What Changes with Ownership?

Evidence from Acquisitions and Divestitures of Regional Airlines

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June 11, 2008

Abstract

Much of the evidence about differences between integrated and non-integrated firms comes from cross-sectional comparisons of firms with different organizational forms. In this paper, we attempt to provide evidence that comes from examining the pairs firms which - at different points in time - operate under both vertical integration and contracts. Our setting is the U.S. airline industry. Large U.S. airlines subcontract portions of their network to regional affiliates. In the late 1990s, several airlines purchased some of their regional partners while in the last few years, several airlines have divested themselves of their regional partners. In all cases, the major and the regional continued to work together after the change in organizational form. We exploit this within-pair variation to document whether ownership affects *ex ante* scheduling behavior.

I. Introduction

What are the implications of firm boundary decisions? While there is a large empirical literature in organizational economics that relates boundary decisions to transaction characteristics, there is a comparably small literature on the implications of firm boundary decisions. The dearth of empirical evidence on the implications of integration decisions is likely the result of two factors: first, it is often difficult to obtain relevant outcome measures for similar transactions that are organized differently; and second, boundary decisions will typically be endogenous (Masten, 1993). In this paper, we attempt to overcome both of these difficulties and provide some empirical evidence on whether and how firms' boundary decisions actually affect specific aspects of their performance.

Our setting is the U.S. airline industry. All of the large U.S. network carriers, often called "majors", employ regional airlines to operate a subset of their routes. There is substantial heterogeneity - both across and within majors – in the extent to which these regional partners are owned. In previous work (Forbes and Lederman, 2008a and 2008b), we have exploited cross-sectional variation across majors in ownership patterns to study the determinants of vertical integration in this industry as well as the effects of integration for airlines' operational performance. Now, in this work, we seek to exploit six ownership changes that have taken place in this industry over the past 11 years. While patterns of ownership have generally been quite stable, we do observe two "waves" of ownership changes. Between 1997 and 1999, three independent regionals were acquired by the major for which they operated and, between 2002 and 2005, three owned regionals were sold by the major that had previously owned them. The primary benefit of these ownership changes is that, in all cases, the major and the regional continue to work together after the ownership change has taken place. Thus, these acquisitions and divestitures provide us with a unique opportunity to observe the *same* two firms carrying out identical transactions under alternate governance structures.

Of course, just as cross-sectional variation in organizational form may be endogenous, the time-series variation that we exploit might be endogenous as well. That is, a major's decision to purchase or sell one of its regional partners may be correlated with other unobserved changes that also affect its outcomes. Fortunately, our setting allows us to address this issue by using a differences-in-differences style of estimation in which we identify sets of flights that can reasonably serve as "control groups" for those flights that could be affected by the ownership change.

Our empirical analysis focuses on the extent to which ownership of a regional affects a major's ability to optimally schedule the regional's flights. Thus, in contrast to our previous work that focused on the relationship between ownership and *ex post* adaptation decisions, we now focus on the relationship between ownership and *ex ante* scheduling decisions. Why might ownership affect scheduling decisions? As we elaborate on below, contracts between majors and independent regionals do not fully align the regional's incentives with those of the major. In particular, until recently, independent regionals were compensated by receiving a portion of the revenue earned from passengers traveling on the flights that they operated on behalf of the major.[1] As a result, from a regional's perspective, the incentive to operate a particular flight depended on the direct revenues and costs of *that* flight. However, from a major's perspective, the incentive to have a regional operate a particular flight depends not only on the direct revenues and costs of that flight but also on all of the indirect contributions of that flight to the major's revenues and costs elsewhere in its network. Because of the

[1] Majors do all of the marketing and ticketing of the regional's flights.

network structure of majors' operations, these indirect effects can be substantial. Because independent regionals' compensation will not be linked to these indirect profits, their incentives to operate a given flight may be very different from those of the major. As a result, majors may be able to better optimize the set of flights operated by an owned regional than an independent one.

To investigate whether ownership does, in fact, affect *ex ante* scheduling behavior, we exploit the six ownership changes that have taken place. We look for evidence that the schedule of flights that a given regional serves for a given major changes after that regional is bought or sold by that major. Since we clearly cannot know the "ideal" schedule that a major would have wanted its independent regional to serve, we instead identify schedule characteristics that should proxy for the desirability of the regional's schedule from the major's perspective and look for changes in these characteristics. For now, we focus on the degree of coordination between a major's own and its regional's flights. Since regionals are used primarily to feed majors' hubs, coordination between their flights and those of the majors is clearly important (and may be reduced if majors cannot persuade their regionals to serve the routes and times that they want).

The remainder of this paper is organized as follows. Sections two and three provide background information on the industry and the ownership changes, respectively. Section four discusses the data and empirical approach. In Section five, we present some preliminary results.

II. Background: The Regional Airline Industry

II.A. The Role of Regional Airlines

Regional airlines operate as "subcontractors" for major U.S. network carriers on low-density short and medium-haul routes.[2] These are routes which are most efficiently served with small aircraft - either turbo-prop planes or regional jets. Majors subcontract these routes to regional airlines because regionals have a cost advantage in operating small aircraft. This cost advantage results from the substantially lower compensation that regional airline employees receive, relative to the compensation of the major's own employees.[3] It is worth pointing out that the major network carriers do not operate any small aircraft themselves. Thus, a major's decision whether to use a regional to serve a particular route is effectively a decision about the type of plane to use for that route.[4]

II. B. Organizational Forms

Regional airlines operate under codeshare agreements with one or more major carriers. Under these agreements, the regional operates flights on behalf of the major carrier, who markets and tickets these flights under its own flight designator code. In addition to using the major's code, the regional's flights also share the major's brand. For example, Delta's regional Comair operates under the name Delta Connection. Tickets on Comair's flights are sold by Delta through the same channels that Delta sells its own tickets. To facilitate passenger connections between a major and its regional, their schedules, as well as check-in and baggage handling, are typically coordinated.

While one could imagine a variety of governance forms for these codeshare relationships, empirically we observe two distinct organizational forms. Either a regional is

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[2] Examples of such routes include Boston to Burlington, VT, or New York City to Albany, NY.

[3] See Forbes and Lederman (2007a) for a discussion of the source of lower labor costs among regional airline employees.

