Cost of Taking Off

An empirical study on the determinants of Air Fares in Canada

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Abstract

In this paper I use posted air fares to examine the determinants of the cost of air travel in Canada. The determinants include route characteristics, competition characteristics, and city characteristics. I look at the overall industry as well as break up the sample into four airlines Air Canada, WestJet, Porter, and Bearskin. I find that the most influential determinants on fare are the distance and length of the flight as well as the level of competition. This paper shows that despite the high air fares the Canadian market follows similar patterns to international markets.

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1. Introduction

For most people purchasing a plane ticket, the price has a large influence on their decision. For every flight there are three types of players involved; the passenger, the airline, and the airport. The airfare has to balance the requirements of each of these players. The airline and airports are attempting to maximise profit while the passenger is attempting to maximize utility while minimizing their costs. Depending on a variety of characteristics the optimal pricing for each of the players will differ. These characteristics can be related to the cost of providing the services, the demand and supply to the route, and numerous other potential factors.

Air Fares in Canada have been found to be higher than in other parts of the world. This is shown in Milke (2010) which finds that for a group of flights covering approximately the same domestic distance the Canadian fares are approximately $560 higher than in the United States and $970 higher than in Europe. In Canada, a proportion of the fares go to taxes and to additional airport fees. The sample from Milke (2010) found that 30% of the airfare was related to additional taxes. Research on Canadian air fares and what influences the price has not been extensive at this point in time. Fares in Europe and the United States have been given more attention, with the main focus on the dispersion of prices. An additional focus of literature in Europe and the United States has been on the impact of competition on prices, especially since deregulation has caused the roles of the airline to be altered. As price is only one factor in the decision of which flight to choose, research such as Hess, Adler, and Polak (2007) and de Luca (2012) look beyond the price at other factors that impact passenger utility. This paper will focus on an examination of air fares within Canada and between Canadian airlines and the expected impact of competition and competition characteristics, including city characteristics.

To examine domestic fares in Canada, I am using a collection of future fares for two dates on routes between 15 Canadian airports. This data was collected from the Travelocity site for flights on November 10, 2012 and February 6, 2013. For each city pair I have included the route in both directions to consider differences in departure and arrival city characteristics that may impact the fares. For each market I have up to two observations per airline. The sample set is made up of 1261 observations. The observations are focused on four main airlines: Air Canada, WestJet, Porter, and Bearskin, as these four make up over 99% of the sample set. I look at how the route, competition and market characteristics impact the Canadian industry as a whole, as well as the differences between these four main airlines.

The following section introduces some relevant literature on the airline industry, as well as a brief background to the industry in Canada. In the third section I introduce the data that is being used. The fourth section presents the model followed by the results in the fifth section. The final section is a summary of the results and some concluding remarks.

2. Background

2.1 Relevant Literature

The domestic airline industry in Canada has not been given as much attention as domestic flights in other parts of the world. The main literature on the topic has been centred in Europe and the United States. This research has focused on topics such as price dispersion, competition between carriers, the impact of airports, and the impact of passenger preferences. Generally, the main attention has been on how these variables affect prices or flights offered. I will explore relevant literature on price dispersion, competition, and some other aspects that impact on the price and utility.

2.1.1 Price Dispersion

One of the most examined topics is the dispersion in prices. It is quite common that two people will pay different fares for the same flight and service level. Borenstein and Rose (1991) found that the expected difference in fares is over 35% of the mean ticket price for two individuals on the same flight (p. 4). The examination of price dispersion has been approached from a variety of ways as it is difficult to know where the dispersion is coming from in each case; it is unlikely that dispersion is motivated by one factor. Dispersion is much more likely to occur on a competitive route and have a larger variance than on a monopolistic route (Borenstein and Rose, 1991). In some cases, price dispersion can be seen as price discrimination; however, it can also stem from a variety of other factors such as competition or supply constraints. Hayes and Ross (1998), Borenstein and Rose (1991) and Hanlon (1994) find that dispersion in prices coming from price discrimination is more likely to occur when the airline holds a monopoly at the departure or arrival airport. To try and maintain a monopoly on a specific route, Hanlon (1994) finds that some airlines will use predatory pricing when faced with new competition on a route. Using the predatory pricing will make it harder for the entrant to succeed in the new market as it will not be able to compete with the lowered fares. Predatory pricing is used as a short term solution to discourage competitors from entering the market. Predatory behaviour of the firm goes further than just pricing as airlines have also been known to use a predatory flight schedule which floods the market with flights lowering the potential return to the new competition on that route.

Price dispersion is dynamic; depending on how far in the future the tickets are booked, the degree of price dispersion will likely differ. Researchers, such as Mantin and Koo (2009) and Chellappan, Sin, and Siddarth (2011), agree that the closer a ticket is purchased to the date of the

flight, the greater the price dispersion will be. However, Gillen, and Mantin (2009) take this a step further and find that while tickets purchased one day before the flight had greater price dispersion than those purchased two weeks beforehand, so did tickets purchased seven weeks in advance. However, it is within two weeks of the departure date that the price dispersion is expected to have the greatest fluctuations. The form of dispersion differs depending on when the tickets are being purchased. Since price dispersion is dynamic the impact of different factors, such as the number of competitors, are also dynamic.

There are a variety of route characteristics that impact dispersion levels therefore causing a large discrepancy on dispersion levels across flights. Borenstein and Rose (1991) found that the level of price dispersion had a large range across different routes; the smallest level of dispersion was a variance of 3.6% from the mean price while the largest level was a variance of 83.2% from the mean price (p. 8). Demand factors are also found to have a large impact on the levels of dispersion. The demand factors include population of the arrival and destination cities as well as the routes characteristics such as length of flight. Another factor is competition levels. Competition levels are generally agreed to positively impact dispersion, although, Mankin and Koo (2009) find that competition intensity is not significant. The level of knowledge that the passengers have on available prices for a flight is another factor that is important in price dispersion, as the less price awareness of the passengers allows the airline to have a larger range of prices on a single flight. Congestion is also relevant because price dispersion can be used to encourage people with more flexibility to take less congested flights (Chellappan, Sin, and Siddarth, 2011; Hayes and Ross, 1998).

2.1.2 Competition

The impact of competition on the airline industry has been a highly researched topic since deregulated airlines have had to adjust their role in the market. Deregulation began in the United States in the late 1970s, followed by Canada and Europe in the 1980s. Deregulation took time as the players in the industry had to adjust to new rules for the same market. One of the biggest transitions has been the easier access for new airlines to enter the market. This has led to the creation of the low cost carrier (LCC), the first of which was Southwest Airlines in 1973 (Gillen and Morrison, 2003, p. 2). A LCC differs from the full service carrier (FSC) in that a LCC offers fewer services for a lower fare, often offering additional services for extra fees. People who choose to fly with a LCC traditionally have the fare as the main determinant in their decision. O'Connell and Williams (2005) find that those who preferred to fly on a LCC had fare as their main determinant with other inputs, such as reliability, having almost no impact. In comparison, they find that those who chose to fly a FSC did not have fares being their first consideration. Instead, more emphasis was put on reliability and quality. It is important to note that LCCs and FSCs have both begun to evolve in response to the market and the differences have become less clear in some cases.

