The Scheduling and Route Impacts of Increased Fare Flexibility*

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I. INTRODUCTION

On August 25, 1978, the Civil Aeronautics Board adopted modifications to its policies developed in the Domestic Passenger Fare Investigation (DPFI) which allow increased pricing flexibility to scheduled air carriers.[1] This article will discuss the likely effects of the enacted rule on route abandonment and service.

Airline fare regulation has historically limited the range of price and service options[2] and has resulted in costly competition in schedules and amenities.[3] The new rule offers the promise of significant benefits to travel-

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1: 43 Fed. Reg. 39,522 (1978).

2. For a notable exception see the Airline Deregulation Act of 1978, Pub. L. No. 95-504, 92 Stat. 1705(1978).

3. R. CAVES, AIR TRANSPORT AND ITS REGULATION (1962); M. STRASZHEIM, THE INTERNATIONAL AIRLINE INDUSTRY (1969); W. JORDAN, AIRLINE REGULATION IN AMERICA: EFFECTS AND IMPERFECTIONS (1970); Keeler, *Airline Regulation and Market Performance*, 1972 BELL J. ECON. & MAN. SCI. 399; White, *Quality Variation When Prices are Regulated*, 1972 BELL J. ECON. & MAN. SCI. 425; G. EADS, THE LOCAL SERVICE AIRLINE EXPERIMENT (1972); and G. DOUGLAS & J. MILLER, ECONOMIC REGULATION OF DOMESTIC AIR TRANSPORT (1974).

ers in the form of lower air fares and services more closely aligned with consumer preferences. The introduction of fare flexibility under the rule will increase the number of passengers carried and result in changes in schedule frequency in a number of markets. The nature of the changes will depend on the elasticities of demand, carrier costs, and carrier route network adjustments. Changes in capacity and service frequency in particular markets are the logical consequences of instituting fare competition and airline service more responsive to passengers' preferences.

It has been argued that permitting more fare competition and the associated changes in schedules is potentially harmful to the public interest. The often-voiced concern is that destructive price competition will undermine service and lead to much route abandonment, particularly to small communities. The CAB correctly minimizes this risk in discussing its enacted rule, for the evidence presented below suggests there is little risk of a substantial loss of air service to small communities as a result of the rule. The principal arguments of this article, developed in the four sections which follow, can be briefly summarized.

The second section of the article outlines the basic rationale of the rule in the context of the current market regulatory environment. In introducing a "suspend-free" zone as a means for permitting fare flexibility, the CAB properly notes that an industry-wide fare formula cannot properly reflect all the special features of costs or market potential which will differ among carriers and markets. Carrier managements are best capable of making accurate predictions of consumer preferences in different markets. The rule is therefore an important and timely step toward a more rational airline system, allowing carriers to introduce fare changes when they think consumers' preferences favor this type of service.

The third section of the article reviews the recent experience of route changes under CAB regulation. The issues are whether the objective of assuring service to small communities is well served by a continuation of present CAB rate, entry, and subsidy policies, and whether service quality to smaller communities under the rule would be worse than under present CAB entry and fare regulation. It will be shown that CAB regulations have done relatively little to assure the continuation of air service to small communities which could not be achieved by fare flexibility under the rule. The exit of local scheduled carriers from small community service has been quite dramatic in the last decade under CAB regulations. This has been accompanied by a very considerable increase in scheduled service provided by commuter carriers.

The fourth section of the article analyzes the argument that carriers currently "cross-subsidize" low-density routes in small communities, and that fare reductions in denser markets will therefore undermine service in less-dense markets. This argument is suspect on both theoretical and em-

pirical grounds. The fourth section of the article discusses the theory of cross-subsidy as it relates to airline network configurations and pricing and scheduling decisions in particular submarkets. There is no economic justification for carriers cross-subsidizing unprofitable routes under the current price and entry regulations or in an unregulated market enviornment. Because airline route systems consist of many independent subnetworks, changes in rates, revenues, or schedule frequency in many submarkets will have no impact on the profitability of other components of a carrier's route system and hence will not affect carriers' decisions in those markets. The principal conclusion is that the current pricing regime does not "cross-subsidize" low-density routes serving small communities.

The final section analyzes what types of service changes might occur under a regime of fare flexibility represented by the rule. Most of the fare reductions will likely be concentrated in denser markets. To the extent that scheduled carriers reduce service in selected smaller markets, commuter carriers will be quick to enter. There is little basis for concluding that major cutbacks in service will result.

II. The Rationale for the Rule

The introduction of fare flexibility by creating a "suspend-free" zone[4] is an important step in making the airline system more responsive to underlying consumer preferences. Major consumer benefits in the form of lower fares are likely to result. The disadvantages of an industry-wide fare structure when differences exist among markets in traveler preferences are evident. The responsibility for tailoring fare and service to consumer preferences is most appropriately placed with carrier managements, who have both better information than regulators to make such decisions and a very direct stake in the outcome of their decisions.

