Application of Core Theory to the Airline Industry

Sunder Raghavan, PhD.

College of Business, Embry Riddle Aeronautical University
600 S. Clyde Morris Blvd.,
Daytona Beach, FL 32114-3900, USA

Tel: 800-862-2416
Vedapuri.raghavan@erau.edu

Abstract

Competition in the airline industry has been fierce since the industry was deregulated in 1978. The proponents of *deregulation* believed that more competition would improve efficiency and reduce prices and bring overall benefits to the consumer. In this paper, a case is made based on *core theory* that under certain *demand* and *cost* conditions more competition can actually lead to harmful consequences for industries like the airline industry or cause an *empty core* problem. Practices like monopolies, cartels, price discrimination, which is considered *inefficient allocation* of resources in many other industries, can actually be beneficial in the case of the airline industry in bringing about an *efficient equilibrium*.

Keywords: empty core, demand, cost, equilibrium, unrestricted contracting, competition, airline industry.

Introduction

US Airline industry is considered a highly competitive industry. However, despite receiving $5.0 billion in direct assistance from the U.S. government in 2001, the financial stability of the U.S. domestic airline industry remains substantially in doubt. The recent spate of bankruptcies filings, first by U.S. Air and then by United airlines, leads one to wonder whether competition is essentially good for the airline industry or will ultimately prove destructive to the airline industry. Clearly, the terrorist attacks of September 11, 2001 have had a serious impact on the industry. However, the industry, particularly the major carriers, was headed toward financial distress prior to the terrorist attacks. For the quarter ended June, 2001, the industry posted an operating loss of $70 million, as compared to an operating profit of in excess of $3,000 million the prior year (Linenberg and Flemming, 2001). Various explanations, ranging from labor issues to weak business plans have been offered as reasons for the current woes of the U.S. Airline industry.

In this paper we offer a theoretical explanation for the problems faced by the airline industry based on core theory. According to core theory in some industries, like the airline industry, excess competition can lead to an empty core problem or lack of a stable equilibrium. The notion that competition in the airline industry may be destructive for the airline industry is further strengthened by what happened in the US airline industry immediately after deregulation in the 80's. At that time price-cutting in the industry was extreme, most firms in the industry were losing money even though buyers wanted the product and were willing to pay higher than prevailing prices. The cumulative losses incurred by the industry exceeded the profits previously earned since the industry's inception. Several carriers failed and ceased operations including such high profile operators as Pan American Airways and Eastern Airlines.

Specifically, core theory suggests that, under some conditions, non-competitive practices may in fact have an efficiency-enhancing role in the sense of making both producers and consumers better off. Core theory also clarifies the notion of efficient competition and cooperation - that agents in a market may simultaneously cooperate and compete at the same time.

The paper is organized as follows. In the second section we provide a brief review of terminology and definitions for introducing Core Theory. The third section provides an applied framework so that the abstract concepts of Core Theory are related to standard notions of market organization. In the fourth section, we identify some symptoms of an empty core and relate it to the airline industry. Section 5 look at how the airlines have dealt with the empty core problem in the industry. Section 6 concludes with some policy implications.

Terminology and Definitions

Core Theory concepts are closely related to many standard economics concepts. To keep the exposition simple, we do not discus these issues. The following definitions are necessary for understanding Core Theory. A numerical illustration and industry examples are included with the definitions.

Avoidable cost: The firm in the industry has the option of avoiding this cost. For example in the shipping industry the ship can decide to sail or not to sail and hence can avoid the cost associated with sailing (this decision is separate from cost of purchasing the ship). Similarly in the airline industry the aircraft may decide not to fly and can avoid fuel and other costs associated with flying (this decision is separate from the decision to acquire the aircraft).

Sunk cost: Expenditure which cannot be recovered. The cost of purchasing a ship or an aircraft can be considered sunk cost.

