AIRLINE CONSOLIDATION AND
CONSUMER WELFARE

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INTRODUCTION

When airline deregulation was enacted in 1978, the conventional wisdom held that the industry would develop along the lines successfully demonstrated by the thriving intrastate carriers who operated independently of federal route and fare regulation. These were small carriers who specialized in point-to-point service, and because they were so much more cost-efficient than the regulated interstate carriers, many scholars saw their mode of service as a model for the national air transport system that would be forged by competitive forces. This, of course, has not happened.

Mergers and bankruptcies have reduced the number of national carriers from twenty-three to eight in the years since 1978, and none of the surviving eight provides point-to-point service. Instead, dense hub-and-spoke network systems have become the norm. The point-to-point route configuration has been the exception, and is confined to a few regional airlines, the most conspicuous of which is Southwest.

We explain this outcome with a model in which consumers care not only about price but also about service, as measured by scope of operations or network density. Consumers value more dense networks because they facilitate more convenient service. Our model suggests that the service-enhancing effects of employing large-scale networks have outweighed the potential price-increasing effects of having a smaller number of competing carriers. Our model concludes that a welfare gain accrues to consumers as a result of the more consolidated market structure.

For a range of plausible parameter estimates, our model suggests that the socially optimal number of national carriers may be even smaller than the current number. Thus, the continued evolution to a competitive airline industry equilibrium may involve further consolidation. Furthermore, the industry is likely to remain consolidated, no matter how large the market becomes. The intuition is that service-enhancing costs attract consumers, and firms therefore have incentives to increase such expenditures as long as the market expands. As a result, only a small number of major players can stay in the market, no matter how large the market becomes.

Our model finds that the market equilibrium is one in which carriers earn sufficient profits to provide them with capital, but not to earn monopoly rents. Thus, com-

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petition is not destructive in equilibrium. Efficiency has required the number of national carriers to shrink. Public policy makers have a role to play within this context: both antitrust policy and bankruptcy policy should be exercised so as not to impede welfare-enhancing consolidations in the airline industry. Responding to political demands to nurse sick airlines through lengthy Chapter 11 proceedings is counterproductive. Global consolidation and partnerships are likely to be efficient and therefore should be encouraged rather than discouraged by governments.

A MODEL OF AIRLINE COMPETITION

The Importance of Network Effects

The significance of unrealized network and other scale economies in the airline industry was not understood at the time airlines were deregulated. The industry appeared to lack economies of scale. While it was recognized that regional (local service) carriers had a higher cost structure than national (trunk) carriers, it was thought that this would be eliminated by permitting free entry and exit. As Alfred Kahn [1988] once expressed it, airplanes are "marginal costs with wings" that can readily be deployed in newly opened markets.

Although it was known that there was a competitive value associated with control of feed traffic (passengers originating in smaller communities), it was also thought that low-cost, no-frills, point-to-point services, such as those offered by the former intrastate airlines, could be replicated across the country. Fixed costs in the industry were modeled as constant (exogenous). With fixed costs constant, more and more firms can enter as the market increases, and the level of concentration decreases accordingly. Hence, many economists expected that there would be a large number of firms in a deregulated airline industry equilibrium.

By eliminating entry restrictions, deregulation freed carriers to restructure their operations. Rather than the linear routes often awarded by regulators, airlines configured their route systems to optimize the flow through their networks. A new operating design, the hub-and-spoke delivery system, became standard for the major carriers in the industry. As pointed out by Carlston, Landes and Posner [1989], if there is an intermediate stop on a trip, passengers prefer single-carrier service to changing airlines. Single-carrier services often involve no change of plane. Even when a change of plane is required, the connection and navigation times within the hub airport are shorter and the hassle is less than with a change of carriers. The advantage of hub-and-spoke systems to consumers is that airlines provide single-carrier service to many cities that do not have enough traffic to support frequent nonstop services.

