft within their fleets than firms of the other two types. This allows for the servicing of smaller markets with minimal excess capacity at the cost of additional crew training and maintenance expenditures.

Non-legacy air carriers are divided into two groups, low-cost carriers and ultra-low cost carriers. Low-cost carriers include Southwest and JetBlue, while the ultra-low cost carriers are comprised of Spirit, Allegiant, and Frontier.[1] Unlike legacy carriers, both low-cost and ultra-low cost carriers favor the usage of direct flights. While this requires them to eschew smaller markets, it allows for the avoidance of expenditures relating to operating hub airports. Furthermore, this focus on direct flights allows these carriers to use only a limited number of aircraft models within their fleets.

Ultra-low cost carriers are distinguished from low-cost carriers through the practice of "unbundling," wherein ticket prices are lower but amenities traditionally included in a fare are additional purchases. While Ryanair in Europe has operated under this model since the 1990s, a United States firm would not successfully adopt the strategy until Spirit introduced fees for checked baggage in 2010 (Bachwich and Wittman, 2017). While complaints regarding the quality of these airlines are well documented in consumer surveys and the press (Vasel, 2016; Elliott, 2022), these airlines have managed a good deal of competitive success within their segment of the market by targeting highly budget-conscious travelers who do not wish to pay more expensive fares. By the later part of the 2010s, trips on ultra-low cost carriers represented over a tenth of total air travel within the United States. Despite this growth, the industry is still dominated by the "big four" carriers - the three legacy carriers who along with Southwest comprise approximately three-quarters of the overall passenger trips within the United States.

Through adopting the ultra-low cost carrier model, Spirit was able to rapidly grow within the post-recession domestic aviation landscape. As documented in Figure 10, Spirit grew its fleet from under 50

[1] Alaska Airlines and Hawaiian Airlines are larger carriers with a regional focus. They both operate a model closer to legacy carriers than those of low-cost carriers. Furthermore, there exist several smaller, more regional-focused low-cost carriers, such as Sun Country. Later analyses within this paper treat products from these airlines as from a unified, "Minor Low-Cost Carrier" airline.

planes before adopting the ultra-low cost model to nearly 200 planes by 2022. As part of this expansion in operations, Spirit increasingly competed against JetBlue (Figure 11).[2] Both firms primarily operate in airports situated along the eastern seaboard of the United States in addition to Las Vegas and major cities in Texas and California.

Despite these similarities in operations, both firms behaved differently regarding competition by the 2020s. In 2020, JetBlue created the "Northeast Alliance" (NEA) with American Airlines, which saw co-operation on flights originating from or departing to airports within the New York City and Boston areas: LaGuardia Airport (LGA), John F. Kennedy International Airport (JFK), Newark Liberty International Airport (EWR), and Boston Logan International Airport (BOS).[3] Beyond the NEA, the Department of Justice has alleged that JetBlue had taken part in anti-competitive behavior using the Airline Tariff Publishing Company to coordinate fares with other firms.

Spirit, on the other hand, competed aggressively and operated as a maverick firm within the aviation industry. It has maintained a consistent pace of increasing its fleet size throughout the 2010s and into the 2020s (as graphed in Figure 10) despite the shock to air travel caused by the coronavirus pandemic.[4] This growth in its fleet was required for expansion into new markets. As shown in Shrago (2024), Spirit causes increased variance in fares within markets that it enters by inducing legacy carriers to compete for the highly cost-concerned travelers targetted by Spirit. They do this by offering "basic economy" fares which operate similarly to Spirit's "unbundled" fares.

Finally, it is important to note the impact of the coronavirus pandemic on the aviation industry. A severe drop in air travel occurred almost immediately as consumers and businesses canceled travel plans due to both virus concerns and government mandates. While widespread vaccine availability allowed for recovery to 2016 levels of air travel by the second quarter of 2021, passenger levels would not recover to 2019 levels of air travel until halfway into 2022 (see Figure 1).

However, this recovery in ridership did not mark a return to the prior market conditions for the industry. Historically, approximately a third of air travel is motivated by business (Berry and Jia, 2010; Bet, 2021a)). However, following the pandemic, business travel decreased as businesses switched to telecommunications for meetings rather than face-to-face interactions (Semuels, 2021). Meanwhile, leisure travelers built savings during the decline in travel, allowing them to behave less price-sensitively following the pandemic. As such, the overall change in price elasticity is apriori ambiguous.[5] As such, consumption patterns are liable to differ

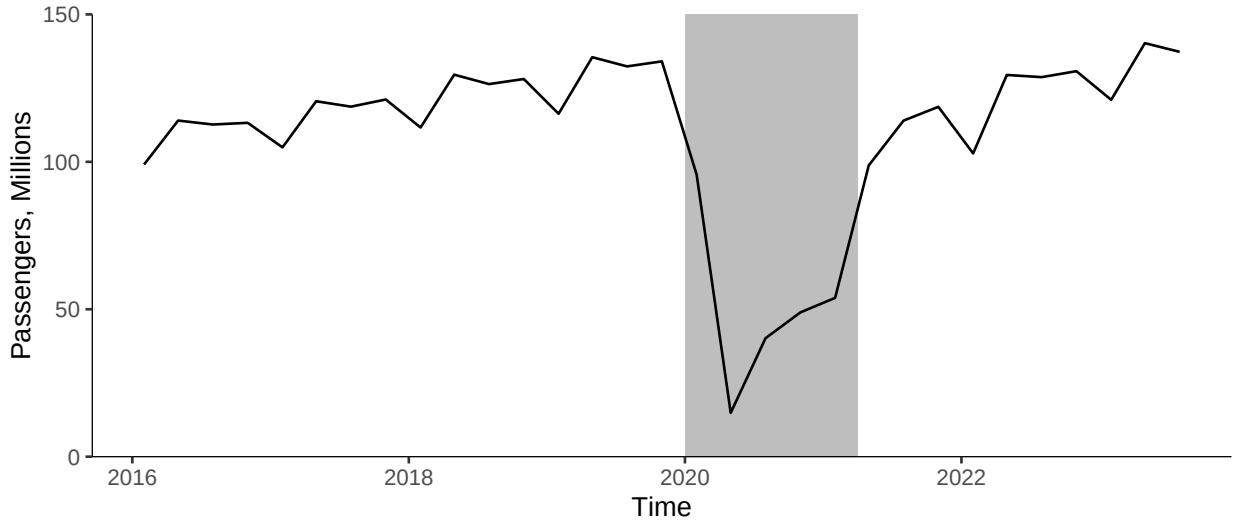
[2]This is especially notable as very few markets have historically had multiple low-cost carriers operating within them (Kwoka et al., 2016; Ciliberto et al., 2021). However, in recent years, there are approximately a third as many markets with multiple low-cost carriers operating within them as there are markets with only a single low-cost carrier (Figure 7

[3]Section 3.3 elaborates on this in more detail.

[4]As depicted in the aforementioned figure, JetBlue's fleet stagnated following the pandemic due to it negotiating delayed fulfillment of orders placed before the pandemic (Bellamy III, 2020; Sipinski, 2020).

[5]In a recent working paper, Ewen (2023), this phenomenon appears to have occurred, with a non-negligible share of leisure

Figure 1: Quarterly Passengers, All Carriers



Source: DB1B Data. Shaded region depicts the duration of the coronavirus pandemic before widespread vaccine availability within the United States, namely, from the first quarter of 2020 through the first quarter of 2021.

between the pre-pandemic and post-pandemic periods despite the large recovery in passenger levels.

3.2 Attempted JetBlue-Spirit Merger

In February 2022, Spirit announced its intention to merge with fellow ultra-low cost carrier Frontier (Schaper and Hernandez, 2022). This prompted a counteroffer from JetBlue in April for ownership of Spirit, which would lead to the attempted merger between Spirit and Frontier being called off in July amid a lack of support from Spirit shareholders (Josephs, 2022a,b). By mid-October, Spirit shareholders approved the acquisition by JetBlue (Koenig, 2022). The next year would see the United States Department of Justice, the District of Columbia, Massachusetts, and New York file suit to block the merger in March (Chokshi, 2023). Following a trial in the winter of 2023, the merger would be blocked on January 16, 2024, and the parties would ultimately decide against appealing the verdict (Chapman and Koenig, 2024). These events are summarized in Table 1.

JetBlue publicly considered the acquisition of Spirit to be a top priority for the company, choosing to not appeal the ruling blocking its Northeast Alliance with American Airlines in favor of focusing its resources on overcoming the lawsuit seeking to block the merger with Spirit (Aratani, 2023). Beyond these legal resources, it directed resources toward trying to win public favor over the merger. Notably, it coordinated comment submissions to a Department of Transportation regulatory filing regarding the merger with pro-

travelers being less price-sensitively than before the pandemic. In Table 6, I find evidence that airfare has become slightly less elastic following the pandemic, consistent with the idea that this change in consumer behavior was enough to offset the changes from business travel on elasticity.

Table 1: JetBlue-Spirit Merger Timeline

Year	Date	Event
2022	February 7	Frontier-Spirit Merger Announced
	April 5	First JetBlue Offer for Spirit Released
	May 6	Spirit Rejects JetBlue Offer
	July 27	Frontier-Spirit Merger Attempt Collapses
	July 28	Spirit Board Approves JetBlue Merger
	October 19	Spirit Shareholders Approve Merger
2023	March 7	Department of Justice Files Suit
	October 31 - December 5	JetBlue-Spirit Merger Trial
2024	January 16	JetBlue-Spirit Merger Blocked
	March 4	JetBlue, Spirit Drop Appeal Plans

merger comments sourced from its employees.[6] Despite this, following the ruling against the merger it would ultimately choose to drop its appeals, with some financial analysts noting a significant deterioration of Spirit's financial stability between 2022 and 2024 (Sider, 2024).

I now turn my attention to the ruling by Judge Young which ultimately blocked the JetBlue-Spirit merger attempt. The judgment identifies five key cities for his ruling: Orlando, San Juan, Miami and Fort Lauderdale (termed "South Florida"), New York City, and Boston. These cities were identified on the basis that the majority of passengers in markets with competition between JetBlue and Spirit departed from these cities. These largely align with the cities in which the two firms would have the largest share of departing passengers within 2022 (Table 14). However, the cities indicated ignores the firms' role in multiple smaller markets within Puerto Rico, namely Ponce and Aguadilla, where the two firms comprise the vast majority of the market.

In section 2.F of the judgment, the potential effects of the merger are listed as decreased airline seats, increased market concentration, increased debt for JetBlue, and increased prices for consumers. Table 2 documents the aircraft in JetBlue and Spirit's fleets in 2022. Both airlines predominantly fly aircraft manufactured by Airbus. JetBlue's fleet is slightly more varied than Spirit's as it uses five different versions of the Airbus A321 aircraft[7] Should Spirit's Airbus A320 and Airbus A321 have been adjusted to the predominant seat configurations of JetBlue's aircraft, a total of 20 seats would be lost on each Airbus A320 and 69 seats would be lost on each Airbus A321, for a total of 4,799 seats lost. This would reflect a loss of approximately 13% of the seats on Spirit's aircraft.[8] These rough calculations closely track the estimate of

[6]Some employees went on to dispute that these comments accurately reflected their views (Birnbaum, 2023; Birnbaum and Nylen, 2023). In Appendix B, I use stance detection techniques to analyze comments left on this filing in more detail.

[7]Two of these configurations reflect solely different seat configurations. The other three configurations are on the Airbus A321neo, a revision of the earlier aircraft.

[8]If instead, Spirit's Airbus A321 were adjusted to the 200 seat configuration rather than the 159 configuration, then this would be 3500 seats lost or a loss of approximately 9.9% of Spirit's seat capacity.