[4] Forbes and Lederman (2007a) show that the decision to serve a route with a regional carrier is determined by the distance of the route and its density, as measured by endpoint population and hub endpoints.

independently owned and contracts with one or more major carriers or a regional is wholly-owned by the major with which it partners.[5] There is substantial heterogeneity both across and within majors in the extent to which regional partners are owned. In the case of an *owned regional*, the major carrier owns the assets of the regional but the regional and the major maintain separate operations and fly under distinct operating certificates.[6] In the case of an *independent regional*, the relationship between the major and the regional is governed by contracts. These contracts specify which routes the regional will serve for the major, the planes that the regional will use and the schedule of flights. Contracts between majors and independent regionals generally take one of two forms. Historically, most were revenue-sharing agreements under which the major and the regional shared the revenue from passengers whose itineraries involved travel on both airlines. The last ten years, however, have seen increasing use of "capacity purchase agreements" under which the major pays the regional a fixed amount to cover the regional's operating costs on a block-hour or flight-hour basis. These agreements are structured so that they insulate a regional from revenue risk but leave it the residual claimant on profit increases that result from effective management of costs such as salaries and benefits. Since capacity-purchase agreements have no revenue-based incentives, they often include incentive payments based on operational performance or passenger volumes.

II. C. What Changes with Ownership?

Before considering what might change with ownership, it is important to emphasize that changes in ownership should have no effects on incentives if contracts between majors and

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[5] In which case, we do not observe that regional operate flights for competitors of its parent company.

[6] The main reason they separate their operations is so that they can maintain distinct labor contracts (one for the major's own employees and one for each of its regional's employees) and thereby preserve the cost advantages that regionals provide. If two separate airlines are effectively being operated as a single entity, the unions representing employees at those airlines may file an application with the National Mediation Board (NMB) seeking to have them declared a "single transportation system". If the application is granted, the unions of the carriers will operate as a single entity.

independent regionals are complete. However, as we argue in earlier work, not only are contracts in this setting inherently incomplete (because they clearly cannot specify all possible scheduling contingencies) but, in addition, they provide independent regionals with fairly narrow financial incentives. Specifically, under both revenue-sharing and fixed-fee contracts, regionals are compensated based only on the set of routes that they serve. As a result, an independent regional faces limited incentives to take actions which maximize the profits of the major's overall network unless these actions also maximize the profits that it earns for the set of routes that it serves. Or, put differently, contracts in this industry do not fully align an independent regional's incentives with those of the major.

In our earlier work, we focus on one particular implication of this incentive misalignment. Specifically, we consider whether owned and independent regionals differ in their willingness to execute real-time schedule adjustments (see Forbes and Lederman, 2008a and 2008b). Real-time schedule adjustments are common in this industry – for example, because of adverse weather – and are unlikely to be contracted on in advance. When they arise, majors and independent regionals may disagree on how these disruptions should be resolved. For example, when weather conditions necessitate schedule reductions, a major may want to delay or cancel some of its regional's (low capacity) flights so that its own (higher capacity) aircraft can depart. While an independent regional may resist (or haggle over) this type of real-time schedule change, an owned regional – whose incentives should be more closely aligned with those of the major – might be more willing to execute it. Thus, our earlier work identifies a potential role for ownership in facilitating (or reducing the transaction costs of) *ex post* adaptation decisions.[7]

[7] Specifically, in Forbes and Lederman (2008a), we show that majors are more likely to use owned regionals on city pairs on which adaptation decisions are more likely or more costly when resolved in less-than-optimal ways.

In this paper, we investigate a second possible implication of the incentive misalignment between majors and independent regionals. Specifically, we consider whether ownership of a regional may improve a major's ability to optimally schedule its regional's flights. Why might ownership affect *ex ante* scheduling decisions? Each scheduling decision that a major makes (presumably) takes into account the full set of incremental revenues and costs generated by the addition of that flight. This includes not only the direct revenue and costs from operating that flight but also all of the indirect effects that the scheduling of that particular flights may have on the major's revenues and costs elsewhere in its network. For example, if consumers have a taste for high flight frequency, then the scheduling of a flight at an off-peak time may increase their willingness to pay for the peak time flights on the same route. Similarly, while scheduling a flight at a "hub banking" time may maximize revenue from passengers connecting from that flight to another, it will also increases congestion and may therefore decrease the willingness to pay of other passengers travelling through the same hub. On the cost side, if airport facilities are scarce, majors must consider the opportunity cost of scheduling a flight at any particular time which would include the forgone profits of scheduling another flight at that time.

In theory, the algorithms that majors use in setting their schedules will internalize most (if not all) of these effects. Problems may arise, however, when majors attempt to set the schedule of flights that they wish to subcontract to an independent regional. Because the regional's compensation for operating a given flight will generally not reflect the overall contribution of that flight to the profitability of the major's network, the regional and the major may disagree on their preferred schedule of flights. In particular, when operating under

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In Forbes and Lederman (2008b) we show that, operationally, majors using owned regionals experience a performance advantage and that this advantage increases on days when unforeseen schedule adjustments are more likely.

revenue-sharing agreements, regionals will evaluate the desirability of a flight by comparing their share of the revenue that will be earned from passenger flying that flight against the costs that they incur to operate that flight. Flights on routes or at times of the day that do not generate much direct revenue but which may generate a considerable amount of indirect revenue elsewhere in the major's network will not be attractive to the regional even if they are to the major. Furthermore, because independent regionals earn 100 per cent of the revenue from passengers who fly their flights as direct itineraries but only a pro-rated portion of the revenue from those who fly their flights as part of an itinerary that connects to one of the major's own flights, regionals may prefer to operate flights that carry a greater fraction of direct passengers.[8] Thus, if independent regionals do not simply operate any flight that generates a non-negative profit but rather allocate scarce flight resources (e.g. planes and crew) to the most profitable set of flights, then these (and other similar) incentive problems may make it difficult for majors to dictate an optimal (in the context of the major's overall network) schedule of flights to an independent regional. To the extent that the incentives of owned regionals are more closely aligned with those of the major, majors may be able to better dictate the flights schedules of owned partners.

One might question why majors do not simply design contracts that better align an independent regional's incentives with their own. More elaborate revenue-sharing contracts that would link a regional's compensation for a flight to the flight's contribution to the major's overall network are theoretically possible but would introduce both double-sided moral hazard issues as well as expose the regional to greater risk. To some degree, the transition to fixed-fee

[8] This will, of course, depend on both the relationship between fares and distance as well as the premium for direct service. But, given that regionals serve a large number of hub-to-spoke routes and on most of these routes the hub carrier will be a monopolist, fares for direct itineraries (hub-to-spoke routes) may be significantly higher than fares for connecting itineraries (spoke-to-spoke routes) where passengers will usually face at least one other choice of carrier.

contracts can be viewed as an attempt to reduce haggling between majors and independent regionals over scheduling decisions. By paying a regional a fixed amount per hour flown (regardless of time or route) as well as compensating the regional for certain costs that may vary across routes (like landing fees), fixed-fee contracts should make a regional indifferent between flights with varying profitability. However, the regional is still the residual claimant on profit increases resulting from effective management of costs such as wages and benefits. If there is variation across flights in these expected costs and if this variation is not accounted for in the fixed payment that it receives, then the regional may still have some preferences that are not aligned with those of the major. For example, if flights to one particular airport are much more likely to be cancelled or delayed due to adverse weather and if the regional incurs higher payroll costs when flights are cancelled, then a regional will be less willing to operate these flights. The ownership changes that we study are particularly interesting because the acquisitions took place during a period when revenue-sharing contracts were still widely used while the divestitures took place during a period when (we think) the industry was mostly covered by fixed-fee contracts. All else equal, we would expect that the scheduling frictions that may result from the incentive problems described above would be greater under revenue-sharing contracts than fixed-fee contracts.