The addition of the LCCs has in many ways been beneficial to the passengers. Not only is there an alternative to the FSCs for people who are more interested in lower fares versus better services, but the LCCs also increase the competition on a route. Ayres (1988) finds that two additional airlines to a monopolistic route, for a total of three carriers, would bring prices to almost competitive level on a given route (p. 7). This means that the creation of a LCC airline should lower prices of other airlines on the routes that the fly. This has been shown to be true in a variety of papers such as Vowels (2006) and Fageda, Jimenez, and Perdiguero (1992). While

Canada does have airlines that are considered LCCs, there are none that take it to the same extreme as some LCCs in Europe and the United States. Canada's main LCC is WestJet which aims to offer low fares while still offering a high level of service, such as light snacks. This is much different than LCCs such as Ryanair who charge additional fees for any extra services beyond the flight, including fees for opting to get their boarding pass at the airport (O'connell and Williams, 2005; Niinimaa, 2011).

While airlines are offering the same basic service they are not homogenous. While some generalizations can be made about how an airline will respond to a change in the market, it will not be consistent across competitors. The size of the airline is very important in how outside forces impact the airfares. Cilberto and Tamer (2009) find that the larger an airline's presence at an airport will increase its competitive effects. A new small airline's competitive impacts on an incumbent will be less if the incumbent is a large airline. A larger incumbent airline presence strengthens the barriers to entry due to these discrepancies in competitive effects. Abramoqjtz and Brown (1993) find that the national presence level, not just the airport presence, can have an effect on an airline's ability to maintain market power and to charge higher fares while maintaining passenger levels; this is due to brand awareness and loyalty. A popular way to maintain loyalty is through frequent flyers programs. The size of the airline creates different reactions to changes in a market. Bornstein (1989) finds that while one airline, typically the larger airline, may be able to charge higher prices if faced with congestion, it does not mean that another airline on the same market can as well. If an airline has a large presence at the airport, compared to its competitors, it is able to charge higher fares even when facing the same demand.

One of the reasons that an airline's presence at an airport has such a large impact on its ability to charge fares is that they generally have long term contracts with the airport renting the

services that the airline needs, such as the gates. This means that for a new airline to enter an airport, and the markets of which the airport is a part, they often have to sublease the space from an incumbent airline. Cilberto and Williams (2009) look at how this subleasing relationship impacts the airfares. They find that the only way this subleasing structure impacts the fares is if there are not enough gates to cover the amount of departures demanded. The amount of gates an airline controls will impact that airline's ability to charge higher fares, as it will be correlated with their presence at the airport. Cilberto and Williams (2009) find that when an airline increases its gate control from 10% of the gates to 30%, prices from that airline increase by 3% (p. 3). However, the true impact of gate control does depend on the size of the airport and the demand for the gates. It was found that a 30% increase in gate leasing at an airport where there are 200 departures a day per gate would lead to a 2% price increase, while an airport that has 600 departures a day per gate would lead to a 6% increase (p. 4). The findings of Cilberto and Williams (2009) are further confirmation that airline presence at a given airport is important to the fares that an airline is able to charge, especially if there are congestion issues.

Airlines must find the right balance when differentiating themselves from the market. The more differentiated an airline is from its competitors, the less impact the competition is expected to have on their prices. However, to be able to gain the largest customer base possible they must offer comparable services to interest new passengers. One area in which this differentiation concept is evident is in the timing of the flights. Salvanes, Steen, and Sograd (2004) as well as Borestein and Netz (1999) compare the effect of competition after deregulation on airline differentiation, especially within the context of flight times. In both studies, the findings indicate that markets that have more than one competitor increase the likelihood of flight clustering between firms. The less price differentiation between the airlines leads to closer

flight times. Depending on the type of passenger, the perceived cost of having to take a flight that differs from their desired flight time will be different. Business consumers are assumed to have the smallest elasticity when it comes to flight times, which is why flights aimed at business travelers are the most likely to be clustered.

2.1.3 Other Factors

To maximize profits, many airlines have adopted the hub-and-spoke model for their routes. Using this model allows airlines to increase the traffic densities on the spokes (Bruckner, Dyer, and Spiller 1992). Instead of offering less populated point-to-point flights, the hub and spoke system allows the airline to combine passengers from a spoke on a flight to the hub, where they can then go to a connecting flight to their final destination with passengers coming from a variety of other spokes. In this model, airlines are merging passengers with different destinations at the departing spoke, and those with different departing airports on the later legs. Thus, the airline is able to maximize the number of passengers on each flight more effectively. Research such as Martin and Dorta (2009) and Bruckner, Dryer, and Spiller (1992), and Borenstein (1989) have emphasized the benefits of the hub-and-spoke networks, as it allows airlines to maximize profits.

The services that are offered in the airport are important as they can impact the airlines' costs and they impact the ability of the airline to differentiate from the competition. Airports have two ways to collect revenue; aeronautical revenue, such as the fees that are charged to airlines to use the airport, and commercial revenue, such as the revenue from the shops and restaurants in an airport's terminal. The revenue from commercial airport services and how it impacts the aeronautical prices is an area that has been increasingly researched since airport deregulation in conjunction with price regulation on the aeronautical services. McHardy and

Trotter (2005) find that unregulated airport's fees will potentially absorb a part of the benefits to the consumer that come from decreased fares related to airline competition, and in some cases, will even end up increasing the charges the passenger faces. In cases where only the aeronautical side is regulated, the airport is still capable of offsetting the lower fees with the commercial profits. If the regulation ignores the commercial side of the airport entirely, then any gain the passenger gets from lower aeronautical prices may be replaced by extra commercial costs. Zhang and Zhang (1997) look at the effect of the commercial revenues on the aeronautical prices at the airlines. They find that allowing for commercial prices at airports to subsidize the aeronautical costs allows for better profit maximization. The cross-product subsidy has been found to increase the overall social welfare. As the aeronautical fees are potentially lowered from the commercial revenues, airlines costs are lowered which leads to lower fares.

Pricing is not the only factor that informs a passenger's choice for what airline to use. Passengers vary in their preferences; depending on the purpose of the trip, a passenger will have differing responses to differences in the airlines, such as prices, flight times, and reliability. Generally, passengers are broken up into leisure and business passengers. Business passengers typically have the lowest price elasticity; also they are most concerned with flight time. Hess, Adler, and Polak (2007) add an extra category of passenger, breaking the leisure passenger up into holiday and visiting friends and relatives (VFR). They find that brand loyalty is important to the business and holiday travellers, each for different reasons. Holiday travellers want to fly with their preferred airline, based on services offered and previous experiences, while business travellers prefer frequent flyer programs in order to maximize the return on flying. The airline is of little importance to the VFR passenger. De Luca (2012) takes the consumer differentiation a step further looking a person's age, travel experience and income, and how utility is impacted by

aspects like fare, duration, and time. The finding was that younger travelers prefer low fares, people who have more experience traveling prefer to fly out of a closer airport, and people with higher income care mostly about the services available on the trip.

Delay time also impacts a passenger's utility from their flight. Delay time again has a different impact depending on the type of passengers. Delay has the largest impact on the business flyer; this is true for both unexpected flight delays as well scheduled delays from the individuals' optimal flight times. Holiday travellers are the least perturbed by delays, with little difference between the impact of being late or early. Hess, Adler, and Polak (2007) find that VFR passengers' utility is more affected by arriving early than late, which is likely related to a preference to have more time at home (p. 232). Forbes (2008) quantifies how prices react to flight delays, specifically delays from the scheduled departure time. As average flight delays increase, prices decrease by $1.42 per minute for passengers on a direct flight, and it can get as high as $2.44 a minute if the market for that flight is highly competitive (p. 2). Interestingly, Forbes (2008) finds that passengers with connecting flights were less perturbed by a delayed flight; prices only fell by $0.77 for flights with connections.

