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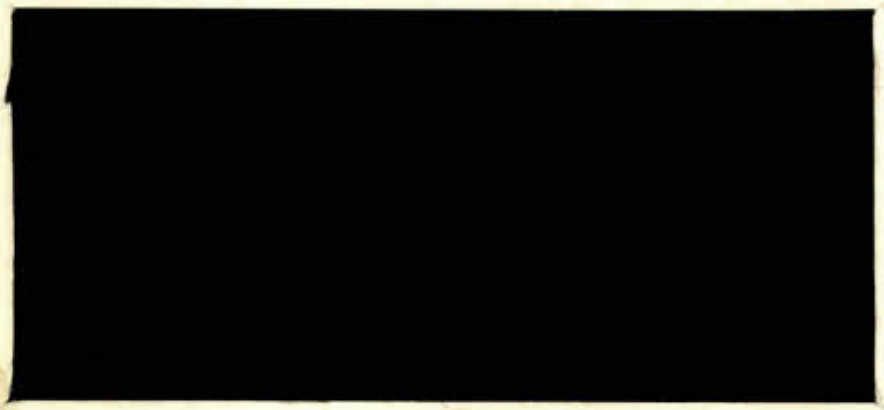

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WORKING PAPER NO. 29

CANADIAN AIRLINE PERFORMANCE UNDER REGULATION

by

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Preface

This study is part of a larger research project, the detailed results of which are being published by Consumer and Corporate Affairs Canada.* Financial support for this research has been provided by Consumer and Corporate Affairs Canada and Transport Canada as well as the Economic Council.

*Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa-Hull: Consumer and Corporate Affairs Canada, 1982)

Acknowledgements

The basic research undertaken for this report was co-sponsored by the Economic Council of Canada (ECC) in collaboration with Transport Canada (TC), and by the Bureau of Competition Policy, Consumer and Corporate Affairs Canada (CCAC). An added contribution from the Bureau of Competition Policy consisted of the very competent services of Miss Pamela Cooper who collected much of the Canadian airline data from Statistics Canada's Aviation Statistics Centre. The financial cooperation of these three agencies was indispensible in collecting the large amounts of data from sources in the United States and, overall, this project would not have been possible without the inter-agency sponsorship. Dr. William T. Stanbury and Mr. Robert A. Jenness of the Economic Council's Regulation Reference, and Dr. Donald F. McKinley of the Bureau of Competition Policy were the prime coordinators of the project, and their assistance, encouragement and, especially, patience throughout the study are greatly appreciated.

This is the second of two reports stemming from the project. The first, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations, is more detailed and technical than the present report and it will be cited frequently in the following pages. It has been published by CCAC and any reader interested in an elaboration of some of the points, or wishing to use the large amounts of data collected for the full study, is referred to that publication. This second report, with its greater emphasis on findings and policy implications, should be of interest to the reader who is less concerned with full explanations of the underlying analyses.

A comparative study of this magnitude depends on the assistance and generosity of many individuals and their organizations. The following is a list of the more important contributors of information, but there were many others who provided essential data at critical points in the project:

Air California: Mr. Frederick R. Davis, Vice President-Marketing

Air Florida: Mr. Donald S. Garvett, Corporate Vice President-Planning
Mr. Mark Creasser, Manager-Telephone Sales
Ms. Joyce Sadinsky, Supervisor of Statistics
Ms. Patricia Tomasetti, Personnel Administrator

California PUC: Mr. James K. Gibson, Director, Transportation Division
Ms. Margaret B. Hollywood, File Room
Mr. Sheldon Rosenthal, Assistant General Counsel
Mr. William H. Well, Principal, Transportation Division

Imperial Oil:	Mr. Lyle G. Ahrens, Aviation Sales Manager Mr. Richard Ward, Product Advisor-Aviation
PSA:	Mr. Lawrence A. Guske, Vice President and Controller Mr. George J. Mitchell, Vice President-Regulatory Affairs Mr. Joseph G. Opp, Director of Reservations
I. P. Sharp:	Mr. David A. Keith, Manager, Data Bases
Southwest:	Mr. Earl L. Doolin, Director of Financial Reporting Mr. Herman H. Farr, Treasurer Mr. Jimmie Johnson, Manager-Employee Benefits Mr. Lowell McCallister, Manager-Procedures & Publications
Statistics Canada, ASC:	Mr. Jan Bekooy, Head, Airports and Civil Aviation Mr. Gordon Baldwin, Civil Aviation Mr. Raynald Lortie, Civil Aviation
U.S. CAB:	Mr. Paul Gavel, Financial Section, Office of Comptroller Mr. Frank M. Lewis, Chief, Financial and Cost Analysis Division, Office of Economic Analysis Mr. H. T. Kent Paxson, Financial Section, Office of Comptroller.

All of these individuals acted in ways that challenge the assertions about there being no such thing as a "free lunch." They gave much and received essentially nothing in return. My sincere thanks to each and every one.

Behind every major research report are the hard, practical contributions of the support staff. For this study these included Dr. Steven Stryker, who assisted in collecting data from the CAB in Washington; Mrs. Janet Gillfillan, who summarized the basic data underlying the weather and population analyses; Mr. Garland A. Cassidy and Mr. Robert A. Gagne, who provided computer services; and Miss Janet De Wilde, who did most of the typing. Finally, the administration of the Faculty of Administrative Studies, York University, under Dean Wallace B. Crowston, was most cooperative and helpful in facilitating this project.

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RÉSUMÉ

Jusqu'à la fin de 1978, les compagnies aériennes du Canada et leurs homologues américaines qui assuraient le service inter-États étaient soumises à des règlements fédéraux généralement comparables, et il existait entre elles des similitudes fondamentales quant à la performance économique. Non seulement n'y avait-il pas de différence appréciable découlant de la nationalité, mais le facteur propriété (intérêts privés ou contrôle par l'État) ne posait pas non plus de problèmes. Par contre, aux États-Unis, la performance des principaux services aériens intra-États (ou locaux) -- qui étaient régis par les gouvernements de la Californie, de la Floride et du Texas -- a été, durant cette période, passablement différente de celle des compagnies assujetties à la réglementation fédérale.

Les données analysées dans la présente étude montrent que les grands écarts de performance entre, d'une part, les sociétés réglementées par le gouvernement fédéral, au Canada et aux États-Unis, et, d'autre part, les transporteurs aériens locaux américains, sont attribuables à des différences de réglementation. Celles-ci découlent du fait que les transporteurs américains inter-États (régis par la Commission de l'aéronautique civile) assuraient aussi des services étendus en Californie, en Floride et au Texas, concurrençant ainsi les compagnies aériennes réglementées par ces États. Par conséquent,

contrairement aux deux monopoles fédéraux qui existaient au Canada et dans le reste des États-Unis, il s'est créé dans ces États un climat réglementaire de duopole qui a laissé se développer, après l'entrée sur le marché de nouveaux transporteurs locaux, une forte concurrence des prix et des services. En effet, ces derniers ont réussi à offrir des tarifs beaucoup plus faibles et, leurs frais d'exploitation étant moindres, ont pu obtenir des bénéfices comparables à ceux des sociétés régies par le gouvernement central.

Dans la présente étude, l'auteur estime que s'il paraissait souhaitable de viser, ici au Canada, à la performance des transporteurs intra-États américains, il serait possible d'y arriver en réduisant la réglementation fédérale et en permettant ainsi de reproduire le climat qui entoure ces compagnies aériennes : soit d'abord l'admission, dans l'industrie, de toutes les nouvelles sociétés satisfaisant aux normes de sécurité fédérales (lesquelles seraient autorisées, tout comme les compagnies existantes, à choisir leurs itinéraires, sans restriction quant au genre d'appareil utilisé); puis l'établissement d'une forte concurrence en matière de prix, sans aucune restriction quant à la qualité et à la quantité des services offerts.

Si les politiques canadiennes étaient modifiées en ce sens, nous arriverions à peu près à reproduire l'expérience américaine

de la déréglementation, car il existe des similitudes fondamentales entre les compagnies canadiennes régies par le gouvernement fédéral et les sociétés américaines. En se fondant sur la performance des transporteurs locaux américains jusqu'à la fin de 1978, l'auteur prévoit que, dans un contexte de déréglementation, la performance des sociétés canadiennes évoluerait généralement de la façon suivante :

1. Les prix baisseraient d'au moins 50 % par rapport aux tarifs réglementés;

2. la structure des tarifs serait beaucoup moins compliquée;

3. les compagnies qui réussiraient dans ce nouvel environnement verraient leurs frais d'exploitation diminuer de beaucoup;

4. leurs bénéfices pourraient se comparer à ceux qu'ont réalisés dans le passé les transporteurs actuels;

5. le nombre de sociétés augmenterait et chacune serait plus spécialisée que les compagnies réglementées actuelles;

6. la qualité des services fléchirait un peu, la première classe étant éliminée, et le nombre de places augmenterait, de même que les coefficients d'occupation moyens;

7. les vols nolisés diminueraient de façon marquée et n'accueilleraient plus qu'une seule classe de passagers;

8. il n'y aurait aucun changement du point de vue de la sécurité; les règlements actuels de Transports Canada à ce sujet pourraient être maintenus.

Remettre à plus tard la déréglementation au Canada ne se ferait pas sans risques. La concurrence directe des transporteurs américains, à faibles coûts d'exploitation, sur les importantes routes aériennes transfrontalières, la concurrence indirecte pour le trafic international avec les villes américaines voisines du Canada, et les pressions sur les transporteurs canadiens à frais d'exploitation élevés pour qu'ils réduisent leurs tarifs intérieurs, pourraient affaiblir les exploitants de grandes lignes et les transporteurs régionaux; ceux-ci devraient alors s'ajuster à la déréglementation plus rapidement et plus péniblement que leurs homologues américains possédant plus d'expérience.

Les tarifs peu élevés et les faibles coûts d'exploitation des transporteurs américains locaux ont montré que la déréglementation constitue une option viable. Elle n'a provoqué aucune anarchie dans le transport aérien aux États-Unis. Jusqu'à maintenant, les sociétés américaines s'y sont progressivement adaptées, tout en faisant face à d'autres changements importants

(par exemple, des augmentations sans précédent des prix du carburant). De nouvelles compagnies ont fait leur entrée dans l'industrie, et les sociétés existantes se sont mises à exploiter d'autres routes aériennes, ce qui a fortement accru la concurrence dans plusieurs paires de villes.

La déréglementation offre un avantage fondamental sur la réglementation permanente : elle apporte à long terme aux transporteurs une stabilité économique beaucoup plus grande si leurs frais d'exploitation sont faibles que s'ils sont élevés, et on sait qu'aux États-Unis les coûts d'exploitation peu élevés ont été la norme en contexte de déréglementation. Par conséquent, des politiques de déréglementation conçues pour favoriser une exploitation peu coûteuse réussiraient probablement mieux que d'autres. En outre, les transporteurs dont les coûts sont faibles peuvent offrir des tarifs réduits et permettre ainsi de recourir aux avantages technologiques propres au transport aérien pour réellement "rapprocher", les unes des autres, les régions éloignées d'un grand pays comme le Canada.

Summary

Fundamental similarities existed in the economic performances of the Canadian airlines and the U.S. interstate airlines during the years through 1978 when both groups of carriers operated under generally comparable federal regulation. Not only were there no appreciable differences associated with nationality, but ownership (private versus government) was also not a relevant factor. In contrast, during these years the performances of the major U.S. intrastate carriers, operating under state regulation in California, Florida and Texas, differed substantially from those of the federally-regulated airlines. The evidence analyzed in this study indicates that the large differences in performance between the federally-regulated airlines in Canada and the U.S., on the one hand, and the U.S. intrastate carriers, on the other hand, were due to the differences in their regulatory environments.

The differences in regulatory environments stemmed from the fact that the U.S. interstate carriers (regulated by the Civil Aeronautics Board) also provided extensive services within California, Florida and Texas in competition with the state-regulated airlines. Thus, in contrast to the federal regulatory monopolies in Canada and the rest of the U.S., a duopolistic regulatory environment evolved in these states which allowed extensive price and service competion to develop following the entry of the new intrastate carriers. Specifically, the successful intrastate carriers offered much lower fares and incurred correspondingly lower operating costs, while achieving profits comparable to those of the federally-regulated airlines.

This study predicts that if the performance of the U.S. intrastate carriers is judged to be desirable for Canada, it can be achieved by reducing federal regulation to permit the duplication of the attributes that character-

ized the intrastate airline environment -- that is, entry into the industry by all new airlines complying with federal safety requirements (with both new and existing airlines permitted to operate over the routes of their choice without restriction as to type of aircraft utilized); extensive price competition allowed; and no restrictions on service quality and quantity.

The basic performance similarities of federally-regulated Canadian and U.S. airlines imply that the U.S. experience under deregulation would be generally duplicated in Canada if similar policy changes were implemented in this country. Overall, based on the U.S. interstate carriers' performance through 1978, it is predicted that Canadian airline performance would change in the following ways under deregulation:

1) Prices would decrease by as much as 50 percent from regulated levels.

2) The fare structure would become much less complicated.

3) Operating costs of successful airlines would be substantially reduced.

4) Profits of successful airlines would be comparable to the historical levels of present-day carriers.

5) The number of airlines would increase, with each being more specialized than existing regulated airlines.

6) Service quality would decline somewhat, with the elimination of first-class service, increases in seat densities and increases in average load factors.

7) Charter service would decline substantially and would be largely limited to single-entity services.

8) There would be no change in safety, with existing safety regulation continuing under the Transport Canada.

Postponing the implementation of deregulation in Canada would not be risk free. The direct competition by low-cost U.S. carriers over the important transborder routes, indirect competition for international traffic through nearby U.S. cities and the pressure on the high-cost Canadian carriers to

introduce low fares domestically could result in weakened mainline and regional carriers eventually having to undergo the necessary adjustments of deregulation more rapidly and painfully than their experienced U.S. counterparts.

The low-fare and low-cost performance of the U.S. intrastate carriers has demonstrated that deregulation is a viable policy alternative. Deregulation has not brought chaos to the U.S. industry. To date, U.S. airlines have been slowly adjusting to deregulation while coping with other major changes that have been quite unrelated to deregulation (such as uniquely large increases in fuel prices). New airlines have begun to enter the industry and existing airlines have expanded into new routes resulting in substantial increases in competition in many city pairs.

Deregulation does have one fundamental advantage over continued regulation. The long-term evonomic strength of low-cost carriers is much greater than that of high-cost carriers, and low-cost operations have been the norm under deregulation. Therefore, deregulation policies designed to foster low-cost operations will more likely be successful than alternative policies. Furthermore, low-cost carriers are able to offer low fares, thereby allowing the inherent technological advantages of air transportation to effectively shrink the distances between the dispersed regions of a large country such as Canada.

1. Introduction

A good way to measure the effects of economic regulation on airlines is to compare the performance of airlines that operate under extensive regulation with those that operate under much less regulation. Significant and consistent differences between the prices, operating expenses, input productivity and profits of such airlines would imply that regulation does have an impact on performance, and the quantitative differences would measure the extent of the regulatory effects.

It is not possible to undertake a comparative study using only Canadian airlines because all virtually all commercial air activities in Canada, from the largest airline to the smallest flying club, have been regulated since 1938 -- first by the Board of Transport Commissioners, then by the Air Transport Board and, since 1967, by the Air Transport Committee of the Canadian Transport Commission [CTC(A)].[1] Thus, in order to undertake such a study of airline performance, it is necessary to look outside Canada to find airlines that have operated under significantly different levels of regulation. It happens that a variety of regulatory environments for airline operations existed in the United States until the end of 1978, so information from that source provides a basis for a comparative study of airline regulation.

Between 1938 and 1978, regulation in the United States ranged from the extensive control by the Civil Aeronautics Board (CAB) of airlines providing interstate common carriage with large aircraft, to the limited regulation by state commissions of intrastate airlines operating large aircraft within a single state (and thereby beyond the CAB's jurisdiction over interstate air transportation), on to the interstate commuter and air taxi carriers (operating small aircraft having less than 20 or 30 seats) to which the CAB gave blanket exemptions from its regulation back in 1952.[2] Until the adoption of the

Airline Deregulation Act (ADA) on October 24, 1978, the CAB's powers over airline entry, exit and prices were very similar to those of the CTC(A).[3] Therefore, the federally-regulated airlines in both Canada and the United States operated in similar regulatory environments where a single federal commission held authority over airline service. It follows that if such regulatory monopolies have an appreciable and consistent impact on economic performance, the performance of the federally-regulated airlines in both countries should be similar in important respects.

The operations of the less regulated U.S. intrastate carriers are of particular interest to this study because some of the large turbine-powered aircraft used by the federally-regulated airlines in Canada and the United States (the relatively short-range DC-9s, B-737s and B-727s) were also the aircraft operated by the intrastate carriers. Furthermore, the intrastate carriers served city pairs within their respective states that were also served by CAB-regulated airlines.[4] As a result, within three large states (California, Florida and Texas) there existed two distinct groups of airlines sharing important operating characteristics but each regulated by a different regulatory commission. Thus, a regulatory duopoly existed within those states in constrast to the regulatory monopolies that existed in the remainder of the United States and in Canada. Therefore, if similar regulatory environments yield important performance similarities, it follows that not only should the performance of the federally-regulated airlines in Canada and the United States have much in common, but there should be significant differences between the performance of these carriers operating under regulatory monopolies and that of the intrastate carriers operating under regulatory duopolies. This report presents evidence to test this double hypothesis and, indeed, the evidence proves to be consistent with the reasoning in both respects -- the performance of the federally-regulated airlines in Canada and the United States

though 1978 were similar, and their similar performance differed appreciably from that of the U.S. intrastate carriers.

Rivalry

One important result of state regulation was that it allowed new airlines to enter the U.S. industry. Furthermore, the state commissions did not prevent the new intrastate carriers from introducing lower fares in order to compete more effectively with the established CAB-regulated airlines. As a result, the intense rivalry that developed within the regulatory duopolies between the intrastate carriers and the CAB-regulated airlines could be expressed through a full range of activities encompassing both lower fares and differentiations in service.

In contrast, federal regulation in Canada and in U.S. interstate air transportation essentially prohibited the entry of new airlines operating large aircraft and rarely allowed general fares to deviate from commission-approved fare formulas. Therefore, the existing carriers did not have to worry about the potential competition of new airlines and, wherever two or more federally-regulated airlines served the same city pair, rivalry for larger traffic shares was restricted primarily to improving the quality of service. Not surprisingly, this resulted in the existing federally-regulated airlines providing levels of service that were generally superior to those of the intrastate carriers. For example, in-flight meals and entertainment have been common features of federally-regulated airline service, but were never offered by the short-haul intrastate carriers; and the federally-regulated airlines consistently installed fewer seats in identical aircraft types while operating these aircraft at lower load factors than the intrastate carriers, thereby providing each passenger with more space and legroom.[5] Differences in service quality did not extend to safety, however. The safety records of

the U.S. intrastate carriers have been fully comparable to those of the CAB-regulated airlines, with both groups being subject to the operating and safety regulation of the Federal Aviation Administration.[6]

Data Coverage

Time constraints limit this study to a comparison of the performance of Canadian airlines operating large turbine-powered aircraft with the performance of selected U.S. airlines operating the same aircraft types. The federally-regulated airlines to be studied consist of the two Canadian mainline carriers (Air Canada and CP Air), the five Canadian regional carriers (Eastern Provincial, Nordair, Pacific Western, Quebecair and Transair), three U.S. trunk carriers (Delta, Northwest and Trans World), and four U.S. local service carriers (Allegheny, Frontier, North Central and Southern). All the U.S. carriers, except Delta and Southern, were selected because their system-wide geographic operating areas were the most similar to those of the Canadian carriers.[7] Delta and Southern, in contrast, were selected because their operating areas were largely in the southern United States and both were headquartered in Atlanta, Georgia. Thus, if adverse weather has a significant impact on operations, their performance should be superior to that of the Canadian and more northern U.S. carriers. These 14 airlines operating under regulatory monopolies are compared with the four major intrastate carriers -- Air California and PSA in California, Air Florida located in Florida and Southwest in Texas -- all operating under state regulation in competition with CAB-regulated airlines.

This study emphasizes the four-year period from 1975 through 1978. Four years were analyzed in order to avoid possible anomalies occurring in a single year. The study ends with 1978 because the major changes in U.S. airline regulation resulting from the passage of the ADA make it inappropriate to use

data for later years. First of all, the ADA preempted state regulation and made the former intrastate carriers subject to CAB regulation, thereby eliminating the regulatory duopolies in California, Florida and Texas.[8] Second, the ADA changed federal policies and CAB procedures to facilitate the entry of new carriers into the industry and to increase the ease with which certificated carriers could enter new or leave existing routes or city pairs. One result has been the expansion of the former intrastate carriers beyond the boundaries of their individual states. Third, carriers were allowed fare flexibility within a range extending from 50 percent below to five percent above a standard industry fare level specified by the CAB. Fourth, the CAB's powers over entry/exit, routes, fares and antitrust matters were scheduled to be phased out starting on December 31, 1981, with the Board itself being abolished on January 1, 1985.[9] Obviously, with the elimination of the regulatory duopoly and the reduction in CAB powers relative to those of the CTC(A), the U.S. regulatory environment following 1978 was no longer consistent with the methodology used in this study.

Relevance of U.S. Deregulation

Assuming the phased provisions of the ADA are fully implemented, the transition period in U.S. airline regulation which began in 1979 will, over time, provide evidence on the many adjustments required to move from regulation to deregulation. When evaluating the transitional effects of U.S. deregulation, however, it will be necessary to consider the effects of other occurrences not related to airline deregulation. For example, in February 1979, four months following the passage of the ADA, turbine fuel prices were decontrolled and, two years later, crude oil prices were also decontrolled.[10] The resulting large increases in turbine fuel prices resulted in increased operating costs and fares for U.S. airlines that were not related to the deregulation of the

industry and are just beginning to be experienced by Canadian carriers as of late 1981.

The U.S. experience will also eventually provide direct evidence regarding industry structure and performance under deregulation. That evidence will not be forthcoming for a number of years, however, since, unlike changes in laws and regulations, adjustments in the marketplace do not occur with the stroke of a pen. It will take a great deal of experimentation over a period of years for existing airlines to determine their optimal route structures, fares and service qualities. Even more time will be required for new airlines to be organized, begin operations and discover their optimal route, fare and service patterns. Given that the CAB will not disappear until 1985, the use of current U.S. airline performance to evaluate the long-term effects of deregulation should be postponed at least until then, and full adjustments to deregulation will probably not occur until several years thereafter. Meanwhile, the performance of the U.S. intrastate carriers in the regulatory duopolies that existed through 1978 provide the best available evidence regarding the eventual effects of deregulation.