III. Background: The Ownership Changes

In this section, we provide background information about the three acquisitions that we study. The information is taken primarily from articles about the acquisitions that appeared in the trade or popular presses. In some instances, we supplement this information with facts extracted from our Official Airlines Guide (OAG) flight schedule data. Table 1 summarizes transaction dates and details.

III.A. Northwest Airline' Acquisition of Express Airlines

In March 1997, Northwest announced its intention to purchase its commuter affiliate Express Airlines. At the time, Express was one of two independent regional airlines that provided feeder traffic to Northwest under the Northwest Airlink name (Mesaba being the other). Prior to being acquired, Express was fully owned by its founder Mike Boyd, a long-time airline industry entrepreneur. Mesaba, in contrast, was publicly traded and was 30% owned by Northwest. Express flew out of Northwest's hubs in Minneapolis and Memphis and operated about 1660 weekly flights for Northwest on over 40 different domestic routes. Over 95% of its flights either arrived at or departed from one of Northwest's hubs. It had a fleet of 66 turboprop planes. Interestingly, Northwest's intentions to acquire Express were announced just two weeks before its existing contracting with Express was set to expire. Apparently, Express employees were relieved by the announcement having "feared that Northwest would not extend the contract with Express if it could not gain control of the regional airline" (Star Tribune. Minneapolis, Minn.: March 16, 1997. pgB1).

Press coverage of the acquisition alludes to several possible motivations for the acquisition. Several mention that ownership of Express would provide Northwest with greater control over its regional operations. Another argues that ownership of its regionals is a natural extension of Northwest's "hub strategy", allowing it to maximize its control of air traffic in the catchment basins surrounding its hubs. One article mentions an alleged dispute between Northwest and Express over safety upgrades after the 1994 crash of a Northwest Airlink flight operated by Express. According to one source cited in the article, Northwest had to pressure Express' owners to carry out the upgrades which Northwest eventually paid for. Finally, in explaining his rationale for agreeing to the sale, Express owner Mike Brady stated that "as [Northwest] shared the plans they had, [the sale] made an awful lot of sense for the growth of the company and for the employees" (The Atlanta Journal. Atlanta, GA: Apr 2, 1007. pg F.06.05). He further stated that he expected Northwest to expand Express' operations and introduce regional jets to its fleet. Thus, while there is no single rationale put forth for the acquisition, it is evident that each of the motivations mentioned (control over operations, greater hub dominance, improved safety standards and growth particularly through the introduction of regional jets) implies some limitation on what Northwest believed it could accomplish through a contractual relationship with Express.

III.B. Delta Air Lines' Acquisition of Atlantic Southeast Airlines (ASA)

In February 1999, Delta Air Lines made a $700 million offer to buy its regional partner Atlantic Southeast Airlines (ASA). Delta previously owned 28% of ASA which had been a Delta Connection partner since 1984. At the time of the offer, ASA served 37 cities from Delta's Atlanta hub and 21 cities from Delta's Dallas Forth-Worth hub. It operated over 3700 weekly flights for Delta with 97% of these flights either arriving at or departing from one of these two hubs. ASA had a fleet of 88 planes that included 19 regional jets. Approximately, 28% of the flights that it operated for Delta were operated with regional jets.

As in the case of Northwest's acquisition of Express, press coverage of the acquisition mentions several possible motivations for Delta's decision. However, unlike the previous case, perhaps the most widely cited reason for the acquisition was ASA's need for operational improvements. According to an article in The Atlanta Journal on February 17, 1999, Delta said it expected to "improve 'fundamental customer service activities' at ASA which has been plagued by spates of canceled flights, lost baggage and staffing shortages while trying to keep up with the growth of Delta's Atlanta hub." Similarly, a Wall Street Journal article covering the acquisition quotes Delta's president and CEO as saying that "owning the commuter carrier will enable Delta to improve customer service and better link flight schedules and connection times."

In addition to performance improvements, several sources argue that acquiring ASA would fortify Delta's position in the Southeast and in Texas by bringing passengers from smaller cities to its Atlanta and Dallas hubs and blocking other carriers from making inroads in these markets. As well, one industry analyst emphasizes the fact that the acquisition will give Delta access to ASA's 18 gates at Atlanta thereby allowing Delta to "borrow" these gates for its own flights as needed (while ASA might use a remote gate facility or bus passengers to/from the terminal). Finally, several articles also make a case that ownership of ASA may allow Delta to both deploy regional jets at ASA more quickly as well as have greater control over how those jets are used. As above, the implication of these arguments is that Delta must have perceived there to be some limitations on its ability to accomplish these things through contractual means.

III.C. Delta Air Line's Acquisition of Comair

In October 1999, Delta announced its intentions to acquire the 78% of Comair that it didn't already own. Like ASA, Comair was one of Delta's existing regional partners, also operating under the Delta Connection name. Comair served Delta's hub in Cincinnati as well as its smaller hub in Orlando. Prior to being acquired by Delta, Comair operated over 4700 weekly flights for Delta on about 90 different routes. About 80% of its flights were operated by regional jets. It is worth pointing out that while ASA and Comair were both independent, prior to being acquired, they were both operating exclusively for Delta.