Winston [1993] has found that the frequency improvement of the wider range of flights far outweighs the added transit costs to consumers of the one-stop hub-and-spoke service.

Because of the importance of hub-and-spoke network systems to airlines' competitive positions, we set up an airline model in which airlines endogenously determine the scale (e.g., coverage and connection) of their hub-and-spoke network systems. In addition, the costs associated with setting up the network systems are treated as fixed costs which are invariable with the number of passengers actually transported. We model the airline competition as a two-stage service-price game. At the first stage, each airline chooses its hub-and-spoke network scale. At the second stage, each airline selects a price that maximizes its profit, given its network scale.

In early models of the airline industry, an airline's competitive position was determined by models which focused on individual city-pair markets rather than on the coverage and connection of its network [Douglas and Miller, 1974; Dorman, 1976; Panzar, 1976]. In our two-stage model, we account for the service-enhancing effect of a large-scale network on passenger demand. We demonstrate that the setup and development costs of an airline's network and other systems play significant roles in determining industry structure. Our model is inspired by a series of papers which have examined industrial concentration from the viewpoint of product differentiation [Shaked and Sutton, 1983; 1987; Sutton, 1991; Gubaszewicz, Shaked, Sutton and Thisse, 1981; Bresnahan, 1990].

Contestability theory has also played a role in airline deregulation [Bailey, 1981; Baume and Panzar and Willig, 1982; Bailey and Baume, 1984]. It was recognized that many city-pair markets would remain concentrated even after deregulation, as the demand for services would be insufficient to support competition within these markets. Yet it was hoped that free and easy entry and exit into such markets would serve to discipline price. The fixed, service-enhancing costs, such as hub-and-spoke network investments, which have been undertaken by the airline industry in the post-regulation period involve substantial sunk costs, which make it hoped for contests by potential entrants less likely. Thus, it is not surprising that evidence has been mounting that airline markets are not as contestable as had been hoped [Bailey and Panzar, 1981; Call and Keezer, 1986; Bailey, Graham and Kaplan, 1985; Morrison and Winston, 1987; Borenstein, 1989; 1992].

Both the entry barrier and service quality enhancing effects of the airlines' hub-and-spoke networks have been recognized in the literature [Morrison and Winston, 1987; Levine, 1987; Borenstein, 1989; 1991; Berry, 1990; 1992]. For example, Berry's early study (1990) incorporated passenger preferences in a product differentiation model of airlines. It found that passengers are willing to pay a premium for those services that relate to airlines' network coverage. In his subsequent paper, Berry [1992] estimated the effects of airlines' network coverage on airline city-pair profitability. However, the welfare implications are left open. We address both welfare and market structure implications in our model.

A Two-Stage Model with Open Entry

Consider n airlines providing differentiated flight services. The airlines compete by choosing a hub-and-spoke network scale \( s_i \) and a price \( p_i \), \( i = 1, 2, \ldots, n \). We model the competition as a two-stage game. At the first stage, each airline chooses \( s_i \). At the second stage, each airline chooses its price \( p_i \), given its \( s_i \), \( i = 1, 2, \ldots, n \). Our presentation here is simplified to identical consumers and symmetric airlines. Hendricks, Picone and Tan [1990] study a case of symmetric demands and costs for a single
airline selecting both price and network design. Liu (1993) considers a case of asymmetric service differentiation and its relation to industry concentration.

We first derive consumer demand from consumer utility equations. Airline flights are viewed by consumers as substitutes, with features that differentiate them from one another. A representative consumer is assumed to have the following consumer surplus function:

\[ CS = \sum_{i=1}^{n} (\alpha + s_i) x_i - (1/2)\beta (\sum_{j=1}^{2} x_i + \gamma x_i x_j) - \sum_{i=1}^{n} p_i x_i, \]

where \( n \) is the number of differentiated airlines; \( p_i \) and \( s_i \) are price and a measure of network scale of airline \( i; x_i \) is the number of trips taken by this individual consumer on airline \( i; \alpha, \beta, \) and \( \gamma \) are parameters with \( \alpha > 0, \beta > \gamma > 0, \) and \( 1 > \gamma/\beta > 0.\) As \( \gamma/\beta \) moves from 1 to 0, the services by the \( n \) airlines are less and less substitutable. This utility function is selected because it yields a standard, linear consumer demand which increases with network scale and decreases with price. As Daughety (1988) points out, this kind of functional form is frequently used in differentiated product models. It allows us to derive simple and explicit results.