The introduction of price competition through a "suspend-free" zone will encourage experimentation and the generation of information needed to formulate optimal fare and service levels. There is necessarily some uncertainty about consumer preferences. Absent such experimentation in the market, administrative decisions over fare and service options must be made with too little information. Permitting carriers to adjust prices based on their expectations of financial profitability for different types of service in particular markets is the best means for determining underlying consumer preferences.

The CAB's proposed criteria for suspension are an important dimension which will increase the likelihood of successful fare and service innova-

4. A "suspend-free" zone is a range of fares within which carriers are free to lower or raise fares without submitting economic data otherwise required by the CAB economic regulations, *supra* note 1.

tion under the rule. The opportunity for carriers to change fares without submitting the economic data presently required by the Board's Economic Regulations[5] gives carrier managements considerably more flexibility. The CAB in its discussion properly notes the burden of these submissions and their inhibiting effect on fare experimentation.

The new rule's provisions for suspension of a proposed fare require that complainants make a strong showing that a fare reduction is unlawful, predatory, and would cause irreparable harm if enacted.[6] Placing the burden of proof on complainants reflects a balancing of the possibility that the alleged harm would in fact occur with the offsetting injury to the traveling public that would be deprived of lower fares if an unnecessary suspension occurred. The CAB's position in this regard reflects the view that the public benefits of lower fares under the rule are substantial, that the opportunity for fare reductions is unlikely to result in destructive competition or predatory prices on any significant basis, and that the usual basis for injunctive relief provides adequate protection for complainants.

III. Service and Route Changes Under CAB Regulation

Service to small communities has historically been affected by CAB regulation of entry and fares and the subsidy payments to local service carriers. The payment of subsidy is intended to finance local service airline operations in low-density markets, and the CAB's control over entry and exit decisions has the potential of influencing service levels. Concern has been voiced that service to small communities will be much worse under the rule, and that retaining present CAB policies with respect to fares, entry, and subsidy is vital to the continuation of air service to small communities. A review of the history of service under CAB policies suggests that prevailing policies have made very little contribution to air service to small communities.

Regulation of the airline industry by the CAB under the Federal Aviation Act as amended[7] has pursued several objectives, including promotion and regulation of the industry to "foster sound economic conditions" and to provide for "competition to the extent necessary to assume the sound development of an air transportation system properly adapted to the needs of the foreign and domestic commerce of the United States . . .".[8] Service to small communities in which traffic levels would not sustain profitable operations has been subsidized by the CAB under the statute, beginning in 1945.[9] In 1955 permanent certificates were granted to local service carri-

5. 14 C.F.R. § 221.165 (1978).
6. Domestic Passenger Fare Investigation, 43 Fed. Reg. 39,522, 39,530 (1978).
7. 49 U.S.C. § 1302 (1976).
8. Federal Aviation Act, § 102(b)(d), 49 U.S.C. § 1302 (1976).
9. Federal Aviation Act, § 406(b)(3), 49 U.S.C. § 1376 (1976).

ers.[10]

The CAB's entry and subsidy policies appear to have yielded only marginally more scheduled service to smaller communities and lower-density routes than would exist in the absence of CAB regulation. The CAB's policies with respect to entry by trunklines might best be described as a cautious policy, permitting entry when the harmful effects on an incumbent carrier's profitability would not be significant, and allowing exit when carriers could show the service to yield sub-normal rates of return. Growth of traffic has, however, permitted some increase over time in the number of markets with more than one carrier. The share of revenue passenger-miles in 1972 in monopoly markets has declined over time to 23.2%.[11] A large number of willing applicants for entry to particular markets exists at all times. The CAB has been relatively lenient in allowing exit, and has no statutory authority to impose restrictions on the type of equipment or service frequency if carriers provide minimum service. Trunk carriers serve only a fraction of the possible city-pair markets within their route authority; trunks have also exited from many markets when profit prospects have been unsatisfactory. A summary of these route changes appears in Table 1. As indicated, trunk carriers served only 180 points in the 48 contiguous states in 1975, versus 210 in 1970 and 315 in 1960.

TABLE 1

Points Served by Certificated Carriers
48 Contiguous States

	Trunk Carriers[2]			Local Service Carriers[3]			All Carriers		
Year[1]	Points Authorized	Points Suspended	Points Served	Points Authorized	Points Suspended	Points Served	Points Authorized	Points Suspended	Points Served
1955	376	27	349	381	18	363	583	44	539
1960	328	13	315	497	38	459	618	51	567
1965	231	8	223	472	4	468	536	12	524
1970	228	18	210	467	34	433	524	50	474
1971	228	18	210	466	34	432	522	52	470
1972	222	15	207	455	32	423	508	47	461
1973	221	19	202	445	40	405	497	56	441
1974	208	16	192	432	49	383	481	64	417
1975	198	18	180	433	53	380	464	70	394

[1] As of December each year.
[2] Includes points served jointly with local service carriers.
[3] Includes points served jointly with trunk carriers.
Source: U.S. DEP'T OF TRANSPORTATION, SERVICE TO SMALL COMMUNITIES 25 (1976).

