THE CONTESTABILITY HYPOTHESIS

AND

CANADIAN AIR TRANSPORT MARKETS

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Until the late 1970's, the economic research in industrial organization was mainly empirical and based on the theoretical doctrine that the structure of the market determines conduct and performance. The structure-conduct-performance paradigm sought to explain the performance of a firm in terms of its conduct, which in turn depends on the structure of the market that is often taken to be exogenous.

Market structure is often characterized by four main aspects: 1) the number and the size distributions of sellers in the market; 2) the number and the size distributions of buyers in the market; 3) the degree of product differentiation practised by the various sellers in the market; and 4) the height of the barriers of entry. The conduct of the firm is the process of choosing the desired levels of several decision variables, such as methods and scale of production, prices, advertising, R&D, etc.. The conduct of the firm is evaluated under various concepts of economic efficiency and the result of this evaluation is referred to as performance.

The centrepiece of the economics of industrial organization in the period of 1950 to 1975 was the intuitive hypothesis that persistently concentrated industries result in greater monopoly power and profits. Advocates of the structure-conduct-performance paradigm often relied on casual observations of industries, institutional descriptions, and metaphors to assert the link between the structural characteristics of an industry and the conduct of its firms as well as the link between the conduct of these firms and the industry's performance. The development of a theoretical basis for explaining these hypothesized links was generally sidestepped.

In the last decade, the economics of industrial organization has been going through a major change. The structure-conduct-performance paradigm has been challenged. A substantial rethinking of the causes, nature and effects of competitive behaviour has taken place. The new literature in this field is mainly theoretical in nature. Under the "New Industrial Organization," industrial structure is no longer taken to be exogenous, but needs to be explained. The basic assumption of the new literature is that of non-cooperative behaviour by firms. The new approach attempts to explain structure, conduct, and performance from the fundamental conditions of consumers' preferences and technology. The new approach also stresses the sequential nature of firms' decisions as well as the role of differential and asymmetric information.

Among the theoretical developments of the New Industrial

Organization, the theory of contestable markets, developed by Baumol, Panzar and Willig (1982), provokes much excitement and controversy. These authors claim that competition has more to do with ease of entry and exit than with the presence of a large number of small firms, one of the main characteristics of a perfectly competitive market.

A market is said to be perfectly contestable if

(1) Potential entrants operate under identical cost conditions as incumbent firms do;

(2) There is no barrier to entry;

(3) There are no sunk costs, thus, exit from the market is costless;

(4) Incumbent firms' prices move slowly in response to entry.

When a perfectly contestable market is in equilibrium, the following results will hold:

(a) There are no profits to be made. If total revenue exceeds total costs, a potential entrant could enter and slightly undercut the incumbent firms to make positive profits, which implies that the situation prevailing before entry was not an equilibrium. This result holds even if there is only one incumbent firm in the market.

(b) When there are at least two incumbent firms, the price will be equal to marginal cost. Indeed, if price is less than marginal cost, an incumbent firm can increase profits by producing one unit less. On the other hand, if price exceeds marginal cost a potential entrant will enter the market, and slightly undercuts the incumbents, then exits before the incumbent firms can react by changing price. The equality of price and marginal cost clearly fulfils a basic condition for Pareto optimality.

The above results imply that if a market is perfectly contestable, then there is no need to worry about market concentration. As a contribution to welfare and public policy analysis, the concept of perfect contestability has deep implications. It emphasizes potential competition rather than actual competition as a mechanism for efficient resource allocation. It also suggests policy measures that remove government and legal restrictions on entry and exit. In their initial enthusiasm, the authors of the contestability hypothesis more than once cited that the airline industry as a case in point. The theory of perfectly contestable market has provided one of rationales for the process of airline deregulation that took place in 1978 in the United States. Several researchers, such as Bailey, Graham, and Kaplan (1985), Call and Keeler (1985) have attempted to test the contestability hypothesis.

The driving force behind the airline deregulation movement in the United States was the belief that an unregulated airline industry would reduce air fares and greatly benefit consumers. This same force also existed in Canada. However, it was mainly the demonstration effect of the U.S. airline deregulation on consumers and policy makers in Canada, as well as the observed diversion of Canadian air traffic to transcontinental U.S. routes (to take advantage of cheaper deregulated U.S. air fares) that made the deregulation of the Canadian airline industry necessary and inevitable. After much hesitation and years of observing the U.S. experiment, airline deregulation became official in Canada on January 1, 1988, almost a decade after the U.S. airline deregulation. At the present time, the Canadian airline industry is still in transition, although some researchers, such as Oum, Stanbury, and Tretheway (1991) have presented a preliminary analysis of the successes and failures of the airline deregulation in Canada.

The purpose of this paper is to test the contestability hypothesis for the Canadian airline industry. In so doing, the paper also examines the applicability of the theory of perfectly contestable markets to the air transport industry in Canada. Although the contestability hypothesis, as a theoretical justification for airline deregulation in Canada, has been questioned by authors, such as Jankowski (1989), Gillen et al. (1986), no attempt has been made to test this hypothesis. The empirical results reported in this paper represents an effort to fill part of this gap.

The organization of the paper is as follows. In section I, the theory of perfectly contestable markets is presented. Section II contains a brief exposition of airline economics. Section III presents the major developments in U.S. airline deregulation, since a knowledge of these developments is necessary in explaining the deregulation of the Canadian airline industry. Section IV presents a brief description of the structure of the Canadian airline industry. The contestability hypothesis is tested for Canadian airline markets in section V. Some concluding remarks are given in Section VI.

I. The Theory of Perfectly Contestable Markets

The theory of perfectly contestable markets was originally advanced by Baumol, Panzar, and Willig (1982) in the late 1970's and early 1980's. Some developments since that time were discussed by Baumol and Willig (1986). In this section, we present the theory of perfectly contestable markets under the framework of a two-stage game, as expounded by Sutton (1990).

The game begins in the first period with a group of firms deciding whether to enter the market for a homogenous good. If a firm chooses not to enter, then its costs and its pay-off are all zero. If a firm decides to enter, it must incur a set-up cost, say $\epsilon > 0$. The set-up cost is not recoverable, thus constitutes a sunk cost. This sunk cost, once incurred, plays no role in the firms's pricing strategy after entry.

In the second period, the firms that have entered the market compete against each other. Let p be the market price and q=q(p) be the industry demand. All the firms that have entered are assumed to produce at a constant marginal cost c. We first look for a Nash equilibrium in price strategies, i.e. a Bertrand equilibrium. Let p^* be the lowest price in the market and k be the number of firms that set price at this level. We also assume that the market is shared equally among these k firms. More precisely, if a firm sets its price p in the second period, then its profit in this period will be $\pi = (p-c)q(p)/k$, if $p = p^*$; and zero if $p > p^*$. The pay-off for a firm that enters the market over the two periods equals the profit earned in the second period minus the sunk cost incurred in the first period, that is $\pi - \epsilon$. To make the problem non-trivial, we assume that, $\pi > \epsilon$, the profits earned by a monopolist in the second period exceed the set-up cost. By the familiar Bertrand undercutting argument, the equilibrium market price must equal marginal cost if two or more firms have entered. Hence the profit in the second period is zero for each firm.

Because the sunk cost is strictly positive, $\epsilon > 0$, the only outcome of the two-stage game supported by a subgame perfect equilibrium is one in which exactly one firm enters the market and sets the monopoly price. To see why, note that, if one firm has entered, the optimal strategy for the other firms is to stay out of the market because entering will yield a negative pay-off equal to $-\epsilon$. This result holds for any positive value of the set-up cost. Hence if post-entry price competition is sufficiently intense, even a small level of set-up costs will deter entry.