Objectives

The objectives of this report, and the companion report published by Consumer and Corporate Affairs Canada,[11] are to:

1. investigate and measure the effects of economic regulation on airline performance;

2. propose a hypothesis explaining why fares and operating costs differ so greatly among airlines; and

3. predict how Canadian airlines would perform if deregulation were adopted in Canada.

This information should assist policy makers in evaluating whether or not existing regulatory policies and practices have resulted in desired levels

of performance being achieved by Canadian airlines. Should their performance be judged deficient in important respects, this report also provides a basis for evaluating deregulation as a policy alternative. Airline managers, employees, labour leaders, suppliers, investors and other participants in the industry should also find this report useful in identifying the role of regulation in the industry and for planning optimal responses to any moves toward deregulation.

Regardless of whether or not deregulation is adopted in Canada, the fact is that it has been implemented in the United States and, as outlined in the concluding chapter, Canadian airlines will be affected to varying degrees by this new U.S. policy. Therefore, this report should be useful to interested readers in both the public and private sectors who are concerned with future Canadian airline operations and performance in an overall environment which will differ appreciably from that which existed through 1978.

Footnotes

1. Transport Act, S.C. 1938, c. 53, parts I-II. Aeronautics Act, S.C. 1944-45, c. 29; now, as amended, R.S.C. 1970, c. A-3. National Transportation Act, S.C. 1966-67, c. 69; now, as amended, R.S.C. 1970, c. N-17. Open entry into charter operations using small aircraft was permitted between 1958 and 1963, while open entry into specialty services was allowed between 1958 and 1964, and again, for most categories, from 1969 to the present. Also, the regulation of services provided with helicopters was relaxed somewhat in 1973 with additional reductions implemented on January 1, 1980. Transport Canada, Economic Regulation and Competition in the Domestic Air Carrier Industry (Ottawa: Inter-departmental Committee on Competition and Regulation in Transportation, February 1981), pp. 85-95 and 100-104.

2. CAB, Handbook of Airline Statistics (1973 ed.; Washington, D.C., 1974), pp. 510, 515 and 530. Also, W. A. Jordan, Airline Regulation in America: Effects and Imperfections (Baltimore: The Johns Hopkins Press, 1970), pp. 2-4.

3. Airline Deregulation Act of 1978, Public Law No. 95-504, 92 Stat. 1705. For a detailed comparison of the powers and procedures of the CTC(A) and the CAB from 1938 to 1978, see W. A. Jordan, "Comparisons of American and Canadian Airline Regulation," in G. B. Reschenthaler and B. Roberts, eds., Perspectives on Canadian Airline Regulation (Montreal: Institute for Research on Public Policy, 1979), pp. 17-31. The CTC(A)'s power over service quality (such as schedules) was greater than that of the CAB, and there were differences in the procedures used by the two commissions, with those of the CAB being more formal, lengthy and open.

4. W. A. Jordan, "Airline Performance Under Regulation: Canada vs. the United States," in R. O. Zerbe, Jrs., ed., Research in Law and Economics, Vol. 1 (Greenwich, Conn.: JAI Press, Inc., 1979), pp. 54-56. These common operating characteristics were not shared with the commuter and air taxi carriers which generally operated small aircraft in city pairs that were not served by airlines operating large aircraft.

5. Ibid., pp. 54-58. Also, Jordan, supra note 2, pp. 197-210.

6. W. A. Jordan, "Results of Civil Aeronautics Board Regulation," in U. S. Senate, Civil Aeronautics Board Practices and Procedures, Report of the Subcommittee on Administrative Practice and Procedure of the Committee on the Judiciary of the United States Senate (1975), Vol. 1, pp. 464-87, esp. pp. 482-83.

7. Air Canada and Trans World both have major transcontinental routes with additional routes extending down to the South and Southwest United States. In addition, their international routes are predominantly transatlantic. CP Air and Northwest have roughly parallel transcontinental routes extending on to Hawaii, with major transpacific international routes. Northwest also serves the U.S. South and Southwest while CP Air operates to California, Mexico and South America. Allegheny, Frontier and North Central all had the majority of their routes in northern areas, including Canada. See Airline Tariff Publishing Co., Book of Official C.A.B. Airline Maps and Airport-to-Airport Mileages, (26th ed.; Washington, D.C., December 31, 1976). The merger of North Central and Southern to form Republic Airlines was effective July 1, 1979 (CAB Order No. 79-6-7/8). Finally, even though Pacific Western purchased the majority of Transair's stock in 1978, the formal merger of these two airlines did not occur until December 1, 1979 [Statistics Canada, Air Carrier Operations in Canada, (October-December 1979), p. 10].

8. The California Public Utilities Commission (PUC) contested the termination of its authority over airlines, and several airlines sued to enjoin the PUC from attempting to regulate airline operations in California. On March 9, 1979, the U.S. District Court, Northern District of California, ruled in favour of the airlines and enjoined the PUC from enforcing state regulatory laws over the airlines [Hughes Air Corp., dba Hughes Airwest, et. al. v. The Public Utilities Commission of the State of California, Civil Action No. C-78-2880-SW (March 9, 1979)].

9. ADA, supra note 3, sections 401, 1002 and 1601.

10. PSA, Annual Report (1979), p. 7; and SEC Form 10-K (December 31, 1980), p. 3.

11. W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982).

2. Fares

Canadian Mainline and U.S. Trunk carriers

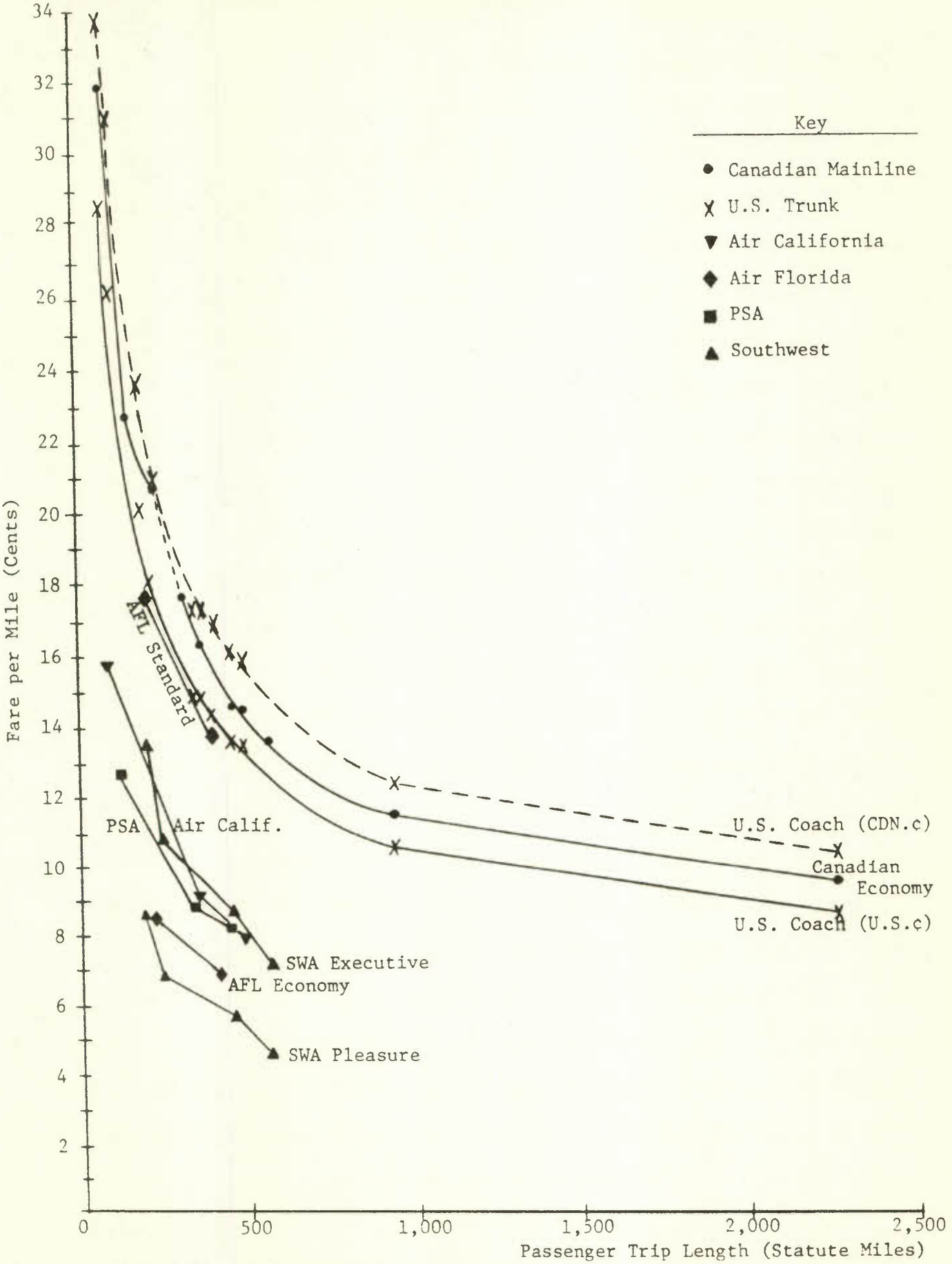
The economy fares of the Canadian mainline carriers have been very similar to the equivalent coach fares of the U.S. trunk carriers during the past fifteen or more years. The regulated airlines of both countries have adopted distance-related fare formulas which have produced fares per mile that were almost the same.[1] This is demonstrated in Figure 2-1 which depicts the fares per mile in effect on December 31, 1978. Similar information for 1966, 1971 and 1975 is shown in Figure 2-2.

The fares per mile in Figures 2-1 and 2-2 are shown in the currency of each carrier's country; that is, Canadian fares per mile are in Canadian cents while U.S. fares per mile are expressed in U.S. cents. To provide some perspective regarding the maximum possible effect of exchange rates, the U.S. trunk carriers' fares per mile in Figure 2-1 were converted into Canadian cents using the average exchange rate in effect during December 1978.[2] These adjusted fares per mile appear as the broken line lying above the Canadian fares per mile. However, since we are comparing domestic prices for domestic goods in each of the two countries, rather than domestic prices for imported goods, it follows that making the full exchange rate adjustment would be inappropriate.[3] Therefore, given that some intermediate position probably depicts the true effects of exchange rate differences, it is clear that the fares per mile of the regulated Canadian mainline carriers were remarkably close to those of the regulated U.S. trunk carriers, both in terms of fare level (the heights of the curves) and fare structure (the steep taper showing lower fares per mile as distance increases). This, of course, is consistent with the underlying hypothesis of this study.

The hypothesis also implies that the fares of the federally-regulated airlines should differ appreciably from those of the U.S. intrastate carriers

Figure 2-1

Fares per Mile
Canadian Mainline, U.S. Trunk and U.S. Intrastate Carriers
December 31, 1978

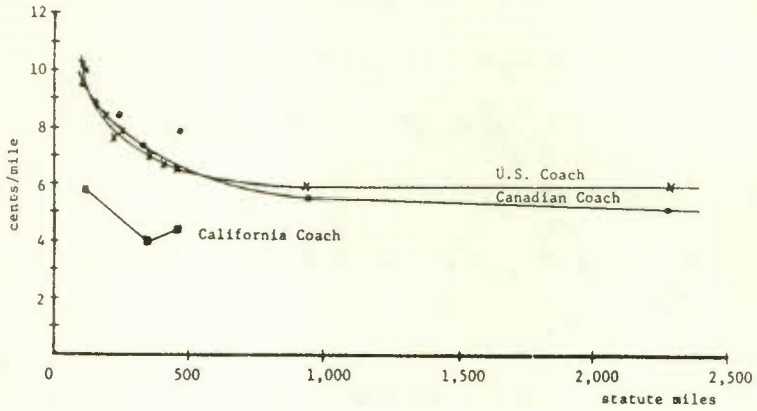


Source: Table 2-1 and footnote 5.

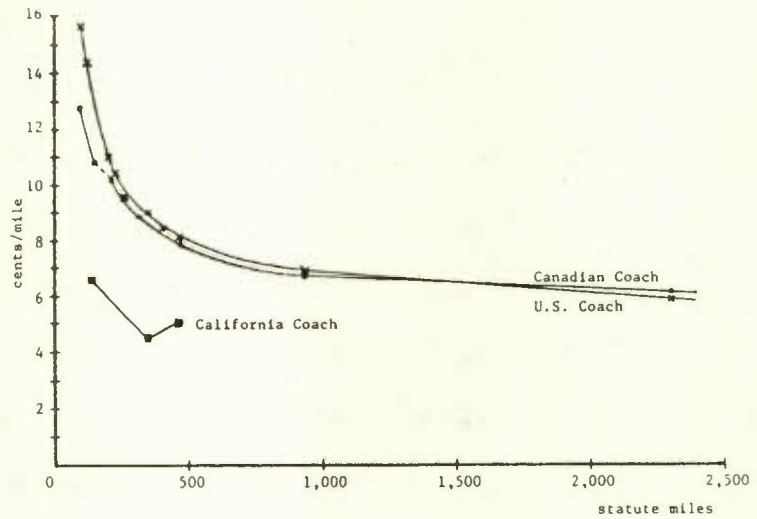
Figure 2-2

Fares per Mile
Canadian Mainline, U.S. Trunk and U.S. Intrastate Carriers
July 1, 1966, January 1, 1971 and July 1, 1975

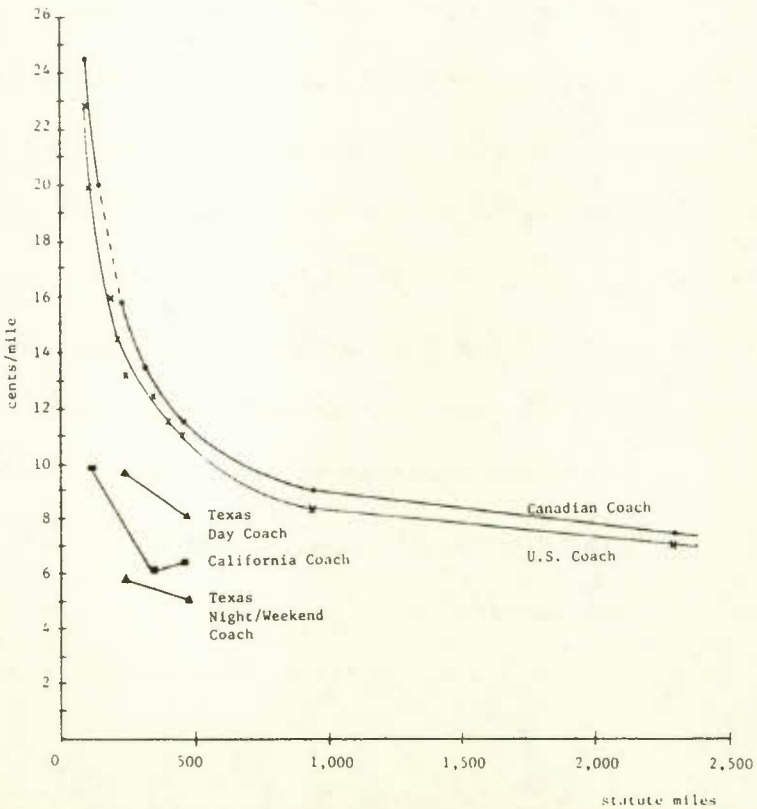
A. July 1, 1966



B. January 1, 1971



C. July 1, 1975



Source:

W. A. Jordan, "Airline Performance Under Regulation: Canada vs. the United States," in R. O. Zerbe., Ed., Research in Law and Economics (1979), pp. 47-48.

operating in a regulatory duopoly. Figures 2-1 and 2-2 show that this was indeed the case. The fares per mile of the California/Florida/Texas intrastate carriers appear in the lower lefthand corners of these figures. With the exception of Air Florida's standard coach fares as of December 31, 1978 (which were only slightly lower than the U.S. coach fares),[4] all these fares per mile were appreciably lower than the CAB-regulated fares per mile which, in turn, approximated the regulated fares per mile of the Canadian mainline carriers.

The differences between the federally regulated U.S. and Canadian fares per mile, on the one hand, and the intrastate fares, on the other, are summarized in Table 2-1.[5] The next to last column on the right side of this table shows that the U.S. trunk carriers' fares per mile were generally 43.5 to 106.7 percent higher than the fares per mile available on the regular weekday flights of the intrastate carriers. In terms of the night and weekend flights for Southwest and the capacity-controlled flights for Air Florida,[6] the differences ranged from 106.8 to 179.6 percent. In other words, the U.S. trunk carriers' coach fares were consistently more than twice as high as the off-peak fares of these two intrastate carriers, and were generally around two-thirds higher than comparable peak intrastate fares.[7]

Similar percentages are given for the Canadian mainline carriers in the far righthand column of Table 2-1. They show that Canadian economy fares per mile ranged from 68.5 to 150.5 percent above the regular weekday fares per mile of Air California, PSA and Southwest, and 114.2 to 200.6 percent higher than the off-peak fares of Air Florida and Southwest. Of course, these percentages are increased somewhat by comparing intrastate fares per mile in U.S. cents with Canadian fares per mile expressed in Canadian cents. Given the earlier conclusion that U.S. trunk and Canadian mainline fares per mile are very similar after allowing for the true effects of exchange rates, it

Table 2-1

Extent to Which the Fares per Mile of Federally-Regulated Airlines Exceeded the Fares per Mile of Intrastate Carriers Selected City Pairs, December 31, 1978[a]

State & City Pairs[b]		Mileage[c]		Fares per Mile[d]			Federally Reg. % Greater than Intrastate	
					Federally Reg.			
U.S.	Canada	U.S.	Can.	Intrastate	U.S.	Canada	U.S.	Canada
California								
SMF-SJC	YUL-YOW	94	94	15.76¢	28.56¢	31.91¢[e]	81.2%	103.5%
LAX-SAN	YUL-YOW	109	94	12.74	26.33	31.91[e]	106.7	150.5
LAX-SFO	YUL-YYZ	337	315	8.79	14.84	17.78[f]	68.8	102.3
SNA-SFO	YQM-YQB	368	369	9.06	14.83	16.26	63.7	79.5
SAN-SFO	YYZ-YQB	447	454	8.29	13.67	14.76	64.9	78.0
SAN-SMF	YUL-YZV	480	478	7.91	13.50	14.44	70.7	82.6
Florida								
MIA-TPA	YYZ-YOW	204	226					
Standard				17.70	18.61	20.80	5.1	17.5
Economy[g]				8.62	18.61	20.80	115.9	141.3
MIA-TLH	YYZ-YQB	403	454					
Standard				13.79	14.25	14.76	3.3	7.0
Economy[g]				6.89	14.25	14.76	106.8	114.2
Texas								
HOU-SAT	YUL-YQB	192	145					
Executive[h]				13.51	19.39[j]	22.76	43.5	68.5
Pleasure[i]				8.68	19.39[j]	22.76	123.4	162.2
DAL-HOU	YYZ-YOW	241	226					
Executive[h]				10.76	17.77[k]	20.80	65.1	93.3
Pleasure[i]				6.92	17.77[k]	20.80	156.8	200.6
DAL-HRL	YYZ-YQB	458	454					
Executive[h]				8.69	13.45[l]	14.76	54.8	69.9
Pleasure[i]				5.66	13.45[l]	14.76	137.6	160.8
DAL-ELP	YYZ-YQT	563	565					
Executive[h]				7.07	12.89[m]	13.45	82.3	90.2
Pleasure[i]				4.61	12.89[m]	13.45	179.6	191.8

[a]January 8, 1979 for U.S. trunk fares. On October 27, 1978, the CAB authorized a 3.2% fare increase. Most carriers implemented a 2.5% increase on November 10, 1978 and the remaining 0.7% increase on January 8, 1979.

[b]The following is a list of the city codes used in this table:

Canadian:	YOW	Ottawa	YQM	Moncton	YUL	Montreal
	YQB	Quebec City	YQT	Thunder Bay	YYZ	Toronto
					YZV	Sept-Iles
U.S.:	BRO	Brownsville	HOU	Houston-Hobby	SAT	San Antonio
	DAL	Dallas-Love Field	IAH	Houston-Int'l.	SFO	San Francisco
	DFW	Dallas/Ft. Worth	LAX	Los Angeles	SJC	San Jose
	ELP	El Paso	MIA	Miami	SMF	Sacramento
	HRL	Harlingen	SAN	San Diego	TLH	Tallahassee
					TPA	Tampa

[c]Statute miles, nonstop airport-to-airport distances where available.

[d] In Canadian and U.S. cents, for the respective countries.

[e] Lower than the formula fare level.

[f] Higher than the formula fare level.

[g] Capacity controlled. Prior to December 14, 1978, this fare category applied to all night and weekend flights.

[h] In effect on all flights scheduled to depart during weekdays from 6:30 a.m. to 6:59 p.m.

[i] In effect on all flights scheduled to depart during weekdays from 7:00 p.m. to 6:29 a.m. and any time on Saturdays and Sundays.

[j] IAH-SAT (191 miles) for U.S. trunk carriers.

[k] DFW-IAH (224 miles) for U.S. trunk carriers.

[l] DFW-BRO (482 miles) for U.S. trunk carriers. BRO and HRL are common fared by the CAB-regulated airlines. Based on the DFW-HRL distance of 461 miles, this fare per mile would be 14.06¢.

[m] DFW-ELP (553 miles) for U.S. trunk carriers.

Sources: Airline Tariff Publishing Co., Local Passenger Fares Tariff No. PF-17, C.A.B. No. 259, 34th revised p. 14 (effective Dec. 14, 1978).
___, Passenger Mileage Manual, 18th ed. (Jan. 27, 1979).
CAB, Press Release 78-210 (Oct. 27, 1978), and PS-80 (Aug. 25, 1978).
California Public Utilities Commission, Decision 89149 (July 25, 1979).
CTC(A), Decision 5101 (Feb. 24, 1977).
Glasspoole, G. C., Pricing Director, Air Canada, Letter to the Secretary, Air Transport Committee (Jan. 27, 1978).
Southwest Airlines, Annual Report (1977), p. 12.

seems proper to conclude that the Canadian mainline fares per mile are about 50 to 100 percent higher than the intrastate carriers regular coach fares per mile and from 100 to 180 percent higher than their off-peak fares which were available on all night and weekend flights operated by Air Florida (until December 14, 1978) and by Southwest. The order of magnitude of the fare differences is so large that any reasonable exchange rate adjustment has no appreciable effect on the basic conclusion that Canadian mainline fares per mile were substantially higher than those of the U.S. intrastate carriers.

Canadian Regional and U.S. Local Service Carriers

In 1974, Phase 9 of the CAB's Domestic Passenger-Fare Investigation allowed local service carriers to file coach fares up to 30 percent higher than the trunk coach fares calculated from the currently approved fare formula, and this policy was reaffirmed in 1978.[8] The result has been that fares for many city pairs served only by local service carriers have been as much as 30 percent higher than they would have been had trunk service been available.[9] Thus, the percentage differences between CAB-regulated fares per mile and those available from intrastate carriers can be even greater than indicated in Table 2-1.