Divisible vs. Indivisible demand: Divisible demand refers to situations where demand can be broken down into separate units. For example in ocean liner shipping where small packets are shipped or as in the case of airlines where each seat on the aircraft can be considered a separate unit which can be sold at different prices. Whereas in the case of indivisible demand it is not possible to divide demand into different units as in the case of bulk shipping.

Empty core: Situation where there is no stable equilibrium. In some industries competition leads to an empty core problem.

In general the essential theoretical ideas of core theory can be set forth in this way.

1. There are a group of *n* individuals (or firms) in a market; some of whom are buyers and others are sellers. They can all trade with each other in a single market, or in sub markets, or may decide not to trade at all.

2. The buyers and sellers can measure the *gains from trade*. For the buyer it is the maximum amount the buyer is willing to pay for the quantities purchased less the amount actually paid. For the seller, it is the amount actually received less the amount the seller would have been willing to accept.

   Following Telser (1994), assume that there are three individuals and the first two are potential buyers of a widget and the third is a seller. The seller S has a valuation of \$10 for the widget. Buyer 1 has a reservation price of \$12 for the widget and buyer 2 has a reservation price of \$15. Let x denote the return to the seller and y1 and y2 denote the returns to the buyers, respectively. In case the seller sells the widget, he would settle for no less than \$10 which is his option value, so that x μ10. For the potential buyers, y1 μ 0 and y2 μ 0 because each can refuse to make a purchase and thereby can ensure a net gain of zero.

3. The buyers and sellers can contract with each other and form groups called *coalitions* to maximize their gains from trade. Such a process of contracting can be either unrestricted or restricted depending on the nature of the Industry. What the members of the coalitions get is called an *allocation*.

   With three members, there are a total of $2^3 - 1 = 7$ possible coalitions, excluding the coalition with no members. These are {S}, {B1}, {B2}, {S,B1}, {S,B2}, {B1,B2}, {S,B1,B2}. Coalitions with single members are called *singletons* and coalition with all members is called the *grand coalition*.

4. An allocation is *dominated* if some members of the coalitions can do better for themselves by leaving one coalition and joining another coalition. If the members cannot do better by leaving their existing coalition then the allocation is undominated.

5. A buyer or a seller would be member of a coalition as along as they can do at least as well as they could in any other coalition (it is important to point out that deciding not to trade or being alone is also a possible coalition).

   The approach is to consider all possible coalitions of traders, recognizing that any coalition of traders will only participate in the market as a whole if and only if they can do at least as well as they could in another coalition. In the decision of a member as to which coalition to join, the maximum payoff available in all other coalitions provides the lower bound.

   Core theory considers all possible coalitions, including singleton coalitions. An implication is that, if a coalition forms instead of singletons, we can surmise that all the members believed that they were better off than they were being alone (pareto-optimal).

6. If we have a coalition with all the buyers and sellers in it (called the *grand coalition*) then it means that the each buyer and seller feel that this is the coalition which would maximize their gains otherwise they would not be in the coalition.

7. The grand coalition should therefore offer to each buyer and seller at least as much as they could get in any other coalition they can form i.e., it should be a undominated allocation. The allocation from each possible coalition therefore imposes a lower bound on the payoff for each member, which must be satisfied for the grand coalition to exist.

   Since we include all possible grouping – i.e., singletons, 2-person, 3-person etc. till n-person coalitions, the grand coalition should satisfy the constraints imposed by all coalitions.

8. If there exists no other coalition, which can make at least one person better off without making another person worse off, then economists call such a situation "*Pareto Optimum*". An allocation is an *efficient* allocation if it is a Pareto optimal allocation.

   It follows that any coalition, which survives all the restrictions imposed, by all the coalitions is a pareto-optimal solution.

9. If such a "grand coalition" exists which is an efficient allocation for all concerned, then we say that a core exists. The core therefore consists of all the undominated allocations.