In the limiting case where $\epsilon = 0$, i.e., there are no sunk costs, as assumed by the theory of contestable markets, several equilibria will appear. One equilibrium involves exactly one firm entering the market and setting the price such that profits are equal to zero. In this case, if another potential entrant decides to enter the market, then he will make zero profits, too. Since a potential entrant is indifferent between entering or not entering, this equilibrium is clearly viable. There exist other equilibria that involve two or more firms that set price equal to marginal cost. These equilibria are analogous to the competitive outcomes studied in the literature of perfectly contestable markets. If there are no barriers to entry, and exits are costless ($\epsilon = 0$), then the market is contestable. The firms in this market make zero profits.

The theory of perfectly contestable markets requires the assumption of no barriers of entry and costless exit (zero sunk costs). In reality, however, sunk costs are always present and must be incurred in connection with long-run decisions on entry, advertising, and R&D. It is the interplay of sunk costs and price competition following the entry that determines market structure.

A variation of price competition in the second period involves the use of quantity strategies by the firms that have entered the market. Each firm sets an output level, taking the outputs of other firms as given. A Nash equilibrium in quantity strategies is known as a Cournot equilibrium. It is well known that under Cournot equilibrium price exceeds marginal cost. For a given positive level of set-up cost, $\epsilon > 0$, if the post-entry profit exceeds the set-up cost, $\pi > \epsilon$, more potential entrants will enter the market. Because the profit of each firm in the second period tends to zero as the number of firms gets larger, there exist a unique number of firms that the market will support. Below this critical level, positive profits can be made by entering the market; once this critical level has been reached, the profits made by a potential entrant in the second period are not sufficient to cover the sunk cost required at the time of entry. Market structure is thus uniquely determined by consumers' preference (demand) and technology (cost conditions).

II. Airline Economics

In this section, we present some fundamental characteristics of airline economics needed for later discussion. For a more detailed treatment of general civil aviation (airplanes, airports, regulations and air traffic control, etc.), we refer the reader to Taneja (1989) and Wells (1989). A readable introduction to airline economics can be found in O'Connor (1985). For a more advanced treatment of the subject, we refer the reader to a book entitled "Airline Economics" edited by James (1982).

The civil aviation industry consists of three components: the air carriers, the airports, and the air traffic control and navigation system. We shall now discuss briefly these components one by one.

Air carriers:

The airline industry consists of a vast network of routes that connect cities of a country or of the world. Over this network, a large number of air carriers provides scheduled passengers and cargo services. The scheduled services are supplemented by chartered flights and private planes flown by individuals or by companies for their own purposes.

In 1987, for example, 21 U.S. and 2 Canadian airlines, which are member of the Air Transportation Association, have the fleet composition as follows (see Taneja, 1989, pp. 130):

(1) The Boeing 727, a three-engine, medium-range airplane made up 33 percent of the fleet or 1,148 out of 3,476 aircrafts;

(2) The Douglas DC-9 and the Boeing 737, both of which are two-engine, short-to-medium-range airplanes made up another 39 percent of the fleet;

(3) The rest of the fleet ranged from the Fokker F-28, with 85 seats and 1000-mile range to the Boeing 747, with 450 seats and a range exceeding 6000 miles.

Airline companies produce several different outputs, such as scheduled passenger services, charter passenger services, and cargo services. These outputs are produced over routes of varying lengths. To understand the behaviour of an air carrier, it is necessary to take into account the joint-product nature of production over a system of routes as well as the spatial competition existing in the industry.

The production plan of an air carrier is represented by its network schedule. In preparing a network schedule, an air carrier first selects the airports it wants to serve. The selected airports, which are a set of points in the plane form the basis on which the network is planned. Then, the air carrier decides which routes to serve. This decision actually determines how the chosen airports are connected. Next, the air carrier chooses the input-output relationships on each of the chosen routes; these input-output relationships capture the firm's multi-product production function. This production function specifies a relationship between the units of air transportation services produced on each route and the required inputs - labour (i.e., ground workers and flight crews, etc.), capital (i.e., aircrafts), and fuel. Formally, the production function might be expressed under the following form (Reynolds-Feighan, 1992, pp. 71):

$$Y = F(PILOT,\ FA,\ FUEL,\ CAP,\ AGENT)$$

where Y is a vector of outputs, measured, for examples, by available seat miles (for passenger service), available ton miles (for cargo service) on each route. Here a seat mile is an output measure denoting one seat flown one mile and a ton mile is a ton of cargo flown one mile. The vector of outputs Y captures the joint-product nature of the firm's production process both in terms of the different services offered (passenger service, cargo service) and the different geographical locations of these services (one seat mile produced on one route and one seat mile produced on another routes are considered to be different products). The variables PILOT and FA are vectors of inputs for pilots and flight attendants on each route. Similarly, FUEL (fuel input), CAP (capital input, i.e. aircraft capacity), AGENT (ground agents) are vectors of inputs on each route. The above production function captures the air carriers's technology over space.

Given input prices, the air carrier's optimal input combination and optimal output prices depend on the traffic potential existing between each pair of cities it decides to serve as well as the competition from other air carriers. However, a proper formulation of spatial competition that involves a group of joint-product firms is quite complicated.

The production function approach to an air carrier's network schedule allows us to look at the strategic behaviour of an individual airline and the interdependence of air routes in a rigorous manner. However, the theoretical constructs of the New Industrial Organization have yet to find their way into research on air transportation. Academic research on the airline industry has consistently viewed the problems and made assessments at the industry levels. The lack of an explicit and formal treatment of the flight network as well as the game-theoretic aspects of the airline industry has led to contradictions and disputes in the literature assessing this industry's performance before and after deregulation.

Airports:

We now discuss the second component of the civil aviation industry: airports. In the United States, airports may be owned by a city, a county, or an independent authority. In Canada, major international airports are owned and operated by the federal government through the Ministry of Transport.

An airport serving large air carriers is a complex system consisting of three major elements: airside services, terminal operation, and landside facilities. The airside services include the services on airfield surfaces on which airplanes move. These surfaces include runways, taxiways, and terminal aprons (the ramp areas surrounding the terminal where airplanes park and unload passengers). The terminal serves as an interchange between airside and landside facilities. The terminal building contains passenger loading and waiting areas, ticket counters, security check points, baggage handling facilities, airline operations offices, customs and immigration facilities, etc.. The landside facilities comprise the roadways and fixed guideways leading to and from the airport as well as auto parking facilities.

The main sources of operating revenue for an airport are: landing fees paid by commercial air carriers, incomes from concession and parking fees, and charges for the use of terminal areas and hangars. An airport's expenses are divided into two categories: operating and nonoperating expenses. Operating expenses include such items as administration and staffing; maintenance of landing areas, terminals, hangars, and ground equipments; expenses on utilities, insurance, security, and communications. Nonoperating expenses include debt interests and depreciation.

The Air Traffic Control and Navigation System:

The last component of the civil aviation system is the air traffic control and navigation system. An airplane relies on the services provided by this system to operate safely in domestic and international airspace. While the International Civil Aviation Organization is responsible for the international coordination of air traffic control systems, each country has its own agency responsible for operation and maintaining its domestic air traffic control system as well as regulating the use of its national airspace. In the United States, these responsibilities are taken by the Federal Aviation Administration. In Canada, these responsibilities belong to the Federal Ministry of Transport.

