

Southwest Airlines and the Impact of Low-Cost Carriers On Airline Ticket Prices

By Sidney Field*

Southwest Airlines is the indisputable leader of the Low-Cost Airline industry in the United States. A product of deregulation, the expansion of its unique business model has been responsible for the substantial real price declines in consumer airfares since the 1980s. However, recent fuel price declines have had a significant impact on the industry and their impact on the low-cost sector today, as the driver of price competition, is important to understand. This paper includes a multivariate linear regression of 2015 data to examine the impact of various US LCCs on average airport, airport-route, and city-route fares, and compares the impacts to the results of ticket data from 2012 and 2007, with a particular interest in the effect of Southwest. It concludes that despite industry concentration, the association of Southwest with lower average route, airport, and market prices had actually strengthened from 2012 to 2015.

Keywords: Airlines; Low-cost airlines; LCCs; Airline deregulation; Southwest effect, Airline pricing; Legacy carriers.

I. Introduction

The growth of Southwest airlines in the era of deregulated transportation markets has arguably been the most influential development in air transport within the US. This study investigates the effect that Southwest and its Low-Cost Carrier (LCC) contemporaries have had on average US ticket prices in the face of significant structural changes in the industry. This paper presents a brief history of US airline deregulation and the subsequent growth of Southwest Airlines resulting from its unique business model and its impact on

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airline competition. An econometric model follows examining the fare impacts of Southwest's growth from several perspectives: specific airports, airport-pair routes, and city-pair routes for 2007, 2012, and 2015.

Major merger activity has reduced the eight largest US airlines (including Southwest, which acquired AirTran) to four since 2008, and such a shift makes it important to understand the nature of price competition in the industry's current state. Legacy carriers, which today are only American, Delta, and United, are the "full fare" airlines that the LCC model aspires to compete with on price. These carriers comprise the status quo against which the presence of particular LCCs at specific airports, on routes between specific airports, and on routes between specific cities, is measured in this study, through the impact on average airfares. With the recent attrition of half of the industry players through consolidation, the expectation is that price competition by Southwest, as measured against the full fare legacy carriers, has decreased. Since only four firms today as opposed to eight in 2008, account for nearly 90% of domestic traffic, it is necessary to track any weakening of the average consumer's pricing power.

The study's multivariate linear regression of airfares, however, indicates that the negative pressure that Southwest and other LCCs have exerted on prices has actually increased since 2012, despite the industry mergers. The most compelling reason for this apparent violation of classic firm-size theory is found to lie in the recent large decline in jet fuel prices that saw every player make enormous windfall profits. Competing was easier.

The development of the LCC concept and the outsize emphasis on Southwest Airlines is only understood by examining the fundamentals of both this airline's history and business model in the context of airline deregulation that began in 1978. The necessity of Southwest, as the largest LCC by far, to keep the deregulated environment working for the greatest consumer interest, motivates this study.

II. Background

REGULATION AND DEREGULATION OF THE U.S. AIRLINE INDUSTRY

In 2015, nearly 700 million domestic passengers were carried by U.S. commercial air carriers. The industry is a far cry from the 1925 Kelly Air Mail Act that first established the government's authority to regulate airfares and allocate distinct air mail routes to private carriers. The modern, post-World War II era started when the Civil Aeronautics Board (CAB) separated the industry into sixteen mainline "trunk" carriers that provided intercity service, and a multitude of supporting regional "feeder" carriers that fed service

to the main trunk route cities. This initial model distinctly mirrored the layout of the railroad industry (Davies, 2011).

The CAB also possessed the power to approve fares, which it did so that revenues would be “sufficient to ensure the performance of the service” to the point where the airline system was “of a character and quality required for the commerce of the United States” (Civil Aeronautics Act of 1938, as cited in Bornstein, 2007). The economic result was that the independent airlines competed for customers through frills such as meals and increased capacity and more flights.

By the 1970s, jet travel had become normal and acceptable. The Boeing 747 ushered in the wide-body era, which enabled mass-scale air travel. Newer airports of the time such as Washington Dulles, JFK, O’Hare, Houston Intercontinental, and DFW were equipped to handle massive volumes of new passengers that the regulated era had been discouraging with higher prices. With the technology essentially ready and the trunk airlines having stagnated with inefficient service, the swift passage of the Airline Deregulation Act in October 1978 brought the network and price controls of the CAB to an end. The U.S. swiftly became the first large-scale, free market for air transport in the world.

When Braniff Airways, one of the original trunk carriers, started service on 300 new routes within the first two years of deregulation, its high-cost business model sent the airline arcing deep into the red, resulting in its full demise in 1982. It was the first casualty of deregulation. Likewise, numerous upstart airlines launching in the 1980s did the same. Midway, People Express, and Presidential Airways all tried to take on a low-cost model and rapidly expand, but they were confronted with unsustainable corporate leverage and an oil price shock related to the first Gulf War. These factors saw some liquidated and some acquired by the trunk carriers, known by this time as “legacy” carriers (Davies, 2011). These relatively unsuccessful Low-Cost Carriers (LCCs) that ceased around 1990 comprised the first wave of what would become a disruptive business model in the industry.

In the early 1990s, as deregulation caught up to and extinguished Eastern Airlines and then Pan-American, the domestic market was briefly without the pressure of any formidable low-cost carrier. It had been nearly 15 years since the beginning of deregulation, and most of the upstarts of the post-1978 era had all folded by the beginning of the decade (Davies, 2011). A 180% spike in the price of oil due to the Gulf War in 1990-1991 was also occupying the rest of the industry,¹ and the second generation LCC’s such as ValuJet (to become AirTran), JetBlue, and Spirit had yet to be conceived. For a short period the competitive landscape had almost stagnated, with the remaining seven legacy airlines dominating the domestic market. But such an arrangement was not to last.