   A grand coalition is a market in which all buyers and sellers are present. If a grand coalition is the core, then all members choose to be in the market-like many to many relationship rather than forming sub-markets or groups.

10. The core may sometimes have either one allocation or many allocations. It is also possible that there may not be any allocation in the core. This is called an *empty core*. The empty core implies that there is no *stable coalition*. Whatever coalition can be formed, there is always an incentive for some subgroup to benefit by leaving it.

When the core is empty, there is no pareto-optimal situation. In the specific context, it means that members may switch among multiple coalitions opportunistically. Telser (1987) uses the word "chaos" to describe this situation.

The Framework of Core Theory

In the last section we set out the basic definitions and a simple theoretical ideas of core theory with example. In this section we attempt to describe the basic framework of core theory, which can be used to analyze the organization of economic activity within and across firms. To do this, it is necessary to relate the abstract concepts from the above section to standard notions of competition.

Telser (1987) applies the above concepts to market organization. The framework uses two basic constructs: the *status of contracting* and the *status of the core*. Contracting can be either restricted or unrestricted. If contracting is unrestricted, it means that economic agents (buyers and sellers) are free to form any coalition without any outside interference. There are occasions, however, when contracting is restricted. The restrictions can take the form of limits on the terms of the contract and may also specify who may enter into a contract. In other words contracting is not totally free and open to all. For example, pure competition is an example of unrestricted contracting while monopoly, cartel etc. can be viewed as restricted contracting.

The core can be either empty or non-empty. We say core exits if there is an undominated allocation. If there is no undominated allocation, the core is empty - this means that there is no single allocation, which is acceptable to all members and any coalition of the members. The implication of an empty core is that the market leads to a potential loss to many of its members.

Telser's (1987) primary contribution is to identify that sometimes, the core may not exist. Prior to Telser (1987), the idea that a core may not exist was not considered a possibility. Since most research followed the standard notions of competition without the idea of empty core, many of the arguments made with respect to the degree of competition would also ignore the possibility of the core being empty. For example, under standard theory, one would argue that unrestricted contracting would lead to a more competitive and efficient market. Under the core theory, it would be contingent on the existence of the core.

The two types of contracting and the two states of the core then give rise to four possible situations summarized by the Figures 1 and 2 below. Standard forms of market organization always assume that a core exists so that only the first row is considered.

Figure 1: The Framework

	Type of Contracting	
	Unrestricted	**Restricted**
Core Exists	**Competitive/Efficient Equilibrium** Perfectly competitive equilibrium	**Inefficient Equilibrium** Monopoly Oligopoly Cartels

Empty Core	No Equilibrium	**Equilibrium** Any solution is efficient, because a perfectly competitive solution is not possible.

Cell 1: Core exists – Unrestricted contracting

A core is not empty if there is a feasible set of allocations acceptable to all participants and all coalitions of participants. A nonempty core, according to Telser (1987), combines the "optimal mixture of cooperation and competition". The cooperation implicit in a nonempty core is "self-enforcing because no one can gain by rejecting the return received as a member of the grand coalition". The first cell also requires unrestricted contracting so that any member can form a relationship with any other member, with no external compulsions. The first cell is consistent with the standard notion of competitive equilibrium. A competitive equilibrium is efficient in the sense that the total surplus is maximized or, equivalently, there are no deadweight losses. Even though most existing research focuses on this cell, we feel that this should be seen as an ideal or alternately, a limiting case.

Cell 2: Core Exists – Restrictions on Contracting

If the core exists and restrictions are in force, this causes departures from perfect competition and concepts from various theories of imperfect competition become the analytical tools. Examples are monopoly, which is known to cause an inefficient equilibrium. A cartel is another example of restrictions in which firms in an industry jointly set outputs or prices. A noncooperative equilibrium may also fall into this category because, at least in theory, the only legal entities are singletons. This requirement imposes restrictions in the sense that firms cannot form n-member coalitions as they please. The effect of these restrictions is to prevent the market from moving towards a competitive and efficient equilibrium. The question arises as to how these restrictions are sustained. Telser (1987) suggests that a third party could sustain these restrictions. The market alternatives in this cell would be inefficient compared to the perfectly competitive equilibrium when core is nonempty and contracting is unrestricted.

