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Antitrust Implications for Mergers Involving Maverick Firms

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Antitrust Implications for Mergers Involving Maverick Firms

DISSERTATION

A dissertation submitted in partial
fulfillment of the requirements for
the degree of Doctor of Philosophy
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By
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ABSTRACT OF DISSERTATION

Antitrust Implications for Mergers Involving Maverick Firms

Maverick firms are defined in the Horizontal Merger Guidelines as those firms that may exert a disproportional competitive effect in markets where they compete. The Guidelines mandate that mergers and acquisitions involving maverick firms be given special consideration by the Agencies, however not much is known about maverick firms or their competitive effects when they are acquired. The Guidelines describe characteristics that may be present in a maverick firm, but stop short of providing a discrete test that may be used for their identification. They are often small firms whose acquisitions do not warrant reporting to the Agencies due to falling under the thresholds in the Hart Scott Rodino Act, and when they are reported, they are often difficult to identify. With the increase in acquisitions of startups and other disruptive firms by dominant incumbents as seen in the tech sector, there is public policy interest in assessing the possible damages or benefits that may arise in mergers and acquisitions of maverick firms. This dissertation takes a look at two mergers in two different industries that may shed light on these questions.

The first chapter analyzes a merger in the airline industry. Using publicly available data from the Department of Transportation, I use a difference-in-differences and a triple difference approach to analyze the price effects of the merger between Southwest Airlines and AirTran Airways, two maverick firms in the airline industry. I find anticompetitive merger-related price effects that are multiple times those of previous merger analyses in the airline industry of non-maverick firms. The results suggest that the merger weakened the firm's own incentives to act as a maverick due to the elimination of maverick competition, as well as its incentives to act as a maverick towards other firms.

The second chapter analyzes the acquisition of a maverick firm by a non-maverick dominant incumbent in the beer industry. I use the Nielsen Scanner database and a difference-in-differences approach to uncover the merger-related effects on price, quantity, and variety of offerings due to the acquisition of Goose Island by Anheuser-Busch Inbev. A fear among policymakers is that dominant incumbents will acquire mavericks to release competitive pressure on themselves or foreclose parts of the relevant market to other startups. I find the contrary to be true in this acquisition,

with the incumbent firm maintaining price competition while expanding sales and encouraging entry into the market for craft beer.

KEYWORDS: Antitrust, Mergers, Airlines, Beer, Mavericks

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Date: July 28, 2020

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For Angie, Cooper, and Toto.
Colossians 3:17

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Within antitrust circles, the word maverick connotates a specific type of firm outlined in the Horizontal Merger Guidelines that has recently captured the attention of policymakers and the general public. There is fear that firms which may be potentially disruptive or may exert a disproportionately competitive influence in oligopoly markets are being acquired by dominant incumbent firms intent on alleviating competitive pressure on themselves and monopolizing markets. The most high profile fears center on the acquisition of startups by Big Tech. For example, a potential new search platform that may "out-google Google" may be acquired by Google in its infancy. Instead of encouraging innovation, Google may decided to shut down the disruptor and reduce consumer welfare by limiting choice and/or innovation and progress.

The literature and documentation on the post-acquisition effects arising from these takeovers is sparse for several reasons. The first is policy-related. The Hart-Scott-Rodino Act outlines when acquisitions and mergers must be reported to the Federal Trade Commission and the Department of Justice. Due to the startup nature of these acquisitions the dollar value paid to owners of these firms often fall below the reporting thresholds and the Agencies never are accorded the opportunity to evaluate the acquisitions' competitive implications. The second is data-related. For markets where products are provided at zero-cost, as is the case with many platforms and two-sided markets, there is often not the traditional price-quantity metrics with which most mergers and acquisitions are assessed. Furthermore, many of the competitive implications, such as reduced innovation, are quality-related and are difficult to assign a price tag or a value given available data. Third, there is no easy litmus test to define a maverick firm. The Horizontal Merger Guidelines outline various criteria that may be associated with maverick firms but stop short of offering any prescriptive method to identify them, making it difficult for economists to analyze mergers under a "maverick" lens.

How a firm becomes a maverick or develops a maverick influence in markets where it competes is often endogenous or unobserved by the econometrician. There may be particular managerial interactions and decisions that cause a firm to exert a maverick influence on its competitors, or there may be intrinsic qualities to the product or the firm that allow it to either offer a particularly innovative quality in its product(s) or a particularly aggressive pricing strategy. Either way, a maverick firm is distinguished from non-maverick firms because it finds these strategies to be profit maximizing, even among collusive strategies that are preferable from a profit perspective to other competing firms. Often a maverick cannot be predicted *ex ante* but can be identified *ex post*. For instance, in retrospect it is clear that Apple acted as a maverick in the smartphone market when it introduced the iPhone, that Southwest acts as a maverick by constraining price on airfare, and that craft brewers act as mavericks in the American beer industry by providing a high quality differentiated product and consumption experience compared to macrobrewed lagers. While it would have been

difficult to predict their maverick effect before their respective market entry, we are able to clearly see their influence when we compare these firms to dominant and incumbent firms in these various markets. It is this comparison to a non-maverick that often allows mavericks to be revealed.

This dissertation analyzes two types of mergers involving maverick firms. The first considers the case where a maverick firm purchases another maverick firm. Mavericks may not only constrain collusion from occurring among non-maverick market participants, but also may encourage other mavericks to remain vigorous competitors. When a merger involves two maverick firms, the primary antitrust question is whether the new firm will produce a strengthened maverick or a weakened maverick. We can answer this by analyzing markets where both firms compete, which experience a loss of competition and in particular a loss of maverick competition, as well as markets where only the acquiring firm competes and markets where only the acquired firm competes, which experience no loss of competition but may be better indicators if the new firm exerts stronger or weaker competitive effects on competing firms. There is little to suggest that a merger of non-maverick firms would affect markets where only one of the firm competes, but in the case of a merger involving a maverick these markets may be particularly instructive on whether or not the merger ended up creating a stronger or weaker maverick, and present insight for future antitrust analysis involving these firms. This chapter in particular examines the airline industry and the first merger to involve a maverick firm in the airline industry - all other literature up through the time period studied only mergers involving non-maverick airlines. The American airline industry also makes an interesting case study because it contains two types of firms, categorized as low cost carriers and legacy carriers, which have characteristics that closely align to the Guidelines' respective definitions of mavericks and non-mavericks.

The second chapter analyzes a merger involving the acquisition of a maverick firm by a dominant incumbent firm in the American brewing industry. This provides a case study that may be instructive into how Big Tech and large companies in other sectors integrate and develop products and product spaces using acquired disruptors. The antitrust concerns in these types of acquisitions are that, taking advantage of high barriers to entry in an oligopolistic market, dominant firms can use acquired maverick firms as a weapon to foreclose other competing mavericks in the relevant product space or shut down acquired firms in order to quell innovation and competition and keep the market power and position the dominant firm enjoyed before the maverick entered. However, it is unclear that a firm would find this profitable or a desirable strategy. It may also be the case, particularly in competitive markets, that the dominant firm will leverage its existing capabilities and economies of scale to create a more aggressive maverick and bring better, more competitively priced products to market faster, and make them available to a larger swath of consumers than the original firm would have been able to do. This should be lauded by both the public and the Agencies.

Finally, it must be noted that the prospect of being acquired by a dominant incumbent firm at a premium valuation is itself an incentive to entry and incentive to innovate. Antitrust policy that prevents or slows disruption by mavericks may have a much greater negative welfare effect than any acquisition of a disruptive firm by

a bad player. In competitive markets with low barriers to entry, shutting down or foreclosing of a market by a dominant firm through acquisition is unlikely to yield long term permanent benefits to the acquirer and make anticompetitive conduct less likely, highlighting the importance of good policy in encouraging free markets that provide entrepreneurs with necessary incentives.

Chapter 2 : Mavericks and Mergers In Concentrated Markets

2.1 Introduction

The Southwest Airlines/AirTran Airways merger is unique among recent airline mergers in that it involves two low cost carriers, which typically act as maverick firms within the airline industry.[1] When a merger involves a maverick firm it is subject to special scrutiny under the Horizontal Merger Guidelines. This merger involved two of the largest maverick firms in the American airline industry, and the largest and second largest low-fare competitors in the top 1000 airline routes. In the second quarter of 2010, Moss (2010) found that Southwest was the low-fare competitor in 30% of these markets and AirTran was the low-fare competitor in 15% of these markets.[2] Moreover, in 1993, the Department of Transportation noted that Southwest has a unique procompetitive effect on price and quality of service, more intense and distinct than that of other low cost carriers. This came to be known as the Southwest Effect (Bennett and Craun, 1993).

A merger between mavericks may create conditions that lead to an increase in market power for the new firm and the possibility of collusion among remaining firms, even more so than a merger of non-mavericks. This paper will investigate whether the merger of these two maverick airlines resulted in reduced competition on the average price of airfares.

The 2010 Horizontal Merger Guidelines (DOJ, 2010) define a maverick firm in *Section 2.1.5* as "a firm that plays a disruptive role in the market to the benefit of customers." The Guidelines mention mavericks five separate times and accord a merger that may involve a maverick special scrutiny. A firm may be a maverick through competition in price, quality, quantity, or a novel business strategy. A summary of the *Guidelines'* definition and description of maverick firms is below:

- Mavericks may possess a disruptive technology or business model that poses actual or potential competition to incumbents *(Section 2.1.5)*
- Mavericks may have incentives that lead them to be price cutters, aggressive competitors, or resist industry price increases *(Section 2.1.5)*
- Mavericks may possess the ability to quickly increase production or may be a firm that resists industry norms or behaviors *(Section 2.1.5)*
- Mavericks may be responsible for fluctuations in market shares in highly concentrated markets *(Section 5.3)*

[1] The mergers between America West/US Airways, Delta/Northwest, United/Continental, and US Airways/American Airlines all involved legacy carriers

[2] The low fare competitor is defined as the airline offering the lowest fare in the market, defined at the city-pair level.

- Mergers may create a new maverick firm or bestow an existing firm enhanced incentives to lower price via cost reductions or realized efficiencies, decreasing the likelihood of coordination *(Section 10)*

The elimination of a maverick firm may lead to merger-related coordinated effects by making conditions more favorable for tacit or overt collusion. When a maverick firm is present, a collusive group of firms may not be able to set price or some non-price product attribute at the level they wish because the maverick will take away market share and profits by competing aggressively and deviating from the collusive firms' strategy. However, the elimination of a maverick firm may also lead to unilateral effects if the maverick is the acquisition target and directly constrains the strategy of the acquiring firm premerger. This may be through either price or non-price strategies over which the acquiring firm may not wish to compete.

A firm may act as a maverick and later transition into a non-maverick. Sometimes a dominant firm may start out as a maverick by producing an innovative product. Apple, currently a dominant firm in the mobile phone industry, has itself acted as a maverick firm. The first iPhone disrupted a market dominated by Palm and Blackberry. Now Apple itself faces maverick firms in the smartphone market from startups located in China and Silicon Valley. In the brewing industry, craft brewers have offered consumers a differentiated product with higher quality than what macro brewers offered. Macro brewers responded by developing their own high quality brews in-house, such as MillerCoors' Blue Moon brand, and by acquiring craft brewers. To date, Anheuser Busch-Inbev has acquired ten craft brewers in order to compete more aggressively in the American market for beer. These examples show how a company itself may be a maverick, become a maverick, or may act as a maverick in some product markets and a non-maverick in others.

A maverick may also meet the demand for a lower-priced, lower-quality product that appeals to a subset of consumers not served by incumbent firms. A simple two-stage Hotelling model illustrates this. In period one, demand is centered at 0.5 and distributed standard normal along the Hotelling line. Entry requires commitment to a spot on the line and afterwards a firm may not move. All firms that enter in the first period will position themselves at 0.5 in order to attract as many consumers as possible with no information as to demand in future periods. In the second period, demand changes, but is now centered at 0.4 and distributed standard normal. New firms will enter at 0.4 to meet the new demand for the lower quality product. The firms that entered in the first period may not move and so stay at 0.5, sharing demand above 0.5 with the other incumbent firms and sharing demand between 0.4 and 0.5 with incumbents and entrants. Entrants share any demands for any customers below 0.4 that would like to purchase given travel costs and the Nash-Bertrand price. This is illustrated in Figure 2.1.

The acquisition of maverick firms has taken higher competitive importance due to activity in the technology sector, where dominant firms such as Apple, Facebook, Google, Microsoft, and Twitter acquire firms that develop new products that compete with products of the acquiring firm or threaten the acquiring firms' market position in some way. These five tech firms alone have made approximately 600 acquisitions.

Such acquisitions also take place in the transportation sector, where firms such as Ford, GM, and Mercedes-Benz are acquiring green energy, mobility, and autonomous driving companies in order to speed the development of autonomous vehicles and new mobility services. Note that this may or may not be anticompetitive. Often these companies acquire startups in order to reduce development time and bring new products to market faster, in a form that better meets the demand for a larger swath of consumers. However, they also may acquire these firms to prevent competition in markets where the acquirers possess market power, though this concern should be balanced by the fact that an active market for corporate control reduces risk for new entrants and spurs innovation and entrepreneurism.

Despite the increased importance of maverick firms in many markets, there is very little literature on their competitive effects. Coate (2006) points out that one-sixth of cases examined by the FTC for coordinated effects between 1993 and 2003 involved maverick firms. Eckert and West (2004) analyze gasoline retailing markets in two Canadian cities and find that price volatility is associated with the presence of a maverick firm, whereas price stability may be associated with successful tacit collusion. Jacobs (2001) suggests that a maverick's strategy may be to become an attractive acquisition target for incumbent firms in order to yield a premium for its shareholders, noting that antitrust law may disincentivize rigorous competition if upstarts are precluded from being acquired. Kwoka (1989) develops a theoretical model which implies that mergers involving maverick firms have a larger effect on industry output than mergers involving non-maverick firms.

Owings (2013) contends that maverick firms in the Guidelines should be defined as *disruptive innovators*.[3] Owings identifies three criteria to identify *disruptive innovators*: (1) a worse product (in some dimension) is offered, (2) the product is priced lower than incumbents' products, and (3) the product meets the demand of a subset of the market so that consumers substitute towards it. She cites Netflix as an example, who offered a movie rental service without late fees, but required consumers to wait for the movie to come by mail and to choose from a smaller selection than offered by incumbents such as Blockbuster. Blockbuster did not view Netflix as a competitive threat because its management was not able to perceive the demand for a product such as that offered by Netflix, allowing Netflix to grow and compete in both its original market, and eventually also in Blockbuster's market through a wider selection and streaming services.

Baker (2002) presents the most detailed and influential exposition on maverick firms. He notes that coordination, when it does arise, is often imperfect and incomplete, and a maverick firm may have a unique role in constraining its effectiveness. The maverick does not even have to lower price to do so; it merely needs to adopt a more profitable strategy in not following the collusive activities of other firms in its market.

In a merger review, (Baker, 2002) notes that the identification of maverick firms may separate out anticompetitive and procompetitive mergers. If a merger involves

[3] *Disruptive innovators*, a term coined by Clayton Christensen, are firms that introduce a product that performs worse than what is offered by incumbents.

a maverick and removes the constraint on coordination imposed by the maverick, for example through acquisition, it may be anticompetitive and should be assessed as such. However, if there are large expected cost efficiencies from the merger, the merger may allow the maverick to further constrain coordination in the market. Furthermore, for mergers involving non-mavericks there may be no effect on the maverick's strategy, or the merger may create a maverick due to cost efficiencies. The merger may also alter the current maverick firm's incentives. In this last case it is not clear which way incentives would be altered; incentives may be such that the maverick will act more competitively, or less competitively, based on the market conditions. Lastly, a merger of non-mavericks may exclude other firms from the market. In the case that the firm excluded is the maverick, the merger will be anticompetitive. However, in the case when non-maverick firms are excluded, there may be no anticompetitive effect.

This previous research leads to several questions regarding mergers and acquisitions involving maverick firms. It is an empirical question as to how the merger will affect other maverick firms as well as other competitors in the market and if these effects are heterogeneous. It is also an empirical question as to how the new incentives of the merged firm affect its own conduct. This line of research is particularly relevant due to the increase in acquisition activity involving firms that are not compelled by the Hart-Scott-Rodino Act to be reported to the Agencies–as pointed out by Wollmann (2019).

This paper will endeavor to answer these questions within the context of a merger in the airline industry. Section 2 describes the U.S. Airline Industry and which firms in it may be described as mavericks. Section 3 outlines a merger among two mavericks firms in the airline industry, Southwest and AirTran. Section 4 describes the data and variables I will use and Section 5 presents a standard merger retrospective model and event study. Section 6 addresses possible issues stemming from selection. Section 7 addresses heterogeneity from a classic antitrust perspective and section 8 addresses heterogeneity from the perspective of a merger involving maverick firms. Section 9 contains robustness checks and section 10 concludes.

2.2 Maverick Firms and the U.S. Airline Industry

In the United States, the airline industry consists of two main groups of airlines, the "legacy" carriers, so-called because they operated prior to deregulation, and the low cost carriers. Legacy carriers offer a full menu of products to fliers, including various fare classes (*e.g.* coach and first class), various sizes and types of aircraft, frequent flier programs, and, typically, service through a hub-and-spoke network. Examples of legacy carriers include Alaska, American, Continental, Delta, Northwest, Republic, US Airways, and United. In contrast, low-cost carriers usually offer a limited menu of products to fliers, offer one fare class, and do not offer similarly comprehensive frequent flier programs, or other perks. They typically fly one type of aircraft (which are often newer and have lower running costs), often utilize secondary airports with cheaper fees, and typically offer service through a point-to-point network. In a point-to-point network, airlines operate service directly between two cities as opposed to through a stopover hub. Low cost carriers typically operate this type of network and

derive their relative efficiency from its lower cost structure.[4] Examples of low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Southwest, Spirit, Sun Country, and Virgin.

This structure of the airline industry is neatly described by the two-stage Hotelling model outlined earlier with legacy firms acting as incumbents and low cost carriers acting as entrants or mavericks. Before deregulation, airline service was federally mandated to be a high price and high quality market. The legacy carriers thus optimized their operations to serve the demands for these customers. Since price competition was constrained, they competed on non-price factors, such as high quality amenities and services. After deregulation, the low cost carriers found that there was demand for cheaper flights with fewer amenities, locating below the legacy carriers on the second period Hotelling line. However, because of fixed investments, legacy carriers never transitioned into low cost carriers, choosing to serve the higher end, more inelastic portion, of the market such as that for business travel. This closely mirrors the industry we see today, decades after deregulation.

Within the maverick firm framework laid out by the *Guidelines*, the literature on the airline industry implies that the low cost carriers, in particular Southwest, may be identified as maverick firms within the U.S. airline industry. *Section 2.1.5* indicates that mavericks may possess a disruptive technology or business model that poses actual or potential competition to incumbents. Goolsbee and Syverson (2008) examine the effect on prices from the threat of market entry and find that incumbent carriers decrease fares when Southwest announces it will enter a market and Morrison (2001) documents the consumer welfare gains due to competition from Southwest airlines, indicating that Southwest may be a maverick under this qualification.

In 1993, the Department of Transportation noted that Southwest had a unique effect on price and quality of service, over and above other low cost carriers, calling it the Southwest Effect (Bennett and Craun, 1993). Many have found that the entry or exit of a legacy carrier from a market has no effect on average fare price but have found that when low cost carriers enter a market, fare prices decrease and when they exit, fare prices increase (Bennett and Craun, 1996; Brueckner et al., 2013; Hüschelrath and Müller, 2011; Ito and Lee, 2003; Kwoka et al., 2016; Morrison, 2001; Moss, 2010; Tan, 2016). This literature indicates that not only Southwest, but low cost carriers in general may fit the definition of maverick firms, as *Section 2.1.5* points out that mavericks may have incentives that lead them to be price cutters, aggressive competitors, or resist industry price increases.

Section 2.1.5 also details that a maverick may possess the ability to quickly increase production or may be a firm that resists industry norms or behaviors. Southwest and AirTran in particular may meet this criterion for defining a maverick. Kwoka et al. (2016) noted that low cost carriers serve over one-fourth of all passengers and capture a corresponding amount of revenue passenger miles and in many markets Southwest and AirTran were the premerger largest and second largest low cost carriers (Moss, 2010). Both firms also resist industry norms, for example, AirTran (along

[4] Ito and Lee (2003) note that two low cost carriers, Frontier and AirTran, operate hub-and-spoke networks instead of point-to-point networks.

with Frontier) chooses to operate hub-and-spoke networks instead of point-to-point networks as a low cost carrier and Southwest is unique among firms in that you may not view or buy their fares (and thus compare their fares) on travel websites.

Section 5.3 tells us that mavericks may be responsible for fluctuations in market shares in highly concentrated markets. This aspect of "maverickness" is difficult to detect in the airline industry using the quarterly data publicly available from the Department of Transportation that most of the airline economics literature analyzes. However, many markets in the airline industry are concentrated (the average market in my dataset would be considered highly concentrated by the Department of Justice) and Ito and Lee (2003) find that incumbent hub-and-spoke carriers accommodate low cost carrier entrants to an extent by lowering fares. However, they do not find that incumbents undercut the entrant's prices or match the entrant's capacity choices.

Finally, the Guidelines explicitly express in *Section 10* that mergers may create a new maverick firm or bestow an existing firm enhanced incentives to lower price via cost reductions or realized efficiencies, decreasing the likelihood of coordination. However, there is antitrust concern that a merger involving a maverick may have the opposite effect, Kwoka et al. (2016) find that low cost carriers' effect on both other low cost carriers' and legacy carriers' prices weaken as their market share increases and as one low cost carrier dominates a market, underscoring the possible competitive importance of a merger involving two low cost carriers in that their market share would increase in any market where they both competed and could lead to a decline in competitive pressure.

The wealth of publicly available information has allowed an extensive economic literature on the airline industry. In addition to the papers mentioned above, Borenstein (1990) analyzes two airline mergers and finds an increase in market power in one but not the other. Kwoka and Shumilkina (2010) look at the USAir/Piedmont merger and find that prices rose on routes where one of the firms was present premerger and the other was a potential entrant. Luo (2014) finds small fare increases due to the Delta/Northwest merger. Brueckner et al. (2013) investigate the effect of in-market and adjacent competition from low cost carriers and legacy carriers in nonstop and connecting markets. They conclude that legacy carriers exert weak effects on average fares while low cost carriers exert strong effects on average fares.[5] By examining the determinants of airfare for trips originating from specific airports instead of prices at the airline-market level, Bilotkach and Lakew (2014) find that consumer welfare losses from consolidation may be concentrated within smaller communities.

Du et al. (2008) examine the effect of the Southwest/American Trans Air code-share agreements and find that prices decreased and the number of passengers served increased for incumbents in affected markets, suggesting that Southwest has an effect when it enters a route by code-share agreement in addition to entering it directly. Lastly, Le (2016) assessed the Southwest/AirTran merger by investigating the price and quantity changes on nonstop routes in different types of markets for the merging

[5]They define connecting markets as those in which neither low cost carriers nor legacy carriers offer nonstop service. I define connecting service similarly, that is, connecting service is a flight where there is a stopover between the two endpoints of the trip, also known as a multi-segment trip. I include both nonstop and connecting service offered within the same market in my analysis.

carriers.[6] However, he does not control for market factors such as the effect of entry and exit from low cost and legacy carriers and the possible influence of connecting service. Neither does Le identify the market segments that drive the anticompetitive effects of the merger. My research also differs from Le's in that it contributes to the general retrospective merger literature by using a difference-in-difference-in-differences approach in retrospective merger analysis to analyze the effects that may arise in a merger among maverick firms.

2.3 The Southwest/AirTran Merger

Since 2005, there have been four major airline mergers involving legacy carriers, America West/US Airways (2005), Delta/Northwest (2008-2010), United/Continental (2012), and US Airways/American Airlines (2013-2015). On September 27, 2010, Southwest Airlines announced its intention to acquire AirTran Airways. On April 23, 2011, AirTran shareholders approved the merger and on April 26, 2011 it cleared the U.S. Department of Justice without challenge. Southwest Airlines and AirTran Airways were fully merged on December 28, 2014, when the last AirTran Airways flight flew out of Atlanta, Georgia. The merger was unopposed by the antitrust authorities because of the efficiencies the merger was expected to generate. The Department of Justice cited both consumer welfare benefits from offering connecting service to new cities through Atlanta (an AirTran hub) and a lack of barriers to entry in markets where the two firms previously competed as justifications for approval (DOJ, 2011).[7] Additionally, Southwest's fleet is comprised solely of Boeing 737s and the AirTran fleet is comprised of 737s and 717s, so there was overlap in the two carriers' infrastructure.[8] Southwest estimated that it would realize 400 million dollars in annual synergies (Esterl, 2010).

