THE IMPACT OF ENERGY COSTS ON DOMESTIC AIRLINE PASSENGER TRAVEL

By Paul M. Hayashi and John M. Trapani*

INTRODUCTION

This paper examines the role of energy costs in determining fare levels and the quality of passenger service on domestic airlines. This research is important for two reasons. First, energy price changes will affect the profitability of fuel-intensive routes and in some markets will result in changes in capacity provided. As Oster (1981) has suggested, this will have system-wide effects on the type of carrier service available in short-haul markets as well as on the speed with which firms will expand into new markets as capacity of the industry becomes obsolete with changing fuel costs. For example, rising energy costs could have the effect of slowing growth in capacity and/or reducing capacity in some markets. This effect on capacity will in turn have an impact on the quality of service and the demand for passenger airline service in these markets.

In addition, the role of energy costs in airline service is an important issue related to deregulation of the airline industry. Deregulation has occurred during a period of unprecedented increases in energy prices, and evaluation of its effects is complicated by the reduced profitability and capacity caused by fuel cost increases. Only when we have accounted for the effects on capacity and demand of increased fuel costs can we determine how deregulation has affected fares and quality of service through price and entry competition.

Recent studies by Graham, Kaplan and Sibley (1983) and Spiller (1983) consider the differential impact of deregulation on airline markets, but they ignore this issue completely. Yet separating the influence on airline operations and employment of fuel costs from that of competition is an important policy issue, in view of the provisions of the Airline Deregulation Act of 1978 on the compensation of airline employees, and in view of likely welfare implications of competition in these markets. The analysis in this paper provides the basis for separating these alternative influences on fare levels and quality of service.

In the next section we develop a model of a city-pair airline market which permits us to isolate the effects of changing fuel costs on capacity and service quality, while allowing for price and entry competition. An econometric model is specified and estimated on the basis of data from a pooled cross-section of 70

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73
city-pair markets for the years 1971, 1976, 1977 and 1979. Given estimates of the key parameters of the model, some simulations are conducted to show how airline fares, load factors and passenger demand are influenced by changing energy costs.

THEORETICAL CONSIDERATIONS

The purpose of this section is to analyse the role of energy cost in a city-pair airline market. The basic model used for this purpose was developed by Douglas and Miller (1974), DeVany (1975) and Schmalensee (1977). Consider profits in any city-pair airline market to be given by

$$\pi = p \cdot q(p,s,f) - C(q,s)$$  \hspace{1cm} (1)

where

- $p$ represents the airline fare level,
- $q$ is passengers enplaned,
- $s$ is seats available, and
- $f$ is an index of fuel cost.

It is assumed that $q_p < 0$, $q_s > 0$ and $q_f > 0$. The direct relation between demand and the number of seats available (capacity) follows from the fact that delay costs associated with any airline trip should be inversely related to capacity in that market.\(^1\) The direct relation between demand and fuel cost follows from the fact that rising fuel costs should make airline travel, like other forms of mass transit, relatively less expensive in comparison with the alternatives, particularly private automobile travel.

Total cost of providing airline passenger service in a city-pair market is defined as

$$C = cq + ks$$  \hspace{1cm} (2)

where $c$ and $k$ represent respectively the marginal and average cost of a passenger enplaned and a seat provided. It should be noted that $k$, capacity cost, is the aircraft operating expense which covers aviation fuel.\(^2\) Thus, $k = k(f)$ where $k_f > 0$.

The determination of capacity, we assume, comes through firms competing with frequency of flights as well as from the entry of new firms in the deregulated environment. Thus, we specify capacity as

$$s = s(p,k,n)$$  \hspace{1cm} (3)

where $n$ is the number of carriers in the market. We expect that $s_p > 0$, $s_n > 0$, and $s_k < 0$.

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\(^1\) This relation has now been well established from the theoretical work of Douglas and Miller (1974) and DeVany (1975) and the empirical estimates of Olson and Trapani (1981) and Trapani and Olson (1982).