An example of these greater differences is the 270-mile, Dallas-Beaumont/Port Arthur city pair where Texas International provided the only CAB-regulated service. As of March 1, 1979, this local service carrier scheduled 20 DC-9 flights per week in that city pair (half nonstop and half one-stop) at a standard class fare of $57.41, 30 percent above the CAB formula fare. Southwest Airlines inaugurated service in that city pair on March 5, 1979, at an executive class fare of $25.93 and operated 38 weekly nonstop round trips.[10] Thus, Texas International's standard class fare was 121.4 percent higher than Southwest's highest fare, rather than the 71.4 percent difference that would have existed had a trunk carrier provided service at the formula fare of $44.44.

The five Canadian regional carriers have generally matched the fares of Air Canada and CP Air in those city pairs where they provide rival service, while adopting different fares in their monopoly city pairs. A common policy among these carriers has been to charge higher fares per mile in city pairs lying on their northern routes relative to the fares per mile for city pairs on their southern (predominantly east-west) routes. In their submissions to the Air Transport Committee for the fare increase authorized in April 1979

[CTC(A) Decision 5903 (August 16, 1979)] the regional carriers presented their formulas for calculating their new (and sometimes their old) fares. These formulas are summarized in Table 2-2 and they demonstrate the differences that exist between northern and southern fares.

Nordair had the most explicit fare formulas and, importantly, its "old formula" applied to the fares in effect as of December 31, 1978. Therefore, it has been selected for more detailed study. Several facts emerge from such a study. First, it turns out that Nordair's fare calculations are often based on mileages computed as actually flown via intermediate stops rather than on nonstop mileages as is generally the case for Canadian mainline and U.S. trunk carriers. Second, some of the mileages used appear to be erroneous. For example, Nordair specifies 340 miles for Montreal-Toronto and 434 miles for Great Whale-Val D'Or (in both of which it provides nonstop services) even though the nonstop distances are reported to be 315 and 500 miles, respectively.[11] Third, even using its own mileages, Nordair's formulas yield fares both higher and lower than the fares actually adopted. In many cases, Nordair is quite correct when it says that it "has developed fare formula towards which individual fares have been adjusted" (emphasis added).[12]

Nordair's fares per mile have been plotted on Figure 2-3 together with the line depicting fares per mile derived from the formula for the Canadian mainline carriers. Using Nordair's own mileages, it can be seen that the fares per mile for its Southern routes generally do lie relatively close to those for the transcontinental routes of the Canadian mainline carriers. However, if Norair's fares were divided by nonstop mileages (to correspond with the mainline carriers' practice) the fares per mile would be increased by up to 25 percent, with most increases being between one and nine percent. Thus, the majority of the fares per mile would lie on or somewhat above the mainline carrier line.

Table 2-2

Fare Formulas of the Regional Carriers
Before and After April 9, 1979

Carrier and Routes	Old Formula	New Formula
Eastern Provincial		
Southern	$29.50 + 8.25¢/mi.	$31.00 + 8.66¢/mi.[a]
Labrador	n.s.	1.50 + 0.41 " over old fares
Nordair[b]		
Southern	$20.00 + 9.8¢/mi	$21.00 + 10.3¢/mi.
Northern	42.00 + 12.4 "	44.50 + 13.1 "
Transborder	34.00 + 9.8 "	35.70 + 10.3 "
Pacific Western[c]		
Mainline	n.s.	$28.00 0 - 100 miles
		28.50 + 15¢/mi. 101 - 200 "
		43.50 + 14 " 201 - 300 "
		57.50 + 12.5" 301 & over "
Sub-Contracts	n.s.	$28.00 1 - 87 miles
		32¢/mi. 88 - 100 "
		32.00 + 17.9" 100 & over "
Quebecair[d]		
Southern	n.s.	$26.25 + 11.85¢/mi
Northern[e]	n.s.	29.50 + 13.10 "
Transair	n.s.	n.s.

n.s. -- not specified in the material available to this writer.

[a]A ceiling of five percent was imposed to reduce the effect of the formula on short stage lengths.

[b]Individual fares adjusted towards these formulas.

[c]"All fares over Vancouver are calculated on the above mileage formula plus a $10.00 transfer fee at Vancouver except Seattle $8.00 transfer fee." New Calgary-Edmonton Airbus fare of $26.85 (15.7¢/mi.) not calculated on the new formula.

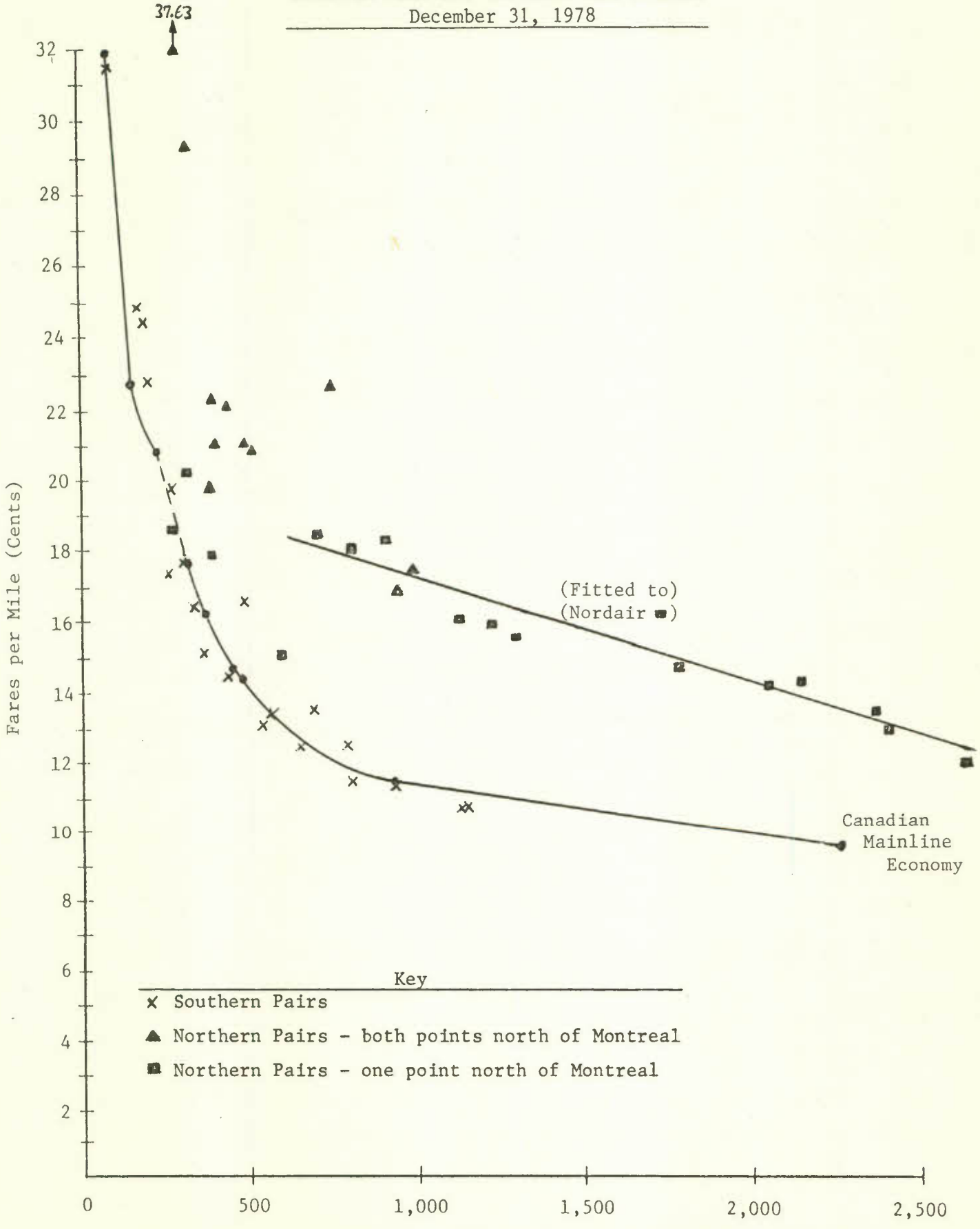
[d]"No particular sector fare should be increased by more than 10% excluding the rounding up or down to the next higher or lower dollar.... Minor adjustments in the order of one dollar were necessary on a few sectors so as to obtain reasonable fares consistent with our objectives."

[e]Includes Gaspe and Magdalen Islands.

Sources: Eastern Provincial, CTC(A) Exhibit 6E (Feb. 15, 1979).
Nordair, CTC(A) Exhibit 1N (Nov. 13, 1978).
Pacific Western, CTC(A) Exhibit 1P (Nov. 7, 1978).
Quebecair, CTC(A) Exhibit 1Q (n.d.)
Official Airline Guide (May 1, 1979).

Figure 2-3

Fares per Mile
Canadian Mainline Carriers and Nordair
December 31, 1978



Sources: Table 2-1
Nordair, CTC(A) Exhibit 1N (Nov. 13, 1978).

Figure 2-3 also shows that as of December 31, 1978, most of the fares per mile for the northern pairs of points were appreciably higher than those for the southern city pairs. Actually, the northern pairs can be grouped into two categories -- one where both points are located north of Montreal, and the second where only one point is north of Montreal while the other is a large city located in the south (Montreal, Quebec City, Ottawa or Hamilton). With two exceptions (Fort Chimo-Val D'Or and Frobisher Bay-Resolute), the fares per mile of the first group were much higher than those of the second. Indeed, two of the pairs of points located entirely in the north had exceptionally high fares per mile for their distances (Chibougamau-La Grande at 37.63¢ per mile for 295 miles and Asbestos-Fort Chimo at 29.28¢ per mile for 321 miles). The remainder of these pairs were clustered between 19.7 and 23 cents per mile for 394 to 754 miles.[13] The fares per mile for this entire group of pairs ranged from 25 to 105 percent above Canadian mainline fares per mile.

There were also a few exceptions among the second group of pairs of points which included a large city in the south. These were four pairs clustered around Montreal (Montreal-Val D'Or/Chibougamau/Matagami/LaGrande) whose fares per mile were equal to or only slightly higher than those of the southern city pairs. If these four are excluded, the remaining pairs of points all lie along a downward sloping straight line (fitted visually) lying about 40 to 50 percent above the Canadian mainline carrier line.

It can be concluded that in late 1978 and early 1979 Nordair's fares per mile for the southern city pairs (plus the four pairs clustered around Montreal) were slightly above those of the Canadian mainline carriers, while its fares per mile for the northern pairs of points were at least 25 percent above mainline fares per mile and were generally more than 40 percent higher. To the extent that Nordair represents the remaining regional carriers (as indicated in Table 2-2), it follows that these carriers and the U.S. local service carriers share

the common characteristic of having higher fares per mile than the larger mainline and trunk carriers for many of their low-density pairs of points.

Transborder Services

Four Canadian carriers (Air Canada, CP Air, Nordair and Pacific Western) operate scheduled transborder services between Canada and the United States. At the end of 1978, nonstop service was provided between eleven Canadian cities and eleven U.S. cities, with a twelfth U.S. city, Houston, being served one-stop via Dallas.[14] The resulting 25 city pairs are listed in Table 2-3 with their fares and fares per mile as of December 31, 1978. In addition, the equivalent domestic fares derived from the mainline carriers' then current domestic fare formula are given together with the percentage relationship between the transborder and domestic fares. The transborder and domestic fares per mile are also drawn in Figure 2-4.

It can be seen from Table 2-3 and Figure 2-4 that, in most cases, the transborder fares per mile were close to those derived from the domestic fare formula (with all fares expressed in Canadian dollars). In only five out of the 25 city pairs were there large differences. Hamilton-Pittsburgh (Nordair) was 42.5 percent above the fare for an equivalent domestic city pair; Seattle-Vancouver (Pacific Western) was 16.7 percent below the domestic norm; and Chicago-Montreal, Houston-Toronto and Calgary-Chicago (Air Canada) were all 11 percent above the domestic formula level. The other 20 fares, however, ranged from just 4.2 percent below to 6.3 percent above the domestic formula fares. This close conformance between transborder and Canadian domestic fares is, of course, consistent with the similarity between the fares in the two countries derived from the domestic formulas used by the larger federally-regulated airlines.

Table 2-3

Transborder Fares Per Mile
Air Canada, CP Air, Nordair and Pacific Western
December 31, 1978

City Pair[a]	Mileage[b]	Domestic Formula Fare[c]	Transborder Economy		
			Fare	Fare per Mile	Percent of Formula Fare
Seattle-Victoria[d]	98	$ 30[g]	$ 29	29.59¢	96.7%
Cleveland-London	117	34[h]	34	29.06	100.0
Seattle-Vancouver[d]	126	36[i]	30	23.81	83.3
Hamilton-Pittsburgh[e]	185	40[j]	57	30.82	142.5
Cleveland-Toronto	193	43[k]	44	22.80	102.3
Boston-Yarmouth	268	52	53	19.78	101.9
Boston-St. John	326	56	59	18.10	105.4
Montreal-New York	342	58	57	16.67	98.3
New York-Toronto	372	60	62	16.67	103.3
Boston-Halifax	412	63	67	16.26	106.3
Chicago-Toronto	435	65	66	15.17	101.5
Boston-Toronto	445	66	69	15.51	104.5
Chicago-Montreal	745	91	101	13.56	111.0
San Francisco-Vancouver[f]	800	96	95	11.88	99.0
Calgary-San Francisco	1,019	114	110	10.79	96.5
Los Angeles-Vancouver[f]	1,081	119	114	10.55	95.8
Tampa-Toronto	1,097	120	122	11.12	101.7
Dallas-Toronto	1,198	128	135	11.27	105.5
Miami-Toronto	1,236	131	135	10.92	103.1
Houston-Toronto	1,281	135	150	11.71	111.1
Montreal-Tampa	1,300	137	133	10.23	97.1
New York-Winnipeg	1,306	137	142	10.87	103.6
Calgary-Chicago	1,382	144	160	11.58	111.1
Miami-Montreal	1,406	145	143	10.17	98.6
Los Angeles-Toronto	2,170	209	207	9.54	99.0

[a] Served by Air Canada, unless otherwise specified.

[b] Statute miles, nonstop airport-to-airport distances.

[c] $29.50 start up charge plus 8.25¢ per mile, unless otherwise noted.

[d] Served by Pacific Western.

[e] " " Nordair.

[f] " " CP Air.

[g]Based on the adjusted fare for Montreal-Ottawa (94 miles).

[h] " " " " " " Halifax-Moncton (119 miles).

[i] " " " " " " Fredericton-Moncton (129 miles).

[j] " " " " " " Gander-Stephenville (184 miles).

[k] " " " " " " Toronto-Windsor (194 miles).

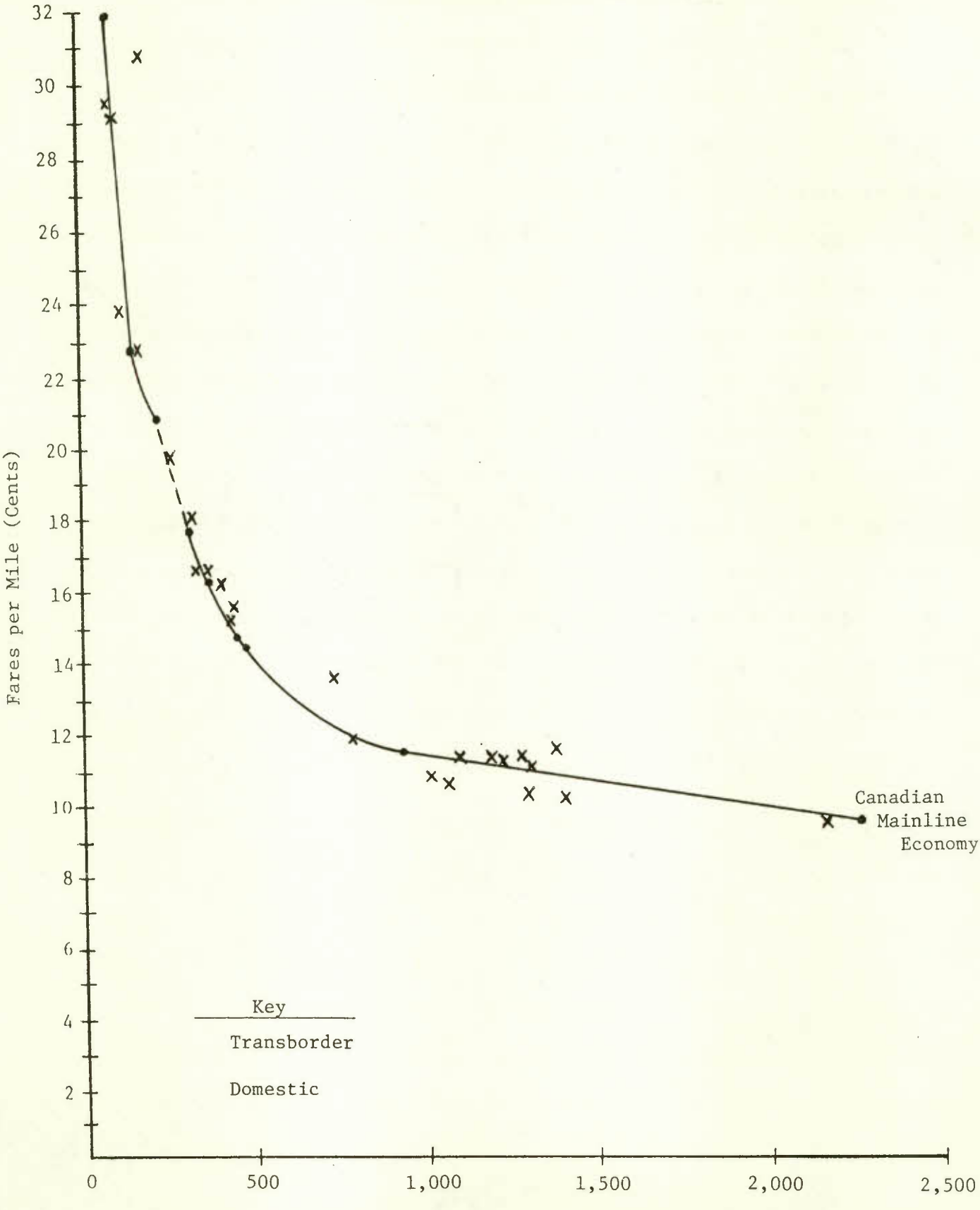
Sources: Air Canada, "Domestic Fare Proposal for Effect January 1, 1979," submitted to the Secretary, Air Transport Committee (Nov. 15, 1978), Table 2-4.
Airline Tariff Publishing Co., C.T.C.(A) Tariff No. 139, 25th revised p. 78-C and 12th revised p. 78-F (Effective Dec. 7, 1978); 18th revised p. 113 (Effective Oct. 29, 1978); and 36th revised p. 136 (Effective Dec. 1, 1978).
CTC(Research), "Great Circle Distances in Miles," for Air Canada, CP Air, Nordair and Pacific Western, computer printout (n.d.) based on latitudes and longitudes of airport control towers.
Official Airline Guide (January 1, 1979).

Summary

Three facts are clear from the above comparisons. First, through 1978 North American fares were very similar for airline services operated between medium and larger cities, whether the service was operated within each country or between the two countries. Second, in both countries the smaller, federally-regulated airlines tended to charge higher fares for low-density pairs where they provided the only service. The U.S. local service carriers' fares were allowed to be as much as 30 percent higher than the trunk carriers' fares for the same distances, while (based on Nordair's fares) the Canadian regional carriers' northern fares were generally 40 percent or more higher than the formula fares of the mainline carriers. Thus, there were also similarities in the fares of these smaller federally-regulated airlines. Third, the intrastate carriers operating in California, Florida and Texas consistently had very much lower fares than the coach/economy fares of the federally-regulated airlines. The domestic formula fares of the mainline and trunk carriers in Canada and

Figure 2-4

Fares per Mile
Canadian Domestic and Transborder City Pairs
December 31, 1978



Sources: Tables 2-1 and 2-3.

the United States were 50 to 100 percent higher than the peak fares of the intrastate carriers, while they were 100 to 180 percent higher than the off-peak (but widely available) fares of the intrastate carriers.

These three facts demonstrate that, with respect to fares, similar performance characterized the Canadian and U.S. airlines operating under the regulatory monopolies of their respective countries, while important differences existed between these federally-regulated airlines and the U.S. intrastate carriers operating under regulatory duopolies. Not only is this initial evidence consistent with the hypothesis that similar types of regulation have similar affects on performance, but it implies that if low fares are a desired policy objective, one way to achieve that objective is to eliminate economic regulatory barriers to entry and to allow competition among all carriers on the basis of price as well as service. The performance of the U.S. intrastate carriers indicate that such an environment would result in substantially lower fares, but one should remember that somewhat lower service quality is also indicated by this evidence. With regards to price/service tradeoffs, however, the fact is that whenever consumers have been given a choice between high fares/high service quality and low fares/somewhat lower service quality, the majority have invariably chosen the latter combination.[15]

Footnotes

1. The fare formulas for both countries are comprised of a lump-sum start up/terminal charge plus one or more mileage charges based on nonstop great-circle mileages. For example, effective April 1, 1978 (and extending through December 31, 1978), the CTC(A) formulas for the Canadian mainline carriers was: $29.50 plus 8.25¢ per mile. First-class fares were 160 percent of economy fares. The CAB formula for U.S. trunk carriers, authorized October 27, 1978, was: $17.92 plus 9.80¢ per mile for the first 500 miles, 7.48¢ per mile for the next 1,000 miles, and 7.19¢ per mile for distances over 1,500 miles. First-class fares were 120 or 130 percent of coach fares. Some carriers did not implement the fares based on this formula until January 8, 1979, but the increase from the previous formula was only 0.7 percent. Two exceptions to the Canadian formula were authorized by the CTC(A). First, in response to a request by the Minister of Transport in 1975, the fares for short-haul city pairs involving distances of under 250 miles were held below the formula, thereby reducing the impact of the high start up charge. This adjustment is indicated in the Figures by the broken line connecting the two solid lines for Canadian fares per mile. Second, an extra $1.00 was added to the one-way formula fare for Montreal-Toronto, the largest city pair in Canada. W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix A-1 and p. 6n.

2. In December 1978, an average of $1.179 Canadian was required to buy one U.S. dollar. Finance Canada, Economic Review (April 1979), p.217.

3. For an analysis of why it is inappropriate to apply the full exchange rate when comparing domestic prices for domestic goods between two countries, see Jordan, supra note 1, Appendix B.

4. Active regulation of Air Florida by the CAB began around December 1, 1978, and its first CAB tariff was effective December 14, 1978. The new CAB-authorized standard coach fares were about 11 percent higher than Air Florida's previous coach fares filed with the Florida Public Service Commission. Capacity controlled economy fares, in contrast, were either unchanged (Miami-Tallahassee) or were decreased by five percent (Miami-Tampa) in the first CAB fare filing. Air Florida, Florida Public Service Commission Tariff No. 2, 16th revised p. 8 (effective September 20, 1978). Airline Tariff Publishing Co., C.A.B. Tariff No. 259, 34th revised p. 14 (effective December 14, 1978).