Cell 3: Empty Core-Unrestricted Contracting.

The core may not exist (empty core) for several reasons such as non-convexities, indivisibilities and externalities. Telser (1987) characterizes this as a "chaotic" situation. Observable symptoms of chaos are extreme price-cutting with most firms in the industry losing money, while at the same time buyers want the product and are willing to pay higher prices than those prevailing in the market. For example, soon after deregulation in the airline industry, excessive price wars led firms to make losses, even though consumers were prepared to pay higher prices. Both airlines and consumers were worse off due to excessive competition – airlines lost money and consumers could not find the service at any price. This leads to undesirable outcomes for most of the participants.

Cell 4: Empty Core – Restricted Contracting

When the core is empty, restrictions have to be imposed in order to restore equilibrium. Without such restrictions, there is no equilibrium. A monopoly is a possible restriction, which restricts contracting by limiting the competition to one single firm, or a singleton. A cartel, a set of firms who make decisions jointly is also a restriction, because it reduced the number of possible coalitions. Likewise, vertical integration (buyers take over sellers or vice-versa) imposes restrictions on coalition formation. Long-term contracts, price discrimination practices and deferred rebates (e.g. frequent flyer miles) are also restrictions on the number of possible coalitions.

Figure 2: Impact of Competition on Contracting

Core Exists	**Unrestricted**		**Restricted**
	Competitive/Efficient Equilibrium Perfectly competitive equilibrium (guaranteed when N is large)	**Industries which become more competitive/efficient due to unrestricted contracting**	**Imperfect Competition** Monopoly Oligopoly Cartels
Empty Core	**No Equilibrium** Chaos	**Industries which become chaotic due to unrestricted contracting**	**Efficient/Inefficient Equilibrium**

Symptoms and Conditions for Empty Core

The symptoms of empty core are described by Telser (1987) using the word "Chaos". According to Telser, there is chaos when "price cutting is extreme, most firms in the industry are losing money, and yet it is plain that buyers want the product and are willing to pay higher prices than those currently prevailing."

Telser (1987) identifies some conditions under which the core can be empty. For private goods, which are continuously divisible, there is an "implication" of an empty core if and only if there are constant or increasing returns to scale. For industries with U-shaped average costs (called Viner industries), core may generally be empty. Sjostrom (1989) suggests that avoidable costs could lead to an empty core. Pirrong (1992) suggests large avoidable costs as well as finely divisible demand as possible causes for an empty core. Specifically, he states "core is frequently empty when demand is finely divisible but production costs are not". On the other hand, when the number of traders is large, a core will almost always exist. The core theory is, therefore, appropriate for markets involving few traders and one or more of the conditions discussed above. Explicit modeling is usually necessary to identify an empty core. Figure 3 contains a graphical representation of the arguments.

The above discussions highlight that the unrestricted ability to contract and re-contract among buyers and sellers within an industry is a necessary condition for an empty core to exist. It is this unrestricted ability to contract that allows prices to be bid down to non-profitable levels. Further these discussions imply the necessity of excess capacity. To the extent that one or more producers have excess operating capacity, attracting additional customers by lowering price, provided such price is above marginal cost, creates additional operating profit (or reduces operating loss) for the individual producer. However, the game theory aspect of the empty core dictates that as customers move away from a producer in pursuit of a lower price, that producer itself will react by lowering its price. This process continues to repeat and may result in an empty core. Restrictions on the ability to contract short-circuit this process. The stronger, more permanent the restrictions, the less likely the core is to be empty. Sjostrom (1989) and Pirrong (1992) have applied core theory to the shipping industry. Coyle (2000) uses core theory to explain the electric power generation industry in a deregulated environment. . Nyshadham and Raghavan (2001) offer core theory as an alternative explanation to Daamsgard (1999) explanation as to why an electronic market did not form in the air cargo market in Hong Kong.