Table 2: JetBlue, Spirit Fleet Composition - 2022

Manufacturer	Model	Seats	Count	Total Seats
JetBlue				
Airbus	A220	140	14	1960
Airbus	A320	150	11	1650
Airbus	A320	162	119	19278
Airbus	A321	159	35	5565
Airbus	A321	200	28	5600
Airbus	A321neo	138	5	690
Airbus	A321neo	160	2	320
Airbus	A321neo	200	16	3200
Embraer	E190	100	55	5500
Spirit				
Airbus	A319	145	31	4495
Airbus	A320	182	133	24206
Airbus	A321	228	30	6840

Source: B-43 Inventory Data.

an 11% reduction in seats accepted by the trial court in its decision.[9]

This paper estimates the counterfactual increase in market concentration and increase in prices in Section 5.3.

3.3 Northeast Alliance

Prior to its attempted merger with Spirit, JetBlue entered into the Northeast Alliance (NEA) with American Airlines at the start of 2021. The NEA saw the two firms coordinate operations to behave as a single carrier for routes that touched upon airports serving the New York City and Boston markets. They jointly decided their network for these routes, and operated them intending for consumers to be indifferent between the two carriers, worked to minimize overlap in product offerings on these routes, and shared revenue from products within the agreement. The United States Department of Justice along with six states and the District of Columbia brought a lawsuit against the agreement in September 2021 alleging violations of the Sherman Antitrust Act. Following a 2022 trial, the agreement would be found to violate the Sherman Antitrust Act in May 2023 and it was subsequently unwound(Rennison and Chokshi, 2023; Rains, 2023).[10] With this timeline outlined, I will now briefly discuss how the NEA differs from traditional aviation alliances and the issues it posses for estimation of the counterfactual merger effects for the JetBlue-Spirit merger.

Alliances between aviation firms are commonplace within consumer aviation. For example, Delta is part

[9]The court further estimated a decline in annual departures of over 6.1 million. As I neither possess data on flight schedules nor model flight schedules endogenously, I am unable to assess this claim.

[10]Table 3 details a timeline of key events relating to the NEA. Notably, some landing slot leases between the two airlines related to the merger experienced a gradual reversion to their original owners.

Table 3: Northeast Alliance Timeline

Year	Date	Event
2020	Quarter 1-2	JetBlue and American Negotiate Alliance
	July 16	Northeast Alliance Announced
	July 22	Alliance Agreement submitted to DOT
2021	January 10	DOT Terminates Antitrust Review
	February 24	Codesharing Agreement Begins on X Routes
	May 26	Reciprocal Loyalty Earnings Begins
	Early September	NEA Shuttle at JFK Opens
	September 21	DOJ Files Lawsuit Against NEA
2022	September 27 - November 18	NEA-Trial
2023	May 19	NEA Ruled Anti-Competitive
	July 5	JetBlue Drops Appeal Plans
	July 21	NEA Codesharing Ends
	October 31	JFK Shuttle Ceases Operation
	October 31	12 Slot Leases to JetBlue Terminate
2024	March 31	27 Slot Leases to JetBlue Terminate
	March 31	1 Slot Lease to American Terminates
	October 26	Remaining NEA Slot Leases Terminate

of the "SkyTeam Alliance" and United is part of the "Star Alliance." These alliances see firms operating code-sharing agreements between different carriers, in which airlines can sell seats on flights operated by other airlines, with the ticket being under the ticketing airlines' code.[11] These agreements are primarily operated between carriers situated in different countries which allows for better access to foreign markets as airlines are not normally able to fly routes entirely situated within a single foreign country. Benefits to consumers include the earning of frequent flier miles across all stages of a journey, regardless of the operating carrier, easier handling of baggage, and easier bookings. Meanwhile, carriers benefit from being able to offer a wider variety of destinations than would otherwise be possible.

Domestic aviation alliances are rare at present. Unlike alliances between domestic and foreign carriers, these agreements are generally unable to receive waivers from antitrust proceedings through the Department of Justice and as such face additional regulatory scrutiny. Traditionally, these domestic agreements only apply to markets without both firms and the alliance's members otherwise maintain separate routing decisions, operations, and planning. One example of a currently active domestic aviation alliance is the West Coast Alliance between American and Alaska Airlines.

Contrasting this traditional approach, the NEA was structured to act more similarly to a merger on affected routes. The two firms jointly scheduled flights within the selected cities, minimized overlap on

[11] This allows, for example, for passengers of the Canadian airline Westjet to book connecting flights into the United States by using Delta flights for the intranational legs of their trip.

routes operated by both firms[12], and coordinated operations at the airports impacted by the agreement.[13] Furthermore, as two of the impacted airports featured slot and gate controls[14], the NEA saw these firms share slot permits and share gates at the affected airports. This would be found by the trial court to have increased barriers to entering the New York City air travel market by deterring these firms by selling off landing slots to other firms.

The NEA impacts the evaluation of the counterfactual effects of the JetBlue-Spirit merger through its effects on the product offerings of JetBlue. Through jointly optimizing its network structure with American Airlines, JetBlue operated flights in different markets than it otherwise would have. As my simulation of the JetBlue-Spirit merger treats product offerings as exogenous, my post-pandemic results should be understood as estimating the world where the merger took place while the NEA was still in effect.

Beyond the changes to market structures, the NEA results in products within my sample that are assigned to JetBlue despite being operated solely or jointly with American. The majority of the NEA's existence saw over thirty products a quarter that fits these characteristics within markets that Spirit competes in (Table 12. As such, the recovery of marginal costs for these products is liable to be incorrect.

4 Data and Summary Statistics

The primary dataset used in the creation of this paper is the Bureau of Transportation Statistics' Airline Origin and Destination Survey (DB1B). The DB1B is a 10% sample of all domestic airline itineraries within the United States. It includes data on pricing, distance, carrier, and number of connecting flights. Within the literature examining the aviation industry, it has been the preferred data for domestic air travel for decades (e.g. Ciliberto et al. (2021); Berry and Jia (2010); Goolsbee and Syverson (2008); Peters (2006)).

Despite the breadth of its included information, the DB1B has one key limitation - fares consist solely of the base airfare. As such, it does not include airline fees (such as for checked bag fees) nor additional amenities purchased by consumers as part of their travel. As Spirit and the other ultra-low cost carriers focus on "unbundled" fares, these airline fares are liable to be reported as systematically lower than the full price paid by consumers after taking into account spending on auxiliary purchases.[15] This inhibits a proper simulation of changes to consumer surplus following the merger. Consider a consumer who purchases

[12]It is not clear how effective this was. As documented in Figure 9, the levels of shared routes at each of the four impacted airports was within historically normal ranges.

[13]One example of this coordination is a shuttle operated by the two airlines at JFK to allow customers to transfer between the terminals used by each airline without having to clear security on a connecting trip (Griff, 2021).

[14]A slot-controlled airport is one in which airlines are assigned specified time slots by the FAA for departures and arrivals to allow for better coordination of runway usage in congested airports. These slots are set in advance of individual operation days and can be transferred between airlines as if they were property of the airline which holds them.

[15]Legacy carriers have instituted a tier of fare known within the industry as "basic economy" to compete with Spirit through a limited amount of unbundled fares. As such, these fares are likewise lower than the true amount paid by consumers. Unfortunately, the DB1B does not include reliable information on fare class, and as such, these fares are unable to be detected.

an unbundled Spirit fare for $30 along with a checked bag for $50 but who had the option of purchasing a JetBlue ticket for $90 which included a checked bag. Using the DB1B, I would estimate the consumer's change in surplus to be $60 rather than $10 following the merger due to an inability to assess full product characteristics.

However, despite this issue, it is still possible to gain insight into consumer welfare following the merger using this dataset. By analyzing the estimated change in the minimum fare within a market (in addition to the average fare), we can gain insight into how the merger would affect marginal consumers within the market who benefited the most from unbundled fares. The judgment which ultimately blocked the JetBlue-Spirit merger focused on this group of consumers. As such, this provides a degree of similarity to the judicial opinion.

Markets are defined by origin airport, destination airport, year, and quarter. Within this definition, originating and terminating airports are treated as the determinants of a market rather than airports' metropolitan statistical areas. It is known within the literature that consumers do not treat airports within a metropolitan statistical area as interchangeable.[16] Within this paper, products within a market are further defined by both ticketing carrier and non-stop status.[17] Appendix A details the sample construction methodology and restrictions on markets and itineraries included within the sample (such as excluding markets that consist of airports that are fewer than 150 miles apart).

Market size is defined as the geographic mean of the population of the origin and destination metropolitan statistical areas population. This is a standard assumption within this literature (such as in (Ciliberto et al., 2021)). This is calculated using the United States Census Bureau's annual estimates of metropolitan statistical area population. The outside good within a market is defined as the decision not to consume air travel between an origin and destination airport pair. As such, the outside good includes not making a trip, making a trip by car or bus, and making a trip between two different airports within the same origin and destination metropolitan areas.

Summary statistics for product-level data are included in Table 4. Both product prices and passengers fell on average following the pandemic, with the average itinerary becoming $22 cheaper in real terms while having 700 fewer passengers. Notably, despite the post-pandemic period's economy having high levels of inflation, there is only a $6 increase in nominal average fares between the two periods. Delta slightly decreased as a share of total products by 3 percentage points while Southwest, Spirit, and the 'Other' carrier increased their product offerings by approximately one percentage point. Products are slightly less likely to include an intermediate stop following the pandemic and cover slightly smaller distances.

[16] Goolsbee and Syverson (2008), for example, observes differential impacts on pricing of possible firm entry at the airport level than would be expected if airports within a metropolitan statistical area were treated as interchangeable by consumers.

[17] As such, each carrier can have zero, one, or two products within a market.

Table 4: Product Level Summary Statistics

	Mean	(SD)	Minimum	Median	Maximum
Pre-Pandemic					
Price (2017 USD)	234.01	(68.85)	33.12	236.38	810.58
Price (Nominal USD)	238.44	(70.1)	34	240.86	821.77
Passengers	4257.23	(10192.88)	100	810	192050
Distance (1000s)	1.42	(0.69)	0.15	1.28	4.8
Extra Distance	0.14	(0.21)	0	0.06	3.71
Nonstop	0.28	(0.45)	0	0	1
Origin Destinations	30	(33.39)	1	13	180
Origin Presence (%)	36.26	(31.28)	0.54	19.57	100
Delta	0.25	(0.43)	0	0	1
American	0.22	(0.41)	0	0	1
United	0.14	(0.35)	0	0	1
Southwest	0.25	(0.43)	0	0	1
JetBlue	0.03	(0.17)	0	0	1
Spirit	0.03	(0.18)	0	0	1
Other Carrier	0	(0.06)	0	0	1
Observations	307289				
Post-Pandemic					
Price (2017 USD)	212.77	(75.21)	27.96	209.94	737.78
Price (Nominal USD)	245.31	(89.02)	30.25	240.19	852.7
Passengers	3531.43	(8648.27)	100	690	144930
Distance (1000s)	1.41	(0.67)	0.15	1.28	3.86
Extra Distance	0.14	(0.19)	0	0.07	1.83
Nonstop	0.26	(0.44)	0	0	1
Origin Destinations	29.24	(33.72)	1	12	187
Origin Presence (%)	34.77	(30.92)	0.53	18.42	100
Delta	0.22	(0.41)	0	0	1
American	0.22	(0.41)	0	0	1
United	0.13	(0.34)	0	0	1
Southwest	0.26	(0.44)	0	0	1
JetBlue	0.03	(0.16)	0	0	1
Spirit	0.04	(0.2)	0	0	1
Other Carrier	0.01	(0.1)	0	0	1
Observations	265196				

A product is defined as a set of origin airport, destination airport, year, quarter, firm, and nonstop status. "Origin Destinations" is the number of airports served from the originating airport across all firms, "Origin Prescence" is the fraction of these destinations served by the ticketing carrier. The pre-pandemic sample includes all quarters of the years 2017 through 2019. The post-pandemic sample includes data from the second quarter of 2021 through the second quarter of 2023.