In contrast to the first two acquisitions, there are fewer different "theories" on the rationale for the Comair acquisition (there is also more limited press coverage). Unlike ASA, Comair was a highly successful and highly profitable regional airline that did not suffer from operational problems. Its success is typically credited to its early adoption of regional jets; in fact, Comair was the one to introduce the 50 seat regional jet to the U.S. market in 1996. All of the trade and popular press coverage of the Comair acquisition describe the acquisition as a way for Delta to gain access to Comair's modern fleet of regional jets. At the time of the acquisition, Comair had 82 Bombardier regional jets in its fleet with orders for 48 more and options to buy another 115. Because demand for regional jets at this time was high and delivery lags therefore long, Comair's existing orders were particularly attractive to Delta. Once again, the fact that Delta viewed ownership as a means to access Comair's fleet of regional jets suggests that it perceived it to be infeasible (or more costly) to do so through a continued contractual relationship. It is also worth noting that as in the case of Northwest and Express, Delta's offer to purchase Comair came shortly before their existing 10 year contract was set to expire. Apparently, there was an expectation at Comair that Delta (or whoever Comair singed with next) would negotiate for (and receive) more favorable terms in its next contract. An article in the Wall Street Journal points out that the purchase price – which was 30% above Comair's most recent closing price but well below its 52-week high – reflected this expectation.

IV. Data and Empirical Approach

IV. A. Data

Our main source of data is flight schedule data from the Official Airlines Guide (OAG). Each observation in this data corresponds to a particular flight and includes information on the carrier, the departure and arrival airports and times, the days of operation and the aircraft type being used. We have a complete weekly schedule for all carriers for one (representative) week of every quarter between 1996 and 2000 (and are in the process of updating this data through 2006). The data include all flights operated by major carriers as well as all of their flights that are operated by each of their regional partners. These data allow us to measure changes in regionals' schedules after they are acquired (or divested) by a major. For example, we can measure changes in the number or types of routes served by the regional, changes in scheduling (as measured by departure/arrival times), changes in the rate and/or nature of regional jet deployment and changes in the degree of coordination between the regional's flights and the major's flights. Shortly, we will be complementing these data with airline ticket data from the Department of Transportation (DOT). The DOT's Databank 1B is a 10% sample of all domestic itineraries that are flown and provides information on the number of passengers flying each itinerary in each quarter at a given fare. The benefit of the DOT data is that they provide information on the actual itineraries that were traveled and therefore allow us to investigate changes in coordination between majors' and regionals' flights using measures of connecting passengers.

IV. B. Empirical Approach

Our objective is to investigate whether incentive problems between majors and independent regionals prevent a major from optimally setting the regional's schedule of flights (where optimality is measured in the context of the major's overall network). Our empirical approach is to use the six changes in ownership that have taken place as a source of time-series variation that allows us to compare the scheduling behavior of the *same major and same regional* under both an integrated and non-integrated structure. However, this approach requires us to overcome two empirical issues – one a measurement issue and the other an identification issue.

The first issue we must deal with is that our analysis of the incentive problem between majors and independent regionals predicts that owned regionals may be more willing to operate a major's desired flights than an independent regional. If so, then after being acquired by its major, we should observe not only a change in a regional's flight schedule but a change that moves the regional's schedule closer to the schedule that the major desires (which one can think of as the schedule the major would set if it were operating the regional's flights itself). However, in order to measure such a change, we must have some way of identifying what is a more or less "optimal" flight schedule. This task is complicated by the fact that our acquisitions coincide with the diffusion of the regional jet which provided a novel combination of aircraft features (low capacity but longer range) that majors may have wanted to utilize in "non-traditional" ways (e.g.: offering point-to-point service that bypasses its hubs).[9]

There is no simple solution to this problem given that it is impossible for us to obtain data on (or ourselves calculate) the optimal schedule of flights that a major would have wanted its regional to serve. Instead, what we do is identify various schedule characteristics that can arguably proxy for the optimality (or desirability) of the regional's flight schedule from the

[9] It is interesting to note that in the coverage of all three acquisitions, a desire to access and/or deploy regional jets at the regional is mentioned as a rationale. This makes us question whether the incentive misalignment with respect to scheduling is perhaps more severe in the case of regional jets than turboprops. For example, is a regional jet's most profitable use in the context of major's overall network very different from that regional jet's most profitable use from the regional's perspective?

major’s perspective. We will document how these characteristics change when ownership changes and then relate these changes back to the incentive issues described above. For now, the characteristic that we focus on is the degree of coordination between a major’s own and its regional’s flights. We focus on coordination for several reasons. First, given a regional’s role as a provider of feeder traffic to the major’s hubs, coordination between its flights and the major’s flights is clearly important and indeed it is even mentioned in some of the articles reporting on the acquisitions.[10] Second, coordination between various stages of production is often cited in the theoretical literature as one of the potential benefits of vertical integration (add cites). Finally, our detailed data on flight schedules as well as purchased itineraries provide us with fairly precise ways of measuring coordination which may not be available in other contexts.

The second empirical issue we need to deal with is the potential endogeneity of the ownership changes. The acquisitions we consider are, of course, not random and could be correlated with other unobserved factors that also affect scheduling decisions at the major and/or regional. Therefore, in order to attribute any observed changes in scheduling to the changes in ownership that took place, we need to control for any other schedule changes that would have taken place in the absence of the ownership changes. To do this, we use a “differences-in-differences” approach in which we identify – for each regional that undergoes an ownership change - various sets of flights which can serve as “control groups”. These different “control groups” are used to capture unobserved factors that may affect scheduling on both the “control flights” and the affected regional’s flights (the “treatment flights”). Put differently, we identify various sets of flights which can be used to estimate the time trend the affected flights would have followed in the absence of the ownership change (we provide more

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[10] However, the diffusion of the regional jet during this period may somewhat undermine this.

concrete examples in the following subsection). The key identifying assumption of our empirical approach is that there are no unobserved factors that are correlated with a particular ownership change and that do not also affect at least one of the possible sets of control routes.

IV. C. Specification and Measures

We estimate whether the three acquisitions that took place changed the degree of coordination between (a) the major's flights and the acquired regional's flights, (b) the acquired regional's flights and the major's flights, and (c) the acquired regional's own flights. Thus, using the Delta-ASA acquisition as an example, we investigate whether – after the acquisition – Delta's flights are better coordinated with ASA's flights, ASA's flights are better coordinated with Delta's flights and ASA's flights are better coordinated with other ASA flights. To do this, we construct two flight-level measures of coordination. Our first measure captures potential connections from a given arriving flight to all possible departing flights. For each flight, we calculate the number of other flights of a given "type" that depart from the arrival airport of that flight within 30 and 120 minutes of the flight's arrival (# FLIGHTS CONNECTING TO). A "type" of flight refers to the airline that is operating the flight. So, for example, for a given ASA flight that arrives at Atlanta at 11:00am on a given day, we calculate the number of ASA flights that depart from Atlanta between 11:30am and 1:00pm on the same day. In this case, the "type" of flights being counted is ASA flights. We also calculate the number of Delta flights that depart from Atlanta between 11:30am and 1:00pm on the same day. In this case, the "type" of flights being counted is Delta flights.