Sjostrom (1989) looks to the imposition of artificial restrictions in differing circumstances in order to distinguish between rent seeking behavior and empty core resolution.

Pirrong (1992) suggests the requirement of variable demand for the core to be empty since "it is usually cost minimizing to build several plants and periodically idle one or several in response to changes in demand," and "it may be optimal to operate some of the active plants below capacity". Sjostrom (1989) recognizes variable demand as contributing to the potential of an empty core. However, he addresses the variability of demand in the context of discontinuities in the supply curve. In effect, the greater the variability of demand, the more likely it is for demand to enter a discontinuous region. Sjostrom also recognizes that variability in cost can have the same effect by shifting the supply curve and causing demand to again fall into a region of discontinuity. Further, Sjostrom also recognizes that an industry slump can be sufficient to result in an empty core. While this may be consistent with Pirrong's requirement for demand variability, Sjostrom suggests that such a slump may also result from increased costs. Thus, the important feature is the effect of excess capacity, not necessarily the cause of that excess capacity.

Sjostrom addresses a discontinuous supply function in the context of differing cost structures between firms and the incurrence of sunk costs for individual firms. Sjostrom theorizes that with greater differentials in cost structures the less discontinuous the supply curve. Thus, the more similar the cost function of individual firms, the more likely an empty core is to exist. As capacity of existing facilities is reached, new firms enter only if demand increases sufficiently to justify incurring sunk costs at entry. Thus, the incurrence of sunk costs to create additional capacity creates discontinuities in the supply function.

The most recognized sufficient cause of a discontinuous supply curve is the existence of avoidable costs. That is, once operating capacity has been created (sunk costs incurred), its actual operation may require the incurrence of large avoidable costs, regardless of the level of capacity utilization. A resulting U-shaped cost curve creates a supply discontinuity at a price

equal to minimum average cost due to indifference to produce at this point (Sjostrom, 1989). The greater the avoidable cost, the greater the discontinuity.

A further condition implied by the discontinuous supply curve relates to the size of firm capacity to the market in general. The greater the size of individual capacity relative to the market, the more likely the core will be empty (Sjostrom, 1989). Pirrong (1992), on the other hand, addresses the scale issue from the demand perspective. The more finely divisible demand, the more likely an empty core is to exist. Pirrong views this resulting from increased competitive options. Viewed from the context of the discontinuous supply curve, indivisible demand reduces the likelihood that demand would fall within a discontinuous region of the supply curve.

The discontinuous supply curve indicates that demand elasticity impacts the status of the core. Perfectly elastic demand results in a horizontal demand curve, eliminating the potential for demand to fall within a discontinuous region of the supply function (Sjostrom, 1989). As a result, the market accepts any quantity that can be supplied at the given price. As a result, competitive pricing reactions are not necessary to fill capacity.

The U.S. airline industry substantially satisfies all of the various conditions, both necessary and sufficient, consistent with the formation of an empty core. The operation of a scheduled airline is in a sense similar to the ocean liner industry described by Pirrong (1992). Just as an ocean liner, an airline at least in the short run, has sizeable fixed avoidable cost. While the large investment in a commercial aircraft represents a sunk cost, its operation includes significant avoidable costs including fuel, labor and maintenance costs. Once however, the airline has committed to a particular fleet and schedule it cannot change output without incurring substantial adjustment cost.

On the supply side the cost conditions of an airline are such that cost per mile flown falls as the number of miles flown increases. However, technological constraints imply that, distance flown can be increased only by reducing aircraft capacity. Further, cost per passenger falls as the number of seats filled on an aircraft raises up to full capacity. Taken together this implies that marginal cost starts increasing well before the payload at maximum range is reached.