5. Table 2-1 is the source of most of the fares per mile drawn on Figure 2-1. Table 2-1, however, does not include the following fares per mile that also appear on Figure 2-1:

U.S. Trunk			Canadian Mainline		
City Pair[a]	Mileage	Fares per Mile	City Pair[b]	Mileage	Fares per Mile
BOS-NYC	185	20.02¢	YUL-YQB	145	22.76¢
NYC-DCA	214	18.17	YYZ-YOW	226	20.80
BOS-DCA	399	14.39			
MSP-DCA	931	10.54	YYZ-YWG	933	11.47
LAX-IAD	2,288	8.66	YUL-YVR	2,286	9.49

[a]BOS Boston
DCA Washington-Nat'l
IAD Washington-Int'l
LAX Los Angeles
MSP Minneapolis
NYC New York-La Guardia

[b]YOW Ottawa
YQB Quebec City
YUL Montreal
YVR Vancouver
YWG Winnipeg
YYZ Toronto

Sources: Same as for Table 2-1.

6. Prior to December 14, 1978, Air Florida's lowest fares were also for night and weekend flights.

7. The exception of Air Florida's initial, CAB-approved standard fares must not be ignored, but they should be evaluated in conjunction with Air Florida's simultaneous introduction of capacity-controlled economy fares that were also available on all weekday flights. During January 1979, 49.2 percent of Air Florida's Miami-Tampa passengers and 40.2 percent of its Miami-Tallahassee passengers used the low, capacity-controlled fares. Air Florida, "Daily Summary of Scheduled Operations" (01/31/79).

8. CAB Order 74-3-82 (March 18, 1974), and PS-80 (August 25, 1978), 43 FR 172 (September 5, 1978), p. 39528.

9. For an example of the wide variety of increases actually implemented within the 30 percent interval, see the listings of "S-FARE PERCNT" for Frontier Airlines in Airline Tariff Publishing Co., Passenger Mileage Manual (18th Ed., January 27, 1979), pp. 96-116.

10. Official Airline Guide (March 1, 1979). One year earlier, when there was no need to consider Southwest's pending entry, Texas International operated 27 weekly round trips in this city pair, half nonstop and half one-stop. OAG (March 1, 1978).

11. Mileages given in Nordair, CTC(A) Exhibit 1N (November 13, 1978), as opposed to CTC(Research), "Nordair - Great Circle Distances in Miles," computer printout (n.d.) based on latitudes and longitudes of airport control towers.

12. Nordair, CTC(A) Exhibit 1N (November 13, 1978), p. 2.

13. Ibid., pp. 5-8.

14. Official Airline Guide (January 1, 1979).

15. The dominance of coach/economy service over first-class service is one example of consumer willingness to give up some service quality in return for appreciably lower fares. The popularity of CP Air's Sky Bus service is another example. In contrast, the relative lack of appeal of high fares and somewhat higher service quality was demonstrated by the failure of CP Air's premium-fare Company Jet service between Montreal and Toronto from September 1980 to May 1981. Finally, an example of service-quality rivalry where regulation prevents or discourages price competition is Air Canada's Connaisseur Service versus CP Air's Empress Class service. Toronto Globe and Mail (August 27, 1980), p. B2, (January 27, 1981), p. B5, and (May 15, 1981), p. B7.

3. Profits

The large differences in fares among the federally-regulated airlines and the U.S. intrastate carriers raises the question of whether or not profits are positively related to fare levels (with high fares yielding high profits and low fares yielding low profits). Such a relationship would imply similar average costs among all the airlines. If fare levels and profits are not closely related, however, the large differences in fares would require large differences in average costs in order for low-fare and high-fare carriers to earn the same profit levels.

Two common measures of profit used in transportation are return on investment and operating ratio. The operating ratio measure will be used here because it provides an adequate indication of relative profitability, is a reasonably unambiguous measure, and avoids some of the problems associated with carriers having different debt/equity ratios or having different portions of their aircraft fleets leased as opposed to owned. Operating ratios are calculated by dividing total operating expenses by total operating revenues. The lower the ratio (due to low expenses relative to revenues) the larger the profits, while high ratios mean small profits (or losses when the ratios are close to or exceed 100).

The 1975-78 operating ratios for all 18 carriers are given in Table 3-1. They demonstrate that profits have not been closely related to fare level. If a positive relationship existed between profits and fare levels, the high-fare Canadian regional and U.S. local service carriers should have had the highest profits, while the low-fare U.S. intrastate carriers should have had the lowest. In direct contradiction to this, however, the total system operating ratios in Table 3-1 show that the highest profits (lowest operating ratios) were enjoyed by Southwest, Northwest and North Central

Table 3-1

Operating Ratios
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78

Carrier	Total System Operating Ratio				
	1975	1976	1977	1978	1975-78[a]
Mainline					
Air Canada	95.9	96.2*	92.5*	93.6*	94.4
CP Air	99.2	101.0*	94.7*	90.6	95.8
Mean					95.1
Trunk					
Trans World	104.5	97.4	98.2	98.0	99.3
Northwest	93.9*	89.4	90.0	91.4*	91.0
Delta	96.5	92.2	90.7	89.9	91.9
Mean					94.1
Intrastate					
Air Calif.	93.8	93.7	90.9	94.4	93.2
Air Florida[b]	115.8	114.5	154.4	98.1	111.4
PSA[c]	96.7	93.0	95.3	93.8	94.6
Southwest	78.3	75.1	79.1	73.9	76.1
Mean					93.8
Regional					
East. Prov.	107.7	111.7*	104.2*	96.2	104.0
Nordair	95.0	95.1*	89.9*	90.7*	92.4
Pac. Western	95.9	97.2*	96.2*	93.3*	95.5
Quebecair	99.9	100.9*	95.8*	97.8*	98.3
Transair	98.2*	93.4*	92.5*	92.9	94.0
Mean					96.8
Local Service					
Allegheny	99.1	95.9	94.8	94.0	95.7
Frontier	93.1	89.7	88.9	95.4	91.9
N. Central	95.6	92.7	92.3	88.4	91.6
Southern	97.1	98.2	95.3	95.9	96.5
Mean					93.9

*Service interrupted by one or more strikes having a significant impact on operations.

[a]Weighted average: 1975-78 operating expenses divided by operating revenues.

[b]Fiscal years ended July 31, 1975-78.

[c]Applies to PSA, Inc., including the following subsidiaries in addition to the airline: Pacific Southwest Airmotive (maintenance services), Airline Training Center, and Jetair Leasing, Inc. Airline and Airmotive revenues accounted for 97.8 and 97.9 percent of the corporate total in 1977 and 1978.

Source: Calculated from data in W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Appendix C.

(low, medium and high fare carriers), while the lowest profits (highest ratios) were experienced by Air Florida, Trans World and Eastern Provincial (also low, medium and high fare carriers). Clearly, there is much more affecting profits than fare level, which means that there must also be important differences in the average costs of these carriers.

The operating ratios in Table 3-1 yield additional useful information. First, it can be seen that during 1975-78 there was considerable similarity in the operating ratios of the federally-regulated Canadian and U.S. carriers. The weighted averages of the total system operating ratios of eleven of these fourteen carriers fell between 91 and 97 for that four-year period, with the exceptions being Trans World, Eastern Provincial and Quebecair (all on the high side). Indeed, the simple average of the four-year operating ratios for Air Canada and CP Air was 95.1, compared with 94.1 for the three selected U.S. trunk carriers. The simple average of the four-year operating ratios for the five Canadian regional carriers was 96.8, while the four selected U.S. local service carriers had an average of 93.9.

Second, in contrast to the similarity among the regulated airlines, considerable diversity in operating ratios existed among the low-fare U.S. intrastate carriers. On the high side, fledgling Air Florida radically bettered its performance by reducing its operating ratio from 154.5 in 1977 to 98.1 in 1978. On the low side, Southwest's superior performance gave ratios of between 73.9 and 79.1. In the meantime, the older Air California and PSA had "normal" operating ratios yielding four-year weighted averages of 93.2 and 94.6.

It can be concluded, then, that unlike their performance differences with regards to fares, there was no consistent difference in operating ratios (profits) between the federally-regulated airlines and the U.S. intrastate carriers operating under regulatory duopolies. At the same time, however, this also means that there must have been consistent performance differences

in terms of average costs, with the high-fare federally-regulated airlines generally having high average costs and the low-fare intrastate carriers generally having low costs. Indeed, since one of the low-fare intrastate carriers (Southwest) was also the most profitable in 1975-78, the cost differences may have been even larger than the fare differences. The extent of the overall cost differences will be shown in the following chapter, and some of the sources of these differences will be analyzed in subsequent chapters.

4. Cost Differences

Differences in Operating Expenses per RTM

It happens that, once the effects of distance are recognized, major differences are found to exist between the operating costs of the federally-regulated airlines and the low fare U.S. intrastate carriers. This can be seen in Figure 4-1 where the weighted average of each carrier's total system operating expenses per revenue ton-mile (RTM) for the four years from 1975 through 1978 are plotted against its average system trip length for combined scheduled and charter passengers.[1] Also depicted is the trend line giving the best fit for the 14 federally-regulated airlines' data from among six possible mathematical relationships.[2] The actual values for the two variables, the trend line values, and the numerical and percentage deviations of the actual from the trend line values for operating expenses per RTM are all given in Table 4-1.

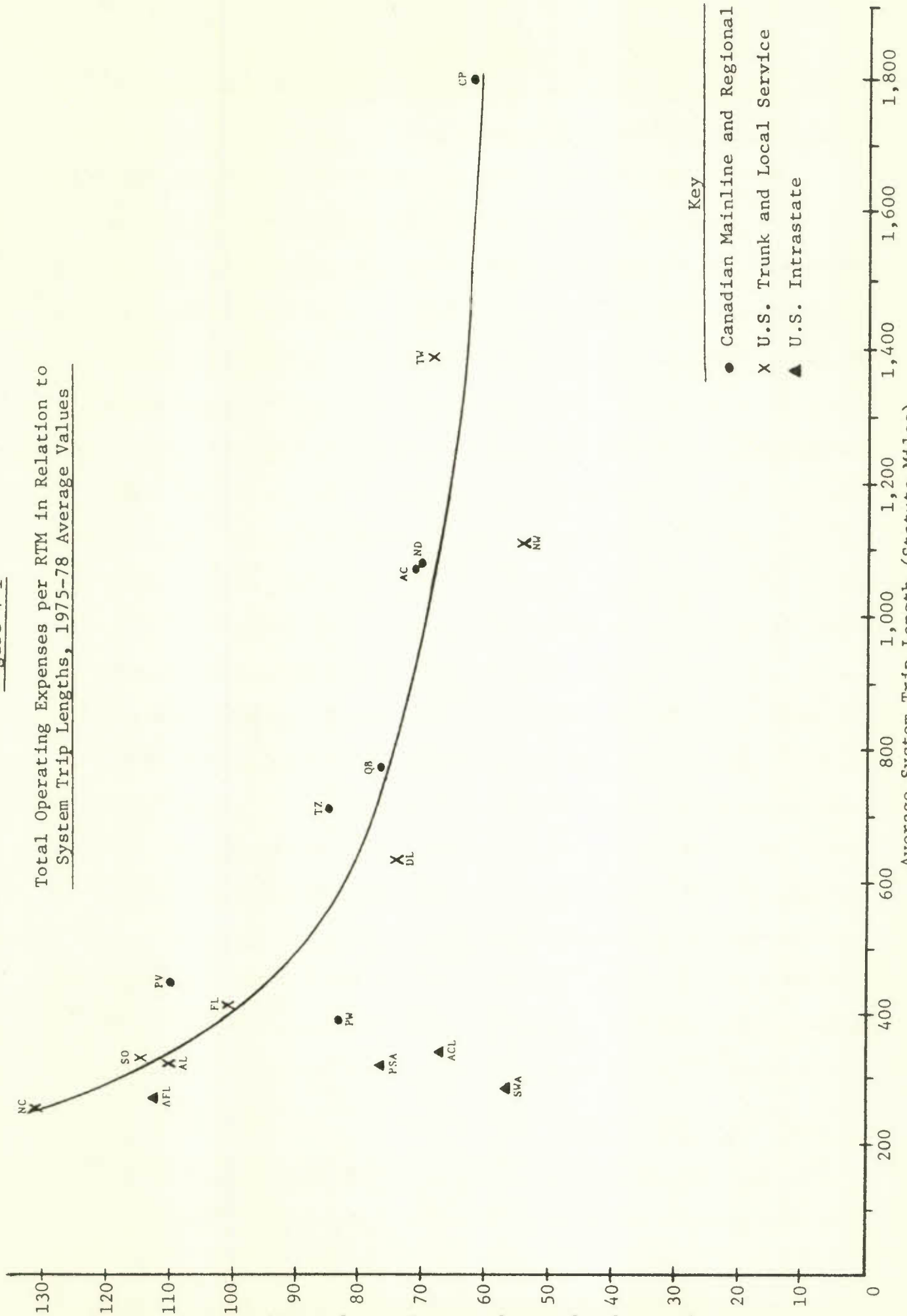
The close association between distance and operating expenses per RTM for the federally-regulated airlines is indicated by the high, and statistically significant, R^2 of .866.[3] At the same time, the appreciably lower operating expenses per RTM of the three largest U.S. intrastate carriers (excluding Air Florida) are clearly evident from Figure 4-1, and from the -31.8 to -52.8 percent deviations of their actual operating expenses per RTM from the federally-regulated airlines' trend line values given in Table 4-1. These large differences are similar to the differences in fare levels found in Chapter 2 and they demonstrate why the intrastate carriers (except Air Florida) were able to achieve average or high profits while charging low fares.

Sources of Cost Differences

Many factors could cause or contribute to the major differences that exist between the operating costs of the federally-regulated airlines and the

Figure 4-1

Total Operating Expenses per RTM in Relation to System Trip Lengths, 1975-78 Average Values



Source: Table 4-1.

Table 4-1

Total System Operating Expenses per RTM and System Trip Lengths
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	1975-78 Average System Trip Length[a]	Operating Expenses per RTM (Can. & U.S. Cents) Actual	Trend[b]	Deviation ¢ per RTM[c]	Percent[d]
Mainline					
Air Canada	1,064	71.5¢	68.6¢	2.9¢	4.2%
CP Air	1,789	61.9	60.9	1.0	1.6
Trunk					
Trans World	1,390	68.6	64.1	4.5	7.0
Northwest	1,110	54.8	67.8	-13.0	-19.2
Delta	636	74.3	81.4	-7.1	-8.7
Intrastate					
Air Calif.	341	67.5[e]	108.9	-41.4	-38.0[f]
Air Florida	268	112.7[f]	125.1	-12.4[f]	-9.9
PSA	318	77.2	113.2	-36.0	-31.8
Southwest	284	57.0	120.8	-63.8	-52.8
Regional					
East. Prov.	444	110.0	95.1	14.9	15.7
Nordair	1,067	70.5	68.5	2.0	2.9
Pac Western	383	83.1	102.4	-19.3	-18.8
Quebecair	771	76.7	75.8	0.9	1.2
Transair	707	85.0	78.2	6.8	8.7
Local Service					
Allegheny	323	110.5	112.2	-1.7	-1.5
Frontier	406	101.4	99.4	2.0	2.0
N. Central	253	131.9	129.5	2.4	1.9
Southern	329	114.9	111.1	3.8	3.4

[a]Total system scheduled plus charter RPM divided by total system passengers yields distance in statute miles.

[b]Calculated from data for the federally-regulated airlines using the equation: $Y = 49.582 + 20{,}227.564/X$, $R^2 = .866$.

[c]Actual operating expenses per RTM minus trend values.

[d]Deviation percent of trend value.

[e]Partially estimated. Scheduled passenger RTM for 1975-76 assumed to be 98 percent of total RTM (Based on 1977 experience).

[f]Year ended July 31, 1978. RTM estimated by averaging data for calendar years 1977 and 1978. Deviation from 1975-78 trend value may be somewhat understated due to the effects of inflation.

Sources: Calculated from data in W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Appendices C, E, G and H.

low-fare intrastate carriers. These include:

1. Inefficient utilization of inputs: Using larger quantities of inputs (such as labour, aircraft, buildings and fuel) to produce a given amount of output will increase operating costs.
2. Higher prices for inputs: Even if inputs are used with equal efficiency, if one group of airlines pays more for its aircraft, employees and facilities, its operating costs will exceed those of carriers paying lower prices.
3. Economies or diseconomies of scale: One effect of government regulation has been to limit the number of airlines in existence.[4] Therefore, if airline size affects operating costs, the costs of some airlines will be higher if regulatory decisions prevent them from becoming large enough to achieve full economies of scale, or if such decisions require them to become so large that they experience diseconomies of scale.[5]
4. Volume of operations: Service provided with large aircraft, between large cities and over long distances, tend to have lower average costs than services produced with small aircraft between points having small populations and located close to each other.
5. Output rate: Rapid production tends to increase costs. For example, flying aircraft at their highest cruising speeds, processing passengers with little or no delay (for reservations, ticketing, check-in, baggage handling, etc.), and reducing aircraft ground times at intermediate stops, could all increase operating costs.
6. Variety of output: The more variety in operations, the higher the costs. Examples of variety are the number of aircraft types operated, number of airports served, classes of service and the range

of discount fares offered, provision of both passenger and cargo services, diversity of geographic coverage (Arctic vs. southern, domestic vs. international), whether charter service is operated in addition to scheduled service, and so on.

7. Aggregation of traffic flows: While variety of output increases costs, lower costs can be achieved by the aggregation of diverse individual requirements for point-to-point service into a small number of homogeneous flights. Thus, for example, carrying passengers between a number of cities located along a roughly linear route should cost less than transporting an equal number of passengers the same distances between an identical number of points, but where these points are located on a diverse route network having segments at right angles to each other, thereby requiring service by many stub-end flights that can efficiently connect only two or three points.
8. Interval for implementing change: Adopting new ideas and technology can be beneficial, but doing so over a short time period is more costly than taking a longer interval of time. For example, buying and introducing a new-type aircraft as quickly as possible will be more costly than doing so over a longer time period. Of course, if the new type of aircraft yields lower operating costs, this benefit may be greater than the increased costs resulting from its rapid introduction. If, however, it primarily improves service quality without reducing costs, the increase in costs of its rapid introduction could be relatively large.[6]
9. Geographic factors: Weather and topography may also influence operating costs. An airline operating at high-altitude airports

having hot temperatures during much of the year will either need aircraft with more powerful engines (and higher fuel consumption) for takeoffs or must sacrifice payload. Airports in remote or difficult locations will be more costly to build and operate and may have fewer facilities -- all of which result in higher charges and costs to the airlines operating there. Heavy snow, fog and other adverse weather conditions may result in delayed or canceled flights. Extremes of cold or hot weather may decrease employee productivity and require expenditures for heating or air conditioning.

10. Costs of economic regulation: Regulation itself can directly affect operating costs in at least two ways. First, the managerial, legal, accounting, statistical and economic personnel (and associated facilities) required to comply with regulatory rules, procedures and practices result in higher operating costs. But the salaries paid to these talented and highly skilled individuals is just one aspect of their costs. Another is the diversion of their talents from operating/marketing problems and innovations to regulatory activities. Second, regulatory delays in the timely implementation of decisions can also serve to increase airline costs.

Implicit in most of the above factors is the assumption that the qualities of service offered by various airlines are roughly equal. If there are appreciable differences in service quality, then operating costs would also differ regardless of the above cost factors. It should be recognized, however, that service quality can affect costs in two ways. First, if service quality is higher, there are the added costs of producing that higher quality, just as there are higher costs in producing Cadillac rather than Chevrolet automobiles. Second, if service quality results in an airline producing two or more classes

of service, rather than just one, the greater variety of service will increase costs (see item 6, above). It would be appropriate to adjust for the first source of increased costs when comparing operating costs between two or more carriers, but adjustments should not be made for the second source since it is a result of service variety and not necessarily improved service quality. Indeed, higher costs would be incurred even if the new level of service were inferior rather than superior to the existing service. (An example of the widespread adoption of inferior service quality can be found in the introduction of economy/coach service during the 1950s.)

As stated in Chapter 1, the U.S. intrastate carriers have generally offered somewhat lower service quality than that provided by federally-regulated airlines (especially the mainline and trunk carriers). In major factors such as types of aircraft, on-time performance, scheduled frequency and safety, their service quality during the period studied was equal to that of the federally-regulated airlines. But in factors such as in-flight meals and entertainment, seat density and interlining with other carriers, their service has been inferior. Of course, individual passengers have different perceptions of levels of service qualtiy. A five-foot woman on a strict diet making a single-plane journey would be little affected by the lower quality service of an intrastate carrier. In contrast, a six-and-a-half foot male athelete making a journey requiring connections with other airlines would consider seat density, meals and interlining relatively important in his overall evaluation of service quality.

Unfortunately, it is extremely difficult to measure the added costs associated with these incremental differences in service quality, and the limited data available from the carriers do not permit estimates to be made of such costs. In 1975, Dr. John R. Summerfield was retained by the federally-regulated airlines (through the Air Transport Association of America) to

estimate how much these aspects of service quality and other factors would increase PSA's annual costs. His estimate of $16.85 million for interlining, food service and seat density yields a 12 percent increase in PSA's 1974 operating expenses of $136.25 million, or about $2.64 per passenger for the 6.4 million passengers carried by PSA in that year.[7] Of that total, $13.2 million were associated with interlining activities, leaving only $3.65 million (three percent) for differences in food service and seat density which are relevant to online passengers. This maximum estimate still leaves the greater part of the superior cost performance of PSA and the other intrastate carriers unexplained by service quality differences, but it does provide a rough idea of the outer limit to which operating expenses may be affected by service quality differences.

Summary

This chapter has shown that basic similarities existed in the distance-adjusted operating expenses per RTM of the federally-regulated airlines, while major differences existed between their operating expenses per RTM and those of the U.S. intrastate carriers. As was the case with fares, this evidence is consistent with the hypothesis that similar types of regulation have similar affects on performance. The long list of factors that may affect costs implies that identifying the reasons for operating cost differences is a complicated and difficult task. If cost differences among the airline groups were small, it might well be impossible to identify factors accounting for an appreciable portion of the differences. It happens, however, that the differences were large. We are not looking for the proverbial needle in the haystack. Rather, we are trying to determine why one haystack had to be almost twice the size of another in order to produce a unit of output. In an effort to achieve this

objective, the following factors will be analyzed in the subsequent chapters of this report:

1. Geographic traffic shares and traffic distributions
2. Labour productivity and payments
3. Fuel prices and utilization
4. Weather
5. Population
6. Economies of Scale
7. Cross-subsidization
8. Government versus private ownership.