Table 5: Market Level Summary Statistics

	Mean	(SD)	Minimum	Median	Maximum
Pre-Pandemic					
Minimum Miles (1000s)	1.18	(0.64)	0.15	1.02	2.95
Average Miles (1000s)	1.23	(0.66)	0.15	1.07	4.39
Number of Firms	2.93	(1.49)	1	3	9
Number of Products	3.52	(2.1)	1	3	15
Number of Customers	14974.29	(28289.99)	260	4150	406050
HHI	8044.07	(4347.52)	1611.61	7058.6	56397.84
Observations	87363		JetBlue Markets	7442	
JetBlue & Spirit Markets	1533		Spirit Markets	7474	
Post-Pandemic					
Minimum Miles (1000s)	1.19	(0.64)	0.15	1.04	2.96
Average Miles (1000s)	1.24	(0.66)	0.15	1.1	2.98
Number of Firms	3.21	(1.56)	1	3	9
Number of Products	3.79	(2.16)	1	3	14
Number of Customers	13375.81	(25085.61)	230	3840	317370
HHI	7479.76	(4410.86)	1460.46	6260.03	20000
Observations	70016		JetBlue Markets	5945	
JetBlue & Spirit Markets	1554		Spirit Markets	9123	

A market is defined as a set of origin airport, destination airport, year, and quarter. The average miles reported within a market is weighted by itinerary passengers. The pre-pandemic sample includes all quarters of the years 2017 through 2019. The post-pandemic sample includes data from the second quarter of 2021 through the second quarter of 2023. JetBlue (Spirit) markets is the total number of markets operated by JetBlue (Spirit) within the period of observation. "JetBlue & Spirit Markets" is the total number of markets with both firms competing within them.

Summary statistics for market-level characteristics are included in Table 5. Despite the post-pandemic period having fewer overall markets included in the sample, JetBlue and Spirit competed in over a hundred additional markets in this period than in the three years before the pandemic. Additionally, there was on average roughly a third of an additional firm in the post-pandemic period in the average market, driven by firms operating a single product within the market. Finally, it is worth noting that the number of customers within the average market decreased by approximately 16,000 customers between the two periods. Aside from this, overall market characteristics are similar in terms of miles flown between the two periods.

5 Analysis

This section is organized into three subsections. I estimate a random-coefficient nested logit model of demand (Section 5.1), assume Bertrand-Nash competition with differentiated products to estimate marginal costs (Section 5.2), and then estimate three merger counterfactual simulations which are roughly a best case, an average case, and a worst case for the merger's effects on consumers (Section 5.2.

Before beginning these analyses, it is important to consider the implications of one critical assumption

used within the simulation, namely that firms treat the overall market structure as exogenously determined when determining prices.[18] The most immediate consequence of this is that routing within the models discussed in this paper cannot respond to demand shocks within a given quarter. Furthermore, within the simulations, firms do not change which markets they operate in following the merger nor reposition their products within these markets except through price and changing the branding.

This creates a problem for proper inference of the counterfactual world in which the merger had been completed. The NEA between American and JetBlue had included a reorganization of the route networks of each of the collaborating firms as part of the agreement. Furthermore, it allowed for codesharing between the airlines.[19] As such, counterfactuals using markets between 2021 and 2023 are those in which the JetBlue-Spirit merger was completed while the NEA is in effect and without any resulting reorganization of routes. However, as the NEA would ultimately be ruled against before the beginning of the trial for the JetBlue-Spirit merger, it is hard to believe in the existence of this world had the JetBlue-Spirit merger been allowed to be completed.

Unfortunately, it is not possible to simply use markets from before the implementation of the NEA as this would require the usage of data from before the coronavirus pandemic. As documented in press sources and in a working paper (Ewen, 2023), air travel demand dynamics have greatly changed following the pandemic. In part thanks to the rise of telecommunications software such as Zoom, low-price elasticity business travel has lessened. Concurrently, American consumers acquired additional savings during the pandemic which they were able to use on additional consumption following the pandemic (Klitgaard and Higgins, 2023). As such, the change in the price elasticity of air travel following the pandemic is a priori ambiguous.

To try to resolve these issues, I conduct all analyses within this section on two samples - the "pre-pandemic" sample which includes markets from the first quarter of 2017 through the fourth quarter of 2019 and a "post-pandemic" sample consisting of markets from the second quarter of 2021 through the end of the second quarter of 2023. By comparing the results from these two samples, a more complete picture can emerge of the counterfactual world in which the JetBlue-Spirit merger had been completed despite the issues facing each sample's overall credibility.

5.1 Demand Model

I use a random coefficient nested logit model to estimate demand, in line with the model originally documented in Berry et al. (1995). Adopting the notation described in Conlon and Gortmaker (2020), each consumer i in market t has indirect utility from buying product j as defined by

[18] This is consistent with the internal pricing processes of airlines, discussed in Hortaçsu et al. (2024).

[19] One consequence of this is that NEA codeshare products ticketed to JetBlue are included as JetBlue products for purposes of the merger simulation.

$$U_{ijt} = \delta_{jt} + \mu_{ijt} + \epsilon_{ijt}$$

where δ_{jt} is the mean utility across consumers in market t for product j, μ_{ijt} is each consumer's deviation from this mean utility, and ϵ_{ijt} is an unobserved consumer-level shock. The mean utility across consumers δ_{jt} is parameterized as

$$\delta_{jt} = \alpha p_{jt} + x_j\beta + F_{jt}\gamma + \epsilon_{jt}$$

where p_{jt} is the price of product j in market t; x_{jt} is a vector of observed itinerary characteristics including nonstop flight status, miles flown, the square of the miles flown, the percent of destinations from the originating airport served by the airline, the miles flown by the itinerary less the minimum miles flown with the market, the square of this value, and a dummy variable which is 1 if the route serves either a market including an end point in Las Vegas or a market in the state of Florida[20] F_{jt} is a vector of carrier and time fixed effects; and ϵ_{jt} is a product level shock shared by all consumers within a market.[21] The non-price product characteristics included here are intended to be largely unresponsive to demand shocks - these characteristics of a product are determined primarily by a carrier's network structure and the geography between the origin and destination airports. As such, these characteristics should not change in response to unobserved quarterly demand shocks.

Finally, the consumer specific deviation from utility, μ_{ijt}, is parameterized as

$$\mu_{ijt} = \sigma_p p_{jt}\nu_{ip} + \sigma_n n_{jt}\nu_{in} + \sigma_m m_{jt}\nu_{im}$$

with the ν parameters drawn from a standard normal distribution, p the product's price, n the product's nonstop status, and m the miles flown for the product. Each parameter σ within this model represents the standard deviation of consumers preferences for this product. Finally, ϵ_{ijt} are assumed to arise from a type 1 extreme value distribution so that market shares will be of the discrete choice nested logit variety. Within this model specification, air travel is included within one nest while the outside good[22] is included in the other nest. Utility of the outside good is normalized to zero.

Consumer i purchases itinerary j if it has greater utility than all other products in the market. As such, market shares can be obtained by integrating over the consumers within the market, resulting in the market

[20];
[21]This includes characteristics of products unobserved by the author, such as advertising.
[22]Which both includes the decision to not travel within the market or to travel by other means, such as train or car.

share of each product being defined by

$$s_{jt} = \int \frac{e^{\delta_{jt}+\mu_{ijt}}}{\sum_{j'} e^{\delta_{jt}+\mu_{ijt}}} d\nu_i$$

Four sets of instruments are used to account for the endogeneity of prices and shares within a market. The first set consists of a dummy variable which is 1 if at least one of the endpoint airports is a hub of the ticketing carrier, the product of this variable with the miles traveled, and the product of this with the square of the miles traveled. These serve as cost shifters.[23] The second set of instruments, employed to account for endogeneity of market shares, consists of the differentiation instruments described in Gandhi and Houde (2019) constructed from a dummy variable for nonstop flight status, the distance traveled, the square of the distance, and the service ratio of the ticketing carrier out of the destination airport. The third set of instruments, employed to instrument for the nesting parameter λ consists solely of the number of products within a market to assist in model convergence. Finally, all remaining exogenous regressors and their interactions comprise the final set of instruments.[24]

Results for the estimation of this model's coefficients for both periods are included in Table 6. With the exception of nonstop flight status and the tourist route dummy variable, all variables are predicted to influence consumer demand in both periods. However, of the variables which allow for random effects, only price takes a significant coefficient, of roughly 0.6. Finally, I estimate a nesting parameter of a little over a tenth in both periods. This is consistent with high degrees of substitutability between air travel and the outside good, which is inconsistent with most previous literature's estimates of the nesting parameter. As such, consumers are predicted to have a high willing to enter (leave) the market in response to a price decrease (increase).

JetBlue's products are more elastic than Spirit's, consistent with it targeting less budget conscious travelers than Spirit. Consumers are estimated to have become less price elastic between the pre-pandemic and post-pandemic periods. This is consistent with the notion that despite the decline in business travel following the pandemic, leisure travelers' spending patterns changed to be less price sensitive, perhaps due to excess savings acquired during the pandemic period or the desire to makeup for lost vacations.

[23] In constructing the data, a round-trip fare is divided into two unidirectional fares each with imputed fare equal to half of the overall payment made. This motivates the symmetric treatment of both origin hubs and destination hubs in the construction of these instruments.

[24] Other instruments for price were considered, including interactions between the gas miles variable and characteristics of the origin airport and interactions between the exogenous variables. However, the selection of price shifters used in the final model had the best performance across the tests documented in Tables 16. The final specification chosen (column 4) has the benefit of passing the Wu-Hausman test while failing the Test of Over Identification by the least amount of the tested models. As noted in Nevo (2001), provided enough observations it is virtually impossible to pass this, and as such, I am not concerned with the result. For comparison purposes, the instrument comparison table on the post-pandemic period (2021 Q2 through 2023 Q2) is included as Table 17.

Table 6: Demand Estimation Results

Variable	Pre-Pandemic	Post-Pandemic
Linear Coefficients		
Price	-3.05***	-3.11***
	(0.38)	(0.44)
Nonstop	0.838	1.16
	(1.3)	(0.8)
Miles Flown	1.34***	2.29***
	(0.12)	(0.24)
Miles Flown^2	-0.141***	-0.343
	(0.039)	(0.17)
Origin Prescence	0.0117***	0.00812***
	(0.00045)	(4e-04)
Extra Miles	-2.65***	-2.34***
	(0.11)	(0.13)
Extra Miles^2	1.62***	0.527***
	(0.069)	(0.11)
Tourist Route	0.0221	0.149***
	(0.028)	(0.03)
Nonlinear Coefficients		
Price	0.591***	0.599***
	(0.14)	(0.12)
Nonstop	0.249	0.0814
	(5.4)	(10)
Miles Flown	0.0152	0.066
	(2.5)	(3.1)
Nesting Coefficient		
Nesting Parameter	0.132***	0.115***
	(0.047)	(0.032)
Summary Statistics		
Period	2017Q1-2019Q4	2021Q2-2023Q2
N Products	307289	265196
N Markets	87363	70016
Mean Elasticity	-5.591	-5.211
Spirit Mean Elasticity	-4.28	-3.44
JetBlue Mean Elasticity	-5.39	-5.18
Mean Markup	0.191	0.21

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$ Products are defined as a Carrier-Nonstop pair within an Origin-Destination-Year-Quarter market. Origin Service Ratio is the fraction of direct routes out of the originating airport operated by the carrier divided by the number of distinct direct routes out fo that airport. Extra Miles is the average additional miles flown with a connecting itinerary minus the minimum miles flown within a market. A tourist product is one that serves the Las Vegas metropolitan statistical area or an airport in Florida.

5.2 Supply Model

The consumer aviation market is assumed to operate under Bertrand competition with differentiated products following the exogenous determination of quarterly route structure. This allows for recovery of marginal costs through the estimated demand elasticities. These are included with the estimates of Demand within Table 6. I estimate a slight increase in markups of approximately two percentage points between the pre- and post-pandemic periods.

