

Economics 191A/B
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Signaling and the Southwest Effect

Section I: Introduction

The U.S. airline industry is principally composed of legacy and low cost airlines. Legacy airlines are essentially those airlines that were in operation before deregulation and which have large route networks. They have large, complex hub-and-spoke networks with a large aircraft fleet that services domestic markets of all sizes at numerous fare levels. On the other hand, low cost carriers (LCC) are those that entered the marketplace after deregulation and primarily operate point-to-point networks from focus cities using fewer types of aircraft. These airlines typically offer a simplified fare structure that was originally aimed at leisure passengers, but is now increasingly attractive to business passengers because they do not have restrictive ticketing rules that make it significantly more expensive to purchase last minute tickets.

In 1978, under the Airline Deregulation Act, the United States deregulated its domestic airline industry. The main purpose of deregulation was to remove government control and open the air transport industry to market forces. In the years since deregulation, fares measured in real terms have fallen since 1978. However, while deregulation led to lower fares, it did not bring about the full measure of competition envisioned by its creators. Legacy airlines created unique hub-and-spoke networks that increased service for consumers but kept local market fares high at their hubs. Moreover, the legacy airlines acted in a highly competitive fashion within their hub (e.g. substantially increasing scheduled service and aggressive pricing) in order to intimidate potential entrants, including LCCs, from entering the market.

The Southwest Effect is characterized as the phenomenon that occurs once Southwest Airlines enters a new market, in which the average airfare decreases and the number of

passengers traveling within that market increases. Past research has taken a look at the mere existence of the Southwest Effect and the reasons why it occurs. Goolsbee and Syverson (2004) showed that the price drop in airfares, a characteristic of the Southwest Effect, occurs before entry. The objective of this paper is to find out if signaling affects when the Southwest Effect occurs. This project is significant in the sense that it concludes that the announcement of entry into a new market by Southwest Airlines sent a signal to the industry to decrease air fares, resulting in an influx of passengers into the market.

Section II: Theory/Literature Review

Definition of the Southwest Effect

Timothy Vowles (2001) finds that not only does Southwest affect the airport that it chooses to serve, but also those airports within close proximity to either the origins and/or destinations served by Southwest. Based on the results from his model, Vowles made two observations. First, fares decreased in a majority of airports in multi-airport regions after Southwest began service at one of the airports in the region. Second, Vowles concluded that Southwest attracts new passengers from routes that it is in their direct competition and also attracts entirely new passengers to these markets.

Oh and Wiggins (2004) discuss the Southwest's ability to affect the distribution of fares. They found that Southwest's presence has a larger effect (proportional and absolute) on high end fares than on low end fares. According to their paper, Southwest charges about thirty to forty percent more for its 80th percentile fares than for its 20th percentile fares, while the legacy airlines charge double the 20th percentile fare at the 80th percentile, meaning that the Southwest marks up its high end fares over its low end fares by less than the legacy airlines. Also, their regression estimates show that Southwest's presence reduces low-end fares by about fifteen percent, median

fares by about twenty-three percent, and high end fares by about thirty percent. They found that Southwest does charge lower fares and that other airlines decrease their fares when Southwest is a competitor in that market. Furthermore, even though the competitor's fares are lower with Southwest's presence, Southwest still has lower fares than competitors. For routes where Southwest is present, their fares are anywhere from twenty to thirty percent lower and as much as sixty or seventy percent lower than their rivals. For routes that are near Southwest's route but where Southwest does not serve that route, the airline fares are considerably higher.

A major part of Southwest's success is related to "uncovering and responding to a market opportunity that is associated with certain inherent vulnerabilities in the major incumbents' dominant hub strategy" (Ben-Yosef 2005). Southwest's point-to-point network allows for non-stop flights to and from secondary airports, thus effectively eliminating the need to connect through hubs). These flights are less expensive to operate and help airlines and passengers avoid congestion and delays. However, the drawback is the "added cost and inconvenience for ground transportation from the secondary airport" (Ben-Yosef 2005).

Market Structure

There are three potential barriers to entry in the airline industry. One is that any airline that might wish to compete on routes connected to another airline's major hubs would have to enter the market on a large scale to match its competitor's large number of flights on those routes. Another barrier to entry is the frequent flier programs that reward passengers for past business and encourage future business by giving those passengers free trips to domestic and international destinations serviced by that airline. A final possible barrier to competition is computer reservations systems. The airline that owns a system has a potential competitive edge

because it is easier for travel agents who use the system to obtain information on that airline's flights.

There is now widespread recognition that an airlines' operation at a given airport greatly affects its competitive position on routes flown out of that airport. Airlines typically defend any competitive advantage as stemming from the lower costs and better service that are said to be generated by hub-and-spoke route systems. Hub-and-spoke networks reduce the number of round trips necessary on a given set of itineraries, while increasing the number of passenger miles flown. By pooling passengers with different ultimate destinations, a hubbed system can offer more frequent flights than would be economically feasible under a point-to-point system. On the other hand, airline critics typically respond that airlines gain market power by dominating individual airports. Incumbent airlines are the major source of financing for many airports and therefore gain a large degree of bureaucratic control over airport operations. Steven Berry (1990) points out that this control may enable them to block the entry or expansion of rivals. Also, David Starkie (2003) has found that while the passenger might benefit from the optimization of flight schedules that concentration allows for, this could be at the expense of fare increases unrelated to the underlying costs of the hub system. Ultimately, if the advantages of airport presence are sufficient to prevent most attempts at entry, then incumbents may gain the ability to exercise traditional market power by restricting output and driving up prices.

Airlines have also developed promotions, particularly frequent flier programs, to attract passengers. A frequent flier program allows loyal passengers to receive benefits, usually in the form of free tickets, after they have flown with that airline for a certain amount of miles. This gives airlines that serve more destinations a competitive advantage over airlines with smaller networks. Also, passengers choose to participate in the frequent flier program for airlines that

they are most likely to fly on in the future. Borenstein (1994) concludes that “the airline with the most service from the passenger’s home airport is particularly attractive because it serves many markets that the consumer may need to travel in the future.” Airlines are able to establish brand loyalty in which passengers are inclined to always fly with the same airline so that they can accumulate more mileage as a frequent flier and earn more benefits.

Passengers differ in the frequency of their trips, their reasons for travel, and the frequency with which someone else pays for their ticket. By offering free trips instead of reduced fares and by using their networks to take advantage of this difference among passengers, large airlines have increased their market share. But smaller airlines can and have offset the competitive advantages of frequent flier programs by charging lower fares and developing stronger customer loyalty. Frequent flier programs are important to competition, but are only one dimension of it.

As fares and schedules have proliferated under deregulation, passengers’ and travel agents’ access to information has been facilitated by computer reservation systems (CRS), developed in the mid-1970s by American and United Airlines. Other airlines soon developed their own systems or became partial owners of existing ones. CRS can be an improvement over independent research. It helps give passengers more complete information on airlines’ routes. It is much easier to use the computer system rather than leafing through paper copies of flight schedules and fares and making many phone calls.

However, CRS have been criticized for bias in the sense that travel agents are less likely to ticket passengers on airlines other than the host. Such biased information could prevent travelers from getting the lowest possible available fares or most convenient flights. Reservation systems can be biased in two ways. First, there is a display bias, in which the host’s flights are listed more prominently than those of other airlines, usually at the top of the computer screen.

This practice, however, was outlawed by the Civil Aeronautics Board in 1984. On the other hand, there could be architectural bias, which makes it easier for travel agents to obtain information about the host's flights than about the flights of the other competitors. For example, the system might require fewer keystrokes to get information about the host's flights or might provide more up-to-date information about the host's fares and seat availability. Although this practice has not been banned yet, Congress has recently proposed to address this problem by requiring that travel agents be able to book flights for all airlines with equal ease.

