THE CANADIAN AIRLINE INDUSTRY: AN IO APPROACH

by

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1 Introduction

Regulation of the Canadian airline market has been an object of contention for a long time. While domestic carriers are able to enter the market freely, they are often wiped out in short order by the incumbent Air Canada, or are unable to maintain profitability. Recent notable bankruptcies span from low cost airlines such as Canada 3000 and Jetsgo to even major carriers such as Canadian airlines. Throughout all of this, Canadian travelers have been subjected to fares that are notably higher than those found in the United States, as well as to a level of services and routes that leave much to be desired. As a result, the possibility of ending Canada's cabotage regulations in order to create a fully integrated North American market, similar to that found in Europe, appears to be an appealing strategy. One would believe that such actions would lead to an increase in not only competition, but in efficiency as well, as the integration of American hubs would have a positive network effect.

Deregulation in the U.S. was initially supported by the theory of contestable markets, and this theory would later form the basis for deregulation in the E.U. According to the theory of contestable markets, deregulation would lead to a scenario of optimal competition. However, given the recent string of bankruptcies among airlines in the U.S. and the current state of airlines in Canada, another theory has come to prominence, namely core theory. According to some researchers, the American airline market displays characteristics of a market with an "empty core", one in which de-

structive competition takes place that leads to permanent instability in the market. While the short-term effects of this competition may lead to benefits to the consumer, the long-term effects may be more harmful as airlines pull routes and drastically cut on other services. If this is indeed the case, Canada may be better off with its current system where Air Canada, somewhat of a regulated monopoly, remains solvent and runs as many routes as possible.

This paper will attempt to show that this empty core argument ignores many of the characteristics of the airline market in the U.S to order to reach a desired conclusion. The emergence of Southwest airlines in the U.S., Westjet in Canada, and Ryan air in Europe is proof that the airline market is indeed healthy. While one might think that these airlines have survived solely on price competition, a closer look shows that their business strategy, arrival rate, services and employee relations have set them apart from the competition.

In short, the deregulated era of the airline market is still young, airlines are still trying to find optimal business strategies and new entrants have a distinct advantage in terms of cost and implementation of these strategies. As a result, incumbents go through growing pains (such as abandoning the once lauded hub and spoke system) in order to become relevant once again.

2 Historical Background

The first nation to deregulate its airline industry was the U.S. Prior to deregulation, markets and fares were regulated by the Civil Aeronautics Board (CAB), which was established in 1938 to "promote, encourage and develop civil aeronautics" (Borenstein, 2007). The CAB was established during the Great Depression when numerous markets were in a chaotic state, and was seen as a safeguard for the emerging aeronautic industry (Borenstein, 2007). Through the CAB, the government hoped to establish "co-ordination" among the air carriers of the time and restrict entry in order to consolidate and stabilize the market as well as protect it from "destructive competition". At the time airlines operated on a mainly regional basis. The CAB granted each major regional airline "grandfathered" operating authority which for the most part restricted all entry into their respective markets.

From this point the CAB manipulated carriers into taking on new routes through cross subsidization programs, which led to rapid growth in the number of trunk and passenger routes. For the next 4 decades the market remained relatively the same, with 11 of the 16 "legacy" airlines in operation and a handfull of small regional carriers providing service for small routes that fell out of the scope of the major airlines (Borentstein, 2007). However during the 70s it became apparent that this system had grown to be quite inefficient. The Californian market was the least regulated market at the time, and its long distance and high density intrastate flights would become

the focal point of research of not only academics but the newly formed National Domestic Fare Investigation. The focal point of these studies was the deregulated intrastate routes; flights within a state were not controlled by the CAB. Given the similar distances and densities of several Californian intrastate routes to interstate routes on the Eastern coast, comparisons between regulated and deregulated routes could be made. This led to papers by Levine (1965), Jordan (1970) and Keeler (1972), which highlighted the inefficiencies and price gouging that were currently taking place in the market. Fares were found to be from 20% to 100% above minimum long-run cost, and fell well into the range of excess profits.

The costs of airlines were also hugely inflated. Given fixed prices, airlines began non-price competition. This resulted in a large increase in amenities, over and above the luxurious CAB standards already in place, and more importantly in a wider range of departures and connecting flights. Douglas and Miller (1974) found that this practice led to a zero sum game in the end; the airlines were not expanding demand but simply stealing business from one another. By the early 70s load factors on flights fell below 50% since the introduction of CAB regulation, as compared to 71% on intrastate Californian flights (Borenstein, 2007). As a result, the CAB increased fares in an attempt to maintain the profitability of the industry.

In 1975, Senator Edward Kennedy's Judiciary Committee revealed the huge inefficiencies in the airline market to a national audience. Amid intense political pressure

economist, Alfred Kahn was appointed as chair of the CAB. This led to the gradual decline of regulation within the CAB and eventually its abolishment in 1978 through the passing of the Airline Deregulation Act.

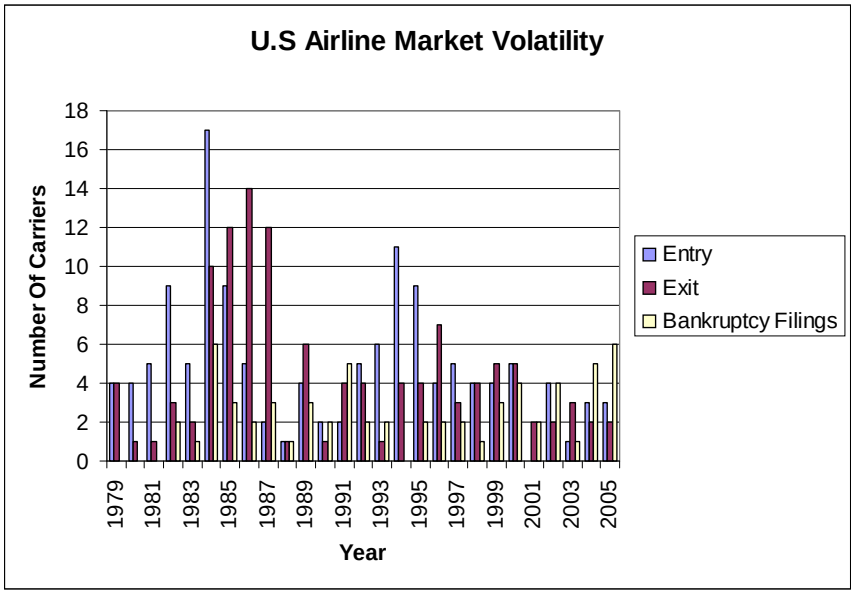
The U.S then became the first nation to deregulate its airline industry and was observed as a "guinea pig" for other nation contemplating similar action. Canada and Europe followed suit in 1987 by deregulating their respective markets. Canada's sole national carrier, Air Canada, was formed in 1935 and regulation similar to that found in the U.S followed suit in 1942 (CBC, 2004). Air Canada was partially owned by the government and by the private sector and as a result its main competitor, Canadian Pacific Air, was rarely granted any international routes and very few lucrative Trans-Canadian routes by regulatory authorities. The two airlines remained the principal competitors in the market over the next 5 decades, despite Air Canada's preferential funding and route selection, while small regional carriers took on smaller routes. However, by 1979 Canadian Pacific Airlines was free to run any routes it wished and this marked the beginning of the end for regulation in Canada.