For a given network scale \( s_i \)'s and price \( p_i \)'s for the various airlines, the consumer chooses a level of trips \( x_i, i = 1, 2, \ldots, n, \) that maximizes his or her utility (1). This would yield a system of demand equations:

\[ p_i = \alpha + s_i - \beta x_i - \gamma x_j, i = 1, 2, \ldots, n. \]

Reiss and Spiller (1986) used this type of inverse demand equation in their empirical study of airline entry behavior. Each \( x_i \) is uniquely determined from equation (2) in terms of \( s_i \)'s and \( p_i \)'s. Assume that there are \( Z \) identical consumers. It follows that the total demand for airline \( i \) is simply \( Z x_i, i = 1, 2, \ldots, n.\)

When the \( n \) airlines are symmetric, \( s_i \)'s and \( p_i \)'s are all equal to a common value \( s \) and \( p \), respectively, all the \( x_i \) are equal to each other. Denote the common \( x \) as \( x. \) Equation (2) then reduces to

\[ x = (\alpha + s - p/\beta) + (n - 1)\gamma. \]

We denote \( e_i \) as the negative of the price elasticity of demand. Using Equation (3), we have

\[ e_i = -\frac{\partial x_i}{\partial p_i x_i} = \frac{p_i x_i + (n - 1)\gamma}{x_i (\alpha + s - p_i / \beta)}. \]

which gives

\[ p = x(\beta + (n - 1)\gamma) e_i. \]

For a given \( n \) and \( s, e_i \) gives the percentage change of a consumer's travel demand for one airline if the airlines' common price \( p \) is increased by one percent. Because the \( Z \) consumers are identical and the \( n \) airlines are symmetric, \( [\partial x_i / \partial (p x_i)] = (p x_i / \partial x_i) [\partial x_i / \partial (Z x + K s)]. \)

\[ e = \frac{p}{Z x_i (\beta + (n - 1)\gamma) e_i}. \]

The equilibrium price \( p \) is determined from the second stage of airline competition where each airline takes the network scale \( s_i \) as given and maximizes profit \( \pi_i \) by setting price \( p_i. \) Adopting the Nash equilibrium concept, Liu (1994) demonstrates how to write out the first order condition on equation (5) and obtain the \( p \) that maximizes \( \pi_i, i = 1, 2, \ldots, n. \) Note that the equilibrium \( p_i \)'s are functions of the given \( s_i \)'s, which are yet to be determined. When \( s_i \)'s are all equal to \( s, \) \( p_i \)'s are also equal to a common value, denoted as \( p. \) This is given by

\[ p = (c + (n - 2)\gamma) + (\beta - \gamma(\alpha + s))/\beta \gamma (n - 3)\gamma. \]

The equilibrium network scale \( s \) is determined from the first stage of airline competition where each airline chooses, to maximize the profit \( \pi, \) realizing that its price \( p \) is selected at the second stage, is directly affected by all the \( s_i \)'s. It is tedious but straightforward to write out the first order condition. For the symmetric case where \( s_i \)'s are all equal to \( s, \) the first-order condition is

\[ (22)(\beta + (n - 2)\gamma)2\beta^2 + 3(n - 2)\beta(\alpha + s - c) + (n - 3)\gamma^2 = K s e_i. \]

It is easy to see that if \( u > 2 \) would ensure the existence of the first stage network scale symmetric equilibrium. Together with the second stage price equilibrium, this also ensures a subgame perfect equilibrium.