Hub-and-Spoke Network vs. Point-to-Point Network

A big difference between the network structure of Southwest Airlines and other domestic airlines is that Southwest does not use a hub-and-spoke system, in which certain large airports serve as centralized hubs where all the local traffic is concentrated and then sent out to other hubs or their final airport destination. Instead, Southwest uses a point-to-point system, in which you fly more directly between cities. While Southwest's top three airports collectively accounted for roughly 18% of its aircraft departures in 2001, Northwest's top three airports accounted for 52% of its domestic departures and United's top three airports accounted for 43% of its domestic departures (Boguslaski 2004). Thus, hub-and-spoke networks are a more efficient method of transporting passengers between different markets; however, point-to-point networks minimize the amount of passenger miles flown.

One benefit of the hub-and-spoke network is that by centralizing the passengers to specific hubs, the airline can offer more frequent flights. Borenstein (1989) finds that by funneling all passengers into hubs, an airline can generate high traffic densities on its "spoke" routes. This allows the airline to exploit economies of density, which results in lower cost per passenger. However, Borenstein has shown that airlines charge higher fares on flights from hub

airports as opposed to flights traveling to hub airports. This is attributed to the idea that consumers are willing to pay a premium for the services of the dominant airline at the specific hub. In other words, passengers are willing to pay more in order to take advantage of an airlines' frequent flyer program, flight frequency travel agent commission overrides.

The benefits from hub-and-spoke systems have been partly offset by the increased travel time, both on the ground and in the air. The increase in ground time can be attributed to greater airport and airway congestion in the wake of deregulation. The difference in travel time increases with distance, which is consistent with "slower cruise speeds that are themselves perhaps the result of pilots flying more slowly to conserve fuel and of the slower cruising speed of more recently developed aircraft" (Morrison 1995). With the hub-and-spoke network, a larger proportion of passengers change planes, especially on longer trips, instead of flying nonstop from their origin to their destination.

Major airlines operating dominant hubs may arguably possess regional monopolistic power and use sophisticated pricing as well as other potential anticompetitive strategies. A large network and high flight frequency reduces average cost through economies of scale, density, and scope. This gives passengers the benefit of schedule coordination that allows smooth interlining and connecting of a large number of city combinations through hubs. However, the hub-and-spoke networks can be seen as anti-competitive as it allows the airlines to capture essential airport facilities, limit competitors' access to the hub, and reduce competition over the satellite markets. Therefore, the advantages of these hub-and-spoke networks are offset by their impediments to new successful entry.

The legacy hub-and-spoke carriers find themselves in somewhat of a prisoner's dilemma. Given the deterioration of pricing, it does not make sense for industry capacity to grow, yet no

individual airline can stand to cede market share. Expansion is defended by citing the very low marginal cost of capacity growth as it is coming through an increase in the utilization of existing aircraft rather than the purchase of new assets. Yet at the end of the day, industry capacity growth depresses yield, or revenue, such that it is not strong enough to support the legacy cost structures, and therein lies the problem.

Southwest's Entry Patterns

Market entry is influenced by the competition on the route and characteristics of the route, especially the way it is integrated with the airlines' and its competitors' networks. In general, airlines are attracted to markets where they have established a hub at the origin or destination and as their expected fare increases relative to the average fare. They are discouraged from entering markets where at least one of their competitors has established a hub at the origin or destination.

Morrison (1995) created a model to represent how the presence of other airlines on a route influenced an airlines' entry decision. He found that the presence of Southwest is a significant deterrent to many airlines from entering a market. USAir also discourages entry, possibly because of its aggressive response to new competition at Philadelphia and at airports in California. In contrast, Delta, Alaska, and America West did not have a statistically significant effect on entry, meaning that they do not discourage any airlines from entry. Also, Morrison concluded that Southwest was found to be discouraged to enter markets with relatively high passenger volumes. This is consistent with the strategy of avoiding long-haul, high-density routes.

Goolsbee and Syverson (2004) examine how incumbents respond to the threat of entry of competitors, as distinguished from their response to competitors' actual entry. Their results

show that incumbents do respond to the threat of entry, quite separately from their responses to actual entry. Incumbents drop average fares substantially when Southwest threatens a route, but before Southwest actually enters the route. This is true even when they compared the fare changes on threatened routes to those on incumbents' other routes out of the same airports, indicating that shifts in airport-specific operating cost are not creating false results. As a result, the lower prices increase the number of passengers flying with the incumbent prior to entry. However, while incumbents cut fares on the threatened route, they do not necessarily cut prices on routes to nearby airports in the same market. Finally, they found that fare drops are greatest for incumbents' high-fare-paying customers and on routes with more business travelers. This means that airlines have tried to increase customer loyalty through mechanisms like frequent flier programs.

All LCCs carefully selects the types of markets they enter. Southwest, in particular, has historically chosen to enter only very dense, short and medium haul markets. Limiting service to mainly these types of markets allows Southwest to exploit economies of density. Also, it allows Southwest to maintain a fleet comprised of a single aircraft type, thus minimizing maintenance, spare parts inventory, and pilot training costs.

Southwest typically avoids congested airports and those with expensive landing fees in favor of secondary, less crowded airports. This strategy lowers costs in two ways. First, smaller and secondary airports tend to have lower passenger facility charges (PFCs). For example, of the 51 airports Southwest served in July 2002, 34 had PFCs of \$3.00 whereas only 17 collected the maximum permitted PFC of \$4.50 (Boguslaski 2004). Secondly, less congested airports allow Southwest to minimize congestion related delay costs and exploit their comparative advantage in providing quick-turn service.

Southwest's entry strategy has evolved rather dramatically over the past decade. Southwest focused almost exclusively on short-haul, dense markets throughout the first half of the 1990s. Its strategy evolved during the latter half of the decade to include a varied mix of markets, including a number of markets which were both long-haul and had not generated a lot of passengers prior to entry. By expanding into medium-haul vacation markets, Southwest could further appeal to customers who had previously not traveled on their routes. It is believed to be that Southwest's entry decisions into the long-haul routes during the later half of the 1990s were strongly influenced by network effects.

Boguslaski, Ito, and Lee (2004) made three important observations regarding how the proliferation of LCCs, notably Southwest, has dramatically transformed the domestic airline industry during the last decade. First, the expansion of LCCs, particularly Southwest Airlines, has partly contributed to at least two recent bankruptcies (United and U.S. Airways) as well as significant labor concessions at other legacy airlines. Secondly, they find that passenger density (both actual and potential), distance, the hubs of its competitors, and per capita income at the end-points of a market have been important factors in determining which city-pairs Southwest chooses to enter. They also observe that Southwest is able to generate dramatic new traffic growth by appealing to the most price elastic passengers. Many of these passengers would have otherwise chosen to drive rather than fly or not travel at all prior to Southwest's entry. Finally, they remark that of the legacy airlines, Alaska, Continental, and American are the most vulnerable to future Southwest expansion, in the sense that these airlines generate the greatest proportion of their domestic revenues in markets that their model predicts Southwest is likely to enter.

Airlines are constantly entering and exiting markets. When one airline leaves the industry, others enter its market. The effect of these changes on fares depends on the characteristics of the incumbent and new airlines. According to Morrison (1995), if a LCC leaves the industry and a legacy airline takes over its routes, fares will probably rise. If a legacy airline leaves the industry and a LCC takes over its routes, fare will probably fall. Airlines have different pricing policies and react differently to other airlines' policies.