\(^2\) Fuel cost will enter supply side decisions through the variable $k$, capacity cost. This is aircraft operating expense which includes fuel cost. Aviation fuel accounted for 21.92% of $k$ in 1971, but this had risen to 48.04% by 1979.
ENERGY COSTS AND DOMESTIC AIRLINE TRAVEL

The model suggests that the effects of fuel cost on capacity in a city-pair airline market will come through both the supply and demand sides of the market. The independent effect on the supply side of increasing aviation fuel cost should be to reduce capacity provided (that is, \( s_k < 0 \)) and thereby to force load factors upward. Consumers of airline passenger service, however, would react to higher load factors (which imply higher delay and frequency costs) by reduced demand for airline travel, other things being equal. The independent effect on the demand side of the market of rising fuel cost could be increased demand for airline travel, which also exerts an upward pressure on the load factor and therefore results in a lower level of service quality. However, this effect on quality of service would tend to reduce passenger demand. Thus, the final impact of these influences on the equilibrium price and quality of service in a city-pair market will be indeterminate; it is a problem for empirical analysis. To analyze the effect on market price we can first differentiate the market profit expression (1), at the competitive equilibrium, and solve for

\[
\frac{dp}{df} = \frac{\{[(p-c)q_s - k]s_k - s\} k_f - (p-c)q_f}{q + (p-c)q_p + [(p-c)q_s - k]s_p}
\]  

(4)

The numerator of this derivative measures the difference between fuel cost effects on net revenue stemming from capacity and those stemming from passenger demand. In general it can be shown that the denominator of this expression will be negative. Therefore, the effect of fuel cost on market price will depend on the relative magnitude of the effects of capacity cost and of passenger demand. It is possible that rising fuel costs could reduce equilibrium airline fares in the market if the demand effect was strong enough. The relative strength of these effects is an empirical question which we consider later in this paper.

The effect of fuel cost on the quality of service is determined from the following relation:

\[
\frac{d(q/s)}{df} = \frac{1}{s} \left\{ q_p + \left( q_s - \frac{q}{s} \right)s_p \right\} \frac{dp}{df} + \left[ q_f + \left( q_s - \frac{q}{s} \right)s_k k_f \right]
\]  

(5)

The sign of this derivative will be positive when \( dp/df \) is negative, but otherwise indeterminate. This means that a potential price reduction with rising fuel costs would have to be accompanied by a higher load factor, but a market price increase could be consistent with either a rise or a fall in the equilibrium load factors.

ECONOMETRIC MODEL

In the preceding section, it has been argued that the impact of changing fuel cost on equilibrium in a city-pair airline market comes potentially through both passenger demand and airline supply decisions. To capture these effects, the following econometric model of a city-pair market is specified:

**Market Demand**

\[
q = \gamma_0 + \gamma_1 p + \gamma_2 s + \gamma_3 f + \gamma_4 y
\]  

(6)
Market Capacity

\[ s = \delta_0 + \delta_1 (1/p) + \delta_2 k + \delta_3 y + \delta_4 h \]  

(7)

Total Cost

\[ C \equiv cq + ks \]  

(8)

Total Revenue

\[ TR \equiv pq \]  

(9)

Market Profit

\[ \Pi \equiv TR - TC \]  

(10)

where

- \( y \) represents total income,
- \( h \) represents a measure of market concentration,\(^3\) and
- \( f \) represents an index of fuel cost.

For the purpose of empirical analysis \( f \) will be measured by ground transport cost.

Equation (6) relates passenger demand to the average fare, number of seats available (measuring capacity), the cost of ground travel, and total income. This specification follows from the theoretical discussion. Income is included as a scale variable for the size of the city-pair market. The second equation relates seats available to the average fare, the cost of a seat mile of capacity, total income, and the extent of market concentration. The inclusion of price and seat cost follows directly from profit-maximising behaviour of firms supplying in the market. The reciprocal form of the fare variable is used to allow for non-linearity between price and seats, as suggested by the theoretical models of city-pair airline markets (DeVany, 1975—see also Schmalensee, 1977, and Trapani and Olson, 1982). The per passenger cost, \( c \), is excluded from (7) because it is assumed to be constant across all city-pair markets, and therefore its influence will be captured in the constant term.\(^4\) Market concentration is included to account for the number of firms serving the city-pair. The number of firms may be an important explanatory variable of seats provided; this follows from the impact of entry on capacity through scheduling rivalry (see Trapani and Olson, 1982). The last two equations are definitional and complete the market model.

Price, or average fare, is treated as exogenous for the purpose of estimation of the model, because fares were regulated by the Civil Aeronautics Board during the sample period. However, both price and entry competition will be introduced through simulation of the model. Energy costs enter the model through the variable \( k \) (capacity cost) and \( f \) (ground transport cost). The impact of these costs

\(^3\) Our empirical measure of market concentration is the Herfindahl index.