The number of airlines, \( n, \) is determined from the zero profit condition, which arises from the free entry condition. We consider only the symmetric case, where \( s_1 = s_2 = \ldots = s_n = s. \) The zero profit condition is simply \( Z x(p - c) = K x s, \) which can be rewritten as

\[ (p - c) / p = K x s / (Z x + K x s) = e. \]
As indicated by equation (5), $\delta$ is defined as the ratio of an airline’s fixed network cost to its total costs. Using equations (3), (4), and (6) to replace $(p - c)$, equation (8) can be restated as:

$$
(3 - \gamma)\beta + \gamma = \frac{\delta}{\beta}.
$$

Equation (9) allows us to empirically examine the relationship between the number of airlines in equilibrium and the ratio of fixed network costs as determined by the airlines’ network scales. As a comparison with equation (9), it is noted that the equilibrium number of firms in a standard, Cournot competition (i.e., competing by product quantity rather than price) with free entry is given by $10/\gamma$. This number corresponds to the $\gamma$ given by equation (9) when $\gamma$ is equal to 0.5.

The equilibrium network scale $s$ has an interesting property. Using equations (7) and (8), it is shown that as market size $Z$ increases, the equilibrium network scale $s$ increases (so does the fixed network cost), and the equilibrium number of airlines $n$ decreases. In more words, the larger market demand actually leads to a smaller equilibrium number of airlines. This result is consistent with the general result obtained by Sutton (1991). The intuition is that the firms have incentives to spend more (i.e., higher fixed costs) on services in larger markets because the returns are higher in larger markets. As a result, larger markets do not necessarily engender more competitors. This result seems to be characteristic of the airline industry: the number of airlines has continued to decline over the years, even though travel demand has expanded.

It is worthwhile to point out that the case for consolidation may be even stronger than the case made in our model, which rests solely on demand-side network economies. There may also be economies on the cost side, if greater network density would improve utilization of aircraft, departure lounges, gates, counter space, ground crews, maintenance facilities, equipment, and flight attendants. We have assumed, to the contrary, that variable cost is constant while network fixed cost increases with scale. Thus, in our model, average costs increase with network size.

**Comparison to a Constrained Welfare Maximization Regime**

In this section, the airlines’ network scale, price, and the number of carriers that maximize consumer welfare are derived. They are then compared with those obtained in the previous section under the competitive equilibrium regime. The difference in modelling comes about because firms equate benefits to profits when making their decisions. Welfare maximization also takes into account the benefits to consumers. We consider a constrained welfare-maximization regime in which the total consumer surplus (TCS) is maximized subject to the constraint that the airlines’ profits (i.e., total producer surplus (TPS), are zero). Parallel with the last section, only cases of identical consumers and symmetric airlines are examined.

Using the consumer surplus equation (1) and demand equation (5), the total consumer surplus, TCS, can be written as

$$
TCS = \frac{2n\alpha + \gamma - p^2}{\beta + (n - 1)\gamma}.
$$

Using the airline profit equation (5) and the demand equation (3), producer surplus for the $n$ airlines totals

$$
TPS = nZ(p - c)(\alpha + s - p) - nKs^\gamma.
$$

We now derive the equations that determine $s$, $p$, and $n$ under the constrained welfare-maximization regime where TCS is maximized subject to the constraint that TPS is zero. If TPS = 0, we obtain

$$
[Z(p - c)(\alpha + s - p)Ks^\gamma = \beta + (n - 1)\gamma.
$$

Using equation (12) to eliminate $n$ from the TCS equation (10) and then maximizing this with respect to $p$ and $s$ gives the following two first-order conditions:

With respect to $p$:

$$
2Z(p - c)(\alpha + s - p)(\beta - \gamma) = 0.
$$

With respect to $s$:

$$
2Z(p - c)(\alpha + s - p)(\beta - \gamma)Ks^{\gamma - 1} = 0.
$$

Denote $s_1, p_1$, and $n_1$ as the network scale, price, and the number of airlines obtained from equations (12), (13), and (14) under the constrained welfare-maximization regime. Further, denote $s_2, p_2$, and $n_2$ as the network scale, price, and the number of airlines obtained from equations (6), (7), and (8) under the competitive equilibrium regime. Liu (1984) has shown that the following relations hold:

$$
\begin{align*}
\text{(15a)} & \quad s_1 > s_2; \\
\text{(15b)} & \quad n_1 > n_2; \\
\text{(15c)} & \quad p_1 > p_2.
\end{align*}
$$

These inequalities show that the network scale under the competitive equilibrium is smaller, the number of airlines larger, and the price lower than under welfare-maximization regime. The result of (15a) stems from the model assumption that
average cost rises with network size. If average cost declined instead with network size, the industry would be characterized by a natural monopoly. This does not mean, of course, that it would necessarily be best to have only a single national airline. The survival of at least a few fringe carriers might stimulate sufficient innovation to compensate for the costs of smaller networks.

The intuition behind our welfare result is that airlines, when they set their network scale under the equilibrium regime, equate the benefits with their effects on profits; they ignore benefits to consumers. Consequently, the equilibrium network scale is lower than the one that maximizes welfare. As a result of this lower equilibrium network scale and consequently lower fixed network setup costs, more carriers are able to enter the market than under the welfare maximization regime. The price under the equilibrium regime is in turn lower than that under the welfare maximization regime.

Given that the welfare maximization regime maximizes consumer welfare, it is clear that the total consumer welfare levels are lower under the competition equilibrium regime than under the welfare maximization regime (both have a zero profit condition). The inequalities expressed by equation (15) thus imply that decreasing network scale from the equilibrium level $e_k$ would allow more airlines and lower prices in the market, which seems to be more competitive, but in fact lowers total consumer welfare because it moves further away from the welfare optimal regime. On the other hand, increasing network scale from the equilibrium level $e_k$ would allow fewer airlines and higher prices in the market, which seems to be less competitive, but in fact increases total social welfare because it moves closer toward the welfare optimal equilibrium.

This result is interesting as well as counterintuitive. It implies that, as the deregulated airline industry has made its structural transition toward a concentrated equilibrium through a series of mergers and bankruptcies, total consumer welfare has been increasing. In other words, the service-enhancing effect of employing large-scale networks has outweighed the potential price-increasing effect of the smaller number of competing carriers.

**EMPIRICAL RESULTS AND POLICY IMPLICATIONS**

**The Empirical Evidence**

Equation (9) allows us to find the equilibrium number of carriers in the industry if we know numerical values for three key variables: (1) the price elasticity of demand; (2) the degree to which fixed network investments are an important feature in the industry; and (3) the degree to which customers view airline services as substitutes. Rather than focus on point estimates, we have searched the literature to find ranges of the key variables that appear realistic for the airline industry. There is evidence on all three.

Consider first demand elasticities of air passenger travel, $e_k$. A recent survey of the empirical literature on transportation demand conducted by Oum, Waters and Young (1992, Table 3) includes thirteen air-travel demand studies. Demand elasticities are classified by data types and nature of travel. The elasticity estimates range from 0.4 to 4.5, with the majority of the figures falling within a narrower range. Results suggest that demand elasticities differ significantly among different fare classes (first class, standard economy, and discount fares) and distance (long versus short haul). This is hardly surprising since price-sensitive holiday travelers form the majority of passengers on long-haul routes, whereas business travelers predominate on short-haul routes. In general, demand for business travel is less elastic than for leisure travel, and elasticity estimates from cross-section data are higher than from time-series data. Oum, Waters and Young believe that demand for business travel is less than unity while that of holiday traffic is greater than unity, although the empirical estimate is not unambiguous. For the following calculation, $e_k$ is depicted as falling within the range 0.8 to 1.6, with the lower end of the range corresponding to business and short-distance travel, and the upper end of the range leisure and long-distance travel.