Pricing Policy

Since the airline industry was deregulated, its financial performance has continued to be extremely volatile. The large fluctuations in industry earnings may be an inevitable result of the business cycle and the high income elasticity of demand for air travel. However, Morrison and Winston (1996) claim that fare wars have helped cause the situation. They note three reasons why price wars in the airline industry are of particular interest. First, price wars are a part of the airline industry's turbulent and ongoing adjustment to deregulation. In their paper, Morrison and Winston estimated that from 1979 to 1995, fare wars lowered industry profits by nearly \$8 billion. Second, the industry's technology and investment behavior, unpredictable demand, and complex patterns of network competition raise questions about why airlines engage in fare wars. Because the two prime causes of fare wars, competition on airline routes and multi-market contact between airlines, are unlikely to change substantially in the future, fare wars will continue to play a role in industry competition. Finally, industry executives can benefit from an explanation of what causes fare wars and the extent to which they affect profitability within the airline industry. The other major cause of fare wars, the unpredictability of GDP, should serve as a constant reminder to the industry of the costs of failing to align capacity with demand. Therefore, fare wars have undoubtedly lower industry profits overall and contribute to their

volatility, but Morrison and Winston believe that they are likely to be a permanent consequence of the nature of competition, demand, and technology in the deregulated airline industry.

On the other hand, price leadership might be practiced when looking at the behavior that is jointly undertaken by two or more airlines. Price leadership occurs when an airline proposes a fare change, sees if their competitors follow its lead, and then reacts accordingly. This practice is harmful to passengers if the attempted act of collusion were to be successful. Morrison (1995) remarks that ever since the deregulation of the airline industry, a small number of airlines have established the credibility to be able to cooperate on fares, while it is harder for an independent airline to disrupt the agreement by charging a lower price. This practice might have also been facilitated by the centralized digital airfare database set up by Airline Tariff Publishers since this database provides airlines with information about how other airlines have reacted to possible fare changes. Since collusion is considered illegal, the Department of Justice has investigated such practices on fare increases. In 1994 several airlines signed a consent decree not to post ending dates for their fare findings. Following the settlement, the Justice Department estimated that such price signaling had cost travelers \$2 billion a year.

Severin Borenstein and Nancy Rose (1994) have taken a look at the price dispersion on airline fares. They have found that the variation in fares to different passengers on the same route is substantial. According to their model, the expected absolute difference in fares between two passengers on a route is 36 percent of the airlines' average ticket price. They have concluded that dispersion increases on routes with more competition or lower flight density, which is consistent with the intuition that passengers are more willing to switch to fly with an airlines' competitor. The causes of the price dispersion are attributed to the structure of the market. Price dispersion increases as the number of competitors in a market increases, holding

the number of flights constant. Also, greater frequency of flights on a route lowers price dispersion, while airport dominance by an airline increases the dispersion of its prices on routes originating from that airport. The latter result is related to the effect of frequent flyer plans, which tend to induce loyalty and enhance value for the high-fare business travelers. Furthermore, Borenstein and Rose found that price dispersion was substantially lower on the most tourist-oriented routes. Finally, airlines that owned CRS demonstrated significantly more price dispersion than those that did not. These findings are generally consistent with the theory of price discrimination in monopolistically competitive markets.

Borenstein and Rose also discuss the existence of price discrimination within the airline industry and its effect on price dispersion. They note that if you think of a route which a single incumbent airline can charge the “full fare” to business travelers, whose demand is inelastic, versus the discounted fare charged to leisure travelers, who have more elastic demand as they have a lower brand allegiance, then entry by a new airline induces the incumbent to lower both prices but to lower the discount price by relatively more. This decrease in concentration in the market results in an increase in price dispersion. In other words, lower-end fares appear to be more responsive to competition than higher-end fares.

Section III: Model/Data

The Southwest Effect describes two phenomena seen when Southwest Airlines enters a new market. The first is that airfares for routes in that market decrease drastically. In order to test this, I have looked at how the real average price of airfares changed in the period before entry, in the quarter of entry, and after entry. Specifically, I wanted to take note at how the price changes once Southwest Airlines announces that they will be entering the market. I believe that this entry signal has a strong effect on the timing of the Southwest Effect. The second is that the

number of passengers flying in that market increase substantially. Much like with airfares, I wanted to see how the number of passengers changed in the period before entry, in the quarter of entry, and after entry.

The two markets analyzed in this paper are Pittsburgh and Baltimore. Pittsburgh is one of the newest markets that Southwest Airlines has entered. Also, I feel that the routes flying out of Pittsburgh exhibit the fact that Southwest Airlines is expanding their network to encompass the entire nation rather than a small region of the United States. I think it is interesting to look at whether the Southwest Effect is still prevalent in the airline industry. Moreover, the main focus of this paper is on signaling and taking a look at when the Southwest Effect occurs in relation to when Southwest Airlines announced that they were entering a new market. However, the downside of looking at a new market like Pittsburgh is that there is not enough data or time for the phenomenon to exude its full effect. Therefore, I wanted to also take a look at Baltimore, a market that is known to exemplify the Southwest Effect in prototypical fashion. Since Southwest Airlines entered the market more than ten years ago, there is a lot of available relevant data. Also, past research has discussed the existence of both a drastic price drop and a significant increase in number of passengers flying from Baltimore.

The data used for this paper was collected from the Airline Origin and Destination Survey (DB1B), which is published quarterly by the Bureau of Transportation Statistics. It is a ten percent sample of airline tickets from carriers flying domestic routes. From this database, I was able to collect information on origin, destination, operating carrier, market fare, and number of passengers. The market fare was determined by multiplying the itinerary yield with the number of market miles flown. The number of passengers represented the amount of people who paid a particular price for the flight.

The average nominal price, \bar{P} , for a specific route was thus defined by the following equation: $\bar{P} = \frac{\sum_i p_i * n_i}{N}$, where p_i represents each particular price paid by passengers on the route, n_i represents the amount of people who paid that particular price, and N is the total number of people flying on that route. As the DB1B is only a ten percent survey of passengers, total number of passengers was found by multiplying n_i by 10.

The real average price, \bar{p} , was calculated by the following equation: $\bar{p} = \bar{P} * \frac{100}{CPI_i}$, where \bar{P} is the nominal average price and CPI_i is the Consumer Price Index value for the specific quarter. The CPI data, which was obtained by the International Monetary Fund website, uses 2000 as the base year. The real average price controls for inflationary effects; and thus, it is a much better measure of price over time than the nominal average price.

The quarter that the flight took place in has a direct effect on number of passengers. One might expect there to be a high amount of people flying in Quarter 2 (April, May, June) and Quarter 3 (July, August, September) as people take their vacation during the summer. Quarter 4 also has a substantial amount of people flying because of the various holidays at the end of the year. On the other hand, Quarter 1 (January, February, March) should probably have a smaller amount of traveling passengers. In order to test for seasonal effects, the data on number of passengers was classified by quarters. For each route, the number of passengers was averaged out based on the quarter. That average was then subtracted from each individual data point, which was then reassembled back based on year and the specific route. Controlling for seasonal effects hones the analysis of the perceived increase in passengers flying within the market, a distinct characteristic of the Southwest Effect.

It would be ideal to look at roundtrip airfares in order to take a look at the Southwest Effect. However, I have chosen to only take a look at those flights originating in Baltimore or Pittsburgh. The reasons are two-fold. One is that it seems intuitive that if there is the Southwest Effect is seen in one direction, similar conclusions can be made about the airfares and number of passengers incoming into the markets. Second, due to time constraints, it would be too massive of a project to look at both sides of the city-pair route. If given more time, or less external responsibilities, then perhaps I could have taken a look at the changes in price and the number of passengers for routes arriving into Pittsburgh and Baltimore. Such findings would help solidify my results and conclusions. However, I feel quite confident that the data and methodology I have used are sufficient to support my conclusions.

Section IV: Results

Southwest Airlines entered the Baltimore market in September 1993 (Southwest Airlines 22 May 2006). There were originally five routes that Southwest Airlines originated from the Baltimore/Washington International Airport (BWI). These airports include Hopkins International Airport (CLE) in Cleveland, Ohio, Kansas City International Airport (MCI) in Kansas City, Missouri, Midway Airport (MDW) in Chicago, Illinois, Will Rodgers World Airport (OKC) in Oklahoma City, Oklahoma, and Lambert-St. Louis International Airport (STL) in St. Louis, Missouri. Although Southwest Airlines added more destinations over time, only these first five routes seemed relevant to evaluating the effect of Southwest Airlines' original entry into Baltimore.