At a more practical level, studies on the airline industry often focus on its cost and revenue structure to determine its profitability.

The bulk of air transportation revenues comes from the carriage of passengers. For the United States, 84 percent of revenues come from scheduled passengers service and only 2 percent form charter passenger service. Cargo services (freight, mail, and express) account for 10 percent of revenues. A more detailed discussion of air transport costs and revenues can be found in Swierenga and Crandall (1982).

The cost structure of the airline industry can be examined by looking at the different functions of air transport services. Flight operations account for the largest category of expenses. The cost of flight operations are fuel costs and salaries for flight crews. The maintenance function involves the maintenance of aircraft as well as other properties and equipments. The aircraft and traffic serving function includes airport and ticket counter operations, baggage handling, flight check-in, landing and parking of aircraft at terminals, routine cleaning and maintenance between flights, loading and unloading cargo. The passenger service function includes activities that provide safety and comfort for passengers. The major expenses of this function are wages and benefits of flight attendants and the costs of foods served on the aircraft. The promotion and sales function deals with advertising, ticket operations, computer reservation. A major cost of this function involves compensation for reservations agents. The administrative function handles accounting, payroll, insurance, legal, budgeting, and planning operations.

In addition to the cost associated with the functions just discussed, an airline company must also take into account interest expenses, depreciation of properties, equipments, and aircraft in computing its profits. The profitability of an air carrier is often assessed with the help of three measures: unit yield, unit cost and load factor.

It is common practice to measure passenger travel by revenue passenger miles rather than by total passengers carried to aggregate long and short trips. Here a revenue passenger mile denotes the actual transport of one paying customer for one mile. Revenue passenger miles are computed for each flight by multiplying the flight distance by the number of passengers carried on that flight, who have been charged for their transportation. Unit yield is defined as the average price of air transportation per revenue passenger mile. In 1987, for example, unit yield ranged from 7.33 cents (US$) for Braniff to 45.73 cents (US$) for air Wisconsin (see Taneja, 1989, p. 135). For cargo service, the unit yield is the average price of air transportation per revenue ton-mile.

The costs of operating an air carrier have already discussed. To arrive at the unit cost, it is necessary to take into account the capacity of the air carrier. Capacity is measured by available seat-miles for passenger transport and available ton-miles for cargo transport. Because it is impossible to separate the costs of passenger and cargo transportation for an air carrier that provides these two services jointly, it is necessary to convert available ton-miles into available seat-miles to arrive at an aggregate number representing the capacity of an air carrier. The unit cost is then the cost per available passenger mile. In 1987, the unit costs for Braniff and Air Wisconsin are 5.56 cents and 20.82 cents, respectively (see Taneja, op. cit.).

Unit yield and unit cost by themselves are not sufficient to determine the profitability of an airline. It is also necessary to consider the load factor. By definition, the load factor for any flight is the ratio of seats occupied to seats available. Most data on load factors are averages over entire months, years, or the entire network. The key to understanding load factors is to recognize the wide fluctuations of air travel around monthly averages. Because the number of seats on an aircraft for scheduled services is necessarily inflexible, the seat supply cannot be shrunk or expanded from one day to the next day to accommodate the wide variations in demand for air travel.

III. U.S. Airline Deregulation

The U.S. commercial aviation industry was regulated by the government for a period of 40 years from 1938 to 1978.

The main object of the Civil Aeronautics Act of 1938 were to improve airline safety, to insure economic stability of the industry, and to promote industry development. The act placed all commercial air transport regulations, both economic and safety, within one federal agency consisting of three separate bodies: 1) the Civil Aeronautics Authority (later known as the Civil Aeronautic Board), responsible for economic and safety regulations; 2) the Air Safety Board, responsible for investigating air accidents; and 3) the Administration of Aviation, responsible for carrying out the safety policies of the Civil Aeronautics Authority. In 1958, the U.S. Congress passed the Federal Aviation Act, which amended and replaced the Civil Aeronautics Act of 1938. This new act established the Federal Aviation Agency (FAA) whose mission was to regulate airspace; develop and operate air navigation facilities; prescribe air traffic rules for all aircrafts; carry out research and development of safety regulation; certify pilots, maintenance facilities, and maintenance personnel. Responsibility for investigating civil aircraft accidents as well as economic regulatory authority over airlines remained with the Civil Aeronautics Board (CAB).

Under regulation, an air carrier must obtain a certificate from the CAB before being able to engage in the business of providing public air transportation. To obtain such a certificate, applicants were required to convince the CAB that they were fit, willing, and able to perform properly the proposed transportation and that such transportation is required by the public.

Certificates were often very detailed. They specified intermediate and junction points, and in some cases required or prohibited stops or through services. Often the carriage of traffic between certain pair of cities was named in the certificate, and even the carriage of certain categories of traffic was prohibited. An important aspect of the regulatory regime was that airlines could not lawfully suspend or abandon a route without the approval of the CAB. Air fares were also controlled by the CAB, which allowed the industry to cover its operating costs and earn an adequate rate of return on investment.

Prior to deregulation, the airline industry's structure consisted of four principal groups of carriers: trunk lines, local service lines, intrastate lines, and commuter airlines. The trunk lines included most of the largest airlines and were mainly engaged in scheduled passenger transport. Trunk carriers were also authorized to transport cargo and provide charter service. In 1970, there were 11 trunk lines that accounted for about 90 percent of the domestic passenger market. Local service lines provided air service to smaller communities not located on the trunk route system. Intrastate lines were carriers that operated within the states of California and Texas. By avoiding interstate routes, these airlines were able to operate scheduled services without a certificate from the CAB. In addition to the four groups of carriers just mentioned, there were two specialized categories of carriers -- one concentrating on charter and one concentrating on all cargo operations.

Through the 1960's and early 1970's, criticisms of the CAB's regulatory regime became widespread. The rigidity of the regulatory regime was blamed for restraining competition, increasing costs to travellers, making the industry less efficient than it could be, and denying large segments of the American public to lower cost transportation. Even a special CAB staff study on regulatory reform, dated July 1975, concluded that the airline industry is naturally competitive and regulation is not justified. Widespread support for some type of reform was crystallized in 1975 at the Kennedy's oversight hearings. Most major U.S. airlines, with an eye on future expansion or obtaining domestic routes, eventually came to support deregulation. The Air Deregulation Act finally became law in October 1978.

In the years following deregulation, the list of airlines offering scheduled service grew by 75 additional carriers, consisting of totally new carriers, formers charter (supplemental), intrastate, and commuter carriers. The expansion of the number of carriers lasted from 1981 to 1984, a relatively short period.

Between 1984 and 1986, a combination of financial failures and mergers reduced rapidly the number of viable carriers in the industry, and most of the additional 75 carriers have ceased to exist (see Pickrell, 1991, Table 2.1). These carriers are now classified into four groups, based on annual revenue, as follows: major carriers, national carriers, large regional carriers, and medium regional carriers.

A major carrier has an annual operating revenue of more than one billion dollars; a national carrier has an annual revenue between 100 million and one billion dollars; a large regional carrier has an operating revenue between 10 million and 100 million dollars; a medium regional carrier has an annual revenue of less than 10 million dollars. In 1987, there were 12 major carriers, 11 national carriers, 24 large regional carriers, and 22 medium regional carriers. The new Big Four -- Texas Air Group, United, American, and Delta -- accounted for more than 60 percent of the total scheduled passenger traffic (see Taneja, 1989, p. 129).