Note that the fixed cost ratio $f_k$ can be written as $1 - \frac{Z}{Z_e e_k + K}$, and $Z = Z_e (e_k + K)$ is the airline's cost elasticity with respect to its output $Z$, while holding the fixed cost $K$ constant (i.e., its network scale) constant. The inverse of this elasticity is defined by Caves, Christensen, and Trefethen (1984) and Kumbhakar (1990) as the airline's returns to density (RTD). It thus follows that $\beta = 1 - \frac{1}{URTD}$, Caves, Christensen, and Trefethen estimated RTD for both trunk and local airlines during the period 1970 to 1981. Kumbhakar extends the RTD estimates to 1994. Based on their estimates of RTD and the above relationship between $\beta$ and RTD, we find that $\beta$ averages around 16 percent for the deregulated period (1979-84). We use a range of 10 percent to 20 percent in our calculation.

The third variable, $\gamma$, measures the degree of substitution among the airlines. Here we use an empirical study of Reiss and Spiller (1989, Appendix, Table A1). These authors model the determinants of competition on direct and indirect airline routes. On the demand side, they find that direct and indirect flights are substitutes, but not perfect substitutes. Several factors affect the degree of substitutability between services, including distance and whether the route has significant tourist traffic. They make estimates for a variety of competitive models, such as maximum-likelihood estimates assuming oligopolistic or perfect cartel competition in indirect service. We adopt for our purposes estimates of the demand parameters evaluated at sample averages for Bertrand cross-service competition. In the following calculation, we present the equilibrium number of airlines under the assumed value $\gamma = 0.6$.

Using the above ranges of $e_k$, $f_k$, and $\gamma = 0.6$, the number of airlines in the industry is calculated from equation (9). The results are presented in Table 1. The numbers in the table are not truncated to integers. Therefore, a number like 4.9 would indicate that four airlines can exist in a market with positive profits but one more airline (with equal size) in the market, i.e., a total of five, would bring a net loss to every airline.

As seen from Table 1, for a given price elasticity of demand, the number of airlines would decrease if the airlines increase spending on fixed network costs. For a given network cost level, as price elasticity increases, Table 1 shows that the number of airlines decreases. This is because airlines cannot charge high prices when the travel demand becomes very elastic. As a result, airlines would have low revenues.
TABLE 1
Number of Airlines in Equilibrium
Degree of Substitution: \( y/b = 0.6 \)

<table>
<thead>
<tr>
<th>Demand Elasticity</th>
<th>Nework Fixed-Cost Ratio</th>
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<tbody>
<tr>
<td>( e = 0.8 )</td>
<td>8.7 4.5</td>
</tr>
<tr>
<td>1.2</td>
<td>5.9 3.1</td>
</tr>
<tr>
<td>1.6</td>
<td>4.5 2.4</td>
</tr>
</tbody>
</table>

and few of them can stay in the market. Similarly, when \( y/b \) increases, airlines become more substitutable. Consequently, prices would be lower and fewer airlines could coexist. For example, when \( y/b = 0.8 \) instead of 0.6, the upper left entry in Table 1 would be 3.9 carriers rather than 8.7, and the lower right entry would be 1.5 carriers rather than 2.4.

The Transition to a More Concentrated Industry

The U.S. airline industry in 1978 was constrained by regulators to consist of specialized (local, national, intrastate, charter, or international) carriers. Nineteen airlines (eleven national and eight local service carriers) had a 98 percent market share. The model we have presented estimates that a deregulated equilibrium would have far fewer carriers. Reality has mirrored our results.