Moss (2010) highlights several concerns regarding this merger. She identifies six airport-pair markets in which the merger would create a monopoly, and twelve markets where the postmerger HHI would be above 5000.[9] With no alteration of pricing strategies, the postmerger company would be the lowest fare competitor on over half of the top 1000 routes. This raises the prospect that the merger of the two firms could potentially reduce competitive pressure on the airline industry as a whole.

On the face of it, a merger between Southwest and AirTran constitutes a Williamsonian tradeoff (Williamson, 1968). The cost savings go on one side of the ledger. But the other side of the ledger deserves consideration as well. After all, the combination of Southwest and AirTran represented a combination of two low cost carriers, which,

[6] Le defines four different types of routes by the type of competition Southwest and AirTran engage in on the route. These include actual, potential, new, and non-overlap competition.

[7] Specifically, the Department of Justice said; "although there are overlaps on certain nonstop routes, the division did not challenge the acquisition after considering the consumer benefits from the new service. Also, the airports affected by the overlaps are not subject to restrictions on slots or gate availability. Where such restrictions exist, entry by other airlines may be particularly difficult."

[8] Southwest ended up selling the 717s to Delta to maintain a fleet of only one type of aircraft.

[9] If a city-pair market structure is used instead, these increases of HHI are not as notable, because market shares tend to be lower in a city-pair market definition.

as outlined above, typically act as maverick firms within a market. For Southwest, the acquisition of AirTran represented the elimination of one of its main competitors whose business model was like its own, not like that of a legacy carrier. Additionally, either Southwest or AirTran typically offered the lowest fares in the majority of the top 1000 markets as identified by Moss (2010). The elimination of head-to-head competition between these firms could reduce pricing pressure on not only legacy carriers, but also other low cost carriers as Kwoka et al. (2016) and Baker (2002) suggest.

Thus, with the merger of what are likely the largest and next largest maverick firms in the U.S. airline industy, conditions are right for an increase in market power for the new firm and collusion among remaining firms, even more so than in the case of a merger of two legacy firms (Moss, 2010). This is the subject of this empirical study.

2.4 Data and Variables

DB1B Market Database

Flight data were obtained from the DB1B database (specifically the DB1B Market database), which is published by the US Department of Transportation. The DB1B database is a quarterly sample of 10 percent of domestic airline tickets. One drawback of the database is that, although it is a large sample compared to many other publicly available databases, due to the random sampling nature of the data there may be some smaller markets that are underrepresented and have a biased distribution of tickets in the database. I deal with this in part by only looking at markets for which both endpoint airports are located in a metropolitan statistical area. This may underestimate my conclusions regarding the merger, given that Bilotkach and Lakew (2014) found that smaller markets may be disproportionately affected by consolidation and firm exit such as may occur as a result of a merger.

For each observation I am able to view the origin and destination airports and the city and state where they are located, the price of the ticket, the number of connections (and consequently whether it is a connecting or nonstop ticket), the airline that sold the ticket, the airline that actually operated the flight, and the quarter and year the flight occurred. I also am able to observe the number of passengers who purchased a ticket at that price, whether or not it was a bulk fare, and various distance metrics. I use the DB1B database to obtain the average fare on nonstop and connecting flights for each carrier at the product level. I define a product as a particular carrier offering a particular type of service in a specific market. For example, Delta providing connecting service in the Chicago-Newark market and nonstop service in the Chicago-Newark market would be considered two separate products. I obtain per capita personal income at the Metropolitan Statistical Area (MSA) level from the Federal Reserve Economic Data that are made available by the St. Louis Federal Reserve and population estimates at the MSA level from the U.S. Bureau of Economic Analysis. I merge these macroeconomic variables with the MSA in which the particular airport is located.

Sample

In my analysis, I distinguish between nonstop and connecting service types.[10] Most of the literature on airline consolidation does not distinguish between nonstop and connecting (multiple flight segments) service, or else considers them separately. Because it is a strong assumption that firms do not strategically react to the full menu of alternatives when developing their pricing strategies, I incorporate data points covering both connecting and nonstop service in the same sample for my analysis. This is done under the assumption that airlines take into account other carriers' existing nonstop and connecting services within a market when making strategic decisions, *e.g.*, how to price, how many seats to supply, whether to exit, or whether to enter. In the sample I use for estimation I include major legacy and low cost carriers, resembling analysis by Brueckner et al. (2013) and Luo (2014);[11] However, I calculate HHIs using all available data (including all airlines) in order to obtain accurate concentration estimates. Additionally, all markets are treated as directional. That is, the route between Chicago and Washington D.C. and the route between Washington D.C. and Chicago are treated as two separate markets.[12] I create a panel from the first quarter of 2009 through the last quarter of 2016. I omit data from the last quarter of 2010 and the first two quarters in 2011 because that is the time frame between when the merger was announced by the firms and cleared by the Department of Justice.[13] I also estimate a model that includes this time period for robustness and find qualitatively similar results. This provides a clean identification of the pricing strategies before and after the merger was consummated. I do not omit very high or very low fares to avoid econometrician-induced bias following Bollinger and Chandra (2005), though I include a winsorized sample for robustness and find qualitatively similar results. I do, however, omit fares sold in bulk to travel agents.[14] Finally, I only include data from carriers that service at least 2000 passengers on a particular route in the premerger

[10] I restrict my sample to flights with either zero or one connections.

[11] For low cost carriers these include AirTran (FL), Allegiant Air (G4), Frontier (F9), Jetblue (B6), Southwest (WN), Spirit (NK), Sun Country (SY), and Virgin America (VX). For legacy carriers this includes Alaska (AS), American (AA), Continental (CO), Delta (DL), Northwest (NW), Republic (YX), US Airways (US) and United (UA).

[12] Due to carriers' various network structures, it is sometimes the case that there will be emphasis either on nonstop or connecting routes, as well as varying utilization rates throughout the day. For instance, while there may be large amounts of traffic from City A to City B on Monday mornings for commuters trying to make a meeting by nine o'clock, there may be less demand for specific flights later in the day as different commuters fly back at different times. Carriers may attempt to increase utilization rates for their aircraft by placing these passengers on connecting routes back to their original city. I have also conducted my analysis at the city-pair level and found qualitatively similar results.

[13] The merger was announced at the end of the third quarter of 2010, but I include data from this quarter because only a very limited number of days may be affected. Given that very few consumers purchase tickets right before a flight, it is unlikely that there was enough time for a significant strategic response on the part of other carriers. I have a relatively short premerger window and my analysis benefits from this increase in data points from this time period.

[14] I omit bulk fares sold to travel agents because they may be very different than the actual market fares that clear the market for individuals.

time period where both endpoints are in the continental United States.[15]

2.5 Standard Model

In keeping with the literature on merger retrospectives, I use difference-in-differences as my main estimation approach (Bilotkach, 2011; Brueckner et al., 2013; Kwoka et al., 2016; Tan, 2016). I estimate a fixed effects model at the product level because I assume there will be differences in pricing strategies unique to each airline in each directional airport-pair market for each type of service (nonstop and connecting). For instance, United will likely price differently than American in the Chicago O'Hare-Cincinnati CVG market as well as in the Chicago O'Hare-Houston Hobby market for both nonstop and connecting service, due to idiosyncratic carrier specific costs and network infrastructures. Using a fixed effects (within transformation) approach will control for these product level effects that are known to the airlines but unobserved by the econometrician.

The most critical assumption for difference-in-differences models is the parallel trends assumption, which says that, but for the shock, the difference in outcomes between treatment and control groups is constant over time. In order to motivate this, I have plotted observed quarterly average fares comparing each of the six treatment market types with the control market. Averages are weighted by passengers carried. These are located in the Online Appendix in Figure A.1. Notice that after the merger there is some level of divergence of trends. This generates evidence for the parallel trends assumption and allows me to go forward with a difference-in-differences model, outlined below. Identification is achieved on the assumption that, save for the merger, there are no other shocks or contemporaneous effects postmerger that were not present premerger which differentially affect markets where Southwest and AirTran offered service premerger compared to those where it does not.

In keeping with the standard difference-in-difference approach for merger retrospectives, I define two comparison markets. The first, "treatment" markets, are defined as a directional airport-pair where both of the merging firms offered either or both nonstop and connecting service in every quarter of the premerger time period. "Control" markets are defined as a directional airport-pair where neither of the merging firms offered any type of service in any quarter of the premerger time period. Note I use the language of treatment and control here, although these are not classic treatment and control categories. I utilize this language in order to make clear that the markets that should be affected by the merger are in the "treatment" group and those markets that should not be affected by the merger are in the "control" group, similar, though not the same, to quasi-experimental designs analyzing the effect of a policy or intervention. In the data, this is captured by the variable *Full SW and AT Market*, which takes a value of one if the market is a treatment market and a value of zero if the market is a control market. These are so defined because if the merger is of antitrust concern, it would likely be in those markets that experience a loss

[15] Due to the 10% sampling mechanism in the DB1B, I require each carrier to service at least 200 passengers on a route in the data.

of a competitor and increase in concentration making tacit or overt collusion more likely due to the merger. The merger should not affect markets where neither firm competes because there should be no change in competition related to the merger in these markets. In the data, I observe 482 of these markets, compared to 2,086 markets in my "control" group, as well as 1,560 markets where Southwest competed premerger but AirTran did not and 572 markets where AirTran competed premerger but Southwest did not.

If the specification and identification strategies are valid and the variable *Postmerger* × *Full SW and AT Market* is positive and statistically significant, this is evidence of anticompetitive effects from the merger on pricing decisions by firms that compete in markets where Southwest competed premerger. I use cluster robust standard errors clustered at the market level. My full model has the following specification:

$$\begin{aligned} log(price_{ijkt}) = {} & \beta_1 Postmerger_t + \beta_2 Full\ SW\ and\ AT\ Market_k + \\ & \beta_3 Postmerger * Full\ SW\ and\ AT\ Market_{kt} + \beta_4 \mathbf{X_{ijkt}} + \\ & \eta_{it} + \tau_t + \alpha_{ijk} + \epsilon_{ijkt} \end{aligned} \tag{2.1}$$

I regress the log of the average market fare for carrier i offering service j in market k at time t against the $Postmerger_t$ dummy, the $Full\ SW\ and\ AT\ Market_k$ variable, their interaction term $Postmerger * Full\ SW\ and\ AT\ Market_{kt}$, a vector of control variables, X_{ijkt}, which consists of market demographic and competition variables, carrier-quarter fixed effects η_{it}, quarterly time fixed effects τ_t, and carrier-service-market fixed effects α_{ijk}.

I estimate three separate specifications. Carrier, market, and service-type fixed effects and interactions are included in all regressions. The first specification controls for the interaction term *Postmerger* × *Full SW and AT Market*, *Full SW and AT Market*, *Postmerger*, quarterly time effects (and thus *Postmerger* is not reported because it is subsumed within these time effects) and quarter by carrier interactions to account for cost differences across time and carriers. The combination of Southwest and AirTran represented a merger between two airlines with different network structures. Southwest operated a point-to-point network whereas AirTran operated a hub-and-spoke network. In a hub-and-spoke network, passengers often will go from point A to point B through a centralized hub controlled by the airline instead of straight to their destination, as in a point-to-point network. By including carrier-time fixed effects I control for the costs of integrating these two different types of networks. The second adds market demographic controls to the first specification: the geometric mean of population at the route's two endpoints (in 1,000,000's of people), and the geometric mean of per capita income at the route's two endpoints (in 1000's of dollars).

The third specification adds competition controls to the second specification. That is, it adds dummy variable bins for the cases where there are one, two, or three (or more) legacy carriers offering connecting service; one, two, or three (or more) legacy carriers offering nonstop service; one, two, or three (or more) low cost carriers offering connecting service; and one, two, or three (or more) low cost carriers offering nonstop

service, twelve dummies in total.[16] I include this last set of variables to capture the amount of competition from low cost and legacy carriers. This is particularly important due to the mergers of legacy airlines and the increase in competition from other low cost carriers that occurred within the time frame of the panel. One would expect that adding one carrier (legacy or low cost) may have less of a competitive effect if there already are several carriers in the market than if there were only one or few carriers in a market. The use of these dummy variables allows me to capture nonlinear effects of additional entrants in the market. This follows the findings of Bresnahan and Reiss (1991), who show that the effect of additional entry is nonlinear conditional on the number of incumbent firms within a market, and that the procompetitive effects of additional entry dissipate after a market has three to five incumbent firms.

There are three controls that would be desirable to include but are omitted due to limitations of the dataset. The first is the date and time of specific flights. Unfortunately, the DB1B only contains temporal information at the quarter level, though it is well known that ticket prices fluctuate for different flights across the day and across the days of the week. Additionally, as the flight approaches, airlines often raise price in order to take advantage of the inelastic demand of business travelers, however the DB1B contains no information when the ticket is sold relative to when the flight occurs. Finally, it would be desirable to control for the "class" of the ticket, first class tickets will sell at higher prices than business class tickets, which will sell at higher prices than coach or economy class tickets. While the DB1B does contain some information for class type, it is not reliable data and is rarely used within the literature on airlines.

Summary Statistics

Summary statistics for all variables in the premerger period are contained in Table 2.1 and summary statistics for all variables in the postmerger period are contained in Table 2.2. Recall that each observation is an airfare product, that is, a carrier offering either nonstop or connecting service in a directional airport-pair market in a particular quarter. Comparing the premerger and postmerger time periods, there are some noticeable differences relating to the extent of competition. The average number of legacy carriers competing with connecting service falls from 4.53 to 3.32 while the average number of low cost carriers competing with connecting service rises slightly from .87 to .89, Figures 2.3 and 2.5 show the evolution of the number of markets served by connecting service by legacy and low cost carriers over the sample period. Similarly, the average number of competing legacy carriers offering nonstop service falls from 1.85 to 1.50 while the average number of competing low cost carriers falls from .45 to .42. Figures 2.2 and 2.4 show the evolution of the number of markets

[16] These will all take a value of zero when Southwest is the only carrier within a market. Because of the Southwest Effect, I exclude Southwest from my tally of low cost carriers, since its effect on competition has been documented to be distinct from that of the other low cost carriers, as mentioned above. It is a valid approach to count low cost carriers separately from Southwest because the effect from Southwest in a market has been shown to be distinct from that of other low cost carriers (Bennett and Craun, 1993).

served by nonstop service by legacy and low cost carriers over the sample period. These numbers and graphs show the consolidation that has occurred over the sample period due to merger and acquisition activity among the legacy carriers. Notice in each case that the decline in the number of competing legacy carriers falls much more both in absolute and relative terms than does the number of competing low cost carriers. This highlights the need for the battery of competition variables I include in my full model.

Selected summary statistics are also shown for products in markets neither Southwest nor AirTran competed in premerger (Table 2.3), and products in markets where they both competed in the full premerger time period (Table 2.4). One thing to note is that they differ in their relative concentration and level of competition, with those markets that neither Southwest nor AirTran compete in having higher average premerger HHI and significantly fewer competing legacy or low cost carriers, despite higher populations.

Results

Across specifications, estimates from the interaction term for *Post* $\times$ *Full SW and AT Market* imply that the increase in market power of the merged firm has allowed airlines in markets both merging firms competed in before the merger to increase prices between 5.27% and 6.10%. This is much more than the 1.1%-1.3% increase in prices found by Luo (2014) in nonstop markets and 2.3% increase in prices in connecting markets due to the 2008 merger of Delta and Northwest, two non-maverick, legacy carriers. In 2016 the Bureau of Transportation Statistics reports that Southwest enplaned over 150 million passengers (BTS, 2011). In the DB1B, I observe an average fare of \$161.37 for all tickets sold by Southwest in 2016. This implies a back-of-the-envelope merger-related transfer of surplus of almost 1.3 billion dollars from consumers to Southwest, more than three times the 400 million dollars in synergies forecasted by the merging firms when announcing the acquisition.

Event Study

I further explore these results by conducting an event study using the same model but with a reference period of Q4 2010. This is the first full quarter after the announcement of the merger and was chosen in order to account for the fact that once the firms announced their intention to merge, strategic information may begin to be shared between the two firms. Furthermore, despite it clearing the Department of Justice in Q2 2011, there may have been anticipatory reactions by other firms directly following the announcement but before the merger was cleared. The equation for the event study has the following form.

$$
\begin{aligned}
log(price_{ijkt}) = & \\
& \sum_{\tau=0}^{7} \gamma_{-\tau} Quarter_{-\tau} * Full\ SW\ and\ AT\ Market_k + \\
& \sum_{\tau=1}^{24} \delta_{\tau} Quarter_{\tau} * Full\ SW\ and\ AT\ Market_k + \\
& \beta_2 Full\ SW\ and\ AT\ Market_k + \beta_3 \mathbf{X_{ijkt}} + \\
& \eta_{it} + \tau_t + \alpha_{ijk} + \epsilon_{ijkt}
\end{aligned} \tag{2.2}
$$

To corroborate the results from the standard diff-in-diff model, we expect that the lead (γ) terms will be statistically indistinguishable from zero and the lag terms (δ) will be positive and statistically significant. The event study is located in Figure 2.6 and seems to confirm the findings from the diff-in-diff model. There is (slightly downward sloping) movement in price around zero in the lead terms up to the quarter after the announcement of the merger as expected. Afterwards, the lag terms diverge from zero three quarters after the merger (right after the DOJ cleared the merger), and continue to rise throughout the postmerger time period, with expected fluctuations around a positive trend.[17]

2.6 Addressing Selection

In order to identify merger-related effects on price, it is standard to compare markets where both Southwest and AirTran competed premerger to those where neither competed premerger. To do so the variable *Full SW and AT Market* was created which takes a value of one for markets where both Southwest and AirTran competed in the full premerger time period (every quarter) and a value of zero for markets where neither competed in any quarter in the premerger time period. One drawback of this approach is that there may be a selection issue in the sample of markets where both competed in every quarter premerger. The concern is that there may be other markets that are affected by this merger that are not included in the "treatment" group. To address this concern I also create a variable *Any SW and AT Market* which takes a value of one for markets where both Southwest and AirTran competed at any point (at least one quarter) in the premerger time period and a value of zero for markets where neither competed in any quarter in my sample's premerger time period. By estimating separate regressions for each of these, I can be assured that my results are robust to the endogenous selection that may be present in markets that Southwest and AirTran competed in for the full premerger time period. Summary statistics for the *Full AT and SW Market* sample are located in Table 2.4 and summary statistics for the *Any AT and SW Market* sample are located in Table B.1 in the Online Appendix. Overall, the selected summary statistics suggest these markets are similar.

[17] Though there appears to be some seasonality in the event study, time fixed effects are included in the model, thus this appears to be some fluctuation in strategy and not solely due to some recurring time trend.

Another source of selection bias may arise from only analyzing markets both firms competed in during the premerger time period. As Rickert et al. (2018) point out, a merger of two firms may affect not only markets where both firms compete in the premerger time period, but also markets where only one of the firms competes in the premerger time period. Endogenous selection issues may arise if these markets are omitted from analysis since it is clear there are unobserved reasons why one but not both firms chose to enter into this second type of market. While there are market power-related issues to investigate in markets where both firms compete premerger, issues relating to pass-through of efficiencies and the potential competitive influence of the non-competing firm can be analyzed in markets where one but not both firms compete.

I extend the methodology of Rickert et al. (2018) by analyzing non-overlap markets for both the acquiring and the target firm. Markets that include both the acquiring and target firm may experience distinct merger-related effects compared to markets where the acquiring firm (Southwest) was present premerger and markets where the target firm (AirTran) was present premerger. Specifically, in markets where Southwest competed and AirTran did not compete we may observe effects related to the potential competitive constraint AirTran may have imposed on Southwest or any efficiencies Southwest may have implemented due to its acquisition of AirTran. In markets where AirTran competed and Southwest did not we may observe any effects related to the potential competitive constraint Southwest may have imposed on AirTran or any efficiencies Southwest may have shared with AirTran. This is of special importance given that Southwest and AirTran may be viewed as maverick firms in the U.S. airline industry and may constrain collusive actions on the part of not only other firms, but each other. To analyze this, I estimate an additional four regression equations using four different treatment variables to the previous two defined above. The first two are *Full SW Market* and *Full AT Market*. *Full SW Market* takes a value of one for markets where Southwest is present in every quarter premerger but AirTran is not present in any quarter premerger and *Full AT Market* takes a value of one for markets where AirTran is present in every quarter premerger but Southwest is not present in any quarter premerger. They both take a value of zero if neither firm is present in any quarter premerger. As above, there is concern that this may be a selected sample of markets. To alleviate this concern I also create the variables *Any SW Market* and *Any AT Market*. *Any SW Market* takes a value of one for markets where Southwest is present in at least one quarter premerger but AirTran is not present in any quarter premerger. *Any AT Market* takes a value of one for markets where AirTran is present in at least one quarter premerger but Southwest is not present in any quarter premerger. They both take a value of zero for markets where neither firm competes in the full premerger time period.

With this battery of regressions, it should be noted that each variable, while designating a different treatment, designates the same control. For each sample, the treatment markets are compared to markets where neither Southwest nor AirTran were present at any point in the premerger time period, consistent with other merger retrospectives.

Results

Estimates are located in Tables 2.6 and 2.7.[18] Table 2.6 contains results for *Post* × *Full SW and AT Markets*, *Post* × *Full SW Markets*, and *Post* × *Full AT Markets*. As discussed above, results for *Post* × *Full SW and AT Markets* range between 5.27% and 6.10%, with the full specification implying a 5.27% average increase in airfare due to the merger. Estimates for *Post* × *Full SW Market* range from 2.52% to 3.56% and estimates for *Post* × *Full AT Market* range from 3.53% to 5.05%. Respectively, the estimates from the preferred full specifications are 2.52% and 3.53%. It should be noted that each type of market, whether containing both firms in the premerger time period, the acquiring firm, or the target firm, experienced merger-related price increases. The results for *Post* × *Full SW and AT Market* are the largest in magnitude, as expected because of the decrease in concentration. While firms may react strategically to the new merged firm in all of the markets in which they compete, it is only markets that both Southwest and AirTran competed in that experienced a merger-related increase in concentration. We would thus expect tacit or overt collusion to be more likely in these markets than in those markets that did not experience a merger-related firm exit.

It is interesting to note that the results from *Post* × *Full AT Market* were higher specification-for-specification than those for *Post* × *Full SW Market*. Were these to have been negative, it would be indicative of efficiencies implemented by Southwest due to the acquisition of AirTran passed through to the consumer. That we see a positive coefficient is not proof that efficiencies have not been realized, but instead that the acquisition of AirTran has allowed firms to raise prices in markets that Southwest competed but AirTran did not. This indicates that AirTran likely had an effect on markets they had not yet entered through the threat of potential competition and is an anticompetitive result of the merger, giving credence to the Guidelines' concerns regarding mergers involving mavericks.

Theoretically, the regression on markets where AirTran was present in but Southwest was not is the most likely to have a null or negative result. The acquiring firm often employs superior technology and/or processes compared to the target firm, revealed by the fact it is the firm that is purchasing the other. If this is true, and Southwest is indeed a more efficient firm than AirTran, these technologies should be implemented at AirTran as it is absorbed into the new company. That these markets observe increases in average airfare, taken with the results from the other two market types, indicates that both of these firms may be considered mavericks, and that the merger appears to have weakened their "maverickness". Undoubtedly, price increases in Southwest-only markets points to a weakening of its maverick effect, but the larger *relative* price increases in AirTran markets points to a larger weakening of AirTran's maverick effect.