The market was officially deregulated in 1987 and Canadian Pacific Air quickly merged with several regional carriers leading to the market essentially becoming an oligopoly. Contrary to the U.S where post deregulation saw an enormous amount of entrants into the market (and a significant amount of exits only two years later), the Canadian market remained stagnant with the two competitors losing $1

million a day (CBC, 2004). Finally in 1999, under revision and suspension of the competition act by the government, the two airlines discussed and organized a merger. Since then, Air Canada has struggled to survive. The cost savings from the merger were offset by sharp declines in demand after September 11th, rising fuel costs and the emergence of a credible low-cost nation wide carrier in WestJet. Between 2001 and 2003, Air Canada lost $1.6 billion and filed for bankruptcy protection.

Given the current situation, dropping Canada's cabotage agreements has been suggested. The Open Skies Act in 1995 allowed for freedom of entry for any international airline into Canada. Prior to the agreement, foreign airlines were subject to regulated entry and routes into Canada. However, it is still illegal for a foreign airline to fly a route totally within Canada. Therefore Air Canada and WestJet are the only players of note in the Canadian market. Dropping cabotage regulations with the U.S would allow for American carriers to fly Canadian routes and potentially provide significant competition and increased service within Canada and to the U.S. This system would be similar to that found in the European Union, where carriers from any nation in the Union have unrestricted access to any market in the Union. On paper this would appear to be a good solution. Even if in the worst-case scenario Air Canada was dropped out of the market, the effect on Canadian terminal traffic and service would most likely not be lowered by any discernable amount (Borenstein and Rose 2003). Canadian routes could now also take advantage of the American

carriers' hub and spoke system for flights across Canada or through the U.S. in hubs such as Chicago or Detroit resulting in a positive network effect and economies of density. However, the airline market in the U.S is no more stable that it is in Canada at the moment.



Between 2001 and 2005, five of the major American carriers filed for bankruptcy and countless airlines have entered and exited the market over the 30 year period following deregulation (Borenstein, 2007). Low-cost, point to point carriers such as Southwest, Jet Blue and AirTran have eaten away at the incumbents' market shares much like WestJet has done in Canada. The question that presents itself is the following; would it be better for Canada to simply stay the course and have Air Canada survive through government aid, or integrate with the U.S and if in fact the

market is chaotic, be faced with deteriorating situation over which we would have little to no control? The answer lies not only in economic theory, but also in the analysis of the industry.

3 Contestable Markets

After the deregulation of the airline market in the U.S, the theory of contestable markets (Baumol 1982) was developed and served as the main proponent for deregulation in the E.U and in Canada. The theory of contestable markets is a generalization of the concept of perfect competition wherein competitive pressures from potential entrants or current rivals lead to ideal behaviour by all players in the market. However, unlike in perfect competition, the theory lends way to economies of scale and oligopolistic market structures.

Much like perfect competition, the following conditions are assumed to be present in the market:

- Entry is free and exit is costless
- All producers have access to the same technology
- The technology may be characterized by economies of scale. If fixed costs are present they do not comprise sunk costs
- A producer can enter the market and instantly produce at any scale. There is

no lag between entry and desired production

- The buyer can switch, without cost, between the incumbent and the entrant

In addition, the theory imposes the following assumption:

Assumption: The exit time for the entrant is less than the reaction time for the incumbent. The entrant can enter the market, undercut the incumbent and regain all of its entry cost before the incumbent can react.

The entrant thus stands to at least break even if not make a profit. This "hit and run" strategy forces the incumbent to lower its price and in the case of a monopoly, the threat of such an entry ensures that the incumbent prices at the most efficient point possible. It is the ever-looming threat of entry that ensures the market outcome is as efficient as possible given the structure. In order to bring the theory into context, take for example a monopoly in an airline market such as Canada. In this simplified case (taken from Church and Ware (2000)), we assume that the service is homogenous among all airlines and that there are increasing returns to scale. While the example is oversimplified, it will nonetheless suffice for the time being.

The airline would initially charge a fare at the monopoly price (P^m) and supply (Q^m) flights. However at this price, it would be perfectly feasible (given that the conditions for contestable markets hold) that an entrant could enter, undercut the incumbent, take all profits from the incumbent and exit before the incumbent could react. The profits in excess of the entry cost of the entrant depend on the reaction

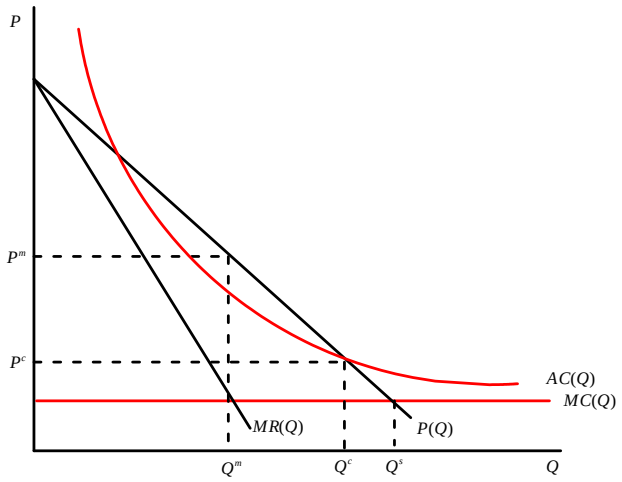


Figure 1: Contestible Market Scenario

lag of the incumbent and the entrant need not fear what reaction the incumbent will take as it can easily profitably exit the market beforehand.

In order to prevent this type of entry the monopolist must charge a fare at (P^c) and supply (Q^c) flights. At this point, the monopolist eliminates any chance of being undercut by an entrant. However, at the same time the monopolist is simply making zero profits since his price simply recovers his average cost. This equilibrium point is known as the contestable market equilibrium and represents the best possible outcome given the monopoly market structure. The key thing to remember, however, is that this is the best outcome given the structure of the market. The optimal scenario would be where price is equal to marginal cost. However this is unattainable give the imposition of increasing returns to scale. Therefore the monopolist's market power,

while limited, is still present.

The issue of sunk costs and fixed costs is also very important for contestability analysis (Church -Ware, 2000). One of the main conditions in the theory of contestable markets is that long run fixed cost may not be sunk costs. Upon shutting down, the fixed costs that are not sunk are not incurred after the firm exits the market or shuts down. For instance, consider an airline with its own hub and an airline simply operating independently. The airline that owns the hub has incurred the construction and operational costs of the hub, but they are free to move their flights to whatever routes or markets they choose. This particular airline is left with the sunk costs of the hub, but the fixed costs of the flights themselves can be avoided by moving them to different markets. In contrast the independent airline can simply move tis flights from market to market and avoid the sunk costs all together. For the purpose of this paper, consider an open North American market. A competitor such as Southwest airlines could potentially enter the Canadian market and undercut Air Canada. Moving a plane from their fleet to service a cross Canada route would involve no sunk costs and likewise exiting the market would be costless. The threat of entry into the market by Southwest would force Air Canada to lower fares to the contestable equilibrium point thereby resulting in the optimal price and quantity.

In theory, the airline industry appeared to fall within the restrictions of a contestable market. Firstly, entrants did not face any supplementary entry costs as

compared to incumbents and while they could eventually be forced out of a market. Planes are seen as "capital on wings" and can easily be moved from one market or route to another without much fixed cost (Tucci 1998). Given the wide variety of airlines on each specific route, it also appeared as if consumers could easily switch between airlines at no cost. Finally the lagged incumbent response was satisfied in part by the fact that the transition to deregulation would provide new carriers with sufficient time to settle in while the legacy carriers adjusted their strategies and business structures. Given these conditions, entrants could presumably use a "hit and run strategy" by entering the market, earning profits and recovering all entry and exit costs before the incumbent could react.