2.2 Canadian Industry

The Canadian market has high fares in comparison with other countries. In Canada, a portion of the fares go to fees levied by three groups; government, the airline, and the airport. Milke (2010) compares air fares in Canada, United States and Europe. Canada is found to be the most expensive followed by the United States. For domestic flights in his sample, 30% of the Canadian fares went to taxes; which is higher than the 14% of fares that go to taxes in the United States, and lower than in Europe where taxes were found to be 52% of fares (p. 8-9). In the sample, Milke (2010) found that the average base fare per mile in Europe was one quarter of that

in Canada (p. 10). One of the reasons that it assumed European airfares are less expensive is the encouragement of competition. In Canada and the United States, foreign airlines are allowed to land and take off in the country but not operate a flight that has both ends within its borders. However, foreign airlines in Europe are able to offer full flights in any country and so competition is higher.

In Canada the airlines were deregulated under the National Transportation Act which was implemented as law in 1988. Under deregulation, entry and exit of a market were opened up, and with it the amount of domestic passengers grew by 80% (Gowrisankaran, 2002, p. 1). The only requirement to enter that was not based on operational needs of an airline was that it had to be 75% Canadian Ownership (Iacobucci, Tebilcock, and Winter 2006, p. 20). Deregulation opened up the industry for competition and the government was no longer regulating prices and which markets an airline flies in for the southern part of the country. However, it was not until 1996 that the government stopped regulating fares and routes in the north (p. 21). Canada has been very protective of the market and has tried to maintain only domestic carriers within the borders. In 1995, the borders were opened up slightly with an open skies agreement with the United States allowing for third and fourth freedoms of the air[1][2]. This agreement has been expanded upon multiple times, most recently in 2007 when it was updated so that they could use the other country as an intermediate point on international flights (Foreign Affairs and International Trade Canada, 2012). Since the mid 2000s, Canada has reached agreements with many countries which allow for third and fourth freedoms of the air, the most recent of which was with Columbia,

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[1] Third freedom of the air is the right or privilege for an air carrier from country A to put down, in the territory of country B, traffic coming from country A. (Transport Canada, 2010)

[2] Fourth Freedom of the air is the right or privilege for an air carrier of country A to take on, in the territory of country B, traffic destined for country A. (Transport Canada, 2010)

Honduras, Nicaragua, Curacao, and Saint Maarten in early 2012 (Foreign Affairs and International Trade Canada, 2012).

Since deregulation, the Canadian government has had to make regulatory decisions concerning airlines on a few occasions. In 2000, Bill C-26 was passed, which allows the government to approve mergers and acquisitions of airlines. It also gave Transport Canada more authority in ways such as; review of fares on monopolistic routes and ability to decrease unfair fares and review and require changes of rules on aspects such as lost baggage and the bumping of passengers (Dewetering, 2000). In early 2012, the government again intervened with Air Canada when the Canada Industrial Relations Board prevented the stoppage of work by the employees through strike or lockout. The action cited potential negative impacts to the health and safety of the public as well as the importation and exportation of goods from Canada and made Air Canada's services essential.

In Canada, there are high taxes and additional fees on plane tickets. The extra charges fall into three categories; government, airline, and airport charges. The government charges are made up of the sales tax, federal and provincial, the Air Travellers Security Charge (ATSC), and Navigational (NAV) surcharge. The ATSC finances current and future security measures (Transport Canada, 2011). The NAV surcharge is for NAV Canada to cover the cost of providing air navigation services; it is based on the distance of the trip (NAV Canada). The airline charges are insurance and fuel surcharges. The insurance surcharge is used to offset the cost of aviation insurance, while the fuel surcharge covers the volatility of fuel prices. Finally, the airport fees are the Airport Improvement Fee (AIF), which are an additional fee that the airport charges directly to the passenger. The AIF changes vary depending on the airport. The AIF ranges from $5 to $30 not including the fees for connecting flights.

For the purposes of this paper, for the observed markets there were four main firms: Air Canada, Westjet, Porter Air, and Bearskin. While there are other airlines in Canada, including some that operated on a handful of the chosen routes, their addition to the sample was quite modest and were not large enough for economic interpretation.

2.2.1 The Airlines

Air Canada

Air Canada was originally Trans-Canada Air lines which entered the market in 1936. It became Air Canada in 1965 (CBC News, 2004). In 1988, when the industry was being deregulated, Air Canada was also liberalized (Iacobucci, Tebilcock, and Winter, 2006). While Air Canada is a FSC, in the early 2000s it created three brands to compete with the LCC; Tango, Jazz and Zip. Of these three, Jazz is the only one to have not been retired. Air Canada has the largest network of flights offered by any of the Canadian Airlines. It flies all around Canada and to numerous international locations. Air Canada offers multiple service levels on their domestic and international flights. The cheapest fare type, with the lowest level of service, is economy class. In economy, passengers get individual TVs[3] which offer hundreds of hours of entertainment, as well as power adapters and USB ports for personal use. Air Canada offers complimentary non-alcoholic beverages on their flights and a variety of snacks or meals for purchase (Air Canada, 2012). Planes used for domestic flights have a range of 37 to 154 economy seats. Air Canada has a fleet of 204 aircraft, with another 158 operated by their express lines, and 279 of these aircrafts are used for North American flights. The hubs for Air Canada are in four cities, Toronto, Montreal, Calgary and Vancouver (Air Canada, 2012).

[3] This is offered on almost all flights with the exception of Jazz flights on the following aircrafts: CRj-100/200, Dash-300 and Dash-100.

WestJet

WestJet started flying commercially in 1996 and for the first few years was just a small airline flying between Calgary, Edmonton, Kelowna, Vancouver, and Winnipeg with three Boeing 737-200s (History of WestJet, 2012). WestJet now flies across North America, Central America, and the Caribbean servicing over 80 destinations. It has Canadian hubs at Toronto's Pearson airport and the Calgary International airport. WestJet aims to offer affordable flights while still offering more than just the basic services (WestJet, 2012). On their flights, WestJet offers live individual TVs which also allow access to pay-per-view TV and movies. Like Air Canada, WestJet offers complimentary non-alcoholic beverages with light snacks; they also have further snacks and drinks available for purchase (WestJet, 2012). At the end of 2011, WestJet had 97 aircraft which range from 119 to 166 seats. (WestJet, 2011)

Porter

Porter Airlines entered the market in 2006. Porter focuses on short haul flights in central and eastern Canada, with the hub at Toronto's Billy Bishop City airport. Porter flies to 18 cities in Canada and the United States. Porter aims for a high standard of service in the airport and on the airplane. On board, Porter offers snacks and beverages to their passengers, but unlike their competitors Porter offers complimentary beer and wine in addition to complimentary soft drinks. Despite aiming to offer high levels of service Porter maintains competitive fares. (Porter Airlines, 2012)

Bearskin

Bearskin airline is a regional airline that offers services to Northern Ontario and Manitoba. In recent years, a few central and southern Ontario destinations have been introduced. It was started in 1963 and was originally used as an air taxi service. In the early 2000s, Bearskin

serviced close to 40 destinations, but now it offers service to a total of 18 destinations. Bearskin has its hubs in Thunder Bay and Sudbury. Bearskin has 16 aircraft each of which can seat 19 passengers. As Bearskin mainly focuses on small communities, it does not have much competition on many of its routes. Due to the fact that Bearskin focuses mainly on small destinations, it is the most likely of the four main airlines observed to have a high number of stops for the chosen markets. (Bearskin Airline, 2012)

3. Data

As Canadian data on realised airfares is not readily accessible, the data used for this paper is based on posted prices. The main sources are Cansim and Travelocity; please refer to Table 1 in Appendix for a complete list of the data and where it was collected from.

