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WHO REPLACES SPIRIT?

ENTRY, EXIT, AND LOW-END FARES

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Abstract

A federal court blocked JetBlue's acquisition of Spirit Airlines in January 2024 to protect consumers who relied on Spirit's low fares. Spirit failed anyway and ceased operations in May 2026. We ask whether the prohibition protected consumers. Using DB1B data for 2022–2025, we estimate the effect of Spirit's exit across the 1,427 routes it served. The 5th and 10th percentile fares rise by 8.6 and 5.8 log points; mean and median fares are unaffected. Where a carrier entered, the bottom is unaffected and mean fares fall. The harm comes from exit without replacement, which entry policy does not reach.

JEL Codes: L93, L41, L13, L51, K21.

Keywords: Ultra-low-cost carriers; Entry and exit; Merger enforcement; Failing firm defense; Fare distribution; Antitrust

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1 Introduction

In January 2024, a federal court blocked the proposed acquisition of Spirit Airlines by JetBlue Airways.¹ The court found that the merger would violate Section 7 of the Clayton Act² by eliminating competition on routes where both carriers operated, harming the consumers who relied on Spirit’s low base fares.³ It was the first airline merger blocked by a federal court on antitrust grounds in over four decades.⁴ Ten months later, Spirit filed for Chapter 11.⁵ In May 2026, Spirit ceased operations.⁶

This paper asks whether blocking the merger protected the consumers the court sought to protect. The answer is no. The merger was blocked as illegal under Section 7, to keep Spirit in the market as an independent competitor. Spirit exited anyway, through bankruptcy rather than acquisition. Between the first quarter of 2024 and the first quarter of 2025, Spirit withdrew from 313 routes. The fare consequences the court sought to prevent materialized through bankruptcy. Merger review had no instrument to address them.⁷ This paper documents those consequences and identifies the margin on which they depend: entry.⁸

We measure the effect of Spirit’s exit on the distribution of fares using the Airline Origin and Destination Survey (DB1B) from the first quarter of 2022 through the second quarter of 2025. The sample covers the 1,427 domestic routes Spirit served during this period. Spirit exited 313 of them; 1,114 remained served through the end of the sample. Identification exploits the staggered timing of Spirit’s exits, driven by fleet contraction and bankruptcy proceedings rather than by route-level demand.⁹ We estimate difference-in-differences specifications with

¹ *United States v. JetBlue Airways Corp.*, 712 F. Supp. 3d 109 (D. Mass. 2024). The airlines appealed, then abandoned the merger and dismissed the appeal.

² 15 U.S.C. § 18.

³ *Supra* note 1.

⁴ Prior airline merger challenges did not result in judicial rulings. The proposed United–US Airways merger in 2001 was abandoned after the Department of Justice announced it would file suit, and the 2013 US Airways–American Airlines merger was resolved by consent decree before trial. See [Horan \(2024\)](#) for a discussion.

⁵ 11 U.S.C. §§ 1101–1195. Spirit Airlines filed a voluntary petition under Chapter 11 of the Bankruptcy Code on November 18, 2024. *In re Spirit Airlines, Inc.*, No. 24-11988 (SHL) (Bankr. S.D.N.Y.).

⁶ Spirit ceased all operations on May 2, 2026, and the bankruptcy court authorized an orderly wind-down. *In re Spirit Aviation Holdings, Inc.*, No. 25-11897 (SHL) (Bankr. S.D.N.Y. May 5, 2026).

⁷ We discuss the failing-firm defense below.

⁸ To be sure, we estimate the effect of Spirit’s exit, not the but-for fares a completed JetBlue acquisition would have set (the “but-for” refers to the counterfactual that would have obtained had the merger been permitted; see [Blair and Kaserman 2009](#), pp. 81–82; see also *Bigelow v. RKO Radio Pictures*, 327 U.S. 251, 264 (1946)). The claim is narrower and sufficient for the enforcement question: the low fares the court sought to protect did not survive, because the carrier that set them exited, and merger review had no instrument to prevent that exit. See Section 5 for details.

⁹ Section 4 reports event studies that fail to reject the null of zero pre-period coefficients in all cases, con-

route and quarter fixed effects, weighted by sampled passengers, with standard errors clustered at the route level. Event study estimates test for differential trends prior to exit and trace the path of fares after it.

We document two main findings. First, Spirit’s exit raises fares at the bottom of the distribution. The 5th and 10th percentile fares rise by 8.6 and 5.8 log points (9.0 and 6.0 percent), each significant at the 1% level. Mean and median fares are unaffected. The harm concentrates on the consumers the court named: those buying the lowest priced tickets on Spirit’s routes. Second, the harm is absent where entry occurred. On routes where no carrier entered after Spirit’s exit, the 5th and 10th percentile fares rise by 9.5 and 6.4 log points (10.0 and 6.6 percent). On the 26 routes where a carrier entered, led by United and Frontier, the effects at the bottom are indistinguishable from zero, and the median and mean fares fall by 5.3 and 3.8 log points (5.2 and 3.7 percent). The harm from Spirit’s exit is not a consequence of losing one carrier. It is a consequence of losing one carrier with no replacement. The estimates are robust to fixed effects that hold the contemporaneous number of competitors constant, and the event studies are consistent with the parallel-trend assumption required for identification. On the no-entry routes, the lowest fares rise by about \$11.46 and \$9.13 per ticket, an exposure on the order of \$26 million per year for the travelers affected (Subsection 5.5).

The documented distributional patterns are inconsistent with a uniform shock. A cost shock or a reduction in the number of competitors would shift the entire fare distribution. The observed response is confined to the lowest percentiles. The fares that moved are those Spirit disciplined. Spirit priced at the floor of the markets it served.¹⁰ When Spirit exited and no carrier replaced it, that constraint disappeared. Where a carrier entered, average fares fell and the effect at the bottom was not statistically different from zero. The entrants were a mix of ultra-low-cost carriers (ULCC) and non-ULCC. The lowest fares fell only on the routes that a ULCC entered.

sistent with the parallel-trends assumption. The institutional record indicates that Spirit’s route withdrawals reflected a system-wide capacity contraction, driven by fleet returns and lessor repossessions in its Chapter 11 proceedings, rather than route-specific demand shocks contemporaneous with the fare changes we estimate (Declaration of Fred Cromer in Support of the Chapter 11 Proceedings and First Day Pleadings, *In re Spirit Airlines, Inc.*, No. 24-11988 (SHL) (Bankr. S.D.N.Y. Nov. 18, 2024)).

¹⁰ *United States v. JetBlue Airways Corp.*, Complaint, No. 1:23-cv-10511 (D. Mass. Mar. 7, 2023). See also Shrago (2024).

The policy implications follow from the entry findings. Spirit’s exit raised low-end fares only where no carrier replaced it. Where a carrier entered, the lowest fares did not rise and average fares fell. Entry held the bottom of the distribution and lowered the middle. The harm concentrated on routes that drew no low-fare replacement. The policy question is therefore what determines whether a low-fare carrier replaces an exiting one. The evidence points to two margins. The first is access to gates and slots, which falls under existing Department of Transportation authority and has precedent in merger remedies.¹¹ The second is route-level entry policy. The Essential Air Service program¹² operates on this margin but is triggered by the total loss of service, not by the loss of low-fare service. A low-cost exit produces on thin routes the consumer harm the program is designed to prevent, through a channel the program does not reach. The mechanism is not specific to Spirit. As the ultra-low-cost sector consolidates, with Allegiant’s 2026 acquisition of Sun Country and Frontier’s repeated bids for Spirit, a merger of two such carriers on overlapping routes would concentrate on the same low fares (Subsection 5.4).

The paper contributes to two main literatures. The first studies low cost carriers and fare discipline. Entry by low cost carriers lowers incumbent fares (Morrison and Winston, 2000; Goolsbee and Syverson, 2008; Tan, 2016; Kwoka et al., 2016), and the presence of ultra low cost carriers widens dispersion of fares by compressing the bottom of the distribution (Shrago, 2024; He et al., 2022). Bachwich and Wittman (2017) describe the ultra low cost carrier business model, and Gil and Kim (2021) relate competition to service quality. Exit has received less attention, and the evidence on financial distress is mixed (Borenstein and Rose, 1995; Ciliberto and Schenone, 2012). We provide estimates of the converse experiment: the removal of an ultra low cost carrier, measured at each point of the fare distribution. The estimates also bear on the contested relationship between competition and dispersion (Borenstein and Rose, 1994; Gerardi and Shapiro, 2009), by showing directly which fares move when a low cost competitor is lost.

The second is the antitrust literature on merger enforcement and the failing-firm defense

¹¹Airport-controlled slots are administered by the Federal Aviation Administration (14 C.F.R. pt. 93). For a slot and gate divestiture conditioning a merger, see *United States v. US Airways Group, Inc.*, 38 F. Supp. 3d 69 (D.D.C. 2014) (requiring divestiture of 104 slots at Reagan National, 34 slots at LaGuardia, and gates at five airports to low cost carriers).

¹²Essential Air Service, 49 U.S.C. §§ 41731–41748.

(Areeda and Hovenkamp 2016, ¶ 951-953; Hovenkamp 2020). The doctrine permits an otherwise unlawful merger only when the target faces imminent failure, cannot reorganize in Chapter 11, and has no less anticompetitive purchaser.¹³ Spirit did not meet the requirements of the defense. It was distressed but operating, and reorganization was available, as its subsequent filing confirmed.¹⁴ Frontier had agreed to acquire Spirit before JetBlue’s competing bid, a combination that would have preserved low-fare capacity.¹⁵ The defense is assessed at the time of the merger, and the merging parties did not raise it. Spirit’s later liquidation does not alter this assessment.

What the doctrine does not reach is the trajectory of a distressed firm after enforcement. The defense asks whether the assets will remain in competitive use, a coarser condition than whether the specific fare discipline a carrier supplied survives. Spirit’s assets remained in use after reorganization; the low fares it set on the routes it exited did not. The imminence requirement widens the gap. The defense is available when exit is certain because blocking the merger then changes nothing. It is withheld from the firm that is viable at review and fails after. Spirit was that firm. It was blocked from merging and failed anyway, exiting the routes it had disciplined. A weakened competitor counts for less in the competitive-effects analysis. Here the same weakness produced the harm. Our estimates quantify that harm. They show it operated through the channel the complaint alleged. The removal of low fares from routes without replacement.

The paper is also related to the literature studying the price and welfare effects of airline mergers. Kim and Singal (1993) find that mergers raise fares and that efficiency gains do not offset the loss of competition. Borenstein (1990) relates airport dominance to higher fares after consolidation. Kwoka and Shumilkina (2010) estimate price increases from the removal of a potential entrant. Peters (2006) compares merger simulation with realized airline mergers.

¹³The failing-firm defense requires a grave probability of business failure, an inability to reorganize under Chapter 11, and a good-faith but unsuccessful effort to find an alternative purchaser that would keep the assets in the market. *Citizen Publishing Co. v. United States*, 394 U.S. 131, 137–138 (1969); *International Shoe Co. v. FTC*, 280 U.S. 291 (1930); U.S. Department of Justice & Federal Trade Commission, Merger Guidelines (2023) (treating failing firms as rebuttal evidence); see Donna and Pereira (2024, p. 336) for a discussion.

¹⁴Spirit reorganized under Chapter 11 and emerged in March 2025 before its second filing later that year, indicating that reorganization was feasible. *Supra* note 5.

¹⁵Spirit and Frontier signed a merger agreement on February 5, 2022, which Spirit terminated on July 27, 2022, after JetBlue’s competing all-cash offer. Spirit Airlines, Inc., Current Reports (Form 8-K) (Feb. 7 and July 27, 2022).

Luo (2014) estimates the price effects of the Delta and Northwest merger. Carlton et al. (2019) estimate the price effects of legacy mergers. Ciliberto et al. (2021) and Li et al. (2022) model product repositioning after mergers. Le and Yimga (2019) estimate the fare and marginal cost effects of the Delta/Northwest and United/Continental mergers. Bet (2021b) estimates the markup and productivity effects of airline mergers from production data. Prince and Simon (2017), Chen and Gayle (2019), and Das (2019) examine merger effects on quality. These papers measure effects at the mean. This paper measures effects across the fare distribution.

There have been several studies investigating the JetBlue acquisition of Spirit and the consequences of blocked mergers. Atwater (2025) simulates the counterfactual fare and consumer surplus effects of the proposed acquisition. Kim et al. (2026) document fare alignment and a reduction in dispersion after the court blocked the merger. Banal-Estanol and Seldeslachts (2011) classify the causes of merger failure. These papers study the merger and its prohibition. In contrast, we study the exit of Spirit after the prohibition.

Several papers study market power and coordination in airline markets. Stigler (1964) models oligopoly coordination. Evans and Kessides (1994) and Ciliberto and Williams (2014) relate multimarket contact to tacit collusion. Ciliberto et al. (2019) document collusive pricing patterns. Aryal et al. (2022) identify coordinated capacity reductions. Kim et al. (2021) relate tacit collusion to price dispersion. Bet (2021a) tests for changes in conduct in the airline industry.

Williamson (1968), Farrell and Shapiro (1990), Whinston (2007), and Kaplow (2025) analyze merger policy and the welfare standards applied to it.

The paper proceeds as follows. Section 2 describes the industry, the merger litigation, and the data. Section 3 presents the empirical strategy. Section 4 reports the results. Section 5 discusses the policy implications. Section 6 concludes.

2 Industry, Spirit Airlines, and Data

2.1 Industry Background

The Airline Deregulation Act of 1978 eliminated federal control over domestic fares and routes. In the decades that followed, entry by low cost carriers reduced fares, particularly on routes

where incumbents had faced low competition ([Dresner et al., 1996](#); [Goolsbee and Syverson, 2008](#)). Entry by low cost and ultra low cost carriers reduces the bottom of the fare distribution by introducing base fares below those posted by legacy incumbents ([Bachwich and Wittman, 2017](#)).

Spirit Airlines, founded in 1983, was the leading ultra-low-cost (ULCC) carrier in the United States. In 2007, Spirit started to unbundle ancillary services such as carry-on bags, seat selection, and boarding priority, and priced them separately, generating base fares at the floor of the distribution. On the routes it served, Spirit typically posted fares at or near the floor of the distribution ([Shrago, 2024](#)). Spirit’s unbundling of ancillary services led rival carriers to lower the bottom distribution of their fares ([He et al., 2022](#)).

The Department of Justice (DOJ) has reviewed airline mergers since 1988 under the same standards applied to other industries. The competitive concern in aviation mergers centers on the elimination of a carrier from a set of routes, which removes fare discipline and raises prices for consumers who valued the exiting carrier’s service. The theory of harm is most acute when the exiting carrier serves the low end of the fare distribution, since those consumers have fewer substitutes.

2.2 The JetBlue-Spirit Merger and Spirit’s Bankruptcy

Table 1 presents the timeline of the proposed merger and Spirit’s subsequent bankruptcy. JetBlue and Spirit signed a \$3.8 billion merger agreement in July 2022, and Spirit’s shareholders approved the acquisition in October. The Department of Justice filed suit in March 2023, arguing that the merger would eliminate competition on routes where both carriers operated and harm price-sensitive consumers who relied on Spirit’s low base fares. The complaint stated that “cost-conscious customers . . . would face increased prices and reduced travel options as a result of the lost competition between JetBlue and Spirit” ([U.S. Department of Justice, 2023](#)).

In January 2024, the U.S. District Court for the District of Massachusetts ruled in favor of the DOJ, blocking the merger. This was the first airline merger blocked by a federal court in over four decades.¹⁶ JetBlue and Spirit terminated the merger in March 2024 ([JetBlue Airways Corporation, 2024](#)).

¹⁶*Supra* note 4.

Spirit’s financial position deteriorated following the COVID-19 pandemic (Black, 2025). Following the merger termination, Spirit began contracting its route network to reduce operating costs. Spirit filed for Chapter 11 bankruptcy protection in November 2024 (Isidore and Dmitracova, 2024), emerged as a private company in March 2025 (Davis Polk & Wardwell LLP, 2025), filed for Chapter 11 a second time in August 2025 (Josephs, 2025), and ceased all operations in May 2026 (Madhani et al., 2026). The empirical analysis uses DB1B observations from 2022Q1 through 2025Q2. Spirit’s route exits, which define treatment, occur between 2024Q1 and 2025Q1. The pre-2024 quarters provide the pre-exit observations used to assess parallel trends, and the sample extends through 2025Q2 to capture the post-exit path of fares. The treatment window spans the merger termination, the initial bankruptcy filing, and Spirit’s first emergence, and it predates the final liquidation.

The DOJ blocked the merger to protect the consumers Spirit served. Spirit’s subsequent exit eliminated the protection the DOJ sought to preserve.