Next I analyze how merger-related price effects may differ if I relax the stringent requirement for a comparison market to experience competition from one or both of the merging firms for all quarters of the premerger time period. A market entered

[18]Full results for variables omitted from tables can be made available by request to the author. It should be stated that in general all control variables were of the expected sign.

by both firms the quarter before the merger may be just as affected by the merger as markets where they have been competing with each other for every quarter premerger. Not only that, but markets both firms enter seasonally to meet fluctuating demand may also be affected by the merger. Table 2.7 contains estimates for *Post* × *Any SW and AT Markets*, *Post* × *Any SW Markets*, and *Post* × *Any AT Markets*. Estimates for *Post* × *Any SW and AT Markets* range from 4.81% to 5.61% with the preferred full specification implying a 4.81% merger-related average increase in price. Estimates for *Post* × *Any SW Markets* and *Post* × *Any AT Markets* are similar in magnitude and smaller than those for *Post* × *Any SW and AT Markets*, ranging from 2.11% to 3.15% and 2.19% to 3.57%. The lower bounds of both estimates are from the preferred full specification. It is reassuring in terms of model specification that although lower in magnitude than the "full" market variables, estimates are positive, statistically significant, and close in magnitude across specifications and variable definitions. This acts as a robustness test towards alleviating concern about specification bias with regards to the standard model, as well as adding information as to how the merger may have had heterogeneous effects across different types of markets the merging firm competed in. This motivates a heterogeneity analysis of the merger across different types of markets from a classic antitrust perspective, and different types of firms from a "maverick merger" perspective.

2.7 Addressing Heterogeneity from a Classic Antitrust Perspective

Difference-in-Differences Estimates, Concentration Subsamples

In general, industrial organization theory and antitrust experience show that firm conduct may differ markedly in more concentrated markets, though exceptions also have been documented. Where concentration is higher, market conditions may induce firms to be more likely to engage in tacit or overt collusion. To address this I conduct a subsample analysis across market concentration levels, because the merger may have had different effects in highly concentrated markets compared to unconcentrated markets. The Horizontal Merger Guidelines consider markets with an HHI above 2500 to be highly concentrated and mergers that result in an HHI in this range accompanied by at least a 100 point increase in concentration pose "potentially significant competitive concerns and often warrant scrutiny," while mergers in unconcentrated markets, "are unlikely to have adverse competitive effects and ordinarily require no further analysis." For this reason, I investigate heterogeneous effects of the merger across markets that the Agencies may consider unconcentrated versus those it would consider concentrated through subsample analysis. The merging firms and their competitors may react strategically to the merger in different ways in these different types of markets. Recall a market is defined as a directional airport pair. I calculate the premerger HHI for each market using each airline's share of passengers between a

directional airport-pair to measure firm market shares.[19,20] This approach has the benefit of aligning with the thresholds considered by the Agencies to be concentrated and unconcentrated (above and below an HHI of 2500).

Given the similarity of results between the treatment variables defining treatment as being present for the entire premerger time period versus requiring presence in a market for at least one quarter, I utilize the more standard treatment variables *Full SW and AT Market*, *Full SW Market*, and *Full AT Market* for this analysis. Table 2.8 contains results. Only in the sample of markets that would be considered concentrated by the Agencies are estimates positive and statistically significant. For the subsample of concentrated markets, the highest estimate is for the coefficient of *Post* × *Full SW and AT Market* (4.70%) and lowest for the coefficient of *Post* × *Full SW Market* (2.87%), similar to those found in analysis of the full pooled sample. In unconcentrated markets, estimates are statistically indistinguishable from zero or statistically negative in the case of *Post* × *Full SW Market* (-7.16%). This may indicate that the previous results are being driven by merger-related effects observed in concentrated markets. One thing to note is that many of the markets in the data, and many airport-pair markets in general, are concentrated. I observe 25,790 airline products in markets that would be considered unconcentrated or moderately concentrated by the agencies but 237,603 airline products in markets that would be considered highly concentrated by the DOJ and FTC. This confirms the fears expressed by Moss (2010) and indicates that entry may not have restricted merger-related effects as predicted by the Agencies in these very concentrated markets. These results are as antitrust experience and theory would expect and motivate part of the triple-difference approach I describe below. That the empirical findings corroborate theory lends credence to the model and this methodological approach.

Triple Difference Estimates: Concentration Differences

In addition to a difference-in-differences approach I also use a difference-in-difference-in-differences (triple difference) approach to analyze the merger. Using a triple difference has many benefits over the well-known difference-in-differences approach. First, it allows the economist to investigate the heterogeneous effects of a program or shock. For instance, (Courtemanche et al., 2017) note that the Affordable Care Act (ACA) may have had a greater impact in states that had a larger uninsured rate prior to the ACA than those states that had a lower rate. To account for this they implement a triple difference by interacting states' pre-ACA uninsured rate with a post-ACA time dummy and a dummy for states that implemented the ACA.

Second, a key econometric benefit of the triple-difference approach is the less restrictive assumption necessary for identification in this approach compared to a difference-in-differences approach. Whereas one must assume that there are not dif-

[19]Market share is defined as the sum of connecting and nonstop tickets sold within a market for a specific carrier

[20]Due to the sampling mechanism of the DB1B there may be measurement error in this variable. The DB1B only reports 10% of airfares and thus may understate or overstate the actual share of market used to calculate HHI.

ferential changes between treatment and control save for that caused by the merger in a difference-in-differences approach, in a triple-difference approach one must only assume that any differential changes that may have occurred in treatment and control markets were not correlated with the third difference. This is a weaker assumption than is necessary for identification in a difference-in-differences setup. The parallel trends assumption for the triple difference models I analyze are shown in Figures A.2 and A.3 in the Online Appendix. For more details on the triple difference approach, the author refers readers to Courtemanche et al. (2017).

A natural triple difference of interest to the Agencies is one where the third difference is along concentrated and unconcentrated markets as defined by the Agencies. That is, concentrated markets are those that have a premerger HHI above 2500 and unconcentrated markets are those that have a premerger HHI below 2500. This model takes the following form:

$$\begin{aligned} log(price_{ijkt}) = {} & \beta_1 Postmerger_t + \beta_2 Treatment_k + \\ & \beta_3 Concentration_k + \beta_4 Postmerger * Treatment_{kt} + \\ & \beta_5 Postmerger * Concentration_{kt} + \beta_6 Concentration * Treatment_k + \\ & \beta_6 Postmerger * Concentration * Treatment_{kt} + \\ & \beta_4 \mathbf{X_{ijkt}} + \eta_{it} + \tau_t + \alpha_{ijk} + \epsilon_{ijkt} \end{aligned} \tag{2.3}$$

As above, given the similarity of results between the treatment variables defining treatment as being present for the entire premerger time period versus requiring presence in a market for at least one quarter, I utilize the more standard treatment variables *Full SW and AT Market*, *Full SW Market*, and *Full AT Market* for this analysis. Results are in Tables 2.9. For robustness I provide results for regressions that include *Any SW and AT Market*, *Any SW Market*, and *Any AT Market* in Table C.1 in the Online Appendix. Results are broadly consistent regardless whether treatment is composed of markets where Southwest and AirTran, Southwest, or AirTran were present for the full premerger time period or at any point.

I find positive and statistically significant estimates for *Post* × *Full SW and AT Market* × *Concentrated* and *Post* × *Full SW Market* × *Concentrated*, however I find a statistically insignificant (though positive) estimate for *Post* × *Full AT Market* × *Concentrated*. This implies that there were merger-related price increases in concentrated markets compared to unconcentrated markets. The full effect of the merger across all markets is captured in the double interaction term. I again estimate coefficients statistically indistinguishable from zero as in the subsample analysis of unconcentrated markets for these double interaction terms, except for *Post* × *Full SW Market*, which I estimate to be negative but smaller in magnitude than the result from the subsample analysis (-5.88% versus -7.16%). This confirms the findings from the subsample analysis, but urges caution regarding the previous results for markets that AirTran competed in that Southwest did not.

A triple difference may be used as an approach in the antitrust economist's toolbox when looking at, identifying, and assessing merger remedies in future analyses. This is especially important given the recent interest by the Agencies in the increased

application of merger remedies and skepticism towards behavioral fixes.[21] A more flexible dummy variable approach for a third difference along concentration can reveal merger-related effects at a more granular level. For instance, instead of simply differencing across whether a market is concentrated or unconcentrated, one could create a flexible approach using four dummy variable bins that take a value of one when the market HHI is between 0 and 2500, 2501 and 5000, 5001 and 7500, and 7501 and 10,000 respectively. The bins chosen could vary. These four were chosen in order to have more evenly spaced and easily interpreted, intervals, with one interval that captures the entire range of HHI for which a market may be considered unconcentrated, for clarity in showing this practical application. (The base case for estimation will be the 0-2500 bin.)

The advantage of this model is the ability to identify and reveal what is happening across different market types across time, across markets related to the merger, and across a market characteristic that may be differentially affected by the merger. Table 2.10 contains results for *Full SW and AT Market*, *Full SW Market*, and *Full AT Market*. Again, results are consistent regardless whether treatment is composed of markets where Southwest and AirTran, Southwest, or AirTran were present for the full premerger time period or at any point.[22] The estimate for *Post* × *Full SW and AT Market* is negative but statistically indifferent from zero, as above. However, for the triple difference in this regression, the estimates become positive, statistically significant, and rise in magnitude with concentration level, indicating a merger-related increase in airfare of 4.76% for *Post* × *Full SW and AT Market* × *HHI: 2501-5000*, a merger related increase in airfare of 6.46% for *Post* × *Full SW and AT Market* × *HHI: 5001-7500*, and a merger related increase in airfare of 5.54% for *Post* × *Full SW and AT Market* × *HHI: 7501-10,000*.

Analyzing markets Southwest competed in premerger but AirTran did not, I find a large, negative, and significant coefficient *Post* × *Full SW Market* of -5.85%, indicating a procompetitive merger-related impact on these markets. This would indicate that the merger may have had the potential to create a "stronger" maverick by sharing technologies or processes between the firms. However, as concentration rises, the signs on the triple interactions become large and positive, even compared to those markets both firms competed in premerger. The estimate for *Post* × *Full SW Market* × *HHI: 2501-5000* implies merger-related price increases of 5.97%, consistent with the upper bound of estimates from previous analysis. However, the estimate for *Post* × *Full SW Market* × *HHI: 5001-7500* implies merger-related price increases of 9.82% and *Post* × *Full SW Market* × *HHI: 7501-10,000* implies merger-related price increases of 12.3%, roughly ten times the merger related price increase Luo (2014) estimated

[21] One particularly clear example of this came during Assistant Attorney General Delrahim's 2017 speech to the American Bar Association's Antitrust Fall Forum, when he said, "I believe the Division should fairly review offers to settle but also be skeptical of those consisting of behavioral remedies or divestitures that only partially remedy the likely harm. We should settle federal antitrust violations only where we have a high degree of confidence that the remedy does not usurp regulatory functions for law enforcement, and fully protects American consumers and the competitive process."

[22] Results for *Any SW and AT Market*, *Any SW Market*, and *Any AT Market* are located in the Online Appendix in Table C.2.

for the merger between the non-maverick airlines Delta and Northwest.

If the results for markets Southwest competed in but AirTran did not present cause for concern, the opposite seems to be true for those markets AirTran competed in, but Southwest did not. For the triple interactions of markets with HHI less than 7500, I find coefficients statistically indistinguishable from zero and while positive, are smaller in magnitude compared to other estimates. While in very concentrated markets (those with HHI above 7500) I do find merger-related price increases of 4.82%, it is smaller in magnitude than either the estimate for *Post* × *Full SW Market* × *HHI: 7501-10,000* or *Post* × *Full SW and AT Market* × *HHI: 7501-10,000*. This seems to indicate that the firm's and their competitors' incentives did not change postmerger in these markets to the extent they did in markets both firms or Southwest competed in. It also seems to indicate that perhaps the potential threat of AirTran affected Southwest's conduct to a greater degree than the potential threat of entry by Southwest posed to AirTran. This is an unexpected but interesting result for both the literature on airlines and the literature on maverick firms. To this second point, it appears to lend credence to the fear that firms, in this case even another maverick firm, may purchase mavericks to alleviate the competitive pressure they exert.

2.8 Addressing Heterogeneity from A Maverick Perspective

Difference-in-Differences Estimates, Carrier Type Subsamples

Because the merger of two mavericks may affect maverick firms and non-maverick firms differently, I apply a difference-in-differences approach on subsamples across the two carrier types because the airline industry's natural delineation between low cost carriers and legacy carriers maps well to definitions of mavericks and non-mavericks, respectively. Low cost carriers and legacy carriers have distinct differences in how they are organized, how they conduct themselves, and how they react to changing market conditions. The literature also has demonstrated that low cost carriers and legacy carriers have different competitive effects on each other, as mentioned above in the literature review. Results for this subsample analysis are located in Table 2.11. This also motivates a separate maverick firm-specific triple-difference approach I implement below. Again, given the similarity of results between the treatment variables defining treatment as being present for the entire premerger time period versus requiring presence in a market for at least one quarter, I utilize the more standard treatment variables *Full SW and AT Market*, *Full SW Market*, and *Full AT Market* for this analysis.[23] For this subsample analysis I drop observations of Southwest and AirTran to fully investigate the impact on the different types of firms they compete with and their responses to the merger.

For the subsamples containing only legacy carriers' products I find positive and statistically significant results for each regression, with the highest estimate coming from the regression on *Post* × *Full SW and AT Market* which implies an average merger-related price increase of 5.03%. This indicates that the loss of competition

[23] As above, results for *Any SW and AT Market*, *Any SW Market*, and *Any AT Market* are located in the Online Appendix in Table C.3.

between Southwest and AirTran has allowed legacy carriers (non-mavericks) to raise price. Results are smaller in magnitude for *Post* × *Full SW Market* (2.79%) and *Post* × *Full AT Market* (3.65%). However, as before, there is evidence that an independent AirTran may have been playing relatively more of a maverick role than Southwest, in that legacy carriers raised prices more postmerger in markets where AirTran was a competitor than in markets Southwest was a competitor.

Interestingly, among the low cost carrier subsamples, only the estimate for *Post* × *Full SW and AT Market* is statistically distinguishable from zero. It is positive and statistically significant and implies a 6.76% merger-related increase in airfare among low cost carriers in markets that both firms served premerger. This is large compared to other results I find. It is also interesting that the estimate for *Post* × *Full SW Market* is negative, but both it and the estimate for *Post* × *Full AT Market* have large standards errors and are statistically indistinguishable from zero.

This is a situation discussed in Baker (2002) and found in the results of Kwoka et al. (2016), which as discussed above, finds that low cost carriers constrain both the prices of legacy carriers and other low cost carriers though their ability to constrain prices dissipates as its market share increases. These findings corroborate their conclusions. The market share of Southwest would necessarily increase in markets where AirTran also competed, and as the increase in price shows, demonstrates a weakening of Southwest's "maverickness" - both towards non-mavericks (legacy carriers) and other maverick firms (low cost carriers). It also reveals that low cost carriers are competitive relative to each other differently than they are relative to legacy carriers and that the loss of competition in a merger involving two mavericks may impact other mavericks to a larger extent than non-maverick firms in markets where both firms competed premerger. It is interesting that there were significant results for *Post* × *Full SW Market* and *Post* × *Full AT Market* for the legacy sample but not the low cost carrier sample. This provides evidence non-mavericks react to the new maverick in different ways than other maverick firms when there is no actual loss of competition due to merger-related firm exit. These are novel findings and merit further exploration.

Triple Difference Estimates: Carrier Differences

The triple difference outlined earlier can be modified to accommodate analysis of maverick firms. As Baker (2002) illustrates and the subsample analysis suggests, a merger involving a maverick firm may change the incentives of other mavericks or change the incentives of the merging mavericks to the benefit of its non-maverick competitors. That these effects may be present is of interest and possible concern to antitrust practitioners. This leads to a third difference across firm type (maverick vs non-maverick) that we may wish to investigate in mergers involving maverick firms.

The use of a triple difference instead of subsample analysis also has advantages from the perspective of efficiency due to the larger sample size in addition to the increase in information the approach reveals to us as well as the weaker assumptions for identification as mentioned above. This approach can be generalized to other analyses involving a merger between mavericks by denoting the third difference as to

whether a firm is a maverick or non-maverick. Because there is agreement as to which firms are legacy carriers and which are low cost carriers, and non-maverick firms can be mapped to legacy carriers while maverick firms can be mapped to low cost carriers, the airline industry is a convenient choice to demonstrate this methodological approach. Interacting a dummy variable indicating whether or not a carrier is a maverick firm (low cost carriers) may reveal whether this merger affected other maverick firms (low cost carriers) differently than non-mavericks (legacy carriers). Such a model would take the following form, with the dummy *Maverick* denoting whether or not the firm is a maverick firm:

$$\begin{aligned} log(price_{ijkt}) = {} & \beta_1 Postmerger_t + \beta_2 Treatment_k + \\ & \beta_3 Maverick_i + \beta_4 Postmerger * Treatment_{kt} + \\ & \beta_5 Postmerger * Maverick_{it} + \beta_6 Maverick * Treatment_{ik} + \\ & \beta_6 Postmerger * Maverick * Treatment_{ikt} + \\ & \beta_4 \mathbf{X_{ijkt}} + \eta_{it} + \tau_t + \alpha_{ijk} + \epsilon_{ijkt} \end{aligned} \tag{2.4}$$

Table 2.12 contains estimates for this triple difference.[24] For this analysis I drop observations of Southwest and AirTran to isolate the effect of the merger solely on mavericks and non-mavericks not involved in the merger.

Looking at the full merger effect (*Post* × *Full SW and AT Market*) I find a merger-related price increase of 4.99%. This is the effect of the merger on both legacy and low cost carriers. The effect of the merger on maverick firms is identified by *Post* × *Full SW and AT Market* × *Maverick* and is positive but not statistically significant. This is weak evidence that low cost carriers were able to raise prices to a larger degree than legacy carriers due to the merger, confirming the findings from the subsample analysis.

Looking at the full merger effect in markets where Southwest competed premerger but AirTran did not, I estimate a merger-related price increase of 2.81% for *Post* × *Full SW Market* and a statistically significant merger-related price decrease of -5.07% for *Post* × *Full SW Market* × *Maverick*, indicating an increase in competition among low cost carriers in these markets. Looking at markets AirTran competed premerger but Southwest did not I find a similar increase of 3.55% in prices for *Post* × *Full AT Market* and my estimate for *Post* × *Full AT Market* × *Maverick* is negative but statistically indistinguishable from zero. These results indicate that mavericks and non-mavericks may indeed react differently to a merger among mavericks. The findings that maverick firms in the acquiring firm's markets seem to enhance their maverickness given this merger is interesting and may indicate that the new firm may be an enhanced or stronger maverick in some markets, though it is also clear that it appears to have lost its competitive significance in those markets where both competed premerger.

Taken together, these estimates indicate that it is only in some types of markets that the merger may have had an anticompetitive effect and that it affected different

[24] For analysis of the treatment variables, *Any SW and AT Market*, *Any SW Market*, or *Any AT Market* please see Table C.4 in the Online Appendix

firms with different intensity levels. These are results that may not have arisen out of subsample analysis alone and would not have been identified using a typical difference-in-differences approach. These models also outline possible ways in which triple-differences may be used in future merger retrospectives and particularly in future merger retrospectives involving maverick firms.

2.9 Robustness checks

Investigating Mechanisms

One concern about the standard model is that it may not capture merger-related increases or decreases in price due to changes in marginal cost. By including carrier-time fixed effects in the model I may be overcontrolling for these as well as merger-related inefficiences related to the integration of the two firms. To address this I estimate a model where I drop carrier-time fixed effects and only include time-invariant fixed effects. Results are located in the Online Appendix in Table C.5. Estimates for *Post* $\times$ *Full SW and AT Market* and *Post* $\times$ *Full AT Market* are consistent with the full specification, positive, and statistically significant. The estimate for *Post* $\times$ *Full SW Market* remains positive but is statistically indistinguishable from zero. This is indicative of merger-related changes in marginal costs not being the sole mechanism through which prices are affected postmerger.

Dropping Data from Merging Firms

By including data from Southwest and AirTran in the full pooled sample, there is a risk that the increase in price could be due to unilateral effects from the merger, that is, the increase in price could be due to strategic price increases only on the part of the merged firm. To alleviate this concern, I run the full model on a sample that includes all legacy and low cost carriers except for Southwest and AirTran. Results are located in the Online Appendix in Table C.6. Estimates are positive, statistically significant, and similar in magnitude to those of the full sample, regardless of which treatment variable is used. This indicates that the merger-related price increases are likely not due solely to unilateral effects.

Sensitivity to Excluding Data During the Merger

Another concern with this analysis may be that there was some shock in the data that was dropped from the sample. Conceivably, the effects observed in this analysis are not in fact due to the merger but due to some event that occurred during the period between the announcement and clearing of the merger that caused the firms to change their strategy in a way that looks like it was caused by the merger. To assuage these concerns, I re-estimate my results and include the time period between the announcement and close of the merger in the premerger time period. Results are in Table C.7 in the Online Appendix and are consistent with those of the full sample that excludes these periods but of a slightly smaller magnitude. Compared to the estimates from the sample that exclude the time period between the announcement

and close of the merger, these may be conservative because firms may change their conduct in anticipation of the merger.

Weighted Regression

One might also be concerned that observations for small providers on small routes are given the same weight as those for large providers on large routes. That is, Delta's Chicago-New York nonstop route is given the same weight as Frontier's nonstop route between Denver and Cincinnati. I thus re-estimate my models using a weighted regression approach, weighting by the passengers flown by the carrier on a route within a quarter. Results are located in Table C.8 in the Online Appendix and estimates on the coefficient of interest are smaller in magnitude than those in the full sample, but still generally positive and statistically significant.[25]

Winsorized Sample

Since I do not drop data below or above any cutoff following the suggestions and findings of Bollinger and Chandra (2005), one concern may be the influence of outliers that are erroneous data inputs or highly unusual, one-off ticket sales. To ameliorate these concerns I analyze a sample of the data winsorized at the 1st and 99th percentiles. Results are located in Table C.9 in the Online Appendix and are qualitatively similar to results from the full non-winsorized sample, with estimates on the interaction term ranging between 2.11% and 5.27% depending on the treatment variable, providing confidence that these findings are not due to outliers.

2.10 Conclusion

The *Horizontal Merger Guidelines* accord special scrutiny to mergers that involve maverick firms. The loss of a maverick or the alteration of its incentives may lead to anticompetive merger-related price increases or changes in quality. After identifying how low cost carriers could be considered mavericks within the U.S. airline industry, I analyze how the merger of two such firms has affected prices in markets where both competed premerger, as well as markets where one of the merged firms competed premerger. I find heterogeneous and large anticompetitive merger-related price increases. These findings are robust to selection bias in how treated markets are defined and are driven by price-increases in concentrated markets, which make up the bulk of airport-pair markets in the U.S.

These findings also suggest that the different types of airlines in the U.S. have likely been affected by the merger differently, consistent with theories of how maverick firms and non-maverick firms are likely to respond to a merger between two mavericks. There is also evidence that acquisition activity could occur in order to take a more aggressive maverick out of the market. As acquisition activity increases,

[25]There is concern regarding the estimates for *Post* × *Full AT Market* and *Post* × *Any AT Market* as these are statistically significant and negative, this merits more investigation.

especially among firms that may not fall under the Hart-Scott-Rodino Act's reporting requirements, some markets may experience real losses in competition due to the elimination of a maverick firm. However, this fact should also be tempered with the realization that innovation, entrepreneurism, and firm entry is likely to be as robust as it is in this country because of the prospect of being acquired at a premium by a larger firm.

This analysis has confirmed the *Guidelines'* concerns regarding the competitive impacts of merger involving maverick firms compared to those involving non-maverick firms. However, more research needs to be done, acquisitions of maverick firms in other industries may result in stronger, more aggressive mavericks. Additionally, acquisitions of maverick firms by non-mavericks may affect competitors differently than acquisitions of maverick firms by other maverick firms, as in this study. This and other questions are left for future research.