Taking full advantage of the liberalization of entry and exit made possible by deregulation, airlines have altered their route structures to utilize their resources more efficiently: new routes were opened; less profitable routes were downgraded or abandoned. The most dramatic development after deregulation was the shift to the hub-and-spoke systems made by major carriers (see Brenner et al., 1985, Ch. 7). Airline hubs refer to those airports (typically two or three) around which the entire route structure is organized. A hub-and-spoke system consists of a set of "spoke routes" flying to and from major hubs. The major air carrier that creates a hub-and-spoke system flies some of the spokes of this system. Commuter, local, or smaller carriers that cooperate with the major carrier fly the other spokes. A set of much longer and heavier regional spokes connect major hubs and are operated by the creator of the particular hub-and-spoke system. The development of a hub-and-spoke system is also seen as a strategic move by a major carrier to deter entry into its market: a potential entrant who contemplates entering this market would not have access to the traffic provided by important feeder carriers aligned with the major carrier.

Air fares, which are not constrained after deregulation, are now much more a function of competition. On some routes fares have been reduced to levels below those of 1978; on other routes, fares have doubled or more than doubled. What has developed is a two-tier pricing pattern -- lower fares on intensely competitive routes and higher fares on less competitive routes. To deal with changes in travel demand patterns and the actions of competitors in thousands of markets, some major carriers have invested large sums of money in developing sophisticated computer reservation systems (CRS) that they put at the disposal of travel agents. The availability of sophisticated CRS's also allows the development of seat-management systems that enable air carriers to cope with the growth of discount fares after deregulation.

IV. THE CANADIAN AIRLINE INDUSTRY

Canada, by area, is second only to what used to be known as the Soviet Union. It has a population of about 26 million, the majority of which live within 100 miles of the common border with the United States to the south. The geography and the spatial distribution of the population prohibit other modes of transport from becoming economically viable competitors. The availability of reasonable air fares makes it totally unattractive to travel cross country by vehicles. Because of its importance to both the economy and the social fabric of the nation, air transport has been the focus of much policy making in Canada.

In 1937, the federal government created Trans-Canada Airlines (TCA) as a Crown corporation to provide transcontinental air service within Canada. One year later, the Transport Act of 1938 imposed economic regulation on the civil aviation industry. The transport act gave the Board of Transport Commissioners, a group that had traditionally regulated rail transport, the power over licensing, fares, entry, and route extensions. The Act emphasized the preeminence of TCA and the subservient role of the other carriers as providing feeder service to the Crown carrier. In 1941, United Air Service, a subsidiary of Canadian Pacific Railways, was founded. One year later, United Air Services was renamed Canadian Pacific Airlines (CPAL), and from this time on the history of the Canadian airline industry until the present time can be characterized as a duopoly game between TCA and CPAL.

Between 1959 and 1965, CPAL's share of the transcontinental market was about 12.7 percent. The regional carriers, which had grown during these years, were confined to serving non-overlapping regions of the country and providing feed for the two transcontinental carriers. In 1966, the regional Air Policy was established, which specified the regions in which each regional carrier was to operate in the following manner (see Oum, Stanbury and Stretheway, 1991, p. 129):

* Pacific Western Airlines (PWA), -- British Columbia and western Alberta;

* Transair -- the Prairies and northeastern Ontario (with

access to Toronto);

* Nordair -- the remainder of Ontario and northwestern Quebec;

* Quebec Air -- all of Quebec east of Montreal;

* Eastern Provincial Airlines (EPA) -- the Atlantic provinces (with access to Montreal).

The regional carriers were meant to serve local and regional routes as a supplement to the mainline operations of Air Canada (TCA was renamed Air Canada in 1964) and CPAL. The two major carriers were encouraged to transfer many routes to the regional carriers.

In 1978, the United States deregulated its airline industry. The U.S. airline deregulation exerted a tremendous impact on Canadian consumers and policy makers and started the deregulation process in Canada. In 1979, all restrictions on CPAL's transcontinental market share was removed, and Wardair, Canada's largest charter carrier, was licensed to provide domestic, advance-booking charters in the transcontinental market. From 1981 to 1982, the Department of Transport issued studies that proposed less restrictive regulation. On May 10, 1984, the Minister of Transport announced plans for a relaxation of controls on entry and air fares. In 1987, Parliament passed the National Transportation Act, which came into effect on January 1, 1988. The National

Transportation Act of 1987 subjects Canadian air carriers to two distinct regulatory regimes. In the north, carriers are still subject to controls over fares, entry, and other conditions of service. In the south where most of the Canadian population live, there is almost complete deregulation. In this region, entry and exit are now free and limitations on frequency as well as capacity are removed.

In 1982 when deregulation was dawning in Canada, the structure of the Canadian airline industry (see Oum, Stanbury and Stretheway, 1991, table 5.1) portrayed a high degree of concentration. The largest carrier was Air Canada, which had 52 percent of the total number of passengers carried. The next largest carrier, CPA, had 16 percent. There were four regional carriers - PWA, Nordair, EPA, Quebecair - with market shares, respectively, of 15 percent, 4 percent, 4 percent, 3 percent. Wardair, a charter carrier, accounted for the remaining 7 percent. In 1987, CPAL merged with the four regional carries to form Canadian Airlines International Limited (CAIL). In 1990, CAIL purchased Wardair. Today there are essentially only two large carriers in Canada: Air Canada (fully privatized in 1989) and CAIL. The Canadian airline industry is now a duopoly.

In addition to controlling the high-density routes, the duopolists, after their consolidation efforts, also control most of the feeders in Canada. Air Canada feeders include Air BC, Air Ontario, Air Alliance, Air Nova, Northwest Territorial, First Air, Air Toronto. The feeders for CAIL are Time Air, Calm Air, Ontario Express, InterCanadian, Air Atlantic (see Oum et al. 1991, table 5.4). There are a small number of turboprops and a small number of charter carriers still operating in Canada; their revenues, measured in terms of market shares are, however, insignificant (see Oum et al. 1991, table 5.3).

The air route system in Canada is a liner hub-and-spoke structure, with Toronto and Vancouver as primary hubs, and Ottawa, Montreal, Halifax Edmonton, Calgary as secondary hubs. In the domestic market, the most lucrative routes involve the golden triangle Montreal-Ottawa-Toronto. International traffic is fed through Toronto and Vancouver, with the former handling traffic bound for Europe and the latter handling traffic bound for the Pacific. Both of these primary hubs also handle North/South U.S. traffic. The international air routes, obtained through bilateral agreements with foreign countries, are divided between Air Canada and CAIL (see, for example, Freedman 1991, Appendices D and C for the policy of international route division).

The response of Canadian air carriers to deregulation was as expected. Air fares increased in less competitive markets and decreased in international routes or long-haul domestic routes, where competition is more intense. As is the case of U.S. airline deregulation, Canadian air carriers have adopted various dynamic seat inventory management techniques made possible by a sophisticated computer reservation system. Pricing strategies are now designed to take into account of both air service demand and the reactions of competitors. Another expected result of deregulation, namely an increase in service frequency, has also been observed.

V. THE CONTESTABILITY HYPOTHESIS AND THE CANADIAN AIRLINE INDUSTRY

In this section, we test the hypothesis that the Canadian airline industry is perfectly contestable.

The theory of perfectly contestable markets has been presented in Section I. When there are no sunk costs, there exists a multitude of equilibria:

(a) There exists a monopoly equilibrium. That is, only one firm enters the market and sets the monopoly price.