Ideally, I wanted to look at the data pertaining to the year before Southwest entered Baltimore. However, the data for the DB1B database started in 1993. Therefore, the data from Quarter 1 of 1993 was used to depict the airfares before entry. Graph 1 in the Appendix shows

the evolution of the real average price in the Baltimore market from Quarter 1 of 1993 to Quarter 4 of 2005. There was a sharp decrease in the average airfare for all routes from Quarter 1 of 1993 to Quarter 4 of 1993. From then onwards it appears that there is a slight increase in prices overtime. However, I would like to note that the prices are generally stable and they never approach the original prices. Thus, once the prices go down, they basically stay at these lowered rates.

Southwest Airlines' airfare movement is quite interesting. Graph 2 in the Appendix shows the evolution of Southwest's fares over time, whereas Table 1 in the Appendix depicts the price of airfare for both Southwest Airline and the industry average for the year before entry ($t-1$), the year of entry (t), the year after entry ($t+1$), five years after entry ($t+5$), and ten years after entry ($t+10$). As Southwest was obviously not in the industry in $t-1$, there is no value for Southwest Airlines' airfare in the column for the year before entry. To be sure, Southwest Airlines' prices are included within the industry average. Southwest Airlines' fares seem to be much lower than the industry average at the initial time of entry. However, the airfares converge to the industry average over time.

There are several developments since Southwest Airlines entered Baltimore in 1993 that may attribute to the increase in prices over time. Intuitively, part of the reason of the gradual increase is to increase profits as the amount of passengers flying on Southwest Airlines increases over time; however, this is somewhat difficult to prove empirically. On the other hand, there are several business developments that occurred as the Southwest Airlines' airfares seem to sporadically increase. In 1996, the ticketless travel system debuted on Southwest's website. This feature allows one to print out the boarding ticket prior to arriving at the airport, which conveniently saves you time from waiting in lines. Graph 2 shows that there is a noticeable

increase in price as this system became available to all routes. Another general price increase occurred around 2000. At this time, Southwest Airlines introduced "SWABIZ," a tool that assists business travelers in booking and tracking trips made through Southwest Airlines' website. Perhaps the slight increase in airfares represented the price premium for the service. Finally, there was another sudden increase in airfares for Southwest Airlines in 2003. This may be attributed to Southwest Airlines' gradual retirement of reusable plastic boarding cards in 2002. Southwest Airlines has teamed with IBM to offer self-service check-in kiosks instead. The project was part of a nationwide effort to reduce the amount of time customers spend in line and to improve the airport experience following the terrorist attacks in September 2001. The general trend shows that the establishment of a service that eases the worries of traveling leads to a slight increase in airfares.

Graph 3 shows the number of passengers flying on each specific route from Quarter 1 of 1993 to Quarter 4 of 2005. The graph is highly volatile and hard to interpret on face value. This is partly due to the effect that the different seasons have on the number of passengers flying within the markets. However, with the control for quarterly effects, it is much easier to understand what changes are being made. Graphs 4-7 show the seasonal effects broken down by quarters. These graphs were collated together into Graph 8, which shows the seasonal effects of all the quarters together. For each quarter, there is an initial increase in the number of passengers from 1993 to 1996. The number of passengers then flattens out from 1996 to 2001. Since 2001, the number of passengers has decreased quite drastically. I attribute this decrease to the September 11 attacks. Although these trends are seen generally in all routes, the magnitude of the changes is different. Therefore, the sensitivity of the changes in the number of passengers varies between the different routes.

Southwest Airlines entered Pittsburgh in May 2005 (Southwest Airlines 22 May 2006). Originally, there were eight routes originating from Pittsburgh International Airport (PIT). These include McCarran International Airport (LAS) in Las Vegas, Nevada, Los Angeles International Airport (LAX) in Los Angeles, California, Orlando International Airport (MCO) in Orlando, Florida, Midway Airport (MDW) in Chicago, Illinois, Oakland International Airport (OAK) in Oakland, California, Philadelphia International Airport (PHL) in Philadelphia, Pennsylvania, San Diego International Airport (SAN) in San Diego, California, and John Wayne Airport (SNA) in Santa Ana, California. As with Baltimore, Southwest Airlines now flies to more destinations from PIT; however, only these original eight routes is relevant to the analysis being made in this paper.

It is interesting to note the similarities and differences between the routes originating from PIT and BWI. Both markets are on the East Coast; however, the routes originating from BWI all fly to the Midwest, whereas Southwest flies to various parts of the country. The distances, however, vary from short-haul routes (i.e. PIT-PHL) to long-haul routes (i.e. PIT-SAN). Four of the eight flights go to California. MDW is the only destination similar to both BWI and PIT. This may be because Southwest Airlines has a stronghold in the market at Midway Airport. It would be interesting to note the evolution of Southwest Airlines' route network as it started as a regional carrier and has now expanded to include longer national routes, but that goes beyond the scope of this paper.

The price evolution in the Pittsburgh market is slightly different than that in the Baltimore market. Graph 9 in the Appendix shows the real average airfare for flights originating in Pittsburgh from Quarter 2 of 2002 to Quarter 4 of 2005. Whereas in Baltimore the price drop was seen as early as two quarters before Southwest Airlines' entry, the price drop in Pittsburgh

occurred two years before Southwest Airlines entered the market. Table 2 in the Appendix shows the percent change in airfares for routes originating in both Baltimore and Pittsburgh. In Baltimore, the price drop occurred for two years starting from the year before entry. However, in Pittsburgh, the price drop lasted one year and started two years before entry. Thus, the drop in airfares characterized by the Southwest Effect occurred earlier for the Pittsburgh market than in the Baltimore market. However, there are two anomalies in the Pittsburgh market. Both the PIT-PHL and PIT-MDW routes did not experience the price drop until the year before entry. The reasons for this shall be discussed later in the paper.

Southwest Airlines charged a lower fare than the industry average to passengers originating in Pittsburgh at each time period. This data can be seen in Table 3 in the Appendix, which depicts the price of airfare for both Southwest Airline and the industry average up to three years before entry. These findings are similar to those seen in the Baltimore market. If Pittsburgh is to follow the Baltimore example, then the airfares are expected to converge towards the industry average over time. However, since Southwest Airlines has only been in the Pittsburgh market for only one year, the convergence effect is not expected to be seen until later. As of right now, the lower prices are expected to help Southwest Airlines attract new passengers to the market, as well as entice passengers to switch brand loyalties and start flying with Southwest Airlines.

Although the price changes in the Pittsburgh market were surprising, the growth in the number of passengers as a result of the Southwest Effect was as expected. Graph 10 in the Appendix shows the number of passengers flying from Pittsburgh from Quarter 2 of 2002 to Quarter 4 of 2005. The number of passengers increased considerably in Quarter 2 of 2005, the quarter in which Southwest Airlines entered the Pittsburgh market. The seasonal effects are not

as pronounced in the Pittsburgh market as they are in the Baltimore market. It is interesting to note that the number of passengers in both the PIT-PHL and PIT-MDW routes increased the most in Quarter 2 of 2005. This can be attributed to the delay in the price drop until Quarter 2 of 2005. The other routes experienced their price drop around Quarter 2 of 2003, which is precisely corresponded to their increase in the number of passengers. Just as the price fell significantly as Southwest Airlines entered the market, the number of passengers flying from Pittsburgh to the eight original destinations increased substantially.

Section V: Analysis

Southwest Airlines announced that they were entering the Baltimore market in July 1993, two months before their first scheduled flight (Hightower A4). Just as Southwest Airlines made this announcement, the real average airfare dropped drastically for all the routes that Southwest Airlines would enter. Thus, there seems to be a signaling effect in the Baltimore market. Southwest Airlines has been known to set prices well under the industry average. Incumbent airlines know that this will eventually happen so they decrease their prices in anticipation of the imminent decrease in airfares once Southwest Airlines officially enters the market.