Our second measure is constructed analogously but measures potential connections to a given departing flight from all possible arriving flights. Thus, for each flight, this measure calculates the number of flights of a given "type" that arrive at the departure airport of that flight between 120 and 30 minutes before the flight's departure (# FLIGHTS CONNECTING FROM).[11] Continuing with the example from above, for a given ASA flight that departs from Atlanta at 6:00pm, we calculate the number of ASA (or Delta) flights that arrive at Atlanta between 4:00pm and 5:30pm on the same day.

Our sample includes each of the airlines involved in one of the acquisitions (Northwest, Express, Delta, ASA and Comair). We look at each of their flight schedules on a representative Tuesday of each quarter between 1996 and 2000 and construct these measures of coordination for every flight they operate on these days.[12] We use information from the trade and popular presses to determine the month and year in which each acquisition was completed and, for each pair of airlines, construct a dummy variable that equal one for quarters after the acquisition took place (POST BUYOUT).

It is worth emphasizing that the level of observation in our data is not the flight but rather the *flight-connection type*. This is because our dependent variable measures the degree of coordination between a flight operated by a given *airline* and other flights of a particular *type*. For now, we run separate regressions for each airline but include different connection types in the regression. Thus, we will run a series of regressions that include only Delta flights but – within those regressions – we may include observations that measure connections between Delta's flights and other flights of various types (e.g.: ASA flights, Delta's flights, etc…). It is these different "types" of connections that allow us to set up a differences-in-differences style regression.

The simplest possible specification that we estimate is:

[11] We don't present results using this second measure in the current draft.
[12] Flight schedules are very consistent across weekdays so including schedules from every day simply increases the number of observations without really introducing any new variation to the data.

$$\# \, FLIGHTS \, CONNECTING \, TO_{iap}^{t} = \alpha + \beta * POST \, BUYOUT^{t} + \varepsilon \qquad (1)$$

where $\# \, FLIGHTS \, CONNECTING \, TO_{iap}^{t}$ measures the number of flights of type p that depart from airport a within 30 and 120 minutes of flight i's arrival at that airport in quarter t. $POST \, BUYOUT^{t}$ takes the value of one if the acquisition involving the airline operating flight i has taken place. Note that we do not include an airline identifier on these variables because all of our regressions are airline specific. In this simple specification, α measures the average number of flights of type p that flight i connects to while β measures the change in the number of flights of type p that flight i connects to after the acquisition has taken place. Note that, in this specification, β is identified entirely off of time-series variation – that is, we do not include a control group.

We then add other "types" of connections to the model and use these as our control flights. For example, if our treatment flights are Delta's flights and we are trying to estimate the change in the average number of ASA flights that Delta's flights connect to, we use the change in the number of Delta's own flights that its flights connect to as our control flights. To do this, we estimate a model that, as above, includes all Delta flights, but now we include observations on their degree of coordination with ASA flights as well as observations on their degree of coordination with other Delta flights. That is, we now include two "types" in the model. The specification (continuing with the Delta-ASA example) now looks like:

$$\# \, FLIGHTS \, CONNECTING \, TO_{iap}^{t} = \alpha + \beta_1 * I(Type = ASA) + \beta_2 * POST \, BUYOUT^{t} + \beta_3 * I(Type = ASA)_p * POST \, BUYOUT^{t} + \varepsilon \qquad (2)$$

where $I(Type = ASA)$ is an indicator variable that equals one if the "type" of flights being coordinated with are ASA flights. In this specification, α measures the average number of Delta flights that a Delta flight connects to while β_1 measures the increase or decrease in the number of connections when the flight type is ASA (or, $\alpha + \beta_1$ measures the average number of ASA flights that a Delta flight connects to). β_2 measures the change in coordination with other Delta flights while β_3 measures the differential change in coordination with ASA flights. This is the sense in which we use a differences-in-differences approach – we are estimating any change in coordination between Delta and ASA flights over and above any change in coordination between Delta and its own flights.[13] To the extent that there is some unobserved factor that is both correlated with Delta's acquisition of ASA and affecting the degree of coordination in Delta's overall network, this specification would capture it.

Finally, in some specifications, we add a third type of flight which serves as a second possible control group. In all three of our acquisitions, the major partners with at least one other regional who does not undergo an ownership change. Thus, we can use changes in coordination between the major and these other regionals to control for unobserved factors that may affect the degree of coordination between a major and its regionals but which may not affect coordination between a major's own flights (and which would therefore not be captured by specification (2)). Adding this additional set of "types" simply requires that additional indicator variables and interactions be added to the model.

V. Results

V. A. Basic Descriptives

In Table 2, we compare several characteristics of the acquired regionals' schedules before and after the ownership change took place. We compare the quarter before the

[13] Or, one can think of it as using connections between Delta's flights and other Delta flights to estimate the change in coordination that Delta's flights and ASA flights would have experienced and then attributing any additional change in connections between Delta's flights and ASA flights to the acquisition.

acquisition to the quarter immediately after as well as to same quarter one year later. We look separately at each of the three acquisitions. We first look at the number of weekly flights that the regional operates on behalf of the major. As the table indicates, within one year of the acquisition, Express' flights for Northwest had fallen by over 30% while both ASA's and Comair's flights for Delta had increased by about 8%. The number of different routes served shows a similar pattern. The number of routes served by Express for Northwest fell by about 15% while the number of routes served by ASA and Comair for Delta increased by 28% and 15% respectively. None of the regionals appear to experience much of a change in their average departure time.

With respect to regional jet use, Express flew no regional jets before or after the acquisition (likely because regional jets were just beginning to diffuse at this point). The fraction of ASA flights operated by RJs increased by 30% during the one year following its acquisition while the fraction of Comair flights by regional jets increased by 10%. Interestingly, the fraction of both ASA's and Comair's flights that depart from or arrive at one of Delta's hubs fell slightly over this period, perhaps indicating that they were increasingly using regional jets for point-to-point service (which perhaps would have been difficult for them to do under a contract relationship?). Of course, this table includes no comparison groups and therefore provides no sense of how these metrics are changing at other regionals or elsewhere in Northwest's or Delta's network.

V.B. Preliminary Regression Results

Our preliminary regression results are presented in six tables. We present two tables for each acquisition (Tables 3A and 3B for Northwest and Express, Tables 4A and 4B for Delta and ASA, and Tables 5A and 5B for Delta and Comair). The first table in each pair estimates the impact of the acquisition on coordination between the major's flights and flights of various "types" while the second table estimates the impact on coordination between the acquired regional's flights and flights of various "types". In all tables, our dependent variable is # FLIGHTS CONNECTIG TO which measures the # of flights of a given "type" that depart between 30 and 120 minutes after a particular flights' arrival. For each column, we indicate that "types" of connections that are included in the regression as well as the set of flights that is included. While all regressions are airline-specific, we sometimes also restrict the sample to include only an airline's flights to or from particular airports.