2.3 Data

The data are from the Airline Origin and Destination Survey (DB1B), a random 10 percent quarterly sample of domestic airline tickets published by the Bureau of Transportation Statistics. The DB1B Market file reports the operating carrier, ticketing carrier, origin and destination airports, market fare prorated by distance, and the number of sampled passengers for each itinerary. The sample covers 2022Q1 through 2025Q2, 14 quarters.

A route is defined as an unordered pair of airports, following the convention in the literature (Borenstein, 1989; Goolsbee and Syverson, 2008), which ensures that entry and exit are not double-counted by direction. The sample is restricted to routes that Spirit served at any point during the sample period. Routes where Spirit exited before 2024Q1 are excluded, since those exits preceded the failed merger and are not part of the competitive event under study. Routes observed in fewer than 10 of the 14 quarters are dropped to exclude seasonal routes and thin markets where fare percentiles are unreliable.¹⁷ The resulting sample contains 1,427 routes, of which 313 exited between 2024Q1 and 2025Q1, and 1,114 continued to operate through

¹⁷Results are similar when routes observed in fewer than 10 of the 14 quarters are included in the estimation sample.

2025Q2.

The exit quarter is defined as Spirit’s last active quarter on a route, identified as the last quarter in which Spirit records appear in the DB1B for that route.¹⁸ Itineraries with fares below \$20 or above \$9,998 are excluded. Fares below \$20 consist primarily of employee/loyalty discounts and data errors; fares above \$9,998 are likely data entry errors. Each route-quarter cell is collapsed to five fare statistics — the 5th, 10th, and 25th percentiles, the median, and the mean — computed over all itineraries on the route.

Entry is defined as the first quarter, no earlier than one quarter after Spirit’s exit, in which a ticketing carrier that did not previously offer nonstop service on the route begins offering it. The carrier must also ticket at least 20 sampled passengers on the route in that quarter, counted across all itineraries. The DB1B records a ticketing carrier on a route whenever it sells any ticket, so a carrier can appear without supplying replacement service; the threshold excludes these cases. Because the DB1B is a ten percent sample of tickets, 20 sampled passengers correspond to approximately 200 passengers.¹⁹ Below this level, a carrier is present on the route through occasional ticketing rather than scheduled service, and does not represent capacity a traveler could book in place of Spirit. As a robustness, Appendix M reports the estimates across thresholds from zero to ninety sampled passengers (0 to approximately 900 passengers), and the no-entry 5th percentile coefficient remains within [0.087–0.096] of the baseline. Entry is coded as 1 in that quarter and all subsequent quarters. No entrant falls below the threshold in a later quarter of the sample. At the route level, 26 of the 313 exited routes experienced entry and 287 did not. These counts describe entry observed through the end of the sample. Routes Spirit exited late in the window have fewer quarters in which entry can occur, so a route counted here as no-entry may draw a replacement after 2025Q2. Table 3, Panel B, reports entry by carrier and counts carrier-route pairs. The main treatment variable is (*Spirit Exit*). To separate the fare effect of Spirit’s exit from the competitive response of entering

¹⁸An alternative exit quarter definition, which assigns treatment to the quarter following Spirit’s last observation, is discussed in Appendix C.

¹⁹Dropping the sampled passenger threshold enlarges the ultra-low-cost cell but reintroduces carriers that supplied no genuine replacement service on the route. Hawaiian Airlines contributes eight entries through joint ticketing with Alaska after their merger, and several foreign carriers appear through the domestic legs of interline itineraries. The DB1B records domestic itineraries only, so the domestic leg of an interline itinerary is coded as nonstop; foreign carriers enter the data through these legs, fall below the sampled passenger threshold, and none counts as an entrant (Table 3, Panel B).

carriers, two interaction terms are constructed on the full sample: $(\textit{Spirit Exit}) \times (\textit{No Entry})$ and $(\textit{Spirit Exit}) \times \textit{Entry}$. See Appendix A for definitions of all variables.

Panel A of Table 3 reports the distribution of Spirit’s exits by quarter. The number of exits increases over the sample period, reaching 93 routes in 2025Q1. Among the entrants in Panel B, United Airlines and Frontier Airlines account for the largest shares, with 10 and 7 carrier-route entries, respectively.

3 Empirical Strategy

We develop a difference-in-differences (DiD) design to estimate the effect of Spirit’s route exits on fare measures, with two-way fixed effects as the reduced-form estimator. Identification rests on the parallel-trends assumption: absent the exit, fares on treated routes would have followed the same path as fares on control routes. The pre-period event-study coefficients provide the relevant evidence, and they are consistent with it across all five fare measures.

The control group consists of routes Spirit served between 2022Q1 and 2025Q2 but did not exit during the analysis window. The treatment group consists of routes Spirit exited between 2024Q1 and 2025Q1. Both groups consist of routes Spirit served, so the comparison holds the type of market fixed and isolates the loss of the carrier. The identifying assumption is that, absent the exit, fares on treated routes would have followed the same path as fares on control routes. Of course, Spirit did not exit routes at random. Treated routes differ from control routes on observables. They carry fewer passengers and are longer, as documented in Table 2, Panel B. Route fixed effects absorb these fixed differences. One concern is that exit may correlate with differential fare trends rather than fixed levels. Four features of our empirical strategy address this. First, the institutional record attributes Spirit’s withdrawals to fleet returns, lessor repossessions, and a system-wide liquidity shock in its Chapter 11 proceedings, rather than to route-specific demand shocks contemporaneous with the fare changes we estimate.²⁰ Second, the event study estimates discussed below show patterns consistent with the parallel-trends assumption across all five fare measures. Third, the estimates are robust to the inclusion of (Number of Carriers) $\times$ (Calendar Quarter) fixed effects, which hold

²⁰Declaration of Fred Cromer in Support of the Chapter 11 Proceedings and First Day Pleadings, In re Spirit Airlines, Inc., No. 24-11988 (SHL) (Bankr. S.D.N.Y. Nov. 18, 2024).

the contemporaneous number of competitors (carriers) fixed (Panel B of Table 4). Fourth, the average effect is robust to estimators designed for staggered adoption with heterogeneous timing (Appendix G). For these reasons, the differences between treated and control routes bound the external validity of the estimates rather than threaten identification. The estimates apply to the type of route Spirit served.

A further concern is that the exit measure reflects sampling rather than withdrawal, since a route that goes unsampled in a quarter could appear to lose Spirit. Several features of the data are inconsistent with this. The exit quarter is the last quarter in which Spirit appears on a route, so a sampling gap followed by a later appearance is not coded as an exit. Spirit does not resume service on any treated route after its exit quarter. A served route would have to go unsampled in every remaining quarter of the panel to be misclassified, which is highly unlikely for a route with positive traffic, and less likely the more post-exit quarters remain. The directional analysis in Appendix H provides a further check. If sampling drove the exit timing, the two directions of a route would lose Spirit in different quarters by chance; we let each direction carry its own exit date and recover the baseline estimates (Table A-7). These features concern the persistence and timing of Spirit’s disappearance, which sampling variation does not reproduce. We conclude that the exit measure reflects withdrawal rather than sampling.

The model is weighted by sampled passengers. Weighting serves two purposes. First, DB1B is a 10% sample of tickets, so the precision of a route-quarter fare percentile depends on the number of tickets sampled on that route in that quarter. Weighting by sampled passengers gives more weight to the route-quarters where these percentiles are estimated from more tickets and are therefore more precise.²¹ Second, weighting by sampled passengers produces the average effect of Spirit’s exit per traveler rather than per route, which reflects the overall impact on consumers.²²

²¹Measurement error in a percentile from finite sampling enters the dependent variable. It increases standard errors but does not bias the coefficient if uncorrelated with treatment (see, e.g., Wooldridge 2010, ch. 4). The 5th and 10th percentile effects are significant at the 1% level even with these standard errors. The event study estimates in Section 4 are consistent with the parallel-trends assumption at these percentiles. Nevertheless, for robustness, Appendix K repeats the analysis and shows that the 5th and 10th percentile results are similar when route-quarters with fewer than 50 or 100 sampled tickets are dropped.

²²The weights are contemporaneous route-quarter sampled passenger counts, so the estimand is the sampled passenger-weighted average effect across observed route-quarters. If Spirit’s exit changes traffic or passenger composition on a route, this estimand differs from the effect weighted by the route’s pre-exit traveler population.

Let y_{rt} denote the fare outcome of interest for route r in quarter t , where the outcome varies across specifications as the 5th, 10th, or 25th percentile fare, the median fare, or the mean fare. We estimate two specifications. The first is the pooled difference-in-differences:

$$\ln y_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}, \quad (1)$$

where α_r is a route fixed effect and γ_t is a quarter fixed effect. The variable $(\text{Spirit Exit})_{rt}$ equals one for a route in its exit quarter and every quarter thereafter, and zero otherwise. The exit quarter is Spirit's last active quarter on the route. The coefficient β_1 is the average effect of Spirit's exit on the fare outcome.

The second specification decomposes this effect by whether a carrier replaced Spirit:

$$\ln y_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}. \quad (2)$$

The variable $(\text{Spirit Exit} \times \text{No Entry})_{rt}$ equals one for a treated route-quarter in which no carrier has entered, and $(\text{Spirit Exit} \times \text{Entry})_{rt}$ equals one for a treated route-quarter in which a carrier has entered. The two indicators are mutually exclusive and partition the treated route-quarters, so the specification omits the standalone $(\text{Spirit Exit})_{rt}$ term, which is their sum. Pre-exit and never-treated route-quarters form the common reference category. The two indicators track the state of a route in each quarter. A route on which a carrier eventually enters contributes to β_2 from Spirit's exit until entry occurs, and to β_3 thereafter. The coefficients measure the effect of Spirit's exit while a route is without a replacement carrier and after one has arrived, each relative to the same reference. Entry is not randomly assigned. Carriers may enter the thicker, more profitable routes (Appendix L). Entry and no-entry routes differ in ways beyond whether a carrier entered. The entry and no-entry estimates therefore describe where the fare increase appears, not the effect of entry itself. The fare increase is concentrated on no-entry routes and is absent where a carrier entered.

To examine the dynamic effects of Spirit's exit on fares, we estimate the event-study

To assess this issue and as a robustness, we re-estimated the baseline weighting each route-quarter by the route's average passenger count in its pre-exit quarters (that is, weights fixed before treatment instead of the contemporaneous weights). The estimates are similar to those in Table 4.

specification:

$$\ln y_{rt} = \alpha_r + \gamma_t + \sum_{k \neq -1} \beta_k \mathbf{1}[\tau_{rt} = k] + \varepsilon_{rt} \quad (3)$$

where $\tau_{rt} = t - t_r^*$ is event time, t_r^* is Spirit’s exit quarter on route r , and the sum runs over $k \in \{-6+, -5, -4, -3, -2, 0, 1, 2, 3, 4, 5+\}$. The period $k = -1$ is the omitted reference category, one quarter before Spirit’s exit. The endpoints bin all periods beyond the window: $\mathbf{1}[\tau_{rt} = -6+]$ equals one for all $k \leq -6$, and $\mathbf{1}[\tau_{rt} = 5+]$ equals one for all $k \geq 5$. The pre-treatment coefficients ($k < 0$) provide a test of the parallel-trends assumption: if treated and control routes were trending similarly prior to Spirit’s exit, these coefficients should be statistically indistinguishable from zero. To examine the dynamic effect of competitor entry on fares, we estimate both specifications separately on two subsamples of treated routes in Appendix F.²³

Both equations 1 and 3 are estimated by two-way fixed effects. Under staggered adoption with heterogeneous treatment effects, this estimator may place negative weight on some treated comparisons, because already-treated routes serve as controls for later-treated ones (Goodman-Bacon, 2021). Two features of the empirical setting limit the scope for such bias. First, the comparison group is large relative to the treated group, comprising 1,114 never-treated routes against 313 treated routes. Identification therefore rests predominantly on comparisons between treated and never-treated routes rather than on the cross-cohort comparisons among treated units from which the bias may arise. Second, the adoption window is narrow. Spirit’s exits span only five consecutive quarters, which leaves little room for treatment-effect heterogeneity to accumulate across cohorts. Appendix G shows that similar results relative to the baseline are obtained with estimators robust to heterogeneous timing.

As mentioned above, Spirit’s exits may coincide with changes in the competitive structure (Number of Carriers) of a route. In such a case, the estimated effect may partly reflect the fare increase associated with operating in a less competitive market. To address this concern, an additional set of (Number of Carriers) $\times$ (Calendar Quarter) fixed effects is included in

²³The subsample decomposition uses a separate estimator for each panel rather than the full-sample interacted specification. In the interacted specification, the entry indicator at event time $k = 0$ is collinear: no entrant operates on a route in the quarter Spirit exits. The indicator drops, shifting the normalization period from $k = -1$ to $k = 0$ in the entry panel and rendering the two panels incomparable. The subsample estimator preserves the $k = -1$ normalization in both panels. The no-entry panel is unaffected by this collinearity, but we apply the subsample estimator to both panels to preserve comparability across them.

4 Results

Table 4 reports the main results. Column (1) reports $\hat{\beta}_1$ using equation (1). Each row corresponds to a separate regression. The dependent variable varies across rows from the ln 5th percentile fare to the ln mean fare, tracing the effect of Spirit's exit across the fare distribution. Column (2) reports $\hat{\beta}_2$ and $\hat{\beta}_3$ using equation (2). Panel A presents the baseline estimates using equations (1) and (2) with route and quarter fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. Standard errors are clustered at the route level.²⁵

Column (1) in Panel A reports the baseline effect. The 5th and 10th percentile fares rise by 8.6 and 5.8 log points, respectively, both statistically different from zero at the 1% level. The effect attenuates moving up the distribution. It is statistically different from zero at the 10% level at the 25th percentile, and it is not statistically different from zero at the median and mean. On routes where no carrier enters after Spirit's exit, the fare increase at the bottom of the distribution is larger. The 5th and 10th percentile fares rise by 9.5 and 6.4 log points, respectively, both statistically different from zero at the 1% level. On routes where a carrier enters, the bottom-percentile effects are smaller and statistically indistinguishable from zero, and the median and mean fares fall by 5.3 and 3.8 log points, respectively, both significant at the 1% level.

Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects, so that the comparison is between routes with the same number of ticketing carriers in the same quarter. The 5th and 10th percentile fares rise by 7.3 and 4.6 log points, respectively, both significant at the 1% level, indicating that the fare increases following Spirit's exit are not driven by changes in the number of competitors alone.

Figures 1a to 1e report the event study estimates. At the bottom of the distribution,

²⁴The number of carriers on a route is itself affected by Spirit's exit and is therefore a post-treatment variable. Conditioning on it may absorb part of the effect of the exit. Thus, Panel B is a conservative check rather than the primary specification. The bottom-percentile effect persists under this control, which indicates it does not arise mechanically from the change in the number of carriers.

²⁵Similar results are obtained clustering by route and quarter, at the endpoint-airport level, and using a wild cluster bootstrap for the entry interaction.

the pre-period coefficients are flat and jointly insignificant, and the post-exit coefficients are positive and statistically significant. The effect attenuates moving up the distribution and is indistinguishable from zero at the median and mean. A joint F -test that all pre-period indicators are jointly zero in each panel fails to reject the null of zero pre-period coefficients in each case, with p -values above 0.5 in all cases, consistent with the parallel-trends assumption.

Appendix D reports event studies with (Number of Carriers) $\times$ (Calendar Quarter) fixed effects, which confirm that the post-exit fare increases are not driven by changes in the number of competitors, and event studies for the no-entry and entry subsamples separately, which show that the increase concentrates on routes where no carrier enters.

4.1 Robustness and Additional Results

We assess the robustness of the results in several ways. First, Panel B of Table 4 adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. The 5th and 10th percentile fares rise by 7.3 and 4.6 log points, both significant at the 1% level. The effect at the bottom of the distribution persists when the number of competitors (carriers) is held fixed.

Second, Figures 1a to 1e report the event study estimates from Equation (3). The pre-period coefficients are jointly insignificant for all five fare measures, consistent with the parallel-trends assumption. The post-exit coefficients are positive and significant at the bottom of the distribution and not statistically different from zero at the median and mean. The event study estimates are consistent with the difference-in-differences estimates.

Third, Appendix C reports robustness to alternative exit quarter definitions. Specifically, we report results from assigning treatment to the quarter following Spirit’s last observation (Table A-1). The estimates retain the distributional pattern of the baseline and attenuate, as expected, because the omitted reference period is the baseline exit quarter, in which fares may already be responding.

Fourth, Appendix D reports event studies with (Number of Carriers) $\times$ (Calendar Quarter) fixed effects (Figures A-1a to A-1e). The estimates are similar to those in the baseline and consistent with the parallel-trends assumption.