5.3 Merger Simulation

With the demand and supply models used within this paper described, I can now turn my attention to the simulation of the JetBlue-Spirit merger. For each of the pre-pandemic and post-pandemic periods, I estimate three counterfactual situations. These are respectively, a best case merger (where the merged product takes the lowest marginal cost and best unobservables of the two products), an average case merger (where the merged product takes the average of the two firms marginal costs and the average of the estimated unobservables), and a worst case scenario (where the merged product takes the greater of the marginal costs of the two firms and the lowest estimated unobservable characteristics). In each of these scenarios, I assume that the combined firm's connecting products take on the minimum of the miles flown, implicitly assuming that in all of these simulations that the combined firm will take advantage of better routing.

Table 7 contains the estimated price effects from the merger on individual product prices for markets that both firms competed in. In the best case scenario, I consistently estimate declines in the average prices of products in markets wherein both JetBlue and Spirit competed of between 13% and 15%, or approximately \$23 and \$29. In the worst case scenario, I estimate a minimal increase in average market fares for the pre-pandemic period and an increase of approximately 5% in the post-pandemic period.

Notably, JetBlue was clear on its intention to retire the Spirit business model following the acquisition and retool all Spirit aircraft to follow the JetBlue configuration. As such, it is worthwhile to examine changes in estimated pricing and costs on market fares in markets in which Spirit competed but not JetBlue of the retirement of the Spirit brand. The results of this simulation are described in Table 8.[25] Within these markets, I estimate that the average market would experience an increase in average fare of approximately 3.4% in the pre-pandemic period and 9.7% in the post-pandemic period. This finding reflects the negative consumer valuation of Spirit products over JetBlue products within the estimated demand models.

Now, I turn my attention to consumer welfare. Unfortunately, calculating consumer surplus is impossible with the available data from the DB1B. As discussed in Section 4, Spirit offers "unbundled" fares which have

[25] As the different simulations are defined by the method used to combine products between the two firms, all simulations are equivalent for markets with only Spirit within them.

Table 7: Simulated Price Effects of Merger - Joint Markets

	N	Mean	(SD)	Minimum	Median	Maximum
Pre-Pandemic						
Prices (100s, 2017 USD)						
Observed	12074	2.04	(0.69)	0.47	1.98	4.91
Best Case	10106	2.08	(0.66)	0.47	2.02	5.06
Average Case	10106	2.12	(0.64)	0.46	2.06	5.15
Worst Case	10106	2.16	(0.64)	0.47	2.09	5.09
Market Average Price						
Observed	1418	2.01	(0.43)	0.93	1.95	3.1
Best Case	1418	1.72	(0.6)	0.8	1.54	3.46
Average Case	1418	2	(0.51)	1.02	1.91	3.49
Worst Case	1418	2.02	(0.5)	0.94	1.92	3.44
% Change Average Price						
Best Case	1418	-15.32	(16.62)	-53.97	-17.16	32.49
Average Case	1418	-0.67	(10.53)	-38.97	-0.51	37.89
Worst Case	1418	0.39	(10.58)	-36.7	0.62	48.53
Post-Pandemic						
Prices (100s, 2017 USD)						
Observed	13650	1.96	(0.78)	0.35	1.89	5.25
Best Case	11496	2.01	(0.77)	0.4	1.94	5.33
Average Case	11496	2.05	(0.74)	0.4	1.99	5.33
Worst Case	11496	2.1	(0.74)	0.4	2.04	5.33
Market Average Price						
Observed	1554	1.95	(0.55)	0.65	1.89	3.57
Best Case	1554	1.72	(0.68)	0.61	1.68	3.69
Average Case	1554	2.04	(0.64)	0.75	1.96	3.91
Worst Case	1554	2.06	(0.64)	0.76	1.96	3.92
% Change Average Price						
Best Case	1554	-13.62	(18.16)	-59.47	-10.51	41.04
Average Case	1554	4.25	(9.96)	-32.5	3.92	49.12
Worst Case	1554	5.4	(10.03)	-26.21	5.09	51.1

Products from markets without both JetBlue and Spirit present are excluded. Distribution of changes of average market fares are graphed in Figures 12 and 13 for the pre-pandemic and post-pandemic periods respectively.

Table 8: Simulated Price Effects of Merger - Spirit Markets

	N	Mean	(SD)	Minimum	Median	Maximum
Pre-Pandemic						
Prices (100s, 2017 USD)						
Observed	37776	2.1	(0.78)	0.38	2.08	7.17
Simulated	30012	2.23	(0.7)	0.38	2.23	7.27
Market Average Price						
Observed	5735	2.08	(0.46)	0.7	2.08	4.61
Simulated	5735	2.14	(0.55)	0.59	2.13	4.75
% Change Average Price						
Simulated	5735	3.41	(15.12)	-56.96	3.01	88.36
Post-Pandemic						
Prices (100s, 2017 USD)						
Observed	49630	1.97	(0.82)	0.29	1.95	6.27
Simulated	40330	2.17	(0.77)	0.32	2.17	6.88
Market Average Price						
Observed	7569	1.97	(0.53)	0.6	1.94	4.07
Simulated	7569	2.16	(0.62)	0.72	2.13	5.52
% Change Average Price						
Simulated	7569	9.71	(12.21)	-44.52	9.65	75.68

Products are solely those from markets in which Spirit operated but not JetBlue.

additional fees required for the various amenities included in the base price of competing firm's tickets (such as carry-on baggage). Consumers who would pay these fees at Spirit would have their change in consumer welfare overestimated by my merger simulation. Furthermore, as these fees differ between both customers and markets due to the use of algorithmic pricing (Senate Permanent Committee on Investigations, 2024) it is unfortunately infeasible to do back-of-the-envelope estimations to try to recover the "true," fee-inclusive, Spirit fares.

This motivates the consideration of another measure of consumer welfare, namely, the minimum fare available within each market. As noted by Judge Young in the merger trial, a large component of Spirit's customer base was highly price conscious travelers who may not have been able to fly without the smaller base fares provided by Spirit. As such, it stands to reason that minimum fares within markets, in addition to the average fares, are important for understanding the counterfactual effects of the merger.

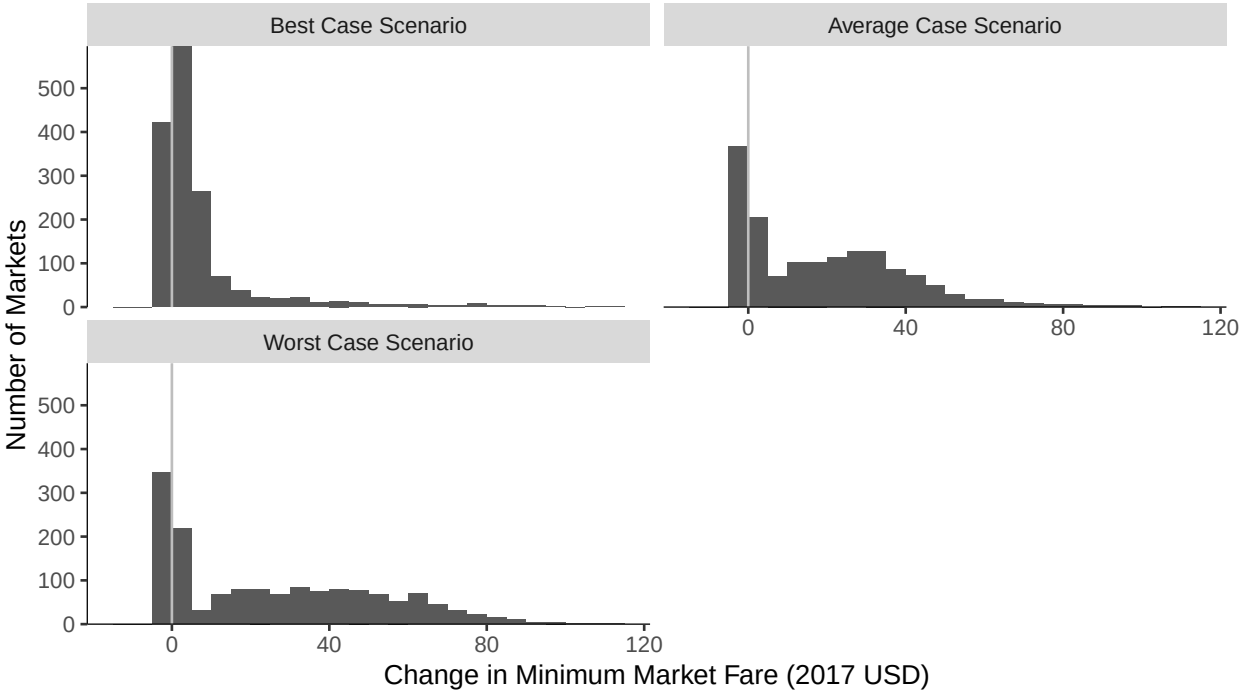
The overall change in minimum market fares, in twenty dollar intervals, is detailed in Table 9. Across all of my simulations, at least 35 markets are estimated to have the minimum price within the market increase by over $60. Within both periods, these markets are primarily between airports in the New York and Boston areas and various destinations within the Southern portion of the United States (such as Houston and Dallas). As such, it is consistent with the finding of the key markets of concern within the trial.

Table 9: Change in Minimum Fare Available in Market

	Pre-Pandemic			Post-Pandemic		
	Best	Average	Worst	Best	Average	Worst
< 20	1388	850	743	1426	848	763
20-40	73	453	306	56	390	254
40-60	35	168	278	36	213	256
60-80	22	44	168	25	77	180
$80 <$	15	18	38	11	26	101

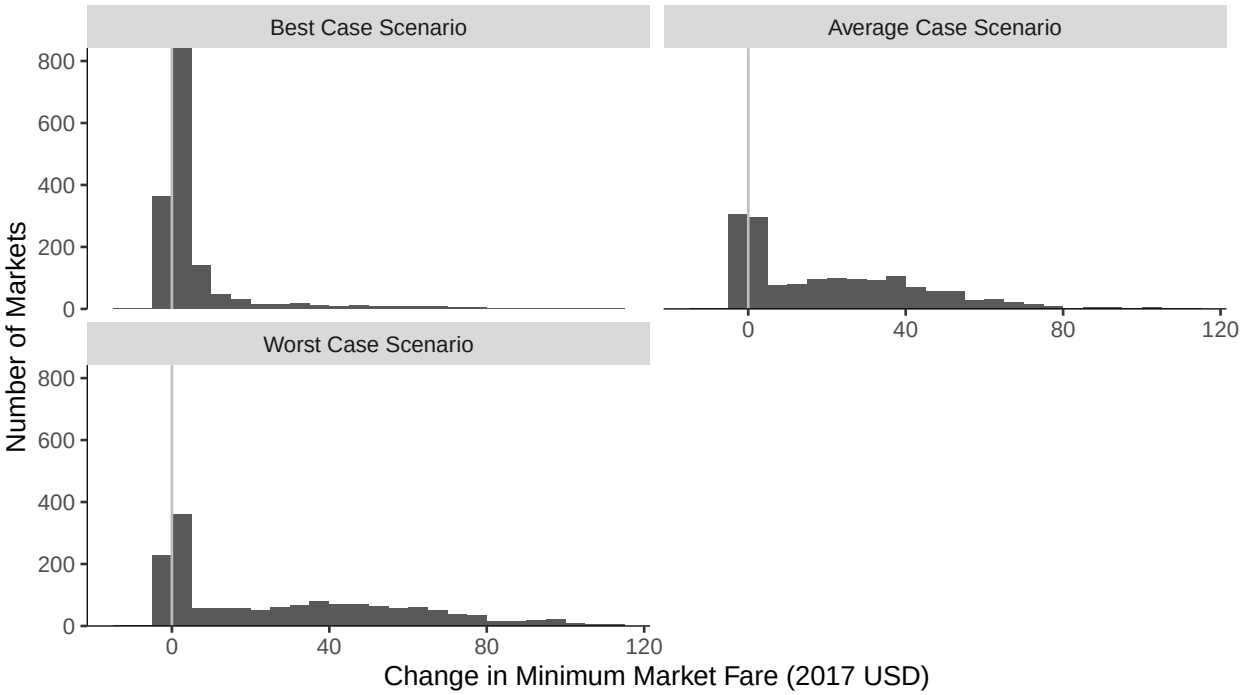
The best case merger scenario is one in which the combined firm inherits the minimum average cost and greatest unobservables of each firm, the average case merger scenario has the combined JetBlue-Spirit inherit the average of the two firms' product characteristics, and the worst case scenario has the combined JetBlue-Spirit inherit the greatest marginal cost and lowest unobserveables. Prices are in 2017 dollars.