(b) There exist other equilibria with two or more firms entering the market. Under these equilibria price is equal to marginal cost.

The results described in (a) and (b) only require the assumption of no sunk costs. If the incumbents cannot change price immediately after a potential firm has entered the market, then marginal cost must equal price even for the monopoly equilibrium. Indeed, if there is only one firm in the market and if this firm sets price above marginal cost, then a potential entrant can enter the market, undercuts the incumbent firm slightly, then exits the market before the incumbent firm has a chance to react. This hit-and-run strategy is clearly profitable.

The preceding discussion implies that if airline markets are perfectly contestable, then air fares should not depend on market structure. That is, given any degree of market concentration, the firms that constitute this market structure always set price equal to marginal cost. Hence a finding that shows the dependence of air fares on the structure of markets casts doubt upon the hypothesis that these markets are perfectly contestable.

The econometric model we use in this section is primarily based on Bailey et al. (1985, Ch.9). Let us consider an air travel market, which can be defined as a pair of cities linked by an air route. The average cost, say C, of serving a passenger in this market depends on:

(a) the distance between the two cities (DIST);

(b) the traffic density of the air route (PAX);

(c) the quality of service, which, in equilibrium, is assumed to be measured by flight frequency (FREQ).

Algebraically, we can write

$$C = C(DIST, PAX, FREQ).$$

The ability of air carriers to set price (FARE) above cost is assumed to depend on market concentration which can be measured by the Herfindahl index of concentration (HERF) and potential competition (PE), i.e.,

$$FARE = M(HERF, PE) * C,$$

where M(HERF, PE) is the mark-up.

These two equations can be combined to yield the following supply equation for the market:

(1) $$FARE = F(DIST, HERF, FREQ, PAX, PE, U_1),$$

where U_1 is an error term. We expect that FARE goes up if DIST, HERF, FREQ, PAX go up, while PE has a negative effect on FARE.

The demand for air service in the market depends on price (FARE), income of travellers (INC), the population (POP) of the two cities, service quality (FREQ), and distance (DIST).

(2) $$PAX = P(DIST, INC, FARE, FREQ, POP, U_2),$$

where U_2 is an error term.

Equation (2) is the demand function for the market under consideration. We expect PAX to vary in the same direction with INC, FREQ, POP, while the effects of DIST, FARE on PAX should be negative.

As for market concentration (HERF), it should decline as traffic volume (PAX) goes up. Because aircraft size increases with distance, market concentration is expected to increase with distance (DIST). Similarly, an increase in service quality (FREQ) is also expected to increase market concentration. If a market serves a major hub with many carriers, then it is expected to have a lower market concentration than another market serving only minor airports. Bailey et al.(1985, p. 157) introduced a variable (HUB) to capture this effect. Algebraically, we write the equation determining market concentration as

(3) $$HERF = H(PAX, DIST, HUB, FREQ, U_3),$$

where U_3 is an error term and HUB is a dummy variable taking on the value one if the route touches a hub and zero otherwise. The inclusion of HUB as a determinant of structure was criticized by Call and Keeler (1985, p. 237) as being difficult to justify theoretically and for causing serious downward bias in the coefficients of concentration of entry variables.

Together (1), (2), (3) constitute the system of simultaneous equations that we are going to estimate. These equations are estimated with the variables in logarithms. The data are collected for those city-pair markets that are located in the south and that had at least 10,000 inbound and outbound passengers in 1990. The variables of the equations (1), (2), (3) are calculated as follows.

FARE, measured in Canadian dollars, is the one-way economy/coach fare.

PAX is the number of origin-and-destination passengers in a city-pair market, as reported in AIR PASSENGER ORIGIN AND DESTINATION, DOMESTIC REPORT 1990, published by Statistics Canada (Catalogue No. 51-204).

DIST, measured in miles, is the nonstop distance between the to cities that constitute a market.

HERF, the Herfindahl index of market concentration, is computed by summing the squares of the market shares of all the firms in the market. The market share of a carrier is based upon its departure share.

FREQ is the number of weekly departures of nonstop and one-stop scheduled flights in a market.

INC and POP are, respectively, the product of per capita incomes and the product of the populations of the two cities that constitute a market. This type of specification is often used in gravity models of transport demand (see, for example, Smith, 1989, p. 111-121).

PE is the number of carriers that do not serve the market under consideration, but that have one of the cities constituting the market either as origin or as destination; this measure of potential competition was suggested by Morrison and Winston (1987, p. 58).

HUB is a vector of dummy variables, one for each of the major airports. When a city-pair market contains one hub, this hub has a dummy variable equal to one while the other airport's dummy takes on the value of zero. If both airports in a city-pair market are hubs, their dummies all take on the value of one. The determination of a large or medium hub is based on traffic volume reported in AIR CARRIER TRAFFIC AT CANADIAN AIRPORT (October 1990), published by Statistics Canada (Catalogue No. 51-005).

The technique of two-stage least squares is used to estimate the system of simultaneous equation (1), (2), (3) with all the variables in logarithms. Following Bailey et al. (1985), we also estimated the system for two cases:

Case A: FARE, PAX and HERF are endogenous;

Case B: FARE and PAX are endogenous, but HERF is exogenous.

The estimates of the FARE equation, i.e. equation (1) are presented in the following table.

The estimated coefficient of LNDIST and LNFREQ are high and statistically significant for both cases. Whether market structure

ESTIMATES OF FARE EQUATION

	CASE A	CASE B
Constant	1.4063 (6.722)	1.4125 (6.466)
LNDIST	0.6114 (20.655)	0.6192 (26.619)
LNFREQ	0.1928 (2.815)	0.1795 (2.975)
LNPE	-0.0121 (-0.797)	-0.0100 (-0.705)
LNHERF		0.1244 (1.860)
LNHERFHAT	0.2736 (0.782)	
LNPAXHAT	-0.0866 (-1.182)	-0.1057 (-1.829)
Adjusted R^2	0.8980	0.9002

Note: The data used for estimation consist of 121 observations and the numbers in parentheses are the adjusted t-statistics.

(HERF) is treated endogenously or not, the estimates are approximately equal in both cases. An increase in the distance (DIST) between the two cities by 10 percent would cause air fares to increase about 6 percent. The effect of service quality (FREQ) is relatively smaller: an increase of departures by 10 percent only causes air fares to rise by about 2 percent.

The negative effect of potential competition (PE) is as expected, but rather weak. The estimated point elasticity is only 1 percent and is statistically insignificant whether market structure (HERF) is treated endogenously or not.

The estimated coefficient of LNPAX has the expected sign and is relatively small in both cases. It is significant when market structure is treated exogenously but insignificant when market structure is treated endogenously.

When market structure (HERF) is treated exogenously, the estimated coefficient of LNHERF is 0.1244 and its t-statistic (1.860) indicates that it is significant at the 5 percent level of significance. On the other hand, when market structure is treated endogenously, the estimated coefficient of LNHERF is not significant even at the 10 percent level. Again, following Bailey et al.(1985), we used the test proposed by Hausman (1978) to test the hypothesis that market structure is exogenous and found that this hypothesis could not be rejected. Therefore, we accept the estimates of the fare equation by treating FARE and PAX as endogenous variables but treating HERF as an exogenous variable.

The analysis just performed leads us to reject the hypothesis that the Canadian airline industry is perfectly contestable. Using the estimated price equation we can assert that air fares in a duopoly market (HERF = 0.05) is 8.6 percent lower than those in a monopoly market (HERF = 1).