Footnotes

1. Average system trip length is calculated by dividing total system revenue passenger-miles (RPM) by total system passengers. Both scheduled and charter RPM and passengers are included in these calculations.

2. The six mathematical relationships and their R^2 are as follows:

   1. $Y = 117.689 - .041X$ $R^2 = .664$
   2. $Y = 120.409e^{-.000*X}$ $R^2 = .701$
   3. $Y = 1{,}011.356X^{-.385}$ $R^2 = .823$
   4. $Y = 49.582 + 20{,}227.564/X$ $R^2 = .866$
   5. $Y = 1/(.008 + .000*X)$ $R^2 = .712$
   6. $Y = X/(.017 - 2.619X)$ $R^2 = .799$

   *Designates significant value beyond three decimal points.

   Based on the lowest mean squared error, the best fit was equation number 4.

3. For a random sample of 14 pairs, the five percent level of significance is achieved at an R^2 of .283, while the one percent level of signficance obtains at an R^2 of .437. S. B. Richmond, Principles of Statistical Analysis (New York: The Ronald Press Co., 1957), p. 459. The 14 federally-regulated airlines selected for this study do not constitute a random sample. They do, however, comprise more than 50 percent of the 26 federally-regulated airlines that operated large aircraft in scheduled passenger/cargo service in Canada and in the 48 contiguous states of the U.S. during 1975-78.

4. W. A. Jordan, Airline Regulation in America (Baltimore: The Johns Hopkins Press, 1970), pp. 24-32. Also, W. A. Jordan, "Comparisons of American and Canadian Airline Regulation," in G. B. Reschenthaler and B. Roberts, eds., Perspectives on Canadian Airline Regulation (Montreal: Institute for Research on Public Policy, 1979), pp. 23-30.

5. These first three factors are implications from traditional production and cost theories to be found in any intermediate level microeconomic textbook. For example, R. W. Leftwich, The Price System and Resource Allocation, 7th Ed. (Hinsdale, IL: The Dryden Press, 1978), Chapters 8 and 9.

6. Factors 4 through 8 are implications of a more recent cost theory proposed in the following articles: A. A. Alchian, "Costs and Outputs," in M. Abramovitz, et al., The Allocation of Economic Resources (Stanford, CA: Stanford University Press, 1959), pp. 23-40; and J. Hirshleifer, "The Firm's Cost Function: A Successful Reconstruction?" Journal of Business (July 1962), pp. 235-55.

7. J. R. Summerfield, prepared statement in U. S. Senate, Civil Aeronautics Board Practices and Procedures, Report of the Subcommittee on Administrative Practice and Procedure of the Committee on the Judiciary of the United States Senate (1975), Vol. 1, pp. 487-90. Also, PSA, "SEC Form 10-K for the Fiscal Year Ended December 31, 1975," p. 26.

5. Traffic Distribution

Geographic Shares

An important characteristic of Canadian airline operations is the surprisingly small role that purely domestic traffic plays in total operations. As shown in Table 5-1, during 1975-78 Air Canada carried just 50.0 percent of its total RTM domestically, and CP Air, Nordair and Quebecair carried only 34.7, 38.4 and 39.3 percent, respectively, of their total system RTM solely within Canada. Eastern Provincial, Pacific Western and Transair did produce more than half of their RTM domestically (77.3, 62.6 and 62.1 percent, respectively), but, taking all seven mainline and regional carriers together, purely domestic Canadian RTM accounted for just 47.0 percent of total system RTM during these years. In comparison, Trans World and Northwest produced around 65 percent of their total system RTM domestically, while Delta, the four local service carriers and, of course, the four intrastate carriers all produced over 95 of their total RTM in domestic service.

The small size of domestic traffic shares in the total operations of Canadian carriers is significant in three respects. First, it means that any changes in purely domestic regulatory policies would generally apply to much smaller shares of the total system operations of Canadian carriers than would similar policy changes in the U.S. Second, it follows from this that policy changes by Canada and other countries affecting international operations would have relatively large affects on Canadian carriers. Third, it means that the basic characteristics of their country's domestic economy are relatively less important to Canadian than to U.S. carriers. For example, Canadian airline executives point to Canada's small population as a major limitation on potential traffic for their carriers.[1] However, since less than half of total RTM is produced domestically, it follows that

Table 5-1

Relative Sizes and Geographic Distribution of Operations
Canadian Mainline, Regional and Selected U.S. Carriers
Based on Revenue Ton-Miles Aggregated for 1975-78[a]

Carrier	Relative Sizes Total System RTM Air Canada = 100	Geographic Distribution Percent of Total System RTM			
		Domestic	Transborder	N. America	Int'l.
Mainline					
Air Canada	100.0	50.0%	15.1%	65.1%	34.9%
CP Air	40.0	34.7	14.5	49.2	50.8
Trunk					
Trans World	209.2	64.0	0	64.0	36.0
Northwest[b]	113.0	n.a.	n.a.[e]	67.3	32.7
Delta	148.4	n.a.	n.a.[e]	97.0	3.0
Intrastate					
Air Calif.[c]	5.2	100.0[f]	0	100.0[f]	0
Air Florida[d]	1.2	95.0[f]	0	95.0[f]	5.0[f]
PSA	15.2	100.0	0	100.0	0
Southwest	4.1	100.0	0	100.0	0
Regional					
East. Prov.	2.6	77.3	22.7	100.0	-[g]
Nordair	5.0	38.4	19.1	57.5	42.5
Pac. Western	9.1	62.6	14.5	77.1	22.9
Quebecair	4.9	39.3	9.9	49.2	50.8
Transair	2.8	62.1	15.9	78.0	22.0
Local Service					
Allegheny	27.3	n.a.	n.a.[e]	100.0	0
Frontier	13.6	n.a.	n.a.[e]	100.0	0
N. Central	10.3	n.a.	n.a.[e]	100.0[h]	0
Southern	8.5	99.0	0	99.0[h]	1.0[h]

n.a. -- not available.

[a]Four-year totals, except where noted.

[b]1975-77. 1978 data are excluded due to Northwest's 108-day pilot strike.

[c]1977-78.

[d]1978 only.

[e]During 1977-78, Canadian stations enplaned the following percentages of total system enplaned passengers: Delta = 0.70%, Northwest = 1.07%, Allegheny = 1.86%, North Central = 2.05% and Frontier = 0.39%. These percentages are probably close approximations to these carriers' transborder RTM percentages since doubling them to account for U.S. enplaned passengers bound for Canada should be offset by the fact that the transborder operations of these carriers were primarily short-haul, stub-end extensions of domestic flights.

[f]Approximately 9.5% of Air Florida's total system RTM were charter, and about 56% of those were to Freeport, Bahamas. Therefore, just over 5% of Air Florida's total system RTM in 1978 was international.

[g]Less than 0.1%.

[h]During 1977-78, Southern's Miami-Grand Cayman route accounted for 0.71% of total system enplaned passengers. Since this route was a relatively long haul for Southern, its international RTM probably accounted for just over 1.0% of total system RTM.

Sources: Calculated from data in W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Appendix E.
Air Florida, worksheets summarizing flight hours (Jan.-Dec. 1978).
CAB/FAA, Airport Activity Statistics of Certificated Route Carriers (12 Months Ended Dec. 31, 1977 and 1978).

the true traffic potential available to most Canadian carriers is much larger than that indicated by domestic population figures. As will be described in Chapter 11, the actual potential includes the major populations surrounding the airports in the United States and other countries where Canadian carriers have traffic rights for scheduled and charter services. Indeed, the 15 percent of total RTM accounted for by transborder operations and the 38 percent in international operations indicate the importance of this foreign traffic potential, even while recognizing that these percentages include Canadian as well as foreign originating traffic. Obviously, as is true for the Canadian economy in general, foreign trade plays a much more important role in Canadian airline operations than it does in the U.S. airline industry.

While large differences existed in the relative sizes of their domestic markets, there were basic similarities among several Canadian and U.S. carriers in terms of North American shares because of the Canadian carriers' large transborder operations. Air Canada's North American RTM accounted for 65.1 percent of its total system RTM, compared with 64.0 percent for Trans World and 67.3 percent for Northwest. Similarly, Pacific Western and Transair had North American shares of 77.1 and 78.0 percent. In addition, Eastern

Provincial's operations were essentially 100 percent North American, just as were those of Delta, the local service carriers and the intrastate carriers. Thus, to the extent that there are common factors in North American airline operations, there should be added reasons for similarities in the operations of these Canadian carriers and the U.S. carriers.

Relative Sizes

Table 5-1 also shows the relative sizes of the total system operations of the 18 carriers through the use of index numbers, with Air Canada being used as the base carrier and assigned an index number of 100. It can be seen that Air Canada was, and is, by far the largest Canadian carrier. The RTM index numbers for CP Air and the five regional carriers totaled just 64.4, which means that, combined, these six airlines carried only 64.4 percent as many RTM as Air Canada. Put another way, during 1975-78 Air Canada accounted for 61 percent of the total system RTM transported by all seven airlines, with CP Air accounting for 24 percent and the five regional carriers the remaining 15 percent.

While Air Canada was large, the U.S. trunk carriers under study were even larger. During 1975-78, Trans World carried more than twice as many RTM as Air Canada, Delta almost 50 percent more, and Northwest 13 percent more (based on 1975-77 data for both carriers). If ranked among all the U.S. trunk carriers, Air Canada would be listed in the eighth position (between Northwest and Western), while CP Air would be ranked thirteenth and last (after National).[2] Thus, while a giant among Canadian carriers, Air Canada is a medium-sized carrier by U.S. standards.

The Canadian regional carriers were generally smaller than the U.S. local service carriers. For the 1975-78 period the RTM index number for the regional carriers ranged from 2.6 to 9.1 (percent of Air Canada) compared with 8.5 to

27.3 for the U.S. local service carriers. Only Pacific Western, the largest of the Canadian regional carriers, produced more RTM during 1975-78 than Southern, the smallest of the U.S. local service carriers.[3]

Least the impression be given that almost all of the Canadian carriers were smaller than the U.S. carriers with which they are to be compared, it should be pointed out that the RTM of the U.S. intrastate carriers encompassed those of the Canadian regional carriers. Air Florida, with an index number of 1.2, produced less than half the RTM carried by Eastern Provincial during 1978, while PSA had an index number of 15.2 compared with Pacific Western's 9.1. At the same time, Air California and Southwest (index numbers 5.2 and 4.1) were about the same sizes as Nordair and Quebecair (index numbers 5.0 and 4.9).

Traffic Categories

There was a wide variation in the traffic mix carried by the five airline groups. Table 5-2 shows that at one extreme the U.S. intrastate carriers' scheduled passenger traffic generally comprised 98 to 99 percent of total system RTM during 1975-78, with very little scheduled cargo or charter traffic. Ranging down from this group were the U.S. local service carriers with 83 to 91 percent of total system RTM derived from scheduled passengers operations, with scheduled cargo accounting for around nine percent of total RTM, and with charter operations ranging from virtually nothing to 10 percent. This group was then followed by the Canadian mainline and U.S. trunk carrier groups with around three-quarters of their total RTM being produced in scheduled passenger service, about 20 percent scheduled cargo, and another five percent charter (with Delta and Northwest deviating somewhat from these averages). Finally, on the other extreme, were the Canadian regional carriers with a significantly different emphasis. Only Eastern Provincial produced more than half (66 percent)

Table 5-2

Distribution of Traffic by Category
Canadian Mainline, Regional and Selected U.S. Carriers
Based on Revenue Ton-Miles Aggregated for 1975-78[a]

Carrier	Percent of Total System RTM				
	Scheduled		Charter		Total
	Passenger	Cargo	Passenger	Cargo	
Mainline					
Air Canada	73.9%	21.0%	3.9%	1.2%	100.0%
CP Air	73.4	19.3	7.3	0	100.0
Trunk					
Trans World	75.3	18.5	5.3	0.9	100.0
Northwest[b]	63.6	32.8	3.2	0.4	100.0
Delta	86.4	12.3	1.3	-[g]	100.0
Intrastate					
Air Calif.[c]	97.6	0.8	1.6	0	100.0
Air Florida[d]	90.1	0.4	9.5	0	100.0
PSA	98.0	1.6	0.4	0	100.0
Southwest	99.0	0.7	0.3	0	100.0
Regional					
East. Prov.	66.0	10.5	23.5	-[g]	100.0
Nordair	19.6	16.3	61.9	2.2	100.0
Pac. Western	38.1	10.0	29.6	22.3	100.0
Quebecair	24.7	3.0	64.5	7.8	100.0
Transair	47.3	5.9	41.5	5.3	100.0
Local Service					
Allegheny	88.9	8.6	2.5	0	100.0
Frontier	91.1	8.8	0.1	0	100.0
N. Central	83.9	9.0	7.1	-[g]	100.0
Southern	82.7	7.0	10.3	0	100.0

Sources and Notes: same as for Table 5-1.

of its total RTM in scheduled passenger service, with the remaining carriers producing between 19.6 to 47.3 percent of total operations in scheduled passenger service. Actually, these other four carriers were primarily charter operators, with between 47 and 72 percent of their total RTM being produced in that category, mainly in transborder or international operations.[4]

These percentages demonstrate that the U.S. intrastate carriers were the most highly specialized of the airline groups in terms of the types of traffic carried, i.e. scheduled passenger, while the Canadian regional carriers were the least specialized. To the extent specialization reduces operating costs, the intrastate carriers should be helped by this specialization. However, it is important to recognize that there are other dimensions to airline specialization. For example, specialization is also a function of the numbers of aircraft types operated, airports served, classes of passenger service provided, types of fares offered, and so forth.

Summary

The above description of the airlines included in this study shows that the Canadian carriers' domestic operations comprised a much smaller portion of total RTM than was the case for U.S. airlines, that the Canadian carriers were generally smaller than their U.S. counterparts (except for the U.S. intrastate carriers), and that charter service (essentially transborder and international) was much more important to four of the regional carriers (all but Eastern Provincial) than to any of the other carriers.

It has already been shown that these differences have had little impact on the fares and profits of the federally-regulated Canadian and U.S. airlines, and the following chapters will show that they have not affected their costs significantly. However, the differences in geographic distributions of

traffic do mean that changes in domestic and international policies will be of varying importance to Canadian and U.S. carriers. Obviously, the U.S. carriers are affected more by changes in domestic policies than their Canadian counterparts, while changes in policies affecting transborder and international operations are much more important to Canadian carriers.

Footnotes

1. For example, "Ian A. Gray, president and chief executive officer of Canada's second largest airline, said here recently that deregulation in his country has resulted in too many airlines 'all charging after 25 million people--and not all of them fly.'" Aviation Week and Space Technology (December 15, 1980), p. 41.

2. CAB, Supplement to the Handbook of Airline Statistics (Dec. 1977 and Nov. 1979); and W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix E. There were eleven U.S. trunk carriers during 1975-78.

3. Ibid.

4. However, in terms of other measures, (such as aircraft hours flown, number of departures and revenues) this characterization would be less accurate because the RTM measure is influenced by the long hauls and high load factors of charter operations. But, even after allowing for that, the importance of charter service would still be very great for these four carriers. For charter RTM by area of operation, see W. A. Jordan, supra note 2, Appendix E-4.

6. Labour Productivity

Major Airline Inputs

Labour and fuel are two inputs comprising large shares of airline operating expenses. Table 6-1 shows that, among the carriers studied, total labour expenses (salaries and wages, fringe benefits and personnel expenses) ranged from 25.3 to 46.7 percent of total operating expenses in 1978. The simple average for these 18 carriers was 39 percent, and only three of them had labour expenses comprising less than 33 percent of their total operating expenses.

At the same time, total fuel expenses (including the fuel itself, oil, taxes and airport fees) accounted for between 15.9 and 28.1 percent of total operating expenses, with a simple average of 21.5 percent. Together, these two major inputs generally comprised an average of just over 60 percent of total operating expenses, with a range of 50.5 percent (Air Florida) to 66.8 percent (Delta). This means that the very large differences that have been identified in total operating expenses per RTM should be reflected to an appreciable degree in these two major input categories.

Measures of Labour Productivity

Rough measures of labour productivity are commonly obtained by calculating revenue passenger-miles (RPM), revenue ton-miles (RTM) and operating revenues per employee. There are two conceptual shortcomings with this approach. First, many inputs are used jointly with labour to produce airline output, and their relative shares influence output per employee. For example, an airline utilizing more or larger aircraft (capital) relative to labour may be able to produce more output per employee than another airline using relatively fewer or smaller aircraft. In this case, however, the

Table 6-1

Labour and Fuel Shares of Total System Operating Expenses
Canadian Mainline, Regional and Selected U.S. Carriers, 1978

Carrier	System Operating Expenses (Thousands of Can. or U.S. $)			Percent of Total Operating Expenses		
	Labour[a]	Fuel[b]	Total	Labour	Fuel	Labour + Fuel
Mainline						
Air Canada	541,342	230,464	1,238,098	43.7	18.6	62.3
CP Air	168,853	89,789	421,985	40.0	21.3	61.3
Trunk						
Trans World	1,053,509	486,649	2,425,659	43.4	20.1	63.5
Northwest[c]	234,874	159,559	726,424*	32.3	22.0	54.3
Delta	918,223	426,687	2,013,216	45.6	21.2	66.8
Intrastate						
Air Calif.	25,277	13,898[d]	63,868	39.6	21.8	61.4
Air Florida[e]	4,186	4,175	16,569	25.3	25.2[f]	50.5
PSA	79,562	46,380	215,683	36.9	21.5	58.4
Southwest	19,763	16,838	59,943	33.0	28.1	61.1
Regional						
East. Prov.	17,932	10,104	50,064	35.8	20.2	56.0
Nordair	23,296	15,348	61,162*	38.1	25.1	63.0
Pac. Western	55,184	30,398	132,860*	41.5	22.9	64.4
Quebecair	22,153	16,624[f]	72,311*	30.6	23.0	53.6
Transair	14,027	10,054	40,542	34.6	24.8	59.4
Local Service						
Allegheny	241,132	96,673	532,590	45.3	18.1	63.4
Frontier	128,114	43,501	274,024	46.7	15.9	62.6
N. Central	120,249	44,231	263,748	45.6	16.8	62.4
Southern	77,316	36,834	180,808	42.8	20.4	63.2

*Service interrupted by one of more strikes having a significant impact on operations.

[a]Total salaries and wages, fringe benefits and personnel expenses.

[b]Fuel, oil, taxes and airport fees.

[c]Northwest's three-and-a-half month strike during 1978 reduced absolute expenditures on labour and fuel with a possible related reduction in percentage shares of total operating expenses. However, 1977 data show labour's share was 31.4 percent (contrary to expectations), while fuel's share was 25.4 percent (a consistent, but relatively small, effect).

[d]Estimated from actual experience for the first ten months of 1978.

[e]Fiscal year ending July 31, 1978.

[f]Includes $459,000 of gasoline and oil for piston aircraft.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 23.

higher employee productivity is due to the use of larger quantities of aircraft rather than to a more effective use of personnel.

The second shortcoming is that there is no completely satisfactory measure of airline output. RPM are deficient in that they exclude cargo output. RTM include all types of traffic, but the conversion of passenger traffic into the common ton-mile measure assumes an average weight of 200 pounds per passenger plus baggage, and this may not accurately reflect the physical relationship between passenger and cargo traffic since it excludes the weight of such passenger-related facilities as seats, galleys, lavatories, etc., as well as cabin attendants. While operating revenues provide a rough indication of the different values of various airline services to consumers, they can be misleading if there are large differences in carrier fares (as Chapter 2 demonstrated to be the case). In that situation, total revenues for low-fare airlines will be lower than for high-fare airlines for the same physical quantities of output having similar service qualities. At the same time, however, total operating revenues do include the value of outputs not directly applicable to an airline's own transport services (such as maintenance, catering, reservations and ground services for other airlines), but which require the airline to use more labour for their production.

Because of their more inclusive natures, RTM and total operating revenues will be used in this study in calculating employee productivity. The above limitations, however, should be kept in mind when evaluating the following comparisons of employee productivity among the airlines.[1]

RTM per Employee

Since labour is a major component of total operating expenses, the decreases in total operating expenses per RTM associated with increases in distance (see Figure 4-1) imply that labour productivity must increase with distance. This expected positive relationship is clearly evident in Figure

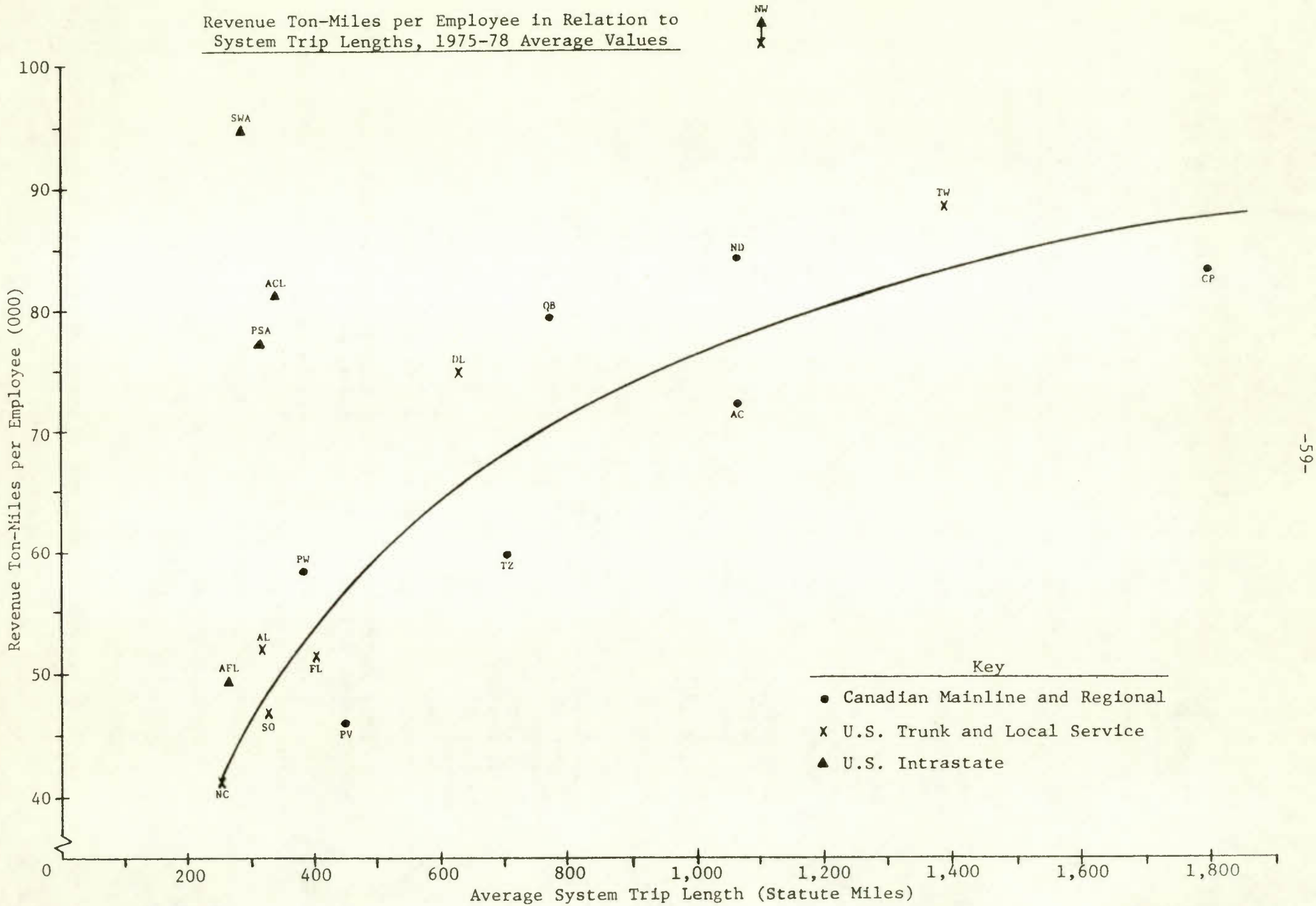
6-1 which shows each carrier's weighted average system RTM per employee for the years 1975-78 plotted against its average system trip length for combined scheduled and charter passengers.[2] The best-fit trend line for the federally-regulated airlines (excluding Northwest) are also plotted on Figure 6-1.[3] The trend line and the associated high R^2 of .837 demonstrate a high degree of similarity between the Canadian and U.S. federally-regulated airlines in terms of RTM per employee, as was also true for total operating expenses per RTM.