10. A local service carrier is one that provides "air service of a short-haul, low-density nature operated generally between smaller outlying communities and major traffic hubs." G. EADS, *supra* note 3, at 3. Trunk carriers, on the other hand, serve principally long haul markets and heavily traveled segments between major cities. W. JONES, CASES AND MATERIALS ON REGULATED INDUSTRIES 1087 (1976).

11. CAB SPECIAL STAFF REPORT ON REGULATORY REFORM 47 (1975).

Local service carriers' networks have also changed quite substantially in recent years. Local service carriers served 380 points in 1975, versus 433 in 1970 and 459 in 1960. There are two principal causes of these changes. The CAB has attempted to limit the size of subsidy to local service carriers by allowing carriers to exit from low density routes. Under the CAB's "use it or lose it" policy, many cities were deleted from the local service carriers' networks when traffic levels fell below established minimums. Second, local service carriers' managements have redefined their objectives in recent years; most appear to seek entry into trunk markets of medium density and to become small trunk carriers. The conversion to jet aircraft is both a cause and a reflection of this change in objectives. Efficient use of jet aircraft requires longer-haul, denser routes than characterized the local service carriers' networks in 1960. The CAB has allowed local service carriers to enter denser routes, in many instances replacing service of trunk carriers, and has permitted exit from more marginal routes.[12] As the local carriers' fleets become more dominated by jet aircraft, the scheduling problems of efficiently using smaller aircraft are accentuated. Local service carriers appear destined in many instances to virtually complete exit from very low density service which they traditionally provided. This reduction in service by local service carriers to smaller communities has occurred under existing CAB regulation.

The exit of local scheduled services has been accompanied by a very considerable growth in service by commuter carriers.[13] Commuter carriers operate under part 298 of the CAB's Economic Regulations.[14] Commuter carriers' operations are neither subsidized nor regulated, with carriers free to enter and charge any price. The exemption from certification under section 401(a) of the Federal Aviation Act[15] enjoyed by commuter carriers derives from the requirement that commuter carriers operate aircraft with a maximum passenger capacity of thirty passengers and a maximum payload of 7,500 pounds. The commuter carriers have in some instances received permission under the exemption authority vested in the CAB to operate larger aircraft. Most of the commuter carriers' fleets are comprised of small aircraft, in the fifteen to nineteen seat range.

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12. The evaluation in local service carriers' route and investment decisions and its interrelationships with CAB regulation is described in G. EADS, *supra* note 3.

13. Commuter air carrier is defined in the economic regulations as "an air taxi operator which (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week and places between which such flights are performed, or (2) transports mail by air pursuant to contract with the United States Postal Service. 14 C.F.R. § 298.2(f) (1978).

14. 14 C.F.R. § 298 (1978).

15. Federal Aviation Act, § 401(a), 49 U.S.C. § 1371(a) (1976).

The market opportunity to which commuter carriers have responded is the willingness of travelers in small communities to pay for high frequency service on small aircraft. In a number of instances, local service carriers have contracted with commuter carriers to provide "replacement service", allowing the local service carrier to meet its obligations under its route certificate in the market in question in this fashion. Allegheny has pioneered this approach. In some cases, the local service carrier has a financial obligation under the agreement. These arrangements reduce subsidy costs to the taxpayer, and also provide a more frequent service to the cities in question than the local service carrier could provide with larger aircraft. As of July 26, 1977, agreements at 53 replacement points in 23 states and involving 24 carriers had been approved by the CAB.[16]

Commuter service has grown considerably more rapidly than scheduled local or trunk service. In 1976, 85 commuter carriers served 300 airports and 746 city-pairs, carrying 7.3 million passengers. This represents a 9.4% annual rate of growth since 1970, versus 5.0% annually for the scheduled domestic carriers over this same period.[17]

The majority of commuter service is to small communities, of less than 75,000 people. Table 2 summarizes growth in service by type of carrier and city size for 1970 to 1975.

TABLE 2

Service to Communities under 100,000 Population, Points Served and Weekly Flights by Type of Carrier

	Number Points Served					
Size of Community:	1970–			1975–		
1970 Population	Trunk	Local	Commuter	Trunk	Local	Commuter
0– 25,000	17	126	116	12	111	149
25,000– 50,000	18	80	52	16	66	60
50,000– 75,000	3	12	9	2	11	11
75,000–100,000	6	16	12	5	15	10
Total	44	234	189	35	203	230

	Percent Change: 1970 to 1975		
	Trunk	Local	Commuter
0– 25,000	–29.4	–11.9	28.4
25,000– 50,000	–11.1	–17.5	15.4
50,000– 75,000	–33.3	– 8.3	22.2
75,000–100,000	–16.7	– 6.3	–16.7
Total	–20.4	–13.2	+21.7

16. COMMUTER AIRLINE ASSOCIATION OF AMERICA, 1977: A TIME FOR COMMUTERS, ANNUAL REPORT 55 (1977).

17. *Id.* at 7-8.