Fifth, Appendix E adds (Number of Carriers) $\times$ (Seasonal Quarter) fixed effects, which absorb seasonal fare variation that differs by the number of ticketing carriers (Table A-2 and

Figure A-2). The estimates and event studies are similar to the baseline.

Sixth, Appendix F reports event studies for the no-entry and entry subsamples (Figures A-3a to A-7b). The fare increases concentrate on no-entry routes and at the bottom of the distribution, and entry routes show no increase.

Seventh, Appendix G addresses heterogeneous treatment effects under staggered adoption. We re-estimate the average effect of Spirit’s exit with the extended two-way fixed effects estimator of Wooldridge (2025) (Table A-3 and Figure A-8). The results are similar to the baseline. We also obtain similar results with the estimator of Callaway and Sant’Anna (2021).

Eighth, Appendix H defines routes directionally and re-estimates the model on 37,602 directional route-quarters (Table A-7). The estimates are similar to the baseline, the 5th and 10th percentile fares rise by 8.7 and 5.9 log points, both significant at the 1% level.

Ninth, Appendix I defines entry at the city-pair level using the airport groupings of Brueckner et al. (2014) (Table A-8). The estimates are also similar to the baseline.

Tenth, Appendix J reports robustness to the level of clustering. The baseline clusters standard errors at the route level. The results are similar under two-way clustering by route and quarter (Table A-10), under clustering on a single endpoint airport (Table A-11), and under two-way clustering on both endpoint airports (Table A-12). We also performed wild cluster bootstrap tests and obtained similar results.

Eleventh, Appendix K addresses the precision of the fare percentiles. Because DB1B is a 10% sample of tickets, a route-quarter percentile is estimated from the tickets sampled on that route in that quarter. Table A-13 shows that the 5th and 10th percentile results are similar when route-quarters with fewer than 50 or 100 sampled tickets are dropped.

Twelfth, Appendix M reports the estimates under alternative entry definitions, varying the carrier attribution between operating and ticketing carriers and the sampled passenger threshold from 0 to 90. Tables A-16 and A-17 show that the 5th and 10th percentile no-entry coefficients are similar across all definitions, each statistically different from zero at the 1% level. Table A-18, Table A-19, and Figures A-9 and A-10 report the full analysis under the operating carrier definition, which yields results similar to the baseline.

We conclude that the results are robust in the cases examined.

5 Discussion and Merger Policy Implications

5.1 The Distributional Harm and the Composition of Entry

The fare increases following Spirit’s exit concentrate at the 5th and 10th percentiles and are not different from zero at the median and mean. The harm depends on entry. With no entry, the bottom-percentile increases are largest (Table 4, Panel A). With entry, the bottom-percentile effects are negative but not statistically different from zero, and the median and mean fares fall.

The composition of the entrants explains the asymmetry. Of the 26 carrier-route entries, 9 are ultra-low-cost carriers (Frontier, Breeze, and Avelo) and 17 are not. The non-ULCC entrants, led by United, Southwest, and JetBlue, are network and low-cost carriers that add capacity without posting fares at the floor of the distribution. Where a ULCC entered, the 5th percentile fare falls; where a non-ULCC entered, it rises (Appendix L, Table A-15). The two responses offset at the bottom, so the pooled entry interaction at the 5th percentile is not statistically different from zero (Table 4). The ULCC decline drives the negative pooled interaction at the median and mean, because sampled passenger weighting loads onto the higher-traffic ULCC routes. Table A-15 corroborates the direction on the 9 ULCC routes available in the data.

5.2 The Failing-Firm Doctrine and Post-Enforcement Failure

The complaint’s theory was that removing Spirit would eliminate the carrier disciplining fares at the bottom of the distribution. The results confirm the prediction and locate its magnitude. Fares rose where the complaint said they would, at the 5th and 10th percentiles, and on the routes where no carrier replaced Spirit.

The merger was blocked under Section 7, and the failing-firm defense was unavailable. The defense is affirmative, reached only after a merger is shown to be *prima facie* unlawful, and the merging parties bear the burden of establishing it (Areeda and Hovenkamp, 2016, ¶ 951c). The merging parties must establish three elements: that the firm faces imminent inability to meet its obligations, that it cannot reorganize successfully under Chapter 11, and that it has made unsuccessful good-faith efforts to find a purchaser posing a lesser threat to

competition.²⁶ The proof requirement is stringent and seldom met ([Areeda and Hovenkamp, 2016](#), ¶ 953c).

The defendants did not raise the failing-firm defense.²⁷ Had they raised it, it would have failed. Spirit did not meet the requirements of the defense in January 2024. It continued to operate and had not sought bankruptcy protection, so it did not face imminent inability to meet its obligations, a conclusion the case law supports even for firms in financial distress (see below). It reorganized under Chapter 11 the following year, which shows reorganization was feasible. The third prong concerns the availability of a less anticompetitive purchaser. Frontier, another ultra-low-cost carrier, had agreed to acquire Spirit in 2022 before Spirit accepted JetBlue’s competing offer, which indicates that a combination preserving low-fare capacity was at least contemplated by the parties.²⁸ The defense requires all three elements, and the first two are not met.

The doctrine asks whether the acquired assets will continue to compete in the market. The 2023 Guidelines confine the defense to cases where the assets “would imminently cease playing a competitive role in the market even absent the merger.”²⁹ That test operates at the level of whether the assets keep competing at all; it does not distinguish the specific competitive function a carrier performs.³⁰ Spirit’s assets continued to play a competitive role after reorganization. The firm emerged from Chapter 11 and kept flying on the routes it retained.³¹ What ended was the fare discipline Spirit exerted at the bottom of the distribution on the routes it exited. The Guidelines test turns on whether the assets remain in competitive use. It does not reach the loss of a segment-specific pricing function when the firm survives and competes in general. The fare increases we estimate measure the loss of that function

²⁶ See 2023 Merger Guidelines §3.1 (restating the three requirements of *Citizen Publ’g Co. v. United States*, 394 U.S. 131, 136–39 (1969), which in turn draws on *Int’l Shoe Co. v. FTC*, 280 U.S. 291, 302 (1930)); cf. 2010 Horizontal Merger Guidelines §11.

²⁷ They argued instead that Spirit’s static market share overstates its future competitive significance given the company’s financial condition, rendering the Government’s market-share statistics unreliable (see Defendants’ Proposed Conclusions of Law, *United States v. JetBlue Airways Corp.*, No. 1:23-cv-10511-WGY (D. Mass. Dec. 13, 2023), ECF No. 446). They expressly declined to raise even on a “weakened competitor” defense. Spirit filed for Chapter 11 in November 2024, after the merger was blocked in January 2024, and reorganized in March 2025. The timing indicates that Spirit’s financial position was weak but that the firm was not yet failing at the time of review.

²⁸ *Supra* note 15.

²⁹ 2023 Merger Guidelines §3.1.

³⁰ *Ibid.*

³¹ *Supra* note 5.

during the period the firm itself kept flying.

The imminence requirement selects against the case that matters most. The defense is available when exit is certain, because then blocking the merger changes nothing and the firm leaves either way. The defense is unavailable for the firm that is distressed but still flying, the firm whose merger is blocked and then fails on its own. Spirit was that firm.³² In January 2024 it was too healthy to be failing and too fragile to survive, and the doctrine has no category for that. The asymmetry runs in one direction. The Guidelines treat merger-induced failure as a competitive harm, flagging the transaction that puts a target at significant risk of exit.³³ They build no counterpart for the transaction that is blocked, and the firm exits anyway. The doctrine’s relief tracks the certainty of exit at the moment of review, not the consumer harm that exit produces. That harm is the same whether the carrier exits before review or after it. The doctrine sees only the first.³⁴

Antitrust already has a category for a weak competitor that does not qualify as failing. In *Arch Coal* the acquired firm earned operating profits but held depleted reserves and had no realistic prospect of improvement or of another buyer. The court held it was not a failing firm in the technical sense and addressed its weakness within the competitive-effects analysis, concluding that its significance had been overstated. *FTC v. Arch Coal, Inc.*, 329 F. Supp. 2d 109, 154–55 (D.D.C. 2004).³⁵ There, the weakness aided the case of the merging parties,

³²Spirit’s later path bears this out. It reorganized in early 2025 and kept flying while exiting routes, returned to Chapter 11 in August 2025, and wound down operations entirely in May 2026, its final collapse hastened by a fuel-price shock and a failed rescue unrelated to the merger. At the January 2024 review, none of this was imminent: the firm was solvent enough to operate and, in the first reorganization, to attract a \$350 million equity commitment from its own bondholders. The discipline this paper measures was lost in the interval between a solvent firm at review and its eventual exit, which the imminence test does not reach.

³³2023 Merger Guidelines §2.1 n.11 (noting that concentration concerns arise where a merger “threatens to cause the exit of a current market participant, such as a leveraged buyout that puts the target firm at significant risk of failure”).

³⁴The Guidelines assess exit entirely at the transaction: whether the assets would imminently cease playing a competitive role at the moment of review. The agencies “evaluate evidence of a failing firm consistent with this prevailing law,” 2023 Merger Guidelines §3.1, and the supporting provisions on persistent negative cash flow and the discounting of management plans prepared to demonstrate a prospect of exit, *id.* §3.1 footnote 64, all ask whether exit is real and imminent as of the merger. A firm that is viable at review and fails afterward falls outside that frame. See [Donna and Pereira \(2024\)](#). The imminence requirement may also reflect the difficulty of predicting failure for a firm that is currently operating; the gap it produces, however, is the same regardless of its justification.

³⁵The denial of the defense to a distressed but still viable competitor is settled. In *Heinz* the acquired firm faced an obsolete plant and eventual exit, yet the court withheld the defense because the firm remained, for the moment, a profitable and ongoing enterprise. *FTC v. H.J. Heinz Co.*, 246 F.3d 708, 736 (D.C. Cir. 2001). In *Pabst* the firm’s sales had fallen 45 percent and an annual profit of \$8 million had become a \$3 million loss, with plant and equipment in deplorable condition, but the court found it not failing because its credit was sound and liquidation was not imminent. *United States v. Pabst Brewing Co.*, 296 F. Supp. 994, 999–1002

because a fading competitor is a smaller loss. Spirit reverses that logic. Its low-fare capacity was significant, its acquisition was blocked under Section 7, and its weakness then produced the exit that the effects analysis had treated as the harm to be avoided. The same fact, a distressed low-end competitor, discounts the harm in *Arch Coal* and delivers it in Spirit.

To be sure, the discussion in this subsection does not imply that the merger should not have been blocked. Approving it would have withdrawn the same capacity sooner and across more routes, and a less harmful buyer was available. The decision was correct. The harm the agency identified was real, and the agency was right to act. The harm arrived anyway, through a channel that merger review does not reach. Blocking the merger exhausts what that instrument can do. Preserving low-fare competition after a carrier fails requires tools that operate on market structure rather than on transactions. We turn to those next.

5.3 Policy on the Entry Margin

If the harm depends on whether a comparable carrier replaces the exiting one, the relevant policy operates on entry. The entry findings point to two instruments.

The first is access to gates and slots at congested airports. Slot-controlled and gate-constrained airports raise the cost of entry for carriers seeking to serve a vacated route. An ultra-low-cost carrier that would price at the floor of the distribution cannot do so on a route it cannot access. Gate and slot divestiture is an established tool of merger remedy design, and it falls within existing Department of Transportation and Federal Aviation Administration authority.³⁶ As shown above, the lowest fares fell only where an ultra-low-cost carrier entered. Lowering the entry cost for these carriers is the margin on which restoring competition at the bottom depends.

The second instrument is route-level entry policy. Entry does not occur at random across the treated routes. Routes that attracted a replacement carrier average 3,272 sampled passengers per quarter; routes that did not average 2,205.³⁷ Entry concentrates on the thicker routes and harm concentrates on the thin ones. The Essential Air Service program subsidizes

(E.D. Wis. 1969). Viability at the moment of review defeats the defense regardless of the firm's trajectory.

³⁶*United States v. US Airways Group, Inc.*, No. 1:13-cv-01236 (D.D.C. Nov. 25, 2013) (slot and gate divestitures at congested airports as condition of merger clearance).

³⁷See Table A-14 in Appendix L.

service on thin routes that would otherwise lose all carriers. It operates on the margin the results identify, route-level entry, but it is triggered by the total loss of service, not by the loss of low-fare service. A thin route that retains legacy or regional service after a low-cost carrier exits keeps its flights; low fares, however, tend to rise. The program does not reach this case. The harm documented here is a loss of fare competition on routes that remain served, and no current instrument is designed to address it.

5.4 Merger Enforcement and ULCC Consolidation

The mechanism recurs as the ultra-low-cost sector consolidates. Allegiant completed its acquisition of Sun Country in May 2026, shortly after Spirit ceased operations ([Allegiant Travel Company, 2026](#)), and Frontier has twice sought to combine with Spirit ([LeBeau and Josephs, 2022](#)). Where two ultra-low-cost carriers merge on overlapping routes, the loss of competition may resemble Spirit’s exit, and the estimates here imply the effect falls on the lowest fares. The DOJ theory of harm in JetBlue-Spirit focused on the consumers who relied on Spirit’s low base fares. Empirical evaluations of airline mergers typically measure effects at the mean.³⁸ The results here support the distributional evidence the theory implied. The harm falls at the bottom of the distribution, on the travelers the enforcement action named.

5.5 The Magnitude of the Harm

The estimates translate into concrete dollar amounts. At the mean of the sample, the 5th percentile fare is \$115, and the 10th percentile fare is \$138.³⁹ On routes where no carrier enters, Spirit’s exit raises the 5th percentile fare by 10.0 percent and the 10th percentile fare by 6.6 percent.⁴⁰ The increase is \$11.46 per ticket at the 5th percentile and \$9.13 at the 10th.⁴¹

The aggregate exposure is large because the affected routes carry substantial traffic. The 287 no-entry routes carry roughly 25 million passengers per year.⁴² The fare increases fall

³⁸See, e.g., [Kim and Singal \(1993\)](#), [Peters \(2006\)](#), [Luo \(2014\)](#), and [Le and Yimga \(2019\)](#).

³⁹Table 2, Panel A. Fares are in nominal U.S. dollars.

⁴⁰Computed as $\exp(\beta) - 1$ from the no-entry coefficients in Column (2) of Table 4, Panel A: $\beta = 0.095$ at the 5th percentile and $\beta = 0.064$ at the 10th. The log-point coefficients correspond to exact percentage changes of 9.97 and 6.61 percent.

⁴¹The dollar increase is the exact percentage change applied to the sample mean of each fare measure: $0.0997 \times \$114.91 = \11.46 and $0.0661 \times \$138.12 = \9.13 .

⁴²No-entry routes average 2,205 sampled passengers per route-quarter in the DB1B sample (Table A-14).

on passengers at the bottom of the distribution, who number in the low millions per year on these routes.⁴³ The increase is modest per ticket, but the aggregate exposure is substantial. It falls on the price-sensitive travelers who relied on Spirit’s low fares.⁴⁴

The estimates describe the distribution of transaction fares among travelers who flew. From the DB1B data, we do not observe offered fares or the travelers who stopped flying, switched airports, or substituted to other products after Spirit’s exit, so a change at the 5th or 10th percentile may combine the repricing of low fares with changes in the composition of remaining travelers. We interpret the estimates as a change in the availability of low fares rather than the welfare loss of a fixed group of travelers, and the figures above gauge the scale of exposure rather than a welfare estimate.

6 Concluding Remarks

We estimate the effect of Spirit’s exit on the distribution of fares across the routes it served. Fares at the bottom rise. The median and the mean do not. The increase concentrates on routes where no carrier replaced Spirit. Where a carrier entered, average fares fell, and the effect at the bottom was not statistically different from zero. The entrants were a mix of ULCC and non-ULCC airlines, and the lowest fares fell only where a ULCC entered. The harm is the loss of the carrier that priced at the bottom, on the routes where no other carrier took its place.

The result marks a boundary of merger enforcement. Merger review operates on a transaction. The harm here arrived after the merger was blocked, through a failure that review had no instrument to prevent. The failing-firm doctrine fixes its test at the moment of review, and

DB1B is a 10 percent sample of tickets, so the population figure is approximately 22,045 passengers per route-quarter. Annualized over four quarters and multiplied by the 287 no-entry routes, this gives approximately 25.3 million passenger-trips per year. The figure is an approximation. It applies the no-entry route mean to all no-entry routes and does not adjust for route-level variation in volume.

⁴³Taking the lowest decile of passengers as those exposed to the 5th and 10th percentile increases yields approximately 2.5 million passenger-trips per year. Applying the average of the two per-ticket increases, \$10.30, gives aggregate annual exposure on the order of \$26 million for the lowest decile of passengers on no-entry routes alone. This is a conservative approximation on total exposure. It omits passengers between the 10th and 25th percentiles, on whom the fare also rises, and it excludes routes where entry occurred but did not restore the lowest fares.