The plotted data are given in Table 6-2 together with the trend value for each carrier's trip length as calculated from the federally-regulated airlines' trend line equation. In addition, the deviations of the actual from the trend-line values are also given. It can be seen from this table, and from Figure 6-1, that there are four airlines with very large positive deviations from the trend line. Southwest lies 118 percent above the line, Air California and PSA are about 67 percent higher, and Northwest lies 82.5 percent above the line. Clearly, these four carriers have achieved very much greater labour productivity than the other carriers, after adjusting for the effects of distance.

For the purposes of estimating the effects of government regulation on airline performance, it would have been convenient had Northwest's RTM per employee been located down near the trend line, and had Air Florida's been appreciably higher than 17.2 percent above the line. Since this is not the case, it appears that federal regulation does not necessarily prevent high labour productivity, nor does its absence guarantee it. However, it should be recognized that, after adjusting for distance, the majority of the successful intrastate carriers managed to achieve exceptionally high labour productivity (in terms of RTM per employee), while Northwest has been unique in this respect among the federally regulated North American airlines.[4]

Figure 6-1

Revenue Ton-Miles per Employee in Relation to System Trip Lengths, 1975-78 Average Values



Source: Table 6-2.

Table 6-2

Total System RTM per Employee and System Trip Lengths
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	1975-78 Average System Trip Length[a]	Total System RTM per Employee Actual	Trend[b]	Deviation RTM/Employee[c]	Deviation Percent[d]
Mainline					
Air Canada	1,064	72,193	77,374	-5,181	-6.7%
CP Air	1,789	82,684	87,062	-4,378	-5.0
Trunk					
Trans World	1,390	88,089	82,700	5,389	6.5
Northwest	1,110	144,783	79,342	65,441	82.5
Delta	636	74,789	65,305	9,484	14.5
Intrastate					
Air Calif.	341	81,344[e]	48,239	33,105	68.6
Air Florida	268	49,002[f]	41,797	7,205	17.2
PSA	318	77,208	46,342	30,866	66.6
Southwest	284	94,456	43,319	51,137	118.0
Regional					
East. Prov.	444	45,757	55,928	-10,171	-18.2
Nordair	1,067	84,099	77,433	6,666	8.6
Pac. Western	383	58,384	51,989	6,395	12.3
Quebecair	771	79,054	70,062	8,992	12.8
Transair	707	59,795	67,951	-8,156	-12.0
Local Service					
Allegheny	323	51,690	47,469	4,221	8.9
Frontier	406	50,976	53,544	-2,568	-4.8
N. Central	253	41,081	41,150	-69	-0.2
Southern	329	46,491	47,954	-1,463	-3.1

[a]Total system scheduled plus charter RTM divided by total system passengers yields distance in statute miles.

[b]Calculated from data for the federally-regulated airlines (excluding Northwest) using the equation: $Y = X/(.004 + .000009X)$, $R^2 = .837$.

[c]Actual RTM per employee minus trend values.

[d]Deviation percent of trend value.

[e]1977-78 average.

[f]1978 only.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 16.

Figure 6-1 also shows that both Air Canada and CP Air, plus two of the five Canadian regional carriers, fell somewhat below the trend line. It happens that the three Canadian carriers lying above the trend line, Quebecair, Nordair and Pacific Western, all operated more than half of their total system RTM in charter services during these years (72.3, 64.1 and 51.9 percent respectively), while Air Canada and CP Air operated only 5.1 and 7.3 percent of their total RTM in charter services (see Table 5-2). From this one might conclude that high labour productivity results from large charter operations, but it should not be forgotten that the two Canadian carriers with relatively low labour productivity (Eastern Provincial and Transair) also operated relatively large charter services (23.5 and 46.8 percent of total RTM). Thus, the evidence about the effects of charter operations on labour productivity is inconclusive, especially when it is recognized that the Canadian carriers' deviations from the trend line were small relative to those of the three largest intrastate carriers and Northwest, none of which had large shares of charter services.

Figure 6-1 also implies that larger aircraft do not necessarily yield appreciably lower average costs than small aircraft. Of course, there is a positive relationship between distance and aircraft size, with long-haul services being provided with relatively large aircraft at any point in time, and the upward sloping trend line in Figure 6-1 may reflect the effects of both distance and aircraft size. However, Air California, PSA and Southwest operated relatively small aircraft during 1975-78, yet they had high outputs per employee even without adjusting for distance.[5] Also, with virtually the same average passenger trip length, Nordair had appreciably higher RTM per employee than did Air Canada even though, on average, its aircraft were smaller.[6] Of course, what these data do not tell is whether still greater

RTM per employee might have been produced with large aircraft operated by small airlines that were not constrained within very limited geographic areas or by restrictive operating rights as were the intrastate carriers and Nordair during 1975-78. Current developments in the U.S., where small airlines such as Capitol International and World are being allowed to operate long-haul scheduled services with large aircraft, may provide better information on the relationship between aircraft size and productivity during the next few years.

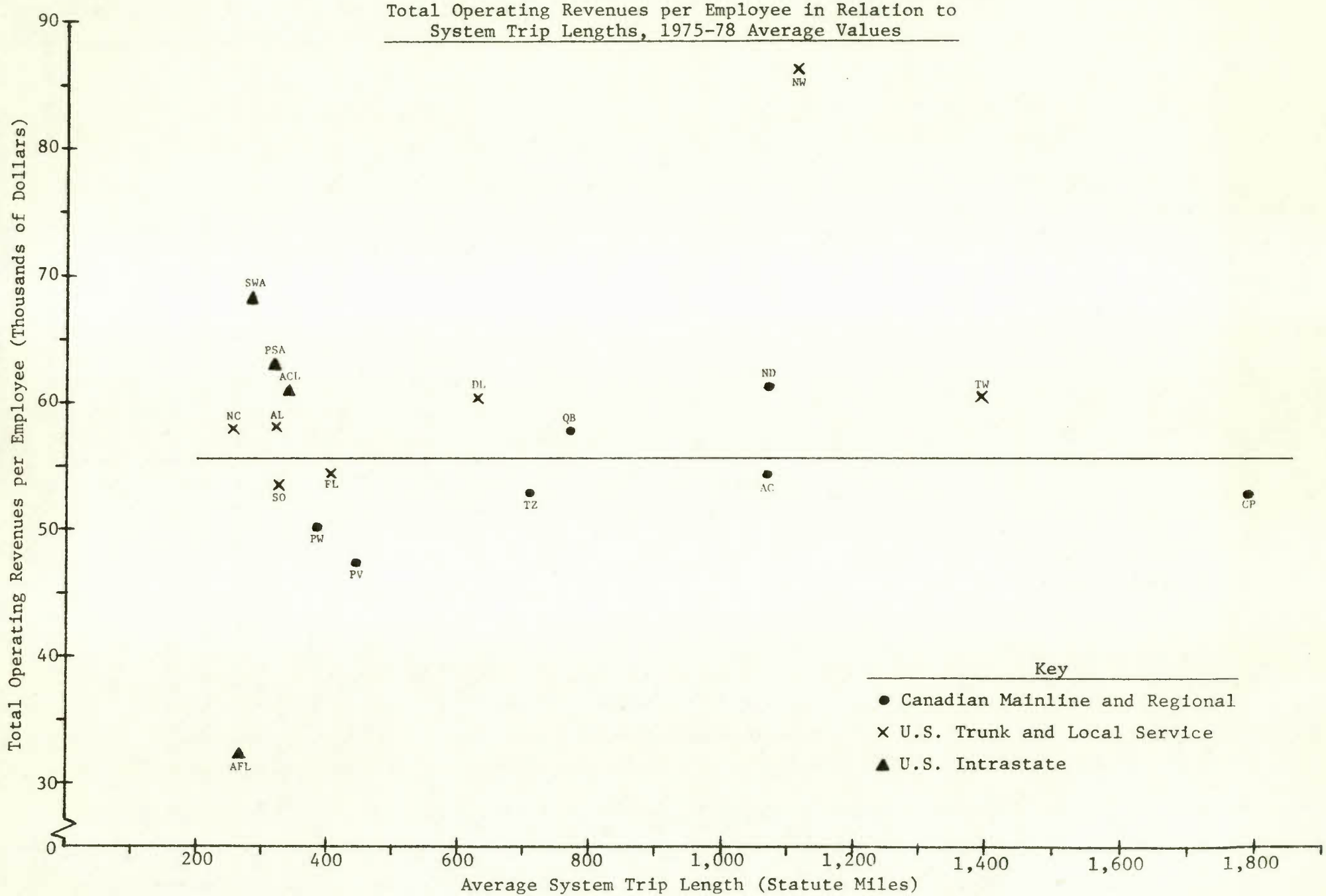
Overall, this section demonstrates that the federally-regulated Canadian and U.S. airlines (except Northwest) were very similar in their production of RTM per employee during 1975-78, and that the three largest intrastate carriers plus Northwest had labour productivity 66.6 to 118.0 percent higher than the trend values of these other airlines. Certainly a portion of the intrastate carriers' lower operating expenses per RTM can be attributed to their higher labour productivity, but the question remains as to why they (and Northwest) were able to be so successful in this important aspect of operating costs.

Operating Revenues per Employee

Figure 6-2 and Table 6-3 indicate average employee productivity measured in terms of total operating revenues for 1975-78, net of outside maintenance expenses.[7] Figure 6-2 shows that distance had no discernible effect on total operating revenues per employee. Clearly, the higher yields of the short-haul regional and local service carriers offset their lower physical outputs, while the opposite was true for the mainline and trunk carriers with their higher RTM per employee being balanced by their lower yields for longer trip lengths. The best-fit trend line for the federally-regulated airlines (excluding Northwest) is a straight line fitted to the logarithms of the variables. The R^2 for even this regression, however, is only .052, so there is no statistically significant relationship between total operating revenues per employee and

Figure 6-2

Total Operating Revenues per Employee in Relation to System Trip Lengths, 1975-78 Average Values



Source: Table 6-3.

Table 6-3

Total System Operating Revenues per Employee[a] and System Trip Lengths
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	1975-78 Average					
	System Trip Length[b]	Outside Maint. Exp./Emp.	Total System Op. Revenues per Employee[a] (Can. & U.S. $)		Deviation	
			Actual	Trend[c]	Rev./Emp.[d]	Percent[e]
Mainline						
Air Canada	1,064	$ 366	$54,341	$55,500	$ -1,159	-2.1%
CP Air	1,789	735	52,638	55,500	-2,862	-5.2
Trunk						
Trans World	1,390	349	60,514	55,500	5,014	9.0
Northwest	1,110	800	86,346	55,500	30,846	55.6
Delta	636	181	60,236	55,500	4,736	8.5
Intrastate						
Air Calif.	341	n.a.[f]	61,292[f]	55,500	5,792[f]	10.4[f]
Air Florida	268	1,513[g]	32,375[g]	55,500	-23,125	-41.7
PSA	318	0[h]	63,011[h]	55,500	7,511	13.5
Southwest	284	2,531	68,282	55,500	12,782	23.0
Regional						
East. Prov.	444	995	47,431	55,500	-8,069	-14.5
Nordair	1,067	2,859	61,335	55,500	5,835	10.5
Pac. Western	383	758	50,043	55,500	-5,457	-9.8
Quebecair	771	3,902	57,799	55,500	2,299	4.1
Transair	707	1,169	52,892	55,500	-2,608	-4.7
Local Service						
Allegheny	323	1,570	58,113	55,500	2,613	4.7
Frontier	406	2,037	54,169	55,500	-1,331	-2.4
N. Central	253	1,400	57,709	55,500	2,209	4.0
Southern	329	1,893	53,438	55,500	-2,062	-3.7

[a]Net of outside maintenance expenses.

[b]Total system scheduled plus charter RPM divided by total system passengers yields distance in statute miles.

[c]No statistically significant relationship could be found between operating revenues per employee and system trip lengths. The simple average of revenues per employee for the federally-regulated airlines (excluding Northwest) was $55,435.

[d]Actual operating expenses per employee minus trend values.

[e]Deviation percent of trend values.

[f]Outside maintenance expenses were not available. Therefore, the actual value is gross operating revenues per employee.

[g]Fiscal years 1975-78.

[h]No adjustment was required since Pacific Southwest Airmotive's revenues and employees are included in the actual value.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 17.

passenger trip length.[8] Indeed, a horizontal line at around $55,500 adequately represents the federally-regulated airlines' total operating revenues per employee (net of outside maintenance expenses) averaged for the years 1975-78. This constant value will be used as the trend line in the following analysis.

As was the case for RTM per employee, Quebecair and Nordair lie above the trend line, while Air Canada, CP Air, Eastern Provincial and Transair continue to lie below it. Pacific Western's position changed from above the trend line for RTM per employee to below the horizontal trend line for total operating revenues per employee. This brings five of the seven Canadian carriers below the average (even though their transborder and international revenues were measured in Canadian dollars), while five of the seven U.S. carriers were above the average. Thus, the intercountry similarities were less for operating revenues than for RTM per employee, but the differences were still not large.

While the regional and local service carriers' outputs per employee were raised by using operating revenues as the output measure, those for the short-haul U.S. intrastate carriers were lowered by their low yields per passenger mile. The combination of low RTM per employee and somewhat lower yields resulted in Air Florida having the lowest operating revenues per employee among all 18 carriers. In contrast, Air California, PSA and Southwest still had operating revenues per employee that were 10.4 to 23.0 percent above the average for the federally-regulated airlines (excluding Northwest). These percentage deviations were equal to or above all the federally-regulated airlines except for Northwest's 55.6 percent deviation, and they provide one indication of why these intrastate carriers were able to be as profitable as the federally-regulated airlines while offering much lower fares to short-haul passengers. Their much greater physical outputs per employee played an

important role in making up for the effects of their low fares.

Labour Productivity by Employee Category

Total employment data are available for six major categories -- pilots and copilots, other flight personnel, maintenance labour, aircraft and traffic servicing, general management, and other employees. However, because of apparent differences in criteria used by three of the Canadian regional carriers in allocating personnel between the general management and the other employees categories, it has been necessary to combine these two categories to provide consistent data for all carriers. This reduces the number of categories from six to five. The RTM per employee for each of these five categories are given in Table 6-4.

Best-fit trend lines were calculated from the data in Table 6-4 for each employee category, and Table 6-5 summarizes the percentage deviations of the actual values from the trend values for each category. The consistently superior performances of Northwest, PSA and Southwest are evident from the large positive percentages by which their actual values deviated from the trend values for every employee category. The large positive total employee percentage for Air California implies that it too shared in this consistently superior performance, but lack of information regarding the allocation of its employees by category prevents this from being verified. The remaining 14 carriers had both positive and negative deviations, with no consistent pattern differentiating Canadian from U.S. carriers.

The single employee category whose deviations were most closely related with total employee productivity was the general management and other employees category. For both Canadian and U.S. carriers, the deviation for total employee productivity tended to have the same sign as that for the general management and other employees category. The only exceptions were Air Florida

Table 6-4

Total System RTM per Employee by Employee Category[a]
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	Total System RTM per Employee, 1975-78 Average				
	Pilots & Copilots	Oth. Flt. Personnel[b]	Maint. Labour	A/C & Tra. Servicing	Gen. Mgt. & Other
Mainline					
Air Canada	996,251	419,976	475,819	198,390	259,485
CP Air	1,089,270	558,849	521,327	315,455	215,339
Trunk					
Trans World	877,478	489,991	508,188	260,419	362,238
Northwest	1,146,353	523,327	1,326,322	353,976	844,242
Delta	722,688	435,799	615,618	146,332	659,208
Intrastate					
Air Calif.	n.a.	n.a.	n.a.	n.a.	n.a.
Air Florida[c]	466,467	327,967	574,029	109,787	233,616
PSA	594,323	447,647	515,103	189,154	542,165
Southwest	895,263	564,027	1,001,233	183,885	781,217
Regional					
East. Prov.	435,793	264,784	153,989	154,764	311,407
Nordair	572,610	462,560	430,280	333,120	328,012
Pac. Western	484,546	332,778	275,473	158,858	322,068
Quebecair	530,815	431,298	473,942	282,621	328,031
Transair	456,936	401,000	269,667	296,926	190,390
Local Service					
Allegheny	436,658	422,479	362,426	110,078	327,954
Frontier	372,319	445,009	299,116	128,017	268,207
N. Central	301,277	327,567	285,139	94,650	239,606
Southern	367,531	404,249	498,921	104,750	202,544

n.a. -- not available.

[a]Definitions of these categories are given in Appendices I.1 and I.2 of the source publication.

[b]These data are passenger RTM per employee since cabin attendants do not contribute to producing cargo output. All other data are based on total (passenger plus cargo) RTM per employee.

[c]1978 only.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 18.

Table 6-5

Deviations of Actual RTM per Employee from Trend Values by Employee Category[a]
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	Percentage Deviations, Actual RTM per Employee from Trend					
	Pilots & Copilots[b]	Oth. Flt. Personnel[c]	Maint. Labour[d]	A/C & Tra. Servicing[e]	Gen. Mgt. & Other[f]	Total Employees[g]
Mainline						
Air Canada	26.5%	-9.1%	6.5%	-28.5%	-7.2%	-6.7%
CP Air	-0.2	0.5	-6.2	3.1	-23.0	-5.0
Trunk						
Trans World	-5.8	-2.8	2.5	-11.4	29.6	6.5
Northwest	41.8	11.8	192.2	26.2	201.9	82.5
Delta	26.7	7.2	60.8	-36.4	135.8	14.5
Intrastate						
Air Calif.	n.a.	n.a.	n.a.	n.a.	n.a.	68.6
Air Florida[h]	41.1	-8.6	75.2	62.0	-16.4	17.2
PSA	61.5	22.6	53.7	69.1	93.9	66.6
Southwest	161.1	56.3	203.4	120.0	179.4	118.0
Regional						
East. Prov.	-4.3	-30.6	-56.5	-13.5	11.4	-18.2
Nordair	-27.4	0.0	-3.8	20.0	17.3	8.6
Pac. Western	16.8	-10.9	-20.1	4.6	15.8	12.3
Quebecair	-17.5	1.7	17.6	12.8	17.3	12.8
Transair	-25.0	-3.5	-31.5	22.8	-31.9	-12.0
Local Service						
Allegheny	17.2	15.5	7.9	-4.7	17.3	8.9
Frontier	-13.5	18.1	-14.1	-21.5	-4.1	-4.8
N. Central	-5.8	-8.2	-12.4	85.1	-14.3	-0.2
Southern	-2.5	10.2	48.2	-12.5	-27.6	-3.1

n.a. -- not available.

[a]Definitions of these categories are given in Appendices I.1 and I.2 of the source publication.

[b]Trend line calculated from data for the federally-regulated airlines using the equation: $Y = 9{,}929.343X^{.627}$, $R^2 = .783$.

[c]Trend line calculated from passenger RTM per employee data for the federally-regulated airlines using the equation: $Y = 324{,}017 + 129.631X$, $R^2 = .597$.

[d]Trend line calculated from data for the federally-regulated airlines (excluding Northwest) using the equation: $Y = 287{,}378 + 149.967X$, $R^2 = .281$.

[e]Trend line calculated from data for the federally-regulated airlines using the equation: $Y = 348{,}096 - 75{,}126{,}520/X$, $R^2 = .726$

[f]Trend line calculated as the simple average of the data for the federally-regulated airlines (excluding Delta and Northwest) = 279,600. No statistically significant relationship found was between RTM per general management and other employee, and passenger trip length.

[g]See note b, Table 6-2.

[h]1978 only.

Sources: Calculated from data in Tables 6-2 and 6-4.

and Eastern Provincial. Thus, for almost all North American carriers studied, high employee productivity among white collar employees was associated with relatively high total employee productivity, regardless of geographic location.

Summary

Since labour is the input generally comprising the largest single share of total airline operating expenses, low average costs should be associated with high labour productivity. This chapter demonstrates that this was indeed the case for Air California, PSA and Southwest, as well as for Northwest. After accounting for the effects of distance, these carriers' total operating expenses per RTM ranges from 19.2 to 52.8 percent below the trend line for the federally-regulated airlines (see Table 4-1), while their RTM per employee ranged from 66.6 to 118.0 percent above the equivalent trend line (calculated without Northwest) specified in Table 6-2. The low fares-per-mile of the three largest intrastate carriers resulted in their total operating revenues per employee being "only" 10.4 to 23.0 percent above the average of the federally-regulated airlines, but it can be seen in Table 6-3 that this was still very good performance. Such high employee productivity is clearly one reason why these three intrastate carriers could achieve equal or superior profitability while offering low fares to their passengers.

The productivity comparisons also show similarities among the federally-regulated airlines (excluding Northwest) regardless of nationality. Among

the Canadian carriers, Nordair and Quebecair had above-average employee productivity under both measures, while Air Canada, CP Air, Eastern Provincial and Transair were below average. Pacific Western, at the same time, had above average employee productivity in terms of RTM, but was below average in terms of total operating revenues. A similar mix of above and below average performances existed for the U.S. federally-regulated airlines, with Trans World, Delta and Allegheny being somewhat superior in both measures, with Frontier and Southern being consistently below average, and with North Central deviating both above and below its two trend values.