2.11 Tables

Table 2.1: Summary Statistics Premerger (product level)

	mean	sd	min	max
Average Fare	169.9465	65.04362	32.37294	3613.837
HHI	4888.717	2396.818	1132.455	10000
Southwest Market	.5323549	.4827092	0	1
AirTran Market	.3897323	.4685111	0	1
Southwest or AirTran Market	.4734696	.4650957	0	1
Origin City Population	4291926	4444117	60464	1.96e+07
Origin City Per Capita Income	42320.19	7150.42	21171	70564
Destination City Population	4297920	4447784	60464	1.96e+07
Destination City Per Capita Income	42350.19	7149.265	21171	70564
Southwest and AirTran Market	.2243088	.3930893	0	1
Market Size	17369.61	19471.5	213	163252
Monopoly Route	.0199636	.1398766	0	1
Carrier Passengers	6581.786	7735.653	8	68295
Number of Connecting Legacy Carriers	4.529978	2.048461	0	8
Number of Connecting LCC Carriers	.8703025	.969515	0	6
Number of Nonstop Legacy Carriers	1.845447	1.545744	0	8
Number of Nonstop LCC Carriers	.4517693	.6389593	0	3
One Connecting Legacy Carrier	.0632911	.2434885	0	1
Two Connecting Legacy Carriers	.0855143	.2796486	0	1
Three or more Connecting Legacy Carriers	.7978632	.4015981	0	1
One Connecting LCC Carrier	.3347301	.4719012	0	1
Two Connecting LCC Carriers	.1742755	.3793504	0	1
Three or more Connecting LCC Carriers	.0547134	.2274224	0	1
One Nonstop Legacy Carrier	.2312046	.4216076	0	1
Two Nonstop Legacy Carriers	.2404625	.427369	0	1
Three or more Nonstop Legacy Carriers	.2980716	.4574161	0	1
One Nonstop LCC Carrier	.3098743	.4624467	0	1
Two Nonstop LCC Carriers	.0616019	.2404337	0	1
Three or more Nonstop LCC Carriers	.0062304	.0786874	0	1
Observations	45583			

Table 2.2: Summary Statistics Postmerger (product level)

	mean	sd	min	max
Average Fare	205.5957	61.15266	26.70188	666.0576
HHI	4742.085	2405.932	1132.455	10000
Southwest Market	.5424056	.4803943	0	1
AirTran Market	.3904097	.4676611	0	1
Southwest or AirTran Market	.4583294	.46136	0	1
Origin City Population	4587658	4633633	61354	2.02e+07
Origin City Per Capita Income	49580.58	9723.983	22411	118295
Destination City Population	4589806	4639707	61354	2.02e+07
Destination City Per Capita Income	49614.13	9744.931	22411	118295
Southwest and AirTran Market	.237243	.3999152	0	1
Market Size	17033.59	19565.68	205	163252
Monopoly Route	.0194353	.1380496	0	1
Carrier Passengers	5493.714	7672.112	1	68295
Number of Connecting Legacy Carriers	3.320916	1.338865	0	6
Number of Connecting LCC Carriers	.8945251	1.091627	0	6
Number of Nonstop Legacy Carriers	1.501965	1.250543	0	6
Number of Nonstop LCC Carriers	.4220014	.6406797	0	4
One Connecting Legacy Carrier	.0764744	.2657566	0	1
Two Connecting Legacy Carriers	.0749502	.2633119	0	1
Three or more Connecting Legacy Carriers	.7953434	.4034518	0	1
One Connecting LCC Carrier	.292593	.4549547	0	1
Two Connecting LCC Carriers	.1510724	.3581206	0	1
Three or more Connecting LCC Carriers	.0858364	.2801233	0	1
One Nonstop Legacy Carrier	.2988931	.4577744	0	1
Two Nonstop Legacy Carriers	.2473479	.4314721	0	1
Three or more Nonstop Legacy Carriers	.2059098	.4043663	0	1
One Nonstop LCC Carrier	.277832	.4479316	0	1
Two Nonstop LCC Carriers	.0614491	.2401532	0	1
Three or more Nonstop LCC Carriers	.0069978	.0833599	0	1
Observations	147618			

Table 2.3: Summary Statistics (products in markets neither AirTran nor Southwest competed in premerger)

	mean	sd	min	max
Average Fare	180.0307	84.58785	32.37294	3613.837
HHI	6177.783	2408.497	1418.017	10000
Origin City Population	5193446	5476564	60464	1.96e+07
Origin City Per Capita Income	42198.45	7137.693	21171	70564
Destination City Population	5191458	5487689	60464	1.96e+07
Destination City Per Capita Income	42215.12	7145.659	21171	70564
Market Size	13943.63	22603.49	213	163252
Carrier Passengers	5959.722	7740.707	70	62560
Number of Connecting Legacy Carriers	3.595728	2.128453	0	8
Number of Connecting LCC Carriers	.3292644	.6015812	0	3
Number of Nonstop Legacy Carriers	1.865644	1.480368	0	7
Number of Nonstop LCC Carriers	.3095085	.5035537	0	2
Observations	12452			

Table 2.4: Summary Statistics (products in markets both firms competed in every quarter premerger)

	mean	sd	min	max
Average Fare	166.3803	43.49036	65.05872	398.1082
HHI	3471.516	1592.252	1247.39	9578.104
Origin City Population	3773307	2904350	612297	1.28e+07
Origin City Per Capita Income	41565.97	6351.282	32240	60771
Destination City Population	3804705	2922204	612297	1.28e+07
Destination City Per Capita Income	41650.34	6386.31	32240	60771
Market Size	21442.49	15169.09	1656	90569
Carrier Passengers	6492.196	6369.456	136	38362
Number of Connecting Legacy Carriers	5.661661	1.300054	1	8
Number of Connecting LCC Carriers	1.81182	.8742155	0	5
Number of Nonstop Legacy Carriers	2.008679	1.500641	0	7
Number of Nonstop LCC Carriers	.7111172	.6909657	0	3
Observations	7259			

Table 2.5: Regression Results: Difference-in-Differences Fixed Effects Model, Full Sample, Southwest and AirTran Market Variables

	(1)	(2)	(3)
Post × Full SW and AT Market	0.0596***	0.0610***	0.0527***
	(0.00811)	(0.00804)	(0.00793)
Observations	84661	84661	84661
Adjusted R^2	0.364	0.366	0.373
Time Effects?	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y
Market Demographics?	N	Y	Y
Competition Variables?	N	N	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.6: Fixed Effects Model, Full Sample (Dependent variable = Log Average Fare)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × Full SW and AT Market	0.0596***	0.0610***	0.0527***						
	(0.00811)	(0.00804)	(0.00793)						
Post × Full SW Market				0.0356***	0.0313**	0.0252*			
				(0.0105)	(0.0104)	(0.0103)			
Post × Full AT Market							0.0393***	0.0505***	0.0353***
							(0.00839)	(0.00819)	(0.00796)
Observations	84661	84661	84661	104923	104923	104923	73809	73809	73809
Adjusted R^2	0.364	0.366	0.373	0.333	0.337	0.349	0.339	0.343	0.354
Time Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Market Demographics?	N	Y	Y	N	Y	Y	N	Y	Y
Competition Variables?	N	N	Y	N	N	Y	N	N	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include arithmetic mean of route endpoints' population, and arithmetic mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.7: Fixed Effects Model, Full Sample (Dependent variable = Log Average Fare)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × Any SW and AT Market	0.0547***	0.0561***	0.0481***						
	(0.00691)	(0.00683)	(0.00679)						
Post × Any SW Market				0.0315**	0.0271**	0.0211*			
				(0.00995)	(0.00990)	(0.00983)			
Post × Any AT Market							0.0263***	0.0357***	0.0219**
							(0.00794)	(0.00782)	(0.00769)
Observations	105601	105601	105601	109727	109727	109727	83488	83488	83488
Adjusted R^2	0.379	0.381	0.388	0.331	0.335	0.348	0.339	0.342	0.354
Time Effects?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Market Demographics?	N	Y	Y	N	Y	Y	N	Y	Y
Competition Variables?	N	N	Y	N	N	Y	N	N	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include arithmetic mean of route endpoints' population, and arithmetic mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.8: Regression Results: Difference-in-Differences Fixed Effects Model, Concentrated vs Unconcentrated Markets

	(1)	(2)	(3)	(4)	(5)	(6)
Post × Full SW and AT Market	-0.0238	0.0470***				
	(0.0124)	(0.00930)				
Post × Full SW Market			-0.0716***	0.0287*		
			(0.0156)	(0.0118)		
Post × Full AT Market					-0.0156	0.0343***
					(0.0121)	(0.00819)
Observations	11473	73188	9695	95228	4622	69187
Adjusted R^2	0.618	0.352	0.582	0.340	0.634	0.349
HHI Threshold	< 2500	> 2500	< 2500	> 2500	< 2500	> 2500
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y	Y	Y	Y
Market Demographics?	Y	Y	Y	Y	Y	Y
Competition Variables?	Y	Y	Y	Y	Y	Y
Southwest and AirTran?	Y	Y	Y	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.9: Regression Results: Triple Difference Fixed Effects Model Across Concentrated and Unconcentrated Markets

	1	2	3
Post × Concentrated	-0.0919***	-0.0955***	-0.0899***
	(0.0118)	(0.0130)	(0.0126)
Post × Full SW and AT Market	-0.0186		
	(0.0133)		
Post × Full SW and AT Market × Concentrated	0.0666***		
	(0.0147)		
Post × Full SW Market		-0.0588***	
		(0.0154)	
Post × Full SW Market × Concentrated		0.0866***	
		(0.0169)	
Post × Full AT Market			0.000106
			(0.0164)
Post × Full AT Market × Concentrated			0.0334
			(0.0176)
Observations	84661	104923	73809
Adjusted R^2	0.374	0.350	0.355
Time Effects?	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y
Market Demographics?	Y	Y	Y
Competition Variables?	Y	Y	Y
Southwest and AirTran?	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Markets are denoted as concentrated if they have a premerger HHI of greater than 2500. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.10: Regression Results: Triple Difference Fixed Effects Model Across HHI Thresholds

	1	2	3
Post × Full SW and AT Market	-0.0194		
	(0.0135)		
Post × Full SW and AT Market × HHI: 2501-5000	0.0476**		
	(0.0157)		
Post × Full SW and AT Market × HHI: 5001-7500	0.0646**		
	(0.0215)		
Post × Full SW and AT Market × HHI: 7501-10,000	0.0554**		
	(0.0185)		
Post × Full SW Market		-0.0585***	
		(0.0157)	
Post × Full SW Market × HHI: 2501-5000		0.0597***	
		(0.0181)	
Post × Full SW Market × HHI: 5001-7500		0.0982***	
		(0.0219)	
Post × Full SW Market × HHI: 7501-10,000		0.123***	
		(0.0191)	
Post × Full AT Market			-0.00120
			(0.0167)
Post × Full AT Market × HHI: 2501-5000			0.0153
			(0.0193)
Post × Full AT Market × HHI: 5001-7500			0.0403
			(0.0206)
Post × Full AT Market × HHI: 7501-10,000			0.0482*
			(0.0233)
Observations	84661	104923	73809
Adjusted R^2	0.376	0.352	0.357
Time Effects?	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y
Market Demographics?	Y	Y	Y
Competition Variables?	Y	Y	Y
Southwest and AirTran?	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.11: Regression Results: Difference-in-Differences Fixed Effects Model, Carrier Subsamples

	(1)	(2)	(3)	(4)	(5)	(6)
Post × Full SW and AT Market	0.0503***			0.0676***		
	(0.00855)			(0.0143)		
Post × Full SW Market		0.0279**			-0.0200	
		(0.0108)			(0.0219)	
Post × Full AT Market			0.0365***			0.0239
			(0.00822)			(0.0245)
Observations	59309	62825	59413	12438	11988	11168
Adjusted R^2	0.336	0.309	0.329	0.443	0.457	0.423
Carrier Subsample	Legacy	Legacy	Legacy	Low Cost	Low Cost	Low Cost
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y	Y	Y	Y
Market Demographics?	Y	Y	Y	Y	Y	Y
Competition Variables?	Y	Y	Y	Y	Y	Y
Southwest and AirTran?	N	N	N	N	N	N

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table 2.12: Regression Results: Triple Difference Fixed Effects Model Across Carrier Type

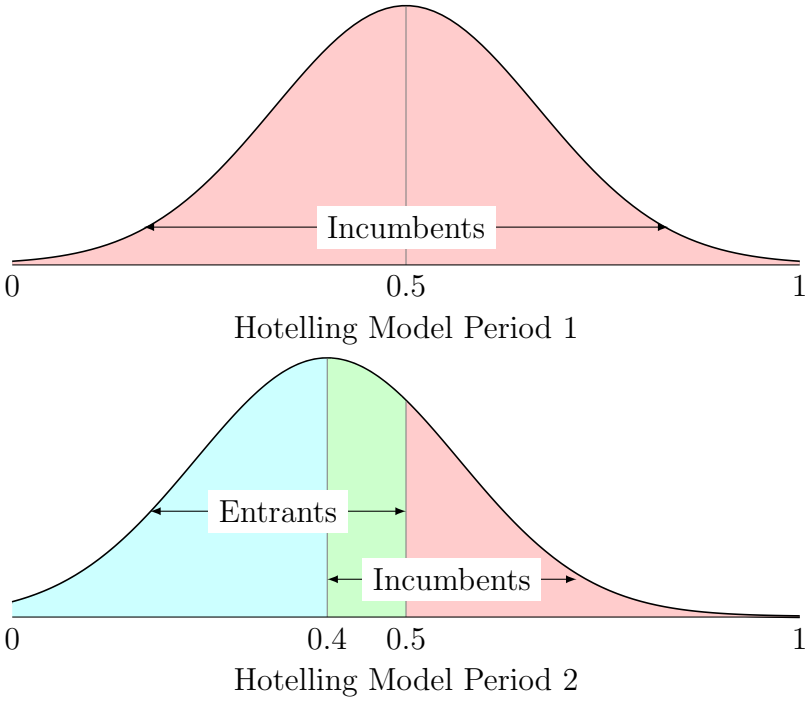
	1	2	3
Post × Full SW and AT Market	0.0499***		
	(0.00857)		
Post × Full SW and AT Market × LCC	0.0204		
	(0.0162)		
Post × Full SW Market		0.0281**	
		(0.0108)	
Post × Full SW Market × LCC		-0.0507*	
		(0.0234)	
Post × Full AT Market			0.0355***
			(0.00822)
Post × Full AT Market × LCC			-0.00691
			(0.0258)
Observations	71747	74813	70581
Adjusted R^2	0.354	0.330	0.342
Time Effects?	Y	Y	Y
Carrier by Time Interactions?	Y	Y	Y
Market Demographics?	Y	Y	Y
Competition Variables?	Y	Y	Y
Southwest and AirTran?	N	N	N

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Results for the full sample. Dependent variable is the log of the product's average fare. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

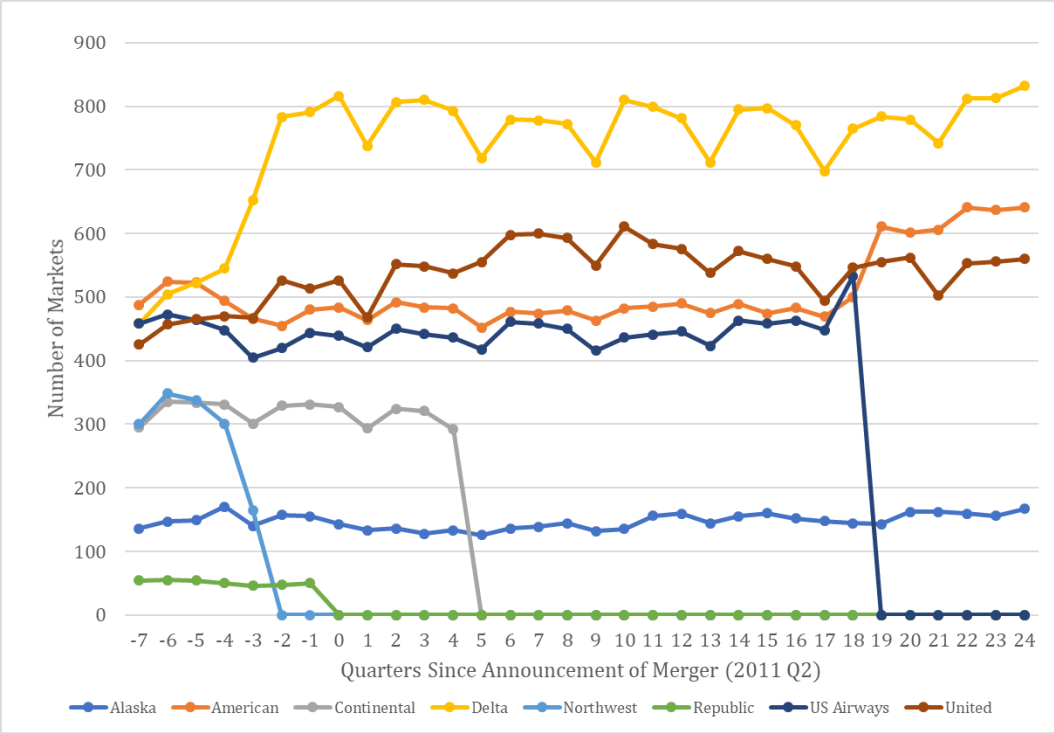
2.12 Figures

Figure 2.1: Two-Stage Hotelling Model of Incumbent and Maverick Firm Entry



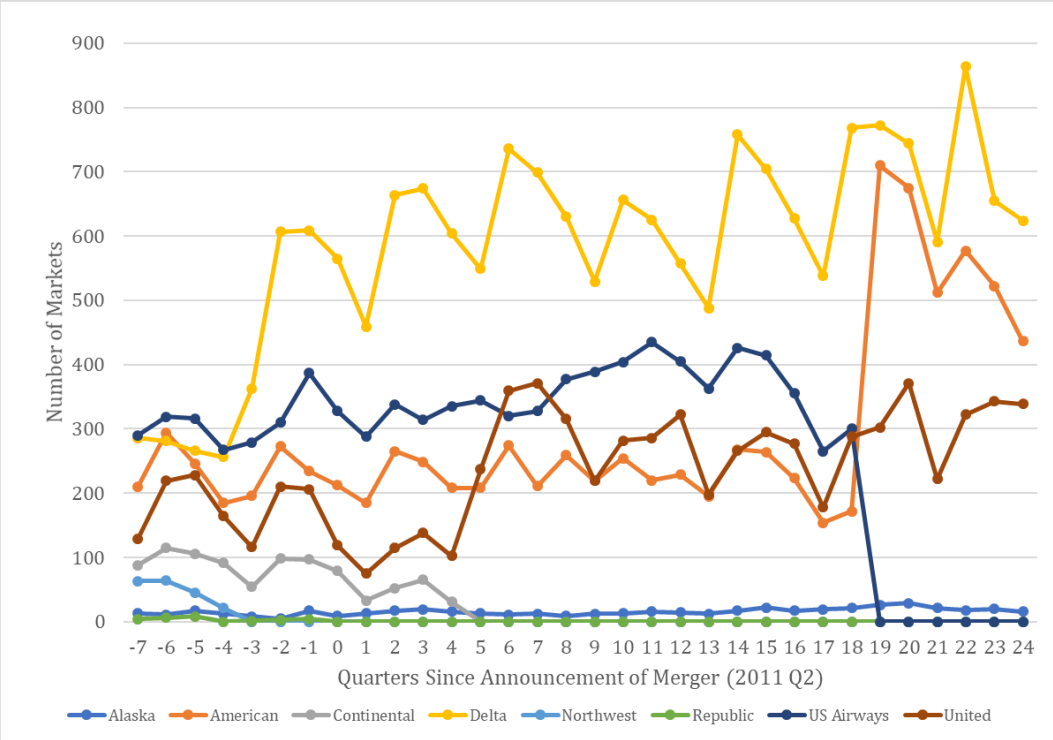
Note: This is an example of how maverick firms may come to enter a market when demand changes over time but incumbent firms find it costly to move to meet new demand. In the first period, all incumbents split the entire market, denoted by the red region. In period 2, entrants choose to locate at 0.4, splitting all the market below 0.4 (blue) and splitting the market with the incumbents between 0.4 and 0.5 (green), incumbents still split the market above 0.5 with each other (red).

Figure 2.2: Number of Nonstop Markets Served By Legacy Carriers



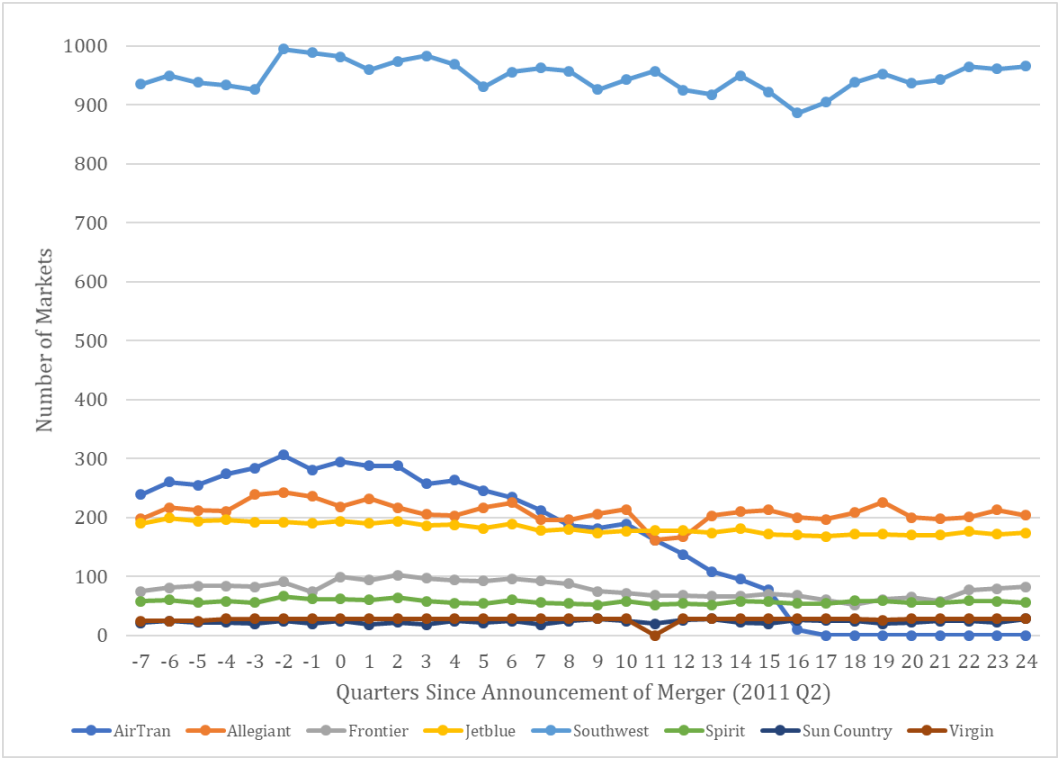
*Note:*This is the number of nonstop markets served per quarter by each of the legacy carriers. Notice the growth and decline of the firms over time and that Northwest, Continental, and US Airways fall out due to merger activity.

Figure 2.3: Number of Connecting Markets Served By Legacy Carriers



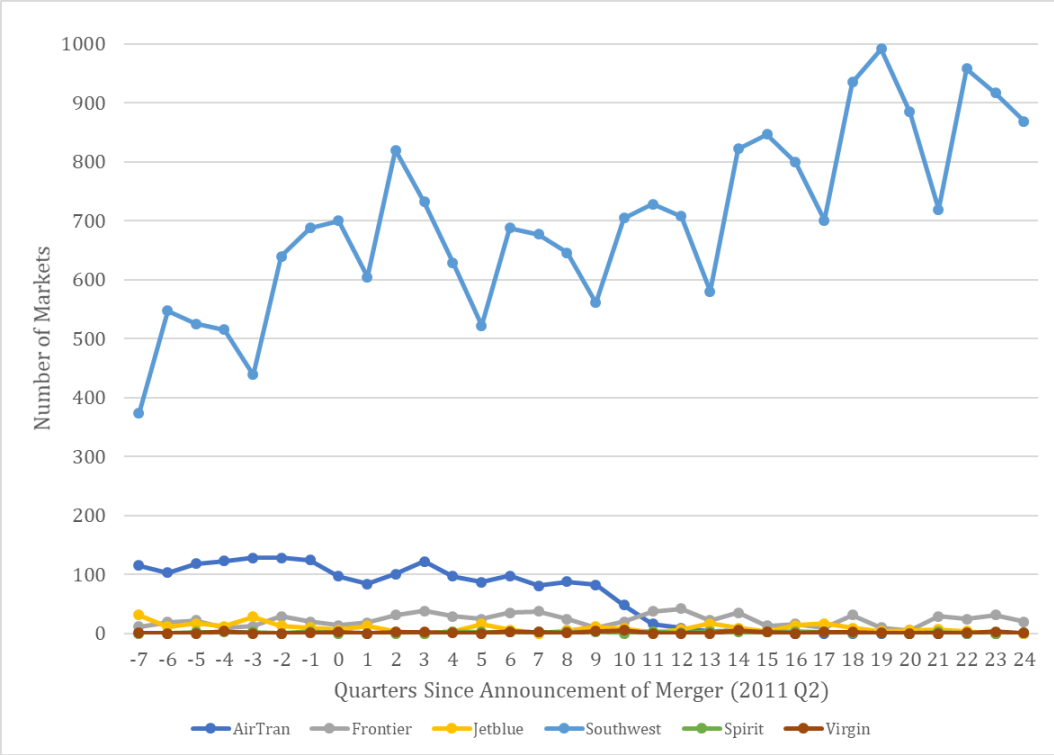
*Note:*This is the number of connecting markets served per quarter by each of the legacy carriers. Notice the growth and decline of the firms over time and that Northwest, Continental, and US Airways fall out due to merger activity.