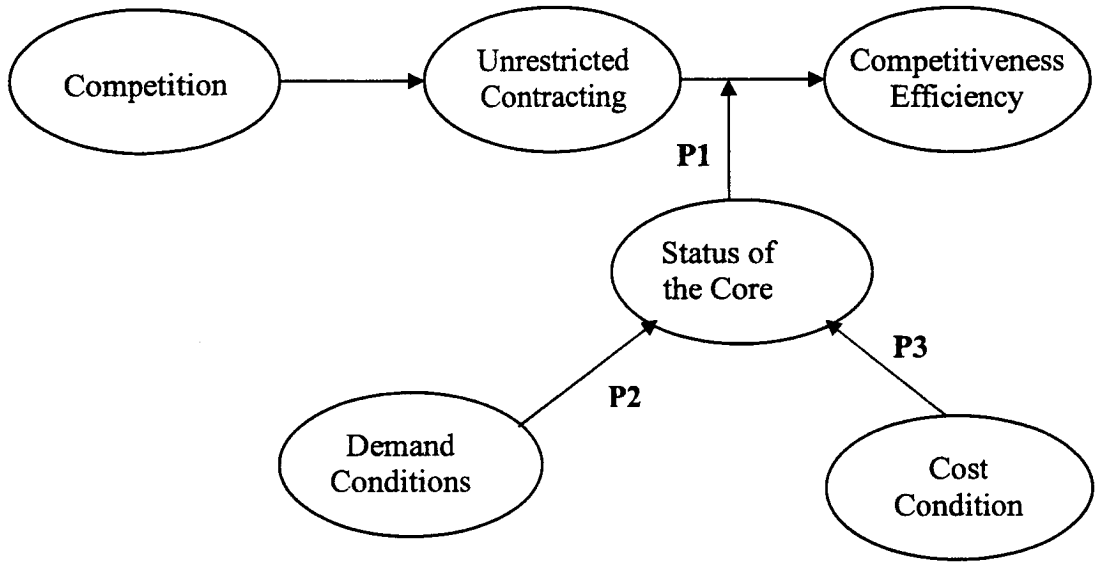
The airline industry has generally operated with excess productive capacity. Further airlines tend to cut prices to short-run marginal cost in the face of excess capacity that will occur due to variations in demand which pushes prices below that required to operate an efficient set of schedules. Recently significant capacity has been idled (parked in the desert) by the industry. This is exacerbated by the existence of the hub and spoke which magnifies these adjustment cost. (see Antoniou (1998)).

On the demand side an airline faces seasonal and cyclical demand. In addition, short-term shocks brought about by events like 911, for example, further increases the volatility in demand.

Thus matching capacity to demand in the airline industry moves it towards an empty core or an unstable equilibrium. Under these conditions imposing competition on this industry will only

make the situation worse. The next section looks at how the participants in the industry have come up with noncompetitive solutions to overcome the empty core problem.

Figure 3: The Theoretical Model



We summarize the theoretical model in a proposition form.

P1: Unrestricted contracting among agents can have different effects on efficiency depending on whether or not a core exists

P1.1. (Core Exists) When Core exists, competition leads to high efficiency.

P1.2. (Core does not Exist) When the Core does not exist, competition leads to lower efficiency

Whether or not a Core exists depends on demand and cost conditions

P2: If an industry has a finely divisible demand, then the core may not exist.

P3: If an industry has large, avoidable costs then core may not exist.

Resolving the Empty Core: The Case of the Airline Industry

An important contribution of Core theory is the means of resolving an empty core. When the core is empty, restrictions on contracting are beneficial and can create an equilibrium. Such an equilibrium may be inefficient compared to a competitive equilibrium, but is an improvement over the chaotic situation that will persist if core is left empty.