	Weekly Flights					
	1970–			1975–		
	Trunk	Local	Commuter	Trunk	Local	Commuter
0– 25,000	583	3,911	4,025	256	3,040	5,488
25,000– 50,000	556	3,464	2,282	603	2,401	2,735
50,000– 75,000	161	409	560	132	471	800
75,000–100,000	458	865	613	373	722	836
Total	1,758	8,849	7,480	1,364	6,634	9,859

	Percent Change: 1970 to 1975		
	Trunk	Local	Commuter
0– 25,000	−56.0	−22.2	36.3
25,000– 50,000	8.4	−30.7	20.0
50,000– 75,000	−18.0	−22.7	42.9
75,000–100,000	−18.6	−16.5	36.4
Total	−22.4	−25.0	31.8

Source: U.S. DEP'T OF TRANSPORTATION, SERVICE TO SMALL COMMUNITIES 28 (1976).

In communities of less than 100,000 population, the trunks have reduced scheduled flights by 22.4% in the period 1970 to 1975, the local service carriers reduced flights by 25.0%, while commuter carriers have added 31.8% to their flights. In 1974 commuter carriers provided more than half of their service in routes with less than ten passengers daily. Average stage length is much smaller than for scheduled carriers. (See Tables 3 & 4).

TABLE 3

Distribution of Passenger Markets by Mileage

	Commuter Air Carriers		Certificated Air Carriers*	
Mileage	Number of Markets	Percent	Number of Markets	Percent
Less than 100	514	40.9	63	2.4
100-200	460	36.6	306	11.7
200-300	190	15.1	374	14.2
300-400	58	4.6	287	10.9
Over 400	35	2.8	1,595	60.8
Total	1,257	100.0	2,625	100.0

* The data refers to markets with single plane service. Markets where connecting service only is offered were excluded in order to make the data more comparable with commuter operations.
Source: U.S. DEP'T OF TRANSPORTATION, SERVICE TO SMALL COMMUNITIES 34 (1976).

TABLE 4

Distribution of Passenger Markets by Passengers per Day

	Commuter Air Carriers		Certificated Air Carriers*	
Passengers per Day	Number of Markets	Percent	Number of Markets	Percent
Less than 10	969	77.0	286	10.8
10-20	103	8.2	578	21.9
20-30	50	4.0	351	13.3
30-40	31	2.5	219	8.3
Over 40	104	8.3	1,204	45.6
Total	1,257	100.0	2,638	100.0

* The data refers to markets with single plane service. Markets where connecting service only is offered were excluded in order to make the data more comparable with commuter operations.
Source: U.S. DEP'T OF TRANSPORTATION, SERVICE TO SMALL COMMUNITIES 33 (1976).

In the shortest-haul, low-density markets in which commuter carriers have been successful, the cost and scheduling advantages associated with smaller aircraft are very considerable. Miller and Laney's study of fares suggest that commuter fares are below local service carriers' fares in the very-short-haul markets.[18] Local service carrier fares are based on a formula in which fares are set by a fixed charge plus a mileage charge; in addition, local service carriers may establish fares up to 130% of the CAB's coach formula if no trunk carriers participate in the market. As a result, the local service carriers' fares are high for very short stage lengths, whereas commuter carriers' fares are higher at longer stage lengths. The other important characteristic of commuter fares is the absence of significant differences in fares between monopoly and non-monopoly routes which commuter airlines serve.[19] The threat of potential entry restrains any tendency for commuters with a monopoly to raise prices. In summary, commuter carriers enjoy cost economies in using small aircraft in short stage lengths, which are reflected in the commuter air fare structure.

These statistics clearly reveal the contribution being made by air commuters to small communities and the reductions in service from local service carriers at small communities. The local service carriers have exited from the small community as rapidly as CAB regulations will permit. Many

18. Memorandum by J. Miller III and L. Laney, Evidence on Regulated and Unregulated Airfares (July 15, 1975).

19. *Id.*

smaller communities have seen their scheduled service switch from local service carriers to commuter carriers in recent years. In brief, pressures to keep the direct subsidy to a minimum have limited the degree to which the Congress has been willing to subsidize service by local service carriers at low-density points. Consumer satisfaction with commuter air service, largely the result of its rapid growth and the financial success of commuter carriers, is one reason why it has been possible politically to reduce the subsidy of local service carrier operations at low-density points.

The fortunes of air service at small communities lies with the commuter carriers, regardless of pricing changes which will result from the rule. The local service carriers have no comparative advantage at this stage to reenter the small community market. Commuter service will expand at routes from which local service carriers exit.[20] The routes from which local service carriers exit have longer stage lengths and higher densities than are typical for commuter carriers, making these routes especially attractive.