¹ See historical jet fuel prices at <https://www.eia.gov/dnav/pet/hist/LeafHandler>

THE HISTORY OF SOUTHWEST AIRLINES

Southwest Airlines was incorporated in 1971 by lawyer Herb Kelleher and businessman Rollin King, with a strategic model closely mirroring the successful west-coast discounter Pacific Southwest Airlines (PSA) (Davies, 2011). 1971 was still seven years before deregulation, but in the pre-1978 regulated era the CAB's authority to set fares applied only to airlines flying inter-state routes. Intra-state routes were not fare-regulated. Operating solely within California, PSA essentially created the first LCC in the "deregulated" airline market within the large state, and Kelleher and King saw the opportunity to do the same in Texas and named their airline Southwest. Southwest started intra-Texas service with flights between Dallas, Houston, and San Antonio, using three new Boeing 737s. These are the same and only type of aircraft the airline uses today.²

By virtue of a quirk of timing, Southwest was able to establish itself early as the main carrier at Dallas Love Field, the older but significantly more convenient main airport in the Dallas area. In 1964, the neighboring cities of Dallas and Fort Worth had come together to plan a joint commercial hub after the FAA stated it would not fund two major airports so close together geographically, which led to the creation and opening of DFW international ten years later in 1974 (Speaker, 2016). In the agreement, all carriers originally at the local airports such as Dallas Love had signed their intent to transfer their service to the new DFW airport upon its completion, and when that occurred, legacy carriers such as American and Continental moved. This left Love nearly vacant except for a small airline that had been created in 1971 after the others had signed their mutual intent to move to DFW (Speaker, 2016). This small airline was Southwest Airlines; since that era Southwest has expanded greatly from its base at Love over the objections of the legacy carriers at DFW. Legislative prohibitions of flights from Love to states beyond those bordering Texas, originally intended to protect DFW, were slowly chipped away by Southwest until they fully expired in 2014, allowing fully liberalized service from the airport (Speaker, 2016). Southwest today is the major carrier at Dallas's convenient Love Field, a unique service advantage.

With its business model initialized and an advantageous location free of space constraints as its home base, Southwest embarked on the incremental expansion that it has relied on to this day. By the time of the Airline Deregulation Act they held a strong platform on which to move into the US-wide deregulated era.³ Crucially, throughout its formative years Southwest expanded through targeted and modest acquisitions of Muse air in 1985 and Morris air in 1992. These engagements helped build the airline's fleet and

² Company-sponsored history of Southwest is available at <http://www.swamedia.com/channels/By-Date/pages/history-by-date>

³ Southwest city service start dates are available at <http://www.swamedia.com/channels/city-start-up-dates/pages/when-did-we-arrive>

employees, and especially its route network in the central and southwestern swaths of the country, moving into the broader regional market (Davies, 2011).

The young Southwest Airlines also differentiated itself from many of its peers by maintaining a good line of credit with its bank financiers. This occurred at a time when airlines of all different types of business strategies from Pan American to low-cost startups were declaring bankruptcy and parking their aircraft. Through the 1980s and 1990s Southwest was actively engaged in stable debt financing and several rounds of equity offerings, stock splits, and buybacks that kept it on a stable growth path. The airline went public in 1971 and has not made a public share offering since 1992.⁴ Southwest was deliberate and cautious with its potential, building up carefully.

THE SOUTHWEST AIRLINES BUSINESS MODEL

The pioneering Pacific Southwest Airlines (PSA) model of investing in a positive, helpful, and even happy, corporate culture to drive customer loyalty alongside low fares was distinctively copied by Kelleher and King, who took the niche idea and brought it mainstream with Southwest. The two recognized from the very beginning that they needed to invest in their employees' well-being in order to build positive rapport with passengers and likewise to keep labor productivity high per block hour (Davies, 2011). The methods included paying pilots and gate workers industry-competitive wages and cultivating a culture of strong team effort. Pilots often helped cleaning the aircraft and loading bags during turnarounds, for example (Vasigh et al., 2013). Flight attendants were dressed in flashy uniforms that the flying public would remember, and they were encouraged by all corporate levels to be humorous, helpful, and happy (Davies, 2011). Creating a positive culture was essential in creating a differentiated air travel product, as PSA had already demonstrated that happy employees will lead to happy passengers, which alongside low fares will lead to a loyal customer base that captures market share from the competition. The key was to gain repeat customers. An additional competitive advantage of this new, positive corporate culture was that it was extremely hard to replicate, especially by entrenched legacy carriers which had long-developed their own corporate stigmas that were not based squarely around personality and friendly service.

Southwest's culture was only a start for a new airline business paradigm. Fundamentally, the low-cost airline needed to seek a "happiness advantage" to retain customers because the revenue stream of low fares could not support extra service or tangible enhancements, normally known as frills. Thus, Southwest developed a no-frills service model. At the time, Southwest's no frills meant peanuts and a soda as opposed to the full hot meal and beverage service served on legacy carriers. Through the 1990's no

⁴ Southwest's recent corporate history is available at <http://investors.southwest.com/investor-resources/investor-faqs/southwest-airlines-faq>

frills was a main element of holding the cost base low. Ultra-Low Cost Carriers (ULCC) of the present, such as Spirit, Frontier, and Allegiant, take no frills to the next level with zero free services or special benefits (Vasigh et al., 2013).

Beyond no-frills, Southwest was simultaneously the pioneer of more efficient fleet planning and aircraft utilization through two simple tactics: a standardized type of aircraft and minimum turnaround times. Except for a brief early lease of two 727s, Southwest has operated only Boeing 737 aircraft. The benefits of using a common fleet are lower maintenance costs as they do not need to invest in anything besides 737 parts and support, lower network management costs as every Southwest aircraft can fly every Southwest route, and lower pilot and flight crew costs as every Southwest pilot and flight attendant can fly on every Southwest airplane (Vasigh et al., 2013). This allows for a unified and flexible operation throughout the airline's operations; there is no need for sub-dividing the firm's operations by aircraft type and route as legacy airlines must do. This model has been copied by successful LCCs around the world, and today the largest LCC's outside the US: Ryanair, EasyJet, and AirAsia, fly exclusively 737s, A320s (the popular Airbus competitor in the short-haul market), and A320s, respectively.

Southwest's fleet commonality was combined with the active pursuit of higher aircraft utilization in order to ensure the 737s all generated the most revenue. Sitting on the ground, an airliner is essentially a dead asset. Southwest accordingly created a carefully scripted turnaround procedure to minimize time at the gate. They relied on open seating for quick boarding and de-planing and on not carrying underbelly cargo (apart from checked luggage), which requires time to sort and load. With a simple equation of quickly offloading passengers, picking up the trash, and loading passengers, the airline developed an advantage over legacy competitors by squeezing more daily short-haul flights from each 737 (Vasigh et al., 2013). Flying Southwest today, the time efficiency is still unmistakable.