However, by the early 90s it appeared as if the application of contestable market theory to the airline market was overzealous. By this time, over 60 airlines had entered and exited the market (Borenstein, 2007). While the incumbents still maintained their market share, they too were suffering from the massive turnover and price undercutting of these unsuccessful entrants. The failure of the new entrants in the airline industry can be partly attributed to the structural barriers still in place after deregulation, which seriously hampered the chances of an entrant to succeed.

Initially incumbents attempted to consolidate market power through a series of mergers in the mid to late 80s. However as competition policy improved in the U.S, the following measures were taken to cling on to market share and block out new

entrants.

After the initial growing pains of deregulation, incumbents' ability to react to price undercutting improved considerably, essentially lowering the "lag time" of reaction and hence the profitability of a "hit and run" by an entrant. Improved computer and information systems allowed airlines to compare and adjust prices much more readily than before. It should be noted that the robustness of contestable markets depends implicitly on the lag time offered by the incumbent and the amount of sunk costs. Obviously if the lag time is equal to zero, it follows that it will not be profitable for the entrant to enter the market as the monopolist can instantly match its price and force it out of the market.

Screen bias is one of the barriers used by incumbents developed by carriers in the U.S. In the 1970s, Computer Reservation Systems were developed that were essentially data banks that supplied travel agents with flight information such as tariffs, schedules, fares as well as availability. However, the data management firms running the systems could manage the order of the data so that some carriers were shown before others (Domanico 2007). This practice was known as "screen bias" and was eventually abolishied after stricter regulations on data management were introduced. Code Sharing was the next attempt by carriers to consolidate their market power. Essentially, an airline will form an "alliance" with another carrier that permits one carrier, even if it is not flying the route, to sell tickets for another carrier

flying the same route (Domanico, 2007). In the U.S, this trend began with incumbent airlines forming agreements with commuter airlines. The commuter airline would fly the passenger to the incumbent's hub and then travel from hub to hub with incumbent airline (Borenstein, 2007). The entire trip would appear as one single ticket though, booked through the incumbent. After the Open Skies Act was established, this effect spilled over to incumbents on their international flights. Continental and America West formed such an alliance in the face of increased competition from foreign carriers. This practice again limits the amount of competition among incumbents and further consolidates the market making entry more difficult.

The aforementioned hub and spoke system presents another barrier to entry. As discussed in more detail later in the paper, the hub and spoke system basically allows major airlines to take advantage of economies of density. By siphoning all passengers from smaller airports or "spokes" to the main hub, it ensures that flights leaving the hub are full. The alternative would be a group of small point-to-point flights leaving each small airport to a major airport carrying lower load factors. The barrier that presents itself with this system is that it very difficult to create an alternative network servicing the same markets (Domanico, 2007). As a result new entrants are limited in their abilities to take advantage of economies of scale. In practice, savvy point-to-point carriers have actually been able to get around this barrier but its existence cannot be discounted.

Another barrier developed by the incumbent carriers and further strengthened through their alliances is that of frequent flyer programs. Targeted mainly at the business traveler, they give an incentive to the consumer to continue flying with that particular airline or alliance. While they seem harmless on their own, they present a switching cost, which is magnified as the number of airlines in the incumbent alliance grows. Let us recall that one of the conditions for a contestable market was that of free choice and the absence of switching costs. A large alliance of incumbents with transferable frequent flyer miles creates a barrier to a new entrant as the incentives of the price differential in fares may not outweigh that of the frequent flyer program in the long run.

One of the most glaring barriers to a new entrant is the generous amount of federal funding most legacy carriers receive. Canada and Europe have been notorious for bankrolling the debt of their "flag" airlines. In addition, these airlines are subject to very lenient restructuring and bankruptcy rules. As such even if an incumbent is running inefficiently, and should logically be knocked out of the market, they linger around until the situation is irreparable, as was the case with Swiss Air (Domanico, 2007).

Given the barriers in place, it seems that the three elements needed for contestable markets to exist are violated, or at the very least distorted. In the U.S, laxed competition law allowed incumbents to merge with each other, as well as with regional

carriers, to further consolidate their power and make a “hit an run” strategy all the more difficult. The E.U deregulated in three separate stages in order to allow incumbents time to adjust to new market conditions (Domanico, 2007). This grace period, in addition to federal funding gave, incumbents more than enough time to gain an unfair advantage over new entrants. As such, the “hit and run” strategy present in the theory is extremely difficult to execute. In addition, consumers are not able to freely choose between airlines as hubs are unfairly dominated by some airlines, alliances limit competition between incumbents and flag carriers, and frequent flyer programs present a switching cost. However, these barriers are not enough to ensure the solvency of the major airlines in the U.S and the E.U. So while contestable market theory is difficult to apply, and the barriers can explain the failure of new entrants, it is difficult to see how the incumbents could have suffered as much as they have over the last two decades. Frequent entry and exit and pricing wars are not in line with the theoretical outline of contestable markets.

4 Core Theory

By the late 1980s, it had become apparent that the airline market was not contestable. Baumol himself stated how the theory might have been rushed in a review of his original paper in 1986. By the early 90s the "empty core" theory started to take precedence. An empty “core” refers to the work of Scarf and Debreu (1963) that

outlines the following conditions for general equilibrium in an exchange market.

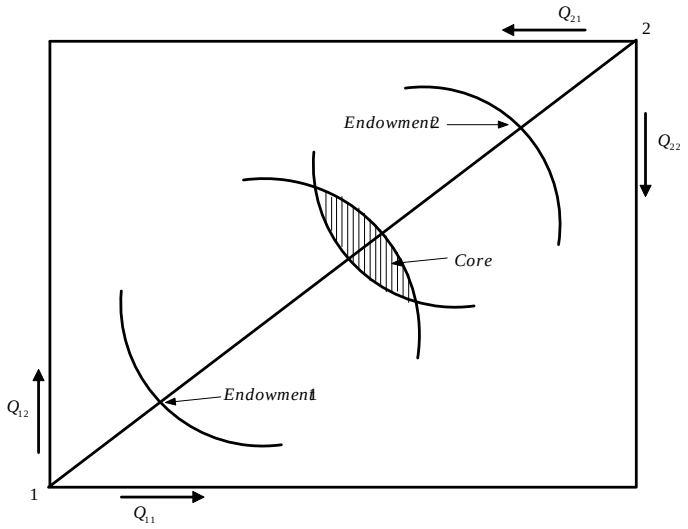


Figure 2: Two-Person Exchange Economy

The basic general equilibrium framework is as follows:

- There is a group of n, individuals in the market who can trade in the market or any submarkets with any other single individual or individuals
- All of the individuals can readily measure their gains from trade and can contract with each other to form coalitions to maximize their gains from trade. These coalitions can either be restricted or unrestricted given the nature of the industry. The coalition is essentially a group agreeing to co-operate and trade with one another
- A coalition is dominated if some members of the coalition can leave the coalition

and do better by joining or forming another one. If no such profitable deviation exists, then the coalition is "undominated"

- A buyer or seller will be a member of a coalition as long as they can do at least as well as they could in any other coalition (including being on their own or deciding not to trade at all)

- If a coalition forms among all individuals instead of a set of singletons then the coalition is pareto-optimal. This is called a "grand coalition". As such the grand coalition, should offer every individual at least as much as it could get in any other coalition it could form. It is an undominated allocation. Therefore the potential payoffs of all other possible coalitions creates a lower bound for the payoffs earned by each individual in the grand coalition

- If the grand coalition is in fact the pareto-efficient allocation, then the market is said to have a "core". As shown by the 2- person example in the Figure (2), the core is the set of all undominated allocations which will result in a pareto-efficient outcome

- A grand coalition is a market in which all buyers and sellers are present. Therefore, if the grand coalition is in the core then all members will join the market as opposed to forming submarkets or being on their own.