The first column of Table 3A presents the results of the very simple specification shown in equation (1) above. It includes only connections from Northwest flights to Express flights (and no set of control routes). The results from this specification indicate that the average Northwest flight connects to 2.5 Express flights that depart within 30 and 120 minutes of its arrival and that – after Express is acquired – this falls by about 0.8 of a flight. In the second column, we allow this relationship to be different for flights that arrive at Memphis which is the main Northwest hub that Express serves. The estimates in column (2) indicate that the average Northwest flight connects to 0.9 Express flights while this increases to about 22 Express flights for flights that arrive at Memphis. After the acquisitions, connections to Express flights fall by about 0.7 flights systemwide but by an additional 2.4 flights at Memphis. Thus, so far, these results suggest a reduction in the degree of coordination between Northwest's own and Express' flights after the acquisition.[14]

[14] Of course, we know from Table 2 that the absolute number of Express flights fell after it was acquired. So, the regression results may simply be reflecting this reduction in Express' level of service rather a real reduction in coordination.

In the next two columns of the table, we add connections between Northwest flights and other Northwest flights to act as a control group. Column (3) includes all Northwest flights while column (4) includes only those which arrive at Memphis (we do this so we can avoid having to include triple interaction terms). The estimates in column (3) indicate that the average Northwest flight connects to about 18 other Northwest flights (this is the coefficient on the constant) while it connects to about 2.5 Express flights (the difference between the coefficient on the constant and the coefficient on the "Type"=Northwest->Express. Relative to the average change in connections experienced by Northwest flights, connections to Express flights appear to have fallen by about 2.5 flights after the acquisition. The estimates in column (4) indicate that this effect is even more pronounced at Northwest's Memphis hub.

In the final two columns of the table, we include an additional control group – we add connections from Northwest flights to flights by its other regional, Mesaba. This allows us to estimate an effect of the acquisition that is common to Northwest's connections to both of its regionals and then test whether there is a differential effect on connections to Express flights. The results in column (5) suggest that averaging across the three "types" of connections, Northwest flights connected to about 1.5 additional flights after the acquisition. There is no differential effect that is common to Express and Mesaba; however, connections to Express did fall by about 3 flights over and above any of the common changes. In the final column, we estimate this same specification but look only at flights that arrive at a Northwest hub. The pattern of results is very similar.

[Discussion of Table 3B left for next draft]

In Table 4A, we carry out a similar set of regressions examining the impact of the Delta-ASA acquisition. The first column again estimates the simple specification that includes only connections between Delta flights and ASA flights. The estimates from this specification suggest that the average Delta flight connected to about 4.7 Express flights before the acquisition and one additional Express flight after the acquisition. In the second column, we allow these effects to be different at the two hubs served by ASA (Atlanta and Dallas). When we do so, we find that observed increase in connections between Delta flights and ASA flights appears to be occurring at Atlanta.

In the next three columns of the table, we add connections between Delta flights and other Delta flights to the model. We first look at the effects averaging across all Delta flights and then at the effects for flights that arrive at Atlanta and Dallas, respectively. Column (3) shows no change in connections between Delta's flights and flights of either type. When we look just at flights arriving at Atlanta (column (4)), we find that after the acquisition, Delta flights arriving in Atlanta connected to an additional 2.5 Express flights. Column (5) indicates that, on average, Delta flights arriving in Dallas connected to about 1.5 fewer flights (of any type) with no differential effect on ASA flights.

The final two columns add connections between Delta flights and each of its other regional carriers (excluding Comair because it underwent its own acquisition). The results in column (6) again suggest an increase in coordination between Delta and ASA flights – and this increase is over and above any increase that is common to Delta's other regional partners. The pattern of results in the final column (which looks only at Delta flights arriving at a Delta hub) is quite similar and again suggests an increase in coordination between Delta and ASA flights.

[Discussion of Table 4B left for next draft]

Table 5A carries out a similar exercise for the Delta-Comair acquisition. The results are very similar to those in Table 4A. After Delta's acquisition of Comair, Delta flights appear to connect to a greater number Comair flights but only at Cincinnati, the Delta hub served by Comair.

[Discussion of Table 5B left for next draft]

References (incomplete)

Forbes, Silke J. and Mara Lederman (2008a), “Adaptation and Vertical Integration in the Airline Industry”, *mimeo*, University of California, San Diego, and University of Toronto

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Table 1
Transaction Dates and Details

Major	Regional	Transaction Type	Date Completed	Transaction Details and Rationale
Northwest Airlines	Express Airlines	Acquisition	April 1997	-Express Airlines was the primary operating unit of Atlanta-based Phoenix Airline Services. It had been privately held by its founder Mike Brady. -"It's believed Northwest wants to buy Express 1 to have more control over the commuter's operations and structure. Northwest already owns 30 percent of its other commuter affiliate, Mesaba Holdings Inc., but has no stake in Express 1." (**The Atlanta Journal/The Atlanta Constitution**. Atlanta, Ga.: Mar 15, 1997)
Delta Air Lines	Atlantic Southeast Airlines	Acquisition	May 1999	-Delta Air Lines acquired the 72% of ASA Holdings Inc. it didn't already own for $34 a share, or about $700 million. -"Delta is seeking full control because the feeder is plagued by frequent delays and cancellations. Leo F. Mullin, Delta's president and chief executive officer, said that owning the commuter carrier will enable Delta to improve customer service and better link flight schedules and connection times." (**Wall Street Journal**. (Eastern edition). New York, N.Y.: Feb 17, 1999. pg. A.4) -"Both ASA and Delta are based in Atlanta, and the deal is intended to protect Delta's grip on its main market, the Southeast and Texas. ASA will bring passengers from smaller cities to Delta's hubs in Atlanta and Dallas, blocking other carriers from making inroads into that territory." (**New York Times**. (Late Edition (East Coast). New York, N.Y.: Feb 17, 1999. pg. C.4)
Delta Air Lines	Comair	Acquisition	January 2000	- Delta Air Lines acquired the 78% of Comair Holdings Inc. it didn't already own for $23.50 a share, or about $1.8 billion. -"Delta's move comes after intense negotiations to renew a 10-year marketing pact that expires Oct. 28. Under that agreement, the carriers share revenue on flights in which Comair links with Delta. However, Delta management has been pushing for more favorable terms in revenue sharing on the agreement, people close to those negotiations say. Delta was attracted to Comair because it is a well-run and highly profitable carrier that brings with it a modern fleet of 82 Bombardier RJ regional jets." (**Wall Street Journal**. (Eastern edition). New York, N.Y.: Oct 18, 1999. pg. A.3)
Continental Airlines	Continental Express	Spin-off (through IPO)	April 2002	-Continental sells initial 30%
Northwest Airlines	Pinnacle Airlines (formerly Express Airlines)	Spin-off (through IPO)	November 2003	-Northwest retained 11 % of Pinnacle's stock
Delta Air Lines	Atlantic Southeast Airlines	Sale to SkyWest	September 2005	