Figure 2.4: Number of Nonstop Markets Served By Low Cost Carriers



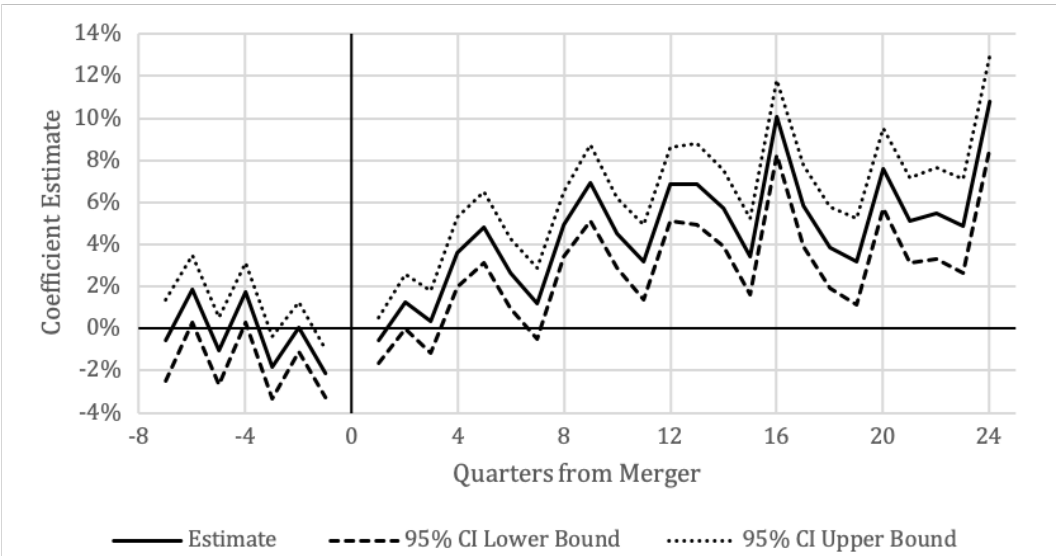
*Note:*This is the number of nonstop markets served per quarter by each of the low cost carriers carriers. Notice the growth and decline of the firms over time. Especially noteworthy is the relative size of Southwest and AirTran in this sample from the DB1B.

Figure 2.5: Number of Connecting Markets Served By Low Cost Carriers



*Note:*This is the number of connecting markets served per quarter by each of the low cost carriers carriers. Notice the growth and decline of the firms over time. Especially noteworthy is the relative size of Southwest and AirTran in this sample from the DB1B.

Figure 2.6: Event Study, Full Sample



*Note:*Results for the full sample. Reference quarter is Q4 2010, the first full quarter after the merger announcement. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers. Time-invariant market, carrier, and service fixed effects, along with all interactions are included, as are carrier-time fixed effects.

Chapter 3 : Has Anheuser-Busch Let the Steam Out of Craft Beer? The Economics of Acquiring Craft Brewers

3.1 Introduction[1,2,3]

In the United States, it has become common for large, established companies to acquire small, innovative firms. In recent years, Walmart, GM, Ford, Apple, Alphabet, Amazon, Facebook, Twitter, Microsoft and Yahoo together have acquired over 800 such firms. These acquisitions, being small, often are not publicized outside of trade and industry circles. However, the economic climate that this strategy of corporate control creates may significantly alter the entry and exit conditions for new entrants and can shape the product offerings of incumbent firms that make these acquisitions. As Wollmann (2019) points out, because of their size, many of these acquisitions fall outside the scope of the Hart-Scott-Rodino Act. For this reason, the antitrust authorities at the Department of Justice or the Federal Trade Commission might not take notice.

In the malt beverage industry, megabrewers such as Anheuser-Busch InBev (AB InBev or ABI) and SABMiller (MillerCoors) have acquired a number of craft brewers in the United States. Within beer industry circles, the acquisition of small, local brewers by large, national brewers is heartening to some and disheartening to others.[4] On the one hand, the prospect of being acquired at a premium valuation can be attractive to a pioneering craft brewer and induce entry by aspiring entrepreneurs. On the other hand, consumers who value craft beer for its small business and local ownership appeal worry that acquisitions of craft brewers by large incumbent brewers will taint the cachet of the craft segment.[5] Craft brewers who go it alone fear that

[1]Researcher's own analyses calculated (or derived) based on data from The Nielsen Company (US), LLC and marketing databases provided by the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the Nielsen data are those of the author and do not reflect the views of Nielsen. Nielsen is not responsible for and was not involved in analyzing and preparing the results found in this paper.

[2]The authors thank Luke W. Haynes for research assistance and Frank Scott, Federico Ciliberto, Orley Ashenfelter, Alexander MacKay, and attendees of the International Industrial Organization Conference in Boston and the American Association of Wine Economists Conference in Vienna for comments and helpful suggestions

[3]This chapter was based on collaboration with my undergraduate economics professor, Kenneth G. Elzinga at the University of Virginia. Elzinga is a long-time student of the beer industry who took me on as a Research Assistant to develop a database on the craft beer segment. Out of that data trove and other parts of his beer industry library, this essay was formed.

[4]According to Noel (2018), after the news of Goose Island's acquisition by ABI sank in, friends of craft beer concluded: "Goose Island was a sellout. Anheuser-Busch was out to destroy craft beer. For twenty years, craft beer and Big Beer had been mostly parallel lines. The lines had intersected." (p. 177)

[5]If the cachet of craft beer is based on locally owned, locally brewed product, the size and geographic footprint of Boston Beer sits outside both of these metrics. Boston Beer (primary brand, Samuel Adams) had sales in 2018 of 4.3 million barrels, making it the sixth largest brewer in the United States (Steinman, 2019a). Jim Koch, the founder of Boston Beer, is a member of the

their access to distribution channels will be foreclosed relative to that of the acquired craft brewers. Testing whether megabrewer-craft brewer combinations have anticompetitive consequences for independent craft brewers and their customers is the theme of this paper.

3.2 The Craft Beer Segment: A Brief History

The year 1965 marks the taproot of the craft beer industry in the United States, when Fritz Maytag assumed ownership of the Anchor Steam Beer Company in San Francisco and pioneered a way forward for small brewers in the U.S. beer industry (Elzinga et al., 2015). At the time, the beer industry was highly concentrated and output was largely homogeneous, consisting of lager beer.

While craft beer got its start with Maytag's entrepreneurial endeavors, the segment was slow to realize growth and popularity. Only 100 craft brewers existed in 1987. Since that time, there has been an explosion of new entrants. Over 7,000 craft breweries now operate in the United States. Most of these are small producers whose individual market share is de minimus (Elzinga et al., 2015). In fact, small-scale is part of the official definition put forth by the Brewers Association, which defines a craft brewer as small,[6] independent,[7] and, naturally, a brewer[8]. The growth in the craft segment has several explanations: a decrease in taxation of craft beer in 1978,[9] the expansion of brewpubs after their federal legalization in 1978,[10] growth in personal income, and consumer demand for product variety.[11,12]

The success of the craft beer movement was achieved in part through the product's differentiation compared to the relative homogeneity of the lager beer produced by the major brewers. Over time, the macrobeer industry evolved into primarily producing a "light beer" (i.e., low calorie) malt beverage whose popularity allowed the exploitation of scale economies. Today three of the four leading brands of beer sold in the U.S. are low-calorie beers.[13] Craft beer filled a demand gap that opened in part because of the close proximity in taste, quality, and price of the major brands. The craft industry

Bloomberg Billionaire group; his stature, and that of the firm he founded, also does not fit the conventional image of the scrappy craft brewer carving out a niche in an industry dominated by megabrewers.

[6] "Annual production of 6 million barrels of beer or less (approximately 3 percent of U.S. annual sales). Beer production is attributed to a brewer according to rules of alternating proprietorships." (Brewer's Association, nd)

[7] "Less than 25 percent of the craft brewery is owned or controlled (or equivalent economic interest) by a beverage alcohol industry member that is not itself a craft brewer." (Brewer's Association, nd)

[8] "Has a TTB Brewers Notice and makes beer." (Brewer's Association, nd)

[9] In 1978, Congress decreased the federal excise tax from $9.00/barrel to $7.00/barrel for the first 60,000 barrels produced by breweries with less than 2 million barrels in total annual sales.

[10] While federal law permitted home brewing, legalization at the state level was not completed until 2013 when the last states, Alabama and Mississippi, legalized home brewing.

[11] See Tremblay and Tremblay (2011) and Silberberg (1985).

[12] "American beer drinkers discovered variety. Tastes diversified. Anheuser-Busch could no longer simply suffocate competition. It needed craft beer. So it bought Goose Island." (Noel, p. xi)

[13] Bud Light, Coors Light, and Miller Lite.

also possesses public policy support, exemplified through the recent decrease of the federal excise tax on beer, a feature of the Craft Beverage Modernization and Tax Reform Act.[14]

Consumer demand for beer in the U.S. is supplied largely by ABI and MillerCoors. For some years, these firms could ignore the craft segment and did. However, in recent years, these firms have embarked on a wave of acquisitions of craft brewers. Craft brewers now produce over 12% of industry output (Brewers Association). The arrival of the craft segment is the most important contemporary development in the domestic beer industry. The interest and importance of craft beer is reflected in a growing literature.[15]

3.3 Beer Distribution

After Prohibition ended, a three-tier system was mandated in order to prevent the excesses and moral degradation that purportedly catalyzed the outlawing of alcoholic beverages under Prohibition. Federal law enabled states to mandate that there should be an independent distributor (i.e., the additional tier) positioned between the producer tier and the retailer tier. The supposed goal of requiring a third tier between the brewer and the retailer was to deter promotional strategies and actions on the part of a vertically integrated brewer-retailer that might stoke the demand for alcoholic beverages in such a way as to cause alcoholism or alcohol-induced crime.

The result is that many distributors have contracts with major brewers to sell the brewers' products exclusively within a certain geographic region. This creates unique incentives for a brewer to structure contracts to induce the distributor to market its product line as opposed to its competitors' products to on-premise retailers (bars), as well as off-premise retailers (grocery stores, convenience stores, liquor stores, etc.).

Distributors also may control placement of products within the beer section of a supermarket or convenience store. As a "category captain," a distributor may determine what brands are placed next to each other, and the individual shelf level or cooler door where particular brands are displayed. Within the industry, shelf placement and shelf space are important marketing variables. For example, eye level products or products on an aisle endcap are more likely to be seen and bought by consumers. Pricing and shelf placement strategies may induce substitution towards one brand and away from another.

[14]The Craft and Beverage Modernization and Tax Reform Act (CBMTRA) went into effect January 1, 2018 and will "sunset" on December 31, 2019. Under the bill, the federal excise tax decreased from $7.00/barrel to $3.50/barrel for the first 60,000 barrels of domestic brewers producing less than 2 million barrels annually (Brewer's Association, nd).

[15]The best treatments are Acitelli (2013), The Audacity of Hops: The History of Americas Craft Beer Revolution and Lewis (2014), We Make Beer: Inside the Spirit and Artistry of Americas Craft Brewers. Book-length treatments of individual craft brewers include Beyond the Pale: The Story of Sierra Nevada Brewing Co. by Grossman (2013) and Beer for Petes Sake by Slosberg (1998). Steve Hindy, one of the founders of The Brooklyn Brewery, also has written a history of craft brewers: The Craft Beer Revolution (Hindy, 2014).

3.4 Distribution by the Two Major Brewers

As of 2016, ABI and MillerCoors sold about 2/3 of all beer sold in the U.S.[16] Because of the existence of only two major sellers, there usually are only two major distributors in any one geographic area, one for the brand portfolio of ABI brands and one for the brand portfolio of MillerCoors. These same distributors also may contract with craft brewers in the area who want access to and distribution in their territory. Until recently, ABI and MillerCoors did not have a product to challenge craft beers in the market. However, with the acquisition of several craft breweries by the two dominant macrobrewers, there is now concern among the craft segment that ABI and MillerCoors will use their influence with distributors to foreclose other craft brewers from on-premise as well as off-premise accounts. The National Beer Wholesalers Association spoke to this in a letter to the Department of Justice regarding the merger between ABI and SABMiller, noting,

> "Through incentive programs to promote ABI beers at the expense of rival brands, influence over distribution management, substantial control through the equity agreement and by other means to control independent distributors, the DOJ has found that ABI can inhibit craft and rival brewers' access to the market through ABI's distribution partners." (National Beer Wholesalers Association, 2016)

While the combined ABI and MillerCoors share of market (SOM) is large, it has been in a free-fall since the start of the twenty-first century. Over the past decade, ABI's volume fell almost 20 million barrels, almost all of this decrease taking place in ABI's two major brands, Budweiser and Bud Light. This loss in sales is the equivalent of shuttering four modern breweries. In terms of market share, ABI has lost approximately eight share points (Steinman, 2019b). This loss in volume took place notwithstanding the acquisition of ten craft brewers and the acquisition itself of Anheuser-Busch by InBev.[17]

While the tailspin at MillerCoors has not matched that of ABI in reduced barrelage, in relative terms MillerCoors' decline has been greater. In the past decade, MillerCoors' volume dropped 14.5 million barrels, the equivalent of three modern breweries. The joint venture of Miller and Coors never experienced a year in which total sales for the combined firm grew. MillerCoors held a SOM of 30 percent in 2008; in 2018, the MillerCoors share was just under 24 (Steinman, 2019a). As macrobeer sales have decreased, their distributors became wary about the future of Big Beer and

[16] Unless cited otherwise, all figures are from the 2016 Beer Industry Update (Beer Marketer's Insights, 2016).

[17] During this period, Anheuser-Busch has diversified through acquisition into other potables including tea, energy drinks, hard seltzer, and even spirits. Recently ABI acquired Cutwater Spirits, a firm founded by the same team that founded Ballast Point, a craft brewer acquired earlier by ABI (Steinman, 2019a).

focused their attention on growth sectors such as import brands, craft brands, and flavored malt beverages.[18] The macrobrewers have taken notice.[19]

Table 3.1 shows U.S. share of beer sales by segment, comparing 2018 to 2013. In 2013, craft SOM was just under eight share points; Import SOM was just over thirteen. Imports now stand at just over seventeen; while craft is just over twelve. Imported beer maintained a consistent segment share lead over craft beer, the delta between import and craft remaining stable at about five share points.

At one time in the U.S., imported beer primarily meant beer from Canada, Germany, and the Netherlands. No more. Table 3.2 shows the shipments of imported brands in 2018. Constellation's portfolio of Mexican brands now has five of the top ten brands being sold in the U.S. Almost all of the growth in imports is accounted for by sales growth from South of the border. Note the absence of any import beer among the top ten brands from North of the border. Once prominent Canadian brands in the Molson and LaBatt portfolio have faded.

3.5 The Major Brewers and Craft Beer

Prior to the expansion of craft brewers in the United States, the beer industry sustained a dramatic decrease in the number of producers. The number of conventional lager breweries in the U.S. fell from 421 in 1947 to 20 in 2006, as firms either merged or exited the market (Elzinga et al., 2015). This drop was the result of economies of scale in production and marketing, which benefitted the large macrobrewers but pushed most of the medium-sized brewers out of the market (Elzinga (2016), Tremblay and Tremblay (2011)).

High profile acquisitions and mergers at the top of the international macrobrewer food chain also have contributed to the diminishing number of conventional breweries. In 2002, South African Breweries acquired Miller Brewing Company to form SABMiller. In 2005, Molson Brewery of Canada and Coors Brewing Company merged to form the Molson Coors Brewing Company. In 2008, SABMiller and Molson Coors formed the joint venture, MillerCoors, for operations in the United States. Also, in 2008, Belgian brewing firm, InBev, acquired Anheuser-Busch to create Anheuser-Busch InBev (ABI).[20] ABI engaged in a Brobdingnagian $107 billion merger with SABMiller in 2016. As a result of that combination, Molson Coors assumed sole ownership of MillerCoors.

Production of "phantom" craft beer brands was the macrobrewers' initial response to the growth of the craft brewing market.[21] In 1988, Miller bought Jacob Leinenkugel Brewing Company, the first such acquisition. In 1995, Miller also purchased Celis

[18] An example of a flavored malt beverage would be Mike's Hard Lemonade.

[19] Kostov (2018) and Bostwick (2018) of the Wall Street Journal both describe how the decrease in sales of macrobeer such as Bud Light as well as the rise in popularity of craft beer have prompted distributors to reconsider their business models.

[20] For a detailed account of the hostile takeover of Anheuser-Busch, see Dethroning the King (Macintosh, 2011).

[21] Anheuser-Busch was the first mover in this product space with Elk Mountain Ale in 1994, followed by Red Wolf Lager brand that same year. Miller followed suit by introducing its Red Dog brand through Plank Road Brewery, an in-house subsidiary of Miller that focused on craft beer

Brewery and a 50% share of Shipyard Brewing. In 2000, Miller shut down Celis Brewery and sold Shipyard back to the original owners. With the exception of Leinenkugel, which went on to become part of Miller's craft and import business development unit, Tenth and Blake Beer Company, these initial acquisitions were not distinguished by their commercial success. The real movement of Big Beer companies acquiring craft brewers came a decade later when ABI got involved.

3.6 ABI and the Craft Segment

In *Barrel-Aged Stout and Selling Out: Goose Island, Anheuser-Busch, and How Craft Beer Became Big Business*, Josh Noel noted "the announcement of Goose Island's $38.8 million sale to the world's largest beer company, on March 28, 2011, functionally ended an era for craft beer-an era of collaboration and cooperation, growth, and good vibes, and the shared cause of building a lifeboat in a sea of Big Beer banality (Noel, p. xi)." Noel added,

> "Goose Island reached a unique place in the American craft beer industry. It was a rare hybrid, serving local, national, and international audiences. It made beer for Chicago, it made beer for stadiums and airport bars, and it was a brand to be exported to Europe and China, Australia and South America. After all the scaling and tweaks, Goose IPA was essentially Anheuser-Busch IPA. 312 was Anheuser-Busch Wheat Ale... All became tepid Big Beer reinventions of what they had been when made in Chicago (Noel, p. 329)."

Goose Island was a natural candidate for acquisition, ABI already had a minority stake in the company, and it was consistently the second or third largest craft brewer in the six-state area in and around Illinois each year from 2004-2009 leading up to the acquisition (as shown in Figure 3.3). In addition to purchasing stakes in Spiked Seltzer, Virtue Cider, and the Craft Brew Alliance,[22] ABI has since purchased nine other craft breweries under its High End Brands subsidiary:

- Blue Point Brewing Co. (New York-based firm selling 60,000 barrels/year at time of purchase, acquired in 2014 for an estimated $24 million)
- 10 Barrel Brewing Co. (Oregon-based firm selling 40,000 barrels/year at time of purchase, acquired in 2014 for an undisclosed amount)

products. The most successful of these phantom brands was Blue Moon, developed by Coors in 1995. MillerCoors now sells over 2 million barrels of Blue Moon per year. Blue Moon's success prompted ABI's 2006 release of its similarly marketed brand Shock Top, which reached an annual production of 900,000 barrels in 2014.

[22]The Craft Brew Alliance is a brewing company consisting of five beer and cider brands: Redhook, Widmer Brothers, Kona, Omission, and Square Mile Cider. CBA was founded in 2008 and then in 2013 sold a 32.2% share of the business to ABI, which became the company's distribution partner.

- Elysian Brewing (Washington-based firm selling 54,000 barrels/year at time of purchase, acquired in 2015 for an undisclosed amount)
- Golden Road Brewing (California-based firm selling 45,000 barrels/year at time of purchase, acquired in 2015 for an undisclosed amount)
- Four Peaks Brewing Company (Arizona-based firm selling 70,000 barrels/year at time of purchase, acquired in 2015 for an undisclosed amount)
- Breckenridge Brewery (Colorado-based firm selling 70,000 barrels/year at time of purchase, acquired in 2015 for an undisclosed amount)
- Devils Backbone Brewing Company (Virginia-based firm selling 60,000 barrels/year at time of purchase, acquired in 2016 for an undisclosed amount)
- Karbach Brewing Company (Texas-based firm selling 40,000 barrels/year at time of purchase, acquired in 2016 for an undisclosed amount)
- Wicked Weed Brewing (North Carolina-based firm selling 40,000 barrels/year at time of purchase, acquired in 2017 for an undisclosed amount)

3.7 MillerCoors and the Craft Segment

Other macrobrewers have since made similar acquisitive forays into craft beer. MillerCoors acquired Terrapin Beer Company in 2011, Crispin Cider in 2012, Saint Archer Brewing in 2015, and Revolver Brewing and Hop Valley in 2016. Constellation, the American distributor of prominent Mexican beers Corona and Modelo, acquired Ballast Point in 2015 and Funky Buddha in 2017. Additionally, Heineken USA acquired a 50% share of Lagunitas in 2015 before purchasing the remaining share of the company in 2017. This progression of acquisitions reveals the increased desire of Big Beer to cross the line between macrobrewed lagers and craft beer varieties to capitalize on the consumer demand for product differentiation and to integrate acquired craft brewers into their established distribution channels.

3.8 A Case Study

To better understand the economic consequences of craft beer acquisitions by a macrobrewer, we examine in detail the consequences of ABI's acquisition of Goose Island. Goose Island is a worthy "representative firm" (in Alfred Marshall's use of the term). Goose Island was the largest craft brewer in Chicago at the time of its acquisition; and it was acquired by the largest macrobrewer (ABI).[23] The leading brand of Goose Island was "312" which is the area code for Chicago. What makes our use of the

[23] "[Goose Island] was an undeniably exciting place to work during an exciting time. The secret of variety, choice, and innovation was out; everyone wanted a piece of craft beer. Breweries were opening at the rate of one a day. Chicago had gone from one production brewery-Goose Island-to nearly a dozen. Goose Island was in the midst of a sixteen-year run of winning twenty-five medals at the Great American Beer Festival-at least one every year." (Noel, p. 146)

acquisition especially fitting (if not ironic) is that Goose Island 312 is now brewed at an ABI brewery in Baldwinsville, New York (where the area code is 315).[24]

3.9 AB InBev and Goose Island: The Competition Issue

Economic theory provides several possible strategic responses that could be the consequence of a major brewer acquiring a craft brewer. Given the number of craft brewers, and the relative ease of entry into the craft segment, it is plausible that craft brewery acquisitions would have no price effect on craft beer. Thus, if the market for craft beer were competitive, ABI would have no ability to raise the price of Goose Island beer, and no incentive to lower its price. Under this scenario, there should be no antitrust concern.

If the acquiring firm can exploit scale economies in production or take advantage of distribution economies in promoting the acquired brand to retail accounts, one would expect a decrease in the price of Goose Island beer and expansion of volume and sales. If this is the case, the antitrust authorities should applaud such acquisitions.

If ABI's acquisition of Goose Island affords ABI the ability to raise the price floor under craft beer by raising the price points of its mainline products (e.g., Budweiser and Busch), then such acquisitions may harm consumer welfare. Additionally, due to the regulatory characteristics of the three-tier system, ABI could use its influence on distributors to foreclose the market to rivals in the craft beer segment. This may differentially affect states based on the legal regimes that govern their specific markets for alcoholic beverages, as discussed in Burgdorf (2019). If either of these occur, such acquisitions merit the attention of the antitrust authorities.

3.10 Data

We use Nielsen scanner data provided by the Kilts Center for Marketing Data Center at the University of Chicago Booth School of Business to explore whether there is evidence of foreclosure. Specifically, we utilize the Retail Scanner Dataset to observe sales of beer at the month-store-product level. In the Nielsen dataset, sales are recorded at the end of each week, and a volume-weighted price is reported, though we aggregate up to the month level.[25] We calculate both the total volume (in ounces) sold of each beer in each store in addition to the total dollar amount of each beer sold in each store. We use these to calculate the effective price per ounce of each brand of beer (*e.g.*, Goose Island 312) at each store and total sales (total revenue) for each brand of beer at each store.