Southwest's second technical breakthrough for its airline business model was the creation and support of a non-hub-and-spoke route network often based on service to secondary airports. Legacy carriers of the deregulated era built up massive hub-and-spoke operations around focus airports in a drive to maintain wide service while seeking economies of scale, with the result that a traveler could move from any US city to any other US city on any carrier with one change of aircraft (Vasigh et al., 2013). Today, Atlanta, Chicago, and Dallas are massive hubs for Delta, United, and American respectively. Southwest adopted a different approach, based on a "point-to-point" network in which roughly 8-10 independent, nonstop Southwest routes originate from each airport served, catering to local demand (Lordan, 2014). While such an arrangement does not seek economies of scale by reducing overhead at large hubs, spacing the flights throughout the day frequently avoids the idle worktime between the timed rushes that must be scheduled at the legacies' hubs to connect passengers efficiently across a hub-

and-spoke network. Though the point-to-point system of Southwest does not preclude its use of “focus cities” at several airports to connect passengers (such as Dallas Love and Chicago Midway), Southwest’s reliance on hubs is significantly less than the reliance of legacy carriers on their much larger hubs and is centered on secondary, smaller airports.⁵ Again, a low cost-base drove part of this model as these secondary airports often have lower costs (gate and landing fees, service rentals, etc.) and less congestion than primary airports, allowing Southwest to conduct its trademark fast aircraft turnarounds (Vasigh et al., 2013). The short-haul operations of Southwest also eliminate any need to connect travelers to long-haul flights on aircraft that often require the longer runways of primary, congested airports. Airports such as Love, Midway for Chicago, Islip for New York, Providence or Manchester for Boston, Oakland or San Jose for the Bay Area, and Ontario or Burbank for Los Angeles are all secondary airports that are focus airports for Southwest. The point-to-point network configuration relying on secondary airports allowed Southwest to couple lower service costs with still high-yielding routes, a key part of their improved business model.

By being transparent about the main pillars of its business strategy to customers, Southwest attracted revenue and built a dominant position in the US short-haul market. Attempts by legacy carriers to create their own Southwest-style subsidiaries have all failed. Newer US LCCs have found their own relative success in alternative niches that do not directly compete in Southwest’s particular short-haul role, and accordingly they have not grown larger than one-quarter the size of Southwest.⁶ The second-largest US LCC, JetBlue, operates predominantly longer-haul coast-to-coast and leisure routes to and from Florida and the Caribbean, with significantly less presence than Southwest in the center of the country. Likewise, JetBlue also operates significant hubs in JFK, Boston Logan, and Fort Lauderdale. Virgin America, a financially weak relative newcomer, likewise focuses on long-haul domestic routes.⁷ Spirit, Frontier, and Allegiant Airways all operate with a separate ultra-low-cost business model, “unbundling,” that targets extremely price sensitive leisure customers by eliminating any costly frills and raising significant revenue through ancillary items such as baggage and amenity fees (Rosenstein, 2013).

While the current state of the domestic US LCC market is characterized by several not-inconsequential carriers, there are none that compete directly with Southwest’s short-haul, point-to-point domestic turf using all of Southwest’s fundamental low-cost principles including a positive corporate culture. One additional carrier, often overlooked as a standalone “specialty” carrier, is Alaska Airlines. Though Alaska has a legacy

⁵ Southwest’s Route Map is available at https://www.southwest.com/flight/routemap_dyn.html

⁶ See footnote 10

⁷ JetBlue and Virgin America’s route maps can be viewed at <http://www.jetblue.com/WhereWeJet/> and <https://www.virginamerica.com/cms/airport-destinations>, respectively.

history, their quiet expansion in the lower 48 since the mid-2000s and their strong position on the west coast indicate that they should be included in any domestic airline analysis.⁸ Alaska is not a traditional LCC; however, their small size (just behind JetBlue) increases their agility, their single-type fleet lowers their costs, and their geographic branding is distinctive. Despite these distinct LCC characteristics, Alaska is historically not seen as a disruptor. The April 2016 purchase of small Virgin America by Alaska has thrust Alaska to the fore of the competitive debate, even though the combination remains only marginally larger than JetBlue.

An additional element underscoring the novelty of Southwest's business model has been that dominant legacy carriers have stopped trying to emulate it themselves by virtue of their inability to reduce their higher costs bases and build higher employee productivity. Over the course of the 1990s and early 2000s, the majority of the legacy carriers opened and closed LCC subsidiaries, each try never operating more than four years: Continental with Continental Lite, Delta (with Delta Express and Song), US Airways (with MetroJet), and United (with United Shuttle and Ted). While the legacies could easily remove frills and amenities and use a single type of aircraft, their mainline, union crews did not work in the same upbeat and hardworking corporate culture as Southwest (Vasigh et al., 2013). Labor productivity was weaker and aircraft turnarounds less efficient. When the legacies entered bankruptcy from high costs they often folded their LCC's into their main brand, leaving the market for Southwest.

IMPACT ON AIRFARES BY SOUTHWEST: PREVIOUS RESEARCH

One primary impact of Southwest's radically different business model, built on the foundation of a low cost-base supported by a strong and positive corporate culture, was its ability to influence the fares of any market that it entered. It could cut its prices and pull in price-conscious consumers while remaining profitable and retaining the productivity of its labor force. By the turn of the millennium, Southwest was boarding more than 60 million passengers annually, more than any other non-legacy US carrier has carried through the present day.⁹ When Southwest entered any given market, its low prices placed market pressure on the legacy carriers to lower their fares lest lose customers. The result was a broad decline in fares. In 2001, Steven Morrison published an influential paper that calculated the fare reductions caused by Southwest's presence, or potential presence, in any given market in 1998. Potential competition from an airline in a market is present when the airline serves the two endpoints of the route. With the

⁸ Alaska's route map and company-sponsored history are available at <https://www.alaskaair.com/content/route-map.aspx> and <https://www.alaskaair.com/content/about-us/history/history-by-decade.aspx>, respectively.