The employee productivity data also cast further doubt about the existence of significant economies of scale in the airline industry due to firm size. First, Table 5-1 shows that the intrastate carriers were small by any measure, and even Northwest was not large in relation to Trans World and Delta, while being only somewhat larger than Air Canada. Yet, Air California, PSA, Southwest and Northwest all had much higher employee productivity, after adjusting for the effects of distance, than Air Canada, Delta and Trans World. Indeed, their employee productivity was equal or superior to that of these carriers irrespective of distance. Second, the existence of economies of scale is also challenged by the fact that Nordair had greater output per employee than Air Canada (at roughly the same average trip length), and that Nordair, Quebecair and, for RTM, Pacific Western all held roughly the same positions relative to the trend line as Delta and Trans World. None of these would be the case if firm size were an important factor in decreasing average costs, thereby yielding economies of scale.

Footnotes

1. Additional information regarding the limitations of the various output measures is given in W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Chapter VI.

2. A more accurate measure of employee input would be total hours worked per year rather than average number of employees. Such information is not submitted to the CAB or Statistics Canada by the airlines. Indirect evidence, however, indicates that the differences in hours worked per week are not large.

3. Based on the lowest mean squared error, the best fit was obtained from the following equation: $Y = X/(.004 + .000009X)$. The associated R^2 of .837 is significant at the one percent level (see footnote 3, Chapter 4).

4. CAB, Productivity and Cost of Employment, System Trunks, Calendar Years 1974 and 1975 (September 1976), p. 11.

5. Air California operated Boeing 737s and a few Lockheed Electras during 1975-78. PSA operated mainly Boeing 727s and 737s, with a few Electras and, during just the first quarter of 1975, two Lockheed L-1011s. Southwest operated only Boeing 737-200s during these years. Air California, PSA, and Southwest, Annual Reports (1975-78). Also, PSA, "First Quarter Report" (Ending March 31, 1975).

6. During this period Nordair operated FH-227, Electra, B-737-200 and DC-8-61F aircraft, plus several smaller aircraft which it phased out of service. Air Canada, in contrast, operated DC-9s, B-727s, DC-8s of various models (including DC-8-61s), L-1011s and B-747s. SC(ASC), Fleet Report, Inventory of Commercial Aircraft in Canada (July 15, 1975 and October 15, 1978), Part 2.

7. In order to prevent overstating the employee productivity of airlines having substantial portions of their maintenance done by other firms, their actual operating revenues were reduced by the amounts spent on such outside maintenance during 1975-78. This served to reduce the numerator of the operating revenues per employee calculation by about the same relative amount the employee denominator was reduced because of the purchase of outside maintenance services.

8. Based on the lowest mean squared error, the best fit was obtained from the following equation: $\text{Log } Y = \text{Log } 45{,}925.441 + .029 \text{ Log } X$. The associated R^2 of .052 is not significant at the five percent level (see footnote 3, Chapter 4).

7. Labour Payments

A carrier having low labour productivity can still have average employee costs per RTM if its payments for labour are low enough to counterbalance the poor productivity. Similarly, the advantages of high employee productivity can be lost by high employee payments or, conversely, can be made even greater if payments are low. This chapter will first compare the Canadian and U.S. carriers on the basis of their annual payments per employee and, then, combining both productivity and payments, on the basis of employee payments per RTM.

Average Annual Payments per Employee

There are three general types of payments to employees. The first and largest is salaries and wages. The second covers payments for fringe benefits such as insurance, pensions and other welfare plans, including payroll taxes for benefits supplied through governments. The third consists of personnel expenses covering reimbursements to employees for personal expenses incurred in the course of their work -- with food, lodging and travel expenses for flight personnel accounting for 56 to 89 percent of this item.[1]

Table 7-1 shows that total salaries and wages per employee paid in 1978 were somewhat higher among the federally-regulated airlines in the United States than in Canada.[2] Except for Southern, the U.S. trunk and local service carriers' total salaries and wages were virtually indistinguishable, ranging from $22,124 to $23,862 with considerable overlap among the two carrier groups. There was also much overlap in Canada, with most carriers paying around $20,000 per employee (assuming Pacific Western's fringe benefits were over $1,200), but with Eastern Provincial and Transair paying $2,000 or $3,000 less than

Table 7-1

Average Annual Payments to Employees by Category
Canadian Mainline, Regional and Selected U.S. Carriers, 1978

Carrier	Average Annual Payments per Employee (Canadian or U.S. Dollars)										
	Salaries and Wages							Benefits and Expenses			
	Pilots & Copilots	Other Flight Pers.	Maint. Labour	A/C & Traffic Serv.	General Mgt.	Other Employ.	Total	Ins.- Employ. Welfare	Pers. Expense	Total	Grand Total
Mainline											
Air Canada	42,087	16,423	19,685	17,882	51,807	19,884	20,454	4,551	1,455	6,006	26,460
CP Air	42,613	18,377	18,921	17,824	35,064	17,846	20,146	2,401	1,613	4,014	24,160
Mean	42,350	17,400	19,303	17,853	43,436	18,865	20,300	3,476	1,534	5,010	25,310
Trunk											
Trans World	51,093	15,779	21,195	18,781	141,132	26,479[a]	23,862	5,288	1,451	6,739	30,601
Northwest	58,229	15,442	21,431	17,807	61,660	17,815[a]	22,474	6,316	1,642	7,958	30,432
Delta	51,644	16,173	18,428	19,589	111,166	27,096	23,097	4,283	1,065	5,348	28,445
Mean	53,655	15,798	20,351	18,726	104,653	23,797	23,144	5,296	1,386	6,682	29,826
Intrastate											
Air Calif.[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	18,806	3,574	852	4,426	23,232
Air Florida[c]	25,753	8,671	21,987	6,871	34,791	4,509	11,460	1,507	646	2,153	13,613
PSA	36,224	11,061	17,112	15,849	74,362[d]	16,415[d]	18,193	3,823	1,093	4,916	23,109
Southwest	32,022	9,787	20,576	11,822	33,543	12,576	15,073	3,577[e]	650	4,227	19,300
Mean	31,333	9,840	19,892	11,514	47,565	11,167	15,883	3,120	810	3,930	19,813
Regional											
East. Prov.	34,761	12,852	17,933	15,719	26,138	13,916	17,990	1,075	1,428	2,503	20,493
Nordair	36,734	13,191	21,242	17,721	36,730	13,502	20,221	3,584	2,519	6,103	26,324
Pac. Western	44,500	17,312	19,664	17,956	19,056[f]	26,356[f]	21,545[g]	n.a.[g]	1,183	n.a.[g]	22,728
Quebecair	35,369	12,918	22,004	17,483	21,553[f]	6,011[f]	19,205	1,215	1,384	2,599	21,804
Transair	33,114	15,269	19,438	13,153	15,285[f]	9,632[f]	17,007	1,920	942	2,862	19,868
Mean	36,896	14,308	20,056	16,406	23,752	13,883	19,194	1,948[h]	1,491	3,517[h]	22,243[h]
Local Service											
Allegheny	50,208	16,136	20,863	18,653	70,057	21,291[a]	23,051	4,382	1,134	5,516	28,567
Frontier	37,231	12,519	13,245	24,355	51,958	17,876	22,124	4,442	1,116	5,558	27,682
N. Central	45,726	14,132	16,566	21,936	96,793	19,192	23,262	4,477	1,139	5,616	28,878
Southern	41,283	12,973	17,624	17,034	50,609	17,466	20,203	3,439	973	4,412	24,615
Mean	43,612	13,940	17,074	20,494	67,354	18,956	22,160	4,185	1,090	5,275	27,435

n.a. -- not available.

[a]Excludes the following hotel, restaurant and food service personnel whose wage data were not reported to the CAB: Trans World = 1,473, Northwest = 318, and Allegheny = 18.

[b]All figures were partially estimated from actual data for 1977 and the first ten months of 1978, and from estimated data for the last two months of 1978 and all of 1979. Employee data by category were not available.

[c]Payments to employees for the year ended July 31, 1978 divided by the average number of employees for calendar years 1977 and 1978.

[d]General management average annual payments calculated from the salaries of 15 corporate officers. The remaining three general management employees were included in the other employees category. Ten restaurant and food service personnel excluded from other employees to be consistent with CAB practice.

[e]Includes $2,297 per employee paid in accordance with Southwest's profit sharing plan.

[f]Pacific Western, Quebecair and Transair appear to have substantially different definitions for their general management and other employees categories. The average annual payments for the combined general management and other employees categories were fairly consistent as follows: Eastern Provincial = $16,260, Nordair = $16,877, Pacific Western = $19,196 (including benefits), Quebecair = $14,864, and Transair = $12,062.

[g]Pacific Western does not report payments for insurance-employee welfare. Apparently such payments are included in salaries and wages.

[h]Excludes Pacific Western. Therefore, total benefits and expenses, and grand total payments do not equal the sum of their parts.

Sources: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 20.

the others. The four U.S. intrastate carriers' total salaries and wages were all lower than those of the federally-regulated U.S. airlines (ranging from $11,460 for Air Florida to $18,806 for Air California), and were equal to or less than those of the lowest paying Canadian regional carriers. This implies that U.S. airline salaries and wages would be lower in the absence of federal regulation and, since federally-regulated airlines in Canada paid somewhat less than their U.S. counterparts, that salaries and wages would also be lower in Canada if federal regulation were eliminated.

With regards to fringe benefits (insurance-employee welfare payments), the U.S. federally-regulated airlines also generally paid more than Canadian carriers (between $3,439 and $6,316 as opposed to $1,075 to $4,551). There were two exceptions. Air Canada's $4,551 was higher than Delta's $4,283, and Nordair's $3,584 exceeded Southern's $3,439 (note that the two U.S. carriers based in the South had lower fringe benefits, but not necessarily lower salaries and wages). Overall, there tended to be more variance in fringe benefits than in salaries and wages, indicating that considerable latitude exists for bargaining or corporate decisions to affect this factor and the resulting allocation of grand total employee compensation among the three types of payments.

Again, the U.S. intrastate carriers' payments for fringe benefits were lower than those of the U.S. federally-regulated airlines, except for Southern, but the differences were not large. Only Air Florida had low fringe benefits ($1,507) that were comparable to those of most of the Canadian regional carriers. It is relevant to point out, however, that two-thirds of Southwest's fringe benefits were paid as part of a profit-sharing plan designed to promote employee productivity.

Table 7-1, when used in conjunction with Table 5-1, shows that personnel expenses are quite homogeneous regardless of nationality within each of two groups of carriers. Those Canadian and U.S. carriers having substantial international and transborder operations (Air Canada, CP Air, Trans World, Northwest, Nordair and Quebecair) all had relatively high personnel expenses (between $1,384 and $2,519), while expenses were lower for most of the carriers whose operations were largely domestic (ranging from $646 to $1,183). Eastern Provincial was the only exception to this dichotomy, with rather high personnel expenses ($1,428) despite its substantial domestic operations.[3]

Combining the three major payment categories yields grand total employee payments, and Table 7-1 shows that a consistent pattern existed among the airlines during 1978 in these overall payments. Using simple averages (means), it can be seen that the U.S. trunk carriers had the highest annual payments per employee at around $30,000. They were followed by the U.S. local service carriers at about $27,500, the Canadian mainline carriers at an average of $25,000 and the Canadian regional carriers with an average of just over $22,000. The U.S. intrastate carriers had a wide range due to the very low average payment by Air Florida ($13,600), but the average payments of the three largest (and oldest) of these carriers were roughly similar to the Canadian regional carriers at around $22,000 a year. Thus, in general, the U.S. local service carriers' payments were about eight percent lower than the trunk carriers and the intrastate carriers were more than 25 percent lower. At the same time, the Canadian regional carriers paid about 12 percent less than the mainline carriers. On an intercountry comparison, the Canadian mainline carriers paid around 15 percent less than the U.S. trunk carriers, and the regional carriers paid around 19 percent less than the local service carriers, on average.[4]

Given the substantial similarities in salaries and wages among the federally-regulated airlines of each country, it follows that many of the differences between carrier groups and between carriers within a group can be attributed to the fringe benefit and personnel expense categories. Actually, since the absolute differences in personnel expenses did not exceed $1,000 (except for Nordair[5]), most of the differences can be attributed to the fringe benefit category. For example, the difference between the mean salaries and wages of the U.S. trunk and local service carriers was $984, compared with a difference of $1,111 in fringe benefits and a $296 difference

in personnel expenses. Similarly, almost identical salaries and wages for Air Canada and CP Air did not result in equal grand total payments because Air Canada's fringe benefits were $2,150 higher than CP Air's. While this $2,150 difference may not seem unduly large, multiplying it by 20,459 employees yields $44.0 million, or about 8.1 percent of Air Canada's total employee costs and 52 percent of its $84.1 million income before taxes (profit) in 1978.[6]

Employee Payments per RTM

Dividing total annual payments to all employees by total system RTM yields employee payments per RTM, which reflects both labour productivity and the price of labour. These calculations for 1978 are given in Table 7-2 for grand total payments per employee, and are plotted against 1978 average system passenger trip lengths in Figure 7-1. This table and figure show that a close relationship existed between grand total payments per RTM and distance among the federally-regulated airlines (excluding Northwest), with an R^2 of .865.[7]

The combination of high employee payments and varying RTM per employee resulted in the Canadian mainline and U.S. trunk carriers having mixed performance in terms of employee payments per RTM. Air Canada, CP Air and Trans World had higher than average employee payments per RTM, lying 2.8 to 18.3 percent above the distance-related trend line, while Delta and Northwest were 2.0 and 25.8 percent below the line. Clearly, Northwest's outstanding performance in RTM per employee (Table 6-2) more than counterbalanced its high average employee payments (Table 7-1), while Delta's more modest advantage in RTM per employee was supported by its employee payments being somewhat lower than those of the other two trunk carriers. Trans World's slightly above average RTM per employee could not offset its paying the highest

Table 7-2

Grand Total Employee Payments per RTM and System Trip Lengths
Canadian Mainline, Regional and Selected U.S. Carriers, 1978

Carrier	Length[a]	Grand Total Employee Payments per RTM[b] (Canadian or U.S. Cents) Actual	Trend[c]	% Deviation[d]
Mainline				
Air Canada	1,116	33.6¢	28.4¢	18.3%
CP Air	1,797	25.7	25.0	2.8
Trunk				
Trans World	1,400	30.9	26.6	16.2
Northwest	1,088	21.3	28.7	-25.8
Delta	652	34.2	34.9	-2.0
Intrastate				
Air Calif.	334	30.0	49.8	-39.8
Air Florida[e]	291	28.5	54.3	-47.5
PSA	320	31.3	51.2	-38.9
Southwest	297	18.7	53.6	-65.1
Regional				
East. Prov.	409	41.5	44.2	-6.1
Nordair	1,092	27.4	28.6	-4.2
Pac. Western	406	38.7	44.4	-12.8
Quebecair	806	25.4	31.9	-20.4
Transair	701	29.8	33.8	-11.8
Local Service				
Allegheny	327	52.2	50.5	3.4
Frontier	430	49.5	43.0	15.1
N. Central	279	57.5	55.9	2.9
Southern	340	50.1	49.3	1.6

[a]Total system scheduled plus charter RPM for 1978 divided by total system passengers yields distance in statute miles.

[b]Salaries and wages, fringe benefits and personnel expenses.

[c]Calculated from data for the federally-regulated airlines (excluding Northwest) using the equation: $Y = 19.272 + 10{,}205.857/X$, $R^2 = .865$.

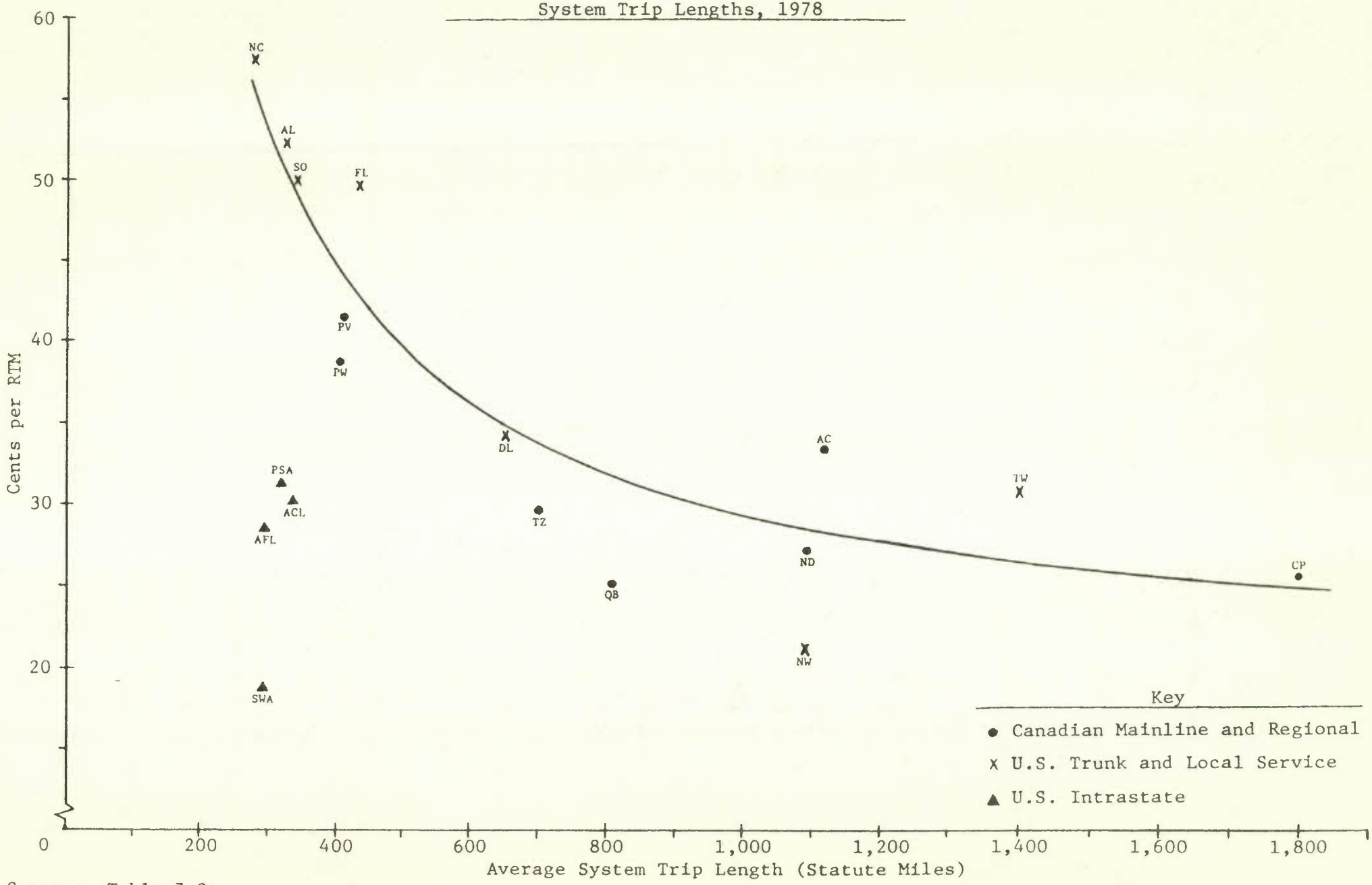
[d]Actual percent deviation from trend value.

[e]Payments for the year ended July 31, 1978, divided by the mean RTM for 1977 and 1978.

Sources: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 22.

Figure 7-1

Employee Payments per RTM in Relation to System Trip Lengths, 1978



Source: Table 7-2.

average rates to its employees, while the lower payments of Air Canada and CP Air did not offset their below average RTM per employee.

The Canadian regional carriers' generally lower average employee payments (except for Nordair) and mixed RTM per employee resulted in their all having below average employee expenses per RTM, ranging from -4.2 percent (Nordair) to -20.4 percent (Quebecair) below the trend line. Appreciably different performance characterized the U.S. local service carriers whose high average employee payments and roughly normal RTM per employee placed them all above the trend line (from 1.6 percent for Southern to 15.1 percent for Frontier).

An intercountry comparison shows that two of the Canadian carriers were above the trend line and five were below, while just the opposite was the case for the federally-regulated U.S. carriers -- five above and two below the line. The pattern is not fully consistent, but the tendency was for the lower average payments per employee of the Canadian carriers to yield somewhat below average payments per RTM, while the higher payments per employee of the U.S. carriers tended to bring them above the line (with Northwest being the notable exception and Delta doing relatively well).

More significant, however, is the impressive performances of the U.S. intrastate carriers. All four had much lower payments per RTM than the federally-regulated airlines due both to lower payments per employee and (except for Air Florida) much higher RTM per employee. Southwest was truly outstanding in this regard. Its grand total employee payments per RTM were -65.1 percent below the trend line, and were even 12 percent lower than Northwest's exceptional performance at a much greater distance. At the same time, Air California, Air Florida and PSA were -38.9 to -47.5 percent lower than the trend-line values for the federally-regulated airlines.

Overall, while there was variation among the federally-regulated airlines (related mainly to differences in average employee payments), they did tend to cluster around the distance-related trend line. In contrast, the U.S. intrastate carriers achieved substantially lower employee expenses per RTM, due both to lower average employee payments (especially for Air Florida) and to very high employee productivity. The fact that the intrastate carriers were -38.9 to -65.1 percent below the norm in an expense category that accounts for around 39 percent of total airline operated expenses goes a fair way in explaining why they could be profitable while charging regular economy fares per mile as much as 50 percent lower than the federally-regulated airlines.

Summary

The grand total payments per employee of the federally-regulated Canadian airlines were lower than their U.S. counterparts -- about 15 percent for the mainline carriers relative to the U.S. trunk carriers, and around 19 percent for the regional carriers versus the U.S. local service carriers.[8] At the same time, the U.S. intrastate carriers (except Air Florida) were roughly equal to the Canadian regional carriers. The differences were largely found in salaries and wages and in fringe benefits. With regards to personnel expenses, the key factor appears to be whether or not operations were primarily domestic. If so, personnel expenses were low. If there were substantial international and transborder operations, however, personnel expenses were high, regardless of whether the carrier was Canadian or U.S.

The intercountry employee payment differences were also reflected in the payments per RTM, but they were partially offset by differences in labour productivity. The regional carriers' low payments per employee

(except for Nordair) resulted in their having below average grand total employee payments per RTM, while Air Canada and CP Air's somewhat lower employee payments were more than counterbalanced by their low labour productivity so that they had above average payments per RTM. At the same time, the relatively high payments of U.S. trunk and local service carriers resulted in five out of these seven carriers lying somewhat above the trend line for the federally-regulated airlines (excluding Northwest). Overall, however, there was still a close relationship among the Canadian and U.S. federally-regulated airlines in general.