This leads us to the concept of an "empty core" which was first developed by

Telser (1987). An empty core results when there is no allocation in the core that can result in a grand coalition. With no stable coalition, there is always an incentive for some individuals to leave the coalition and form their own subgroup. In this case individuals will switch coalitions opportunistically resulting in what Telser described as "chaos". In this particular case unrestricted contracting or an unregulated market would not result in market equilibrium or an optimal efficient scenario. Recall that this market "chaos" is what the CAB and other regulating authorities were meant to control upon their formation in the 30's and 40's.

While the notion of an empty core is interesting its application was fairly limited until papers by Sjostrom (1989) and later Pirrong (1992) applied it to the shipping industry. Pirrong (1992) illustrates a simple case of an industry without a core with the following example: Assuming demand is variable it is in fact cost minimizing to build several plants and periodically idle one of several in response to changes in demand. In addition it may even be optimal to run some of the plants below maximum capacity and it is this excess capacity that will lead to an empty core.

Example 1 *Optimal operations lead to excess capacity*

- First assume that 3 independent firms have constructed a plant to produce output

- Plant 1 has a capacity of 2 units, plant 2 has a capacity of 4 units and plant 3

has a capacity of 8 units. Each plant faces an indivisible fixed cost if it produces any amount of output and incurs no costs if it remains idle. This particular set up is similar to that of an airline in the sense that the plane will either take off or stay grounded. Either way the majority of the costs lie in simply flying the plane, not the marginal cost of additional passengers. Such indivisible fixed costs are known as "avoidable" costs

- Plant 1 has an avoidable cost of 8, Plant 2 has an avoidable cost of 12 and Plant 3 has an avoidable cost of 16. Clearly the larger plants have lower average avoidable costs at capacity

- Marginal costs are assumed to be zero for all output levels below capacity. Consequently marginal cost is lower than average cost up to capacity

- A Pareto-optimal production plan specifies the plants that should produce given the state of demand. In this case assume each consumer wants to purchase 1 and only 1 unit of the given good at a valuation of 5. The demand curve will shift as the number of customers who wish to purchase the produce varies

Given this scenario, consider the case where 11 customers appear in the market. In this case, it would be optimal for plant 3 and plant 2 to produce with plant 1 remaining idle. However this situation requires either of the firms to operate with excess capacity and while idling plant 2 would ensure that plant 3 operates at capacity

it is inefficient. The reasoning for this is that 20 units (4x5) of consumer surplus is lost by idling Plant 2 which exceeds the cost of running Plant 2 (12). This example illustrates the effect of indivisibilities. It is usually inefficient to match capacity and demand exactly. Sometimes it is better for plants to operate with excess capacity.

To take the example further consider the following scenario:

Example 2 *Market Failure in the presence of excess capacity*

- Consider a coalition comprised of buyers j and sellers I
- The characteristic function $V(I, j)$ represents the maximum amount of surplus a coalition of firm I and j customers can obtain by contracting among themselves
- Call the imputation of the firm y and the imputation of the consumer x

First take an example of a coalition between the aforementioned Plant 2 and four customers. By producing at capacity and selling 4 units to the 4 customers, the plant will naturally incur the avoidable cost of 12. However it generates a consumer benefit of 20 leaving a net surplus of 8. Therefore the characteristic function $V(2, 4) = 8$

By the general equilibrium framework the agents' equilibrium must be pareto-optimal and the coalition must be undominated. Therefore the following core constraints need to be satisfied:

$y2 + 4x \geq (4)(5) - 12 = 8 = V(2, 4)$

This equation simply states that since a coalition of firm 2 and 4 customers can earn an aggregate surplus of 8. Then if a grand coalition were formed (and the market had a core) this group of participants would have to receive at least this much aggregate surplus to remain in the coalition (ie the firm y2 and the buyers x would need to share a surplus of at least 8).

Consider now a second coalition, with firm 3 contracting to the remaining 7 buyers in our original 11 buyer case. The cost of operating the plant is 16 but the consumer benefit is 35, leaving a total surplus of 19.

$y3 + 7x \geq (7)(5) - 16 = 19 = V(3, 7)$

Therefore a coalition of firm 3 and 7 buyers would generate an aggregate surplus of 19. This group would therefore need to receive at least 19 units of surplus in the grand coalition in order to remain and for the core to be non-empty.

Now consider the following situation. If instead Plant 3 operated at capacity and sold 8 units to 8 buyers, the consumer benefit would be 40 with the avoidable cost once again at 16. This would result in a total surplus of 24.

$y3 + 8x \geq (8)(5) - 16 = 24 = V(3, 8)$

This allows us to solve for x by subtracting the 2nd condition from the 3rd one can find that x>5.

Now consider $V(N)$, the grand coalition in which all firms are active and all buyers are in the market. Recall that a grand coalition is needed for the market to

have a non-empty core. The condition for the grand coalition to remain stable is that the total required imputations for the firms and buyers cannot exceed the maximum aggregate surplus generated by the grand coalition.

$y1 + y2 + y3 + 11x \leq (11)(5) - 28 = 27$

However, given that $x > 5$, it follows that the consumer surplus required to remain in the grand coalition exceeds the total amount of surplus available in the grand coalition. This is an example of an empty core. The total allocation in equilibrium is not enough to entice all members to remain in the grand coalition.

While the numbers in this example are obviously contrived to obtain the result the intuition is nonetheless sound. Under the optimal plan or equilibrium, there is excess capacity (as was previously shown) and one firm will be serving fewer buyers than it could if it were to form its own separate coalition and serve members at full capacity. As such, the firm will deviate and offer any buyer a price just above marginal cost to join its new separate coalition. The firm will therefore increase the amount of surplus to divide amongst itself and its members given. This in turn sets off a chain reaction as all buyers could potentially take advantage of the new low offer from the firm. They will thus demand a price between their reservation price and marginal cost of the firm. However these new marginal cost prices are not sufficient to cover the avoidable costs of the firm (especially in this case where marginal costs are essentially 0). Firms will then simply stay idle and not take on the avoidable cost

of operation.

Pirrong's (1992) example illustrates a basic cause of an empty core. Firms must operate with excess capacity. Competition to "steal" buyers and fill capacity drives prices down to marginal cost. However, given the assumed cost conditions marginal cost prices do not cover total avoidable costs and variable costs. Recall that in the first example it was pareto-optimal for the 2 firms to operate with one experiencing excess capacity. However, it this excess capacity that leads to the price competition and the eventual failure of the market.