The signaling effect in Pittsburgh is even more interesting. Southwest Airlines announced that they were entering Pittsburgh market in January 2005 (Southwest Airlines 5 Jan. 2005). Their first official flight out of Pittsburgh International Airport did not occur until May 2005, four months after the announcement was reported in a Southwest Airlines press release. Whereas the price drop in Baltimore occurred immediately after Southwest Airlines announced their eventual entry, the price drop in Pittsburgh occurred much earlier. In fact the first price drop can be seen in Quarter 2 of 2003, two years before Southwest Airlines officially announced that they were entering the Pittsburgh market.

There could be several possible reasons why the price drop occurred so early; however, I believe that brand loyalty provides the best reasoning behind this phenomenon. First, brand loyalty allows firms to differentiate themselves from their competitors in order to gain market power. Before deregulation of the airline industry, firms attempted to differentiate themselves by the services that they offered, such as comfort of seats in airplanes, quality of airline staff, etc. However, airlines currently focus on prices and frequency of flights as a method of differentiation, two aspects that were previously heavily regulated. By decreasing prices well before Southwest Airlines enters the market, incumbent airlines attempt to please their customers in an attempt to entice them to stay loyal even after the entry of Southwest Airlines. Reputation and history also increases the cost of switching brands and allows firms to therefore charge higher prices. There is a large amount of academic articles written on the Southwest Effect. Surely the incumbent airlines are aware of the phenomenon. In anticipation of the imminent price drop, incumbent airlines realize that they must take action in order to cement their strong market share in the Pittsburgh market. In an attempt to keep customers from switching brand loyalties to Southwest Airlines, incumbent carriers reduced their prices well in advance of the official entry of Southwest Airlines into the market.

The initial price decrease is very steep; however, not every route sees the same percentage decrease. There are two main reasons that account for this difference. One is the presence of the incumbent airlines in the market of entry. The other is the effect of the destination airport as another carrier's hub. Both reasons account for the idea that the incumbent airlines tried to maximize profits until Southwest Airlines would enter the market and establish their market power.

One of the anomalous routes flown by Southwest was the PIT-MDW route. The price drop did not occur until Quarter 2 of 2005, the same quarter that Southwest Airlines entered the route. This can be explained by the fact that Continental Airlines was previously the only major carrier flying the route. Since Continental Airlines did not experience much competition from any other airline, they had the market power to keep prices stable for as long as they wanted. Southwest Airlines is known to have a stronghold in Midway Airport. As such, Continental Airlines knew that once Southwest Airlines entered the market, they would lose their market power over the PIT-MDW route. Therefore, Continental Airlines, as well as the other airlines flying that route, held prices constant for as long as possible to maximize the profits they would be able to receive before Southwest Airlines officially entered the market. The strong presence of Continental Airlines, the major incumbent carrier at Midway Airport, explains why the Southwest Effect occurred later in the PIT-MDW route than in the other routes.

Philadelphia is known to be a hub for U.S. Airways. As a result, U.S. Airways held a high market share for the PIT-PHL route. Under the hub-and-spoke system, passengers would fly from Pittsburgh into Philadelphia and then onto their final destination. Therefore, one can infer that most people flying the Pittsburgh to Philadelphia route were actually using Philadelphia as a hub airport instead of as the final destination. Passengers on this route have a higher inelastic demand as they must fly from Pittsburgh to their destination via Philadelphia. Thus, U.S. Airways has the market power to maintain high prices. This leads to the notion that U.S. Airways can afford to keep prices high for the period before Southwest Airlines entered the market. This idea holds up empirically as the price drop for the PIT-PHL route did not occur until Quarter 2 of 2005, the same quarter Southwest Airlines entered the Pittsburgh market. Unfortunately, the data is flawed in the sense that the final destination airport is not specified in

the database. Ideally, it would be nice to look at whether there were non-stop flights from Pittsburgh to the final destination and compare those prices with flights flying via Philadelphia. Regardless of this data constraint, this reasoning seems sensible and holds true empirically. US Airways' usage of PHL as a hub allows them to delay the Southwest Effect until the quarter of entry by Southwest Airlines.

Other factors are involved in the difference in the strength of the Southwest Effect. The frequency of flights by each airline in the route would affect the ease of travel and the number of passengers flying on the route. Increasing the ease of travel has been previously seen to increase prices (i.e. Southwest's ticketless travel system and SWABIZ program). Also, different incumbent airlines would hold different market power in the particular route. A major carrier, including American Airlines and United Airlines, would constitute as stronger competition for Southwest Airlines than smaller airlines, such as AirTran or Alaska Airlines. Weaker competition from incumbent airlines would entice them to cut prices prior to the entry of Southwest Airlines. Finally, the strength of the Southwest Effect depends on what type of market the destination airport entails. Cleveland is larger market compared to Oklahoma City so it seems intuitive that the price drop for the BWI-CLE route was stronger than the BWI-OKC. Likewise, the Los Angeles market is larger than the Orlando market so the PIT-LAX route was more sensitive to the Southwest Effect than the PIT-MCO route. All of these reasons explain for the possible differences of the Southwest Effect between routes, however it is hard to develop statistical tests to prove each of these cases.

It is rare to find a model that is perfect. The model described in this paper is no different. There are several improvements that can help bolster the conclusions made from this model. First, it would be better to look at more markets than just the two analyzed in this paper. It

would be beneficial to investigate more markets that Southwest Airlines has previously entered in order to gain a better perspective on the Southwest Effect. Also, the model could be improved if the routes that Southwest Airlines did not enter were taken into consideration. I have shown that there is a significant price drop in airfare and a substantial increase in the number of passengers on routes that Southwest Airlines entered. However, it would be helpful to look at the price and passenger movements of the routes that Southwest Airlines did not enter. If, for example, the prices for the other routes dropped by as much or more than the routes that Southwest Airlines entered, then obviously Southwest Airlines is not the reason for the price drop in the routes. Controlling for the other routes would give a better look at Southwest Airlines' effect on airfares and the number of passengers. Finally, the announcement date used in the signaling analysis was based on when Southwest Airlines publicized their press release on their eventual entry into a new market. However, this may not be the only signal emitted by Southwest Airlines. In order to enter a new airport, an airline must apply for airport slots and gate times. It would be interesting to look at when the airline applied directly to the airport authorities and whether this date had any effect on the timing of the price drop and increase in passengers. Future research on the Southwest Effect should try to handle one or more of these issues in order to have a better understanding of the signaling effect on the industry.

Section VI: Conclusions/Policy Implications

The results from Pittsburgh market show that the incumbent airlines are getting smarter about the entry by Southwest Airlines. Much literature has already been written about the Southwest Effect. In particular, economists have taken a look at what airports Southwest Airlines should enter based on their past entry decisions. This analysis is well-known to the

incumbent airlines at Pittsburgh. Thus, they were able to anticipate the entry by Southwest Airlines even before the entry announcement was made.

It will be interesting to study the trends in the Pittsburgh market in the future. The prices of airfares in Pittsburgh is expected to stabilize and remain constant based on the Baltimore example. Moreover, the prices for flights by Southwest Airlines should eventually converge to the industry average. Likewise, the number of passengers should also become steady, barring any external setbacks like the September 11 terrorist attacks. Due to the recent entry by Southwest Airlines, this paper was only able to examine the very short run of the Southwest Effect in Pittsburgh.

Southwest Airlines has recently announced that they plan to enter Dulles International Airport in Dulles, Virginia (Southwest Airlines 4 Apr. 2006). This is a surprising market for Southwest Airlines to enter for it serves about the same target audience as the passengers flying in and out of Baltimore/Washington International Airport. However, Southwest Airlines has a fantastic track record for successful entry in the past so their decision to enter another airport serving predominately the Washington D.C. market likely means that this particular market remains unsaturated. Questions arise about whether the Southwest Effect will occur once Southwest Airlines enters Dulles and also when the phenomenon will transpire. With the first flights set to take off in fall of 2006, one can eventually look at whether the announcement still stimulated a price decrease within the incumbent airlines, as well as an increase in passengers flying in the Washington D.C. market.