3.1 Market

For the purposes of this paper the market will be considered one direction of a route between two cities on a given day. The market does not change if the flight stops in other cities. The market does differ if the two end cities are the same but the flight is on a different date. The markets are made up of airport-pairs between 15 Canadian airports. Please see Table 2 in the Appendix for a complete list of the airports being used.

3.2 Airfares

The variable of interest is the air fares for a given route. This was collected using future airfares off of the Travelocity website. The data is for two different dates November 10, 2012 and February 6, 2013, each with a return flight for one week later. The flights were chosen using the closest flight to a preferred departure time, which was set as noon.

The preferred departure time was used to choose the flight instead of the lowest fare to avoid the possibility of preferential prices being given to inopportune flight times. Noon was chosen as the preferred time as it generally not as desirable to the business travelers, which are the most focused on specific flight time, but is not an inopportune flight time for many travellers. The noon flight time is most likely to be chosen by non business travellers. This is useful as in certain markets airlines will use different strategies in attempting to capture market power. One of these strategies is offering less desirable flight times at a lower cost to their competition to get passengers with higher price elasticity. This strategy poses the risk of skewed results. If only one airline offers an early morning flight, as well as flights at more demanded times, then the flights in the sample, if chosen by cheapest airfare, will be aimed at different sections of the population. This would pose a risk of changing the impact of competition. Often the time of the flight has a large impact on the price, especially if it is a market with a high number of flights. The difference between the expected flight time and the preferred flight time has been recorded in the number of minutes between the two. For some routes there are large delays offered, and the range of flight time ranges from leaving at 12:15 in the morning to 10:50 that night, this large range occurs as for certain routes an airline may only offer late night or early morning flights. The average delay time is 116 minutes, or 1 hour and 56 minutes before or after noon. While this range is quite large, it is infrequent that the fares used were too distant from the preferred noon time and 67% of the fares used in this data set were expected to depart within a range of two hours from noon and 82% within a four hour range.

There are two main reasons for using the two dates. The first reason is in case of price dispersion. When the data was collected, the November date was approximately 1 month out, while the February date was approximately 4 months out. While price dispersion is not expected

to have a significant effect until two weeks before the date of departure on domestic flights it is not possible, with the data collected, to see how strong the dispersion is at given time. Thus the use of the two dates allows for there to be some control on how much the possible dispersion effects the estimates. The second reason relates to the possibility that if the date of departure is a weekend or not may impact the fare. November 10th is Saturday while February 6th is a Wednesday, therefore the two dates should hopefully help control for any bias that may occur for weekend, or weekday, trips. This bias should also be reduced due to the fact that the return ticket is a week later, as the length of trip and the fact there is a weekend in the duration of the stay, are assumed to be indicators, to some airlines, that the passenger is not solely a business traveler. Some airlines are now offering fares based on the each one-way route and these indicators have no impact on the prices. Generally, business travelers have lower price elasticity so stays with no weekend are given higher fares.

The air fares are for each airline flying a specific route. For each route there are two flight classifications used; preferred type and not preferred type. If there is a nonstop option, it would be the preferred while a flight with one or more being stops would not preferred. However, if there is no nonstop then one layover would be the preferred type with two or more layovers being not preferred. For each airline, there are up to two data points for a given market. This occurs when the airline offers flights from both the preferred and not preferred category. There are never more than two data points chosen for a given airline, market combination. Six was the most data points for a given market, which only occurred on markets with four competitors; this indicates that on a given market there are at most only two airlines that offer both the preferred and not preferred flight type.

3.3 Route Characteristics

The route characteristics consist of the distance and the length of the route. The distance was collected using the Travel Math website. The distance is the distance between the two end cities in kilometers. The distance does not take into consideration if there are layovers for the flight. The longer the distance, the higher the fare is expected due to increased costs and decreased turnover ability for the plane being used. The length of the flight is the total number of minutes the flight will take; this includes the time spent in layovers. The lengths of flights range from 39 minutes to 20 hours and 50 minutes. Not including flights with layovers, the range for the length is much smaller as it goes from 39 minutes to 5 hours and 43 minutes. The length was collected on Travelocity with the air fares and the competition variables. The length is useful as it is the airline's perception of how long the flight will take. Despite the fact the flights are going the same distance; the airlines will have different expectations for a nonstop flight in the same market. The longer the airline perceives the flying time may have an impact on their perception of the cost and when that plane will be ready to be used for its next flight.

3.4 Competition Characteristics

Competition was also collected from Travelocity. These competition variables consists of the number of airlines offering flights on the market, the total number of flights available on that market, and the number of flights the individual airline is offering for that market.

The total number of flights indicates the number of alternatives in a given market that are available to a passenger. The more flights available, the easier it is for a passenger to find one that will offer higher utility, through things such as preferred flight time or flight length. The number of airlines serving a market ranges from one to four. In total there are nine airline that offer services to a minimum of one of the markets observed. Five of these airlines offer services

on four or less markets and altogether these 5 airlines only offer 0.8% of the flights observed. As such they have been combined into a single dummy variable named *small*. The four airlines that offer 99% of the flights observed are Air Canada, WestJet, Porter Airlines, and Bearskin airlines. Table 3 shows summary statistics for the individual airline including the portion of the observations that belong to each of the airlines, as. Air Canada and Westjet offer the majority of flights observed, controlling 89.6% of the market. Air Canada is the only airline that has a monopoly in any of the markets, with 8% of the flights observed being in a monopolized market. The majority of markets are a duopoly with 60% having two airlines offering flights. Finally, 25% of the markets have three airlines and 5% have four airlines offering services.

3.5 Market Characteristics

The market characteristics variables consist of variables that are about the specific airports and cities that make up the endpoints of the flight.

The city characteristics are a tourism indicator and the per capita GDP. The tourism indicator used is the number of person-trips (in 1000s) in 2010 for each city. As the fares are looking at one day, I have computed the tourism to an average for each day of the year. The tourism indicator is only used for the arrival city. The tourism indicator ranges from 0.7698 (Thunder Bay) to 59.05 (Toronto). The average number of daily person-trips in 2010 was 15.75. The per capita GDP is used for both the city of departure and of arrival. Per capita GDP is also in 2010 values, as that was the most recent population data available. While it would be preferable to have a tourism indicator, and the per capita GDP from the same period as the fares are collected it is not available at this time. The earlier data is the most current for these variables and is used as a proxy for the 2012 data.

The variables that refer to the airports in the market are; the amount of commercial services at the airport, the number of itinerant movements, if it is a hub, and if it is an international airport. The number of commercial services available at the airport refers to the number of restaurants and retail shops at the airport. The more passengers that go through an airport, the more the commercial services are expected to be used, increasing the commercial profits for the airport which can be used to offset the aeronautical costs. The higher the commercial profits the lower the aeronautical fees need to be to maximize profits, or as in Canada the airports are not for profit, to cover costs. For the 15 airports observed, the number of services ranges from 1 to 123, with an average of 36 services offered. The number of itinerant movements[4] is the total of itinerant movements from 2011 which have been transformed to a daily average. The number of itinerant movements is an indicator of the traffic that goes through the airport. The airport's status as a hub is two dummy variables, one for departure airports and one for arrival airports. If hub is equal to one, then that airport is a hub for the specific airline. Of the observed flights, 40% include a hub at one or both of the endpoints, with only 3% of the flights having a hub at both endpoints. The international airport is a dummy which equals one if departure airport is an international airport. While this paper is focused on domestic flights, if an airport is an international airport then there will be increased demand for the airports slots due to international airline being allowed to use the airport. For the purposes of this paper an airport is considered international if international airlines are allowed access, as has been defined by Transport Canada.