This market structure closely resembles that of the airline market. There are numerous airlines, often with excess capacity on their flights. Borenstein (2007) notes that in the late 70s, given fixed prices and rivals' flight schedules, most of the increased traffic on newly added flights came from business stealing rather than demand expansion. If one simply removes the notion of fixed prices it follows that massive price undercutting simply would steal business from other flights instead of generating new demand in the market. Given the volatility of demand and the increase in carriers in the market, this is not such a hard notion to grasp. While demand has roughly doubled since deregulation (Borenstein 2007), so have the number of competitors and their capacity. In short, airlines face the following problem; they operate a business that has high avoidable costs and low marginal costs. In equilibrium, it would still be more efficient for planes to have excess capacity, run their flights and sustain higher

prices, as was the case in the 1970's where load factors ranged around 60% and airlines remained profitable. However, without the price control of the CAB airlines have the incentive to lower prices to marginal cost levels as the departure date nears and excess capacity remains. By doing so, they start a chain reaction of price wars which eventually leads to unsustainable prices and then exit from the market.

This process is best exemplified by the efforts of American Airlines' Chief executive Robert Crandall in the early 90's. After devastating price wars in the 1980's, he tried to establish a reasonable pricing structure throughout the industry. American Airlines eliminated discount flights and introduced four classes of simplified universal fares (Smith, 1995). However, competitors immediately saw the incentive to deviate and immediately undercut each other eventually leading to more years of price wars and instability.

While the above examples successfully convey the concept of an empty core, additional technical examination in the 90's led to even more precise analysis. Pirrong (1992) and Sjostrom (1989) state the cost curve conditions resulting from avoidable costs that lead to an empty core. The core is non-empty, if and only if, the industry total cost curve (ITCF) is homogeneous of degree 1, or less. When the ITCF is homogeneous of degree 1 the industry average cost curve (IATCF) is perfectly elastic. As the IATCF becomes more elastic, the divergence between marginal and average costs decreases. Recall that it is this divergence between average and marginal costs

that lead to the empty core problem in the first place. When firm costs curves are continuous, the IATCF becomes more elastic as the number of optimal firms in the market increases. Therefore, as the industry grows the IATCF becomes more elastic at the efficient level of output and the empty core becomes less and less of a problem. When evaluated at an infinite limit, the IATCF becomes perfectly elastic and the divergence between marginal cost and average cost is zero, effectively eliminating the empty core problem as marginal cost pricing will cover average costs.

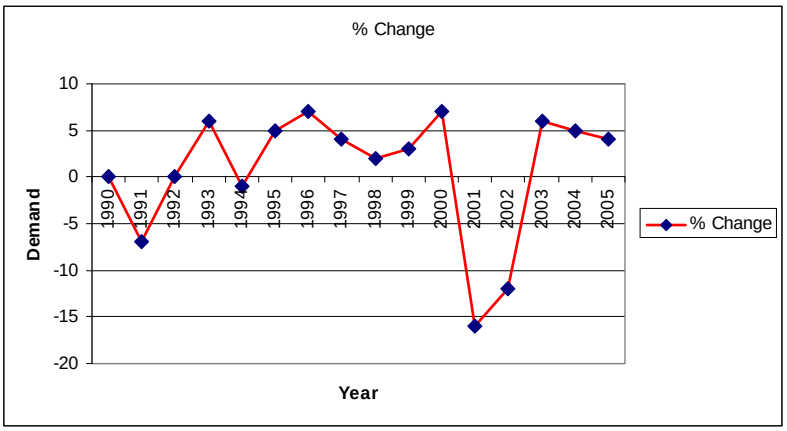
Now consider a discontinuous cost curve at the firm level. While it may seem implausible, it is best to think of it in the context of an airline. An analysis by Raghaven (2003) on the nature of marginal costs of airlines comes to the following conclusion. As distance flown increases, the cost per mile-flown decreases. However distance-flown can only be increased by decreasing the amount of passengers. Also, cost per passenger falls the closer the plane comes to full capacity. All of this implies that marginal costs start increasing before the maximum payload is reached. As the plane approaches capacity, these marginal costs increase even more rapidly as the possibility of overbooking, complaints and refunds increases. This creates a large spike in marginal costs when the plane is near or over capacity that can be seen as a gap in the supply function since the airline would never service a flight at such a high level. This range can be seen as a break in the marginal cost function. When firm cost curves are discontinuous, the IATCF does not become more elastic as the

number of optimal firms increases. In fact, the IATCF will be perfectly inelastic at each point at which it is optimal to open a new plant or in our case send off a new flight. If one falls into this inelastic region, the necessary condition for a non-empty core is not satisfied as the differential between average cost and marginal cost will be extremely large.

In short, as an airline approaches capacity on a certain plane, it will approach the region of rapidly increasing marginal costs. In order to avoid that region, it might be optimal for the carrier to send out another flight and divide capacity among the two planes. However, given the cost conditions it is very difficult and costly to match demand fluctuations with supply and capacity. Adding the second plane to a route to increase capacity involves significant avoidable costs. Naturally, the larger the avoidable cost, the less likely another flight will be added and the larger the gap in the marginal cost and supply curve. These gaps lead to a divergence between average and marginal costs. Given the cost conditions even in large markets, it is very difficult to match supply with varying demand and it is oftentimes optimal for firms to operate where average cost exceeds marginal costs as was seen in example 1. Therefore, due to fluctuating demand airlines are often faced with situations where demand will lie in a discontinuous region of the supply curve, one in which excess capacity is present and average costs will exceed marginal costs. It is this excess capacity that leads to the problem of the empty core. In general this is what has been seen in the airline

industry, as the market is over capitalized (Borenstein, 2007).

It is important to remember that this theory is based on the assumption that demand is variable. In fact, the greater the variability of demand the greater the chance that the demand curve will land in a discontinuous portion of the supply curve. It is obvious that the industry is subject to very significant demand shocks such as increased fuel prices (which result in an increase in avoidable costs) and cyclical demand in and out of recessions as well as exogenous shocks from terrorist attacks or global instability.



Source: RITA

5 Solutions to the Empty Core Problem

Core Theory provides a good explanation for the current state of the airline industry. Button (2003), Raghaven (2005) and Antoniou (1998), all argue that there is

considerable evidence pointing towards the existence of an empty core in the airline industry. The solutions to an empty core presented by Telser (1994), Pirrong (1992), McWillams (1991) and others are the following; cartels, tying contracts and vertical integration.

Of the three the most convincing and applicable solutions to problems in the airline industry would be the formation of cartels. The airline industry has, in fact moved, towards the formation of cartels through the formation of global alliances. Effectively these code-sharing agreements allow each international airline to take advantage of network effects by offering previously unavailable flights to their customers through their alliance partners effectively expanding each airline's global network and reducing potential price competition amongst the players. However, in order to ensure stability and optimization of the core further measures need to be taken.

For over one hundred years the international shipping industry has operated with the use of "shipping conferences" (Pirrong, 1992). These conferences utilize output restrictions, capacity restrictions and price co-operation in order to avoid the problems associated with an empty core. It should be noted that by the early 1900's it had become quite apparent that the industry was experiencing an empty core problem. Crippling price wars and firm exit as well as the organization and nature of the industry, one with excess capacity and high avoidance costs and low marginal costs, certainly pointed towards the existence of an empty core.