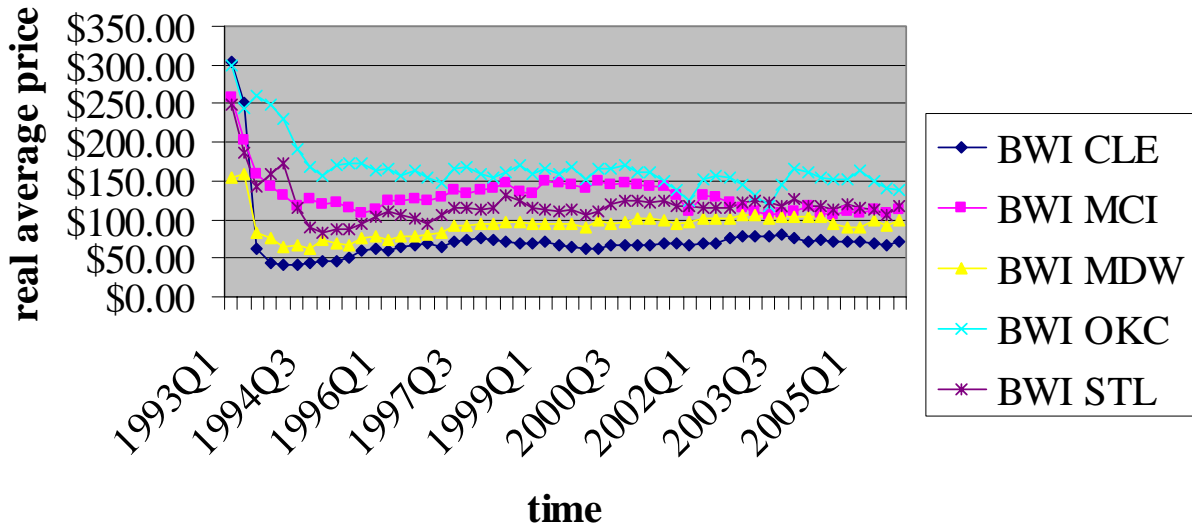
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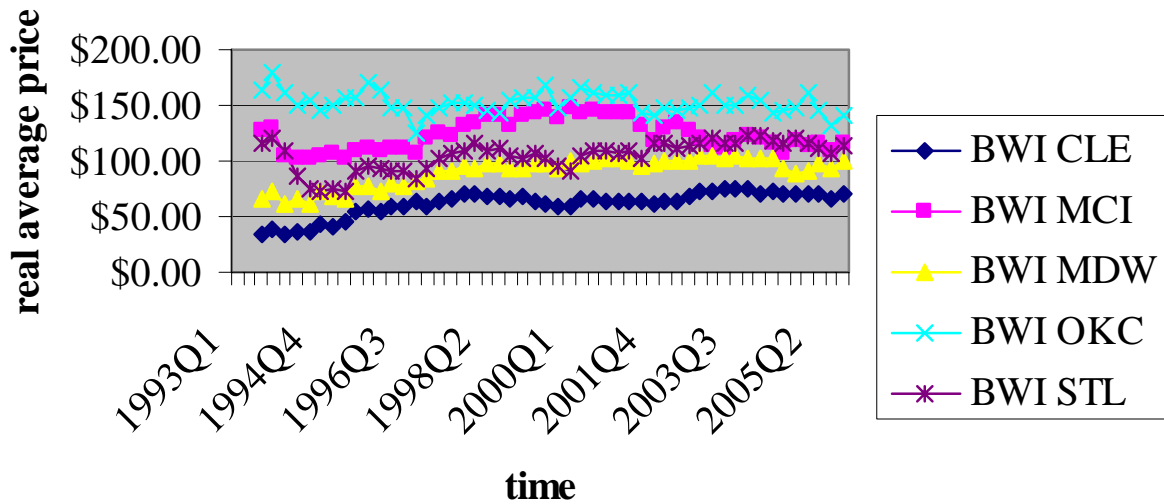
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Appendix

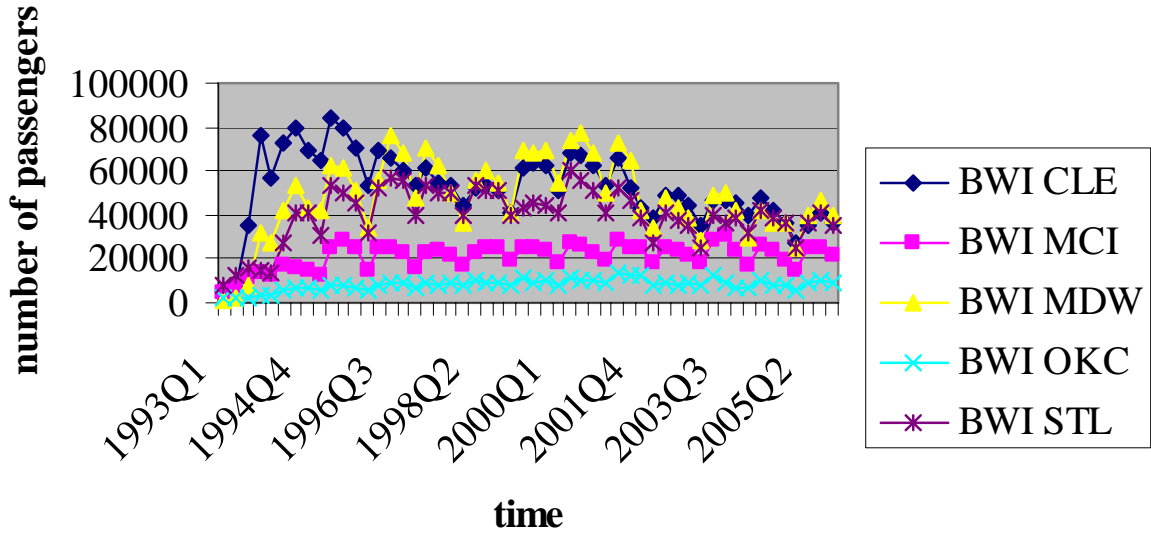
Graph 1: Airfares (all airlines)



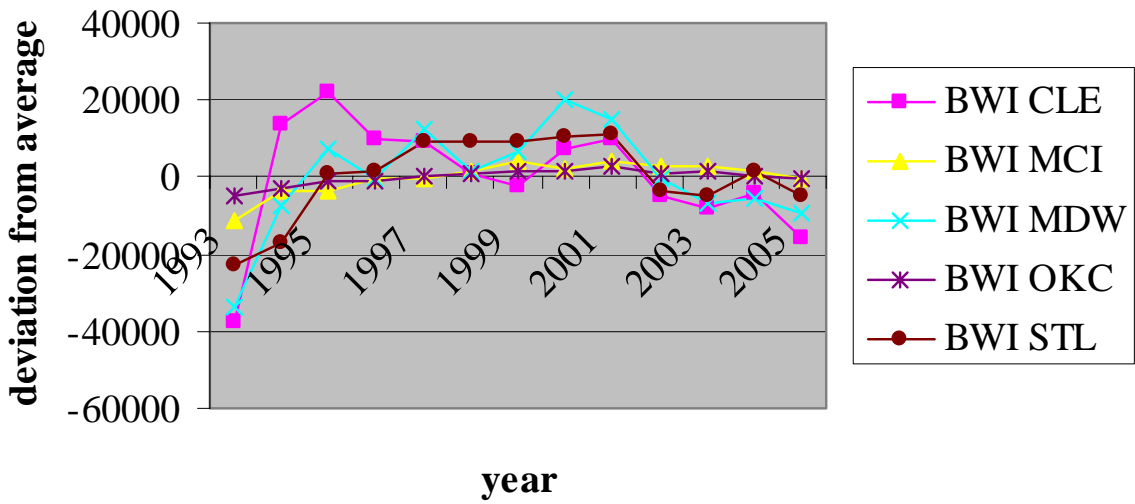
Graph 2: Airfares (SWA)