⁹ Southwest annual report summaries are located at <http://www.swamedia.com/channels/By-Category/pages/yearend-summary>

infrastructure on both ends, input costs to begin flying a new route are minimal. When that airline on both ends is a LCC such as Southwest, incumbent carriers will often lower their fares in an effort to deter the LCC from realizing the potential profit to be had from entering and further undercutting the incumbents (Brueckner et al., 2012). Morrison's study found that in the aggregate, airline passengers were saving \$12.9 billion total from the reduced fares of Southwest combined with the reduced fares of the legacy airlines competing with Southwest.

Eleven years after Morrison's work, John Kwoka et al., traced the initial presence of Southwest to a drop in legacy airlines' fares by 24.0% over 2009-2010 (Kwoka et al., 2013). This compares to a 3.4% drop in fares when a second legacy carrier enters to compete against another dominant legacy carrier. They also found that the effect on fares as a result of Southwest's presence varied with Southwest's own market share, as average fares decline by 9.7-10% when Southwest moved from a 25% to a 50% market share, but by only 5.4% when the airline moved to a 75% market share. In the broader LCC framework, they ultimately determined that the fare reduction marginally diminishes as LCCs gain market share, bottoming out when the LCC possess 65.7% of the market. Similarly it has also been substantiated that the presence of an LCC in a market increases the incumbent carriers' probability of codesharing with each other on the same aircraft, a form of revenue cooperation (Goetz and Shapiro, 2012; Brueckner et al., 2012).

While the "Southwest effect" has been shown to be true and effective at reducing fares over the majority of the airline's history, more recently it has been observed that the effect is potentially weakening. Wittman and Swelbar reported as much in a study in their 2012 paper, "Evolving Trends of U.S. Domestic Airfares: The Impacts of Competition, Consolidation, and Low-Cost Carriers." Their study used a linear regression to explore the relationship between average ticket prices for flights originating at a given airport, the average distance covered by such flights, and the presence of Southwest and other LCCs at the airport. They ran regressions separately for the years 2007 and 2012 and compared the results. As one could expect, a significant positive effect was found for average itinerary distance. The longer the flight, the higher the price. Also, they found a significantly negative effect of the presence of Southwest at an airport on mean fares, thus substantiating the existence of the "Southwest effect." The presence of Southwest at airport reduced the airport's mean fares by \$36 in 2007 and \$17 in 2012.

Though not conclusive, this change in the Southwest-specific drop in average fares from 2007 to 2012 indicates that the impact of Southwest to lower market prices is diminishing. To test whether that trend has continued, or whether the Southwest effect is still holding, this study includes a model of the year 2015 that can be compared to results for earlier years.

Southwest in 2015 carried 144 million passengers, roughly four times the 35 million carried by JetBlue, its closest LCC competitor, and ahead of United's total of 140

million.¹⁰ With such a significant presence that it is operating at about the same size as the consolidated legacy carriers it once sought to disrupt, any decrease in the ability of its presence to lower fares in a given market lends credence to the idea that Southwest may be drifting away from its low-cost core. According to the *Los Angeles Times* and *USA Today*, over the course of January and February 2016, Southwest raised its general fares by a cumulative \$22. These incremental price hikes were immediately matched by American, Delta, and United. However, while Southwest's fare hikes were matched by competitors, when Delta and JetBlue independently raised their fares by small amounts earlier in February, they were forced to reverse course after the rest of the industry did not go along. Likewise in September 2012, a general \$10 hike by Southwest was also immediately matched, indicating that the airline's blossoming dominance over pricing strategy could be solidifying (as in 2012 Southwest also carried four times the number of passengers of its nearest non-legacy competitor JetBlue).¹¹ Thus it will be informative to investigate whether or not the Southwest effect has weakened in recent years.

III. Empirical Analysis

In this section a multivariate econometric model to test the effect of LCCs on domestic airfares is developed and results are presented.

DATA SOURCE

Wittman and Swelbar used data based on government datasets, adjusted by data from a private aviation data company to account for the itinerary characteristics of each ticket. In context of this update for 2015, however, the ability to access a private consultancy to clean and fully standardize the data is limited. Thus the data used are straight from the databases of the Department of Transportation's Bureau of Transportation Research (BTS). The main data on airport mean airfare were acquired through BTS's DB1B market dataset that records a 10% sample of the itineraries purchased on domestically-

¹⁰ Passenger numbers for these three airlines can be observed at <http://www.swamedia.com/releases/southwest-airlines-reports-record-fourth-quarter-and-annual-profit-43rd-consecutive-year-of-profitability?l=en-US>, http://otp.investis.com/clients/us/jetblue_airways/usn/usnews-story.aspx?cid=981&newsid=32404, and <http://www.wsj.com/articles/delta-surpasses-united-for-no-2-airline-spot-by-traffic-1452626778>, respectively.

¹¹ Newspaper articles that highlight all of these fare shifts are located at <http://www.latimes.com/business/la-fi-airlines-match-third-airfare-hike-of-2016-20160223-story.html>, <http://www.usatoday.com/story/money/2016/02/22/airlines-attempt-raise-fares-fifth-time-year/80759150>, <http://www.latimes.com/business/la-fi-airlines-match-third-airfare-hike-of-2016-20160223-story.html>, and <http://articles.latimes.com/2012/sep/14/business/la-fi-southwest-fare-hike-20120914>.

operating airlines. The data therein include the operating carrier, origin, destination, distance, and total fare paid and allow for the examination of the average itinerary price originating from the top 418 domestic airports. The most recent time period for which this full set of cross-sectional data is available is for Q3 2015 and these data are used for this econometric model.¹² The econometric model was run using the software STATA.

MODEL

The model has the following structure:

Average fare = f [average itinerary distance; LCC dummies; sum of major carriers at the airport; dummy for vacation destination of the airport]

Average Fare: The average fare represents the dollar amount that is paid for the itinerary. It includes fuel surcharges and taxes, but importantly it does not include ancillary fees such as baggage fees. Q3 data are used in all cases to control for seasonality.