[4] Transport Canada defines itinerant movements as " [aircraft movements] that arrive from or depart to a point other then the reporting airport, or where the aircraft leave the circuit"

3.6 Summary Statistics

Table 4 in the appendix presents the summary statistics for variables of interest. The sample size is 1261 flights.

As Canada is a large country, it is expected that the flight prices, distance, and lengths will have a large range. The average airfare is found to be $701.77 and range between $195.24 and $2635.96. The majority of prices are between $500 and $1000 with 70% of the observed fares falling in this range. While the prices observed do reach a high price, it is important to note that there are only three that are above $2000, each of which belong to one of the five smaller airlines. If these three prices are considered outliers, which is a reasonable assumption as the next highest price is under $1500; the average price falls to $697.84. The highest fares come from a combination of the small airlines and Bearskin. The average distance was 1985 KM, while the average length was 6 hours and 4 minutes.

Table 3 breaks up the price, distance and length, by looking at the averages of the airlines, not including the small airlines, as well as looking at the price in terms of the distance and the trip length. From the average prices, it is evident that WestJet and Porter offer lower fares on average while Air Canada and Bearskin have much higher average fares. It is important to note that Air Canada and WestJet offer many more observed flights than the other airlines which may impact the nominal averages. A better understanding of how price relates to the distances and length will be discussed in the results section.

Air Canada has the second largest average distance and length, topped only by WestJet in terms of distance and Bearskin in terms of length. When broken down to the price per kilometer and per minute there is a shift in the pricing order. There is a reversal in order between WestJet

and Porter as WestJet, which has the highest average distances and second longest flight lengths, is the cheapest airline in terms of per kilometer and per minute price. Porter in turn becomes the second cheapest in terms of distance and length but has the lowest average distances and lengths for flights offered. This indicates that while Porter may have a lower average fare, WestJet offers the cheaper service. Air Canada has lower average fares as well as fares per KM compared to Bearskin, both of which are above the average for those two specifications. However, when the fares are examined in terms of length of the trip, Air Canada is found to be more expensive than Bearskin. Air Canada is the only airline of the four to have fares more expensive than the average in each specification. If one assumes that the only variables of interest when computing airfares are the length and distance of the flight, then Air Canada can be said to offer the flights with the lowest value. However, fares are impacted by more than just how far one is going, as is the utility that a passenger receives from the flight.

4. Model

For this paper the impact of a variety of route and carrier specific variables on air fare will be examined. To do this, the following model will be used:

(1) $$LFare_{jik} = \beta_0 + \beta_1 LDistance_j + \beta_2 LLength_{jik} + X_{jik}\alpha + Y_{jk}\phi + \varepsilon_{jik}$$

where *LFare* is the log of the fare for *I* flight on route *J* and carrier *K.*

LDistance is the log of the distance between the two cities on route *K*

LLength is the length of time the total trip is expected to take.

X_{jk} is a vector of variables related to competition on a specific route, including the number of competitors, the total number of flights offered on that route, the number of stops for that flight, and which airline is offering the flight

Y_{jk} is a vector of variables related to the airports on each end of the flight, including: number of services, itinerant movements in 2011, if the airport is a hub for the given airline, if the airport of departure is classified as international, the per capita GDP for both cities, and the tourism indicator for the arrival city

ε_{jik} is a normally distributed error term.

This model allows for a broken down examination of the specified characteristics and their impact on Canadian air fares. For some of these variables the expectations are clear, such as distance and length having a positive relationship with fares, while the number of competitors is expected to have a negative relationship. Other characteristics I have included are less obvious in how they are expected to affect the fares. For the competition characteristics, the variable that is most ambiguous is the number of stops. Increasing the number of stops increases the cost due to increased distance, which for this paper is reflected in the increase to the flight length. However, passengers are less willing to pay increased fares for flights with more stops, and often airlines are able to use the hub-and spoke system, increasing the number of stops, to decrease marginal costs and thus the fares. The other variable that is ambiguous is the number of services at either end of the trip. More services are indicative of a more popular airport which means the flights will have higher demand, thus the airlines should be able to charge more, but theory suggests that more services also allow the airport fees, and as such the air fares, be lower.

This model will be looked at multiple times and with different specifications. By gradually including different variables to the model, it allows for some possible endogeneity issues to be addressed. The additional specifications enable interactions between variables to be visible. The types of endogeneity that are most likely to be in this model are measurement errors, and omitted variable bias.

For this data, measurement error is a possibility due to the way that the airfares were collected. As air fares were collected for round trip tickets only, there is potential that it poses a risk for errors in results on variables that concern the arrival/departure city. However, tickets are rarely purchased as one-way tickets, and it is possible for some of the routes to have discriminatory fares for one-way travellers, therefore results from using a one-way trip may not be consistent with the majority of flyers. Generally, the original arrival city is where the passenger plans to visit, therefore the original flight is a choice variable and the return is a response. This assumption about the trips allows for the further assumption that the tourism and other city characteristics are important to the trip of choice more than the return trip. These two assumptions allow for confidence in the results when using roundtrip tickets. Omitted variable bias could be caused from a variety of sources. Variables such as where layovers occur, load factor for a flight, and the average flight delay for a specific airline and market are all expected to have impacts on the airfare but are not included in this examination.

5. Results

This section will present the results from estimating model (1). The results will be presented in two parts; the overall results and the results by individual airline. All results are robust due to heterogeneity in the data.

5.1 Overall results

Table 5, broken into A and B, in the Appendix show the results for the overall model. Table 5 consists of five specifications for the model. Each specification uses additional variables to observe for the possibility of variable interactions. The first two specifications look at the results if either trip distance or length is the only explanatory variables. The third regression includes only the distance and length; this is to see any interactions that occur between the two.

The fourth specification brings in the competition variables (airline fixed effects, number of competitors, number of stops, and number of flights in a market). The final specification adds in the market characteristics (departure and arrival city variables).

The two variables that are expected to have the most significant impact on air fares are the distance and length of the flight. In Table 5, column one shows the results if the only explanatory variable is the distance and column two shows the results if only trip length is used. Both distance and length are found to be statistically significant at the 1% level. Column 3, of Table 5, shows the results if length and distance are used as the explanatory variable. When both the length and distance are explanatory variables, the individual impacts on price decrease drastically. The fact that the effect of both these variables decreases, confirms that they are correlated and they should both be included in the model to avoid omitted variable bias.

When both the distance and length are included as explanatory variables, a 10% increase in distance increases the price by 1% while the same change in length increases price by 2.7%. As more variables are added, in the fourth and fifth specification, the impact of the trip distance and length are again found to change in comparison to the earlier models, though they remain constant through these last two specifications. In the last two specifications, a 10% increase in distance approximately increases price by 1.3% and the same increase in length approximately increases price by 2.3%. These results are of economic significance. Using the average price which is $701.78, a 10% increase in distance, which would be approximately 200 kilometer increase from the mean, would add an extra $9.12 to the ticket price, and a 10% increase in the length, or an increase of 36.5 minutes from the mean, would increase fares by $16.14.