Button (1996) differentiates the conditions where collusion or the adoption of cartel-like characteristics by an industry occurs as a result of rent-seeking behavior (i.e. decreasing market efficiency) or resolution of the empty core (i.e. increasing market efficiency and stability). The notable differences lie in the elasticity of demand, volatility of supply/demand, and barriers to entry. Industries with legal barriers to entry and a smaller number of participants have a higher tendency toward collusion for rent seeking purposes. Industries which have more inelastic demand, variable supply/demand, and a smaller number of participants are more likely to have an empty core, in which case they tend toward collusion in order to resolve the empty core, particularly during recessionary periods.

Many methods exist to resolve the empty core through the implementation of restrictions on contracting. We will discuss some attempts in the airline industry to resolve the empty core problem.

Monopoly/Cartel Formation

First, the U.S. airline industry has adopted certain characteristics similar to cartels. An interesting practice among US Airlines is for them to share fare information with one another on a nearly real time basis through an intermediary called ATPCO (http://www.atpco.net/index2.htm). The ability of US airlines to respond rapidly to fare cuts by competitors comes from the data provided in the ATPCO system. Membership in ATPCO is voluntary but interestingly, most airlines choose to become members of ATPCO and post their fares regularly to ATPCO. ATPCO states that they collect fare information from over 550 airlines and distribute it to global distribution systems (GDS) such as Sabre, Amadeus/System One, Galileo and Worldspan. ATPCO believes that it "creates efficiencies in this process by permitting each airline to submit its information via ATPCO, thereby giving each CRS/GDS the opportunity for a single source of fare related data." This practice of sellers signaling their pricing intentions is somewhat unusual and it may be construed as an uncompetitive practice with intent to collude. To the extent that ATPCO is a voluntary body, airlines would not have joined the organization unless they thought they were better off. In the context of the core theory, this is an attempt by the airline industry to address the problem of empty core.

More recently, the industry has moved toward more direct cooperation amongst competitors through the implementation of code-sharing agreements that allow airlines to coordinate schedules and capacity. The U.S. Department of Transportation has approved such an agreement between United Airlines and US Airways (October, 2002), and Delta, Northwest and Continental are pursuing a similar agreement. These agreements potentially allow individual airlines to coordinate schedules and capacity, and adopt characteristics of cartels further reducing competitive practices within the industry.

Price Discrimination

The U.S. airline industry relies heavily on a sophisticated form of price discrimination called revenue management. Revenue management systems allow airlines to use historical data on load factors on a flight as well as real time load factors to adjust prices for different classes of fares.

This results in different customers paying different prices based on the time and even the channel of purchase, apart from the fare class. While many observers would disagree with the practice of an airline seat being sold at widely different prices, many researchers argue that airlines cannot be profitable unless they do so. It is also argued that, if price discrimination was banned and airlines were forced to offer the same price, many airlines might suffer losses and some might even stop flying. If this is true, this may have a contrary effect of making consumers, who could have paid higher prices, worse off. This is another example of how noncompetitive practices like price discrimination can lead to an efficient equilibrium.

Long-term Contracts/Deferred Rebates

Virtually every major US airline has implemented a frequent flyer program. These programs are designed to increase customer loyalty and effectively increase the cost of "re-contracting". Accordingly, these frequent flyer programs function as a long-term contract between the airline and the individual consumer, which contract provides a deferred rebate in the form of free flights, upgrades to first class, and enhanced levels of service. The benefits of these programs improve with increased purchasing and protect the airlines most valuable customers, the frequent traveling business passengers who typically pay a much higher fare under the revenue management systems.

Instances such as these lead us to look at the notion of 'efficiency' from a broader perspective. Under the broader perspective, maximizing the total surplus (producer plus consumer surplus) may lead to higher efficiency and lower deadweight loss to the society. Under some conditions, non-competitive market structures and practices such as monopolies, cartels, restrictions on transactions among industry members, deferred rebates, price-discrimination etc. may have an efficiency-enhancing role.