IV. Scheduling Decisions and Cross-Subsidy: Some Theoretical Observations

Fare flexibility will result in changes in service in certain markets. Some concern has been voiced that massive reductions in service will result. It will be shown below that in order to predict the nature of changes in schedule frequency it is necessary to analyze the rationale for carriers' scheduling decisions. The extent to which fare reductions will require changes in schedule frequency depends on cost functions and the elasticity of demand. Service adjustments should be viewed as the natural consequence of achieving a more efficient outcome in which service is more closely aligned with consumer preferences.

The second argument analyzed below is the extent to which carriers "cross-subsidize" low-density markets with profits from high-density routes. The importance of this issue derives from a concern that reductions in fares and profits in high-density routes will undermine service throughout an airline's route network. It will be argued that this viewpoint is incorrect.

In considering first the adjustments of schedules, the interrelationships between fares and schedule frequency must be analyzed. Lower fares require higher load factors to cover costs and hence a tradeoff exists between the level of fares and the level of capacity.[21] Greater capacity, or lower load factors, implies higher schedule frequency and convenience and a

20. Department of Transporation, Service to Small Communities 26 (1976).

21. White, *supra* note 3; Straszheim, *Airline Fares and Load Factors: Some Oligopoly Models*, J. Transp. Econ. & Pub. Pol'y, 1-4 (Sept. 1974); G. Douglas & J. Miller, *supra* note 3, at 86-94.

higher probability that a seat is available at the desired departure hour. However, more capacity may require higher fares. The possible choices of fare and schedule frequency will depend on both fare and schedule elasticities of travelers and carriers' cost functions. Travelers will differ in their preferences regarding the optimal fare-schedule frequency combination, with business travelers preferring lower load factors while tourist travelers likely will prefer lower fares at the expense of lower schedule frequency.[22] Even within a city-pair market, passenger preferences will vary substantially. The optimal choice of fare and load factor in any city-pair will therefore depend on the mix of travelers by trip purpose, and also on the stage length and route density. The latter will be relevant in passengers' valuations of the benefits of more- versus less-frequent service.

The choice between lower fares and more frequent service has been made by the CAB in its prevailing fare regulation, which has attempted to establish fares consistent with a 55% load factor. Price flexibility under the new rule allows carriers to test market responses to lower fare service. Carriers' willingness to experiment with alternative price-service options may in turn result in adjustments in schedule frequency.

The effects of fare flexibility on capacity will depend both on the elasticity of demand and airline cost functions. Fare reductions which stimulate demand will entail additional costs to carry the additional traffic even if aircraft seat miles are held constant. Douglas and Miller estimate that the marginal costs of carrying additional passengers are well below the costs of providing capacity for most aircraft and under most load factors.[23] The demand elasticity must be well above unity (about -1.3) if the increased traffic associated with a fare reduction is to provide sufficient revenues to cover the added costs of carrying the additional passengers. If the elasticity is less than -1.3, the carrier must reduce frequency, *i.e.* increase the load factor, when fares are reduced.[24]

To conclude this argument, it should be stressed that service or frequency changes, including reductions in frequency, which will occur as a result of the rule should be viewed as the natural consequence of realigning service with consumer preferences. Such adjustments in frequency are a necessary part of a process of obtaining an economically efficient outcome, which is the appropriate objective of the change in the fare regulations.

The argument that the airlines now cross-subsidize low-density routes with profits from higher-density routes is inconsistent with the economic theory of the firm. That fares diverge from marginal costs in particular markets

22. Douglas and Miller developed a theoretical model relating the value of schedule delay to passengers' valuation of time. Business travelers likely place higher values on time. G. DOUGLAS & J. MILLER, *supra* note 3, at 82-94.

23. *Id.* at 8-26.

24. *Id.* at 57-60.

is not in itself evidence that cross-subsidy occurs. A brief theoretical discussion of the concept of cross-subsidy will usefully focus the issues which arise in assessing the impacts of the rule.

Cross-subsidy exists when outputs and prices are such that prices differ from marginal costs among markets, assuming all cost functions are characterized by constant costs and all costs are assignable. Markets in which prices are below marginal cost are being subsidized. It is difficult to envision circumstances when firms would willingly choose to cross-subsidize one market by revenues from another if cost and demand functions in each market were independent. Sellers would have no incentive to use profits from one market to subsidize output in another market in these circumstances. Regulation of markets is the one circumstance in which cross-subsidy is often created; as a condition of participation, firms may be required to establish output and price levels across markets which cross-subsidize certain markets. Certain types of postal service illustrate a market subsidized in this fashion.