Due to sales promotions, stockpiling, and uneven consumption around occasions such as the Super Bowl and the Fourth of July, sales may be choppy at the week

[24] For a recent ("light" - pun intended) account of ABI's acquisition of Goose Island, see Noel (2018).

[25] Beer sales are not evenly spaced across the week. Because of this, as well as for simplicity during data aggregation, we count the whole weeks worth of sales in the month that sales are reported. For instance, if sales are reported on the third of the month, the entire week of sales are recorded as having occurred in that month.

level. By aggregating sales to the month in which they were reported, we avoid the influence of outliers due to holiday or sporting event consumption spikes and the pitfalls of having too many zeroes in our data. We also reduce the number of data points, which allows us to expand the geographical scope of our sample and keep the computational burden of the large size of the Nielsen dataset manageable.

Product characteristics such as brand, package-type, and volume also are included. We restrict our sample to beer sold in six packs of 11.2 ounce or 12-ounce bottles.[26] If different pack sizes were included, we would have to control for and explain the price differences due to quantity discounts.[27] Additionally, packs including more than six bottles of beer are often only sold by macrobrewers and large craft brewers who have invested in the machinery to package larger pack sizes, creating a possible selection issue. Furthermore, it is unlikely consumers are substituting from six packs to other multi-packs as they do between six packs. By limiting our analysis to six packs, we move closer to an apples-to-apples instead of oranges-to-apples comparison.

For our analysis, we develop two samples based on brand information. The first contains all brands of craft beer sold in the Nielsen dataset. Descriptive statistics for this sample are located for the premerger time period in Table 3.3 and for the postmerger time period in Table 3.4. This sample was chosen to ascertain if the merger had an effect on craft brands in general, as has been feared by fans of the craft beer segment. As mentioned earlier, most craft brewers produce very little beer, and most sell primarily through a taproom or brewpub environment, or to on-premise accounts. Only the most successful brewers place their beer in the channels observed in the Nielsen dataset. This sample attempts to discern the effects of the acquisition on these craft brewers. The second sample contains beers produced by macrobrewers.[28] This sample was chosen to see if the acquisition allowed the macrobrewers to raise prices on their brands through the alleviation of competitive pressure from the craft beer segment. Descriptive statistics for this sample are located for the premerger time period in Table 3.5 and for the postmerger time period in Table 3.6. From a market definition perspective, the brands in these two samples may be most likely to suffer adverse consequences from an acquisition of a craft brewer by a macrobrewer.

When the two megabrewers acquire craft brewers, the antitrust authorities might be concerned that independent craft brewers will be foreclosed from distribution. In our case study, the concern would be that ABI will use the acquisition of Goose Island to foreclose other craft brewers. This can be investigated by analyzing the first sample consisting of beers sold by craft brewers. If ABI has used Goose Island to foreclose or weaken competing craft brewers, we would expect quantity sold of craft beer to decrease. If ABI has created a more efficient rival in Goose Island, we would

[26]Bottles that contain 11.2 ounce of beer hold one-third of a liter. European brewers and brewers that follow the European tradition may use this size instead of the 12-ounce size Americans are used to. To the untrained eye they are the same as those that hold 12 ounces of beer and are frequently placed next to each other in stores and sold as if they had the same fill.

[27]It is known that the major brewers engage in price discrimination as part of their competitive strategy but we can find no precedent in the literature studying this to follow and leave analysis of price discrimination in the beer industry to future research (Elzinga, 2016).

[28]We include all beers sold my ABI, Constellation, MillerCoors, Heineken, and Pabst.

expect prices to decrease, and quantities to either stay the same or increase, both procompetitive results.

A second concern is that the acquiring firm will absorb a craft brewer in order to alleviate the competitive pressure on the acquirer's own products. Here the concern would be that ABI will position Goose Island's pricing in a way that will induce substitution to the lager brands of the macrobrewers, leading to sustained or increased prices of these products and growth in their volume. This can be investigated by analyzing the second sample of beers produced by macrobrewers - consisting of brands from ABI, MillerCoors, Heineken, Pabst, and Constellation. If ABI is able to position Goose Island to alleviate competitive pricing pressure on its mainstream brands, we should observe increased prices in these brands or we should see substitution from craft beer to mainstream brands, resulting in increased quantity sold.

Store characteristics also are included in this dataset; specifically, we identify the Designated Market Area (DMA),[29] channel type, state, three-digit zip code, FIPS county code, and FIPS state code.[30] We also identify different retailers based on their store and corporate codes, though the true identity of each particular retailer is shielded in the dataset.

In addition to this information from Nielsen, we also add control variables for income, education, alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs. We control for these because each of these measures is correlated with consumption of beer, and craft beer in particular.

Due to computational limitations, we apply several restrictions to our dataset. First, we limit our dataset geographically to Midwestern and mid-Atlantic states that are proximate to Goose Island's focal point of Chicago and would be the part of the country most likely to experience the effects, if any, of an aggressive expansion of Goose Island sales under the patronage of ABI. The territory we examine includes Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin. We further limit our dataset only to beers sold between 2010 and 2013. This gives us both a pre- and post-period for the acquisition of Goose Island by ABI.[31] The result is over four million observations at the brand-store-month level in the craft beer sample and over six million observations in the macrobrewer sample. Using a difference-in-differences framework, we examine the effect of the merger on volume and pricing of craft beers and macro lagers.

3.11 Estimation Approach

Recall that the primary concern of competitors of Goose Island in the craft beer segment is that ABI will exploit distributor relationships to induce substitution towards Goose Island and away from "true craft" beers. If this is true, the potential effect of

[29] These regions are determined by Nielsen based upon the regional reach of metro area commercial TV channels.

[30] FIPS codes, or Federal Information Processing Standards, are five-digit codes that uniquely identify counties or county-equivalent jurisdictions in the United States.

[31] The acquisition occurred on March 28, 2011.

the merger should be stronger in stores and markets where ABI has a greater share of market and thus has more influence over their distributors. The National Beer Wholesalers Association (2016) expressed its concern that ABI

> "encourages distributors to drop rival beers and replace it with an ABI owned "craft" to replace any lost sales. ABI may threaten the ability of a distributor to transfer its business. The pressure to drop rival beers does not end there. ABI executives have frequently visited distributors that choose to sell non-ABI products to encourage them otherwise, and publicly criticize distributors that carry non-ABI brands at trade meetings."

To address this, we would like to know the actual share of revenue or profits generated by ABI for each of its distributors in each of its retail stores. Unfortunately, that information is not publicly available. However, Nielsen data do allow us to find the market share at the store-month level captured by ABI products.

The variable ABI Market Share is defined as the premerger market share (determined by revenue) of ABI branded products for a particular store. We implement our difference-in-differences model with this as our treatment variable, making this akin to an intent-to-treat specification. We adopt this because the economic concern of the merger is that ABI will use its market power to foreclose other craft brewers, or use its portfolio, now including Goose Island, to move pricing in such a way as to alleviate pressure on its mainline brands and portfolio in general. We expect that stores having significant sales of ABI brands in the premerger period should be more affected than stores whose revenue is largely sourced from other firms due to the influence of the distribution tier in off-premise sales. This specification also allows us to drill into the effects of the merger at the store level.

The Goose Island acquisition was announced on March 28, 2011, and we use this date to demarcate the premerger and postmerger time periods.[32] Our standard errors are heteroscedasticity robust and clustered at the store level in all models.[33] We implement a fixed-effects model at the product-store level, which should control for time-invariant differences in individual stores' pricing strategies of individual brands.

We model our difference-in-differences framework with five separate specifications and three outcome variables of interest. Our first specification regresses each dependent variable against a dummy variable that is equal to 1 for the post-acquisition time period (Post), the ABI Market Share variable, and an interaction term of these two dummy variables (Post x ABI Market Share). Commensurate with the typical difference-in-differences approach, this interaction term is the variable of interest. If our estimates are causal, the coefficient on this term will reveal the positive or negative impact of the acquisition on each of the dependent variables of interest. We implement several improvements over the nave regression of our first specification.

Our second specification adds yearly time effects and our third specification adds year and DMA (Designated Market Area) interactions to the yearly time effects of

[32]The postmerger time period begins in April of 2011 and the premerger time period ends in March of 2011.

[33]Note this is individual store level, not retailer level.

our second specification. Our fourth specification adds year and retailer interactions to both the yearly effects and the year and DMA interactions. Our fifth, final, and preferred specification adds the control variables mentioned above to the fixed effects in the fourth specification.

The fifth specification is preferable for several reasons. First, it includes yearly time fixed effects to control for the significant growth of the craft beer industry over this period. Second, it includes year and Designated Market Area interaction terms. Craft beer demand and growth has a distinct geographical profile. They are concentrated in certain areas, and both are heterogeneous across areas and time. These interactions control for this. We include year and retailer interactions because, within the beer industry, there are distinct differences across channels in terms of breadth of offerings and types of beer sold.

Typically, selection is wider at liquor stores than supermarkets, where selection is wider than convenience stores. That said, there is also variation in the selection of beers offered across different retailers, and even across individual stores within these channels. Retailers such as Walmart have a different inventory portfolio than Target, just as Whole Foods will offer different brands and package sizes than Kroger.[34] However, due to the three-tier system, retailers may interact with distributors at a higher level than the individual store. This approach captures more heterogeneity than the typical channel-level analysis, but also takes into account the idiosyncrasies of the three-tier system. Moreover, by including the time interaction, we allow these effects to fluctuate as the craft beer landscape evolves and as retailers respond.

Finally, we include a battery of demographic controls (income, education, alcohol consumption, and year of brewpub legalization) to control for state level factors that may affect consumption patterns of craft beer. We choose to do this at the state level because we are unable to disaggregate available data to the DMA level.

This results in a difference-in-difference model that has the following specification:

$$\begin{aligned} log(price_{ijkmt}) = \beta_0 + \beta_1 Post_t + \beta_2 ABI\ Market\ Share_k + \\ \beta_3 Post * ABI\ Market\ Share_{kt} + \beta_4 \mathbf{X_{ijkt}} + \\ \tau_t + \gamma_{mt} + \alpha_{kt} + \delta_{ijkm} + \epsilon_{ijkmt} \end{aligned} \tag{3.1}$$

That is, we regress the log of price (or quantity) of a particular brand of beer (i) sold in a particular store (j) that belongs to a particular retailer (k) in a particular DMA (m) at a particular time (t) against the difference-in-difference variables and a battery of controls and fixed effects.

We study three outcome variables of interest: (1) the log of price per ounce; (2) log of total dollar sales; and (3) the number of competing brands sold in a store. The first two outcome variables are conventional variables in merger retrospectives. We wish to know if price has decreased, commensurate with efficiencies dominating merger related effects, or if price has increased, commensurate with coordination dominating merger related effects. Similarly, increasing total sales at the brand-store level may

[34] In the Nielsen dataset, because retailers names are masked, our results do not imply anything concerning these specific stores.

be indicative of a procompetitive merger and decreasing total sales may be indicative of an anticompetitive merger, such as would occur if AB InBev foreclosed other craft brewers from the market.

The craft beer segment competes for consumer patronage more through product differentiation than by price. Consumer welfare is a function not only of price but also quality. For this reason, we include a measure of the number of brands that compete within a store, to attempt to identify the effect of the acquisition on one quality metric, product variety. For each craft beer product we calculate the number of distinct types of craft beers that are sold in the relevant store-month in the sample of craft beers and for each macro beer product we calculate the number of distinct types of macro beers that are sold in the relevant store-month for the sample of macro beers.

3.12 Results: Craft Beer Sample

We find no impact on the price of craft beer due to the acquisition of Goose Island by ABI. Results are in Table 3.7. This implies that while the acquisition did not have an anticompetitive effect on consumers from a rise in price of craft beer, there is also not evidence that the efficiency gains from ABI's superior technology and production capability were passed on to consumers of craft beer through aggressive price competition by Goose Island brands. We are unable to disentangle if this is a result of efficiencies not being achieved or economic profit not being passed through to consumers. These results are also consistent with vigorous price competition in the market for craft beer given that prices did not rise, and may not have fallen because they were already at a competitive level, which seems likely given the attributes of the craft beer market explained above.

We do find statistically significant evidence that the volume of sales of craft beer increased postmerger in stores that had larger market share premerger of ABI products. This implies that the amount of craft beer sold per week has increased in those stores that may have been more likely to be affected by the acquisition, perhaps as a result of aggressive marketing of Goose Island by ABI that may have spilled over to other brands. Results are located in Table 3.8. This suggests that craft brewers have benefitted from ABI's acquisition and entry into the American craft beer market, possibly because of ABI's large advertisement expenditure and availability in capacity constrained on-premise accounts.

However, results on the impact of the acquisition on the number of craft beer brands sold, shown in Table 3.9, indicates that the number of distinct craft beer brands sold has decreased in stores more likely to be affected by the acquisition, as we found statistically significant and negative effects on the number of competing craft beer brands sold in stores postmerger with a greater share of premerger ABI revenue. Together this is interesting, while there seems to be some confirmation of craft brewers' fear of being foreclosed on entering stores where ABI has a larger market share, conditional on gaining shelf space in these stores, the acquisition of Goose Island appears to be a boon to craft brewers. However, as evidenced by the explosion in small craft brewers in Figures 3.1 and 3.2 it does not appear that shelf

space in an off premise establishment is a requisite for entry or sustained success in the craft brewing industry and that entry conditions are consistent with a vigorously competitive industry.

3.13 Results: Macro Beer Sample

In terms of movement within macro beers, we find statistically significant evidence of postmerger increases in the price of macro beer products in stores with larger premerger ABI market share, but statistically significant evidence of sales decreases for these products. Results are in Table 3.10 and Table 3.11. That these are opposite in direction show that while macrobrewers may have tried to jockey their products to a higher price point with their new portfolio of craft beer, quantity sold was not maintained and it is unlikely this was profitable. If the price increase was sustained with no decrease in quantity sold we may be concerned with oligopoly power in these markets. That we do not observe this is comforting from an antitrust perspective - the availability of higher priced, higher quality, import and craft beers ensures that substitution may occur when macro brewers raise prices on their own products and also constrains their ability to do so. In terms of number of competing macro beer brands, we find no statistical evidence of change postmerger, and show our results in Table 3.12.

3.14 Results: Goose Island Sample

Finally, we would like to know the impact of the acquisition on sales of Goose Island beer itself. We investigate this by looking at a subsample of our craft beer sample consisting of only Goose Island brands. If the acquisition resulted in increased access and consumption of Goose Island it would be a boon to consumers, as would any price decreases passed through from efficiency gains made as a result of the acquisition. We first look at price effects and find that ABI maintained prices and did not pass through any achieved efficiencies to consumers, evidenced by no statistically significant impact on price. Results are located in Table 3.13. Second, we look at sales. If ABI was aggressive in marketing Goose Island we would expect increases in sales of the brand. We cannot conclude the coefficient on the difference-in-differences interaction term is statistically significant but do observe positive coefficients on our regression of sales of some magnitude, providing weak evidence of an expansion of Goose Island sales after the ABI acquisition, as expected.

3.15 Regional Analysis: Illinois

It has become apparent that ABI's acquisitions have a distinct regional flavor to them. Each of the ten acquisitions is at the heart of a state or metro area that has seen tremendous growth in the craft segment. For that reason, a natural question is whether or not there are different effects in the regions these craft brewers are located compared to larger geographic areas. We first analyze the effect on craft beer

sold in Illinois. Results are located in Table 3.15. We find much larger effects on sales and price than our more general analysis, for sales we find an effect almost five times that estimated in our more general sample as well as larger and statistically significant effects on price compared to that estimated in the more general sample. We find a negative effect on the number of brands of craft beer sold in individual stores more than twice that of our more general sample. It is clear that there have been much larger merger-related effects in the market for craft beer in Goose Island's home state of Illinois than elsewhere. This contrasts with our estimates from our macro beer sample in Illinois, which are located in Table 3.16. These coefficient estimates are similar for price and sales effects but larger, negative, and significant when analyzing the variety of brands of macro beer sold in stores compared to our more general geographic sample. Finally, we analyzed the impact on sales and price of Goose Island in Illinois, finding no impact on price but large, positive impacts on sales after the acquisition of Goose Island ten times that of the estimates from the more general sample. Results are located in Table 3.17. Together it appears that ABI has greatly expanded sales of Goose Island in Illinois at the expense of many smaller craft breweries.

3.16 Channel Level Analysis

We next analyze whether or not the acquisition had heterogeneous effects across different channel types. The Nielsen database allows us to observe whether each product was sold in a convenience store, drug store, food (grocery) store, or mass merchandiser. The exact identity of each of the retailers is hidden and unknown to us. We re-analyze the price, sales, and product variety effects in our macro, craft, and Goose Island samples by breaking the data into subsamples for each of these four types of stores. Results are in Tables 3.18 - 3.25. We observe several interesting findings. First, we observe that increases in sales of craft beer are driven by stores in the convenience, drug, and mass merchandiser channels and not in grocery stores. We find large positive coefficients in these channels that range between roughly two and four times the magnitude observed in our full sample, and a smaller and statistically insignificant estimate on the interaction term in the grocery channel. This lends credence to the theory that ABI is spurring sales of craft beer in these channels where there is less variety of choice. Conditional on Goose Island being available on the shelf, ABI may drive more traffic to its own product option. Second, the loss of sales in macro beers are driven by drug stores but no meaningful loss is observed among mass merchandisers. This may be an artifact of our sample excluding non six-pack package sizes, as these two channels sell mainly very large or very small (single) packages of beer. Nonetheless, while estimates are generally in line with those of the full sample for convenience and grocery stores, drug stores observe an effect more than double the magnitude observed in the full sample. Finally, we observe weak price decreases in price of Goose Island beer in grocery stores as in the full sample, but large and positive increases in price in mass merchandise stores, suggesting that craft beer is earning a premium in these channels.

3.17 Conclusion

One swallow does not make a Spring and one case study of an acquisition does not prove a proposition. Nonetheless, in watching for Spring we do look for swallows. For that reason, the ABI-Goose Island acquisition is a fitting case study of the economic consequences of combining a megabrewer with a prominent craft brewer.[35] To the extent this case study is a harbinger of others, however, the standard price-quantity consequences studied in merger retrospectives of the ABI-Goose Island combination fail to confirm the fears that many had that the acquisition of Goose Island by ABI would hamper other craft brewers and consumers.

If the ABI-Goose Island amalgamation is a reflection of other such combinations, present and future, our study suggests that beer drinkers are not worse off in terms of the usual consumer welfare metrics of price and output. To the extent consumers value the Brandeisian merits of small business and derive utility from the purchasing the product of locally owned firms, the acquisition of craft brewers by megabrewers reduces the choice set of (true) craft beers with these attributes. Fortunately, through the rapid rise of on-premise outlets, the increasing supply of new entrants in the craft segment comes at a more rapid rate than the current propensity of megabrewers to acquire them or foreclose them from shelf space in off-premise accounts.

[35] It is the one such acquisition to merit a book length treatment (Noel, 2018) whose author also extrapolates the lesson of this combination to the craft segment as a whole.

3.18 Tables

Table 3.1: Beer Sales by Segment in the US

	Market Share 2018	Market Share 2013
Imports	17.4	13.3
Craft	12.4	7.8
Superpremium	7.9	6.9
Cider	4.5	3.7
High End	0.9	0.6
Premium Regular	43.2	32.4
Premium Light	7.7	9.7
Premium	28.2	33.8
Subpremium Regular	35.9	43.6
Subpremium Light	10.0	11.5
Malt Liquor	8.5	9.6
Subpremium	2.1	2.6
No Alcohol	20.6	23.7

Source: Beer Marketer's Insights

Table 3.2: Top Import Beer Brands in the US

Brand	Bbls 2018	Market Share 2018	Bbls 2008
Corona Extra	8,580	23.8	7,940
Modelo Especial	8,180	22.7	1,810
Heineken	3,800	10.6	4,950
Stella Artois	2,675	7.4	755
Dos Equis	1,900	5.3	725
Corona Light	1,125	3.1	925
Guinness	1,110	3.1	980
Corona Familiar	730	2.0	
Pacifico	725	2.0	360
Tecate	680	1.9	1,515
Top 10 Brands	29,505	82.0	19,960
Others	6,495	18.0	8,929
Total Imports	36,000	100.0	28,889

Source: Beer Marketer's Insights

Table 3.3: Premerger Summary Statistics, Craft Beer Sample

	mean	sd	min	max
Six pack price	8.192643	1.348875	.01	24
Six pack sold	9.121971	17.46063	1	1698
Total sales	72.78735	148.2007	.01	15858.57
Goose Island sold in store-week	.5444173	.4980234	0	1
ABI market share	.2284364	.1168051	0	.9860957
Brewpub legalization year	1987.113	2.356039	1985	1993
Percent bachelor's degree or higher, 25 and over	28.04414	4.72663	17.5	36.9
Per capita income (chained 2012 dollars)	48884.35	5264.827	36910	66706
Per capita ethanol consumption from beer	1.214892	.1500962	.89	1.49
Per capita ethanol consumption from wine	.3279882	.1025704	.1	.66
Per capita ethanol consumption from spirits	.7020477	.1911048	.44	1.36
Total brands sold	112.1514	57.30957	1	331
Craft beer brands sold	44.37833	33.17063	1	189
Observations	1111201			

Table 3.4: Postmerger Summary Statistics, Craft Beer Sample

	mean	sd	min	max
Six pack price	8.672829	1.44457	.01	65.94
Six pack sold	9.276056	20.14404	.9333333	2663
Total sales	78.15854	188.9804	.01	31929.37
Goose Island sold in store-week	.7156956	.4510826	0	1
ABI market share	.2289627	.1312322	0	1
Brewpub legalization year	1987.084	2.271642	1985	1993
Percent bachelor's degree or higher, 25 and over	29.02666	4.644906	18.5	37.4
Per capita income (chained 2012 dollars)	49900.82	4875.026	37405	68310
Per capita ethanol consumption from beer	1.176728	.1455296	.84	1.46
Per capita ethanol consumption from wine	.3541886	.0947028	.1	.72
Per capita ethanol consumption from spirits	.72547	.1909979	.46	1.63
Total brands sold	130.2513	67.95475	1	404
Craft beer brands sold	64.28937	46.12406	1	267
Observations	3479193			

Table 3.5: Premerger Summary Statistics, Macro Beer Sample

	mean	sd	min	max
Six pack price	6.433155	1.355273	.01	20
Six pack sold	12.10633	15.37041	.9333333	1671
Total sales	75.21994	93.34719	.01	8672.49
Goose Island sold in store-week	.3956651	.4889932	0	1
ABI market share	.3054471	.1716414	0	1
Brewpub legalization year	1987.449	2.627596	1985	1993
Percent bachelor's degree or higher, 25 and over	27.85404	4.887537	17.5	36.9
Per capita income (chained 2012 dollars)	48445.99	5686.22	36910	68310
Per capita ethanol consumption from beer	1.192587	.1455707	.89	1.49
Per capita ethanol consumption from wine	.3266767	.1031089	.1	.69
Per capita ethanol consumption from spirits	.7004236	.178198	.44	1.52
Total brands sold	79.26268	51.63728	1	331
Macro beer brands sold	38.58319	17.03259	1	86
Observations	1953498			

Table 3.6: Postmerger Summary Statistics, Macro Beer Sample

	mean	sd	min	max
Six sack srice	6.884017	1.339058	.01	119.615
Six sack sold	12.17785	15.22255	.9333333	1472
Total sales	81.92596	103.0672	.01	9936
Goose Island sold in store-week	.5219289	.499519	0	1
ABI market share	.2982102	.1720245	0	1
Brewpub legalization year	1987.412	2.579948	1985	1993
Percent bachelor's degree or higher, 25 and over	28.82931	4.909575	18.5	37.4
Per capita income (chained 2012 dollars)	49369.57	5386.312	37405	68310
Per capita ethanol consumption from beer	1.159184	.1469885	.84	1.46
Per capita ethanol consumption from wine	.3516101	.1004513	.1	.72
Per capita ethanol consumption from spirits	.7353005	.1877256	.46	1.63
Total brands sold	89.16157	61.40486	1	404
Macro beer brands sold	37.19947	16.65444	1	84
Observations	4127748			