The transition toward more concentration began almost immediately. The consolidations have been of two main types. First, regional carriers that wished to have more of a national profile have consolidated. For example, three local service carriers with largely non-overlapping catchment areas — North Central, Southern, and Hughes Air West — merged to form Republic. Similarly, two regional trunksm — Delta and Western — combined, joining route systems lying primarily east and west of the Mississippi, respectively. Second, trunk carriers have bought out regional carriers that had strength at the trunk's hub airport. As described in the literature (Bailey and Williams, 1988; Moore, 1986; Borenstein, 1992), the merged entity had both local feed strength and national reach. Examples include the mergers between Northwest and Republic (with Minneapolis-St. Paul as the hub) and between Trans World and Ozark (with St. Louis as the hub).

Virtually all surviving carriers adopted the strategy of becoming full-service, nationwide, and now global, carriers. Thus, our assumption of symmetric airline strategy is reflective of the reality that has emerged over the past decade and a half. Some carriers became survivors through growth and merger, while others had one or more bouts with bankruptcy, often followed by exit.

Arlne Consolidation and Consumer Welfare

The speed at which national firms are exiting the industry is in line with data on survival in other industries after the introduction of major change. Suarez and Utterback [1995] find that transition in market structure after the introduction of a dominant design is long. It takes from 15 to 30 years to reach an eventual equilibrium of roughly one quarter the initial number of firms. In the airline industry, the transition has been from twenty-three carriers in 1978 to eight national carriers in 1994. So the speed of adjustment following airline deregulation does not seem out of line with that in other industries which have experienced fundamental change. In terms of our theory, it is likely to be an efficient outcome even if more of the financially troubled airlines exit the industry.

The role of Chapter 11 of the bankruptcy law has proven to be important. The purpose of Chapter 11 is to allow for a reasonable rehabilitation of a going concern instead of a liquidation. Chapter 11 offers guidelines and time frames for reorganization. Courts should be discouraged from repeatedly waiving guidelines for meeting reorganization goals in the airline industry, and their effort to save competitors may be misplaced. In the case of Eastern, for example, the judge extended reorganization from the intended 120 days to two or more years, during which period the company dissipated the full value of its assets. Pan Am's exit from the market was preceded by a lengthy period of operating losses, but much of the liquidation process took place prior to the declaration of bankruptcy, through asset sales. Some of Trans World and Continental Chapter 11 filings have been lengthy. Recent research has suggested that the ticket prices of bankrupt airlines typically decline before the filing for bankruptcy protection and remain somewhat depressed. However, Borenstein and Rose [1995] have found no evidence that the competitors of the bankrupt airline lower their prices or that they lose passengers to their bankrupt rival. Thus, their results indicate that bankrupt carriers have not harmed the financial health of the remaining national competitors.

The Transition toward a More Global Industry

The consolidation movement is taking place internationally as well as domestically, and for many of the same network-based reasons. American, United, and Delta, the three biggest U.S. carriers, which have purchased the former international routes of Pan Am and Trans World, have become international powerhouses. Smaller U.S. carriers, such as Northwest, USAir, and Continental, are also aligning with foreign airlines to provide a similar global capacity.

Global consolidation is also affected by public policy. U.S. laws prohibit full mergers between a U.S. and a foreign airline, a restriction that remains from the days of regulation, and requires a greater degree of government involvement than is the case for other industries. Thus, even if a merger would be approved under U.S. antitrust guidelines, the carriers must nevertheless seek immunity from U.S. antitrust laws. To make the grant of such immunity more palatable in the KLM-Northwest case, the Netherlands recently signed an open-skies trade agreement with the U.S., setting a new standard for U.S.-European freedom of access. In contrast, the opposition to the USAir and British Air alliance was based in part on current restrictions on access to
Great Britain. It is significant that the senior partners in these international consolidations are European carriers. Under European Economic Community Rules, purchase of a European by a U.S. airline would mean that the European airline would lose its status as a community airline and thus its access to the internal European markets.

In terms of the theory, the cooperation associated with international airline alliances is preferred to the restrictions often favored by governments. The largest welfare improvement to consumers will come about through market forces that reduce the number of international players, rather than through governmental aims aimed at divisions of the pie among existing players.