⁴⁴See the 5th and 10th percentile increases in Table 4. The DOJ identified these as the tickets purchased by cost-conscious travelers who relied on Spirit’s low fares ([U.S. Department of Justice, 2023](#)). Low-fare segments attract a larger share of leisure travelers, associated with lower income ([Shrago, 2024](#)).

it asks whether the assets remain in competitive use, not whether the specific fare discipline a carrier supplied survives. Restoring that discipline after exit turns on entry, a margin merger review does not reach.

The policy question follows from the entry margin. Enforcement preserves competition by preventing a transaction; it cannot preserve competition that ends when a firm exits on its own. That loss depends on whether a comparable carrier enters, which depends in turn on conditions enforcement does not set: access to gates and slots at constrained airports, and route-level support that responds to the loss of low-fare service. The Essential Air Service program subsidizes thin routes that lose all carriers. It does not reach a route that keeps legacy or regional service and loses its low fares. The entry margin points toward instruments already within existing authority (gate and slot access at congested airports, and route-level service policy) though the design and welfare effects of specific reforms remain open questions. Existing instruments address the loss of service. None addresses the loss of low-fare competition, which is the harm our estimates identify.

Table 1: Spirit Bankruptcy Timeline

Date	Event
2022, July	JetBlue and Spirit signed a \$3.8 billion merger agreement. ^a
2022, October	Spirit shareholders approved the acquisition. ^b
2023, March	The U.S. Department of Justice filed suit to block the merger. ^c
2024, January	The U.S. District Court blocked the merger. ^d
2024, March	JetBlue and Spirit agreed to terminate the merger. ^e
2024, November	Spirit Airlines filed for Chapter 11 bankruptcy protection. ^f
2025, March	Spirit Airlines emerged from Chapter 11 as a private company. ^g
2025, August	Spirit Airlines filed for Chapter 11 bankruptcy a second time. ^h
2026, May	Spirit Airlines ceased all operations. ⁱ

Sources: (a) Spirit Airlines, Inc., Current Report (Form 8-K) (July 29, 2022); (b) [Josephs \(2022\)](#); (c) [U.S. Department of Justice \(2023\)](#); (d) [U.S. Department of Justice \(2024\)](#); (e) [JetBlue Airways Corporation \(2024\)](#); (f) [Isidore and Dmitracova \(2024\)](#); (g) [Davis Polk & Wardwell LLP \(2025\)](#); (h) [Josephs \(2025\)](#); (i) [Madhani et al. \(2026\)](#).

Table 2: Descriptive Statistics

Panel A: Summary Statistics				
	Mean	Median	SD	Obs.
5 th Percentile Fare	114.91	112.46	51.19	19,945
10 th Percentile Fare	138.12	137.00	54.84	19,945
25 th Percentile Fare	184.88	181.50	61.39	19,945
Median Fare	255.53	248.50	73.81	19,945
Mean Fare	292.64	284.59	85.02	19,945
Sampled Passengers	4,535.76	1,891.00	6,430.29	19,945
Number of Carriers	6.47	7.00	1.81	19,945

Panel B: Control vs. Treated Routes				
	Control		Treated	
	Mean	SD	Mean	SD
Market Distance	1,444.91	733.03	1,689.57	819.38
Sampled Passengers	5,162.54	6,824.27	2,300.55	4,041.50
Number of Carriers	6.65	1.76	5.84	1.84
ln(P5 Fare)	4.59	0.46	4.85	0.41
ln(P10 Fare)	4.80	0.42	5.03	0.36
ln(P25 Fare)	5.13	0.35	5.29	0.30
ln(P50 Fare)	5.47	0.29	5.60	0.27
ln(Mean Fare)	5.61	0.29	5.72	0.27
Observations	15,577		4,368	

Notes: The unit of observation is a route-quarter. Fares are reported in U.S. dollars. Passengers is the mean of quarterly route-level sampled passengers, computed across route-quarters. Number of Carriers counts distinct ticketing carriers per route-quarter. Panel A reports summary statistics. Panel B reports means by group: control routes are those where Spirit operated through 2025Q2, treated routes those where Spirit exited between 2024Q1 and 2025Q1. All route-quarters of a treated route are assigned to the treated column, including those before the exit quarter. See [Appendix B](#) for data construction details.

Table 3: Spirit Route Exits and Subsequent Entry

Panel A: Route Exit Distribution	
Exit Quarter	Routes
2024Q1	48
2024Q2	32
2024Q3	63
2024Q4	77
2025Q1	93
Total	313

Panel B: Entry by Carrier	
Carrier	Entries
United Airlines (UA)	10
Frontier Airlines (F9)	7
Southwest Airlines (WN)	5
JetBlue Airways (B6)	2
Breeze Airways (MX)	1
Avelo Airlines (XP)	1
Total	26

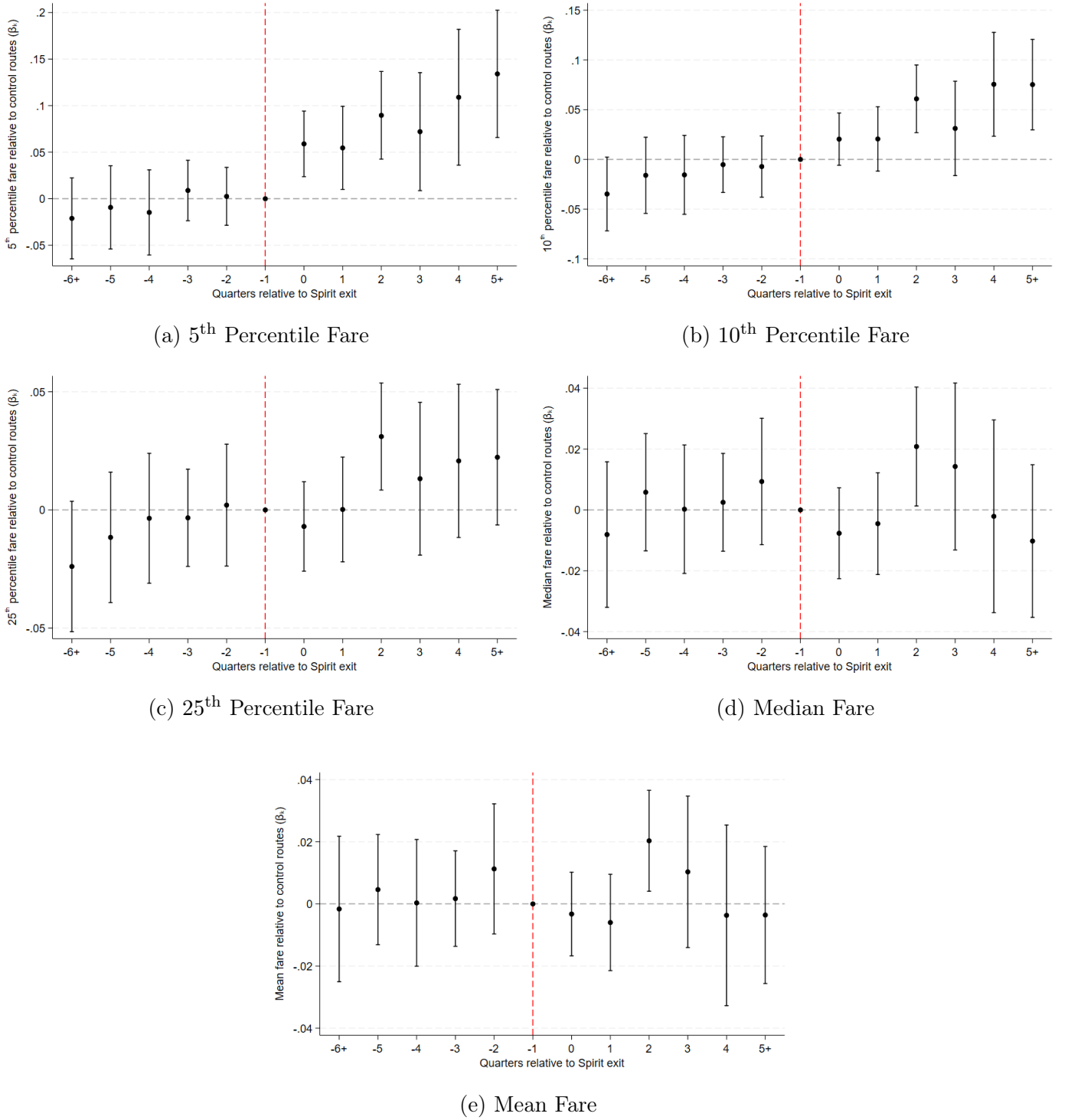
Notes: Panel A: Exit Quarter is defined as the last quarter Spirit was active between 2024Q1 and 2025Q1. Routes is the total number of routes Spirit has exited in each quarter. Panel B: Each row reports the number of routes a carrier entered after Spirit’s exit. Entry is defined at the ticketing-carrier level on nonstop itineraries, with a minimum of 20 sampled passengers per route-quarter.

Table 4: Airline Fares after Spirit Exit

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)		Adj. R ²	N
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE		
Panel A: Baseline										
ln(<i>P</i> 5)	0.086	(0.022)	0.862	19,945	0.095	(0.022)	-0.037	(0.038)	0.862	19,945
ln(<i>P</i> 10)	0.058	(0.017)	0.869	19,945	0.064	(0.017)	-0.024	(0.033)	0.869	19,945
ln(<i>P</i> 25)	0.021	(0.011)	0.881	19,945	0.025	(0.011)	-0.034	(0.021)	0.881	19,945
ln(<i>P</i> 50)	0.003	(0.010)	0.890	19,945	0.007	(0.010)	-0.053	(0.014)	0.890	19,945
ln(<i>Mean</i>)	0.001	(0.009)	0.920	19,945	0.004	(0.009)	-0.038	(0.010)	0.920	19,945
Panel B: Adds (Number of Carriers) $\times$ (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.073	(0.021)	0.867	19,945	0.082	(0.022)	-0.030	(0.038)	0.867	19,945
ln(<i>P</i> 10)	0.046	(0.016)	0.874	19,945	0.051	(0.016)	-0.020	(0.033)	0.874	19,945
ln(<i>P</i> 25)	0.011	(0.010)	0.886	19,945	0.014	(0.010)	-0.030	(0.022)	0.886	19,945
ln(<i>P</i> 50)	-0.007	(0.008)	0.896	19,945	-0.003	(0.008)	-0.054	(0.013)	0.896	19,945
ln(<i>Mean</i>)	-0.008	(0.008)	0.924	19,945	-0.006	(0.008)	-0.041	(0.011)	0.924	19,945

Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$, where the dependent variable y_{rt} denotes the fare outcome of interest for route r in quarter t : 5th, 10th, or 25th percentile fare, the median fare, or the mean fare, as indicated in each row. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Figure 1: Event Study: Spirit Exit's Effect on Fare Percentiles



Notes: Each point plots the event-study coefficient β_k from Equation 3, the effect of Spirit's exit on the relevant log fare k quarters from exit, relative to the omitted period $k = -1$. Panels show, respectively, the 5th, 10th, and 25th percentile, median, and mean fare. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

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ONLINE APPENDIX

WHO REPLACES SPIRIT?

ENTRY, EXIT, AND LOW-END FARES

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A Definitions of Variables and Fixed Effects

Fare: The price of an airline ticket in U.S. dollars.

$\ln(P5)$, $\ln(P10)$, $\ln(P25)$, $\ln(P50)$, $\ln(Mean)$: The $\ln$ of the 5th, 10th, and 25th percentile, median, and mean fare on a route in a quarter, computed across itineraries, respectively.

Sampled Passengers: Total number of sampled passengers on a route in a given quarter. Because DB1B is a ten percent sample of tickets, 20 sampled passengers correspond to approximately 200 passengers.

Market Distance: Total miles flown between the origin and destination airports.

Number of Carriers: Total number of ticketing carriers on a route in a given quarter.

(Spirit Exit): A dummy variable equal to 1 for a route in its exit quarter and every quarter thereafter, and 0 otherwise. The exit quarter is Spirit's last active quarter on the route, the last quarter in which Spirit appears in the DB1B for that route.

Entrant: A dummy variable equal to one for a ticketing carrier on a treated route in a quarter after Spirit's exit quarter in which the carrier (i) offers nonstop service on the route, (ii) did not offer nonstop service on the route before Spirit exits, and (iii) tickets at least 20 sampled passengers on the route that quarter. It equals zero otherwise. Because DB1B is a ten percent sample of tickets, 20 sampled passengers correspond to approximately 200 passengers.

Entry: A dummy variable equal to one for a route from the first quarter in which the variable (Entrant) equals one for some carrier, and one in every quarter thereafter. It equals zero otherwise.

No Entry: A dummy variable equal to one minus (Entry).

(Spirit Exit) $\times$ (No Entry): A route-quarter indicator equal to one for a treated route-quarter before any carrier has entered, that is, from Spirit's exit quarter up to the quarter before entry occurs, and through the end of the sample on routes where no carrier enters.

(Spirit Exit) $\times$ (Entry): A route-quarter indicator equal to one for a treated route-quarter from the quarter a carrier other than Spirit enters the route.

Route F.E.: A set of 1,427 dummy variables, each corresponding to a unique route. A route is an unordered pair of airports.

(Calendar Quarter) F.E.: A set of 14 dummy variables, each corresponding to a calendar quarter from 2022Q1 through 2025Q2. The same quarter of different years is a different dummy variable, so 2022Q1 and 2023Q1 are distinct.

(Seasonal Quarter) F.E.: A set of 4 dummy variables, each corresponding to a quarter of the year, Q1 through Q4. The same quarter of different years is the same dummy variable, so 2022Q1, 2023Q1, 2024Q1, and 2025Q1 share one value.

(Number of Carriers) F.E.: A set of dummy variables, each corresponding to the number of ticketing carriers on a route in a quarter.

(Number of Carriers) $\times$ (Calendar Quarter) F.E.: A set of 151 dummy variables that result from the interaction of (Number of Carriers) F.E. and (Calendar Quarter) F.E. (Note that 151 refers to the number of non-empty combinations. That is, combinations of carrier count and calendar quarter that do not occur in the data are omitted.)

(Number of Carriers) $\times$ (Seasonal Quarter) F.E.: A set of 45 dummy variables that result from the interaction of (Number of Carriers) F.E. and (Seasonal Quarter) F.E. (Note that 45 refers to the number of non-empty combinations. That is, combinations of carrier count and season that do not occur in the data are omitted.)

B Additional Data Description

The DB1B Market data covers 2022Q1 through 2025Q2. The sample is restricted to routes Spirit served at any point during this period. The exit quarter is the last quarter in which Spirit appears in the DB1B for a route, defined as the last quarter with a Spirit observation that is followed by no further Spirit observations on that route. Treatment is coded 1 in the exit quarter and every subsequent quarter. Only routes whose exit quarter falls between 2024Q1 and 2025Q1 are treated.

A route is defined as an unordered pair of airports ([Borenstein, 1989](#); [Goolsbee and Syver-son, 2008](#)). Each route-quarter cell is collapsed to a single record containing the 5th, 10th, and 25th percentile fares, the median, and the mean, along with total sampled passengers and the number of carriers. If a ticket includes multiple flight segments, the fare is prorated based on distance. Tickets with fares below \$20 or above \$9,998 are excluded. The estimation sample is the set of route-quarters retained under the (Number of Carriers) $\times$ (Calendar Quarter) fixed effects, which drop three singleton observations.

A nonstop flight is defined as a flight ticket without any layovers. In the DB1B Market Data, a nonstop flight is an itinerary with a single coupon. The sampled passenger threshold is the minimum number of sampled passengers a carrier must ticket on a route in a quarter, counting both nonstop and connecting itineraries, for that carrier to count as an entrant. The baseline threshold is 20 sampled passengers. Alaska Airlines completed its acquisition of Hawaiian Airlines on September 18, 2024 ([Alaska Air Group, 2024](#)). Following the merger, the two carriers started ticketing each other's flights, so a single carrier can appear as two distinct ticketing carriers on a route. Alaska and Hawaiian are therefore treated as a single carrier throughout the sample, which reduces spurious entries.

C Alternative Exit Quarter Definition

The baseline estimates in Table 4 define the exit quarter as Spirit’s last active quarter on a route. For robustness, we repeated the analysis defining the exit quarter as the quarter following Spirit’s last observation. This robustness checks whether the estimates are sensitive to the placement of the exit quarter relative to treatment.