Conclusion and Policy Implication

In this paper we use core theory to examine the airline industry. Core theory helps explain why, for industries with certain cost and demand conditions, a competitive equilibrium may not exist. In such cases, a pareto-optimal outcome for all members does not exist, resulting in an empty core. Unrestricted contracting, enabled by enforcing competition in industries like the airline industry creates more "chaos" when the core is empty.

Some financial economist have questioned the need for government aided competition and have raised concerns about the lax bankruptcy laws (see Wruck, K.H. (1990)) which have enabled inefficient firms to survive in the industry in an effort to promote and preserve competition. The Economist (2002) predicts that due to the protection afforded to it by the bankruptcy laws, U.S Air and United airlines can push through changes like lower fares and wages easily. This will have the effect of lowering prices through out the industry as other airlines try to preserve their market share, pushing the entire industry towards an unstable equilibrium.

McWilliams, A. (1990), argues that current antitrust laws have to recognize that some industries are subject to the empty core problem or an unstable equilibrium. If antitrust laws do not recognize the empty core problem it can lead to business practices as prevalent in the airline industry today, which are inconsistent with our common sense notion of competition. Practices like monopolies, cartels, price discrimination, which are considered inefficient allocation of resources in many other industries it seems can actually be beneficial in the case of the airline industry in bringing about an efficient equilibrium.

Thus government "bail out" of the industry, lax bankruptcy laws and stricter antitrust legislation to aid competition can be potentially damaging to the industry. Surprisingly enough, to solve the problem (i.e., resolve the empty core), the theory suggests that additional restrictions may be placed. The resulting equilibrium is often more efficient compared to the alternative outcome of an empty core which results from unrestricted contracting.

This is a preliminary investigation of the existence of empty core problem in the airline industry. The next step would be to develop a model and test the ideas of core theory for the U.S. airline Industry.

References

American Public Power Association (2000, January). Price Discrimination, Electronic Redlining, and Price Fixing in Deregulated Electric Power. Washington, DC: Coyle, Eugene P.

Antoniou, Andreas (1998). The Status of the Core in the Airline Industry: The Case of the European Market. *Managerial and Decision Economics.* 19(1), 43-54

Button, Kenneth (1996). Liberalising European Aviation: Is there an Empty Core Problem? *Journal of Air Transport Economics* 30(3), 275 – 291.

Damsgaard, Jan (1999). Electronic Markets in Hong Kong's Air Cargo Community: Thanks, but no Thanks. *Electronic Markets.*

Linenberg, Michael J. and Flemming, Sandra (2001). Airline Industry Quarterly Review: June Quarter 2001. Global Securities Research & Economics Group; Merrill Lynch, Peirce, Fenner & Smith Inc. August, 2001.

McWilliams, Abagail (1990). Rethinking Horizontal Market Restrictions: in Defense of Cooperation in Empty Core Markets. *Quarterly Review of Economics and Business* 30(3), 3-14

Nyshadham, Easwar A., and Raghavan, Sunder (2001). The Failure of Electronic Markets in the Air Cargo Industry: A Core Theory Explanation. *Electronic Markets* 11(4), 246 – 249

Pirrong, Stephen C. (1992, April). An Application of Core Theory to the Analysis of Ocean Shipping Markets. *Journal of Law & Economics* XXXV, 89-131

Sjostrom, William (1989). Collusion in Ocean Shipping: A test of Monopoly and Empty Core Models. *Journal of Political Economy* 97(5), 1160 – 1179

Telser, Lester G. (1994). The Usefulness of Core Theory in Economics. *Journal of Economic Perspectives* 8(2), 151-164

Cruel Phoenix. *The Economist*, December 12, 2002.

Wruck, Karen H. (1990). Financial Distress, Reorganization, and Organizational Efficiency. *Journal of Financial Economics* 27, 419-444