There are a variety of circumstances in which prices diverge from marginal cost but no cross-subsidy occurs. For example, if sellers had some degree of market power and entry were precluded by entry barriers or entry controls, firms would have incentive to set prices and outputs such that prices diverged from marginal cost by varying amounts, the amounts dependent on the elasticity of market demand curves. No price would lie below marginal cost, but prices could diverge from marginal costs in particular markets even if the firm's cost function was characterized by constant costs and all costs were assignable. No cross-subsidy would exist.

Other circumstances in which prices diverge from marginal costs in particular markets involve considerations of decreasing costs, non-assignable common costs, and the interdependencies between markets. For example, the firm may perform activities where there are significant common or non-assignable costs. Several types of users may share a facility, but all of the facility costs cannot be traced to the use of individual users. Or, a firm may produce many products with a given production process, with some common or overhead costs non-assignable to particular products. The airlines are by no means unique in confronting the problem of recouping overhead or common costs.

"Cross-subsidy" is a misnomer to describe the situation in which different markets make different contributions to overhead costs. In these circumstances there is no basis on economic efficiency grounds in support of any particular assignment of common costs to different products. (Efficiency requires marginal cost pricing, with lump-sum taxes used to finance non-assignable costs.) In practice a variety of procedures are employed by firms to "assign" common costs to particular markets. The most common procedure is a constant markup of costs of particular products. Much of

the retailing sector uses markups of this sort to recoup overhead or common costs. Another procedure often used by firms in recouping common costs is to price discriminate, assigning differential amounts of common costs to products based on differences in demand elasticities.[25]

In the case of the airlines the principal issue in interpreting fares in different markets stems from the existence of common costs associated with operating networks comprised of more than one city-pair route. A route system will include both common costs and costs traceable to operations in each link. These common costs arise from indivisibilities in the production process. Station expenses are not proportional to output at low levels of output since a minimum level of station facilities must be provided even at low passenger demand levels. Some portion of station expenses cannot be directly assigned to output levels in any given city-pair link.[26] (Overhead costs also are unassignable to particular routes.)

The size of aircraft used on a network also creates an indivisibility which affects the definition of cost functions in particular city-pair submarkets. Aircraft represent an input available in discrete sizes, and which cannot be varied continuously by city-pair market. Costs do not vary proportionally with output at small levels of output due to aircraft sizes available and the economies associated with larger aircraft. The fact that it is most efficient in most circumstances to schedule a given aircraft over a linear route system comprising several city-pair markets creates an indivisibility. The least-cost choice of aircraft will depend on the network over which it is to be flown, including the stage length and traffic density in each route. The most efficient means of serving a network may entail scheduling an aircraft over a network so that revenues are below assignable marginal cost in a subportion of the network.[27]

In pricing service over a network comprising many route segments, and in which some portion of costs are non-assignable to particular segments, an allocation of common costs is necessary. In particular submarkets, prices may bear different relationships to assignable costs. In this circumstance it is inappropriate to label these differences between prices and costs cross-subsidy. Even in the situation when prices fall below assignable marginal cost in one submarket it may be inappropriate to suggest that this one submarket is being subsidized by others. For example, it may

25. The opportunity to price discriminate requires that separate markets be identified, resale be prohibited, and differing elasticities of demand exist. The elasticity of demand for products will depend on the degree of competition in the market and the availability of substitutes. The existence of competitors or the threat of entry limits the degree to which firms may charge prices well in excess of costs in any given market.

26. The author found significant cost economies associated with greater route density in the international airline industry. M. STRASZHEIM, *supra* note 3, ch. 4.

27. Positioning flights illustrate this phenomena. M. STRASZHEIM, *supra* note 3, at 72-82.

be that service in each individual city-pair market in a subnetwork is unprofitable if operated individually, *i.e.* revenues would fall below costs in each individual market. Yet when operated as a network of city-pairs, common costs can be assigned to various submarkets so that the entire network is profitable. If omitting service in one submarket results in separate subnetworks each of which is unprofitable, or in which costs are now higher (*e.g.*, due to lesser utilization of equipment and personnel), the connecting market should be included even though prices fall below assignable cost. It would be inappropriate to label this a cross-subsidy of the connecting market since the existence of the latter provides cost savings and service benefits to other markets.

It must be stressed that it is only the existence of indivisibilities arising from station expenses or aircraft size, or cost or demand interdependencies among city-pair submarkets in a network, that creates a situation where price-marginal cost relationships could vary among submarkets even in a purely competitive market enviornment. Were productive inputs completely divisible in all markets, firms would have incentive to offer that output where price (equal to marginal revenue in the competitive case) equaled marginal cost in each market.