Under the baseline definition, the exit quarter is one in which Spirit still has some observations on the route before it withdraws. The alternative definition treats the first quarter without any Spirit observation as the exit quarter. The reassigned quarter is one in which fares may already be responding, so treatment is dated one period late relative to the fare response. The two definitions differ by one quarter.

Table A-1 reports the estimates. The results are similar to those in the baseline in Section 4. The estimates are also robust to dropping the potential partial-exit quarter from the difference-in-differences estimates.

Table A-1: Airline Fares after Spirit Exit, Alternative Exit Quarter Definition

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)		Adj. R ²	N
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE		
Panel A: Baseline										
ln(<i>P</i> 5)	0.083	(0.022)	0.862	19,945	0.091	(0.022)	-0.098	(0.062)	0.862	19,945
ln(<i>P</i> 10)	0.059	(0.017)	0.869	19,945	0.065	(0.016)	-0.077	(0.053)	0.869	19,945
ln(<i>P</i> 25)	0.026	(0.011)	0.881	19,945	0.030	(0.011)	-0.067	(0.033)	0.881	19,945
ln(<i>P</i> 50)	0.007	(0.010)	0.890	19,945	0.010	(0.010)	-0.061	(0.021)	0.890	19,945
ln(<i>Mean</i>)	0.003	(0.009)	0.920	19,945	0.006	(0.009)	-0.054	(0.013)	0.920	19,945
Panel B: Adds (Number of Carriers) $\times$ (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.063	(0.022)	0.866	19,945	0.070	(0.022)	-0.091	(0.061)	0.867	19,945
ln(<i>P</i> 10)	0.041	(0.016)	0.874	19,945	0.046	(0.016)	-0.074	(0.052)	0.874	19,945
ln(<i>P</i> 25)	0.012	(0.010)	0.886	19,945	0.016	(0.010)	-0.068	(0.032)	0.886	19,945
ln(<i>P</i> 50)	-0.005	(0.008)	0.896	19,945	-0.002	(0.008)	-0.068	(0.021)	0.896	19,945
ln(<i>Mean</i>)	-0.008	(0.008)	0.924	19,945	-0.005	(0.008)	-0.062	(0.014)	0.924	19,945

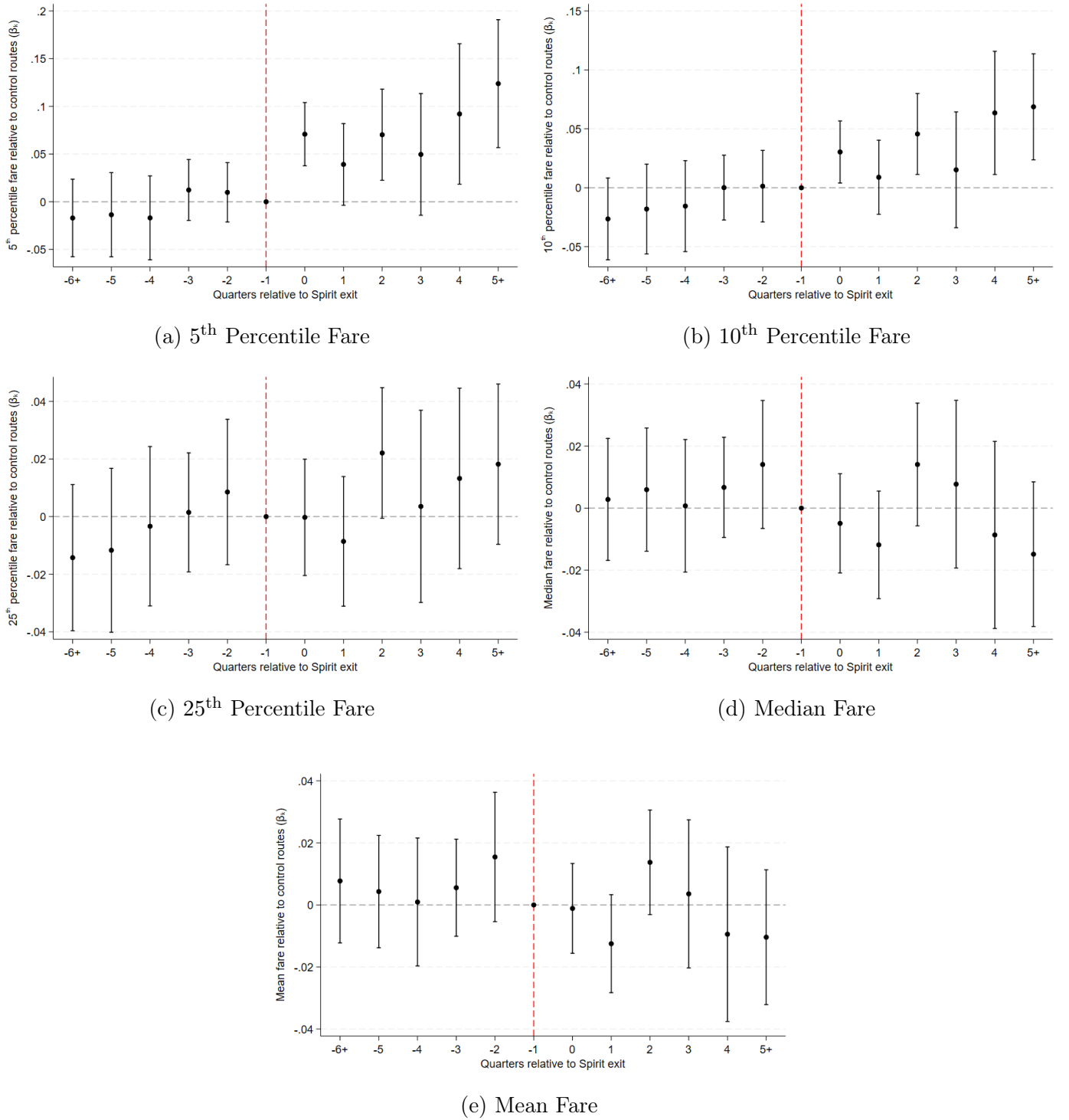
Notes: The dependent variable is indicated in each row, estimated under the alternative exit-quarter definition (the quarter following Spirit's last observation). Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

D Event Studies with (Number of Carriers) $\times$ (Calendar Quarter) Fixed Effects

Panel B in Table 4 adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects to the difference-in-differences specification. This appendix adds the same fixed effects to the event study. We re-estimate Equation (3) with these fixed effects, which absorb fare variation common to routes with the same number of ticketing carriers in the same quarter. The comparison is between routes with the same number of carriers in the same quarter that differ in whether Spirit had exited, holding the number of competitors (carriers) fixed.

Figures A-1a to A-1e report the estimates. The estimates are similar to the baseline in Figure 1 for all five fare measures. The joint F -test fails to reject the null of zero pre-period coefficients in each case, consistent with the parallel-trends assumption. The fare increases following Spirit's exit are not driven by changes in the number of competitors alone.

Figure A-1: Event Study: Spirit Exit's Effect on Fare Percentiles, Carrier $\times$ Quarter Fixed Effects



Notes: Each point plots the event-study coefficient β_k from Equation 3, estimated with carrier $\times$ quarter fixed effects, for the relevant log fare k quarters from Spirit's exit relative to the omitted period $k = -1$. Panels show, respectively, the 5th, 10th, and 25th percentile, median, and mean fare. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

E (Number of Carriers) $\times$ (Seasonal Quarter) Fixed Effects

The baseline Table 4 includes route and calendar quarter fixed effects, and Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. This robustness check addresses the concern that fares follow a seasonal pattern that differs by the level of competition. If routes with few carriers and routes with many carriers have different seasonal fare cycles, and Spirit's exits are unevenly distributed across seasons, the estimated effect could partly reflect this seasonal variation rather than the exit itself.

We address this concern by adding (Number of Carriers) $\times$ (Seasonal Quarter) fixed effects, which absorb seasonal fare variation that differs by the number of ticketing carriers. The seasonal quarter takes four values, Q1 through Q4, pooling the same quarter across all years. The joint F -test fails to reject the null of zero pre-period coefficients in each case, consistent with the parallel-trends assumption.

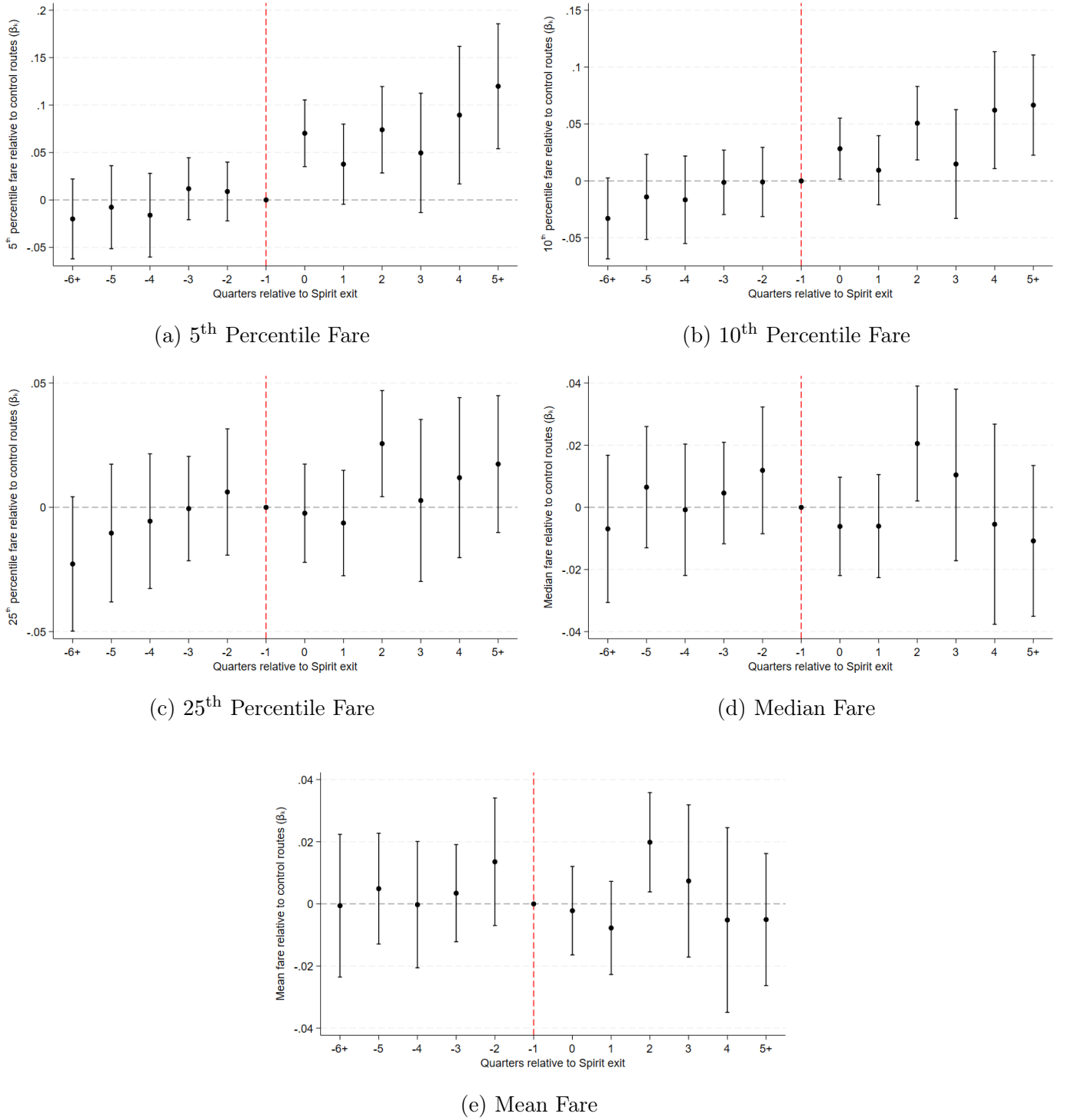
Table A-2 reports the estimates. The results are similar to those in the baseline, Table 4. Figure A-2 reports the corresponding event studies, which are similar to the baseline.

Table A-2: Airline Fares after Spirit Exit: (Number of Carriers) $\times$ (Seasonal Quarter) Fixed Effects

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)		Adj. R ²	N
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE		
$\ln(P5)$	0.074	(0.021)	0.864	19,945	0.082	(0.021)	-0.031	(0.038)	0.864	19,945
$\ln(P10)$	0.049	(0.016)	0.871	19,945	0.054	(0.017)	-0.019	(0.033)	0.871	19,945
$\ln(P25)$	0.016	(0.011)	0.882	19,945	0.019	(0.011)	-0.027	(0.021)	0.882	19,945
$\ln(P50)$	0.001	(0.010)	0.890	19,945	0.005	(0.010)	-0.048	(0.014)	0.890	19,945
$\ln(Mean)$	-0.001	(0.009)	0.920	19,945	0.002	(0.009)	-0.034	(0.011)	0.920	19,945

Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit); regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry), where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column combination corresponds to a different regression. All specifications include route and time fixed effects, (Number of Carriers) $\times$ (Seasonal Quarter) fixed effects, and are weighted by sampled passengers. Seasonal Quarter takes values Q1–Q4, interacted with the number of carriers. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Figure A-2: Event Study: Spirit Exit's Effect on Fare Percentiles



Notes: Each point plots the event-study coefficient β_k from Equation 3, the effect of Spirit's exit on the relevant log fare k quarters from exit, relative to the omitted period $k = -1$. Panels show, respectively, the 5th, 10th, and 25th percentile, median, and mean fare. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

F Event Studies by Entry Status

The main results decompose the effect of Spirit’s exit by whether a carrier entered (Table 4 and Figure 1). This appendix reports the event study for the no-entry and entry routes separately, which shows the path of fares around the exit and the pre-period coefficients for each group.

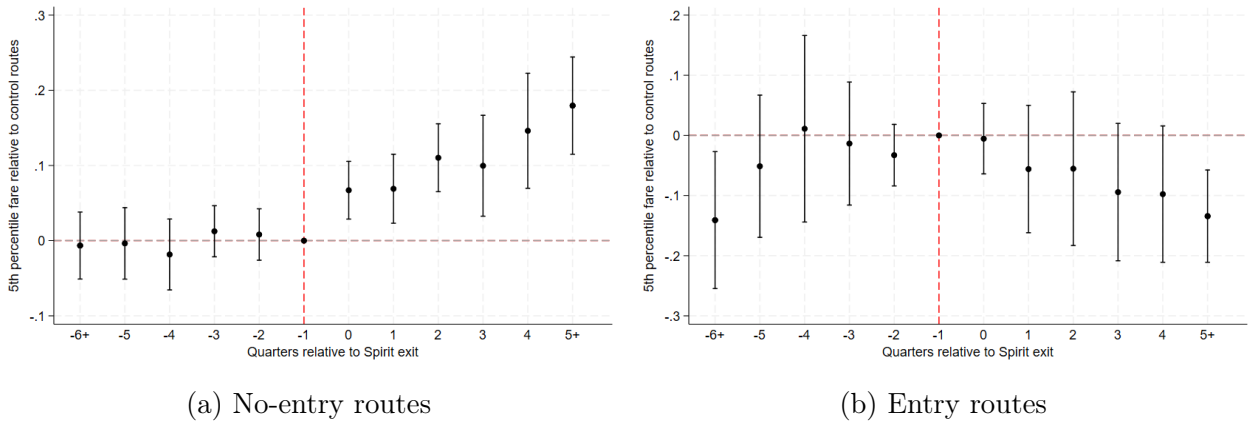
We re-estimate the event study in Equation (3) on two subsamples of treated routes. A route is a no-entry route if no ticketing carrier other than Spirit began selling nonstop service on it, with at least 20 sampled passengers in a quarter, after Spirit’s exit. On these routes, the set of competitors is unchanged, and the fare response reflects the loss of Spirit.

A route is an entry route if at least one ticketing carrier other than Spirit began selling nonstop service on it, with at least 20 sampled passengers in a quarter, after Spirit’s exit. Each subsample retains the full set of never-treated routes as the comparison group.

Panel (a) of Figures A-3 to A-7 reports the no-entry estimates. The fare increases concentrate at the bottom of the distribution. Panel (b) reports the entry estimates.