Figure 2: Simulated Change in Pre-Pandemic Minimum Market Fares



The mean change in markets' minimum fares is 7.25 (19.36) [26.15] in the best (average) [worst] case merger simulations respectively.

Figure 3: Simulated Change in Post-Pandemic Minimum Market Fares



The mean change in markets' minimum fares is 6.51 (21.45) [29.21] in the best (average) [worst] case merger simulations respectively.

Figures 2 and 3 graph the distribution of estimated minimum market fares for the pre-pandemic and post-pandemic periods. In the pre-pandemic (post-pandemic) period there exists roughly 300 (200) markets estimated to have decreases of under $5 in the minimum market fare in all specifications. At the same time, Importantly, these figures reveal the highly heterogeneous nature of the estimated changes under each simulation scenario, with the average case and best case scenarios having consistently highly dispersed predictions as to the change in the minimum market fares.

6 Conclusion

The proposed JetBlue-Spirit merger would have seen the end of the largest ultra-low cost carrier in the United States had it not been blocked following suit by the Department of Justice in 2024. Through the use of a structural demand model, I estimate that this merger would have increased the average fare within the average market by roughly 4% had it been completed in the post-pandemic period and negligibly impacted average market fares had it been completed during the pre-pandemic period.

However, this result obscures a key insight into Spirit's role within the aviation industry, namely, that its presence within a market primarily impacts fares at the low end of the fare distribution due to its targeting

cost-conscious consumers of air travel through unbundled fares. As such, it is critical to consider the change in the minimum market fares had the merger been completed.

Under even the assumptions most favorable to the pro-competitive effects of the merger, I estimate that over 35 markets in the pre-pandemic and post-pandemic periods would have seen fares increase by over $60 had the merger been in effect. This finding aligns with the findings of the judge who considered the merger, who believed that the core consumer harm would have been for highly cost-conscious consumers at risk of being priced out of the market.

Beyond the immediate findings of this paper regarding the anti-competitive effects of the JetBlue-Spirit merger, its results further our understanding of the role of maverick firms in differentiated product markets. Even in cases where these firms have minimal impact on average prices within a market, they may still significantly lower prices at the bottom end of the distribution of prices, allowing consumers to enter the market who would otherwise be unable to.

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Appendices

A Data Processing Methodology

As detailed in Section 4, the Bureau of Transportation Statistics' Airline Origin and Destination Survey (DB1B) database was the primary data set used for this research. After compiling the DB1B into a single dataset for the years 2017 through the second quarter of 2023, some observations were excluded from the sample. Itineraries with fares lower than $15 were excluded to remove air travel purchased through frequent flier rewards points (4.88% of itineraries were excluded this way). Similarly, in line with prior work[26], itineraries with reported fares of over $2,000 dollars were excluded to avoid erroneously recorded fares (0.08% of itineraries were excluded this way). Beyond fares, itineraries were excluded from the sample if they had three or more layovers[27] or if they had a leg outside of the continental United States.[28]

Beyond this excluding of individual itineraries, additional filtering rules were placed on products and markets. All markets within the year 2020 and the first quarter of 2021 were dropped to avoid capturing the coronavirus pandemic induced decline in travel depicted in Figure 1. Furthermore, markets were excluded if they had fewer than 500 passengers fly within them, or had origin and destination airports within 150 miles. This restriction is in line with the past-literature (such as Ciliberto and Williams (2014)) and serves to not only improve computational speed but also account for these markets featuring stronger substitutability to the outside good for travel. Finally, products with fewer than 100 passengers were excluded from the sample to avoid capturing irregular product offerings (2.50% of itineraries were excluded this way).

In calculating product shares, the total number of passengers of each product is ten times the number of passengers recorded as purchasing it within the DB1B as the DB1B is a 10% sample. Following this, all airports not serving one of the hundred largest metropolitan statistical areas were dropped from the sample to improve computational speed. Notably, as both firms of interest within this paper focus on larger airport markets, this should have minimal impact on the results.

As part of the handling of price data, prices were modified in two ways. For Spirit itineraries completed before 2020, fares had an additional $22.99 times the number of trip legs added to them. This accounts for Spirit's additional usage fee placed on itineraries which were not booked in-person at the airport, and which the majority of consumers paid.[29] Furthermore,, prices were re-expressed in terms of 2017 United States dollars to account for inflation and allow for easier comparisons between the two sample periods.

[26] such as Berry and Jia (2010)

[27] A total of 0.03% of itineraries were excluded this way.

[28] As noted in Ciliberto et al. (2021), these flights receive subsidies from the United States Postal Service. As such, proper marginal cost recovery is infeasible while including them in the sample.

[29] As documented in Shrago (2024), these fees were included in DB1B releases following 2020.

Table 10: Sentiment and Stance - Unique Comments

Stance	Sentiment		
	Positive	Neutral	Negative
Approves	40	37	4
Disapproves	5	387	227

Each cell includes the number of comments with the given stance and sentiment. Only unique comments are included within this table.

B Merger Comments Analysis

As part of the merger process, JetBlue and Spirit were required to file an application with the Department of Transportation for the transference of operating certificates from Spirit to the combined firm, to be effective after the completion of the merger. Members of the public were allowed to leave public comments on the regulatory filing. Within this section, I employ stance detection techniques to analyze these comments at scale. While these comments are largely irrelevant to the result of this particular merger (namely, that it would be rejected following a suit brought by the Department of Justice), the use of these comments was used as part of the two firms' attempt to get the public to approve of the merger.

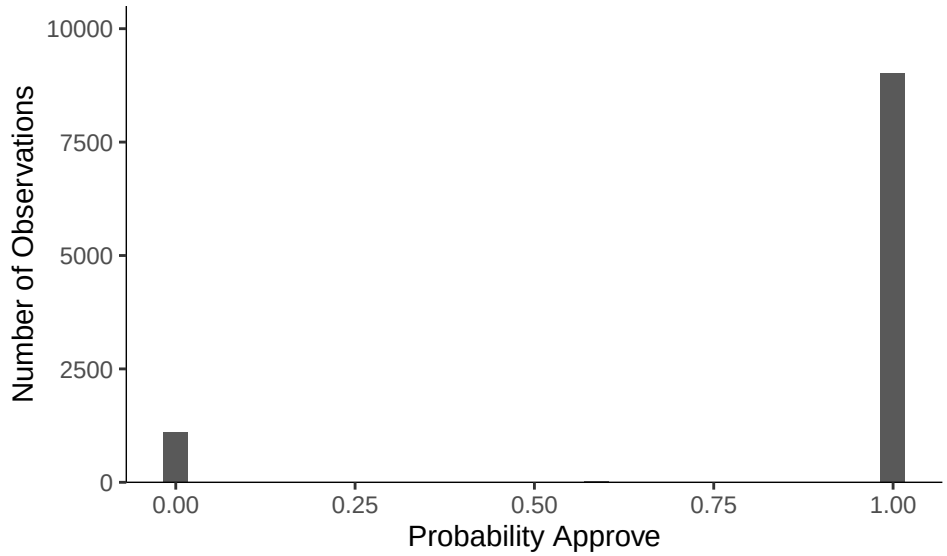
Stance detection, in brief, is the task of detecting the position held by the author of a text regarding some topic. In this context, it is to determine if the author of a comment left on the regulatory filing supported or opposed the proposed JetBlue-Spirit merger. This context is particularly suitable for the use of modern machine learning models as focused and direct. Therefore, an unsupervised zero-shot model should be effective with minimal issues with trying to gauge potentially contradictory statements that could be found in a longer work.

The stance detection problem should not be confused with that of the sentiment analysis problem. Sentiment analysis intends to capture the emotions expressed in a text rather than identify the emotions expressed within the text. As an example of how these differ, consider the comment "Competition is good for a healthy economy."[30] Using a pre-trained sentiment detection model developed for analyzing financial sentiment data, FinBERT, [31] this statement is judged to possess positive sentiment. However, it is correctly judged to oppose the merger by the stance detection model used for my analysis. Table 10 details the breakdown of unique comments' assigned sentiments and stances.

This paper uses the pre-trained model documented in Laurer et al. (2024) to detect the stances of each comment left on the docket. Each comment is assessed for the probability that each comment agrees with the statements "The author of this comment {approves of, disagrees with} the merger." As these statements

[30] This is an actual comment left on the regulatory docket.
[31] Model documentation is contained in Araci (2019).

Figure 4: Probability Comments Approve



Data is sourced from the Department of Transportation regulatory filing regarding the JetBlue-Spirit merger (DOT-OST-2023-0024). "Probability Approve" is the probability that a comment approves of the merger.

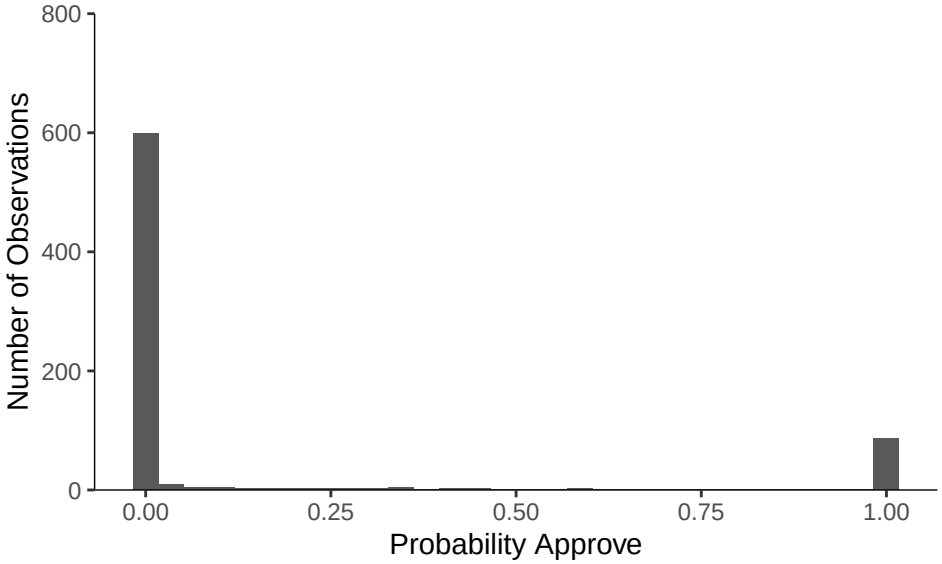
are mutually exclusive, the probabilities assigned for each comment sum to 1. As documented in Figures 4 and 5, most comments are strongly polarized, suggesting that the language model had little difficulty in assigning stances to comments. Looking over a sample of fifty unique comments, all are sorted as would be expected based on my understanding of the text. As such, I believe that this model is well suited for analyzing the public comments.

Table 11 contains summary statistics for these comments. Most comments approve of the merger. However, this is driven by duplicate comments. [32] The vast majority of unique comments, on the other hand, disapproved of the merger. On average, comments which approve of the merger are longer than those that disapprove. This table provides a helpful demonstration of the difference between the stance detection and sentiment detection problems - the majority of disapproving comments expressed their views with neutral sentiment. Finally, the table documents the state of origin for the comments.

Figure 6 plots the distribution of submitted comments on each day after the regulation was available for commenting upon. In the first twenty days, virtually every comment left on the docket supported the merger. Virtually every comment left on the docket after this period was opposed the merger. This may reflect asymmetry in the the resources available to JetBlue, Spirit, and anti-merger consumer welfare organizations.