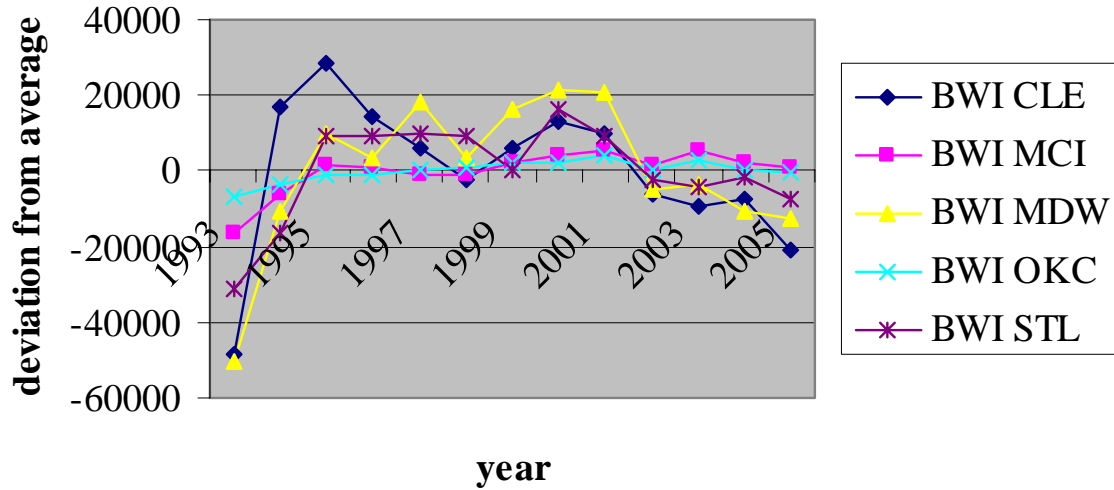
Graph 3: Passengers (all airlines)



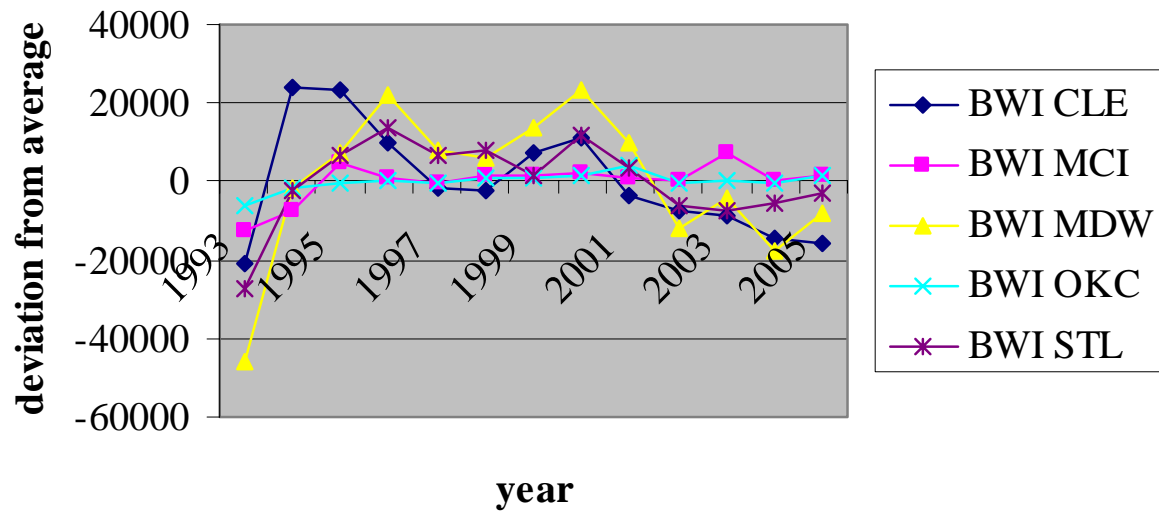
Graph 4: Seasonal Effects (Quarter 1)



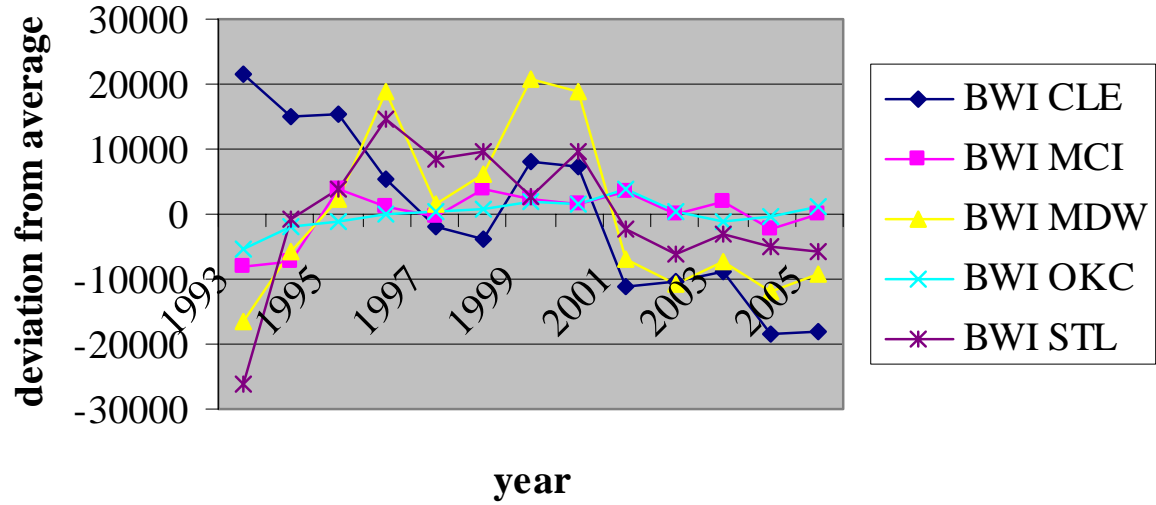
Graph 5: Seasonal Effect (Quarter 2)



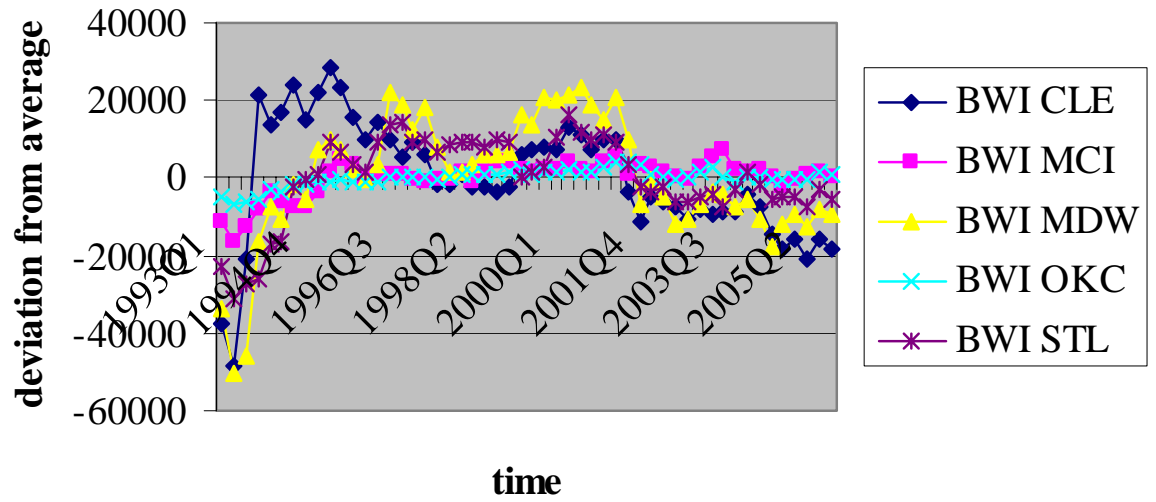
Graph 6: Seasonal Effects (Quarter 3)