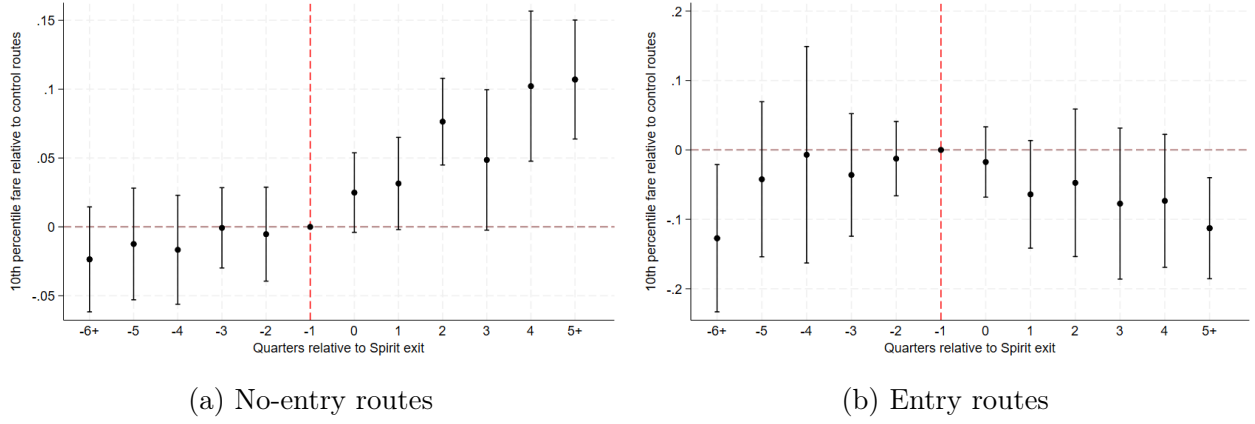
The entry subsample contains 26 treated routes. We interpret the entry figures as descriptive time-series patterns rather than as parallel-trends tests. The decomposition of the entry effect rests on the joint specification in Table 4, which is estimated on the full sample and does not depend on these figures.

Figure A-3: Event Study: Spirit Exit’s Effect on the 5th Percentile Fare



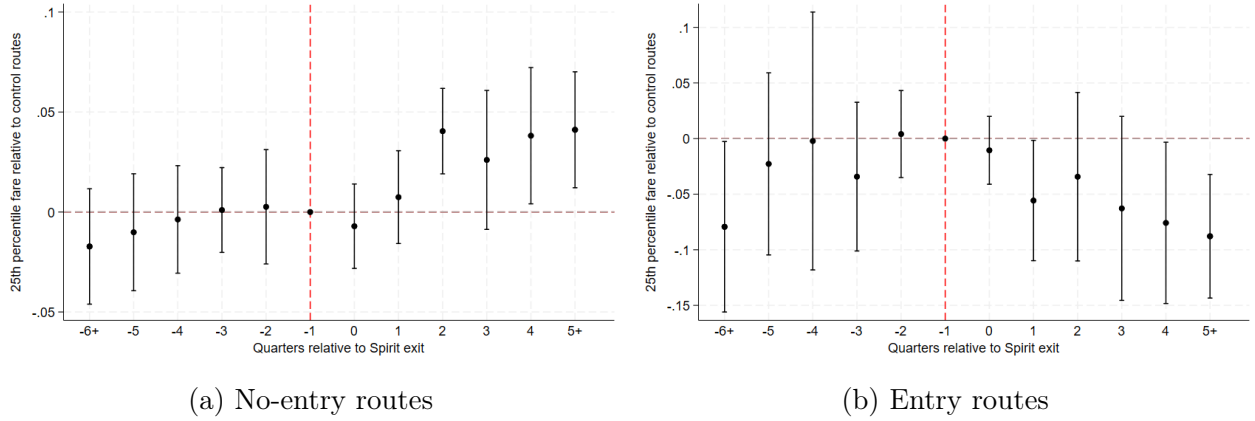
Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log 5th percentile fare k quarters from Spirit’s exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

Figure A-4: Event Study: Spirit Exit's Effect on the 10th Percentile Fare



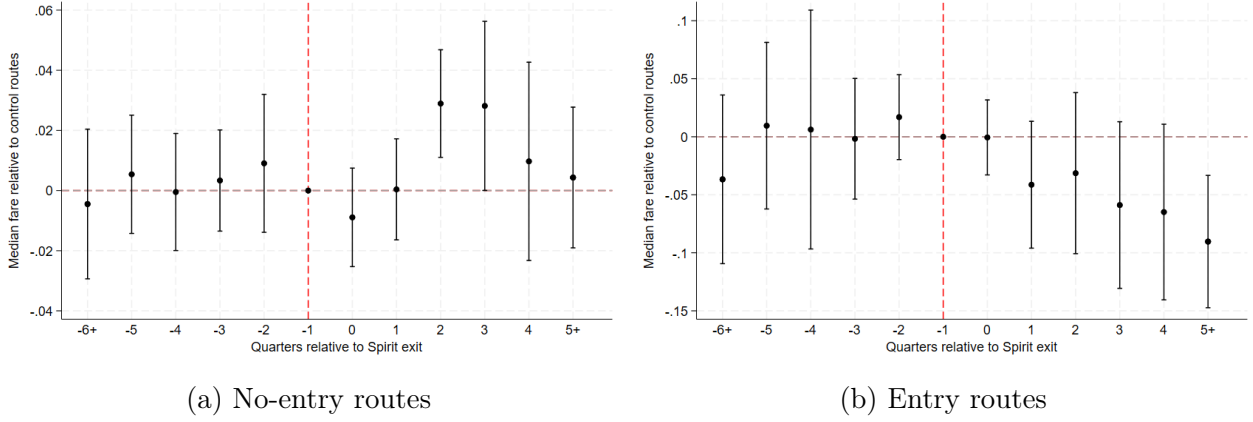
Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log 10th percentile fare k quarters from Spirit's exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

Figure A-5: Event Study: Spirit Exit's Effect on the 25th Percentile Fare



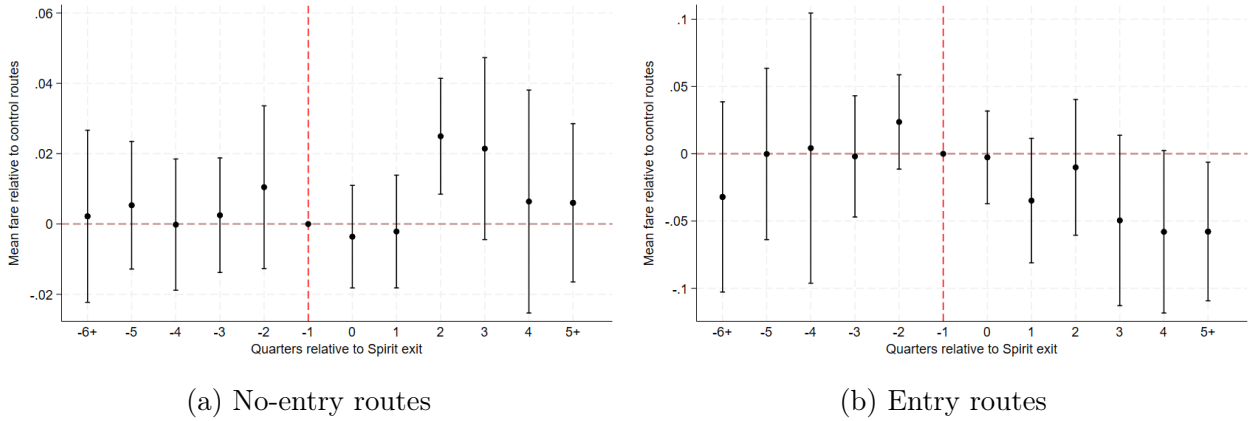
Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log 25th percentile fare k quarters from Spirit's exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

Figure A-6: Event Study: Spirit Exit's Effect on the Median Fare



Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log median fare k quarters from Spirit's exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

Figure A-7: Event Study: Spirit Exit's Effect on the Mean Fare



Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log mean fare k quarters from Spirit's exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

G Staggered Adoption

Spirit’s exits occur in different quarters across routes. Under staggered adoption with heterogeneous treatment effects, two-way fixed effects could place negative weight on some treated comparisons, because already-treated routes serve as controls for later-treated routes (Goodman-Bacon, 2021; Roth et al., 2023).

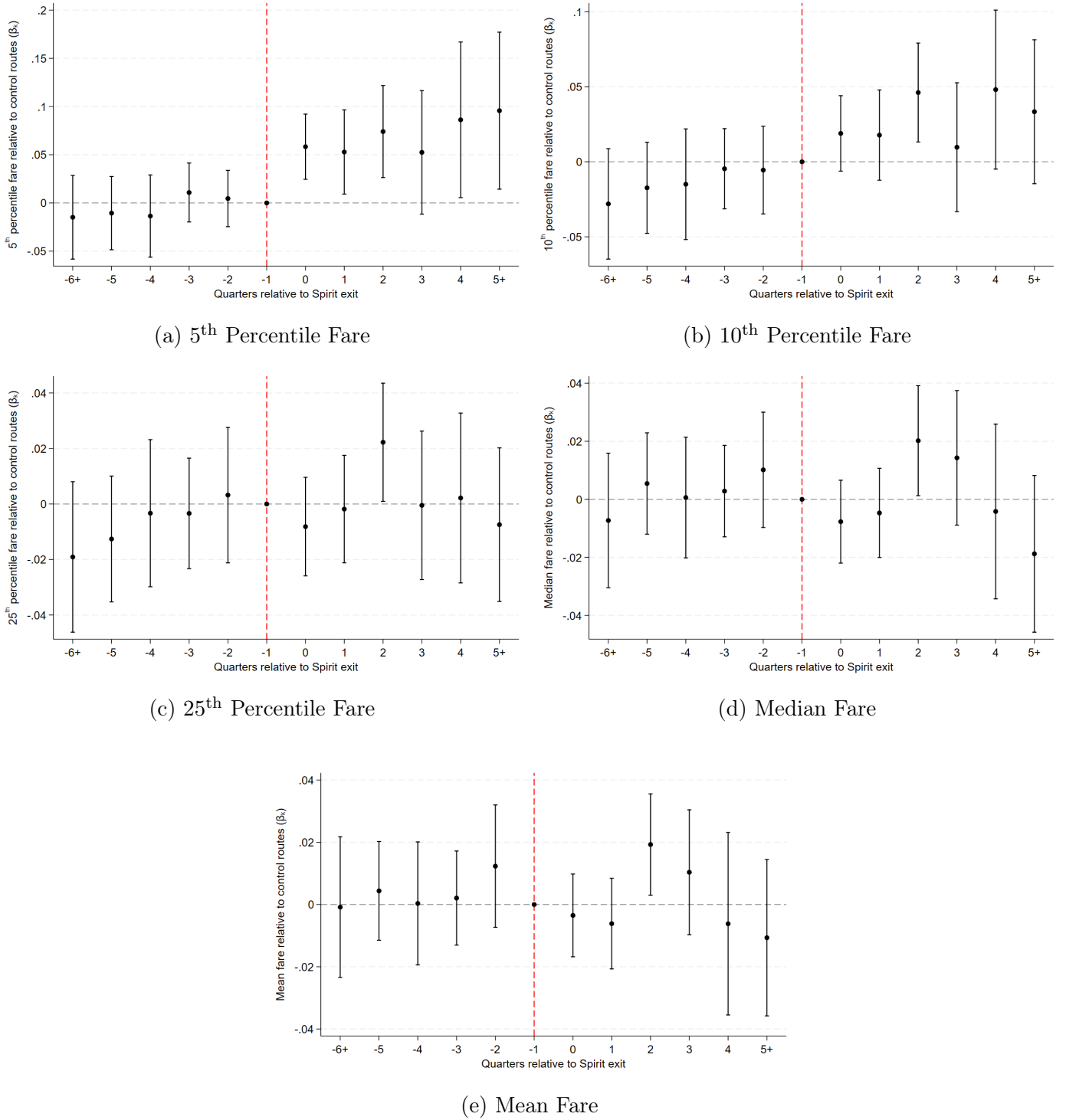
To address this concern, we repeated the analysis with the extended two-way fixed effects estimator of Wooldridge (2025), which is robust to heterogeneity across cohorts. Table A-3 reports the average effects and Figure A-8 the event study estimates. The joint F -test fails to reject the null of zero pre-period coefficients in each case, consistent with the parallel-trends assumption. The estimator requires an absorbing treatment. Spirit does not resume service on any treated route after its exit quarter, which satisfies this condition. The no-entry and entry interactions do not, because a route moves from no-entry to entry when a carrier enters. We therefore report only the average effect under this estimator and retain two-way fixed effects for the no-entry and entry specifications. The results are similar to the ones in the baseline, Table 4 and Figure 1. We also obtained similar results with the estimator of Callaway and Sant’Anna (2021).

Table A-3: Airline Fares after Spirit Exit, Extended TWFE

	ln(P5) (1)	ln(P10) (2)	ln(P25) (3)	ln(P50) (4)	ln(Mean) (5)
ATT	0.065 (0.024)	0.027 (0.014)	0.001 (0.008)	0.001 (0.007)	0.001 (0.006)
Observations	19,945	19,945	19,945	19,945	19,945

Notes: ATT is the average treatment effect on the treated, where treatment is Spirit’s exit from a route. The estimator is the extended two-way fixed effects estimator of Wooldridge (2025). All regressions are weighted by sampled passengers. Robust standard errors clustered by route are in parentheses.

Figure A-8: Extended TWFE Event Study: Spirit Exit's Effect on Fare Percentiles



Notes: Each point plots the event-study coefficient β_k , estimated using the Extended TWFE estimator, for the relevant log fare k quarters from Spirit's exit relative to the omitted period $k = -1$. Panels show, respectively, the 5th, 10th, and 25th percentile, median, and mean fare. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

H Directional Symmetry and Bidirectional Routes

The baseline defines a route as an unordered pair of airports, which pools the two directions of a city pair into one observation. We examine whether Spirit’s presence and exit timing are symmetric across directions.

Table A-4 decomposes the 313 treated routes. Spirit serves a single direction on 65 routes. It serves both directions and exits in the same quarter on 128 routes, and both directions but exits each in a different quarter on 120 routes. Table A-5 reports, for the last group, the gap in quarters between Spirit’s exit in one direction and its exit in the other. The gap is one or two quarters on 92 of the 120 routes.

The asymmetry reflects the sampling design of DB1B. The survey draws a 10% sample of tickets and does not cover both directions of a route in every quarter. On a route with low passenger volume, one direction can go unsampled in a quarter while the other is observed.

Table A-6 documents this. The single-direction routes carry fewer sampled passengers than the routes Spirit serves in both directions, 1,673 against 2,528 and 2,379. The routes most likely to miss a direction are the ones with the fewest sampled passengers. No treated route shows Spirit exiting one direction while continuing to serve the other through the end of the sample.

Table A-4: Directional Symmetry of Spirit Route Exits

Exit Type	Routes
One direction	65
Both, same quarter	128
Both, different quarters	120
Total	313

Notes: “One direction” denotes routes Spirit served and exited in a single direction only. “Both, same quarter” denotes routes Spirit served in both directions and exited both in the same quarter; “both, different quarters” denotes routes Spirit served in both directions but exited each in a different quarter.

Table A-5: Exit Gap for Asymmetric Route Exits

Gap (quarters)	Routes
1	71
2	21
3	10
4	5
5	2
6	2
7	1
8	2
9	3
10	1
11	1
12	1
Total	120

Notes: Gap is the number of quarters between the two directional exits. Routes are the bidirectional routes Spirit exited at different quarters.

Table A-6: Route Characteristics by Exit Type

Exit Type	Sampled Passengers	Carriers	Routes
One direction	1,672.61	4.98	65
Both, same quarter	2,528.44	6.15	128
Both, different quarters	2,378.50	5.94	120
Total	2,293.23	5.83	313

Notes: The unit of observation is a route. For each variable, we first average over the quarters in which the route appears, then average across routes. Sampled Passengers is quarterly sampled passengers and Carriers is the quarterly number of carriers.

The baseline, Table 4, defines a route as an unordered pair of airports. For robustness, we re-merged the data with routes defined directionally and repeated the analysis, so that each direction of a city pair is a separate observation with its own exit quarter, and standard errors clustered at the directional route level. The sample contains 37,602 directional route-quarters. Table A-7 reports the estimates. The results are similar to those reported in the main table. The directional event studies are also similar to those in Figure 1.

This addresses a measurement-error concern. The unordered-pair exit quarter is taken from the last quarter in which Spirit appears in either direction. The directional estimates assign each direction its own exit quarter and recover the baseline, so the results are robust to defining routes directionally and to timing discrepancies between the two directions. Because both definitions infer the exit quarter from Spirit’s last appearance in DB1B, this exercise does not by itself rule out sampling-driven mismeasurement of the exit timing; the checks in Section 3 address that concern.