In this study, average fare is analyzed over three levels of analysis and across three time periods: 2007, 2012, and 2015. The first analysis of average fare is at the airport level, the second at the airport-pair level, and the third at the city-pair level. The airport-pair and city-pair analyses attempt to uncover the effect of LCCs' presence in particular passenger markets, and differ from the airport-only analysis by going beyond simply evaluating the effect of a LCC's presence at any airport. Fare competition most likely will be heightened between competitors on identical routes between airports and between cities. The study will examine these three levels of competition in turn for each year.

Average price is used in the present model; however, it would be additionally informative to analyze the impact of LCC prices on the specific ticket prices of legacy airlines rather than using the average over all airlines. Doing so would allow the identification of fare decreases from incumbent carriers that are a specific result of LCC competitive presence. This is beyond the scope of the present study which follows the methodology of recent studies that have used average fare.

Average itinerary distance: The average itinerary distance, measured in flight miles from point of departure to point of arrival for flights originating at each airport. An itinerary refers to one full trip to a destination, allowing intermediate connections. As mentioned, a longer route traditionally implies a higher price. Expectations for the 2015 model are that

¹² Data is publically available at http://www.transtats.bts.gov/databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0

average itinerary distance will display a significantly positive impact on airfares, as it did for Wittman and Swelbar.

LCC-specific dummy variables: Dummy Variables for LCCs are set with 1 equal to presence and 0 equal to no presence at the airport. The carriers are Southwest, JetBlue, Spirit, Frontier, Allegiant, Virgin America, and Alaska. For the carrier-specific dummy variables, it is expected that their effect will each be negative; the operating presence of any of six LCCs at an airport will generally lower the average price a passenger will pay to fly from that airport. Although the presence of Southwest is expected to affect average price negatively, if the Southwest effect is decreasing, the effect of the presence of Southwest at an airport should be relatively small. It is appropriate to expect that this decreasing trend probably has continued to 2015 from the 2007 to 2012 period, given the continued growth of the airline, the further consolidation in the domestic LCC and legacy market, and Southwest's general price increases between 2012 and 2015. The additional market share taken by Southwest via its 2011-2014 merger with AirTran will also give it competitive power to reduce fares less. The presence of Alaska and Virgin America are included in later route and city-based regressions, with identical regression equations to Wittman and Swelbar's used to start. It is necessary to remember that the amount paid per passenger in ancillary fees is proportionately much higher on ULCC airlines. Big fare reductions are not all consumer savings.

Sum of major competitors serving an airport: The number of major airlines serving a given airport was used in certain regressions. It was not included in Wittman and Swelbar's model. Sum is predicted to vary inversely with price but not to be extreme, considering that as the number of airlines at a given airport initially increases, consumers should face more options for flights, but from then on competition's marginal increase should theoretically see the size of the reduction in average airfare diminish. It must also be noted that the total number of passengers using a given airport could be a function of the average airfare, and thus it is not included over endogeneity concerns.

Vacation destination of the airport: This variable is included to capture the lower average prices associated with flights that include Florida and Nevada. The decision to use these states as indicators of vacation flights follows Wittman and Swelbar's model.

RESULTS: FARE IMPACT BY AIRPORT

The data on ticket fares can be reported in several ways. This section discusses results when the dependent variable, average fare, refers to the fares for all flights originating at a given airport. Table 1 shows results of regressions for the years 2007,

2012, and 2015. The first two columns, for 2007 and 2012, show results similar to Wittman and Swelbar.

In 2007 both Southwest and JetBlue are associated with strong negative impacts on average prices, with Southwest’s \$63 indicated reduction demonstrating that the carrier was the most influential in lowering average route fares. 2007 was just before the start of an industry-wide wave of consolidation. At the time the legacy carriers were weak, trying to cut costs that had allowed LCC’s to extract substantial pricing advantages over the course of the early 2000s. Minor disparities between the results and those of Wittman and Swelbar remain present, but in the 2007 data the order of the carriers and their proportional impacts relative to each other are analogous. Southwest’s impact is largest.

TABLE 1

Regression Results, Impacts by Airport¹³

Variable	Coefficient		
	2007 Q3	2012 Q3	2015 Q3
Constant	74.99** (11.894)	134.64** (9.920)	112.08** (20.970)
Air Itinerary	0.16** (0.007)	0.13** (0.006)	0.17** (0.013)
Vacation	-7.29 (20.557)	-35.85** (17.415)	-30.98 (32.627)
Southwest	-63.32** (16.097)	-43.30** (11.727)	-31.36 (22.199)
JetBlue	-45.55** (18.266)	-37.76** (13.972)	-39.00 (25.430)
Spirit	-30.27 (24.761)	-30.83* (16.489)	-47.77 (32.560)
Frontier	20.15 (13.786)	16.43* (9.735)	17.34 (27.595)
Allegiant	-33.84** (13.879)	-50.50** (9.702)	-56.74** (17.146)
AirTran	-20.83 (16.824)	-9.48 (14.132)	n/a
N	465	446	418
Adjusted R ²	0.51	0.57	0.32

*statistically significant at 10%, **statistically significant at 5%

¹³ The means for the regression variables for 2007 are: average fare (269.66), average itinerary distance (1327.25), vacation (0.05), Southwest (0.14), Jet Blue (0.10), Spirit (0.04), Frontier (0.17), Allegiant (0.12), AirTran (0.12). Means for the other regressions are comparable.

In 2012, all of the LCCs had a statistically significant impact on airport average prices, except for AirTran. In addition, a vacation location had a significant negative impact on fares. Spirit's low fares, modeled on a zero-frills model like those of Allegiant, exerted a modest price reduction of \$31 on the fares of a given airport in 2012. At the time, Bill Franke, the chairman of Spirit and former CEO of America West, had not yet decided to sell his stake in Spirit and purchase Frontier to also develop it into an ULCC (Nicas, 2013). This would occur a year later, and is the most plausible reason that the presence of Frontier in a given airport was associated with a fare increase in 2012. Both Southwest and JetBlue had significant, downward impact on airport ticket prices, with Southwest's \$43 associated reduction surpassing JetBlue's \$38. The reduction of Southwest's indicated by this regression was significantly larger than the \$17 reduction that Wittman and Swelbar recorded. Allegiant again demonstrated the greatest negative impact on fares, with a \$51 dollar reduction significantly higher than the \$29 reduction recorded by Wittman and Swelbar in the same year. The differences may be partly due to differences in the data used, as the firm that standardized Wittman and Swelbar's data most likely controlled for additional factors given the peculiarity of the airports Allegiant serves.