\(^4\) The cost per passenger, \( c \), is derived from the traffic costs of providing airline service in a given city-pair market. In principle, it would be computed as the sum of passenger service costs, promotion and sales, and perhaps some of the general and administrative overhead costs per passenger enplaned (see Douglas and Miller, 1974a). We are assuming here that these costs do not vary with the length of the trip or the type of aircraft, and are the same for all city-pair markets. This cost is to be distinguished from total cost per passenger \( C/q = c + k(q/q) \), which varies with the type of aircraft and load factor.
ENERGY COSTS AND DOMESTIC AIRLINE TRAVEL  

P. M. Hayashi and J. M. Trapani

on the market equilibrium is assessed by (1) estimating their coefficients in the model as specified and (2) evaluating the solution of the model at various price levels (including the zero profit, competitive price level) for different levels of fuel cost.

Equations (6) and (7) comprise a system of two equations in two unknowns, seats and passengers. If we include additive disturbances for each equation, equation (6) is over-identified and equation (7) is exactly identified, so the system may be estimated by 2SLS.

To estimate the model a cross-sectional sample of 70 city-pair markets within the US was selected, and data were collected for the years 1971, 1976, 1977 and 1979. This provides a sample period during which there was considerable variation in fuel costs. The relevant data to measure each variable of the model were collected for each year. A description of each variable follows.

Quantity, \( q \), is measured as the number of paying passengers multiplied by the mileage between the city-pair during the one-year period. We measure sales in passenger miles to account for the fact that city-pairs are of different lengths. Data on the number of paying passengers and the mileage between city-pairs are available from the Civil Aeronautics Board.

Seats Available, \( s \), represents the product quality variable in this model. It is measured here as the total number of seats flown in the city-pair market by all participating firms during the year. The data were provided by the Civil Aeronautics Board.

Price, \( p \), is measured by the jet coach fare divided by mileage between the city-pair. The data are taken from the Official Airline Guide. The jet coach fare is selected as a proxy for the weighted average revenue in each market. This procedure is necessary because total passenger revenue by market is not available. Data on the fare for first-class, jet-coach, military and other discount services are available by city-pair in the Official Airline Guide, but the proportion to total passenger revenue miles in each service class is not reported. The choice of jet coach fare to measure average revenue seems appropriate because it represents the class with the highest proportion of total passengers and because first-class and discount fares are set as percentages of jet coach fare. Therefore, average revenue should be highly correlated with jet coach fare.

Income, \( y \), is measured as the sum of total disposable income in the two cities comprising the city-pair market. It is taken from the Survey of Buying Power.

Capacity cost, \( k \), is computed as the weighted average cost of an available seat mile in the city-pair. The weights are the proportions of each type of aircraft flown in the city-pair. Specifically, for the \( it^b \) city-pair

\[
k_{it} = \Sigma K_{ij}(s_{ij}/\Sigma s_{ij})
\]

where

- \( K_{ij} \) is the aircraft operating expense per available seat mile of aircraft type \( j \), and
- \( s_{ij} \) is the total number of seats of aircraft type \( j \) flown in the \( it^b \) city-pair during the year.

The components of \( K_{ij} \) are: cost of flying operations, maintenance cost,
depreciation of flight equipment, and capital cost. Data on $K_{ij}$ are taken from Aircraft Operating Cost and Performance Report. $S_{ij}$ was calculated from data on the number of flights, by aircraft type, in each market reported in the Official Airline Guide. Aviation fuel cost enters into capacity cost through cost of flying operations. In 1971 aviation fuel cost represented 21.9 per cent of aircraft operating expense, whereas by 1979 its share had risen to 48.04 per cent.

Ground Transport Cost, $f$, is based on the sum of fuel cost plus travel time costs. For each city-pair the ground transport distance was calculated and then gasoline consumption estimated, assuming 55 miles per hour and an average of 15 miles per gallon. Also, travel time was estimated, allowing for layover time required for longer trips. The total cost of a trip was computed as the sum of gasoline consumption, valued at current cost per gallon, and time cost, valued at average hourly earnings of non-supervisory personnel for all industries in the US. For the purpose of estimation, ground transport cost was computed on a per-mile basis.

Market Concentration, $h$. The Herfindahl index was selected as the measure of market concentration. The individual firm shares were obtained by dividing the number of passengers enplaned in the city-pair by each firm during the year by the total for the market. Data on enplaned passengers by firm and by market were provided by the Civil Aeronautics Board.