[32]The exact legitimacy of these duplicate comments was a matter of some public debate, with some lawmakers alleging that they represented an "astroturf campaign" by the two merging firms falsely attributing them to employees (Birnbaum, 2023).

Figure 5: Probability Comment Approves - Unique Comments Only



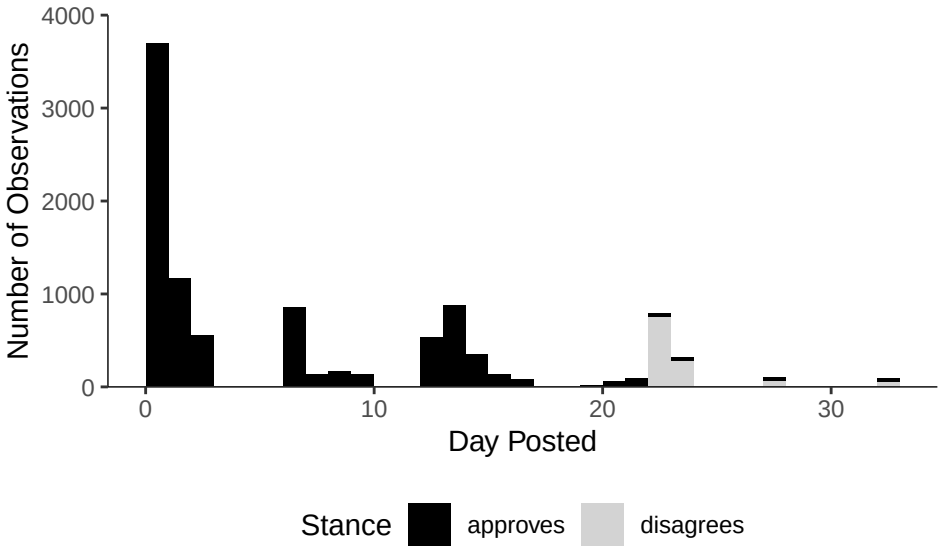
Data is sourced from the Department of Transportation regulatory filing regarding the JetBlue-Spirit merger (DOT-OST-2023-0024). "Probability Approve" is the probability that a comment approves of the merger.

Table 11: Stance Detection Summary Statistics

	Mean	(SD)	Minimum	Median	Maximum
All Comments					
P(Approves)	0.89	(0.31)	0	1	1
Approving Comment P(Approves)	1	(0.02)	0.51	1	1
Disapproving Comment P(Approves)	0.01	(0.04)	0	0	0.49
New York Comment	0.14	(0.35)	0	0	1
Florida Comment	0.35	(0.48)	0	0	1
Massachusetts Comment	0.05	(0.22)	0	0	1
Puerto Rico Comment	0.01	(0.12)	0	0	1
Observations	10185				
Unique Comments					
P(Approves)	0.13	(0.32)	0	0	1
Approving Comment P(Approves)	0.98	(0.08)	0.51	1	1
Disapproving Comment P(Approves)	0.01	(0.06)	0	0	0.49
New York Comment	0.06	(0.24)	0	0	1
Florida Comment	0.07	(0.26)	0	0	1
Massachusetts Comment	0.03	(0.18)	0	0	1
Puerto Rico Comment	0	(0)	0	0	0
Observations	701				

Data is sourced from the Department of Transportation regulatory filing regarding the JetBlue-Spirit merger (DOT-OST-2023-0024). Comments have the stance with the highest probability assigned to them. This is the "Stance Probability." Similarly, "Sentiment Assigned Probability" is the sentiment with the highest probability assigned to a comment by the language model. Comment length is in characters.

Figure 6: Timeline of Submitted Comments

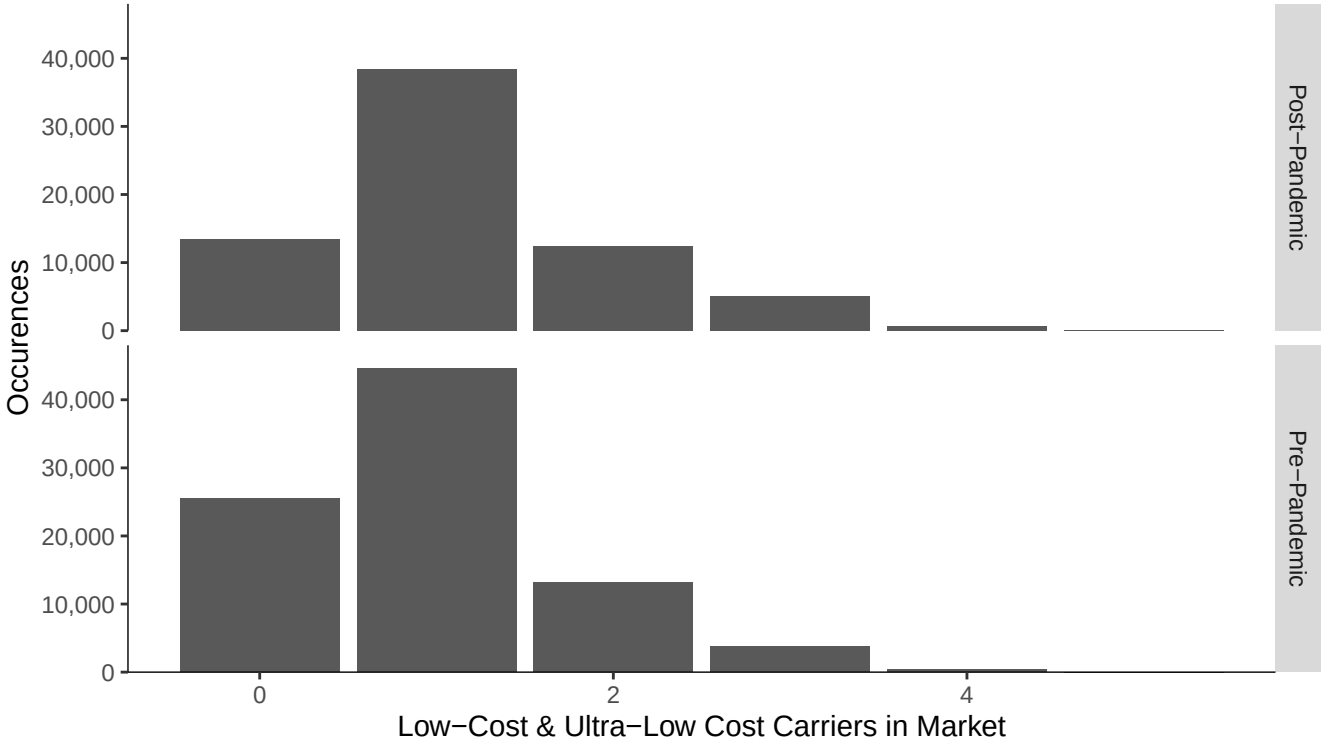


Data is sourced from the Department of Transportation regulatory filing regarding the JetBlue-Spirit merger (DOT-OST-2023-0024). Comments have the stance with the highest probability assigned to them.

C Additional Figures and Tables

C.1 Additional Descriptive Figures and Tables: Aviation Industry

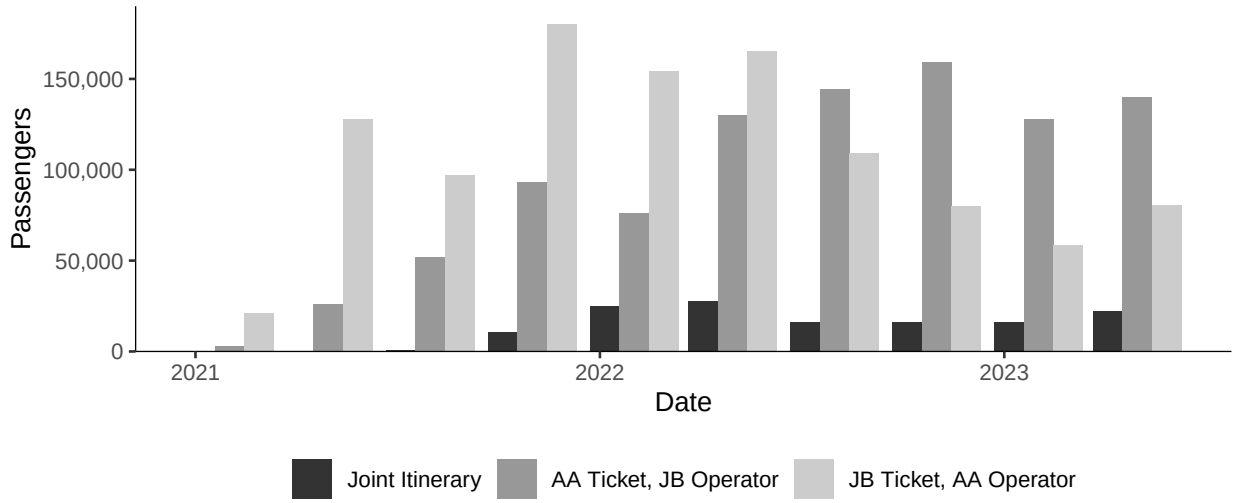
Figure 7: Distribution of Low-Cost and Ultra-Low Cost Carriers



Each market is a Year-Quarter-Origin Airport-Destination Airport ordered quartet. Carriers included in the count of low-cost and ultra-low cost carriers are Southwest, JetBlue, Spirit, Frontier, and Allegiant.

C.2 Additional Descriptive Figures and Tables: Northeast Alliance

Figure 8: Northeast Alliance Passenger Uptake



A joint itinerary is one in which both JetBlue and American Airlines operated flights on one or more legs of the unidirectional trip. The ticketing carrier collects fares and issues tickets, the operating carrier operates the flights. Itineraries are classified as an "AA Ticket, JB Operator" if the entire itinerary was issued by American Airlines and JetBlue operated at least one leg of the trip.

Table 12: NEA Codesharing Products

	2021Q1	2021Q2	2021Q3	2021Q4	2022Q1	2022Q2	2022Q3	2022Q4	2023Q1	2023Q2	2023Q3
All Markets											
JetBlue Only	843	1375	1327	1374	1363	1583	1531	1456	1412	1562	1640
JetBlue American Required	10	22	25	17	24	27	21	29	18	41	35
JetBlue-American Joint	0	0	0	67	90	69	50	85	74	134	90
American Only	4487	6728	7534	7351	7119	7596	8099	8338	7742	8173	8434
American JetBlue Required	61	90	86	87	84	88	87	75	81	81	86
American-JetBlue Joint	1	0	0	1	0	0	2	1	2	6	3
Spirit Markets											
JetBlue Only	338	438	420	447	409	517	490	540	554	644	676
JetBlue American Required	4	11	6	9	10	15	12	14	11	17	12
JetBlue-American Joint	0	0	0	22	26	20	16	27	25	44	33
American Only	1161	1491	1694	1849	1773	2012	2112	2340	2309	2563	2666
American JetBlue Required	16	28	28	30	27	31	16	23	21	25	28
American-JetBlue Joint	0	0	0	0	0	0	0	0	0	0	1

Each row indicates the number of products within a given quarter that belong to each classification. A "Firm Only" product is one in which the product had no codesharing flights included within it. A "JetBlue American Required" product is one in which all itineraries credited to the JetBlue for that quarter had all legs operated by American. A "JetBlue-American Joint" product is one where at least one leg was operated by each firm. A Spirit Market is one in which Spirit operated within it during the given quarter of interest.