VI. Conclusion

The econometric analysis carried out in the preceding section casts doubts on the hypothesis that the Canadian airline industry is perfectly contestable. This result is not surprising. Previous empirical studies on the U.S. airline industry, such as those performed by Bailey et al. (1985) or Call and Keeler (1985) did not support the theory of perfectly contestable markets, either. In light of these empirical studies and recent developments in theoretical industrial organization, the enthusiasm over the theory of perfectly contestable markets has declined. The airline industry, initially claimed to be a model of perfect contestable markets, is now accepted as departing significantly from the contestability model (see Baumol and Willig, 1986).

There are several arguments that can be advanced to explain why airline markets are not perfectly contestable.

First, entry into a market always involves sunk costs, such as the costs of purchasing new aircrafts for a new comer. Although the costs of entry into the airline industry are lower than those required to enter other industries (i.e., the manufacturing), they are still substantial. The theoretical model presented in Section I asserts that as long as sunk costs are positive, only one firm will enter the market and set the monopoly price if competition is through price. If the Cournot framework is adopted, then firms will compete in quantities. Under this framework, price is above marginal cost and the number of firms is endogenously determined. More precisely, under Cournot equilibrium the active firms make zero or positive profits, but if entry into the market is attempted by another firm, this firm will make negative profits. The existence of sunk costs, therefore, will deter entry. For some potential entrants who entered the industry for the first time, there might be shortages in the supply of aircraft due to delivery lags that might stretch for a few years.

Second, the extreme assumption that incumbents cannot change price immediately after the entry of a new carrier, and, therefore, the potential profitability of a hit-and-run strategy, is not born out in reality. After deregulation, established air carriers were observed to match instantaneously the fares of new competitors.

Third, the airline industries in the U.S. and Canada have always been highly concentrated. After deregulation, major air carriers have consolidated their operations and formed new alliances with smaller feeder carriers. In Canada, as already explained in Section IV, the result is a duopoly structure with two players, Air Canada and CAIL, and their affiliated feeders. This makes the entry of a potential airline extremely unlikely because this potential entrant would lack the feeder traffic from smaller communities. In rationalizing their route networks, the major air carriers have adopted the hub-and-spoke system to take advantage of economies of scope due to the spatial nature of air service production. A new potential entrant will be reluctant to enter a market served by a major carrier. These game-theoretic aspects of the airline industry are completely absent in the theory of perfectly contestable markets.

Fourth, in response to deregulation, major airlines have made heavy investments in computer reservation systems (CRS). The control of these distribution channels provides a great advantage over potential entrants.

Finally, it should be noted that deregulation affects only the airline industry. The other two components of the civil aviation systems -- airports and air traffic control -- are still under the control of the government. At the two primary hubs in Canada, namely Vancouver and Toronto, there is a shortage of airside and slot controls are in effect. The National Transportation Act of 1987 also does not allow foreign ownership to exceed 25 percent of any Canadian airline. This restriction thus limits considerably potential competition from foreign companies.

Our analysis, like most academic research on the airline industry, has been conducted at the industry level. A deeper understanding of air transportation markets, we believe, can only be achieved by descending to the microeconomic level. Efforts should be directed to formalizing the spatial nature of economies of scope involved in the production of air service and the game-theoretic aspects of fare and route scheduling.

Appendix

DATA ON SELECTED SCHEDULED AIRLINE CITY-PAIR MARKETS (1990)

OBS	DIST	FARE	HERF	FREQ	INC	PAX	PE	POP	LHUB	MHUB
1	79	95	0.41	92	295.7	18.6	7	28,558.8	1	0
2	89	143	0.51	230	372.1	18.7	0	1,145,743.2	1	0
3	94	144	0.44	314	327.3	18.2	1	1,918,310.2	1	1
4	98	144	0.50	162	324.8	31.8	0	52,144.2	0	1
5	102	152	0.53	102	275.1	15.5	0	51,250.0	0	1
6	108	95	0.43	112	334.1	44.5	7	44,900.8	1	0
7	115	68	0.50	104	401.3	17.2	0	1,153,934.2	0	1
8	120	152	0.50	130	405.4	31.7	0	276,656.3	0	1
9	120	153	0.51	174	231.0	21.8	0	1,836.8	0	0
10	142	158	0.53	464	312.3	18.6	3	639,333.9	1	0
11	142	159	0.50	102	487.9	18.3	0	366,185.9	1	0
12	148	106	0.73	104	320.4	22.5	1	54,611.2	0	0
13	154	118	0.52	350	476.5	288.4	1	2,780,031.5	0	1
14	162	142	0.50	108	320.6	42.8	8	96,941.3	1	0
15	162	142	0.50	104	295.7	29.4	7	64,733.3	1	1
16	162	163	0.52	92	325.4	27.1	0	210,952.4	0	1
17	163	77	0.50	90	349.0	19.7	0	44,438.0	0	1
18	173	142	0.51	176	362.5	135.3	7	365,421.4	1	0
19	186	158	0.51	120	389.9	26.4	1	218,641.3	1	0
20	190	168	0.52	144	412.7	46.3	0	1,194,500.0	0	1
21	195	161	0.52	152	437.8	59.4	1	6,064,619.8	1	0
22	198	170	0.65	22	284.6	15.7	4	27,093.0	0	0
23	210	166	0.54	162	399.0	76.0	1	572,213.3	1	0
24	213	159	1.00	36	343.7	19.1	9	449,642.4	1	0
25	226	179	0.50	450	374.1	785.0	2	183,522.7	1	1
26	228	151	1.00	32	349.0	13.6	1	150,769.3	0	1
27	255	184	0.52	106	332.3	34.8	0	69,529.9	0	1
28	257	180	0.72	36	295.7	20.1	2	78,009.6	0	1
29	262	191	0.43	124	375.9	18.3	2	802,482.8	1	0
30	268	184	1.00	36	286.1	16.6	8	39,189.0	1	0
31	281	184	0.51	64	388.7	9.2	1	593,476.8	0	1
32	301	202	0.82	60	347.8	24.1	2	2,516,625.6	0	1
33	307	191	0.53	134	418.9	25.6	3	2,730,353.7	1	0
34	307	195	0.50	112	410.4	53.3	1	319,934.9	1	0

(Continued on the next page)

DATA ON SELECTED SCHEDULED AIRLINE CITY-PAIR MARKETS (1990)