Table 2
Descriptive Analysis – Acquisitions

	QR Before	QR After	% Change	1 Year After	% Change
Northwest Acquires Express – April 1997					
Weekly # flights for Northwest	1660	1632	-1.69%	1101	-33.67%
Weekly # domestic routes for Northwest	91	89	-2.20%	77	-15.38%
Average departure time (# from 12 am)	802.94	804.10	0.14%	798.43	-0.56%
% flights by RJs	0	0	0%	0	0
% arrive/depart at hub	0.96	0.96	-0.08%	0.95	-0.66%
Delta Acquires ASA – May 1999					
Weekly # flights for Delta	3759	3718	-1.09%	4073	8.35%
Weekly # domestic routes for Delta	108	105	-2.78%	139	28.70%
Average departure time (# from 12 am)	838	840	0.17%	830	-1.02%
% flights by RJs	0.28	0.31	11.27%	0.37	30.11%
% arrive/depart at hub	0.97	0.98	0.36%	0.95	-2.61%
Delta Acquires Comair – January 2000					
Weekly # flights for Delta	4761	4854	1.95%	5156	8.30%
Weekly # domestic routes for Delta	182	181	-0.55%	210	15.38%
Average departure time (# from 12 am)	844.91	847.46	0.30%	840.67	-0.50%
% flights by RJs	0.80	0.82	1.91%	0.88	10.14%
% arrive/depart at hub	0.83	0.82	-0.92%	0.79	-4.85%

Table 3A
Changes in "Connectedness" After Northwest's Acquisition of Express
Northwest's Flights to Acquired Regional's Flights

Dependent Variable	***# of Flights of a Given "Type" that Depart between 30 and 120 minutes after Flight's Arrival***					
"Type" of Connections	Northwest➔Express		Northwest➔Express Northwest➔Northwest		Northwest➔Express Northwest➔Northwest Northwest➔Mesaba	
Sample	All Northwest		All Northwest	Arrive Memphis	All Northwest	Arrive any Northwest hub
	(1)	(2)	(3)	(4)	(5)	(6)
Post Buyout	-0.839 (0.180)**	-0.733 (0.123)**	1.487 (0.537)**	2.768 (0.946)**	1.487 (0.537)**	2.500 (0.542)**
Arrives at Memphis		20.684 (1.198)**				
Post Buyout*Arrives at Memphis		-2.382 (0.647)**				
"Type" = Northwest➔Express			-15.871 (1.208)**	-7.924 (0.844)**	-0.234 (0.712)	-0.421 (1.299)
Post Buyout* "Type" = Northwest➔Express			-2.326 (0.557)**	-5.883 (0.748)**	-3.032 (0.302)**	-5.474 (0.456)**
"Type"=Northwest➔Any Regional					-15.637 (0.997)**	-27.543 (0.814)**
Post Buyout*"Type" = Northwest➔Any Regional					0.705 (0.491)	1.430 (0.576)*
Constant	2.582 (0.533)**	0.877 (0.144)**	18.453 (1.185)**	29.485 (1.860)**	18.453 (1.185)**	32.660 (0.917)**
Observations	28058	28058	56116	4834	84174	46395
R^2	0.00	0.85	0.30	0.33	0.32	0.77

Notes:
Standard errors in parentheses. Standard errors are clustered by departure airport/departure interval. + significant at 10%; * significant at 5%; ** significant at 1%. Columns (1) and (2) include connections from Northwest's mainline flights to Express flights only. Columns (3) and (4) include connections from Northwest's mainline flights to Express flights and to other mainline flights. Columns (6) and (7) also include connections to flights by Northwest's other regional partner (Mesaba).

Table 3B
Changes in "Connectedness" After Northwest's Acquisition of Express
Acquired Regional's Flights to Northwest's Flights and Its Own Flights

Dependent Variable	***# of Flights of a Given "Type" that Depart between 30 and 120 minutes after Flight's Arrival***			
"Type" of Connections	Express➔Express		Express➔Express Express➔Northwest	
Sample	Express flights, systemwide		Express flights, systemwide	Express flights, arriving Memphis
	(1)	(2)	(3)	(4)
Post Buyout	1.563	-0.577	0.772	0.098
	(0.566)**	(0.131)**	(1.165)	(0.291)
Arrives at Memphis		23.508		
		(0.503)**		
Post Buyout*Arrives at Memphis		-2.485		
		(0.415)**		
"Type"=Express➔Express			-8.110	-9.620
			(1.016)**	(0.351)**
Post Buyout* "Type"= Express➔Express			0.791	-3.160
			(1.059)	(0.411)**
Constant	9.444	1.280	17.554	34.408
	(1.742)**	(0.181)**	(2.117)**	(0.248)**
Observations	3169	3169	6338	2792
R^2	0.00	0.94	0.06	0.61

Notes:
Standard errors in parentheses. Standard errors are clustered by departure airport/departure interval. + significant at 10%; * significant at 5%; ** significant at 1%. Columns (1) and (2) include connections from Express' flights to other Express flights. Columns (3) and (4) also include connections from Express' flights to Northwest mainline flights.