Results of the regression for 2015 are shown in the third column of Table 1. While the resulting coefficients displayed the expected negative values and the relationship between average itinerary distance and mean fare was highly significant and positive, the only other variable significant in determining the mean fare out of a given airport was the presence of Allegiant Air. The adjusted R^2 term shows that 32% of the variations in average itinerary fare from an airport can be explained by these particular variables.

While the 2015 results are not compelling with their modest significance levels, they do pass the F-distribution test of joint significance (seen by the "Prob > F = 0.000"), indicating that they are collectively significant in determining the mean airfare when flying out of a given airport. Allegiant's presence was associated with a reduction in mean airfares by \$57. For Allegiant, such a reduction is expected considering that its no-frills, non-connecting vacation model that focuses on keeping its cost base low allows for lower fares that raise price competition at the airports where it serves (which are mostly secondary airports). The remaining carriers, though not significant, display negative price influences associated with their presence at an airport, with Southwest indicating a fare reduction of \$31 and JetBlue a \$39 decrease. Southwest's presence from this piece of data proposes that the airline was generally acting to lower airport prices slightly less than the other LCCs in 2015, but a better conclusion requires upcoming analyses.

A very interesting question is why the statistical significance of the results for 2007 and 2012 are strong but appears weaker in 2015. The most plausible

explanation for such behavior is based on the two-thirds reduction in the price of jet fuel since the summer of 2014. With lower input prices, all carriers have seen record profitability such that the presence of any carrier at an airport in 2015 may not necessarily have been associated with as much of a unique change in fares than in previous periods of tighter margins.¹⁴ Because fares have not seen declines proportional to the recent decrease in fuel costs, the presence of particular carriers at an airport may possess less of an effect at an airport because the carriers are not as susceptible to losing money even when LCC competition is present. Essentially, the larger profit margins give each carrier a buffer from setting fares that finely track their cost bases. There could also simply be more airport fare fluctuations that are not linked to a specific carrier and a result of greater disparities between the regions the airports serve, such as varied airport taxes. This would imply that airlines possessed less of a unique pressure on airfares at a given airport in 2015.

RESULTS: FARE IMPACT BY ROUTE

The analysis above is based on average fares over all flights originating at given airports. But head-to-head competition normally occurs on certain flights between common origins and endpoints. A more detailed analysis comes by examining mean fares between unique endpoints (Refer to Table 2).

The dependent variable in this case is the mean fare on an itinerary over two unique endpoint airports. In the Q3 2015 data, there were 68,213 unique domestic routes contained in the DB1B database. All average fares in the original data that displayed prices of less than \$20 were removed in order to eliminate flash deals and other super-low-priced marketing deals. This regression was built with the same DB1B database and data, in the statistical programming language R.

In this regression, all the variables remained the same, except Vacation was discarded. Within one route, whether or not that route is to or from a vacation destination will not have a material impact on the carriers' differences in fares. All carriers' fares will reflect a price shift if the route is a vacation route. The average itinerary distance is the average distance flown between two airports, which depends on connections.

Results from Q3 2007 indicate that the LCC effect of reducing fares on airport-pair routes was healthy and present and included a relative strong impact from Southwest. Southwest's presence was associated with a \$34 reduction in mean route fares, whereas JetBlue was associated with only a \$24 reduction. Frontier, at the time a smaller regional legacy carrier, was expectedly associated with an increase in fares

¹⁴ 2015 margins were up 6.8% on average for legacy carries and 6.2% for LCCs since 2014. See Hazel et al., 2016.

(\$29), while Allegiant, again the strongest force at pulling down fares, was associated with a \$99 reduction in fares on the routes that it operated. Spirit was interestingly associated with more modest fare declines of \$17, and Alaska, which in 2007 was a large regional carrier similar to Frontier, was expectedly associated with a fare increase of \$36 over the routes that it operated. Virgin America was still being founded. The adjusted R^2 of the model in 2007 demonstrated that it would explain 33% of the variation in average route fare with these variables, in the same range as that of 2012.

TABLE 2

Regression Results, Unique Domestic Airport-Pair Routes

Variable	Coefficient		
	2007 Q3	2012 Q3	2015 Q3
Constant	203.65** (0.910)	219.7** (1.020)	222.6** (2.300)
Air Itinerary	0.084** (0.0005)	0.096** (0.0005)	0.099** (0.001)
Sum of major carriers	-27.44** (0.841)	-28.34** (0.725)	-18.82** (1.711)
Alaska	35.89** (3.797)	44.25** (3.536)	-5.19 (7.157)
Southwest	-33.82** (2.884)	-7.62** (2.701)	-24.00** (6.006)
JetBlue	-24.25** (4.262)	-30.55** (4.229)	-33.62** (8.692)
Spirit	-16.94* (9.542)	-34.09** (7.435)	-45.55** (13.260)
Frontier	28.98** (4.193)	3.08 (3.410)	21.43* (12.910)
Allegiant	-99.05** (10.429)	-135.1** (7.545)	-157.9** (14.050)
Virgin America	n/a	79.67** (13.850)	41.17* (25.650)
n	70,163	70,784	68,213
Adjusted R^2	0.33	0.34	0.10

*statistically significant at 10%, **statistically significant at 5%

With Q3 2012 data, the results demonstrate that in that year there was still a solid degree of fare reduction when LCCs were present on an airport-pair route. Southwest was associated with an \$8 fare reduction, and JetBlue, Spirit, and Allegiant were associated with reductions of \$31, \$34, and \$135 respectively. Frontier was associated with a \$3

increase in fares as this was prior to its rebranding as a ULCC. Alaska (now significant) was associated with a \$44 fare increase. The addition of an extra major carrier to a route pair was associated with a \$28 fare decrease. All of the variables were significant except for the impact of Frontier.

The reduction in the Southwest coefficient from 2007 to 2012 is the trend that led Wittman and Swelbar to conclude that the Southwest effect might be diminishing.