It is of interest that the trip length has almost double the impact of the trip distance. The assumed marginal costs to the airline for the flight would be focused mainly on the amount of time the airplane is in use. As the length of the trip is the total flying time plus the length of any layovers, one would expect that only the length of the flying time would have a significant change on the price. As the results indicate that the length has a larger impact on price than distance it suggests that the length of layovers may be of more importance than initially expected. To check this possibility, I have rerun specification 5, which is my preferred specification, using only nonstop flights. When only nonstop flights are considered, in the preferred specification, length and distance are both found to have a similar impact on the price, approximately an increase of 1.8% price increase from 10% increase. The fact that when no layovers are included in the model, the distance and the length have the same impact indicates that the length of layovers has a positive relationship with the air fare. The presence of a layover indicates that the overall distance has increased beyond the point to point distance, which would increase the overall cost, though the length of the layover would not increase the airlines costs. Depending on the layover the connecting flight may also have more demand and thus increase the cost of the second flight.

The fourth column in Table 5 consists of the results when the competition variables are added into the model. The total number of flights is found to be statistically significant at the 1% level. The economic significance of the number of flights is found to be small when considering a single additional flight however, if a large number are added the economic effect is notable. An increase of one flight would decrease that markets prices by 0.8%. However, when a new airline enters the market or a current airline tries to gain a large percent of the market share and increases the total number of flights by 10, which is the average number of flights an airline

offers in one market, the prices would decrease by approximately 8%. An 8% decrease of the average fare would be a decrease of $56.

Table 5B shows the results for the dummy variables for the number of competitors and the number of stops. The dummies are in comparison to the base groups which are a monopolistic route for the number of competitors and a nonstop route for the number of stops. The number of competitors on a route range from one to four; a dummy variable has been used for each. The number of stops range from none to seven, with no flights having six stops. However, Bearskin is the only airline in the model to have more than three stops, most likely due to the fact it is a regional airline focusing service on small northern communities. As only one airline and 2% of the flights have more than three stops, I have opted to include all stops of four or greater into one dummy variable, while all stops three or less each have their own dummy variable.

The results show that increasing competitors on the route decreases the prices. If the market changes from a monopoly to having two, three or four airlines offering services in the market, the fares are expected to decrease by 15%, 23%, and 28% respectively. Testing shows that the difference between two and three competitors is statistically different, while three and four competitors are statistically equivalent. This result is consistent with Ayers (1988) who reports that it was when there were two additional carriers, for a total of three, that prices began to converge to competitive price levels.

The results show that changing from a nonstop flight to one or two stops will decrease the fares while increasing to three or more stops is found to increase the fares. However, one and two stops are found to be statistically equivalent as is the difference between no stops and two

stops. Nonstop flights are not found to be statistically equivalent to flights with one stop. Flights that are made up of one or two stops generally make use of the hub-and-spoke system. Airlines make use of the hub-and-spoke system to increase traffic on less used flights which decreases marginal cost so the fares can be lower. The hub-and-spoke system increases the hassle for the passengers and so lower fares would encourage choosing these flights. It is of interest that the nonstop flights are statistically equivalent to the flights with two stops. This indicates that the optimal usage of the hub-and spoke system is when the trip has only one stop.

When the market characteristics are added into the model, the results for the number of competitors and number of stops change as shown in Table 5B. The statistical relationships of these variables with each other remain intact; it is their impact on the fares that alters. These adjusted results are of economic significance and indicate that the market characteristics are correlated to the competition characteristics. When the market characteristics are not included in the model then they become a part of the error term, which in turn means that the results for the competition variables are skewed as they are reporting results that are incorporating the impact from the omitted variables.

The majority of market characteristics only have a small level of economic significance in determining air fare; however, the impact on the competition variables indicates that the market characteristics are important to understanding the fares. When the model is broken down further by airline, it is expected that these variables will show more significance. This is expected since the decisions about competition levels are in part based on the market that they are serving. While the market characteristics may not be of great economic or statistical significance, the fact that they impact the competition variables indicate that not including them would create an endogeneity issue.

Looking at the correlations between the number of competitors and the market characteristics, it can be seen that the correlation is generally strongest with the base group. The monopolistic market has a negative correlation with each of the market variables. The market characteristics are indicative of the appeal the market has to passengers, which in turn would encourage more competition in the market as it would be easier to attract passengers given the higher demand. The market characteristics that are most correlated with the base competition are the per capita GDPs for both the city of departure and arrival, with correlations for both being -0.35, which indicates that the more money in a market draws in more airlines and it is less likely the route is monopolistic.

For the number of stops, the correlations of the base stop, which is a nonstop flight, with all the market characteristics are positive. For all the other number of stops, there is a negative correlation with the market characteristics, except for the per capita GDP of the arrival city and having one stop. This relationship has a correlation of 0.01, which indicates that it does not have a large impact. The fact that the market characteristics have a positive relationship with nonstop flights indicates that airlines are more willing to offer direct flights to the cities with high appeal to passengers. This makes sense with the hub-and-spoke system, since less popular routes are usually routed through a hub thus increasing the number of stops.

When adding the market characteristics, I find that when both the per capita GDP as well as city dummies are included in a regression there is a high level of collinearity. This means that the GDP per capita appears to control for any city specific characteristics that may be impacting the results. Due to this finding, I opted to exclude the city dummies in my final regressions. I also used the logged form of the per capita GDP, which is supported by specification testing. The economic significance of the market characteristics directly on the price is not large. However,

as previously mentioned, it is important to the model due to the relationships with the competition variables. The variables that are found to have a negative impact on the expected price are the number of services at both airports, as well as the number of itinerant movements for both the airport of departure and arrival. All the other market characteristics have a positive impact on the expected price.

The results for the market characteristics are in line with the economic theory as well as previous research. I find number of services at the airports as well as the number of itinerant movements is found to decrease the expected fares. Research such as Zhang and Zhang (1997) found that the number of services decreased the fares due to cross product price substitution decreasing the fees from the airport. The more itinerant movements that go through an airport would in theory decrease the charges per individual. Canadian airports are not for profit organizations, and thus when they are able to spread out the costs over more flights and people, the individuals' costs will decrease. Also, if an airport has a large number of itinerant movements then it is expected that the passengers have more choice for flights. The current model has already shown that the more total flights on a given day, the lower the fare and so it can be concluded that the larger number of itinerant movements will lead to lower fares. For the other aspects that were examined including international airports, hub airports, tourism levels, and per capita GDP, the fares are found to increase. Each of these factors is expected to increase fares as they each lead to increased demand for that route. The impact of airport congestion is another important factor. When congestion is too high, it will lead to increased prices at optimal flight times to try and encourage passengers to fly at non-congested times, as found in Salvanes, Steen and Sograd (2004) and Borestein and Netz (1999).

5.2 Results by airline

Given the fact that the market variables were found to have more of an influence on the competition variables and that testing finds the airlines not to be equivalent it is of interest to see how the individual airlines respond to changes in the markets, be it a market change or competition change. As the airlines have different objectives, from the level of services they offer to the areas of the country in which they operate, it would be expected that they would have different responses in their fares to market determinants. To examine how the four main airlines are affected by the determinants I have run the preferred specification, with all of the explanatory variables, for each airline. Table 6 shows the results of running the specification from column (5) in Table 5 on the individual airlines.