Table A-7: Airline Fares after Spirit Exit (Bidirectional Routes)

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) × (No Entry)		(Spirit Exit) × (Entry)			
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE	Adj. R ²	N
Panel A: Baseline										
ln(<i>P</i> 5)	0.087	(0.015)	0.861	37,602	0.097	(0.016)	-0.013	(0.022)	0.861	37,602
ln(<i>P</i> 10)	0.059	(0.012)	0.869	37,602	0.065	(0.012)	-0.008	(0.018)	0.869	37,602
ln(<i>P</i> 25)	0.020	(0.008)	0.881	37,602	0.024	(0.008)	-0.021	(0.015)	0.881	37,602
ln(<i>P</i> 50)	0.001	(0.006)	0.890	37,602	0.005	(0.006)	-0.044	(0.015)	0.890	37,602
ln(<i>Mean</i>)	-0.002	(0.006)	0.920	37,602	0.001	(0.006)	-0.035	(0.012)	0.920	37,602
Panel B: Adds (Number of Carriers) × (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.075	(0.015)	0.867	37,602	0.083	(0.015)	-0.011	(0.021)	0.867	37,602
ln(<i>P</i> 10)	0.047	(0.011)	0.874	37,602	0.053	(0.012)	-0.006	(0.017)	0.875	37,602
ln(<i>P</i> 25)	0.011	(0.007)	0.886	37,602	0.014	(0.007)	-0.022	(0.014)	0.886	37,602
ln(<i>P</i> 50)	-0.008	(0.006)	0.897	37,602	-0.004	(0.006)	-0.047	(0.014)	0.897	37,602
ln(<i>Mean</i>)	-0.010	(0.005)	0.924	37,602	-0.007	(0.005)	-0.038	(0.012)	0.924	37,602

Notes: The dependent variable is indicated in each row. Routes are defined directionally (origin–destination ordered pairs). Regressions in column (1) report the coefficient on (Spirit Exit); regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry), where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Robust standard errors clustered by directional route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

I City-Pooled Entry Definition

The baseline defines entry at the airport level. This robustness check addresses the concern that a traveler may treat airports in the same metropolitan area as substitutes. If a carrier serves a neighboring airport in the same city, the baseline may code a route as a no-entry route when a substitute exists. Under the airport-level definition, a route is coded no-entry when no carrier enters the same airport pair, even if a carrier serves a neighboring airport in the same city. This could potentially misclassify routes with a metropolitan substitute as no-entry, overstating the no-entry effect and understating the entry effect.

We address this concern by pooling airports into city groups following [Brueckner et al. \(2014\)](#). The groups are Chicago (ORD, MDW), Cincinnati (CVG, DAY), Cleveland (CLE, CAK), Dallas (DFW, DAL), Houston (IAH, HOU), Miami (MIA, FLL), New York (LGA, EWR, JFK), San Francisco (SFO, OAK), Tampa (TPA, PIE), and Washington (DCA, IAD, BWI). A carrier counts as a post-exit entrant if it begins service through any airport grouped with a Spirit-exit endpoint.

Table [A-9](#) reports entry by carrier under the pooled definition, counting carrier-route pairs as in Table [3](#), Panel B. The count of carrier-route entries falls from 26 to 25, because United already served a paired airport before Spirit's exit in one of the routes.

The 5th and 10th percentile fares rise by 9.6 and 6.5 log points on no-entry routes in the baseline specification and by 8.3 and 5.2 log points with (Number of Carriers) $\times$ (Calendar Quarter) fixed effects, all statistically different from zero at the 1% level. The entry interaction is indistinguishable from zero at the bottom of the distribution, and the median and mean fares fall on entry routes.

Table A-8: Airline Fares after Spirit Exit (City-Pooled Entry Definition)

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) × (No Entry)		(Spirit Exit) × (Entry)		Adj. R ²	N
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE		
Panel A: Baseline										
ln(<i>P</i> 5)	0.086	(0.022)	0.862	19,945	0.096	(0.022)	-0.031	(0.035)	0.862	19,945
ln(<i>P</i> 10)	0.058	(0.017)	0.869	19,945	0.065	(0.017)	-0.023	(0.030)	0.869	19,945
ln(<i>P</i> 25)	0.021	(0.011)	0.881	19,945	0.026	(0.011)	-0.034	(0.019)	0.881	19,945
ln(<i>P</i> 50)	0.003	(0.010)	0.890	19,945	0.008	(0.010)	-0.053	(0.013)	0.890	19,945
ln(<i>Mean</i>)	0.001	(0.009)	0.920	19,945	0.004	(0.009)	-0.035	(0.010)	0.920	19,945
Panel B: Adds (Number of Carriers) × (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.073	(0.021)	0.867	19,945	0.083	(0.022)	-0.027	(0.035)	0.867	19,945
ln(<i>P</i> 10)	0.046	(0.016)	0.874	19,945	0.052	(0.017)	-0.020	(0.031)	0.874	19,945
ln(<i>P</i> 25)	0.011	(0.010)	0.886	19,945	0.015	(0.010)	-0.032	(0.020)	0.886	19,945
ln(<i>P</i> 50)	-0.007	(0.008)	0.896	19,945	-0.003	(0.008)	-0.055	(0.012)	0.896	19,945
ln(<i>Mean</i>)	-0.008	(0.008)	0.924	19,945	-0.006	(0.008)	-0.039	(0.010)	0.924	19,945

Notes: The dependent variable is indicated in each row. Entry is defined at the city-pair level using the [Brueckner et al. \(2014\)](#) airport groupings: a carrier counts as a post-exit entrant if it begins service through any airport grouped with the Spirit-exit endpoint. Column (1) repeats the (Spirit Exit) estimates from Table 4 so that this table is self-contained. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) under the city-pooled entry definition, where pre-exit and never-treated route-quarters form the common reference category. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Table A-9: Entry to Spirit Exit Routes by Carrier: City-Pooled

Carrier	Routes
United Airlines (UA)	9
Frontier Airlines (F9)	7
Southwest Airlines (WN)	5
JetBlue Airways (B6)	2
Breeze Airways (MX)	1
Avelo Airlines (XP)	1
Total	25

Notes: Entry is defined at the city-pair level using the airport groupings of [Brueckner et al. \(2014\)](#). A carrier counts as a post-exit entrant if it begins service through any airport grouped with a Spirit-exit endpoint. Each row reports the number of city-pooled routes a carrier entered, counting carrier-route pairs. The count falls from 26 under the airport-level definition (Table 3, Panel B) to 25 because one United entry occurs at an airport pooled with one United already served.

J Robustness of Standard Errors

The baseline, Table 4, clusters standard errors at the route level. We repeated the analysis clustering the standard errors at different levels and obtained similar results, including, among others, standard errors clustered at the route and quarter level, the single endpoint-airport level, and the double endpoint-airport level. We also performed wild cluster bootstrap tests and obtained similar results.

J.1 Two-Way Clustering by Route and Quarter

This robustness check addresses the concern that common fare shocks in a quarter may correlate the errors across routes. Table A-10 repeats the analysis in the baseline, Table 4, with standard errors clustered by route and quarter. The results are similar to those reported in the main table.

Table A-10: Airline Fares after Spirit Exit: Two-Way Clustering by Route and Quarter

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)			
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE	Adj. R ²	N
Panel A: Baseline										
ln(<i>P</i> 5)	0.086	(0.025)	0.862	19,945	0.095	(0.025)	-0.037	(0.041)	0.862	19,945
ln(<i>P</i> 10)	0.058	(0.021)	0.869	19,945	0.064	(0.021)	-0.024	(0.035)	0.869	19,945
ln(<i>P</i> 25)	0.021	(0.014)	0.881	19,945	0.025	(0.014)	-0.034	(0.021)	0.881	19,945
ln(<i>P</i> 50)	0.003	—	0.889	19,945	0.007	(0.011)	-0.053	(0.014)	0.890	19,945
ln(<i>Mean</i>)	0.001	—	0.920	19,945	0.004	—	-0.038	—	0.920	19,945
Panel B: Adds (Number of Carriers) $\times$ (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.073	(0.024)	0.867	19,945	0.082	(0.024)	-0.030	(0.040)	0.867	19,945
ln(<i>P</i> 10)	0.046	(0.020)	0.874	19,945	0.051	(0.020)	-0.020	(0.035)	0.874	19,945
ln(<i>P</i> 25)	0.011	(0.013)	0.886	19,945	0.014	(0.013)	-0.030	(0.022)	0.886	19,945
ln(<i>P</i> 50)	-0.007	(0.010)	0.896	19,945	-0.003	(0.010)	-0.054	(0.012)	0.896	19,945
ln(<i>Mean</i>)	-0.008	—	0.924	19,945	-0.006	(0.010)	-0.041	(0.012)	0.924	19,945

Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$, where the dependent variable y_{rt} denotes the fare outcome of interest for route r in quarter t : 5th, 10th, or 25th percentile fare, the median fare, or the mean fare, as indicated in each row. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Standard errors are two-way clustered by route and quarter. Cells marked “—” are coefficients for which the two-way clustered variance estimate is not positive definite; each is estimated with a finite route-clustered standard error in Table 4. See Section 2.3 for a description of the data and Appendix A for variable definitions.

J.2 Single Endpoint-Airport Clustering

This robustness check addresses the concern that Spirit’s exits from a shared airport may be correlated across routes with that airport as an endpoint. Table [A-11](#) repeats the analysis in the baseline, Table [4](#), with standard errors clustered on a single endpoint airport of each route. The results are similar to those reported in the main table.

Because a route is an unordered airport pair, clustering on a single endpoint captures correlation through that airport only. The double endpoint-airport specification in Appendix [J.3](#) addresses correlation through either airport of a route.

Table A-11: Airline Fares after Spirit Exit: Single Endpoint-Airport Clustering

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)			
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE	Adj. R ²	N
Panel A: Baseline										
ln(<i>P</i> 5)	0.086	(0.024)	0.862	19,945	0.095	(0.027)	-0.037	(0.032)	0.862	19,945
ln(<i>P</i> 10)	0.058	(0.018)	0.869	19,945	0.064	(0.020)	-0.024	(0.026)	0.869	19,945
ln(<i>P</i> 25)	0.021	(0.013)	0.881	19,945	0.025	(0.013)	-0.034	(0.020)	0.881	19,945
ln(<i>P</i> 50)	0.003	(0.011)	0.890	19,945	0.007	(0.011)	-0.053	(0.020)	0.890	19,945
ln(<i>Mean</i>)	0.001	(0.009)	0.920	19,945	0.004	(0.010)	-0.038	(0.012)	0.920	19,945
Panel B: Adds (Number of Carriers) $\times$ (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.073	(0.023)	0.867	19,945	0.082	(0.026)	-0.030	(0.031)	0.867	19,945
ln(<i>P</i> 10)	0.046	(0.018)	0.874	19,945	0.051	(0.020)	-0.020	(0.023)	0.874	19,945
ln(<i>P</i> 25)	0.011	(0.012)	0.886	19,945	0.014	(0.013)	-0.030	(0.017)	0.886	19,945
ln(<i>P</i> 50)	-0.007	(0.010)	0.896	19,945	-0.003	(0.011)	-0.054	(0.017)	0.896	19,945
ln(<i>Mean</i>)	-0.008	(0.009)	0.924	19,945	-0.006	(0.009)	-0.041	(0.011)	0.924	19,945

Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$, where the dependent variable y_{rt} denotes the fare outcome of interest for route r in quarter t : 5th, 10th, or 25th percentile fare, the median fare, or the mean fare, as indicated in each row. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Standard errors are clustered on a single endpoint airport of each route. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

J.3 Double Endpoint-Airport Clustering

This robustness check addresses the concern that Spirit's exits from a shared airport may be correlated across routes with that airport as an endpoint. Table [A-12](#) repeats the analysis in the baseline, Table [4](#), with standard errors two-way clustered on both endpoint airports of each route. Standard errors are two-way clustered on the two endpoint airports of each route, with each airport treated as a single cluster regardless of its position in the pair. This captures correlation among all routes sharing an airport. The results are similar to those reported in the main table.

Table A-12: Airline Fares after Spirit Exit: Double Endpoint-Airport Clustering

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)			
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE	Adj. R ²	N
Panel A: Baseline										
ln(<i>P</i> 5)	0.086	(0.024)	0.862	19,945	0.095	(0.028)	-0.037	(0.033)	0.862	19,945
ln(<i>P</i> 10)	0.058	(0.017)	0.869	19,945	0.064	(0.020)	-0.024	(0.027)	0.869	19,945
ln(<i>P</i> 25)	0.021	(0.012)	0.881	19,945	0.025	(0.013)	-0.034	(0.020)	0.881	19,945
ln(<i>P</i> 50)	0.003	(0.011)	0.890	19,945	0.007	(0.012)	-0.053	(0.020)	0.890	19,945
ln(<i>Mean</i>)	0.001	(0.009)	0.920	19,945	0.004	(0.009)	-0.038	(0.012)	0.920	19,945
Panel B: Adds (Number of Carriers) $\times$ (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.073	(0.024)	0.867	19,945	0.082	(0.028)	-0.030	(0.032)	0.867	19,945
ln(<i>P</i> 10)	0.046	(0.018)	0.874	19,945	0.051	(0.020)	-0.020	(0.022)	0.874	19,945
ln(<i>P</i> 25)	0.011	(0.011)	0.886	19,945	0.014	(0.012)	-0.030	(0.015)	0.886	19,945
ln(<i>P</i> 50)	-0.007	(0.010)	0.896	19,945	-0.003	(0.010)	-0.054	(0.016)	0.896	19,945
ln(<i>Mean</i>)	-0.008	(0.008)	0.924	19,945	-0.006	(0.009)	-0.041	(0.009)	0.924	19,945

Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$, where the dependent variable y_{rt} denotes the fare outcome of interest for route r in quarter t : 5th, 10th, or 25th percentile fare, the median fare, or the mean fare, as indicated in each row. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Standard errors are two-way clustered on both endpoint airports of each route and reported in parentheses.

K Robustness to Sample Size per Route-Quarter

Because DB1B is a 10 percent sample of tickets, a route-quarter fare percentile is estimated from the tickets sampled on that route in that quarter. This robustness check addresses the concern that, on routes with few sampled tickets, the percentiles may be imprecisely estimated. The median treated route-quarter rests on 632 sampled tickets and the median control route-quarter on 1,619. Of the 4,368 treated route-quarters, 92.2 percent contain at least 50 sampled tickets and 87.5 percent contain at least 100. The corresponding shares on the 15,577 control route-quarters are 97.4 and 95.6 percent.

Table [A-13](#) re-estimates the 5th and 10th percentile regressions in the baseline, Table [4](#), dropping route-quarters in which the fare percentiles are estimated from few sampled tickets. A route-quarter is the unit of observation, and its fare percentiles are computed from the tickets sampled on that route in that quarter. Panel A is the full sample. Panel B drops route-quarters with fewer than 50 sampled tickets. Panel C drops those with fewer than 100. The results are similar to those reported in the main table. The results do not depend on the route-quarters with the fewest sampled tickets.

Table A-13: Airline Fares after Spirit Exit: Minimum Tickets per Route-Quarter

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) × (No Entry)		(Spirit Exit) × (Entry)			
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE	Adj. R ²	N
Panel A: Full sample										
ln(<i>P</i> 5)	0.086	(0.022)	0.862	19,945	0.095	(0.022)	-0.037	(0.038)	0.862	19,945
ln(<i>P</i> 10)	0.058	(0.017)	0.869	19,945	0.064	(0.017)	-0.024	(0.033)	0.869	19,945
Panel B: ≥ 50 tickets										
ln(<i>P</i> 5)	0.086	(0.022)	0.862	19,192	0.095	(0.022)	-0.037	(0.038)	0.862	19,192
ln(<i>P</i> 10)	0.058	(0.017)	0.869	19,192	0.064	(0.017)	-0.024	(0.033)	0.869	19,192
Panel C: ≥ 100 tickets										
ln(<i>P</i> 5)	0.085	(0.022)	0.861	18,705	0.095	(0.022)	-0.037	(0.038)	0.862	18,705
ln(<i>P</i> 10)	0.058	(0.017)	0.869	18,705	0.064	(0.017)	-0.025	(0.033)	0.869	18,705

Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. All regressions include route and time fixed effects and are weighted by sampled passengers. Panel A uses the full estimation sample; Panels B and C drop route-quarter cells with fewer than 50 and 100 underlying fare records, respectively. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Because the regressions are weighted by sampled passengers, route-quarters with few sampled tickets already receive little weight, so dropping them changes the estimates negligibly. The values differ from the full sample beyond the third decimal and coincide at the reported precision. For example, the ln(P5) coefficient on (Spirit Exit) is 0.085527 in the full sample, 0.08555 dropping cells below 50 tickets, and 0.08540 dropping cells below 100 tickets, with standard errors of 0.02174, 0.02175, and 0.02179 respectively.

L Entry Analysis

This appendix characterizes the routes that experienced post-exit entry and the carriers that entered.

Table A-14 compares the treated routes by entry status. Routes that a carrier entered average 3,272 sampled passengers per quarter. Routes that no carrier entered average 2,205. Entry concentrates on the routes with higher traffic. The number of carriers and the distance are similar across the two groups.