Figure 9: NEA: Overlapped Operating Routes

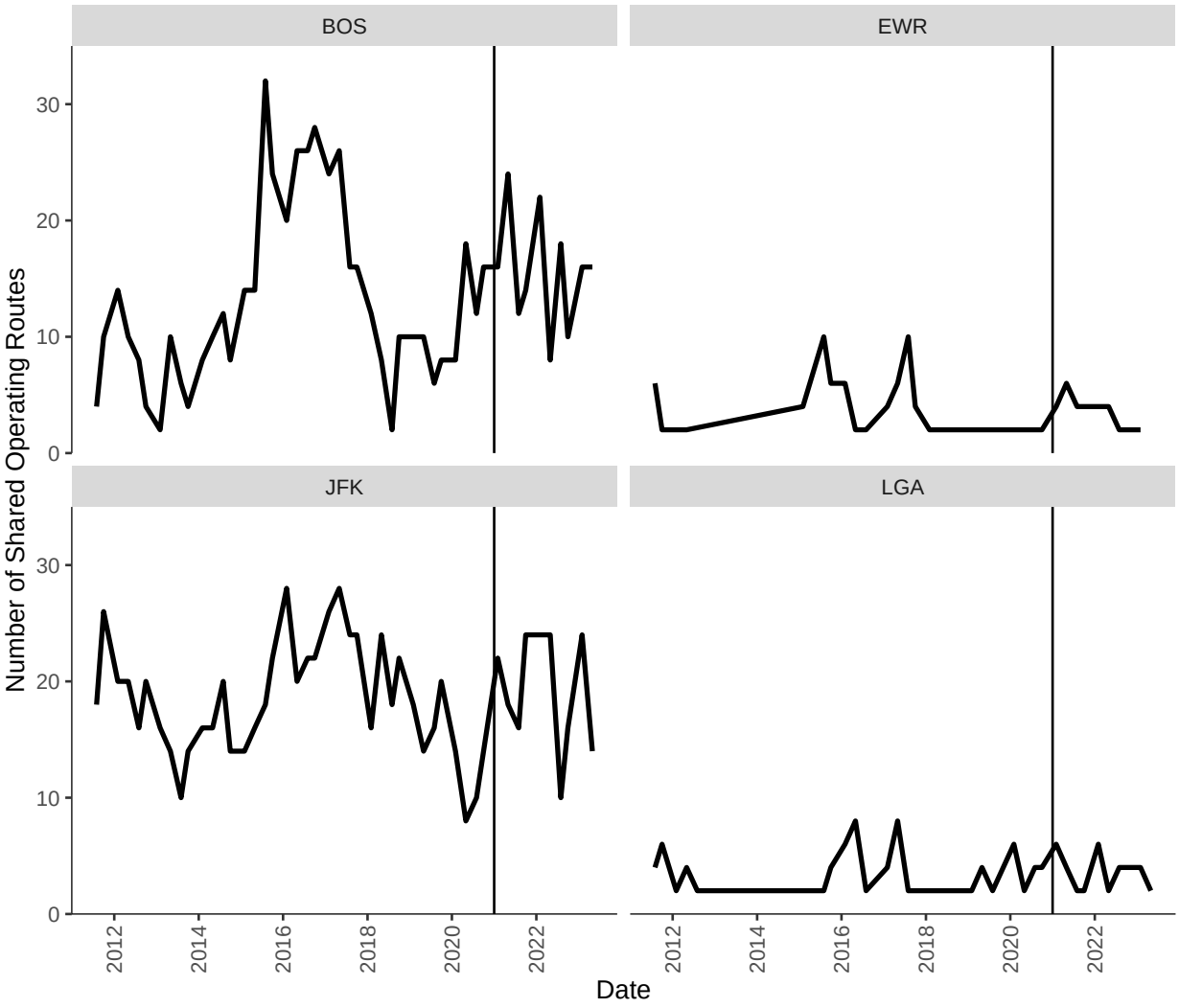
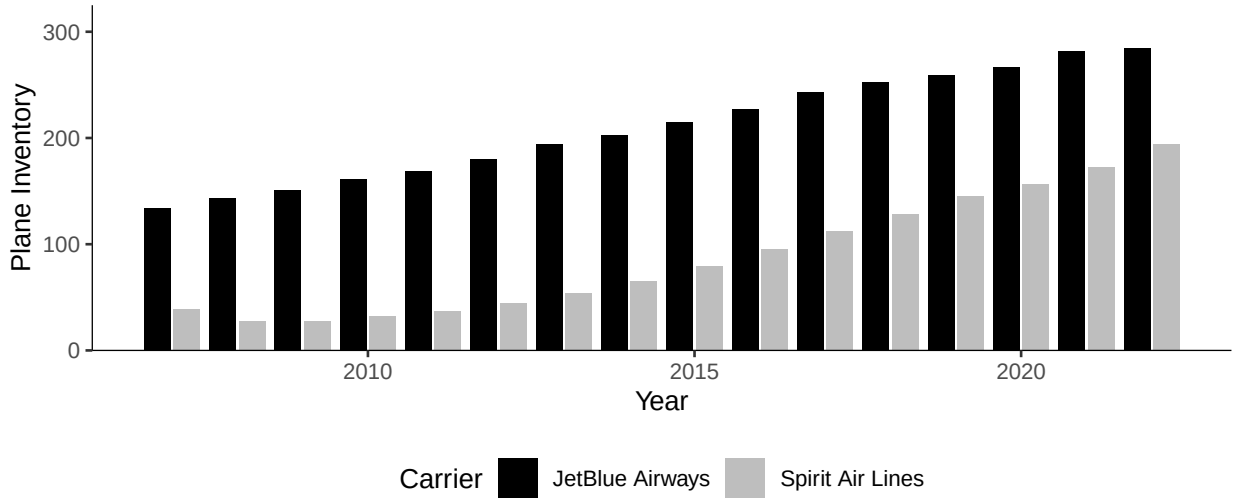


Figure plots the number of routes operated by both JetBlue and American within a given quarter. The vertical line represents the start of the Northeast Alliance in January 2021.

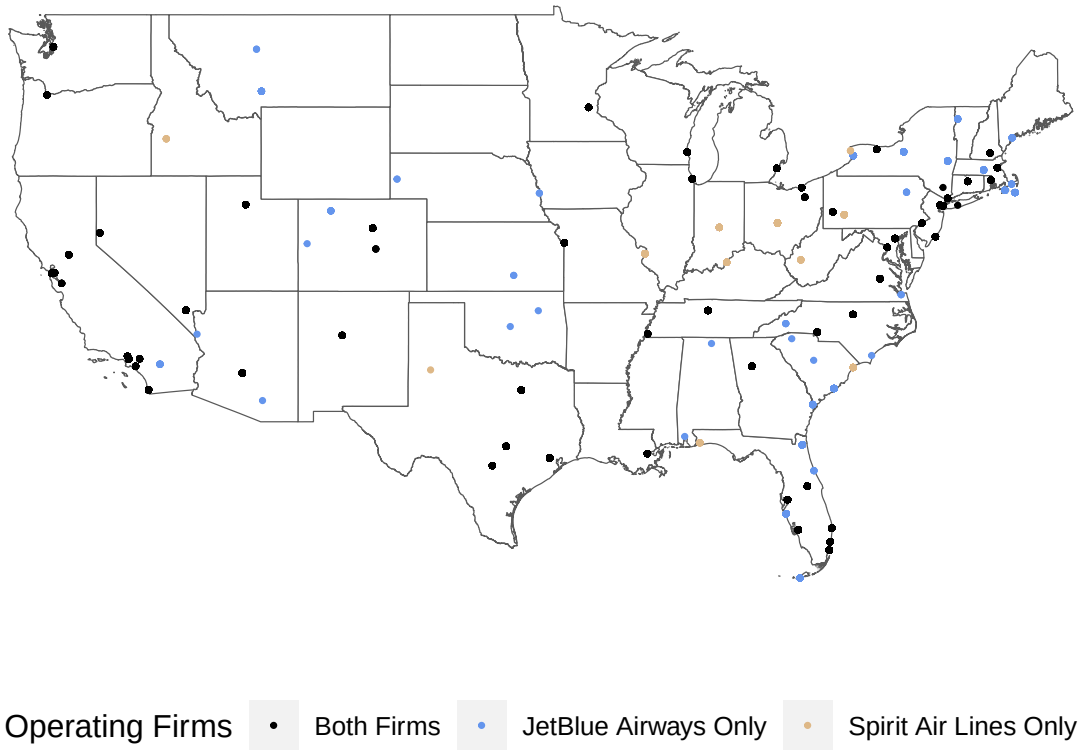
C.3 Descriptive Figures and Tables: JetBlue, Spirit

Figure 10: JetBlue, Spirit Fleet Size Over Time



Source: B-43 Inventory Data. Each bar is the number of airplanes in a given firm's inventory within a given year.

Figure 11: JetBlue, Spirit Airports - 2022



Derived from DB1B Data. Beyond the United States mainland, both carriers operated in Puerto Rico.

Table 13: American, JetBlue Overlap at NEA Airports

	JFK		BOS		LGA		EWR	
Year	Ticket	Operating	Ticket	Operating	Ticket	Operating	Ticket	Operating
Q1								
2023	75.4	23.7	69.1	21.4	67.3	4.2	46.7	7.7
2022	77.0	29.7	75.0	29.1	73.9	8.9	47.6	8.3
2021	18.6	24.4	26.8	21.7	50.0	33.3	9.5	13.6
2019	22.4	23.3	22.9	20.0	8.1	6.7	0.0	0.0
Q2								
2023	70.0	15.9	63.1	22.2	68.3	5.4	46.7	7.7
2022	68.3	26.5	70.3	21.9	75.0	6.4	45.5	17.4
2021	57.7	21.1	57.4	28.6	27.3	7.4	28.6	13.6
2019	21.1	21.0	21.2	25.0	8.9	5.6	0.0	0.0
Q3								
2023	69.0	16.9	63.9	19.0	61.0	4.1	40.0	7.7
2022	73.8	21.9	73.8	24.2	75.9	6.4	57.1	7.1
2021	63.6	25.9	58.9	23.1	30.4	3.2	37.5	14.8
2019	19.6	20.3	21.6	21.6	8.9	5.6	0.0	0.0
Q4								
2022	72.1	25.4	66.1	21.1	69.8	2.0	46.7	7.7
2021	71.9	25.8	73.2	23.2	75.0	4.3	43.5	7.7
2019	15.3	17.5	22.0	19.2	6.8	5.4	0.0	0.0

Each cell is the percent of markets originating from the specified airport with both carriers present in the market as either the ticketing carrier or operating carrier. Ticketing carriers are responsible for buying and selling of tickets while the operating carrier handles flight operations. Data for the first quarter of 2021 should be interpreted cautiously as this was before widespread vaccination availability.

Table 14: JetBlue and Spirit: Overlap Cities - 2022

City	Firm Passengers	Total Passengers	Share
Ponce, PR	106320	106320	1.000
Aguadilla, PR	251180	321170	0.782
San Juan, PR	1848180	4149260	0.445
Boston, MA	4262240	12136460	0.351
West Palm Beach/Palm Beach, FL	919690	2960650	0.311
Miami, FL	5885260	19049140	0.309
Charlotte Amalie, VI	155220	584450	0.266
New York, NY	8243150	32401400	0.254
Hartford, CT	596840	2358950	0.253
Orlando, FL	4890200	19981730	0.245
Fort Myers, FL	964970	4577540	0.211
Detroit, MI	1330090	7481070	0.178
Cleveland, OH	567000	3537960	0.160
Richmond, VA	235760	1474130	0.160
New Orleans, LA	774190	4909390	0.158
Las Vegas, NV	2783710	18384770	0.151
Tampa, FL	1371860	9955070	0.138
Pittsburgh, PA	391900	3023570	0.130
Los Angeles, CA	2839960	22400620	0.127
Philadelphia, PA	844170	7694760	0.110

Derived from DB1B Data. Cities are ordered by the combined share of passengers who used JetBlue or Spirit flights as a share of the total passengers departing from the city within 2022. Cities in which only one firm operates are excluded.