The model was estimated for the cross-sectional sample pooled over the four years 1971, 1976, 1977 and 1979, and for the individual years separately. For the pooled sample, a test on the estimated residuals was conducted for heteroskedasticity. The results indicated that the estimated residual variances by year were not significantly different for the capacity equation, but were significantly different for the demand equation under Bartlett’s test. From the magnitudes of the yearly variance estimates it appeared that the 1979 residual variance was larger than those estimated for 1971, 1976, and 1977; the inference of heteroskedasticity was the result. This occurrence is most probably attributable to the fact that CAB deregulation of airline fares and entry was under way by 1979, and fewer markets were adjusted to a full equilibrium. However, a test for structural stability revealed that the demand equation estimated for 1979 was not significantly different from that estimated from the pooled regression model for 1971, 1976 and 1977.

The variables involving dollar magnitudes, price, capacity cost, income and ground transport cost were normalised to the 1979 level, using the implicit price deflator for GNP. The resulting parameter estimates are given in Table 1. All coefficients estimated are significant at the 95 per cent confidence level, with the exceptions of the constant term in the demand equation, and those of the individual year estimates of the coefficient of income in the demand equation. The signs on all coefficients are in accord with the theoretical predictions. Of particular importance are the signs and significance of capacity cost in the capacity equation and of ground transport cost in the demand equation. The

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5 Capital cost per available seat mile was estimated from industry-wide statistics. The procedure was to take 12 per cent (the allowable rate of return on owners' equity) plus interest expense and divide by the available seat miles for each year.
TABLE 1

Estimated Parameters of the City-Pair Market Model

<table>
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<td></td>
<td></td>
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<td>Constant</td>
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<td>-162290.0</td>
<td>-107913.0</td>
<td>-121164.0</td>
<td>-95551.4</td>
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<td>(-4.0407)</td>
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<td>(4.1337)</td>
<td>(-2.6566)</td>
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<td>y</td>
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<td>$R^2$</td>
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<td>0.5501</td>
<td>0.5236</td>
<td>0.4906</td>
<td>0.3263</td>
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Demand Equation

<p>| | | | | | |</p>
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<td>Constant</td>
<td>325977.0</td>
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<td>576.353 E3</td>
<td>528.005 E3</td>
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<td>(0.0050)</td>
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<td>203.958</td>
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<td>(4.5402)</td>
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<td>f</td>
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<td>0.100831 E10</td>
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<td>(1.81657)</td>
<td>(1.2322)</td>
<td>(1.0429)</td>
<td>(1.3044)</td>
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<td>$R^2$</td>
<td>0.5499</td>
<td>0.59012</td>
<td>0.5812</td>
<td>0.6117</td>
<td>0.5102</td>
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The point estimates reported here were developed using 2SLS. The numbers in parentheses below the coefficients are the t-ratios under the null-hypothesis that the coefficient is zero.
negative coefficient on \( k \), capacity cost, in the capacity equation, combined with the positive coefficient on \( s \), seats available, in the demand equation, suggests that increases in aviation fuel cost will decrease capacity and thus lower quality of service and passenger demand for airline travel. The positive coefficient of \( f \), ground transport cost, in the demand equation suggests that an increase in fuel costs does, in fact, lead to an increase in passenger demand for airline travel.

EMPIRICAL RESULTS

The estimated coefficients of this model permit us to assess the impact of changing energy cost on the airline market equilibrium. The procedure is: to simulate the response of capacity and demand to varying only the fuel cost component of \( f \) and \( k \), holding all other variables at their 1979 levels.\(^6\) The range of values for fuel cost in the simulations is the range of the actual values which prevailed in 1979 and the pre-embargo levels of 1971. That is, we simulate the effect of increasing gasoline cost from $0.25 per gallon to $0.88 per gallon and increasing aviation fuel cost from $0.115 to $0.575 per gallon, assigning to all other variables their 1979 actual values. The market response to these changes is analysed for various price levels and values of the Herfindahl index, using the parameter estimates from the pooled sample regression. Table 2 summarises the results of the simulations reporting the market solutions at different price levels, with the extent of market concentration held fixed (that is, Herfindahl index equals 0.60, which is approximately the mean value of \( h \) in 1979).

For the purpose of comparison, let the fare be $0.17 in Table 2 (approximately the 1979 average fare level) and consider the market outcome for 1979 and 1971 fuel costs. The independent effect of increasing fuel costs by this amount is to lower capacity from 898,152 to 684,132 seats available per year. This implies a reduction in the average number of one-way flights from 12.3 to 9.37 per day for a city-pair market. The overall impact on passengers enplaned is a reduction from 469,835 to 433,412 per year, with an increase in the load factor from 0.52 to 0.63. This means that the supply side effect of increased cost, which reduces passenger demand, is stronger than the demand side effect of rising ground transport cost, which increases passenger demand for air travel (other things being equal). The overall reduction in seats and passenger demand results in a substantial increase in the load factor, and therefore lowers the quality of service provided.