There are three main methods used by shipping conferences to promote stability; cargo tonnage quotas, profit pooling and sailing rights. A profit pooling agreement entails that the firms each allocate a set percentage of revenues that are then redistributed amongst the group. This pooling leads to a common price schedule that all members must adhere to (Sjostrom, 1989). This could easily be applied to the alliances now found in the airline industry, however, no such alliances or agreements exist in domestic regional markets where airlines face the most competition (Borenstein, 2007). Sailing rights are given out to different firms for different shipping lines. The coalition will determine the amount of voyages each firm can make per line in a year and the ports of call of each line. By doing so supply, is constrained for each line, keeping prices reasonably high while the distribution of lines is equitable enough so that each firm is sufficiently compensated to remain in the coalition. Essentially this form of organization eliminates the price-cutting due to excess capacity shown in example 2. Once again, while this has been shown in limited capacity in the major global alliances among airlines, only code sharing agreements are present at the regional level in the U.S. Given current anti-trust regulations, it seems quite unlikely that a coalition similar to that found in the shipping industry could be formed on a regional level without serious scrutiny. It should be noted that despite numerous entrants over the course of the past century, these cartels have not only held and ensured stability in the shipping industry but have also operated more efficiently than

their non-member competitors with load factors upwards of 85% as compared to 65% (Pirrong, 1992).

Telser (1994) presents several examples of vertical integration that could mitigate the effects of an empty core. However his models do not take account of market entry and his contrived examples could easily fail if a "maverick" firm presented itself in the market. American Airlines vertically integrated its regional carriers by establishing American Eagle. It hoped not only to offer more service to its hubs and easier customer change-overs, but to optimize pricing over a larger network of routes (which will be further explained in the next section of the paper). However, this integration does not leave the incumbent immune to new entrants in the market, picking up where the old airlines left off. Should any routes still remain profitable and avoidable costs be met, the entrant will enter the market and once again the airlines face the prospect of an empty core problem. This was best seen in the late 80's when there was a large string of mergers between incumbents and regional carriers in an attempt to consolidate the market. However it only led to new entrants taking the place of the merged firms.

The final solution presented in the literature is that of incentive laden contracts (Sjostrom, 1989). The first type of contract is the deferred rebate contract. Under this type of contract the customer pays the full fare of a shipment. If they remain loyal, a portion of the fee is then returned to the buyer. This type of contract best

resembles the frequent flyer programs now in use by most airlines and alliances. This method has been quite effective for frequent flyers such as business travelers. However, the current system does not provide much incentive for the majority of vacationers who would have to commit to long-term loyalty with the airline in order to reap any benefits given their less frequent travel schedule.

The second type of contract is an immediate rebate system. Under this system the buyer signs a legally binding contract obliging them to use exclusively members of the cartel. In return for this contractual promise, the buyer receives a rebate immediately, which can be rescinded should he or she breach the contract over the course of the voyage. For casual travelers this type of contract would seem to be more effective. It offers them an immediate reward for exclusively using alliance members for travel plans. However, it is only effective over multi-leg flights or longer term travel that could involve numerous flights within the span of several weeks. For a regional or intranational market, it would seem to be rather redundant, given the small amount of change overs the customer is likely to make.

The implementation of tying contracts is quite difficult in the airline industry given the large number of travelers that are infrequent users of the system. In fact business travel accounts for only 16% of long range travel in the United States (RITA, 2003). Therefore it is difficult to offer incentives to keep consumers within an alliance given that most are thinking short-term and have short term plans.

Given the difficulties involved in implementing a contracting and vertical integration, the formation of supply controlling cartels appears to be the optimal solution for the airline industry. However because of anti-trust regulations, it is very difficult to implement anything more than a code-sharing agreement amongst airlines (McWilliams, 1991). Therefore the optimal market structure solution to an empty core appears to be impossible at present, meaning that the ill-effects of an empty core will persist.

Fischer (2003) used a Rosse-Panzer test to evaluate the amount of competition in the U.S airline market. The statistic represents the change in the firms revenue given an increase in all factor prices. The key assumption is that firms are in long-run equilibrium. A one percent increase in factor prices, w, will result in a one percent increase in total revenue. Average cost is homogeneous of degree 1 in and a one percent increase in all factor prices w, will shift the average cost curve up by one percent for all output levels. Therefore the minimum point is unchanged, the long-run competitive firm operates at minimum average cost, the competitive output remains unchanged. However, average cost has increased by one percent and in equilibrium the competitive price must be equal to minimum average cost. Therefore the competitive price must have increased by one percent as well driving up total revenues by the same percentage. This process leads to the Rosse-Panzer statistic equaling 1 in perfect competition. The sums of these elasticities will be

negative in the long run if there is any form of oligopoly or monopoly.

Fischer found that the industry is in fact somewhere between perfect competition and a collusive structure such as an oligopoly or monopoly. This empirical finding is consistent with the legislation in place, which forbids collusion but allows for some barriers to entry as well as limited co-operation amongst members in the form of code sharing agreements. In light of this, it seems that only a change in legislation would permit the airlines to operate in the optimal market structural form.

However a study of the airline industry in Canada presents an interesting case. Since its merger with Canadian Airlines, Air Canada has had a firm grip on the Canadian market. Up until recently, they faced only regional competition from small competitors yet they continued to lose money over this period (CBC, 2004). By all accounts they had control over the entire supply of flights within Canada and for a large part over those exiting Canada given their membership in the Star Alliance, the largest alliance in the world. From a core theory context these conditions would be sufficient for them to avoid the pitfalls of an empty core given that excess capacity could be limited and price competition would be close to zero given the lack of competition.

Previous literature has come to conclusions with only a limited understanding of core theory and insufficient analysis of the airline market structure in the U.S or in the E.U and thus somewhat ingnores basic priciples of study of industrial organization.

Button (2003), Antoniou (1998), Raghaven (2005) look at the state of the airline industry today, link it with the most basic concepts of core theory and deduce that it must have an empty core. However, they fail to analyze the market composition and network structure of the industry, which indicate that incumbents themselves are creating the empty core problem through the structure of their airlines. The best example is of course is Air Canada itself, an airline with tremendous market power that can barely surivive.

There are of course other difficulties inherent in core theory analysis. The main one is that empirical tests for empty cores have not yet been conducted, one can only observe market structure and the circumstances present to deduce if a core does in fact exist. Antoniou (1998) ran a series of regressions on routes in Europe to determine if the pricing behaviour resembled that of an empty core and found that there was significant evidence to suggest that the market did in fact have an empty core. However it should be noted that his data was dated from 1989, the first year of European deregulation and extreme market turmoil was sure to be found.

The testing of this theory is further complicated by the fact that the core is fairly non-testable, and that the process leading to an empty core is rather unknown as well. Core theory is essentially a static concept, as illustrated in examples 1 and 2. The market is of a certain form and this leads to fierce and unprofitable price competition based on "business stealing" at which point players are forced to exit the market.

There is no insight on how one would reach a market structure that would lead to an empty core or on the process resulting in market chaos and destructive competition.

6 Structure of the Airline Industry

The misfortunes of the legacy carriers are not a universal phenomenon. While these full service airlines (FSA) struggle to hold market share, become victim to pricing wars and fall into bankruptcy, value based airlines (VBA) such as Southwest and Jet Blue in the U.S or WestJet in Canada are thriving and continue to remain profitable even in difficult economic times (profits figure). It is important to note that the symptoms experienced by the legacy FSA's are not nearly as prevalent amongst the VBA's. While core theory provides a good explanation for the plight of the FSA's, does not necessarily account for the state of the industry as a whole. Therefore the suggestion that the market must be consolidated in order to remain solvent is rather bold. Consolodation is the optimal solution for the incumbents but is, at least theoretically, unnecessary for the industry to continue to survive.