Table A-15 reports fare changes by the type of entrant. Routes are coded by the first entrant as ULCC or non-ULCC.⁴⁵ Each row is the mean change in the indicated log fare from the four quarters before exit to the four quarters after, differenced against the never-treated control routes over the same calendar window. On routes entered by a ULCC, fares fall across the distribution. On routes entered by a non-ULCC carrier, the lowest fares rise. The pattern is consistent with the regression evidence that entry lowers fares in the middle of the distribution and leaves the lowest fares unchanged. As an additional robustness, we repeated the table restricting to the 19 routes with a complete post-entry window. Such analysis leaves the non-ULCC pattern unchanged and attenuates the ULCC decline. Similar results are obtained. The directional contrast holds in both. The route counts are small, so the table is descriptive.

Table A-14: Route Characteristics by Entry Status

	No entry	Entry
Mean Sampled Passengers	2,204.54	3,272.25
Mean Number of Carriers	5.80	6.10
Mean Distance	1,701.57	1,537.75
Routes	287	26

Notes: Entry is defined as any ticketing carrier that had not previously sold nonstop service on the route beginning to do so, with at least 20 sampled passengers in a quarter, no earlier than one quarter after Spirit's exit. The unit of observation is a route. Each measure is averaged first over the quarters in which the route appears and then across routes. Mean Passengers is the quarterly count of sampled passengers, Mean Carriers the quarterly number of carriers, and Mean Distance the quarterly market distance. Routes is the number of routes in each group.

⁴⁵19 routes have a complete four-quarter post-entry window, 6 of the 9 ultra-low-cost and 13 of the 17 non-ULCC; the remaining 7 have a shorter one.

Table A-15: Fare Changes after Spirit Exit by Entrant Type

	ULCC	Non-ULCC
Routes	9	17
Mean Sampled Passengers	6,000.7	1,827.8
$\Delta \ln(P5)$	-0.133	0.076
$\Delta \ln(P10)$	-0.116	0.030
$\Delta \ln(P25)$	-0.065	-0.012
$\Delta \ln(P50)$	-0.038	-0.008
$\Delta \ln(Mean)$	-0.036	-0.016

Notes: Entry is defined as any ticketing carrier that had not previously sold nonstop service on the route beginning to do so, with at least 20 sampled passengers in a quarter, no earlier than one quarter after Spirit's exit. Routes are coded by the first entrant. ULCC is ultra-low-cost carrier entrants: Frontier, Breeze, and Avelo. Non-ULCC is any carrier that is not a ULCC. "Mean passengers" is the route-level average of quarterly sampled passengers. Each $\Delta \ln(\cdot)$ row is the mean change in the indicated log fare measure from the four quarters before Spirit's exit to the four quarters after, differenced against the never-treated control routes over the same cohort-matched calendar window. The route counts are small, so the table is descriptive.

M Alternative Entry Definitions and Sampled Passenger Thresholds

This robustness check presents alternative entry definitions. An operating carrier is the airline that physically operates the flight. A ticketing carrier is the airline that sells the ticket. Table A-16 reports bottom-percentile results under operating carrier entry with no sampled passenger threshold, ticketing carrier entry with no threshold, and ticketing carrier entry with a 20 sampled passenger threshold. Table A-17 reports bottom-percentile results across sampled passenger thresholds for the ticketing carrier nonstop entry definition. Across all threshold definitions, the (Spirit Exit) $\times$ (No Entry) coefficient is similar and significant at the 1% level for both the 5th and 10th percentile fares. For routes with entry, none of the estimates are statistically significant, except under the operating carrier definition at the 5th percentile, where the coefficient is significant at the 10% level.

Under the operating carrier definition, a regional airline flying under a capacity purchase agreement counts as a distinct entrant from the mainline carrier it operates for. Entry is defined as an operating carrier entering a route at least a quarter after Spirit's exit. All of the robustness analyses conducted under the nonstop ticketing carrier definition have been replicated under the operating carrier definition, with similar results. To conserve space, we report a subset below.

Table A-18 reports the number of entries for each operating carrier. Of the 63 entries under this definition, 26 are operated by regional airlines (Envoy, SkyWest, Republic, Mesa, PSA, and Horizon) flying under capacity purchase agreements for the mainline carriers that ticket and price the service. Table A-19 repeats the analysis in the baseline, Table 4, with entry definitions based on operating carriers. Figures A-9 and A-10 show the event studies on entry and no-entry subsamples based on equation 3. Table A-20 repeats the staggered robustness in Appendix G with the new entry definitions. These results are similar to those from the baseline ticketing carrier entry definition in Table 4.

Table A-16: Bottom-Percentile Effects: Operating vs. Ticketing Definitions

Definition	Itinerary	ln(P5)				ln(P10)			
		× No Entry $\hat{\beta}_2$	× Entry $\hat{\beta}_3$	Adj. R ²	N	× No Entry $\hat{\beta}_2$	× Entry $\hat{\beta}_3$	Adj. R ²	N
Operating, no threshold	Any	0.098 (0.024)	0.037 (0.022)	0.862	19,945	0.066 (0.018)	0.025 (0.019)	0.869	19,945
Ticketing, no threshold	Any	0.088 (0.020)	0.075 (0.056)	0.862	19,945	0.059 (0.016)	0.050 (0.041)	0.869	19,945
Ticketing, ≥ 20	Any	0.093 (0.022)	−0.053 (0.055)	0.862	19,945	0.063 (0.017)	−0.041 (0.049)	0.869	19,945
Ticketing, ≥ 20 ^a	Nonstop	0.095 (0.022)	−0.037 (0.038)	0.862	19,945	0.064 (0.017)	−0.024 (0.033)	0.869	19,945

Notes: ^a The ticketing, nonstop, ≥ 20 definition is the baseline in Table 4. Operating refers to the entry definition by operating carrier. Ticketing refers to the entry definition by ticketing carrier. The threshold is the minimum number of sampled passengers a carrier must ticket on a route in a quarter, counting both nonstop and connecting itineraries, for that carrier to count as an entrant. The Itinerary column indicates whether the entering carrier must begin selling nonstop service or service on any itinerary. Regressions report the coefficients on (Spirit Exit) × (No Entry) and (Spirit Exit) × (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Table A-17: Bottom-Percentile Effects across Sampled Passenger Thresholds: Ticketing Carrier Nonstop Definition

Definition	ln(P5)				ln(P10)			
	× No Entry $\hat{\beta}_2$	× Entry $\hat{\beta}_3$	Adj. R ²	N	× No Entry $\hat{\beta}_2$	× Entry $\hat{\beta}_3$	Adj. R ²	N
Ticketing, no threshold	0.087 (0.019)	0.074 (0.068)	0.862	19,945	0.058 (0.016)	0.054 (0.048)	0.869	19,945
Ticketing, ≥ 10	0.095 (0.022)	−0.018 (0.037)	0.862	19,945	0.064 (0.017)	−0.011 (0.030)	0.869	19,945
Ticketing, ≥ 20 ^a	0.095 (0.022)	−0.037 (0.038)	0.862	19,945	0.064 (0.017)	−0.024 (0.033)	0.869	19,945
Ticketing, ≥ 45	0.096 (0.022)	−0.050 (0.039)	0.862	19,945	0.065 (0.017)	−0.034 (0.035)	0.869	19,945
Ticketing, ≥ 90	0.095 (0.022)	−0.060 (0.046)	0.862	19,945	0.064 (0.017)	−0.046 (0.041)	0.870	19,945

Notes: ^a The ≥ 20 row is the baseline in Table 4. Ticketing refers to the entry definition by ticketing carrier. The threshold is the minimum number of sampled passengers a carrier must ticket on a route in a quarter, counting both nonstop and connecting itineraries, for that carrier to count as an entrant. Entry is measured on nonstop itineraries in all rows. Regressions report the coefficients on (Spirit Exit) × (No Entry) and (Spirit Exit) × (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Table A-18: Entry by Operating Carrier

Carrier	Entries
Frontier Airlines (F9)	14
Sun Country Airlines (SY)	11
Envoy Air (MQ)	9
JetBlue Airways (B6)	6
SkyWest Airlines (OO)	6
Republic Airline (YX)	6
Alaska Airlines (AS)	3
Mesa Airlines (YV)	3
Breeze Airways (MX)	1
PSA Airlines (OH)	1
Horizon Air (QX)	1
United Airlines (UA)	1
Avelo Airlines (XP)	1
Total	63

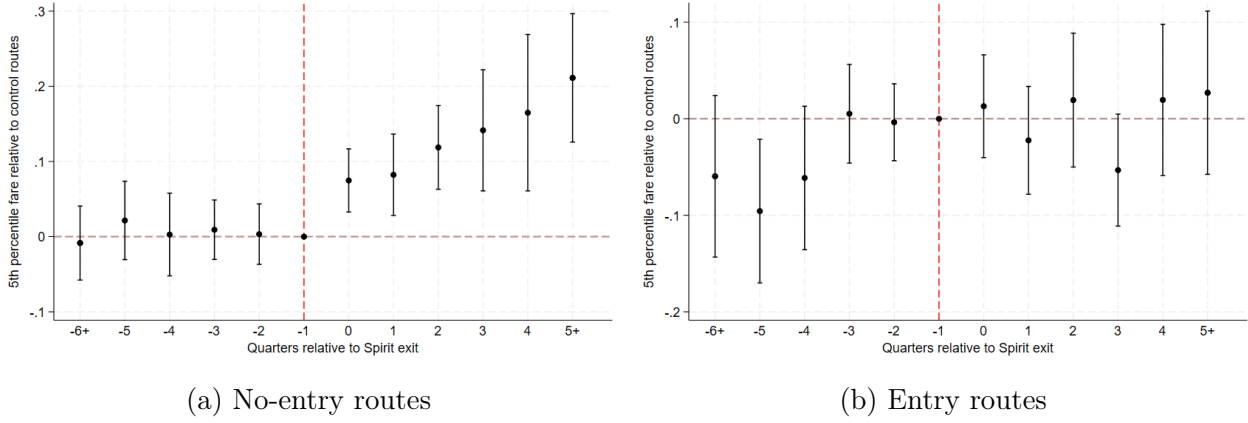
Notes: Each row reports the number of routes a carrier entered after Spirit's exit. Entry refers to a carrier-route entry (a carrier-route pair), so a route entered by more than one carrier contributes to more than one row. The 63 carrier-route entries occurred on 52 unique routes; 10 routes were entered by more than one carrier (nine by two, one by three).

Table A-19: Airline Fares after Spirit Exit: Operating Carrier Entry Definition

	(1)				(2)					
	(Spirit Exit)				(Spirit Exit) $\times$ (No Entry)		(Spirit Exit) $\times$ (Entry)		Adj. R ²	N
	$\hat{\beta}_1$	SE	Adj. R ²	N	$\hat{\beta}_2$	SE	$\hat{\beta}_3$	SE		
Panel A: Baseline										
ln(<i>P</i> 5)	0.085	(0.022)	0.862	19,943	0.098	(0.024)	0.037	(0.022)	0.862	19,943
ln(<i>P</i> 10)	0.058	(0.017)	0.869	19,943	0.066	(0.018)	0.024	(0.019)	0.869	19,943
ln(<i>P</i> 25)	0.021	(0.011)	0.881	19,943	0.027	(0.012)	-0.003	(0.014)	0.881	19,943
ln(<i>P</i> 50)	0.003	(0.010)	0.890	19,943	0.010	(0.010)	-0.023	(0.012)	0.890	19,943
ln(<i>Mean</i>)	0.001	(0.009)	0.920	19,943	0.006	(0.009)	-0.020	(0.010)	0.920	19,943
Panel B: Adds (Number of Carriers) $\times$ (Calendar Quarter) F.E.										
ln(<i>P</i> 5)	0.070	(0.020)	0.866	19,943	0.083	(0.022)	0.022	(0.021)	0.866	19,943
ln(<i>P</i> 10)	0.045	(0.015)	0.874	19,943	0.053	(0.016)	0.014	(0.018)	0.874	19,943
ln(<i>P</i> 25)	0.013	(0.010)	0.885	19,943	0.019	(0.010)	-0.008	(0.013)	0.885	19,943
ln(<i>P</i> 50)	-0.002	(0.008)	0.894	19,943	0.004	(0.009)	-0.024	(0.011)	0.894	19,943
ln(<i>Mean</i>)	-0.004	(0.008)	0.923	19,943	0.001	(0.008)	-0.022	(0.009)	0.923	19,943

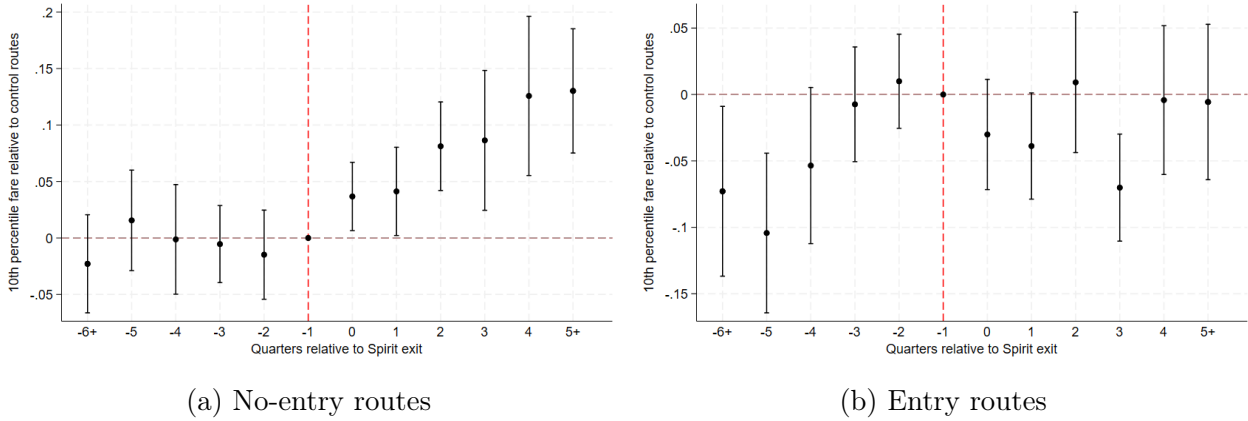
Notes: The dependent variable is indicated in each row. Regressions in column (1) report the coefficient on (Spirit Exit) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_1 (\text{Spirit Exit})_{rt} + \varepsilon_{rt}$, where the dependent variable y_{rt} denotes the fare outcome of interest for route r in quarter t : 5th, 10th, or 25th percentile fare, the median fare, or the mean fare, as indicated in each row. Regressions in column (2) report the coefficients on (Spirit Exit) $\times$ (No Entry) and (Spirit Exit) $\times$ (Entry) from the specification $\ln(y)_{rt} = \alpha_r + \gamma_t + \beta_2 (\text{Spirit Exit} \times \text{No Entry})_{rt} + \beta_3 (\text{Spirit Exit} \times \text{Entry})_{rt} + \varepsilon_{rt}$, where pre-exit and never-treated route-quarters form the common reference category. Each row (fare measure) and column (1 and 2) combination corresponds to a different regression. Panel A includes route and time fixed effects. Panel B adds (Number of Carriers) $\times$ (Calendar Quarter) fixed effects. All regressions are weighted by sampled passengers. Robust standard errors clustered by route are in parentheses. See Section 2.3 for a description of the data. See Appendix A for variable definitions.

Figure A-9: Event Study: Spirit Exit's Effect on the 5th Percentile Fare



Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log 5th percentile fare k quarters from Spirit's exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

Figure A-10: Event Study: Spirit Exit's Effect on the 10th Percentile Fare



Notes: Each point plots the event-study coefficient β_k from Equation 3 for the log 10th percentile fare k quarters from Spirit's exit, relative to the omitted period $k = -1$. Panel (a) is estimated on routes with no post-exit entry and Panel (b) on routes with post-exit entry, each using the full set of never-treated routes as the comparison group. Capped bars are 95% confidence intervals from standard errors clustered at the route level. The dashed vertical line marks the reference period; the endpoints bin all periods at -6 and earlier and 5 and later.

Table A-20: Airline Fares after Spirit Exit, Extended TWFE

	ln(P5) (1)	ln(P10) (2)	ln(P25) (3)	ln(P50) (4)	ln(Mean) (5)
ATT	0.065 (0.024)	0.026 (0.014)	0.001 (0.008)	0.001 (0.007)	0.001 (0.006)
Observations	19,943	19,943	19,943	19,943	19,943

Notes: ATT is the average treatment effect on the treated, where treatment is Spirit's exit from a route. The estimator is the extended two-way fixed effects by [Wooldridge \(2025\)](#). All regressions are weighted by sampled passengers. Robust standard errors clustered by route are in parentheses.