CONCLUSIONS

We have presented a model of the airline industry in which carriers enhance consumers' willingness to pay by expanding their hub-and-spoke networks. The argument has demonstrated that for reasonable parameter estimates of the level of such endogenously determined investments and other demand-related attributes of the market for airline travel, the equilibrium number of firms in the airline industry will be far fewer than existed during the era of regulation. Because airlines can satisfy consumers' demands for improved flight frequency better, the transition to a smaller number of firms has been welfare-improving. Basically, consumers are willing to pay more to have fewer firms in order to enjoy certain welfare-enhancing service improvements.

We thus arrive at a conclusion that is quite contrary to general economic thinking, which focuses only on price. In that world, smaller numbers of competitors mean higher prices and more monopolistic rents. But in a world in which consumers value both price and service, there can be higher welfare with fewer, rather than with many, national carriers. In sum, the trend of airline consolidation appears to be one which is efficiency-improving. Governmental policies aimed at preserving competitors should be broadened so that market structure consolidations that might benefit consumers can be permitted, both domestically and internationally.

NOTES

The authors are grateful to Bruce Allen, William Baumol, Robert Frank and Aris Schramm for suggestions which have significantly improved our paper.

1. It should be noted that not everyone predicted that deregulation would result in an industry with a large number of firms. Robert Frank, who was chief economist at the Civil Aeronautics Board in the early deregulatory years, wrote a detailed memo to the Board (in which Klein and one of the authors, Bailey, served) in 1980 entitled, "Economics of Scales and Board Policy Toward Merger", in which he postulated a shocker of the sort that has occurred in the years since.

PROPERTY RIGHTS AS A CAUSE OF THE TRAGEDY OF THE COMMONS:

INSTITUTIONAL CHANGE AND THE PASTORAL MAASAI OF KENYA

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INTRODUCTION

More than forty years have passed since the publication of H. Scott Gordon’s seminal work on common property resources [Gordon, 1954]. Gordon explained the simple economics of the “tragedy of the commons,” a term popularized by Hardin [1968] and offered the institution of private property as one possible solution. Unspecified property rights now are considered by most as prima facie evidence of market failure. Many cases of a common property resource (CPR) that operate reasonably well with neither private property rights nor state intervention, however, have been documented. Often these cases are historical or from less developed countries where informal community institutions effectively manage a local commons [Bromley, 1992; Ostrom, 1990; Denen, 1976; Ostrom, 1990; Ostrom and Gardner, 1993; Tung, 1992; Umbc, 1977]. Economists should now realize that commons problems are necessarily associated with only CPRs with no restrictions in access. Not all CPRs are open access; some CPRs are managed by other institutions, like the case presented in this article.1 While economists have often analyzed how property rights can eliminate the overuse of the common property, much recent research concerns the conditions under which the commons problem can be overcome without resorting to property rights or the state [Hardin, 1968a; Bromley, 1992; Ellickson, 1992; Larson and Bromley, 1990, Ostrom, 1992; Ostrom and Quiggin, 1995; Rungo, 1992; Seabright, 1993].

This article offers a case, the pastoral commons of the Maasai in Kenya, where common ownership proved superior to private property. The creation of property rights by colonial and even post-colonial governments diminished the long-run viability of the commons by disrupting the complex institutional structure of the Maasai.2 With pastoralism, the tragedy of the commons is often thought to be the result of overgrazing, too many cattle devouring too much grass so that the commons is not sustainable. The Maasai case differs from the usual pastoral example: the land was used for both grazing and farming. The individual decisions by farmers to substitute the grass areas with farming is analogous to herders deciding to allow more cattle to graze the grass. In both instances, individuals have little incentive to take into account the benefits of the grass for others. This counterintuitive result that property rights can cause a commons problem may seem critical of property-rights literature. On the contrary, this case is a non-