C.4 Additional Merger Figures

Table 15: Market Level Summary Statistics (By Competition Structure)

	Mean	(SD)	Minimum	Median	Maximum
Pre-Pandemic					
Spirit Markets					
Minimum Miles (1000s)	1.3	(0.61)	0.18	1.14	2.81
Average Miles (1000s)	1.35	(0.66)	0.18	1.19	4.39
Number of Firms	4.8	(1.37)	1	5	9
Number of Products	6.53	(2.25)	1	7	14
Number of Customers	51859.49	(48793.03)	300	37600	360320
HHI	8225.48	(4382.4)	1622.69	7360.39	56397.84
Observations	5941				
JetBlue & Spirit Markets					
Minimum Miles (1000s)	1.44	(0.71)	0.32	1.17	2.78
Average Miles (1000s)	1.47	(0.73)	0.32	1.19	2.9
Number of Firms	6.17	(1.06)	2	6	9
Number of Products	8.51	(2)	3	8	15
Number of Customers	80495.06	(53421.42)	1300	69680	344530
HHI	6750.6	(2646.51)	1680.29	6247.49	17066.21
Observations	1533				
Post-Pandemic					
Spirit Markets					
Minimum Miles (1000s)	1.32	(0.6)	0.18	1.22	2.81
Average Miles (1000s)	1.37	(0.63)	0.18	1.26	2.92
Number of Firms	5.11	(1.24)	2	5	8
Number of Products	6.55	(2.01)	2	6	13
Number of Customers	36898.62	(37432.1)	410	24260	214550
HHI	7648.74	(3855.01)	1750.61	7023.19	19917.19
Observations	7569				
JetBlue & Spirit Markets					
Minimum Miles (1000s)	1.52	(0.67)	0.2	1.26	2.79
Average Miles (1000s)	1.56	(0.69)	0.2	1.35	2.9
Number of Firms	6.34	(0.94)	3	6	9
Number of Products	8.78	(1.78)	3	9	14
Number of Customers	73002.09	(54873.21)	2250	59070	261740
HHI	6635.64	(2769.53)	1730.25	6207.7	17230.6
Observations	1554				

Table 16: Pre-Pandemic Instrument Comparison Table

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Price	-0.42^{***}	-4.97^{***}	-0.18^{**}	-0.18^{**}	-2.12^{***}	-0.14^{*}	-2.09^{***}	-2.28^{***}	-2.23^{***}
	(0.00)	(0.09)	(0.06)	(0.06)	(0.04)	(0.06)	(0.04)	(0.03)	(0.03)
Nesting	0.55^{***}	0.42^{***}	-0.14^{***}	-0.14^{***}	0.12^{***}	-0.14^{***}	0.12^{***}	0.18^{***}	0.18^{***}
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
Products in Market		X	X	X	X	X	X	X	X
Gas Instruments		X			X		X		X
Hub Interactions			X	X	X	X	X	X	X
Gandhi Instruments						X	X	X	X
Exog Interactions								X	X
Price Test		101307.015	94273.624	94273.624	87736.444	94159.23	87480.095	78369.648	77831.661
p-Value		0	0	0	0	0	0	0	0
Test of Over Identification		N/A	4187.14	4187.14	7279.16	4283.57	7526.31	11166.96	11605.17
p-value		N/A	0	0	0	0	0	0	0
R-Squared	0.66	−0.96	0.32	0.32	0.27	0.31	0.28	0.27	0.28
Adj. R-Squared	0.66	−0.96	0.32	0.32	0.27	0.31	0.28	0.27	0.28
Mean Elasticity	−0.99	−11.62	−0.42	−0.42	−4.96	−0.32	−4.88	−5.32	−5.21
Median Elasticity	−1.00	−11.74	−0.42	−0.42	−5.01	−0.33	−4.93	−5.37	−5.27
Share Inelastic Products	0.51	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00
Share JB Inelastic Products	0.67	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00
Share SP Inelastic Products	0.88	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00
Num. obs.	307289	307289	307289	307289	307289	307289	307289	307289	307289

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 17: Post-Pandemic Instrument Comparison Table

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Price	-0.24^{***}	−0.06	1.50^{***}	1.50^{***}	0.01	1.28^{***}	−0.00	-2.46^{***}	-0.63^{***}
	(0.00)	(0.03)	(0.16)	(0.16)	(0.03)	(0.15)	(0.03)	(0.07)	(0.03)
Nesting	0.54^{***}	-0.11^{***}	-0.26^{***}	-0.26^{***}	-0.11^{***}	-0.24^{***}	-0.11^{***}	0.15^{***}	0.01^{**}
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Products in Market		X	X	X	X	X	X	X	X
Gas Instruments		X			X		X		X
Hub Interactions			X	X	X	X	X	X	X
Gandhi Instruments						X	X	X	X
Exog Interactions								X	X
Price Test		77288.49	81853.459	81853.459	76910.107	81743.441	76883.509	66904.122	64536.553
p-Value		0	0	0	0	0	0	0	0
Test of Over Identification		N/A	1269.2	1269.2	4165.87	1453.45	4271.75	7094.09	11604.74
p-value		N/A	0	0	0	0	0	0	0
R-Squared	0.65	0.34	0.02	0.02	0.34	0.09	0.34	0.16	0.42
Adj. R-Squared	0.65	0.34	0.02	0.02	0.34	0.08	0.34	0.16	0.42
Mean Elasticity	−0.50	−0.14	3.19	3.19	0.02	2.72	0.00	−5.22	−1.34
Median Elasticity	−0.50	−0.13	3.14	3.14	0.02	2.69	0.00	−5.15	−1.33
Share Inelastic Products	1.00	1.00	0.02	0.02	1.00	0.04	1.00	0.00	0.23
Share JB Inelastic Products	1.00	1.00	0.00	0.00	1.00	0.01	1.00	0.00	0.30
Share SP Inelastic Products	1.00	1.00	0.11	0.11	1.00	0.22	1.00	0.00	0.84
Num. obs.	265196	265196	265196	265196	265196	265196	265196	265196	265196

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Figure 12: Distribution in Changes of Average Market Fare - Pre-Pandemic

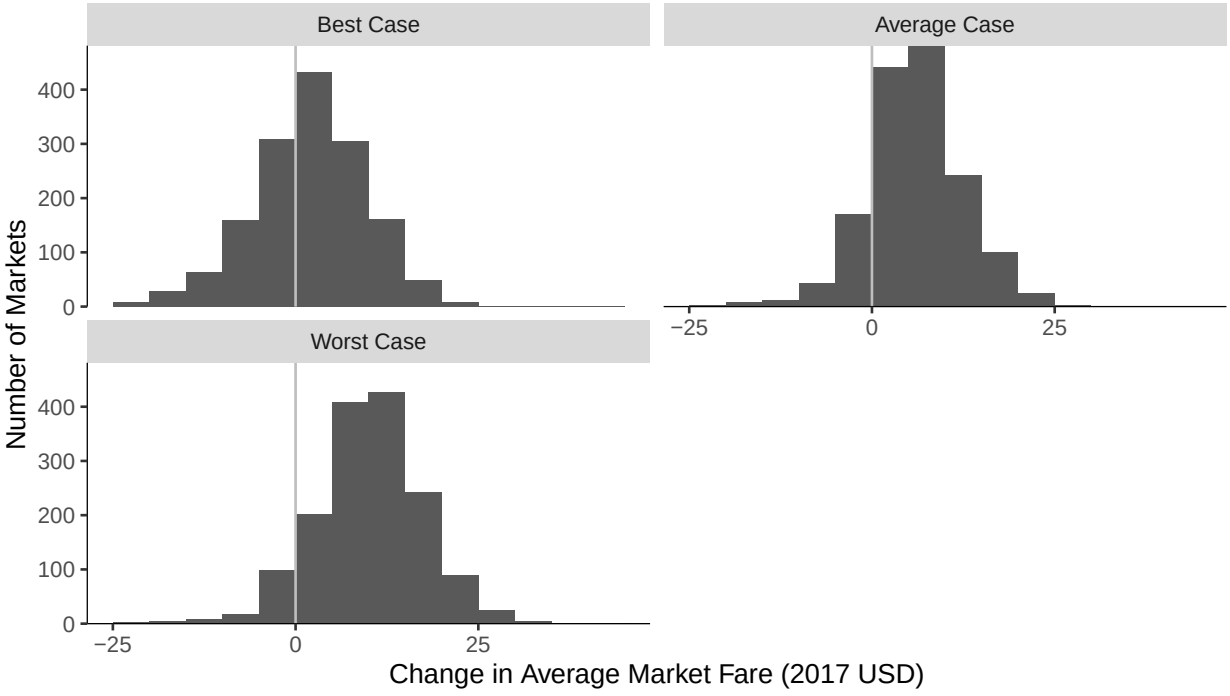


Figure 13: Distribution in Changes of Average Market Fare - Post-Pandemic

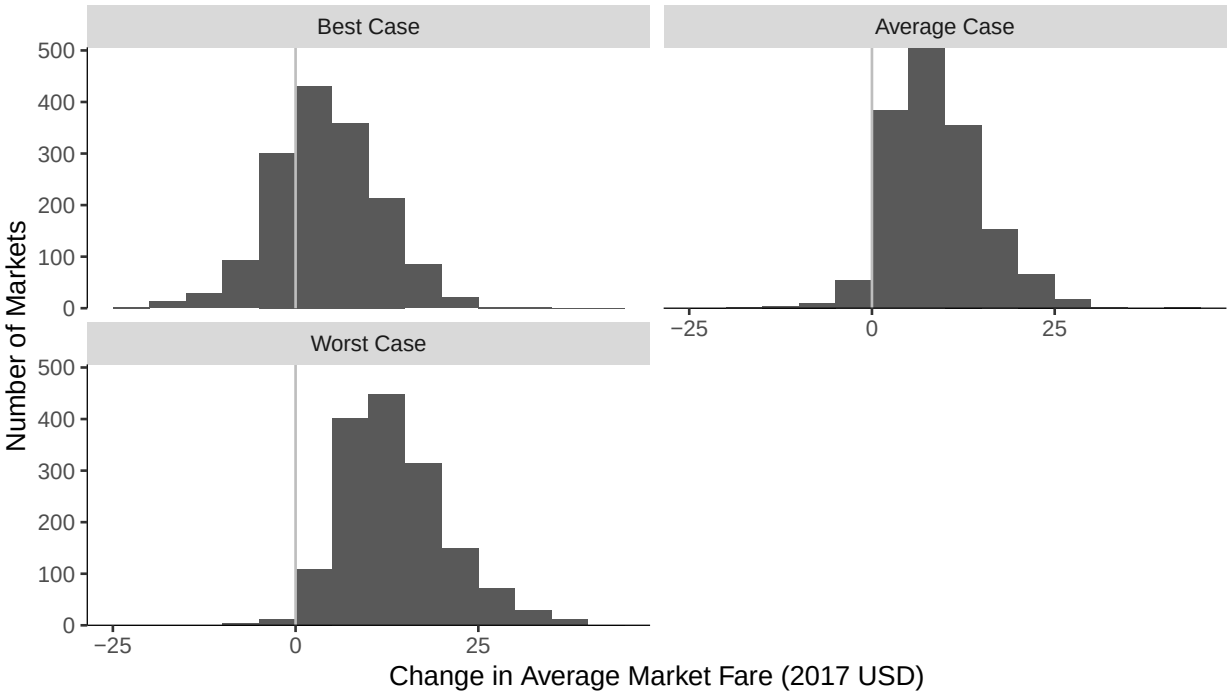


Table 18: Consistency in Estimated Minimum Fare Change Across Time

Quarters	Best Case	Average Case	Worst Case
Pre-Pandemic			
1	21	50	61
2	8	21	19
3	4	12	16
4	0	10	13
5+	4	11	42
Post-Pandemic			
1	32	81	93
2	11	31	27
3	3	21	23
4	1	19	26
5+	1	6	37

For each route with an estimated increase in minimum fare greater than $40 estimated in at least one quarter, the number of quarters is reported for which that route is estimated to have an increase in minimum fare greater than $40. Table 9 details distribution of minimum price changes in terms of markets.