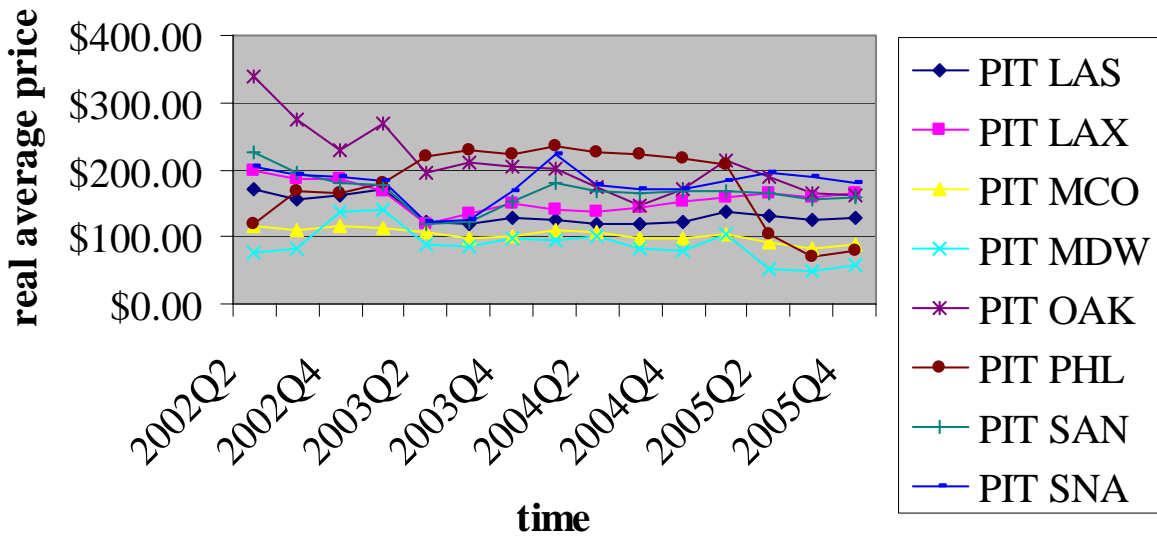
Graph 7: Seasonal Effects (Quarter 4)



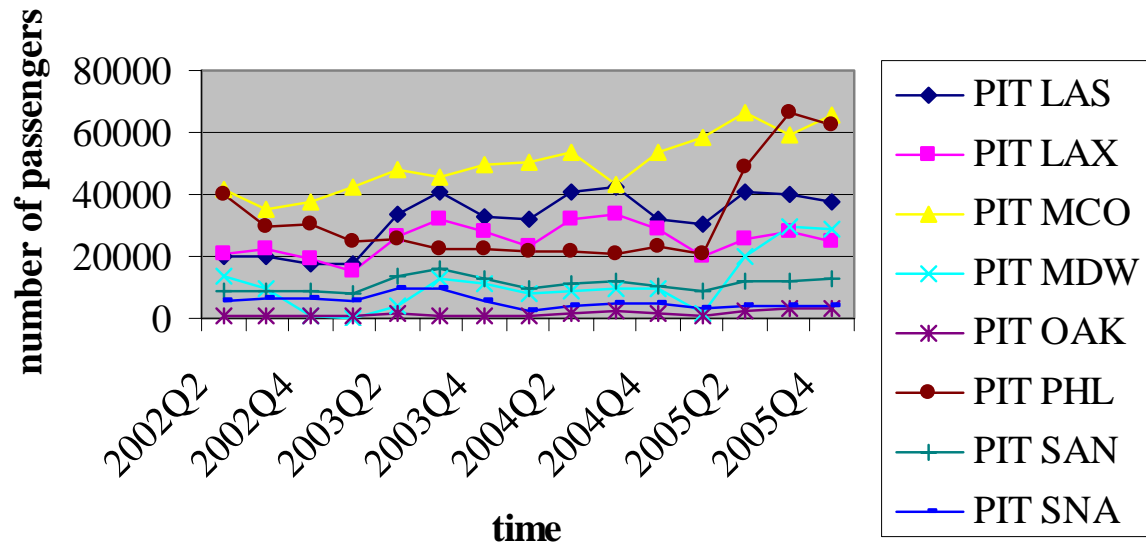
Graph 8: Total Seasonal Effects



Graph 9: Airfares (all airlines)



Graph 10: Passengers (all airlines)



origin	destination	t-1	t	t+1	t+5	t+10	
BWI	CLE	\$303.90	\$62.90	\$42.85	\$69.60	\$79.83	
BWI	MCI	\$256.75	\$159.79	\$127.03	\$136.61	\$108.86	
BWI	MDW	\$153.49	\$83.29	\$61.31	\$96.72	\$103.64	
BWI	OKC	\$299.86	\$261.02	\$167.91	\$169.39	\$145.40	
BWI	STL	\$249.68	\$142.22	\$88.83	\$125.25	\$118.03	all airlines
BWI	CLE		\$33.66	36.87191	67.66804	74.07027	
BWI	MCI		\$127.69	103.2853	139.9098	118.574	
BWI	MDW		\$64.99	60.55133	96.64906	103.6928	
BWI	OKC		\$163.13	155.0956	143.5878	149.9692	
BWI	STL		\$116.63	74.71505	110.4546	116.4934	SWA

origin	destination	t-2	t-1	t	t+1	t+5	t+10
BWI	CLE			-79.30%	-31.88%	62.42%	14.70%
BWI	MCI			-37.77%	-20.50%	7.54%	-20.31%
BWI	MDW			-45.74%	-26.38%	57.75%	7.15%
BWI	OKC			-12.95%	-35.67%	0.88%	-14.16%
BWI	STL			-43.04%	-37.54%	41.00%	-5.76%
PIT	LAS	-28.44%	-3.19%	12.65%	-3.18%		
PIT	LAX	-40.70%	16.37%	20.47%	-0.95%		
PIT	MCO	-8.71%	0.74%	-14.95%	-2.28%		
PIT	MDW	15.57%	15.35%	-49.67%	14.55%		
PIT	OAK	-42.26%	-12.01%	9.93%	-13.93%		
PIT	PHL	87.45%	3.09%	-54.29%	-24.88%		
PIT	SAN	-46.66%	40.67%	-2.66%	-3.72%		
PIT	SNA	-40.29%	43.65%	10.37%	-7.61%		

Table 3: Prices in PIT for all airlines vs. Southwest Airlines (SWA)							
origin	dest	t-3	t-2	t-1	t	t+1	
PIT	LAS	\$170.18	\$121.77	\$117.89	\$132.79	\$128.58	
PIT	LAX	\$199.71	\$118.42	\$137.81	\$166.02	\$164.45	
PIT	MCO	\$116.98	\$106.80	\$107.59	\$91.50	\$89.41	
PIT	MDW	\$75.92	\$87.75	\$101.21	\$50.94	\$58.35	
PIT	OAK	\$339.69	\$196.14	\$172.58	\$189.71	\$163.28	
PIT	PHL	\$117.70	\$220.64	\$227.45	\$103.97	\$78.10	
PIT	SAN	\$225.60	\$120.34	\$169.28	\$164.77	\$158.64	
PIT	SNA	\$206.07	\$123.06	\$176.76	\$195.10	\$180.25	all airlines
PIT	LAS				\$122.36	\$114.06	
PIT	LAX				\$120.97	\$147.90	
PIT	MCO				\$84.11	\$81.98	
PIT	MDW				\$49.01	\$57.60	
PIT	OAK				\$153.50	\$142.29	
PIT	PHL				\$53.19	\$62.23	
PIT	SAN				\$136.23	\$143.43	
PIT	SNA				\$162.10	\$124.07	SWA