To summarize, there is no theoretical argument in support of the thesis that carriers cross-subsidize certain markets. That city-pair markets make different contributions to overhead or common costs is not evidence by itself that cross-subsidy exists. In addition, scheduling competition is such that load factors approach break-even levels in most markets.[28]

While cross-subsidy is not relevant in predicting the effects of fare changes under the rule, the potential role of network effects on carriers' decisions in individual markets must be recognized. Airlines are providing service over networks of cities, with the financial returns on components of these networks interrelated. Much air carrier service is conducted on route systems, in which aircraft are routed along a series of city-pair markets. That such subnetworks are a cost-efficient means of providing service over a larger route system creates interdependencies between outcomes in particular submarkets. In a connecting service A to B to C, there may be insufficient traffic from A to B, A to C, or B to C to cover costs if each were served individually. Yet service A to B to C is profitable. The nature of service which can be provided between any two cities may depend in part on service and traffic levels in other markets.

As a result of these network effects, changes in pricing under the rule and changes in revenues in one submarket would in principle alter an airline's incentive to offer service in an entire subnetwork of routes. However,

28. Douglas and Miller argue that very little excess profit exists in any market due to scheduling competition. G. DOUGLAS & J. MILLER, *supra* note 3, at 97.

these direct effects would only be felt in routes in which there were production interdependencies arising from the use of common station facilities, common aircraft, and personnel inputs, or demand interdependencies. Service in the rest of the airline's operations should be unaffected; changes in profits in links unrelated in a production or cost sense to other links should not directly alter carrier's decisions in these latter markets. Changes in revenue associated with fare changes in any given market under the rule would not affect decisions regarding entire carriers' route system. It will be argued in the next section that these network interdependencies are likely small.

V. Fare and Service Changes

The opportunity afforded carriers to change prices in markets under the rule will result in fare and service changes in a number of markets. The nature of these adjustments is discussed below. The fare reductions are likely to be concentrated in the denser markets, but these are not likely to lead to major cutbacks in service in low-density markets.

The discussion of these service adjustments is based on limited empirical evidence, since there inevitably remains considerable uncertainty about passenger preferences and their reactions to various fare-service options before the fact. The CAB properly notes the difficulty of anticipating what is an optimal fare and service configuration. Carriers are best suited to making these predictions. In some instances experimentation will be needed to determine the outcomes consistent with consumer preferences.

The best assurance of continued service in markets derives from the fact that the industry is a constant-cost industry. Changes in fares which increase break-even load factors will result in lower schedule frequency. The important questions revolve around the types of service changes likely in particular markets and the role of "network effects" in firms' decisions to offer service in particular submarkets.

Predicting the most likely service changes under the rule involves an examination of the structure of fares under the previous DPFI regulations. In the past, prices were established to yield a normal rate of return for carriers experiencing costs equal to the average costs of industry participants at a load factor of 55%. The fare structure was designed to reflect differences in costs associated with varying stage lengths but not varying traffic density. Carrier incentives under regulated prices were to expand service and frequency until actual load factors approximated break-even levels. In actual practice, market load factors have been inversely related to stage length and density,[29] implying that the previous fare structure did not fully reflect cost economies on a per-mile basis associated with stage length or density.

29. *Id.* at 91-92.

Carriers' response to the opportunity to introduce fare reductions will reflect their sense of passenger preferences with respect to lower fares versus lower quality service. Carriers may choose to reduce on-board amenities or terminal facilities. The principal service dimension at choice is schedule frequency. In most instances, demand elasticities are not sufficiently high that lower fares will increase revenue per seat-mile of service. The markets in which passenger preferences most likely favor lower fare service are those with major tourist markets and/or high traffic density. Theoretical markets of passenger demand and schedule convenience suggest that traffic density and schedule convenience implied by any given level of flights are positively-related variables.[30] In denser markets with more frequent departures, less waiting time is incurred before another flight in the event that any given flight is fully booked. For any given probability distribution of planned departure times, average schedule delay time will be less if more flights are available. Schedule frequency being higher in denser markets, the inconvenience of higher load factors is less; this is the circumstance in which a lower-fare service is likely the most attractive to passengers. High-density markets are therefore the markets which will most likely be the target for fare reductions.

The mix of tourist and business travel will also influence carrier decisions, with tourist-dominated markets the likely target of low-fare experimentation. Since demand elasticities are less in markets with more business travel, less fare cutting is to be expected here. Finally, fare reductions are more likely in markets with more carriers, where tacit collusion on prices is perhaps less easily achieved. There also may be instances in which carriers reduce prices in an attempt to increase market share, either in a market which they now serve or one in which they have chosen to begin service again. This motive is not synonymous with a motive of predatory pricing. Since some entry controls remain, and many markets have only one or two carriers, it is quite possible that price cutting may not be prevalent in these markets, but would rather be substantially concentrated in the larger, more competitive markets.