Table 2 shows that, in 2015, the Southwest effect has recovered to its 2007 levels. In that year the presence of Southwest on an airport-pair route is associated with a reduction in fares by \$24, which is relatively less than the JetBlue's, Spirit's, and Allegiant's associated reductions of \$34, \$46, and \$158 respectively. Frontier, two years after its restructuring as a ULCC, strangely shows that its presence increases mean route fare by \$21, and Virgin America has a similar effect but with a magnitude of \$41. The addition of an extra major air carrier to a route is associated with a \$19 average fare reduction. These airport-pair specific results indicate that Southwest's presence in a market is not associated with as large a reduction as JetBlue or any of the other three ULCC's (Spirit, Frontier, and Allegiant). Allegiant's very large value is most likely related to the fact that it directly competes with few other carriers on its routes, being almost exclusively oriented to a leisure market between rural areas and Florida and Las Vegas, and it sees significant income for its size from ancillary fees (baggage fees, seat selection, beverages, entertainment fees).^{15,16} The adjusted R^2 demonstrates that the particular set of variables accounts for 10% of the variance in route fares.

These route data indicate that since 2012, the effect of the presence of Southwest on a route has actually increased; giving credence to the notion that price competition from the airline might be on resurgence today. With many more highly significant coefficients, these results are more credible than those from the airport-level analysis.

While through the era of large industry mergers that lasted until 2013, the route fare data from 2012 demonstrate that the price effect of Southwest and other LCCs was decreasing, this has not appeared to continue through 2015, when the relative price reductions increased. A significant external factor over the period since 2012 has been the 2014-2016 fall in oil prices, which has saved the airline industry huge levels of input costs, resulted in exceptionally high profits, and perhaps has reinvigorated pricing competition in pursuit of market share. The airport-specific route data seem to indicate as much could be the case. The LCCs can continue to ensure their prices are below market averages. By measuring so many dummy variables and only two truly floating variables (the average itinerary distance and the number of total carriers operating on a specific route) it is necessarily implied that the explanatory power of the model (the adjusted R^2

¹⁵ Allegiant's route map can be viewed at <https://www.allegiantair.com/interactive-routemap>

¹⁶ Baggage and other reservations fees are recorded by carrier at https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/airline_information/baggage_fees/index.

value) will not be as high. The point of this analysis is to observe the direction and magnitudes of the dummy variable coefficients, rather than predicting fares.

RESULTS: LEGACY CARRIERS

To place these regressions in context, the Q3 2015 analysis on the legacy airlines was undertaken by replacing the LCC dummies with dummies for the legacy carriers. The results are shown in Table 3. The presence of legacy carriers (American, Delta, United, and Alaska) has significant positive impacts on the mean route fare. This is expected, because legacy carriers are generally associated with higher fares. AA, DL, and UA are associated with increases of average route fare by \$28, \$25, and \$48 respectively. This is compared to the other carriers (essentially all the historical LCC's) that are not included in this model and thus make up the reference group. While Alaska's presence results average fare increases of \$26 compared to the reference group, this can be combined with the findings of the previous regression to conclude that Alaska does not possess the same ability to lower fares over an airport-pair as the pure LCCs do. It is on par with Delta in this linear model. The \$48 reduction associated with an extra major carrier on a route is a result of the positive bias from including high-fare legacy carriers. One more carrier in a legacy carrier framework will result in a larger decrease in fares than a many-LCC market.

RESULTS: FARE IMPACT BY CITY-PAIR ROUTE

By analyzing each airport itinerary routing's average price, price competition provided by flying to and from alternate airports is not included. A market for air travel is ultimately created by participants that want to fly from one city to another city. When a city possesses competing airport alternatives, a rational decision-maker will evaluate the price of airfares at the array of origin and destination airports. In the case of the LCCs, where Southwest pioneered the use of secondary airports to serve primary locations, comparing routes on a strictly airport-for-airport basis fails to capture the entire market. For example, a trip from New York to Dallas can be accomplished by departing Kennedy, LaGuardia, or Newark, and arriving at DFW or Love Field. Were Southwest to offer lower fares from Newark to Love, it would effectively require that American reduce its prices from LaGuardia to DFW, or lose customers to Southwest's flight. Kwoka et al. describe this appropriately as "adjacent airport competition."

To continue analyzing the current state of the "Southwest effect" and the effects of other US LCC's on airfares in 2015, this analysis runs the same regression using city pairs instead of airport pairs to capture the full extent of multi-airport markets. Cities are defined by the BTS and include multiple-airport districts in Atlanta, Boston, Cleveland,

Washington D.C., New York City, San Francisco, Los Angeles, Miami and Tampa. The same regression equation is used.

TABLE 3

**Regression Results, Unique Domestic Airport-Pair
Routes for Legacy Carriers, 2015 Q3**

Variable	Coefficient
Constant	221.83** (2.323)
Air Itinerary Distance	.099** (0.001)
Sum of major carriers	-48.30** (3.317)
American	27.82** (6.255)
Delta	25.14** (5.009)
United	47.80** (6.663)
Alaska	25.52** (7.684)
n	68,213
Adjusted R ²	0.10

*statistically significant at 10%

**statistically significant at 5%

Results for the three time periods are shown in Table 4. In 2007, city-pair results again followed the trend of being associated with larger absolute price changes due to the operating LCCs. A major difference, however, was the weak impact of Southwest's presence in city-pair markets in 2007. The \$9 reduction associated with Southwest's presence over a city-pair is significantly smaller than the \$34 reduction it was associated with over airport-pair markets in the same time period. It is very possible that the shift from airport-pair to city-pair markets results in Southwest incurring less of a pricing impact because the probability of the existence other LCCs in the larger city-pair markets is greater. 2007 was before Southwest purchased its next-largest LCC competitor, AirTran, whose presence at the time most likely served to keep city fares low because it operated into most major cities. By adding Southwest to a city, this most likely meant that city-pair fares would not move exceptionally lower. Alaska still followed legacy behavior in 2007 in city-pair markets.

In 2012, the price-decrease effect of most LCCs in city-route markets is smaller than the comparable results for airport routes. The major exception to this trend is Southwest, which displayed an \$8 reduction when it was present on airport-routes in 2012 but a \$22 increase in average fares on city-routes. Such a stark contrast is strange, but it emphasizes the fact that the “Southwest effect” had become significantly smaller in 2012. The presence of JetBlue, Spirit, and Allegiant all possess smaller impacts on average fare in city-pair markets than in airport pair markets.