When broken down by airline, the results show that the fares react very differently to the market characteristics depending on the airline. The two variables that are found to be of statistic and economic importance to each of the four main airlines are the distance and the length. Flight distance and length are found to have the smallest impact on Air Canada flights and largest on Bearskin. The airline response to flight length is found not to be statistically different across airlines, however the response to flight distance is. Further examination shows that the impact of the flight distance is statistically equivalent across Air Canada, WestJet, and Porter. For these three airlines, the effect of the flight length is greater than the effect of the distance. However, for Bearskin the opposite pattern was found. For Bearskin and WestJet the differences between the distance and length are not found to be statistically significant. For Air Canada and Porter the difference is significant, and for each the length has over twice the effect of the distance.

Only distance and length are found to be of statistical importance to all four of the airlines. For the other variables, the statistical and economic importance varies. The total number

of flights is not significant to the fares charged by Porter or Bearskin. The impact of the total number of flights is consistent between Air Canada and the overall model, which are 0.3 percentage points greater than the impact on WestJet. As Air Canada offers more than 50% of the flights observed, it may skew the overall results. I find that when I run specification 5 for all airlines, excluding Air Canada, the impact of total number of flights decreases by half, decreasing the fares by 0.04% for each additional fight.

Each of the dummy variables for the number of stops is found to be significant only for flights offered by Air Canada. For the other airlines, having one stop is significant at the 10% level. Economically, having one stop is found to have a large decrease on fares offered by Air Canada and Bearskin, decreasing the price by 10% and 14% respectively from the base group. WestJet and Porter had a much smaller impact, decreasing prices by 3% and 8% respectively. For Air Canada, changing a flight from nonstop to two or three stops decreases the price by 12% and 31% respectively. It is surprising that three stops decrease Air Canada's prices so drastically, since in the overall model three stops is found to increase fares. It is most likely to do with the fact that Air Canada offers the most flights, and with this high quantity there are more opportunities for connecting flights. The only other airline that has a number of stops, not including one stop, to have a statistically significant impact on fares is Porter. Increasing the number of stops to three on Porter is found to increase the fares. This is in line with my conclusion that the number of potential connections impacts the price as Porter only offers 5% of the flights in my sample, one-tenth of the flights offered by Air Canada.

As Porter and Bearskin airlines do not have routes in which they are the sole carrier, I have altered the dummies for number of competitors so that the base dummy is having one competitor. For all four airlines, having two competitors is found to be statistically equivalent to

having three competitors, which is expected given the assumption that when a market has three carriers it reaches competitive pricing, which is in line with the results for the overall market as well as research done by Ayres (1988). A monopolistic route is expected to create a larger price increase for WestJet than for Air Canada. Numerically, a change from a duopoly to monopoly on Air Canada would increase prices by about $107 and on WestJet by about $217. For routes with two or three competitors, Air Canada is expected to have a larger price decrease than WestJet. While at first glance the effects of competitors on Air Canada and WestJet are different, statistical testing shows that for each level of competition they are equivalent.

The market characteristics have the most effect on Air Canada's fares. For the arrival cities characteristics, only the airport's status as a hub does not have a statistically significant effect on Air Canada's fares. While the city characteristics are found to be of statistical significance on Air Canada's fares, they are of small economic significance. For each of the other airlines, only one arrival city characteristic is found to be statistically significant. For both WestJet and Bearskin, the per capita GDP are found to be statistically significant. The largest economic impact that any of the arrival city characteristics has on one of the given airlines is the per capita GDPs impact on WestJet. A 10% increase in arrival city per capita GDP will increase WestJet's air fare by 4.8 percentage points, which is 5 times greater than the impact on Bearskin prices, and 10 times greater than the impact on Air Canada prices. For Porter, the only arrival city characteristic that has statistical significance is the level of tourism, though it is of low economic significance, as a 10% increase in tourism would increase Porters prices by 7 percentage points.

The statistical and economic significance of the departing city characteristics is greater on Air Canada's fares than the city of arrival. For the departing city, the number of itinerant

movements and the per capita GDP do not have a statistically significant impact on Air Canada's fares. However, if a departing city's airport is an international airport, then it is expected to increase Air Canada's fares by 9.6%, and if it is a hub it is expected to increase fares by 15%. The only departure variable that is statistically significant for WestJet is if the airport is an international airport which is found to raise the fares by 4%. Porter also has fares increased by 23% if the airport is designated as international. While per capita GDP of the arrival city was statistically significant for all the airlines except Porter, in the case of the departing city it is only significant for Porter. A 10% increase in per capita GDP for the departing city will increase Porter's fares by 4 percentage points. Finally, Bearskin's fares are found to be increased by the amount of services offered by the airport and decreased by number of itinerant movements. An airport with a high number of itinerant movements is more likely to have a higher number of slots available for the airlines to use, which could allow for cheaper rates for the use of that airport. The fact that the services increases Bearskin's prices is surprising as it goes against the research as well as the earlier results using this model. A possible explanation for this result is that Bearskin is a regional airline and focuses mainly on small airports which offer few services. Thus, when it is departing from an airport with a high level of services, it is not one of the airports on which it focuses its services and therefore has a smaller presence at. As it has a smaller presence as the airport the marginal cost per passenger will be higher for the airline to use that airport, thus increasing total fares.

6. Conclusion

While the Canadian fares are higher than in other parts of the world, the impact of competition and market determinants are found to impact the fares in a way that is consistent

with the previous literature which has been focused internationally. My results indicate that the route characteristics (distance and length) consistently have a significant impact on air fares for the overall industry and for each of the four main airlines from the sample. When looking at further possible determinants I find that there is less consistency in the Canadian industry. For the industry as a whole I find that the number of competitors as well as the total number of flights offered on a given market has a large negative impact on the fares. The number of stops for a flight has differing impacts on the price depending on the number, there is a slight decrease for flights that have one or two stops, flights that have three or more stops are found to have a substantial impact increasing the fares.

When market characteristics are added to the sample it is the changes in the competition characteristics that has the biggest impact. I theorized that this is due to the fact that it is unlikely that any of the market characteristics would have an economically significant impact on what the airline is able to charge, but will instead impact the airlines' level of supply to the market which will in turn impact fares. This theory is strengthened by the changes to the competition variables, as well as the correlations that are found between the competition and market characteristics. Overall the market characteristics are found to have the most direct impact on Air Canada, the largest of the airlines. For each of the other airlines only a select few of the market characteristics have a direct impact on the fares. The differing results that are found when the sample is broken up by airline reaffirm the fact that each of the airlines approaches the market differently, and with differing strategies.

This is just an initial look into the determinants of Canadian air fares. I suggest that future research attempt to take a more in depth look into this topic. There are a few areas that additional research would increase the understanding of this subject greatly. First, it would be of use to

have a larger sample set, covering more flight dates. If more dates were looked at the ability the potential weekend bias could be accounted for, which would allow for a comparison of how fares respond to the which day of the week the trip is taken. Second, it would be useful to have more information about the stops, such as which city they are in and the length. This would allow for a better discussion on the impact of the hub-and-spoke system in Canada. Third, including an estimate for load factor, as well as the planes size, would allow for a further discussion on the hub-and-spoke system. A possible proxy for load factor could be made using the data for number of annual passengers and itinerant movements, though this would be airport load factor not airline. Finally, the impact of average flight delays for a given route, or airline depending on data availability, as well as people's perceptions of the airlines would allow for a discussion on how the airlines past market behaviour impacts their fares as well as their market power.