It is possible that more than one type of service may be offered in certain markets, especially for short periods of time. Some carriers may provide only peak-hour service, at low fares and high load factors in a few high-density markets. In these latter markets some carriers may continue to offer conventional service at higher fares. The carrier with higher fares may have the advantage of feeder traffic. Whether fare differentials can exist within a given market over the long run is not obvious on *a priori* grounds. Intrastate service at lower fares has operated in competition with higher-fare

30. Douglas & Miller, *Quality Competition, Industry Equilibrium, and Efficiency in the Price-Constrained Airline Market*, AMER. ECON. REV., 657-69 (Sept. 1974).

air service in some markets.[31]

If only small adjustments in capacity are required as a result of any fare flexibility downward that increases break-even load factors, these adjustments might be made gradually through time. Capacity adjustments could be made by increasing capacity less rapidly than the normal growth in demand that would occur in the absence of price changes. Individual carriers can also adjust capacity downward more quickly, by selling or leasing equipment or deferring new equipment deliveries. Past experience has shown the airlines to be quite reluctant to reduce their capacity commitments, though they will make such adjustments if financial circumstances require it.[32]

It is possible that fare reductions and higher load factors in denser, more competitive markets will encourage carriers to shift capacity to less-dense markets or those with fewer carriers, where they feel additional schedule frequency may be a more effective competitive strategy than price cutting. A carrier might judge that such additions to frequency in these latter markets would preempt entry or service frequency expansion by other carriers. Of course, if one carrier in such a market judges itself to be disadvantaged competitively in scheduling competition, it has the opportunity to reduce fares under the rule. Thus, while some tendency may exist to transfer capacity away from markets in which fare reductions are occurring, there are clear incentives for fare cutting to spread to other markets as well, especially if one or more carriers considers there to be excess frequency in these other markets.

The discussion in Section IV noted that city-pair markets are in some instances interrelated by network considerations. In principle, some service changes traceable to airline network configurations may occur. As noted earlier, fare reductions and lower revenues could in principle affect the decision to offer service in feeder markets. Lower profits might result in exit from a network of several city-pair markets in the absence of opportunity to increase fares in these markets. The reverse might also occur; lower fares might increase demand and induce carriers to increase frequency throughout a subnetwork.

These types of network effects leading to service reductions are not likely to be large. In practice, airline networks are comprised of many "independent" subnetworks, in which demand and cost functions are unrelated from one subnetwork to another. Outcomes in any one city-pair should only affect outcomes in related city-pairs. Also, it is not evident that

31. The California and Texas markets are described in *Regulatory Reform in Air Transportation: Hearings on S. 2551, S. 3364, and S. 3536 Before the Subcomm. on Aviation of the Comm. on Commerce*, 94th Cong., 2d Sess. (1976) (statement of William A. Jordan).

32. Straszheim, *Airline Demand Functions in the North Atlantic and Their Pricing Implications*, J. TRANSP. ECON. AND PUB. POL'Y (forthcoming).

common costs are allocated among airline city-pair submarkets in a highly unequal manner (*i.e.*, that realized load factors are such that there exist significant variations in the contributions of different markets to overhead costs). As noted earlier, competition among trunks, local service, and, recently, commuter carriers is such that airlines' ability to recoup additional profits from particular submarkets is limited.

It is not evident on *a priori* grounds whether more or less limited types of networks will prove the more cost-efficient means of providing air service in the future. It is possible that much more "limited" route networks will prove most efficient. Carriers may find it cheapest to schedule high-density turnaround service rather than the use of multiple-stage linear route systems. The latter create potential scheduling problems; delays in some portion of the network may affect on-time performance. But the reverse is also possible. More competition in denser markets may shift the advantages in favor of multi-stage systems, with feeder links providing additional traffic to denser links of a system. Carriers may seek to expand their route systems under the new pricing rules rather than contract them.

The small-community markets in which the local service carriers provide monopoly scheduled service (or in competition with commuter carriers) will not likely be significantly affected by increased fare competition in competitive markets. The profitability of much of the small-community market is unrelated to outcomes in denser, more competitive markets. To summarize this discussion, lower-density markets are less likely to experience significant fare reduction or to be affected by fare competition in denser markets.

VI. Concluding Observations

The new rule allowing fare flexibility is an important step in creating more price competition and in encouraging an economically efficient outcome in which price and service in the airline industry are more closely aligned with consumer preferences. The introduction of fare competition will necessarily entail some changes in schedule frequency. These adjustments are the natural result of adjusting service to consumer preferences.

There is no evidence that service changes under the rule will result in significant service abandonment to small communities or that small communities will receive any less service than if prevailing CAB entry, fare, and subsidy policies were continued. Under previous policy, local service carriers have exited from small-community service at a rapid rate, with these markets being subsequently served by commuter airlines. Based on the high rate of growth of commuter service, travelers apparently place very considerable value on commuter air operations. The future of air service to small communities lies largely with the commuter carriers.

The effects of the rule will likely be most evident in the denser markets.

Load factors are inversely related to density. Consumers will likely be most responsive to lower fares even at the expense of less-frequent service in the denser markets, where schedule frequencies are such that the scheduling inconvenience of increasing load factors is least. Tourist markets are also candidates for fare reductions. Denser markets with more than one carrier are the market structures in which price competition is most likely. Major fare reductions in smaller markets and significant reductions in service are unlikely.