Capacity, demand and fares

To provide some assessment of the impact of these cost changes on the price level of airline services, we simulated the same change in fuel costs and evaluated the model at the zero-profit equilibrium (that is, where \( p = c + k/[q/s] \)), allowing for

\(^6\) The aviation fuel component of \( k \) in 1979 represented 48.04\% of the total capacity cost per seat mile. This percentage is based upon a given constellation of aircraft types used on the city-pair as well as given fuel efficiency of each aircraft type. In performing our simulations we are holding the type of aircraft flown and their fuel efficiencies fixed at the 1979 actual values.
various levels of competition. The results of these simulations are given in Table 3. Since we are concerned here with the effects on the fare level, we may hold the degree of competition fixed at the level where the Herfindahl index equals 0.60 and again vary aviation fuel and gasoline prices from their 1971 to 1979 levels, holding all other variables at their 1979 levels. From Table 3, the zero-profit market equilibrium with 1971 fuel cost yields capacity of 878,930 (12.04 flights per day), 478,740 passengers enplaned, a load-factor of 0.54, and a breakeven fare of $0.164 per mile. Increasing fuel costs to the 1979 level results in a reduction in capacity to 654,762 seats per year (a decline of about 3 flights per day), a reduction in passengers enplaned to 446,569 yielding a load factor of 0.68, and a slight decline in the breakeven price to $0.161 per mile. Thus the responses of capacity and passenger demand which produce a higher equilibrium load factor could actually result in a lower breakeven fare.

We should note that the effect of increasing competition (lowering the Herfindahl index) is to raise the breakeven fare. This result follows from the fact that increasing competition leads to an expansion in capacity, because competition in scheduling lowers the load factor. This expansion in capacity may alter the effects of fuel cost changes on the breakeven fare, as shown in Table 3. With the Herfindahl index less than or equal to 0.55, the breakeven fare no longer falls as fuel cost increases, but, indeed, begins to rise as competition increases capacity. This is because fares would most probably increase with every increase in capacity in the market.

The results of these simulations may be summarised in Figure 1, where we
FIGURE 1

*City-Pair Market Model Normalized to 1979 Levels*
TABLE 3

Simulation Results at the Zero-Profit Market Solution

<table>
<thead>
<tr>
<th>Herfindahl Index</th>
<th>1971 Fuel Prices</th>
<th>1979 Fuel Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fare</td>
<td>Passengers</td>
</tr>
<tr>
<td>0.50</td>
<td>0.168</td>
<td>522,893</td>
</tr>
<tr>
<td>0.55</td>
<td>0.166</td>
<td>500,845</td>
</tr>
<tr>
<td>0.60</td>
<td>0.164</td>
<td>478,740</td>
</tr>
<tr>
<td>0.65</td>
<td>0.161</td>
<td>457,976</td>
</tr>
<tr>
<td>0.70</td>
<td>0.158</td>
<td>437,069</td>
</tr>
<tr>
<td>0.75</td>
<td>0.154</td>
<td>417,294</td>
</tr>
</tbody>
</table>

Fare is reported in dollars per mile. Number of passengers and number of seats available are estimated annual totals.

The actual market equilibrium in 1979 may be characterised by the following sample average values: $p = 0.173$, $q/s = 0.5997$, $q = 453,449$, $s = 756,079$, $h = 0.6241$.

represent market equilibria of the typical city-pair market in our sample in terms of fare and passenger demand. The loci represent the equilibrium demand for airline passenger service in a city-pair market at different fare levels, given the number of carriers and the level of fuel costs. Their shape is determined by scheduling competition among carriers and the response of passenger demand to changes in capacity (DeVany, 1975; Trapani and Olson, 1982). Changes in fuel cost and increased competition through entry will shift the curves. These particular loci are positioned according to the estimated parameters of the city-pair model normalised to actual 1979 levels. Point A, on the innermost locus, represents the sample mean solution for 1979, with fare at 17.3 cents per mile and 453,449 passengers enplaned. The independent effect of increasing fuel costs from the 1971 pre-embargo level to their 1979 level is represented by the leftward shift in the passenger locus from point A, the simulated market solution at 1971 energy costs, to point A, the actual 1979 market solution. The capacity effect associated with this increase in fuel cost between 1971 and 1979 is approximately a decrease of 2 flights per day for the typical city-pair market, and an accompanying fall in passenger demand of 3.6 per cent. This analysis assumes fare levels are unchanged.