Since deregulation, the FSA's have developed and run on a hub-and-spoke system. Regional flights from smaller airports form the "spokes" and lead to the "hub", frequently a large central city such as Chicago or Detroit, where passengers then transfer over to their long haul international or intra-national flights. The hub-and-spoke system was a very attractive prospect when first introduced (Gillen, 2005). From a

passengers' standpoint it gave them a very wide variety of destinations and schedules to choose from at the main hub as well as a comfortable travel environment. These high service levels were certainly helpful at a time when air travel was still uncommon for many. From the airlines' point of view, the hubs allowed for significant economies of density.

The small feeding spokes fed the hub and ensured that large flights would leave with higher load factors and thus lower per passenger costs. In addition, the airlines experienced positive economies of stage length, as hubs allowed for larger long-range flights as unit costs decrease as stage lengths increase. However, one of the key characteristics of the hub-and-spoke system is that while it provides a wide variety of flights and destinations, it also requires a wide variety of aircraft and equipment to feed the hub and service these particular destinations (Gillen, 2005). This variety obviously leads to higher costs which are inflated by the costs of resources spent on data management, permanent staffing, and congestion problems such as lost baggage and delays caused by the high volume of feeder flights entering the hub.

Aside from this, the key to the difficulty of running a hub-and-spoke system lies in the scheduling and pricing mechanisms. In the hub and spoke system, a carrier will manage flights from a city A through a hub in city H to the final destination city B. The carrier thus can collect a variety of passengers and feed them at the hub into a flight leaving from H to B. This is the basis behind the economies of density argument.

The complexities arise from the fact that by running such a network the carrier is able to internalize all externalities created by complimentaries in the network (Gillen, 2005).

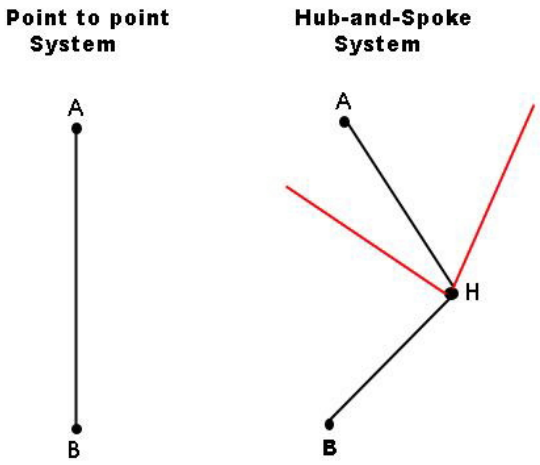


Figure 3: Point to Point and HS Networks

In the above example above the airline must decide how the pricing of the AH link will affect the demand for the HB ink and vice versa. If each link were operated by a separate company neither would take this into consideration. However by internalizing it all, the airline assumes a set schedule and pricing difficulties. Given this structure, the FSA's base their profitability on the entire network and not on the individual links within the network. However it is obvious that the airline is essentially giving itself as little flexibility in terms of supply side rigidity. The network

does not allow the airline to move flights away from unprofitable routes or decrease the amount of service from hubs. Put concretely, one can book a flight with an FSA nearly a year in advance. The FSA is therefore committed to tremendous avoidable costs not only on one flight, but all the connecting flights servicing the hub. Each flight represents a high avoidable cost, many of which will not be able to recouperate their expenses in rougher times.

The absolute rigidity of supply implies that the industry cannot adjust to demand fluctuations. The possibility of the demand shifting to a discontinuous portion of the supply curve and leading to and empty core problem is plausible given the suppliers inability to adjust. By committing their fleets and incurring large avoidable costs, the FSA's effectively guaranteed themselves an excess capacity problem given cyclical demand. The ensuing pricing wars should therefore be expected. These pricing wars then continued even in prosperous times and prevented FSA's from recouperating their losses.

Another aspect warranting attention the way in which the network optimization leads to price competition. Consider, for example, two airlines flying the following routes shown in figure 4.

In order to maximize its profits over the network, airline 1 might discount the price of the trip to the hub (A - B) and take advantage of economies of density for the more profitable flight from (B - C). Consequently they optimize their network profits. In

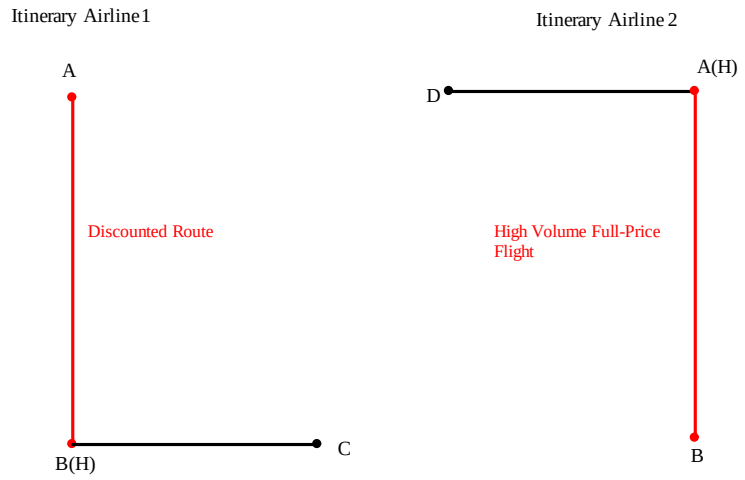


Figure 4: Network Optimization

fact airlines frequently run unprofitable routes because, overall, the network profits are increased by their addition (Gillen, 2005). However, the problem that remains is that by running a route at a discount to feed the hub, Airline 1 could very well start a price war with airline 2. Say Airline 2 has a feeder flight (D-A) and flies a more profitable high density route from (A-B) to optimize profits. Essentially the discounted (A-B) flight flown by Airline 1 is now competing with the normally priced (A-B) route flown by Airline 2. Under the simplest case a customer could take the (D-A) route at a discount with Airline 2 and then fly the (A-B) route with airline 1 and face a much lower total fare. Clearly this will cause airline 2 to adjust its price on the route and a price war will begin.

While this arbitrage problem is somewhat mitigated by price discrimination, made

possible by advanced computer systems computing prices for each specific traveler, it is nonetheless significant as the average price of a certain flight may very well be lower than the average price of another on the same route. Therefore the incentive to lower prices is still present as airlines could still very well "steal" customers away if it is optimal to do so from a network standpoint. In fact, interline connections have risen from 8% in the early 90's to 42% (Borenstein, 2007). While this can be attributed to an increase in the amount of code sharing agreements, one must also consider the ease at which consumers can now check pricing online and plan optimal routes. Arbitrage has become increasingly simple over the past decade.

These problems less important to VBA airlines. First, they have a set pricing structure as part of their business model. VBA's typically have 3 classes of tickets that remain at the same price and can be purchased online. Not only does this type of pricing structure make online purchases much easier, but it also stabilizes price competition amongst VBA's given that their reputation is based on reliability and ease of purchase. In fact, this also produces a cost advantage. As of 2007, 30% of airline tickets were purchased online, with the VBA's accounting for a large portion (GAO, 2003). Through the direct sale of tickets, VBA's avoid numerous costs associated with intermediaries and are able to operate with fewer service employees. In addition, this type of system attracts many casual vacationers who can easily access the VBA's database and check up on ticket prices, rather than to having to

deal with a travel agent or struggle through an FSA's more complicated site.