Table 3.7: Fixed Effects Model (D-i-D), Craft Beer Sample (Dependent Variable = Log of Price)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	0.0290***	0.0303***	0.00560	0.000951	0.0000251
	(0.00328)	(0.00330)	(0.00355)	(0.00316)	(0.00312)
Observations	4589530	4589530	4589530	4589530	4589530
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of price per ounce of a particular beer in a particular store in a particular month. Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.8: Fixed Effects Model (D-i-D), Craft Beer Sample (Dependent Variable = Log of Sales)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	0.112***	0.107***	0.104***	0.111***	0.108***
	(0.0226)	(0.0226)	(0.0242)	(0.0249)	(0.0249)
Observations	4590394	4590394	4590394	4590394	4590394
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of sales (in total dollars sold) of a particular beer in a particular store in a particular month. Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer id (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.9: Fixed Effects Model (D-i-D), Craft Beer Sample (Dependent Variable = Number of Brands Sold in Store)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	0.0186*	-45.54***	-40.59***	-29.88***	-29.63***
	(0.00935)	(3.173)	(2.846)	(2.908)	(2.886)
Observations	4590394	4590394	4590394	4590394	4590394
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the number of craft beer brands sold in a particular store in a particular month. Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.10: Fixed Effects Model (D-i-D), Macro Beer Sample (Dependent Variable = Log of Price)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	0.0639***	0.0652***	0.0423***	0.0294***	0.0296***
	(0.00259)	(0.00259)	(0.00247)	(0.00236)	(0.00238)
Observations	6080662	6080662	6080662	6080662	6080662
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of price per ounce of a particular beer in a particular store in a particular month. Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.11: Fixed Effects Model (D-i-D), Macro Beer Sample (Dependent Variable = Log of Sales)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	-0.00938	-0.0117	-0.0571***	-0.0799***	-0.0808***
	(0.0111)	(0.0110)	(0.0119)	(0.0119)	(0.0119)
Observations	6081246	6081246	6081246	6081246	6081246
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of sales (in total dollars sold) of a particular beer in a particular store in a particular month. Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.12: Fixed Effects Model (D-i-D), Macro Beer Sample (Dependent Variable = Number of Brands Sold in Store)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	-1.874***	-1.836***	0.287	-0.344	-0.303
	(0.278)	(0.277)	(0.303)	(0.280)	(0.282)
Observations	6081246	6081246	6081246	6081246	6081246
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the number of macro beer brands sold in a particular store in a particular month. Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.13: Fixed Effects Model (D-i-D), Goose Island Beer Sample (Dependent Variable = Log of Price)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	-0.107***	-0.107***	-0.0345***	-0.00720	-0.0125
	(0.00990)	(0.00990)	(0.00956)	(0.00874)	(0.00836)
Observations	187877	187877	187877	187877	187877
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of price per ounce of a particular beer in a particular store. Sample includes beer produced by Goose Island in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.14: Fixed Effects Model (D-i-D), Goose Island Beer Sample (Dependent Variable = Log of Sales)

	(1)	(2)	(3)	(4)	(5)
Post × ABI Market Share	0.422***	0.427***	0.188*	0.0609	0.0607
	(0.0818)	(0.0823)	(0.0882)	(0.0885)	(0.0880)
Observations	187877	187877	187877	187877	187877
Time Fixed Effects?		Y	Y	Y	Y
Time × DMA Interactions?			Y	Y	Y
Time × Retailer Interactions?				Y	Y
Demographic Controls					Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of sales (in total dollars sold) of a particular beer in a particular store. Sample includes beer produced by Goose Island in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.15: Fixed Effects Model, Craft Beer Sold in Illinois

	(1)	(2)	(3)
Post × ABI Market Share	0.475***	0.0348**	-80.62***
	(0.134)	(0.0121)	(13.76)
Observations	586839	586787	586839
Dependent Variable?	Log of Sales	Log of Price	Number of Brands
Time Fixed Effects?	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y
Demographic Controls	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Illinois between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.16: Fixed Effects Model, Macro Beer Sold in Illinois

	(1)	(2)	(3)
Post × ABI Market Share	0.0630	-0.00563	-5.757***
	(0.0651)	(0.00611)	(0.889)
Observations	706790	706633	706790
Dependent Variable?	Log of Sales	Log of Price	Number of Brands
Time Fixed Effects?	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y
Demographic Controls	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Illinois between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.17: Fixed Effects Model, Goose Island Beer Sold in Illinois

	(1)	(2)
Post × ABI Market Share	0.603*	-0.01000
	(0.303)	(0.0220)
Observations	66616	66616
Dependent Variable?	Log of Sales	Log of Price
Time Fixed Effects?	Y	Y
Time × DMA Interactions?	Y	Y
Time × Retailer Interactions?	Y	Y
Demographic Controls	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Sample includes beer sold by Goose Island in Illinois between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.18: Fixed Effects Model, Craft Beer Channel Sub-analysis (Dependent variable = Log of Price)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	0.00987	0.0214	-0.00678*	-0.0124
	(0.0112)	(0.0128)	(0.00312)	(0.0146)
Observations	48085	301425	4067326	173558
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of price per ounce of a particular beer in a particular store in a particular month. Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.19: Fixed Effects Model, Craft Beer Channel Sub-analysis (Dependent variable = Log of Sales)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	0.391**	0.187***	0.0602	0.255**
	(0.142)	(0.0474)	(0.0330)	(0.0834)
Observations	48085	301425	4067326	173558
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of sales (in total dollars sold) of a particular beer in a particular store in a particular month. Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.20: Fixed Effects Model, Craft Beer Channel Sub-analysis (Dependent variable = Number of Brands Sold in Store)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	-1.155	-7.630**	-36.06***	-2.369
	(1.785)	(2.456)	(4.037)	(2.376)
Observations	48085	301425	4067326	173558
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the number of craft beer brands sold in a particular store in a particular month. Sample includes all craft beer sold by brewers meeting the Brewers Association definition of a craft brewer in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.21: Fixed Effects Model, Macro Beer Channel Sub-analysis (Dependent variable = Log of Price)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	0.0641***	0.0326***	0.0308***	0.0141*
	(0.00608)	(0.00869)	(0.00267)	(0.00639)
Observations	267473	896323	4483428	434022
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of price per ounce of a particular beer in a particular store in a particular month. Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.22: Fixed Effects Model, Macro Beer Channel Sub-analysis (Dependent variable = Log of Sales)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	-0.0607	-0.193***	-0.0683***	0.0106
	(0.0615)	(0.0298)	(0.0168)	(0.0414)
Observations	267473	896323	4483428	434022
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of sales (in total dollars sold) of a particular beer in a particular store in a particular month. Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.23: Fixed Effects Model, Macro Beer Channel Sub-analysis (Dependent variable = Number of Brands Sold in Store)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	-0.985	0.130	-0.311	0.780
	(0.905)	(0.326)	(0.430)	(0.651)
Observations	267473	896323	4483428	434022
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the number of macro beer brands sold in a particular store in a particular month. Sample includes macro beer sold by AB InBev, Constellation, MillerCoors, Heineken, and Pabst in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.24: Fixed Effects Model, Goose Island Beer Channel Sub-analysis (Dependent variable = Log of Price)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	0.00354	0.0202	-0.0272**	0.0984*
	(0.00770)	(0.0344)	(0.0103)	(0.0447)
Observations	3677	13349	158450	12401
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of price per ounce of a particular beer in a particular store in a particular month. Sample includes beer produced by Goose Island in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

Table 3.25: Fixed Effects Model, Goose Island Beer Channel Sub-analysis (Dependent variable = Log of Sales)

	(1)	(2)	(3)	(4)
Post × ABI Market Share	-0.105	0.124	0.0973	-0.0411
	(0.343)	(0.305)	(0.113)	(0.227)
Observations	3677	13349	158450	12401
Store Type	Convenience	Drug	Food	Mass
Time Fixed Effects?	Y	Y	Y	Y
Time × DMA Interactions?	Y	Y	Y	Y
Time × Retailer Interactions?	Y	Y	Y	Y
Demographic Controls	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent variable is the log of sales (in total dollars sold) of a particular beer in a particular store in a particular month. Sample includes beer produced by Goose Island in Delaware, Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New Jersey, Ohio, Pennsylvania, Virginia, West Virginia, and Wisconsin between 2010 and 2013. Only 12 oz or 11.2 oz beer sold in packs of six are included in the sample. Time effects are dummy variables at the year level. Time x DMA interactions are interactions between year and Nielsen defined DMAs (Designated Market Area). Time x Retailer interactions are interactions between year and Nielsen retailer ID (the identity of retailers is hidden in the data set). Demographic controls include income, education, and alcohol consumption from beer, wine, and spirits at the state-year level, and the year the state legalized brewpubs.

3.19 Figures

Figure 3.1: Number of Craft Brewers in USA by 2009 Production (bbls)

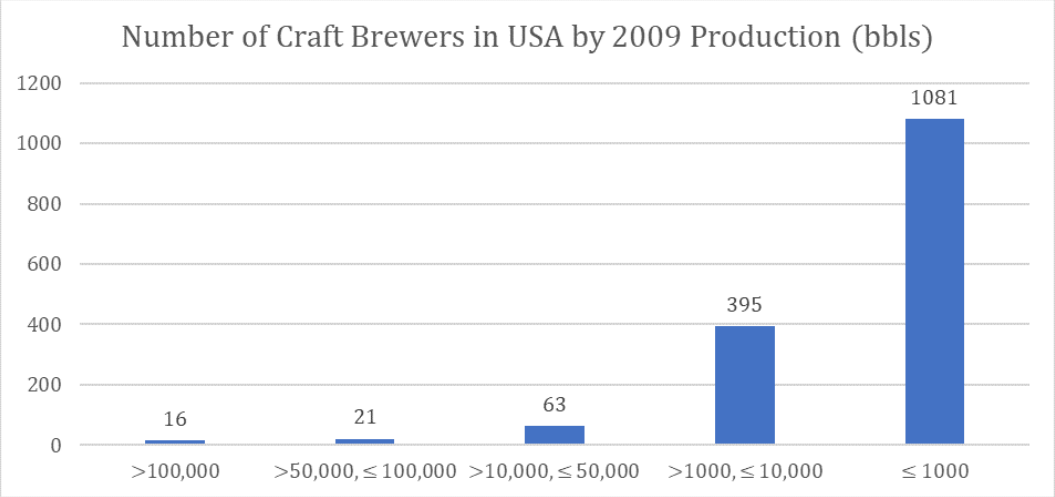


Figure 3.2: Number of Craft Brewers in USA by 2015 Production (bbls)

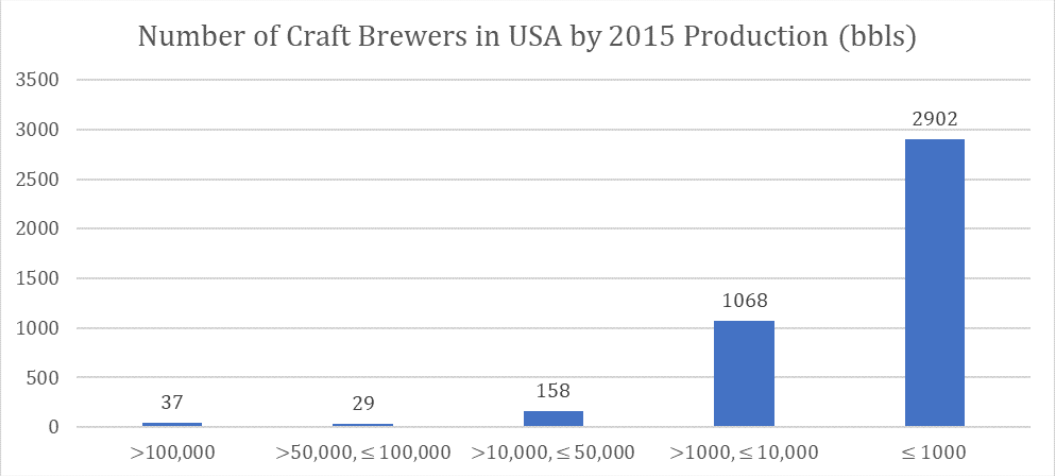
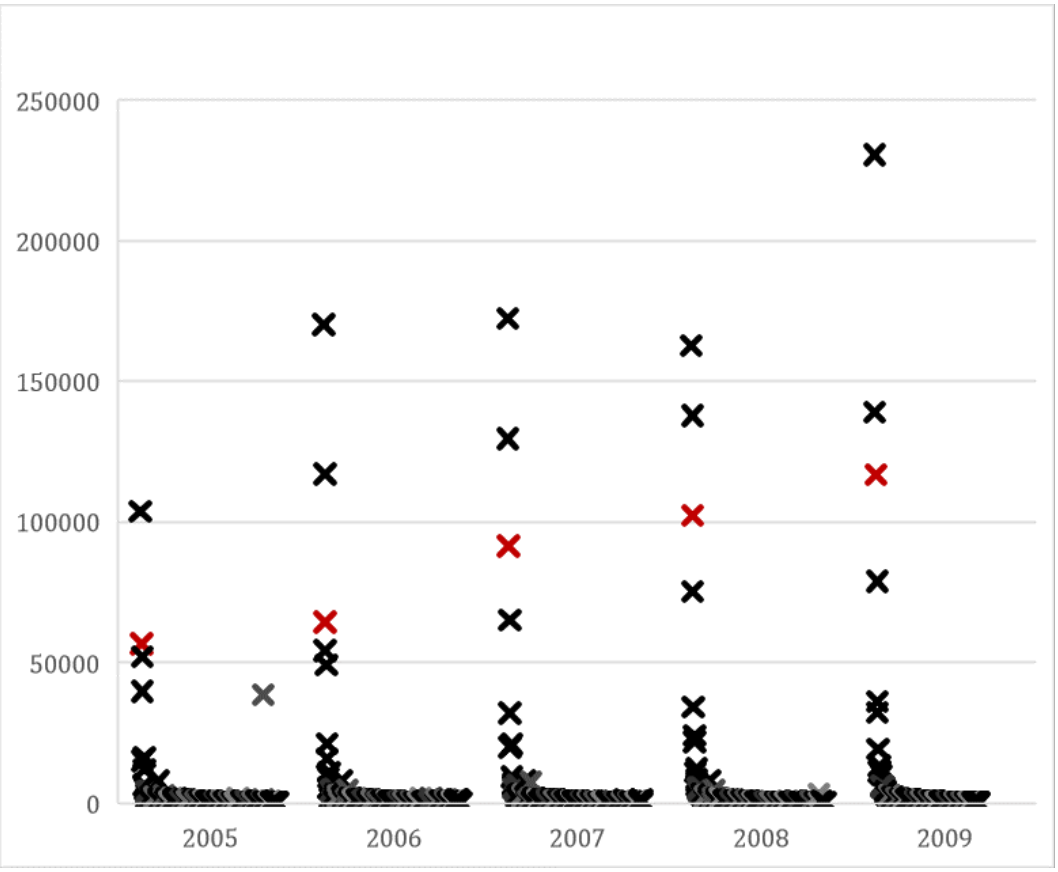


Figure 3.3: Distribution of Production by Craft Brewers in the Midwest (Goose Island in red) (bbls)



Chapter 4 : A Conclusion to Mergers Involving Maverick Firms

The two analyses of this dissertation confirm the Guidelines' stance that mergers involving maverick firms should be afforded special scrutiny. That the merger between Southwest and AirTran resulted in multiple times the price increase observed in a previous merger involving two non-maverick firms and that small craft brewers seem to be foreclosed from off-premise shelf space should give pause to policymakers when they consider how to treat future mergers involving maverick firms.

However, it also must be said that the two markets these mergers occur in should also be taken into consideration when assessing these results. In the airline industry there are high barriers to entry. There are large fixed costs involved in starting an airline that include leasing planes, training staff, and securing landing slots in order to create a network of routes to create an attractive air travel product for consumers. Additionally, the small number of players and high concentration in the industry makes it especially conducive to tacit collusion and the public availability of pricing data lowers the cost to firms of monitoring rivals.

A merger that involves a maverick acquiring another maverick should spur particular concern. Because the loss of a maverick in markets both compete may have anticompetitive impacts on both maverick firms and non-maverick firms, and the loss of potential competition from a maverick may impact those markets where only one of the merging entities operated premerger, the incentives that the new firm may face must be taken into account. The Department of Justice cited the fact that competition would be maintained because there were landing slots available at airports and on routes of concern where entry would likely occur if prices were raised to economically profitable levels. However, to the extent that entry is associated with competitive pricing this appears to not have been the case. Moreover, future analysis of mergers involving two maverick firms should take seriously the question of whether the acquisition is occurring to alleviate the competitive pressure faced by the acquiring firm as a result of the target maverick firm. It should be evident that the predicted efficiencies will be achieved and passed through to the consumer. In competitive markets prices did appear to decrease, however in highly concentrated markets efficiencies were not passed through and in markets where Southwest competed and AirTran did not there were large increases in price consistent with the acquisition resulting in the reduction of competitive pressure felt by Southwest due to AirTran.

In the second chapter, it is clear that consumers may benefit from acquisitions of mavericks by dominant incumbent firms such as those between startups and Big Tech. That prices were maintained at a previous competitive level and that the market for craft beer expanded to a greater degree in off-premise accounts more likely to be influenced by ABI lend credence to the theory that dominant incumbents acquire small disruptive firms in order to supercharge their growth. If this is happening in other markets and industries, policy should encourage incentivizing entrepreneurs to develop innovative and disruptive products by allowing them to reap the financial rewards that come by acquisition. However, it is clear from the reduction in choice

and variety in stores more likely to be affected by the acquisition that to the extent that it impedes the growth of future disruptors these acquisitions should be viewed with caution.

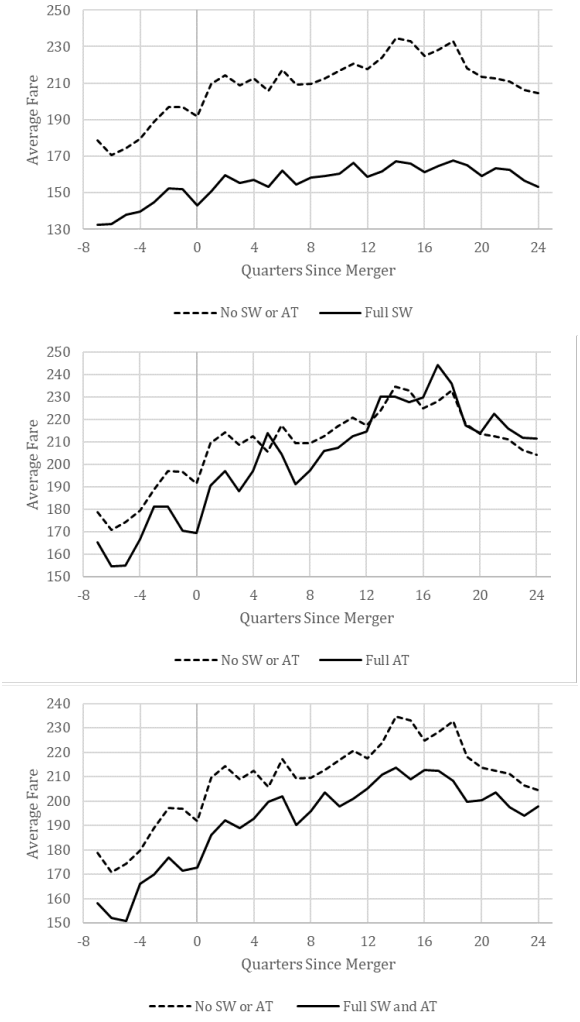
Fortunately for the competitive craft brewing industry, barriers to on-premise sales and the liberalization of alcohol sales regulations across the 50 states have ensured that access to off-premise accounts is unnecessary for entry and success in this industry. This is clear from the growth of the number of craft brewers in the United States and the increasing share of market that they are capturing. Here also lies a valuable lesson. To the extent that distribution and access to consumers is controlled by an acquiring firm, the acquisition of a maverick firm by a dominant incumbent firm may result in decreased consumer welfare due to restricted quality and quantity of offerings. However, a competitive market seems to be the vaccine necessary to protect consumers from feeling the pain of lost innovation and competition.

-AJM

Online Appendix, Mavericks and mergers in concentrated markets

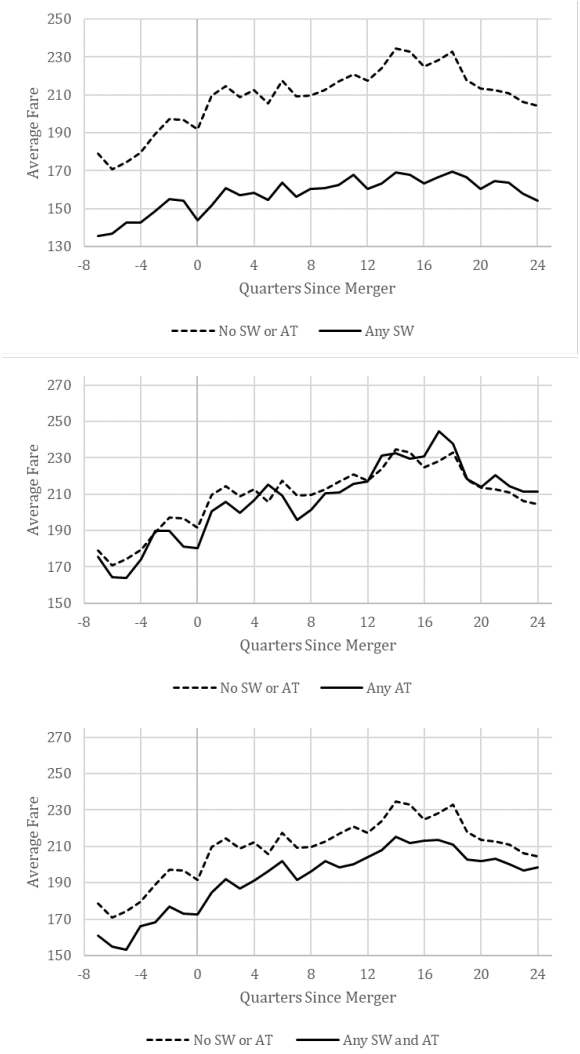
Parallel Trends

Figure A.1: Parallel Trends, Main Specification



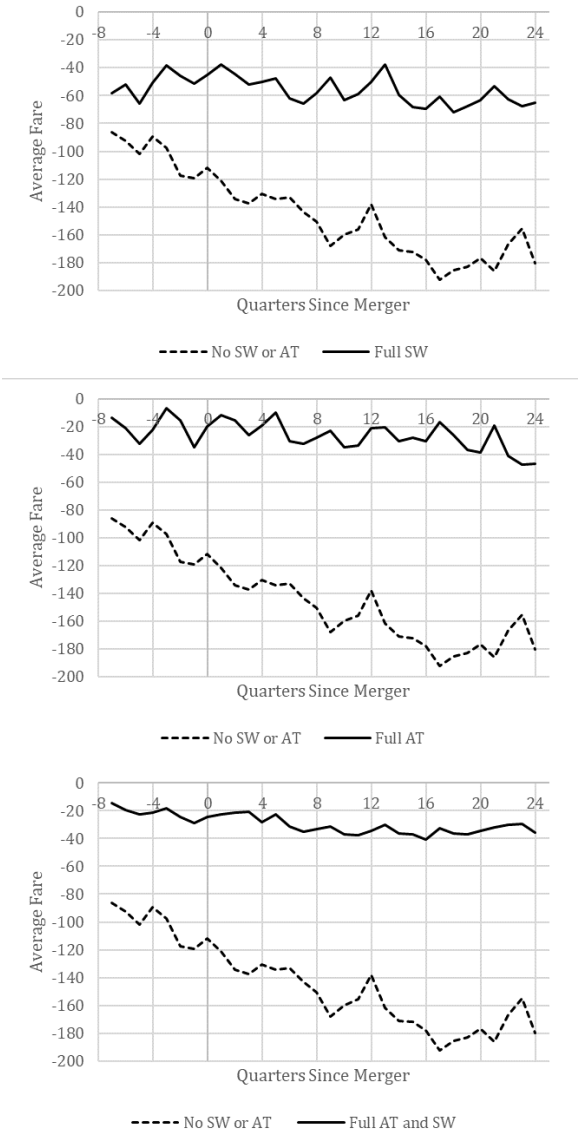
Note: Parallel trends of unconditional passenger weighted mean airfare across markets where Southwest, AirTran, or both competed in all quarters premerger compared to markets where they competed in no quarter premerger. These are unconditional passenger-weighted means of airfare across treatment and control markets before and after the merger. Time zero is the close of the merger (Q2 2011). Some divergence of the two trends is present postmerger.