OBS	DIST	FARE	HERF	FREQ	INC	PAX	PE	POP	LHUB	MHUB
35	315	203	1.00	64	453.7	38.5	3	1,420,021.6	0	1
36	315	205	0.46	612	334.7	1447.9	3	874,033.9	1	0
37	324	208	0.50	114	374.1	54.7	1	140,150.7	0	1
38	326	220	0.45	130	332.2	131.4	7	110,110.0	1	0
39	332	209	0.51	86	318.6	39.6	5	124,966.0	0	1
40	335	214	0.50	74	314.9	41.1	7	25,544.3	1	0
41	347	222	0.90	36	336.7	29.4	1	255,000.0	0	1
42	347	203	0.51	116	399.0	56.7	2	182,328.5	1	0
43	350	213	0.51	70	389.8	23.9	3	60,554.5	1	1
44	377	216	0.43	106	374.4	22.6	4	194,993.1	0	1
45	383	223	0.51	64	230.0	28.2	3	371,942.5	1	0
46	404	233	1.00	40	445.8	24.7	4	328,889.0	1	0
47	404	270	0.65	122	222.6	11.4	0	37,687.5	0	1
48	412	228	0.50	116	390.8	76.8	1	2,243,065.9	0	1
49	413	252	1.00	28	248.7	10.3	4	110,102.4	1	0
50	421	255	0.72	118	430.1	16.9	2	1,404,617.0	0	1
51	427	231	0.50	552	378.3	420.9	7	227,281.3	1	1
52	431	233	0.52	54	357.1	36.5	2	1,294,665.6	0	1
53	432	250	0.38	88	303.4	62.0	6	28,241.5	1	0
54	440	236	0.52	106	320.6	57.3	5	328,902.2	0	1
55	440	241	0.91	40	362.9	52.7	4	93,222.1	1	0
56	444	239	0.55	24	396.7	24.8	2	261,452.2	0	1
57	452	807	1.00	218	399.0	11.7	1	2,377,532.8	0	0
58	453	268	0.69	200	468.2	75.0	4	643,878.7	0	1
59	468	217	0.54	116	326.4	14.3	7	97,575.9	1	0
60	471	250	0.53	62	345.6	51.3	8	27,606.8	1	0
61	476	249	0.51	34	398.7	17.6	2	574,117.1	0	1
62	501	258	0.51	172	324.0	139.5	3	88,562.5	1	1
63	503	258	0.49	250	416.6	330.5	6	722,404.8	1	1
64	508	270	0.51	58	275.1	13.0	1	3,500.0	0	1
65	510	285	0.72	118	306.7	11.7	3	89,438.9	1	0
66	515	284	0.93	58	262.5	17.5	4	18,406.3	1	0
67	534	264	1.00	52	302.9	24.6	3	324,755.7	0	1
68	536	293	0.54	176	332.9	60.0	5	231,254.4	0	1
69	547	270	0.50	218	347.5	106.4	2	495,812.5	0	1

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DATA ON SELECTED SCHEDULED AIRLINE CITY-PAIR MARKETS (1990)

OBS	DIST	FARE	HERF	FREQ	INC	PAX	PE	POP	LHUB	MHUB
70	564	270	0.51	102	444.6	197.1	2	469,773.0	1	0
71	571	308	0.54	42	369.4	14.3	2	402,498.7	0	0
72	594	276	0.55	184	316.8	127.6	2	194,375.0	0	1
73	608	307	1.00	30	330.6	23.7	3	225,139.4	0	1
74	661	301	1.00	88	314.9	53.5	1	21,375.0	1	0
75	663	336	0.72	82	364.7	13.7	3	379,035.9	1	0
76	677	319	0.50	120	340.5	19.0	4	109,423.1	0	1
77	688	306	1.00	66	346.6	53.6	1	472,448.6	1	0
78	741	319	0.52	60	316.2	85.1	5	50,184.0	0	1
79	743	319	0.50	140	336.5	122.5	4	37,237.8	0	1
80	751	322	0.90	44	298.9	80.1	8	58,748.8	1	0
81	752	322	0.93	110	246.2	73.5	1	17,269.2	1	0
82	759	340	0.68	60	359.0	12.8	5	4,893,233.1	1	0
83	777	353	1.00	50	380.8	18.0	6	792,383.5	0	0
84	802	336	0.51	254	293.2	326.3	0	32,906.3	1	1
85	827	373	0.93	112	271.2	52.2	1	181,653.5	1	0
86	830	342	1.00	54	298.9	74.8	8	39,946.7	1	0
87	851	380	1.00	42	408.1	16.7	5	736,576.5	0	0
88	936	373	0.50	172	458.3	354.1	4	994,588.5	1	1
89	973	413	1.00	56	280.4	43.6	1	460,981.4	1	0
90	1,006	385	0.78	78	284.2	44.7	5	505,792.4	1	0
91	1,052	401	0.51	158	401.0	104.9	6	170,597.3	0	1
92	1,098	411	1.00	76	510.7	40.0	4	3,383,970.7	0	1
93	1,132	426	0.51	122	334.7	78.3	7	594,306.1	1	1
94	1,162	434	0.50	150	288.0	171.1	11	56,324.3	1	1
95	1,182	468	0.69	82	318.6	29.0	8	183,784.9	0	1
96	1,263	463	0.60	68	343.7	93.2	1	305,737.8	1	0
97	1,320	470	0.51	112	346.6	127.8	2	626,873.6	1	0
98	1,375	492	0.52	52	297.3	88.6	1	134,434.1	1	0
99	1,384	493	0.57	84	340.5	29.2	3	145,189.2	0	1

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DATA ON SELECTED SCHEDULED AIRLINE CITY-PAIR MARKETS (1990)

OBS	DIST	FARE	HERF	FREQ	INC	PAX	PE	POP	LHUB	MHUB
100	1,464	516	0.72	82	289.9	18.2	4	144,335.9	1	0
101	1,481	524	0.52	64	401.0	26.0	3	250,894.0	0	1
102	1,557	545	0.53	70	284.2	16.4	4	381,194.8	1	0
103	1,605	563	0.50	124	338.5	23.1	4	963,781.3	0	1
104	1,675	572	0.50	182	355.3	417.9	0	44,729.0	1	1
105	1,676	572	0.51	154	310.6	290.4	1	169,156.8	1	1
106	1,777	602	0.52	136	332.9	69.3	3	157,243.2	0	1
107	1,794	602	0.51	228	374.1	89.0	2	206,116.8	0	1
108	1,851	626	0.50	170	331.1	62.0	4	529,176.0	1	1
109	1,873	626	0.50	204	372.0	104.4	3	471,654.1	1	1
110	1,915	667	1.00	40	305.3	12.1	1	151,679.0	1	0
111	2,084	683	0.50	232	405.8	670.0	7	2,478,826.4	1	0
112	2,100	720	0.50	156	408.1	73.6	4	1,083,268.2	1	0
113	2,213	717	0.63	158	450.2	148.0	9	230,355.1	1	1
114	2,233	755	0.53	76	436.8	27.7	6	108,803.4	0	1
115	2,294	739	0.52	122	332.9	169.1	10	2,000,038.9	1	0
116	2,295	761	0.51	120	424.1	25.1	1	3,119,078.4	0	1
117	2,314	776	0.51	98	426.4	15.2	7	11,788,663.8	1	0
118	2,333	852	0.55	184	363.7	31.3	0	13,527.8	0	1
119	2,359	270	0.53	62	336.0	115.9	7	986,865.2	1	0
120	2,782	910	0.56	36	275.1	11.9	4	38,625.0	0	1
121	2,795	877	0.51	126	322.2	40.4	7	202,656.3	1	1

OBS = Observation
DIST = Distance (miles)
FARE = Passenger fares (Canadian Dollars)
HERF = Herfindal index
FREQ = Flight frequency (departures per week)
INC = Per capita personal income (000s Canadian dollars)
PAX = Passengers (000s)
PE = Potential competition (number of airlines)
POP = Population (000s)
LHUB = Major hub
MHUB = Medium hub