7 The analysis here is very similar to that of Beesley and Glaister (1983).
To determine how fare levels are affected by the changes in energy cost we re-evaluated the 1979 market solution at the zero-profit price level shown in Figure 1 at point B. Now if we lower fuel costs to their pre-embargo level the effect on capacity is an increase of about 3 flights per day in the typical city-pair market, with passenger demand increasing by about 7.2 per cent. These changes are illustrated as the movement from point B to point C. The important result here relates to market price. The simulations show that market price is fairly insensitive along the zero-profit price path, and may actually fall over some ranges of capacity when energy costs increase. This is because higher energy costs result in lower capacity and higher load factors, other things being equal. Higher load factors, in turn, force breakeven fares downward, so that, in competitive markets, fares may actually fall. Our results show a slight fall in the competitive price level, from 16.4 to 16.1 cents per mile, associated with the increase in fuel costs between 1971 and 1979.

Independent effects of competition

Finally, the independent effects of entry competition can be isolated by holding fuel costs constant and varying the Herfindahl index. To illustrate, we increased competition by lowering the index from 0.62 (the 1979 mean sample level) to 0.55, which we use to approximate a fully competitive market solution. The competitive market equilibria are shown as point D, assuming 1979 fuel cost, and point D' assuming 1971 fuel costs. At each point, profits are zero and market adjustments through entry are complete. The difference between these market solutions allows us to separate the effects of competition from the effects of increases in energy cost under the two different fuel cost assumptions. With 1971 fuel costs, the competitive market solution at point D' has capacity of 953,000 seats and 50,000 passengers, yielding a load factor of 0.53. This is roughly 13 flights per day. With 1979 fuel costs the competitive market solution at point D has 739,000 seats and 464,000 passengers, yielding a load factor of 0.63. This level of capacity means the typical city-pair market will have about 10 flights per day. Thus, the increases in fuel cost lead to lower capacity and higher load factors in the competitive environment. The 10 per cent higher load factor is attributed in part to lower capacity, but also to the increased passenger demand resulting from the increased cost of ground travel. It is interesting that the fare levels are about the same at each competitive solution.

SUMMARY AND CONCLUSIONS

The purpose of this paper is to examine the role of energy costs in determining fare levels and the quality of service provided by airline carriers. This research is important to our understanding of the impact that fuel cost changes may have on

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8 The choice of 0.55 for the Herfindahl index to represent a competitive market solution in the city-pair is consistent with the popular view that very little entry is required to produce the zero-profit equilibrium in these markets. It is also consistent with the findings of Trapani and Olson (1982) that $h = 0.575$ would produce the competitive solution for markets in this sample.
ENERGY COSTS AND DOMESTIC AIRLINE TRAVEL  

P. M. Hayashi and J. M. Trapani

capacity provided to airline markets, and to our assessment of the consequences of deregulation of the airline industry during an unprecedented period of rising energy costs. Our empirical analysis allows for the influence of changing energy costs on both supply and demand decisions related to airline passenger service. We find that rising costs of aviation fuel will reduce capacity supplied in city-pair markets, and thus reduce passenger demand. Independently, rising costs of ground travel induce greater passenger demand. The overall effect of increased energy cost is lower capacity, reduced passenger demand and higher load factors. Our simulation results for a typical city-pair market in a fully competitive equilibrium suggest that increases in fuel cost of the magnitude experienced between the pre-embargo 1971 level and that prevailing in 1979 would reduce capacity in the market by 3 flights per day; passenger demand would decline by 7.4 per cent, and the load factor would increase by 10 per cent from 0.53 to 0.63. These changes represent a significant impact on the quality of service provided by the airline carriers, even though we found that the average fare level would remain roughly the same in a fully competitive equilibrium.

The results here are crucial to studies of deregulation of the airline industry. One important implication of CAB regulation is commonly believed to be excess capacity. Recent studies (Graham, Kaplan and Sibley, 1983) have attempted to show that deregulation has resulted in reduced capacity, as firms are free to compete on fare levels and entry. They propose to test the hypothesis of excess capacity by examining load factors before and after deregulation. They attribute the rise in load factors during this period to increased competition. Our results indicate that there are significant reductions in capacity associated with the increases in fuel costs of the 1970s, and that these effects on capacity must be taken into account before the effects of deregulation can be assessed.

REFERENCES