Figure A.2: Parallel Trends, Main Specification, Alternative Treatment Variables



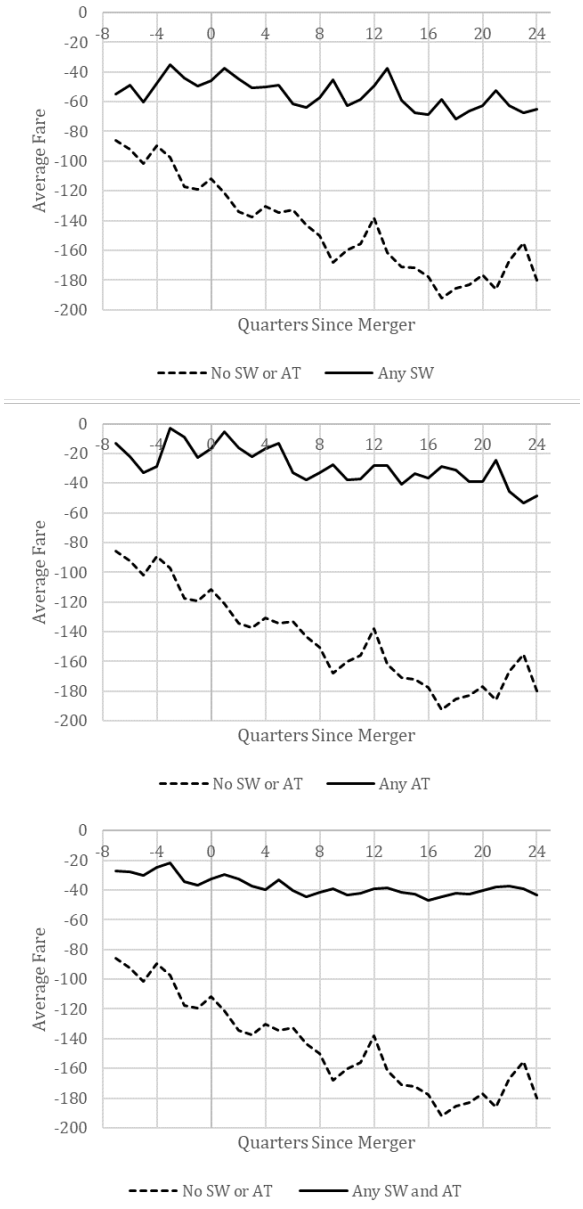
Note: Parallel trends of unconditional passenger weighted mean airfare across markets where Southwest, AirTran, or both competed in at least one quarter premerger compared to markets where they competed in no quarter premerger. These are unconditional passenger-weighted means of airfare across treatment and control markets before and after the merger. Time zero is the close of the merger (Q2 2011). Some divergence of the two trends is present postmerger.

Figure A.3: Parallel Trends, Concentrated vs Unconcentrated Markets



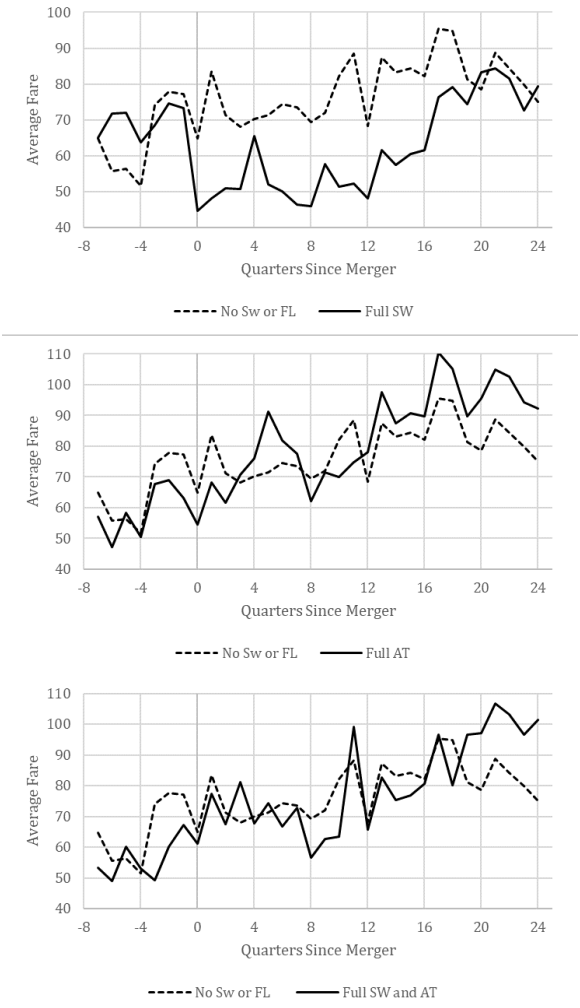
Note: Parallel trends of the difference in unconditional passenger weighted mean airfare between concentrated and unconcentrated markets across markets where Southwest, AirTran, or both competed in all quarters premerger compared to markets where they competed in no quarter premerger. These are unconditional passenger-weighted means of airfare across treatment and control markets before and after the merger. Time zero is the close of the merger (Q2 2011). Some divergence of the two trends is present postmerger.

Figure A.4: Parallel Trends, Concentrated vs Unconcentrated Markets, Alternative Treatment Variables



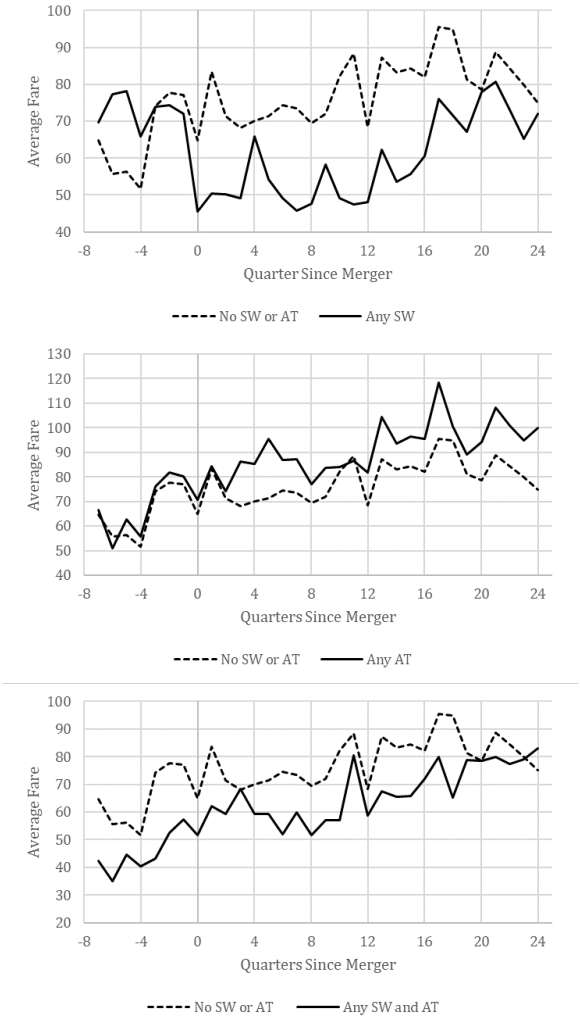
Note: Parallel trends of the difference in unconditional passenger weighted mean airfare between concentrated and unconcentrated markets across markets where Southwest, AirTran, or both competed in at least one quarter premerger compared to markets where they competed in no quarter premerger. These are unconditional passenger-weighted means of airfare across treatment and control markets before and after the merger. Time zero is the close of the merger (Q2 2011). Some divergence of the two trends is present postmerger.

Figure A.5: Parallel Trends, Maverick vs Non-Maverick Firms



Note: Parallel trends of the difference in unconditional passenger weighted mean airfare between legacy and low cost carrier across markets where Southwest, AirTran, or both competed in all quarters premerger compared to markets where they competed in no quarter premerger. These are unconditional passenger-weighted means of airfare across treatment and control markets before and after the merger. Time zero is the close of the merger (Q2 2011). Some divergence of the two trends is present postmerger.

Figure A.6: Parallel Trends, Maverick vs Non-Maverick Firms, Alternative Treatment Variables



Note: Parallel trends of the difference in unconditional passenger weighted mean airfare between legacy and low cost carrier across markets where Southwest, AirTran, or both competed in at least one quarter premerger compared to markets where they competed in no quarter premerger. These are unconditional passenger-weighted means of airfare across treatment and control markets before and after the merger. Time zero is the close of the merger (Q2 2011). Some divergence of the two trends is present postmerger.

Summary Statistics

Table B.1: Summary Statistics (products in markets both firms competed in at least one quarter premerger)

	mean	sd	min	max
Average Fare	167.6193	46.19723	65.05872	1122.991
HHI	3367.51	1654.94	1132.455	9883.826
Origin City Population	4267328	3938448	612297	1.96e+07
Origin City Per Capita Income	43121.2	7079.401	32240	60771
Destination City Population	4204321	3841074	612297	1.96e+07
Destination City Per Capita Income	43124.19	7007.401	32240	60771
Market Size	22141.02	16753.61	1153	103917
Carrier Passengers	6490.436	6687.988	136	39071
Number of Connecting Legacy Carriers	5.791264	1.36483	1	8
Number of Connecting LCC Carriers	1.840235	.9609359	0	6
Number of Nonstop Legacy Carriers	2.202856	1.584777	0	8
Number of Nonstop LCC Carriers	.7952961	.7822446	0	3
Observations	11905			

Table B.2: Summary Statistics (products in markets Southwest competed in every quarter premerger)

	mean	sd	min	max
Average Fare	158.5333	56.70634	40.19587	2098.22
HHI	5182.738	2506.021	1295.872	10000
Origin City Population	3015515	2692954	140948	1.28e+07
Origin City Per Capita Income	41316.99	6986.432	22173	70564
Destination City Population	3033276	2720924	140948	1.28e+07
Destination City Per Capita Income	41321.25	7030.814	22173	70564
Market Size	15835.89	19057.88	641	142439
Carrier Passengers	6895.335	8088.112	8	68295
Number of Connecting Legacy Carriers	3.967832	1.989721	0	8
Number of Connecting LCC Carriers	.3738355	.5941962	0	3
Number of Nonstop Legacy Carriers	1.392706	1.556423	0	8
Number of Nonstop LCC Carriers	.1441198	.363481	0	2
Observations	12559			

Table B.3: Summary Statistics (products in markets Southwest competed in at least one quarter premerger)

	mean	sd	min	max
Average Fare	160.8532	61.67292	40.19587	2098.22
HHI	5133.397	2480.619	1295.872	10000
Origin City Population	3216900	3218859	140948	1.96e+07
Origin City Per Capita Income	41712.14	7275.417	22173	70564
Destination City Population	3311751	3392854	140948	1.96e+07
Destination City Per Capita Income	41766.42	7329.037	22173	70564
Market Size	15833.99	18971.09	233	142439
Carrier Passengers	6793.797	7963.372	8	68295
Number of Connecting Legacy Carriers	4.006944	1.980127	0	8
Number of Connecting LCC Carriers	.3778533	.5940182	0	3
Number of Nonstop Legacy Carriers	1.436729	1.565551	0	8
Number of Nonstop LCC Carriers	.1535052	.3715877	0	2
Observations	13537			

Table B.4: Summary Statistics (products in markets AirTran competed in every quarter premerger)

	mean	sd	min	max
Average Fare	164.5623	47.12866	53.10074	472.7694
HHI	4672.765	1704.881	1347.454	9440.935
Origin City Population	4110194	3363506	185265	1.96e+07
Origin City Per Capita Income	41882.32	6744.829	29459	60771
Destination City Population	4069182	3374357	185265	1.96e+07
Destination City Per Capita Income	41779.17	6623.215	29459	60771
Market Size	18215.23	16452.81	1065	98833
Carrier Passengers	7388.6	8452.608	287	63919
Number of Connecting Legacy Carriers	4.929965	1.724881	0	8
Number of Connecting LCC Carriers	1.230912	.6471468	0	3
Number of Nonstop Legacy Carriers	1.974921	1.324778	0	7
Number of Nonstop LCC Carriers	.7637005	.604613	0	2
Observations	5383			

Table B.5: Summary Statistics (products in markets AirTran competed in at least one quarter premerger)

	mean	sd	min	max
Average Fare	173.2277	56.29233	37.47603	926.628
HHI	4727.453	1785.511	1347.454	9987.908
Origin City Population	4763535	4767725	185265	1.96e+07
Origin City Per Capita Income	42356.88	6942.93	29459	60771
Destination City Population	4730430	4715803	185265	1.96e+07
Destination City Per Capita Income	42371.16	6918.389	29459	60771
Market Size	18256.32	17125.26	803	98833
Carrier Passengers	7367.265	8695.008	87	63919
Number of Connecting Legacy Carriers	5.014332	1.77832	0	8
Number of Connecting LCC Carriers	1.113746	.7199546	0	3
Number of Nonstop Legacy Carriers	1.977329	1.379796	0	7
Number of Nonstop LCC Carriers	.6763518	.6302324	0	2
Observations	7675			

Table B.6: Summary Statistics (products of low cost carriers)

	mean	sd	min	max
Average Fare	133.835	56.8566	26.70188	377.5225
HHI	5648.242	2956.285	1132.455	10000
Origin City Population	4626701	5429959	75238	2.02e+07
Origin City Per Capita Income	47011.3	10439.56	21171	87643
Destination City Population	4615681	5428536	75238	2.02e+07
Destination City Per Capita Income	47002.02	10437.43	21171	87643
Market Size	21634.1	26286.75	213	163252
Carrier Passengers	6888.016	7924.412	1	52097
Number of Connecting Legacy Carriers	2.836758	2.012338	0	8
Number of Connecting LCC Carriers	.9902876	1.15193	0	6
Number of Nonstop Legacy Carriers	1.2609	1.464517	0	8
Number of Nonstop LCC Carriers	1.174022	.5067331	0	4
Observations	18739			

Table B.7: Summary Statistics (products of legacy carriers)

	mean	sd	min	max
Average Fare	219.5369	62.29675	56.42365	3613.837
HHI	4425.062	2118.864	1132.455	10000
Origin City Population	4939085	4901751	60464	2.02e+07
Origin City Per Capita Income	48567.43	9600.613	21171	118295
Destination City Population	4948603	4918002	60464	2.02e+07
Destination City Per Capita Income	48596.69	9602.334	21171	118295
Market Size	17268.67	19987.52	205	163252
Carrier Passengers	4853.572	7319.666	1	63919
Number of Connecting Legacy Carriers	3.835901	1.488964	0	8
Number of Connecting LCC Carriers	.9231542	1.091449	0	6
Number of Nonstop Legacy Carriers	1.910589	1.251343	0	8
Number of Nonstop LCC Carriers	.3556537	.6097436	0	4
Observations	120488			

Additional Regressions

Table C.1: Regression Results: Triple Difference Fixed Effects Model Across Concentrated and Unconcentrated Markets

	1	2	3
Post × Concentrated	-0.0948***	-0.0960***	-0.0890***
	(0.0121)	(0.0132)	(0.0126)
Post × Any SW and AT Market	-0.0263*		
	(0.0122)		
Post × Any SW and AT Market × Concentrated	0.0675***		
	(0.0138)		
Post × Any SW Market		-0.0638***	
		(0.0150)	
Post × Any SW Market × Concentrated		0.0877***	
		(0.0166)	
Post × Any AT Market			-0.00739
			(0.0159)
Post × Any AT Market × Concentrated			0.0270
			(0.0172)
Observations	105601	109727	83488
Adjusted R^2	0.389	0.349	0.355
Time Effects?	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y
Market Demographics Included?	Y	Y	Y
Competition Variables Included?	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.2: Regression Results: Triple Difference Fixed Effects Model Across HHI Thresholds

	1	2	3
Post × Any SW and AT Market	-0.0275*		
	(0.0124)		
Post × Any SW and AT Market × HHI: 2501-5000	0.0501***		
	(0.0148)		
Post × Any SW and AT Market × HHI: 5001-7500	0.0507*		
	(0.0202)		
Post × Any SW and AT Market × HHI: 7501-10,000	0.0689***		
	(0.0207)		
Post × Any SW Market		-0.0636***	
		(0.0154)	
Post × Any SW Market × HHI: 2501-5000		0.0620***	
		(0.0178)	
Post × Any SW Market × HHI: 5001-7500		0.0957***	
		(0.0214)	
Post × Any SW Market × HHI: 7501-10,000		0.124***	
		(0.0198)	
Post × Any AT Market			-0.00882
			(0.0160)
Post × Any AT Market × HHI: 2501-5000			0.0104
			(0.0185)
Post × Any AT Market × HHI: 5001-7500			0.0295
			(0.0202)
Post × Any AT Market × HHI: 7501-10,000			0.0526
			(0.0324)
Observations	105601	109727	83488
Adjusted R^2	0.391	0.350	0.357
Time Effects?	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y
Market Demographics Included?	Y	Y	Y
Competition Variables Included?	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.3: Regression Results: Difference-in-Differences Fixed Effects Model, Carrier Subsamples

	(1)	(2)	(3)	(4)	(5)	(6)
Post × Any SW and AT Market	0.0464***			0.0463***		
	(0.00745)			(0.0119)		
Post × Any SW Market		0.0225*			0.000580	
		(0.0104)			(0.0192)	
Post × Any AT Market			0.0227**			0.0132
			(0.00819)			(0.0161)
Observations	71245	66427	67905	14819	12437	12009
Adjusted R^2	0.353	0.309	0.327	0.463	0.459	0.436
Carrier Subsample	Legacy	Legacy	Legacy	Low Cost	Low Cost	Low Cost
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y	Y	Y	Y
Market Demographics Included?	Y	Y	Y	Y	Y	Y
Competition Variables Included?	Y	Y	Y	Y	Y	Y
Southwest and AirTran Included?	N	N	N	N	N	N

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.4: Regression Results: Triple Difference Fixed Effects Model Across Carrier Type

	1	2	3
Post × Any SW and AT Market	0.0488***		
	(0.00748)		
Post × Any SW and AT Market × LCC	-0.00519		
	(0.0137)		
Post × Any SW Market		0.0226*	
		(0.0104)	
Post × Any SW Market × LCC		-0.0225	
		(0.0211)	
Post × Any AT Market			0.0219**
			(0.00818)
Post × Any AT Market × LCC			-0.00335
			(0.0172)
Observations	105601	78864	79914
Adjusted R^2	0.388	0.330	0.343
Time Effects?	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y
Market Demographics Included?	Y	Y	Y
Competition Variables Included?	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.5: Regression Results: Difference-in-Differences Fixed Effects Model, Carrier-Time Fixed Effects Excluded

	1	2	3	4	5	6
Post × Full SW and AT Market	0.0545***					
	(0.00701)					
Post × Full SW Market		0.00414				
		(0.00768)				
Post × Full AT Market			0.0418***			
			(0.00693)			
Post × Any SW and AT Market				0.0512***		
				(0.00655)		
Post × Any SW Market					0.00260	
					(0.00772)	
Post × Any AT Market						0.0267***
						(0.00740)
Observations	84661	104923	73809	105601	109727	83488
Adjusted R^2	0.257	0.221	0.244	0.275	0.214	0.240
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions included?	N	N	N	N	N	N
Market Demographics Included?	Y	Y	Y	Y	Y	Y
Competition Variables Included?	Y	Y	Y	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.6: Regression Results: Difference-in-Differences Fixed Effects Model, Southwest and AirTran Excluded

	1	2	3	4	5	6
Post × Full SW and AT Market	0.0518***					
	(0.00793)					
Post × Full SW Market		0.0250*				
		(0.0103)				
Post × Full AT Market			0.0352***			
			(0.00797)			
Post × Any SW and AT Market				0.0464***		
				(0.00678)		
Post × Any SW Market					0.0209*	
					(0.00980)	
Post × Any AT Market						0.0217**
						(0.00770)
Observations	71747	74813	70581	86064	78864	79914
Adjusted R^2	0.354	0.330	0.342	0.371	0.330	0.343
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y	Y	Y	Y
Market Demographics Included?	Y	Y	Y	Y	Y	Y
Competition Variables Included?	Y	Y	Y	Y	Y	Y
Southwest and AirTran Included?	N	N	N	N	N	N

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.7: Regression Results: Difference-in-Differences Fixed Effects Model, All Quarters Included

	1	2	3	4	5	6
Post × Full SW and AT Market	0.0445***					
	(0.00714)					
Post × Full SW Market		0.0190*				
		(0.00964)				
Post × Full AT Market			0.0277***			
			(0.00721)			
Post × Any SW and AT Market				0.0410***		
				(0.00614)		
Post × Any SW Market					0.0145	
					(0.00930)	
Post × Any AT Market						0.0179**
						(0.00687)
Observations	93396	115808	81727	116395	121076	92526
Adjusted R^2	0.373	0.350	0.357	0.388	0.348	0.356
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y	Y	Y	Y
Market Demographics Included?	Y	Y	Y	Y	Y	Y
Competition Variables Included?	Y	Y	Y	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Low cost carriers include AirTran, Allegiant, Frontier, Jetblue, Spirit, Sun Country, and Virgin. Legacy carriers include Alaska, American Airlines, Continental, Delta, Northwest, Republic, US Airways, and United. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.8: Regression Results: Difference-in-Differences Fixed Effects Model, Weighted by Passengers Carried

	1	2	3	4	5	6
Post × Full SW and AT Market	0.0285***					
	(0.00311)					
Post × Full SW Market		0.0165***				
		(0.00304)				
Post × Full AT Market			-0.00865**			
			(0.00316)			
Post × Any SW and AT Market				0.0227***		
				(0.00245)		
Post × Any SW Market					0.00871**	
					(0.00290)	
Post × Any AT Market						-0.0163***
						(0.00255)
Observations	84661	104923	73809	105601	109727	83488
Adjusted R^2	0.883	0.876	0.873	0.877	0.867	0.875
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y	Y	Y	Y
Market Demographics Included?	Y	Y	Y	Y	Y	Y
Competition Variables Included?	Y	Y	Y	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

Table C.9: Regression Results: Difference-in-Differences Fixed Effects Model, Winsorized Sample

	1	2	3	4	5	6
Post × Full SW and AT Market	0.0527***					
	(0.00793)					
Post × Full SW Market		0.0252*				
		(0.0103)				
Post × Full AT Market			0.0353***			
			(0.00796)			
Post × Any SW and AT Market				0.0481***		
				(0.00679)		
Post × Any SW Market					0.0211*	
					(0.00983)	
Post × Any AT Market						0.0219**
						(0.00769)
Observations	84661	104923	73809	105601	109727	83488
Adjusted R^2	0.373	0.349	0.354	0.388	0.348	0.354
Time Effects?	Y	Y	Y	Y	Y	Y
Carrier by Time Interactions included?	Y	Y	Y	Y	Y	Y
Market Demographics Included?	Y	Y	Y	Y	Y	Y
Competition Variables Included?	Y	Y	Y	Y	Y	Y
Southwest and AirTran Included?	Y	Y	Y	Y	Y	Y

Cluster robust standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Results for the full sample. Dependent variable is the log of the product's average fare. Only airfare products that transported at least 200 passengers in the DB1B (thus in real life 2000 passengers would have been transported) in the premerger time period are included. Time effects are dummy variables at the quarter level. Market demographics variables include geometric mean of route endpoints' population, and geometric mean of route endpoints' per capita income. Competition variables are dummy variable bins that indicate whether a market has one, two, or three or more legacy carriers offering connecting service; one, two, or three or more legacy carriers offering nonstop service; one, two, or three or more low cost carriers offering connecting service; or one, two, or three or more low cost carriers offering nonstop service. Recall that Southwest is not included in the number of low cost carriers because of the empirically demonstrated differences between the presence of Southwest in a market and the presence of other low cost carriers.

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Education

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Honors and Awards

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Professional and Invited Presentations

IIOC 2018 - Indianapolis, IN, presented "Mavericks and mergers in concentrated markets" in "Rising Stars" Session.

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AAWE 2019 - Vienna, AT, presented "Has Anheuser-Busch let the steam out of craft beer? The Economics of acquiring craft brewers" (with Kenneth G. Elzinga) in Plenary Session

SEA 2019 - Ft. Lauderdale, FL, planned presentation "The effect of hubbing on airline flight delays" (with Aaron Levy)