TABLE 4

Regression Results, Unique Domestic City-Pair Routes			
Variables	Coefficients		
	2007 Q3	2012 Q3	2015 Q3
Constant	206.6** (0.981)	222.5** (1.109)	224.2** (2.639)
Air Itinerary	0.09** (0.0005)	0.10** (0.0006)	0.10** (0.001)
Sum of major carriers	-31.33** (1.003)	-32.39** (0.835)	-21.57** (2.096)
Alaska	40.0** (4.216)	47.60** (3.933)	-5.03 (8.439)
Southwest	-9.38** (3.571)	21.51** (3.384)	-0.88 (7.941)
JetBlue	-2.96 (4.925)	-17.28** (5.070)	-24.72** (10.840)
Spirit	-7.51 (9.771)	-12.14 (7.910)	-35.48** (15.070)
Frontier	37.36** (4.677)	10.43** (3.655)	22.63 (14.810)
Allegiant	-85.58** (10.540)	-95.69** (7.711)	-113.6** (15.230)
Virgin America	n/a	64.53** (14.840)	62.32* (31.910)
n	59,710	60,413	58,179
Adjusted R ²	0.33	0.35	0.09

*statistically significant at 10%, **statistically significant at 5%

The 2015 analysis includes 58,179 unique city-pair routes. The effects of the presence of Southwest, Frontier, and Alaska are not significant, but the directions and most of the magnitudes are on par with what was witnessed in the airport-specific route regression. The coefficient of Southwest is significantly smaller, indicating only a \$0.88 decrease over city-pairs where the carrier operates, but without a high significance the conclusions that can be drawn are limited. JetBlue, Spirit, and Allegiant all indicate

slightly smaller impacts than before, which can be interpreted to mean that the associated fare decrease with the presence of these LCCs is higher if the airline is presently operating between two specific airports than just between two specific cities. This is intuitive. Alaska and the number of major carriers exhibited similar effects to the airport-pair market data.

Alaska's presence in both airport and city-pair markets indicates that the impact of its presence on fares has moved from an associated increase in 2012 of around \$40-50, to a much more negative effect on the order of a \$5 reduction. Such a trend was also visible in the airport-pair route data. Such a decline signifies the increasing presence of Alaska as a unique type of legacy whose fares are looking more and more like those of a LCC acting to capture share.

IV. Conclusions

The most compelling 2015 results in this section are from the airport-pair data, because with these data the majority of domestic LCCs have an effect on price that is statistically significant. Southwest is undeniably the most important carrier to examine by virtue of its dominant market position and its history of shaping lower domestic fares via the "Southwest effect." Accordingly, Southwest's association with a \$24 decrease in average fares between two airports over the course of last summer and early fall can be compared to associated decreases of \$34 and \$8 in the same time periods of 2007 and 2012, respectively. This indicates that the Southwest effect decreased to 2012 but has since reappeared. While the domestic airline industry changed in 2013, when American and US Airways began the final legacy merger to form the world's largest airline, this was not a shift that, on its own, would have allowed Southwest to charge relatively lower fares. On the contrary, the re-appearance of the Southwest effect is most likely tied to the major recovery of the industry's profitability as a result of vastly lower jet fuel costs. With lower fuel prices, Southwest saw an increase in net income in 2015 of 92% in its annual report. The other major carriers also experienced similar windfalls, and this type of exogenous impact on financial sustainability has allowed the carriers more leeway in maintaining fares and market share.¹⁷ Essentially, despite the consolidation in the industry, the fact that all carriers are suddenly flush with cash has seen them become more flexible in competing with one another on fares. The price reductions associated with Allegiant, Spirit, and JetBlue's presence in markets increased from 2012 to 2015 on all of the regressions run, indicating that the larger "LCC effect" was alive in 2015. However, these carriers still are very small compared to Southwest. Additionally, the

¹⁷ Among other carriers, American, Delta, United, JetBlue, Alaska, and Spirit saw net income increase by 164%, 587%, 548%, 69%, 40%, and 41% in 2015, respectively. See financials at quotes.wsj.com

decrease in ticket price associated with one extra major carrier decreased in both route regressions from 2012 to 2015. This result can be interpreted to mean that price competition has increased, as a smaller impact by an additional carrier implies that the incumbent carriers are competing more heavily on price than in 2012. Another participant means less of a price effect.

This study has shown that the Southwest effect is again quite strong in 2015. The industry could be observed after major mergers had been achieved and compared to both 2007 pre-merger and 2012 mid-merger data. Also, the comparison of data from both airport-pair and city-pair itineraries took the study a step beyond the airport-specific data that was described in Wittman and Swelbar's similar analysis.

These conclusions are contrary to what was expected as a result of industry consolidation. Lower fuel prices have led to much higher profits by the legacy carriers, who have tried to maintain "capacity discipline." But these low fuel prices have also given the LCCs the opportunity to compete on price, which is why there has been a resurgence of the Southwest effect. Many more consumers can afford to fly today thanks to the business model of Southwest and smaller LCCs. While recently the industry has heavily consolidated, the impact on its pricing behavior has been affected simultaneously by an enormous drop in input prices that has resulted in substantial improvements in financial performance, and most likely the renewed competitive pressure in the industry. To maintain price competition alongside the greater market shares of the four dominant US airlines, it is essential that the low-cost model remains viable. A broader takeaway from this study is the importance of having a competitive fringe in industries experiencing consolidation. Vigorous competition can be provided by relatively small companies with strong innovation efforts, such as the LCC sector in the airline industry.

The analysis did have certain scope limitations in terms of the extent to which additional variables might have improved the results. Adjusting for market share, airport concentration, and the marketing carrier in the case of codeshared flights, would have provided a more representative analysis of the true effects of each airline. A wider panel of data than just the third quarter of three selected years would furthermore have aided the empirical analysis in clarifying the competitive evolution of each carrier. In addition, analysis of LCC effects on the actual prices of tickets on legacy airlines, instead of their impact on average ticket prices, would be an important subject for future research.

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Forthcoming