Table 4A
Changes in "Connectedness" After Delta's Acquisition of Atlantic Southeast Airlines (ASA)
Delta's Flights to Acquired Regional's Flights

Dependent Variable	***# of Flights of a Given "Type" that Depart between 30 and 120 minutes after Flight's Arrival***						
"Control Group"	None		Delta's own flights			Delta's own flights; Delta's other regional flights	
Sample	All Delta		All Delta	Arrive Atlanta	Arrive Dallas	All Delta	Arrive any Delta hub
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post Buyout	0.998	0.017	0.491	0.881	-1.436	0.491	0.946
	(0.328)**	(0.005)**	(0.918)	(0.983)	(0.584)*	(0.918)	(1.251)
Arrives at Atlanta		17.324					
		(0.381)**					
Arrives at Dallas		11.000					
		(0.674)**					
Post Buyout* Arrives at Atlanta		3.528					
		(0.486)**					
Post Buyout* Arrives at Dallas		-0.973					
		(0.506)+					
"Type"=ASA			-15.255	-42.193	-7.418	3.969	9.044
			(1.169)**	(0.974)**	(0.768)**	(0.608)**	(1.075)**
Post Buyout*"Type"=ASA			0.507	2.663	0.480	0.964	2.032
			(0.656)	(0.891)**	(0.733)	(0.348)**	(0.596)**
"Type"=Any Regional						-19.224	-39.694
						(1.692)**	(2.287)**
Post Buyout* "Type"=Any Regional						-0.456	-0.743
						(0.930)	(1.312)
Constant	4.736	0.020	19.991	59.536	18.438	19.991	41.042
	(0.553)**	(0.004)**	(1.669)**	(1.101)**	(0.998)**	(1.669)**	(2.143)**
Observations	44,635	44,635	89,270	21,300	5124	312,445	141,771
R^2	0.00	0.91	0.15	0.84	0.35	0.29	0.64

Notes:
Standard errors in parentheses. Standard errors are clustered by departure airport/departure interval. + significant at 10%; * significant at 5%; ** significant at 1%. Columns (1) and (2) include connections from Delta's mainline flights to ASA flights. Columns (3) through (5) include connections from Delta's mainline flights to ASA flights and other mainline flights. Columns (6) and (7) also include connections to flights by Delta's other regional partners (excluding Comair).

Table 4B
Changes in "Connectedness" After Delta's Acquisition of ASA
Acquired Regional's Flights to Delta's Flights and Its Own Flights

Dependent Variable	***# of Flights of a Given "Type" that Depart between 30 and 120 minutes after Flight's Arrival***				
"Type" of Connections	ASA➔ASA		ASA➔ASA ASA➔Delta		
Sample	ASA flights, systemwide		ASA flights, systemwide	ASA flights, arriving Atlanta	ASA flights, arriving Dallas
	(1)	(2)	(3)	(4)	(5)
Post Buyout	1.173	-0.064	0.807	-1.570	-1.826
	(0.552)*	(0.034)+	(1.612)	(0.236)**	(0.277)**
Arrives at Atlanta		17.510			
		(0.299)**			
Arrives at Dallas		10.717			
		(0.997)**			
Post Buyout*Arrives at Atlanta		3.047			
		(0.532)**			
Post Buyout*Arrives at Dallas		-1.278			
		(0.763)+			
"Type"=ASA➔ASA			-15.832	-43.636	-7.128
			(1.890)**	(0.200)**	(0.208)**
Post Buyout* "Type"= ASA➔ASA			0.366	4.553	0.483
			(1.184)	(0.334)**	(0.392)
Constant	8.203	0.482	24.035	61.629	18.327
	(0.701)**	(0.027)**	(2.512)**	(0.141)**	(0.147)**
Observations	9470	9470	18940	6668	2902
R^2	0.00	0.92	0.12	0.91	0.36

Notes:
Standard errors in parentheses. Standard errors are clustered by departure airport/departure interval. + significant at 10%; * significant at 5%; ** significant at 1%. Columns (1) and (2) include connections from ASA's flights to other ASA flights. Columns (3) through (5) also include connections from ASA's flights to Delta mainline flights.

Table 5A
Changes in "Connectedness" After Delta Air Line's Acquisition of Comair
Major's Flights to Acquired Regional's Flights

Dependent Variable	***# of Flights of a Given "Type" that Depart between 30 and 120 minutes after Flight's Arrival***					
"Control Group"	None		Delta's own flights		Delta's own flights; Delta's other regional flights	
Flights Included	All		All	Arrive at Cincinnati	All	Arrive at any Delta hub
Post Buyout	0.413 (0.235)+	0.041 (0.017)*	0.559 (0.833)	-1.877 (0.639)**	0.772 (0.547)	1.627 (0.764)*
Arrives at Cincinnati		28.083 (1.801)**				
Post Buyout* Arrives at Cincinnati		6.289 (0.906)**				
"Type"=Comair			-17.253 (1.788)**	3.755 (1.206)**	2.502 (0.556)**	5.225 (1.203)**
Post Buyout* Connections to Comair			-0.146 (0.898)	8.208 (0.787)**	0.483 (0.237)*	0.836 (0.535)
"Type"=Any Regional					-12.161 (1.101)**	-25.540 (1.501)**
Post Buyout* "Type"=Any Regional					-0.842 (0.551)	-1.615 (0.780)*
Constant	2.774 (0.551)**	0.277 (0.034)**	20.027 (1.647)**	24.606 (1.309)**	12.433 (1.089)**	25.868 (1.468)**
Observations	44,635	44,635	89,270	7838	312,445	141,771
R^2	0.00	0.86	0.18	0.11	0.19	0.43

Notes:
Standard errors in parentheses. Standard errors are clustered by departure airport/departure interval. + significant at 10%; * significant at 5%; ** significant at 1%. Columns (1) and (2) include connections from Delta's mainline flights to Comair flights. Columns (3) and (4) include connections from Delta's mainline flights to Comair flights and other mainline flights. Columns (6) and (7) also include connections to flights by Delta's other regional partners (excluding ASA).

Table 5B
Changes in "Connectedness" After Delta's Acquisition of Comair
Acquired Regional's Flights to Delta's Flights and Its Own Flights

Dependent Variable	***# of Flights of a Given "Type" that Depart between 30 and 120 minutes after Flight's Arrival***			
"Type" of Connections	Comair→Comair		Comair→Comair Comair→Delta	
Sample	Comair flights, systemwide		Comair flights, systemwide	Comair flights, arriving Cincinnati
	(1)	(2)	(3)	(4)
Post Buyout	2.187	-0.145	-0.420	-1.682
	(1.076)*	(0.130)	(0.767)	(0.312)**
Arrives at Cincinnati		27.987		
		(1.784)**		
Post Buyout*Arrives at Cincinnati		4.993		
		(1.303)**		
"Type"= Comair→Comair			2.053	5.659
			(0.561)**	(0.211)**
Post Buyout* "Type"= Comair→Comair			2.608	6.530
			(0.563)**	(0.442)**
Constant	12.422	1.218	10.368	23.547
	(1.724)**	(0.176)**	(1.352)**	(0.149)**
Observations	11901	11901	23802	9582
R^2	0.00	0.82	0.01	0.15

Notes:
Standard errors in parentheses. Standard errors are clustered by departure airport/departure interval. + significant at 10%; * significant at 5%; ** significant at 1%. Columns (1) and (2) include connections from Comair's flights to other Comair flights. Columns (3) and (4) also include connections from Comair to Delta's mainline flights.