Appendix

Table 1: Data Description

Variable	Summary	Retrieved From
Fare	Fare paid for a given flight	Travelocity
Distance	Distance in KM between departure and destination	Travel Math
Length	Total expected time between departure and arrival	Travelocity
Competitors	Dummy variables for Air Canada, WestJet, Porter, Bearskin, and a collective variable for the small airlines	Travelocity
Number of Competitors	Number of airlines offering flights for a specific market on the specific day	Travelocity
Total Flights	Number of flights offered for a market on the specific day	Travelocity
Number of Stops	How many stops between departure and destination	Travelocity
Number of Airport Services	How many Restaurants and Shops available at the airport	Individual Airports' Websites
Hub Airport	Dummy variable if the airport is a hub for the given airline	Individual Airlines' Websites
International	Dummy variable indicating if international airlines are allowed to use the airport	Transport Canada
Tourism	Number of person-trips. 2010 values	Cansim
Itinerant Movements	Number of non-local movements of aircrafts to/ from the airport. 2011 values	Cansim
Per Capita GDP	GDP and population levels per metropolitan area in 2010 values used to calculate the per capita GDP	GDP- Conference Board of Canada Population-Cansim

Table 2: Airports

Airport	City	Code
Calgary International Airport	Calgary	YYC
Edmonton International Airport	Edmonton	YEG
Halifax International Airport	Halifax	YHZ
London Municipal Airport	London	YXU
Montreal Pierre Elliot Trudeau International Airport	Montreal	YUL
Ottawa McDonald Cartier International Airport	Ottawa	YOW
Quebec International Airport	Quebec city	YQB
Regina Airport	Regina	YQR
St John Airport	Saint john	YSJ
Saskatoon Airport	Saskatoon	YXE
St John's Airport	St. Johns	YYT
Thunder Bay Airport	Thunder bay	YQT
Toronto Pearson International Airport	Toronto	YYZ
Vancouver International Airport	Vancouver	YVR
Winnipeg International Airport	Winnipeg	YWG

Table 3: Airline Summary Statistics

Airline	Price	Price per km	Price per Min	Distance	Length	Number Obs	% of flights offered
Air Canada	748.20	0.59	2.84	2012.04	359.05	677	53.6%
WestJet	635.05	0.39	2.08	2160.76	386.45	452	36%
Porter Air	448.94	0.46	2.31	1165.32	248.93	74	5.8%
Bearskin	1035.56	0.81	2.46	1468.35	459.95	45	3.5%
Total	699.73	0.52	2.52	1996.35	366.12	1248	

Table 4: Summary Statistics

Variable	Mean	Min	Max
Price	701.77 (239.764)	195.24	2635.96
Length (minutes)	366.955 (203.795)	39	1250
Distance (km)	1985.326 (1150.847)	166	5022
Total	18.209 (1.095)	3	36
Number of airlines on route:			
One	0.085	--	--
Two	0.602	--	--
Three	0.253	--	--
Four	0.057	--	--
Number of Stops:			
None	0.252	--	--
One	0.467	--	--
Two	0.239	--	--
Three	0.017	--	--
Four	0.016	--	--
Five or more	0.005	--	--
City Characteristics:			
Services at Airport	--	1	123
International	0.7256	--	--
Hub	0.4060	--	--
Tourism	15.75	16.86	59.052
Observations	1261		

Standard Deviations in Parentheses

Table 5A: Regression Results

	(1)	(2)	(3)	(4)	(5)
Distance	0.2752*** (0.0149)	--	0.1012*** (0.0163))	0.1341*** (0.0161)	0.1339*** (0.0163)
Length	--	0.3476*** (0.0137)	0.2744*** (0.0175)	0.2369*** (0.0249)	0.2383*** (0.0254)
Total Flights	--	--	--	-0.0085*** (0.0015)	-0.0081*** (0.0017)
Arrival city:					
Services	--	--	--	--	-0.0005** (0.0002)
Itinerant Movements	--	--	--	--	-0.0001** (0.0000)
Hub	--	--	--	--	0.0118 (0.0198)
Tourism	--	--	--	--	0.0024*** (0.0006)
GDP	--	--	--	--	0.0672*** (0.0198)
Departure city:					
Services	--	--	--	--	-0.0012*** (0.0002)
Itinerant Movements	--	--	--	--	0.0000 (0.0000)
Hub	--	--	--	--	0.0370** (0.0198)
International	--	--	--	--	0.0752*** (0.0166)
GDP	--	--	--	--	0.0095 (0.0209)
Number of Competitors	No	No	No	Yes	Yes
Number of stops	No	No	No	Yes	Yes
Airline Fixed effects	No	No	No	Yes	Yes
Constant	4.4646	4.5079	4.1792	4.5733	4.7697
Observations	1261	1261	1261	1261	1261

Results are not weighted. Standard errors are in parenthesis.
*significant at 10%, **significant at 5%, ***significant at 1%

Table 5B: Regression Results

	(1)	(2)	(3)	(4)	(5)
Number of Competitors:					
Two	--	--	--	-0.1508***	-0.1876***
				(0.0265)	(0.0347)
Three	--	--	--	-0.2354***	-0.2952***
				(0.0289)	(0.0357)
Four	--	--	--	-0.2804***	-0.3340***
				(0.0408)	(0.0447)
Number of stops:					
One	--	--	--	-0.0555**	-0.0693***
				(0.0229)	(0.0230)
Two	--	--	--	-0.0396	-0.0546*
				(0.0287)	(0.0290)
Three	--	--	--	0.1512**	0.1176*
				(0.0678)	(0.0696)
Stops 4-7	--	--	--	0.1889***	0.1708**
				(0.0727)	(0.0721)

Results are not weighted. Standard errors are in parenthesis.
*significant at 10%, **significant at 5%, ***significant at 1%

Table 6: Regression Results By Airline

	AC	WJ	PO	BS
Distance	0.1172***	0.1881***	0.1255**	0.3238***
Length	0.2208***	0.2371***	0.3327***	0.2739***
Total Flights	-0.0087***	-0.0055**	-0.0000	0.0053
Number of Competitors				
None	0.1441***	0.3440*	--	--
Two	-0.1273***	-0.0712***	-0.0532*	-0.5385*
Three	-0.1638***	-0.0964*	-0.1082*	-0.2091***
Number of stops				
One	-0.1031***	-0.0399	-0.0802	-0.1451
Two	-0.1257***	0.0005	0.0437	--
Three	-0.3183***	-0.0061	0.1493	-0.0548
Four-Seven	--	--	--	-0.0547
Arrival city:				
Services	-0.0009*	-0.0002	-0.0000	-0.0048
Itinerant Movements	-0.0001*	-0.0001	-0.0005	0.0000
Hub	0.0151	-0.0601	--	--
Tourism	0.0027***	0.0227	0.0078**	0.0012
GDP	0.0405**	0.4821***	0.1256	0.0946***
Departure city:				
Services	-0.0029***	-0.0005	-0.0018	0.6042***
Itinerant Movements	-0.000	-0.0000	-.0001	-0.0636***
Hub	0.1574***	-0.0073	--	--
International	0.0961***	0.0409*	0.2323**	--
GDP	0.0031	0.1111	-0.4214*	--
Constant	5.0145	5.1797	2.7176	12.0149
Observations	677	454	74	45

Results are not weighted.
*significant at 10%, **significant at 5%, ***significant at 1%

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