NAMES OF SELECTED CITY-PAIR MARKETS

OBS	PAIRS OF	CITIES
1.	POWELL RIVER, BC	VANCOUVER, BC
2.	LONDON, ONT	TORONTO, ONT
3.	MONTREAL, QUE	OTTAWA, ONT
4.	CHARLOTTETOWN, PEI	HALIFAX, NS
5.	HALIFAX, NS	MONCTON, NB
6.	CAMPBELL RIVER, BC	VANCOUVER, BC
7.	CALGARY, ALTA	LETHBRIDGE, ALTA
8.	HALIFAX, NS	SAINT JOHN, NB
9.	GANDER, NFLD	ST. JOHNS, NFLD
10.	MONTREAL, QUE	QUEBEC, QUE
11.	SARNIA, ONT	TORONTO, ONT
12.	REGINA, SASK	SASKATOON, SASK
13.	CALGARY, ALTA	EDMONTON, ALTA
14.	KAMLOOPS, BC	VANCOUVER, BC
15.	PENTICTON, BC	VANCOUVER, BC
16.	FREDERICTION, NB	HALIFAX, NS
17.	CALGARY, ALTA	MEDICINE HAT, ALT
18.	KELOWNA, BC	VANCOUVER, BC
19.	NORTH BAY, ONT	TORONTO, ONT
20.	HALIFAX, NS	SYNDEY, NS
21.	TORONTO, ONT	WINDSOR, ONT
22.	KELOWNA, BC	VICTORIA, BC
23.	SUDBURY, ONT	TORONTO, ONT
24.	VANCOUVER, BC	WILLIAMS LAKE, BC
25.	OTTAWA, ONT	TORONTO, ONT
26.	CALGARY, ALTA	LLOYDMINSTER, SK
27.	CALGARY, ALTA	KELOWNA, BC
28.	EDMONTON, ALTA	LETHBRIDGE, ALTA
29.	MONTREAL, QUE	VAL D'OR, QUE
30.	QUESNEL, BC	VANCOUVER, BC
31.	CALGARY, ALTA	KAMLOOPS, BC
32.	EDMONTON, ALTA	SASKATOON, SASK
33.	MONTREAL, QUE	ROUYN/NORANDA,QUE

(Continued on the next page)

NAMES OF SELECTED CITY-PAIR MARKETS

OBS	PAIRS	OF CITIES
34.	SAULT STE MARIE,ONT	TORONTO, ONT
35.	LONDON, ONT	OTTAWA, ONT
36.	MONTREAL, QUE	TORONTO, ONT
37.	CALGARY, ALTA	SASKATOON, SASK
38.	PRINCE GEORGE, BC	VANCOUVER, BC
39.	REGINA, SASK	WINNIPEG, MAN
40.	CRANBROOK, BC	VANCOUVER, BC
41.	EDMONTON, ALTA	KELOWNA, BC
42.	TIMMINS, ONT	TORONTO, ONT
43.	FREDERICTION, NB	MONTREAL, QUE
44.	THUNDER BAY, ONT	WINNIPEG, MAN
45.	MONTREAL, QUE	SAINT JOHN, NB
46.	LONDON, ONT	MONTREAL, QUE
47.	HALIFAX, NS	QUEBEC, QUE
48.	CALGARY, ALTA	REGINA, SASK
49.	BATHURST, NB	MONTREAL, QUE
50.	OTTAWA, ONT	WINDSOR, ONT
51.	CALGARY, ALTA	VANCOUVER, BC
52.	EDMONTON, ALTA	REGINA, SASK
53.	TERRACE, BC	VANCOUVER, BC
54.	SASKATOON, SASK	WINNIPEG, MAN
55.	MONCTON, NB	MONTREAL, QUE
56.	FREDERICTION, NB	OTTAWA, ONT
57.	QUEBEC, QUE	TORONTO, ONT
58.	CALGARY, ALTA	VICTORIA, BC
59.	LETHBRIDGE, ALTA	VANCOUVER, BC
60.	PRINCE RUPERT, BC	VANCOUVER, BC
61.	OTTAWA, ONT	SAINT JOHN, NB
62.	HALIFAX, NS	MONTREAL, QUE
63.	EDMONTON, ALTA	VANCOUVER, BC
64.	GANDER, NFLD	HALIFAX, NS
65.	MONTREAL, QUE	WINDSOR, ONT

(Continued on the next page)

NAMES OF SELECTED CITY-PAIR MARKETS

OBS	PAIRS	OF CITIES
66.	CHARLOTTETOWN, PEI	MONTREAL, QUE
67.	MONCTON, NB	OTTAWA, ONT
68.	EDMONTON, ALTA	VICTORIA, BC
69.	HALIFAX, NS	ST. JOHNS, NFLD
70.	THUNDER BAY, ONT	TORONTO, ONT
71.	MONCTON, NB	ST. JOHNS, NFLD
72.	HALIFAX, NS	OTTAWA, ONT
73.	CHARLOTTETOWN, PEI	OTTAWA, ONT
74.	FREDERICTION, NB	TORONTO, ONT
75.	MONTREAL, QUE	SYDNEY, NS
76.	OTTAWA, ONT	THUNDER BAY, ONT
77.	SAINT JOHN, NB	TORONTO, ONT
78.	EDMONTON, ALTA	WINNIPEG, MAN
79.	CALGARY, ALTA	WINNIPEG, MAN
80.	SASKATOON, SASK	VANCOUVER, BC
81.	MONCTON, NB	TORONTO, ONT
82.	MONTREAL, QUE	THUNDER BAY, ONT
83.	SASKATOON, SASK	VICTORIA, BC
84.	HALIFAX, NS	TORONTO, ONT
85.	CHARLOTTETOWN, PEI	TORONTO, ONT
86.	REGINA, SASK	VANCOUVER, BC
87.	REGINA, SASK	VICTORIA, BC
88.	TORONTO, ONT	WINNIPEG, MAN
89.	SYDNEY, NS	TORONTO, ONT
90.	MONTREAL, QUE	ST. JOHNS, NFLD
91.	OTTAWA, ONT	WINNIPEG, MAN
92.	OTTAWA, ONT	ST. JOHNS, NFLD
93.	MONTREAL, QUE	WINNIPEG, MAN
94.	VANCOUVER, BC	WINNIPEG, MAN
95.	VICTORIA, BC	WINNIPEG, MAN
96.	REGINA, SASK	TORONTO, ONT
97.	ST. JOHNS, NFLD	TORONTO, ONT
98.	SASKATOON, SASK	TORONTO, ONT
99.	OTTAWA, ONT	REGINA, SASK

(Continued on the next page)

NAMES OF SELECTED CITY-PAIR MARKETS

OBS	PAIRS	OF CITIES
100.	MONTREAL, QUE	REGINA, SASK
101.	OTTAWA, ONT	SASKATOON, SASK
102.	MONTREAL, QUE	SASKATOON, SASK
103.	HALIFAX, NS	WINNIPEG, MAN
104.	CALGARY, ALTA	TORONTO, ONT
105.	EDMONTON, ALTA	TORONTO, ONT
106.	EDMONTON, ALTA	OTTAWA, ONT
107.	CALGARY, ALTA	OTTAWA, ONT
108.	EDMONTON, ALTA	MONTREAL, QUE
109.	CALGARY, ALTA	MONTREAL, QUE
110.	KELOWNA, BC	TORONTO, ONT
111.	TORONTO, ONT	VANCOUVER, BC
112.	TORONTO, ONT	VICTORIA, BC
113.	OTTAWA, ONT	VANCOUVER, BC
114.	OTTAWA, ONT	VICTORIA, BC
115.	MONTREAL, QUE	VANCOUVER, BC
116.	EDMONTON, ALTA	HALIFAX, NS
117.	MONTREAL, QUE	VICTORIA, BC
118.	CALGARY, ALTA	HALIFAX, NS
119.	QUEBEC, QUE	VANCOUVER, BC
120.	HALIFAX, NS	VICTORIA, BC
121.	HALIFAX, NS	VANCOUVER, BC

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