Furthermore VBA's can easily pick and choose between profitable routes and schedules. While the FSA's are constrained by their network choice, VBA's can enter and exit any route they want since they implement a point-to-point system. In addition a VBA flight can be booked no more than 5-6 months in advance, which allows greater flexibility to the airline in economic downturns or in periods of rising costs. The VBA's are thus able to avoid many of the aforementioned "supply gaps" as they are able to operate at variable capacities.

VBA's have a number of other advantages such as homogenized fleets that offer them purchasing power and lower training and maintenance costs significantly, lower airport costs given their use of secondary airports. Their greatest advantage however is their position as entrants. During the regulation era prices were identical across all airlines. They could compete was through service competition. The incumbents are now saddled with excess capacity and standards of service that the average consumer does not need. Pitfield (2007) arrived at interesting conclusions in this regard. Using ARIMA models, he conducted an intervention analysis on various routes to see the impact of RyanAir's entry into those respective markets. The traffic is first seasonally adjusted and consequently modeled by an ARIMA model. A dummy variable is then added to mark the entry of RyanAir and inferences on the growth of the market can be made. Pitfield (2007) found that RyanAir's entry into a market led

not only to pure growth of the route, but led to customers leaving the incumbents on each route. This illustarted that unlike the 1980's and 90's where incumbents simply stole customers from each other, in line with core theory, the entry of a VBA could stimulate demand of certain markets. Given customers affinity for VBA's it seems that the incumbents are unable to compete on several levels.

While the low prices offered by VBA's are blamed for the loss of market share experienced by the FSA's, it should be noted that FSA's have been competing with VBA's since deregulation. Morrison and Winston (1995) argue that most losses amongst the FSA's were a result of their own pricing wars, not the existence of undercutting lower capacity rivals. The truth is that the hub and spoke system presents a cumbersome travel environment for a customer. Not only are there layovers but the high volume traffic results in delays, lost luggage and numerous other difficulties all of which are disutilities to the consumer. With the help of industry specialists Bowen and Headly (1991) constructed an index that enabled passenger utility to be measured. The formula is as follows, with the weights being determined after numerous surveys:

	criteria	*weight*	*impact*$(-,+)$
OT	On-Time	8.63	$+$
DB	Denied Bookings	8.03	$-$
MC	Mishandled Baggage	7.92	$-$
CC	Customer Complaints	7.17	$-$

$$AQR = \frac{8.63OT - 8.03DB - 7.92MB + 7.17CC}{8.63 + 8.03 + 7.92 + 7.17}$$

	2006		2005		2004		2003	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Air Tran	-1.13	2	-0.99	2	-0.76	2	-1.05	6
American	-1.83	8	-1.66	7	-1.3	6	-1.24	10
ATA	-2.14	9	-1.71	8	-1.5	8	-1.17	8
Atlantic Southeast	-5.45	15	-4.68	13	-4.1	13	-5.76	11
Comair	-3.55	14	-2.96	12	-3.27	12	N/A	N/A
Continental	-1.63	6	-1.51	6	-1.31	7	-1.04	5
Delta	-2.17	10	-2.14	9	-1.54	9	-1.24	9
Frontier	-1.3	3	N/A	N/A	N/A	N/A	N/A	N/A
Jet Blue	-0.93	1	-0.93	1	-0.59	1	-0.64	1
Mesa	-3.12	13	N/A	N/A	N/A	N/A	N/A	N/A
Northwest	-1.35	4	-1.46	5	-1.24	5	-1.02	4
SkyWest	-2.76	12	-2.48	10	-2.46	11	N/A	N/A
Southwest	-1.38	5	-1.06	3	-0.9	3	-0.89	2
U.S Air	-2.32	11	-2.77	11	-1.55	10	-0.96	3
United	-1.65	7	-1.21	4	-1.09	4	-1.11	7

Figure 5: Air Quality Rankings

Data was obtained from the U.S department of transportation and input into the equation outlined by Bowen and Headly (1991). The results over the past few years clearly indicated that the FSA's have either underperformed or at best, equaled their VBA counterparts in most aspects of passenger utility.

In short, the FSA's are operating on a system that creates numerous problems in today's market. During the era of regulation, the hub-and-spoke provided a high service model and ensured frequent flights and economies of density. In the absence of entry (Pets, 2000) state that the hub-and-spoke system is in fact the most profitable system easily dominates the point to point system. However with deregulation the system's weaknesses become apparent the incumbent airlines were potentially subject to an empty core problem. This does not mean that the industry is suffering from an empty core, as VBA's operating on point-to-point networks remain quite profitable and discussion of of widespread mergers among the incumbents to "save" the industry must be very analyzed very carefully.

In fact, at this point, none of the VBA's are capable of supplanting any of the incumbents and filling the void left by the natural progression of the market. However it may not be very harmful for some of the incumbents to exit the market permanently in order to lower the aforementioned pricing pressures amongst the FSA's and to allow for some very careful mergers or coalition agreements amongst incumbents. Raghaven (2005) states that the most efficient case would be to have a single North American airline operating on a hub-and-spoke system with VBA's offering peripheral service. While this may be extreme, it is nonetheless the direction the industry must take. However, to ensure that demand can be met, some of the FSA's must remain in the industry until the new entrants have expanded enough to take their place.

7 Conclusion

The deregulation of the airline industry was seen as an opportunity to create a contestable market that would offer efficient pricing and service to consumers. In reality it provided mixed results. While there was initial mass entry into the market, many of the entrants were forced out thereafter. Following this, the incumbents fought amongst themselves for numerous years over a dwindling market share leading to strings of bankruptcies in the early 2000's. While many have been quick to respond and say that the market as a whole suffers from an empty core and that consolidation is the only answer, closer analysis reveals that the network structure of the incumbents leaves them prone to en empty core. While the hub-and-spoke system is, on its own, the most efficient, with new entry into markets and uneven traffic on feeder routes its numerous weaknesses are revealed. It is too cumbersome to handle the volatility of the market given the current number of carriers.

The notion that the airline industry is in "chaos" is too harsh a statement. There is a clear need for a structural shift and some consolidation or market exit. From Canada's standpoint, opening up Canadian routes to U.S companies is an excellent idea. While there will be some turmoil among incumbents, VBA's will easily pick up major routes such as the Toronto-Vancouver, or Toronto-Montreal. In order to ensure that smaller routes are serviced, the government can impose mandates similar to those implemented in the U.S in the 1970's. While Air Canada may suffer, as

a whole the Canadian consumer stands to gain a lot in terms of savings from fares and service. The U.S market is definitely changing. However it is not failing and Canada should not fear that it will be subjected to market "chaos" should cabotage agreements be dropped.

In short the airline market is neither contestable nor does it suffer from an empty core problem. The success of entrants operating on the VBA framework increasing competition has proven to be quite profitable. Legislation recently passed in Germany with respect to predatory pricing by incumbents shows promise of further opening the market and breaking down the natural and structural barriers of the industry.

While this paper is the first to take a fully comprehensive look at en empty core problem in the airline industry further research could be made with respect to the nature of airlines' supply curves and their sensitivity to the great amount of market volatility they experience. Analysis of supply curve elasticities similar to those seen in Fischer (2003) would provide a good starting point in analyzing the flexibility of airlines and their ability to avoid an empty core. In addition, a Williamsonian analysis of firm exit or consolidation would also provide insight into the matter. The process by which consolidation or exit would be most efficient is a major issue given the conclusions of this paper.

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