As before, the largest deviations from the trend line were those of the U.S. intrastate carriers, and their truly outstanding performance in terms of grand total employee payments per RTM serve to emphasize the fundamental similarity among the federally-regulated airlines. Table 7-2 shows that while these airlines' grand total employee payments per RTM ranged from Air Canada's 18.3 percent deviation above the trend line to Northwest's -25.8 percent deviation below it, the intrastate carriers all fell between -38.9 and -65.1 percent below the trend line. Indeed, their employee payments per RTM in short-haul operations were even equal to or lower than those of the federally-regulated airlines having average passenger trip lengths two to five times longer. They achieved their low employee payments per RTM by paying their employees lower salaries and somewhat lower personnel expenses (but not benefits), and by producing appreciably more RTM per employee. The former factor was the most important for Air Florida, while the latter played the dominant role for Air California, PSA and Southwest.

The remarkable similarity between the fares-per-mile data in Figure 2-1 and the grand total employee payments per RTM in Figure 7-1 have two important ramifications. First, they indicate how the U.S. intrastate carriers were able to achieve their low total operating expenses per RTM

(see Figure 4-1) which allowed them to be profitable while charging low fares per mile. Second, and most important from a policy viewpoint, the large differences in performance continue to be consistent with the hypothesis that similar types of regulation have similar affects on performance. This supports the implication that one way to change airline performance is to change the regulatory environment within which airlines operate.

Footnotes

1. Calculated from data in W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix J-3.

2. The time required to summarize the detailed employee payment data by the six employee categories for the 18 carriers made it infeasible to do so for more than one year. Because of stability in employee compensation, however, it seems unlikely that the relative values per employee for the various carriers in 1978 differed appreciably from their 1975-78 averages.

3. In a critique of the initial chapters of the technical report (supra note 1), Mr. J. J. Smith, then Assistant to the President of the Air Transport Association of Canada, stated that one reason the personnel expenses of the U.S. intrastate carriers (he specified PSA) are low is "simple aircraft routing" whereby "flight and cabin crews are home at night, reducing crew cycle expenses." J. J. Smith, "Comments on Initial Findings of Professor William A. Jordan," Economic Council of Canada, Professional Workshop on Regulation Research, McGill University (April 18, 1980), p. 2. Calculations using data from Appendices I and J of the technical report show that PSA's personnel expenses for flight and cabin crews were $3,032 per employee compared with $4,618 for Air Canada. This is consistent with Mr. Smith's statement, but further calculations show that Delta's personnel expenses per crew member were $3,542 for its large, mainly domestic system. The relatively small difference between PSA and Delta's personnel expenses per crew member implies that most of the difference between PSA and Air Canada is due to Air Canada's extensive international operations rather than to PSA's crews being home at night. The fact is, of course, that PSA (as well as Air Canada and all other larger airlines) overnight aircraft and crews away from their home bases in order to originate flights in both directions at popular morning hours. They incur personnel expenses accordingly and the size of these expenses for domestic operations is little affected by the crew being 300 miles or 3,000 miles from home.

4. Since the Canadian carriers' payments are measured in Canadian dollars, while the U.S. carriers' payments are in U.S. dollars, these inter-country comparisons may be somewhat understated. Applying a partial exchange rate adjustment of about seven percent to these 1978 data would result in the Canadian mainline carriers being about 21 percent below the U.S. trunk carriers in average employee payments, and the Canadian regional carriers being about 25 percent below the U.S. local service carriers. However, for reasons outlined in Appendix B, supra note 1, significant exchange rate adjustments do not appear to be warranted.

5. Nordair's high personnel expenses may be caused in part by long crew layovers due to low frequencies to some charter or some northern scheduled destinations.

6. Air Canada, Annual Report (1978), p. 4.

7. Based on the lowest mean squared error, the equation for the best-fit trend line is $Y = 19.272 + 10{,}205.857/X$. The associated R^2 of .865 is significant at the one percent level (see footnote 3, Chapter 4).

8. The Canadian carriers' total payments could be 21 to 25 percent lower than their U.S. counterparts if exchange rate adjustments are appropriate in these comparisons.

8. Fuel Prices

Fuel is a second major component of airline costs, one that has been increasing in importance since 1973.[1] As is true for all inputs, fuel can influence total operating expenses both by changes in prices and by the quantities utilized to produce given levels of output. This chapter will compare the Canadian and U.S. airlines in terms of the prices (including taxes) they pay for fuel. Then, the next chapter will compare them in terms of the outputs they achieve per unit of fuel input.

An idea of the importance of petroleum products relative to total system operating expenses is provided in Table 8-1 for the 18 carriers analyzed in this study. Table 8-1 lists the 1978 system operating expenses for fuel and oil plus, where available, the taxes paid in conjunction with the purchase of these products. Simple means and the medians for the 18 carriers show that petroleum products commonly accounted for just over 21 percent of total operating expenses. There was a fair degree of homogeneity among the carriers in that ten out of the 18 had percentage shares ranging between 20.0 and 23.0 percent. Of the remaining eight, the two intrastate carriers operating outside of California (Air Florida and Southwest) and the two Canadian regional carriers with extensive far northern routes (Nordair and Transair) had high petroleum shares ranging from 24.8 to 28.1 percent, while three U.S. local service carriers plus Air Canada had low petroleum shares of between 15.9 and 18.6 percent.[2]

The modern turbine engine is extremely efficient in its use of oil and, as can be seen in Table 8-1, oil comprised a minuscule portion of total petroleum costs in 1978. In only three cases (Southwest, Eastern Provincial and Pacific Western) did it account for as much as one-half of one percent of total petroleum expenses. Therefore, since fuel is the only significant

Table 8-1

Petroleum Shares of Total System Operating Expenses
Canadian Mainline, Regional and Selected U.S. Carriers, 1978

Carrier	System Operating Expenses (Thousands of Can. or U.S. $)					Petroleum % of Total Operating Expenses
	Petroleum				Total	
	Fuel	Oil	Taxes	Subtotal		
Mainline						
Air Canada	229,916	548	n.a.[a]	230,464	1,238,098	18.6
CP Air	39,638	151	n.a.[a]	89,789	421,985	21.3
Trunk						
Trans World	476,175	1,575	8,899	486,649	2,425,659	20.1
Northwest*[b]	155,887	581	3,091	159,559	726,424	22.0
Delta	416,192	1,555	8,940[c]	426,687	2,013,216	21.2
Intrastate						
Air Calif.	13,898[d]	n.a.	n.a.	n.a.[d]	63,868	21.8
Air Florida[e]	4,175	n.a.[f]	0	n.a.[f]	16,569	25.2[f]
PSA	44,026	191	2,163	46,380	215,683	21.5
Southwest	16,752	86	0	16,838	59,943	28.1
Regional						
East. Prov.	10,015	89	n.a.[a]	10,104	50,064	20.2
Nordair*	15,303	45	n.a.[a]	15,348	61,162	25.1
Pac. Western*	30,172	226	n.a.[a]	30,398	132,860	22.9
Quebecair*	16,565[g]	59[h]	n.a.[a]	16,624	72,311	23.0
Transair	10,032	22	n.a.[a]	10,054	40,542	24.8
Local Service						
Allegheny	94,709	460	1,504	96,673	532,590	18.1
Frontier	41,852	157	1,492	43,501	274,024	15.9
N. Central	43,012	n.a.[i]	1,219	44,231	263,748	16.8
Southern	35,597	124	1,113	36,834	180,808	20.4

n.a. -- not available.

*Service interrupted by a strike having a significant impact on operations.

[a]Non-refundable provincial and other fuel taxes are not reported separately by Canadian carriers but are included in total fuel and oil expenditures.

[b]See note c of Table 6-1.

[c]Estimated based on Delta's practice of using 2.14 percent of fuel and oil costs to derive taxes for budgetary purposes.

[d]Estimated from actual experience for the first ten months of 1978. Probably includes oil expenses, the five percent California sales tax and airport fees.

[e]Fiscal year ending July 31, 1978.

[f]Detailed audit working papers did not list any expenditures for oil products during FY 1978. Thus, oil is probably included in fuel expenditures.

[g]Includes $456,000 of aviation gasoline for piston aircraft.

[h]Includes $3,000 of other oil for piston aircraft.

[i]Starting in 1977, North Central reported oil and fuel as a combined expenditure. In both 1975 and 1976 reported oil expenditures were just over $39,000.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 23.

component of petroleum costs among airlines operating turbine-powered aircraft, the remainder of this chapter and the next will deal exclusively with fuel prices and utilization.

Intracountry Comparisons

The 18 carriers' domestic and system fuel prices (including taxes and fuel-related airport fees)[3] are presented in Table 8-2 for each year from 1975 to 1978. The prices are given in cents per litre to avoid any confusion between the Imperial gallon used in Canada and the smaller U.S. gallon.[4] In addition, the data are limited to turbine fuel used in turbojet and turboprop aircraft.[5] No allowance is made, however, for differences in the qualities of turbine fuel used by the various carriers. For example, between 1975 and 1976, Air Canada changed from using primarily grade B turbine fuel to the higher priced grade A-1 fuel.[6]

Looking first at the mean (weighted average) system fuel prices for each carrier group, it can be seen that there was a high degree of similarity among the U.S. groups. The average prices paid by the local service carriers were generally about one percent more than those paid by the trunk carriers

Table 8-2

Domestic and System Fuel Prices[a]
Canadian Mainline, Regional and Selected U.S. Carriers, 1975-78

Carrier	Turbine Fuel Prices[a] (Canadian or U.S. Cents per Litre)							
	Domestic[b]				System			
	1975	1976	1977	1978	1975	1976	1977	1978
Mainline								
Air Canada	8.409*	10.218*	11.625*	12.844*	8.932	10.239	11.645	12.888
CP Air	9.713*	10.855*	11.839*	13.329*	9.834	10.629	11.632	13.376
Mean[c]	8.739*	10.376*	11.678*	12.968*	9.176	10.343	11.642	13.022
Trunk								
Trans World	7.895	8.262	9.801	10.496	8.447	8.743	9.898	10.731
Northwest	8.190	8.612	9.895	10.501	8.441	8.871	9.985	10.713
Delta	7.656	8.295	9.569	10.293	7.706	8.327	9.594	10.309
Mean[c]	7.862	8.350	9.725	10.399	8.199	8.630	9.900	10.557
Intrastate								
Air Calif.	Same as System				n.a.	n.a.	n.a.	11.719[d]
Air Florida	" " "				n.a.	n.a.	n.a.	10.750[e]
PSA	" " "				8.177	8.898	10.195	10.854
Southwest	" " "				8.198	8.335	9.820	10.244
Mean[c]					8.180	8.813	10.114	10.684[f]
Regional								
East. Prov.	10.594*	11.458*	12.494*	13.305*	10.353	11.209	12.365	13.239
Nordair	11.357*	12.142*	13.963*	15.052*	11.075	11.703	13.364	14.559
Pac. Western	9.815*	10.886*	13.297*	14.828*	9.875	10.796	13.066	14.601
Quebecair	9.741*	11.018*	12.818*	14.110*	10.046	11.003	12.688	13.966
Transair	9.046*	10.534*	11.660*	13.423*	9.212	10.538	11.655	13.368
Mean[c]	10.063*	11.179*	12.990*	14.317*	10.095	11.042	12.783	14.128
Local Service								
Allegheny	Same as System				7.421	8.734	9.967	10.639
Frontier	" " "				7.810	8.886	9.958	10.898
N. Central	" " "				8.390	8.764	10.078	10.920
Southern	" " "				7.409	8.449	9.791	10.365
Mean[c]					7.653	8.718	9.957	10.697

*Estimated (see Appendix K of the source publication).

[a]Turbine fuel including taxes and fuel-related airport fees.

[b]Includes transborder operations for U.S. carriers.

[c]Weighted average (total fuel expenses divided by total litres purchased).

[d]Partially estimated. May be somewhat larger than actual.

[e]Fiscal year ended July 31, 1978.

[f]Excludes Air California and Air Florida.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 24.

(except for 1975 when the local service carriers' average was less than the average of the trunk carriers). During the same years, the intrastate carriers paid about two percent more than the trunk carriers. This similarity in prices, was, however, due in part to the effects of higher priced international fuel on the system prices of the trunk carriers. A comparison of the domestic fuel prices shows the local service carriers paid about three percent more than the trunk carriers, while the intrastate carriers paid about four percent higher prices. Overall, it seems fair to conclude that during these four years the differences in fuel prices paid by all three groups of U.S. carriers were small and, at most, could account for only a minor portion of differences in total operating expenses per RTM. Indeed, Figure 4-1 shows that the U.S. carriers having the lowest total operating expenses per RTM, after adjusting for distance, were the intrastate carriers plus Northwest. Since these were among those who paid slightly higher fuel prices it follows that fuel prices were not a factor in their favourable cost performance.

The same similarity in fuel prices did not exist between the two groups of Canadian carriers. The means for the regional carriers' system fuel prices were from 6.8 to 10.0 percent higher than those of the mainline carriers, and there was also considerable variation within each of the two groups. CP Air, for example, paid up to 10 percent more for fuel than Air Canada (in 1975), while Nordair generally had the highest fuel prices among the regional carriers, followed by Eastern Provincial (1975-76) or Pacific Western (in 1977, with virtual equality in 1978). The differences were even greater for estimated domestic fuel prices. These data indicate that mean domestic fuel prices paid by the regional carriers ranged between 7.7

to 15.1 percent higher than the prices paid by the mainline carriers. These larger differences may reflect the higher prices paid by several of the regional carriers for fuel at remote points in the far north. Regardless of the reasons, however, fuel price differences of up to 15 percent are large enough to account for some of the differences in total operating expenses per RTM among Canadian carriers. But, there is again the inconsistency that carriers paying higher fuel prices (CP Air, Nordair, and Pacific Western) had lower total operating expenses per RTM (after adjusting for distance) than Air Canada, the carrier with the lowest system fuel prices (see Table 4-1).

Intercountry Comparisons

Although the differences among Canadian carriers were fairly large, even larger differences appear to have existed between carriers in Canada and comparable U.S. carriers. Before making these intercountry comparisons, however, some adjustment must be made for differences in exchange rates -- not necessarily for domestic fuel purchased by each carrier within its own country, but for fuel purchased by each carrier in other countries for transborder or international operations. Obviously, if a Canadian carrier and a U.S. carrier purchased the identical types of fuel at identical prices in the same foreign country, the dollar prices reported by the two carriers would differ if the Canadian and U.S. dollars were not trading at par. It happens that the exchange rates were essentially at par in 1975 and 1976 (1.017 Canadian dollars equaled one U.S. dollar in 1975, while 0.986 Canadian dollars equaled one U.S. dollar in 1976), but in 1977 and 1978 the Canadian dollar decreased in value relative to the U.S. dollar (1.063 and 1.141 Canadian dollars equaled one U.S. dollar in 1977 and 1978, respectively).[7]

Precise adjustments for 1975-78 exchange rate differences cannot be made because the carriers do not report fuel expenditures by place of purchase.

However, this reporting deficiency does not eliminate the need to obtain a rough estimate of the extent to which differences in exchange rates do affect system fuel prices of Canadian and U.S. carriers. Since the U.S. dollar is the major international currency, it was decided to leave the U.S. carriers' fuel expenditures unadjusted and to limit the exchange rate adjustments to estimating U.S. dollar prices for fuel purchased by Canadian carriers in foreign countries (including the U.S.). This was done by using the Canadian carriers' plane-mile data by area of operation, average system fuel consumption per plane-mile, and system fuel expenditures, in conjunction with relevant fuel price and consumption data for U.S. carriers.[8] Implicit in the procedure is the assumption that domestic fuel expenditures by Canadian and U.S. carriers in their respective countries can be compared without exchange rate adjustments. This assumption is clearly correct for 1975-76 due to the small differences in the value of the two currencies for those two years. Furthermore, the basic consistency between the estimates for 1975-76 and those for 1977-78 indicate that the assumption is also correct for these two later years.

Table 8-3 summarizes the 1975-78 estimated fuel prices per litre for Canadian carriers after making the exchange rate adjustments. Comparing these prices with the Canadian carriers' unadjusted prices in Table 8-2 brings out the fact that the exchange rate differences had only minor effects on average fuel prices for these carriers. As is also shown in Table 8-3, the largest exchange rate adjustments (for 1978) resulted in reductions in average Canadian fuel prices of from 0.7 percent (Eastern Provincial) to 3.7 percent (CP Air). The reason why these reductions were so small is that the Canadian carriers actually purchased most of their total system fuel within Canada. The proportion purchased domestically ranged from

Table 8-3

System Fuel Prices per Litre After Exchange Rate Adjustments
Canadian Mainline and Regional Carriers, 1975-78

Carrier	Fuel Prices in Cents per Litre Adjusted for Exchange Rates				Adjusted Fuel Prices Percent of Unadjusted Prices			
	1975	1976	1977	1978	1975	1976	1977	1978
Mainline								
Air Canada	8.893	10.271	11.504	12.521	99.6	100.3	98.8	97.2
CP Air	9.785	10.670	11.434	12.884	99.5	100.4	98.3	96.3
Regional								
East. Prov.	10.341	11.220	12.321	13.142	99.9	100.1	99.6	99.3
Nordair	11.038	11.740	13.185	14.142	99.7	100.3	98.7	97.1
Pac. Western	9.854	10.816	12.961	14.386	99.8	100.2	99.2	98.5
Quebecair	10.003	11.035	12.511	13.565	99.6	100.3	98.6	97.1
Transair	9.191	10.559	11.573	13.185	99.8	100.2	99.3	98.6

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 25.

an estimated 70 percent (CP Air) to 94 percent (Eastern Provincial), with the average for all seven mainline and regional carriers as a group being about 77 percent.[9]

A comparison between the adjusted system fuel prices for Canadian carriers in Table 8-3 and the system fuel prices of the U.S. carriers given in Table 8-2, shows that the Canadian carriers consistently paid more than the comparable U.S. carriers during 1975-78. These percentage differences are summarized in Table 8-4. Air Canada paid prices that were roughly 17 percent higher than those paid by Trans World (except for 1975 when Air Canada used large amounts of grade B fuel). During the same period, CP Air's fuel prices fluctuated between 15 and 20 percent above those of Northwest. The differences were even greater for the five regional carriers in relation to the weighted average for the three local service carriers that operated mainly in northern areas of the U.S. They ranged from 15.8 to 43.4 percent higher, with a simple average for the four years of 27.4 percent. Given the similarities in system

Table 8-4

Canadian Carriers' System Fuel Prices After Exchange Rate Adjustments
Percent of System Fuel Prices of Comparable U.S. Carriers, 1975-78

Carrier		Canadian Adjusted Fuel Prices % Greater than U.S. Prices			
Canadian	Comparable U.S.	1975	1976	1977	1978
Mainline					
Air Canada	Trans World	5.3	17.5	16.2	16.7
CP Air	Northwest	15.9	20.3	14.5	20.3
Regional					
East. Prov.	Local Service[a]	34.3	27.9	23.3	22.1
Nordair	" "	43.4	33.8	32.0	31.4
Pac. Western	" "	28.0	23.3	29.7	33.6
Quebecair	" "	29.9	25.8	25.2	26.0
Transair	" "	19.4	20.4	15.8	22.5

[a]Weighted average of Allegheny, Frontier and North Central.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 26.

fuel prices among the three U.S. carrier groups, it follows that the percentages given in Table 8-4 also indicate the differences between the system fuel prices of the Canadian carriers and the average for the U.S. intrastate carriers.

While the reality of the higher system fuel prices paid by Canadian carriers is the important factor in intercountry cost comparisons, it remains desirable to determine why these differences existed in 1975-78. Since there is no reason to believe Canadian carriers paid more than U.S. carriers for fuel purchased in foreign countries served in common, the differences are probably to be found in domestic fuel purchases.

One important source of the differences was the federal sales tax assessed in Canada on the retail value (including airport fees) of fuel used in domestic operations. This tax was 12 percent until November 17, 1978, when it was reduced to nine percent.[10] During these years, the U.S. did not have a federal sales tax on turbine fuel.[11]

Provincial fuel taxes in Canada were also appreciably higher on average than state fuel taxes in the U.S. While Newfoundland and P.E.I. did not assess fuel taxes; Alberta, New Brunswick, Nova Scotia, Ontario and Quebec charged 0.66 cents per litre; British Columbia and Manitoba charged 1.10 cents per litre; and Saskatchewan had a tax of 1.32 cents per litre in 1977-78 (increased from .88 cents per litre in 1975-76).[12] In contrast, 31 states (62 percent) in the U.S. did not tax turbine fuel and the tax rates among the remaining 19 states ranged up to 1.057 cents per litre.[13]

Another source of price differences was the fuel-related airport fees. During these years all airports operated by Transport Canada charged a 0.33 cents per litre fee for turbine fuel delivered to aircraft.[14] In the U.S. there was considerable diversity among the locally operated airports with regards to such fees. Data available for PSA and Southwest indicate an average airport fee of 0.15 cents per litre existed in California and 0.25 cents per litre in Texas,[15] but these averages doubtless overstate the fees paid by the larger CAB-regulated airlines who often have special fueling arrangements at their major airports. An estimate of 0.10 cents per litre would probably more closely approximate the average airport fees paid by these carriers.

Table 8-3 summarizes the net domestic fuel prices paid by Canadian and U.S. carriers after deleting the federal sales tax, provincial/state fuel taxes and fuel-related airport fees. While these figures are partially estimated, any errors are likely to be small and it is believed these net prices provide a fairly accurate indication of the relative differences in prices actually paid to domestic fuel suppliers in the two countries. The relative differences in net domestic fuel prices are indicated by the percentage differences also given in Table 8-5. These data show that Air

Table 8-5

Relative Differences in Net Domestic Fuel Prices[a]
Canadian Mainline, Regional and Selected U.S. Carriers, 1975-78

Carrier	Net Domestic Fuel Prices[a] (Can. or U.S. Cents per Litre)				Relative Differences Can. % of Comparable U.S.[b]			
	1975	1976	1977	1978	1975	1976	1977	1978
Mainline								
Air Canada	6.589	8.204	9.460	10.585	-15.3	2.4	-0.1	4.2
CP Air	7.753	8.773	9.651	11.019	-3.2	5.2	0.9	8.3
Trunk								
Trans World	7.776	8.013	9.474	10.160	-	-	-	-
Northwest	8.007	8.339	9.562	10.177	-	-	-	-
Delta	7.456	8.083	9.269	9.970	-	-	-	-
Regional								
East. Prov.	8.834	9.606	10.531	11.293	18.9	13.4	8.9	8.4
Nordair	9.221	9.922	11.548	12.563	24.2	17.1	19.5	20.6
Pac. Western	7.648	8.604	10.757	12.165	3.0	1.6	11.3	16.7
Quebecair	7.778	8.918	10.525	11.719	4.7	5.3	8.9	12.5
Transair	6.961	8.290	9.259	10.906	-6.3	-2.1	-4.2	4.7
Local Service								
3 Carrier Mean[c]	7.427	8.470	9.666	10.420	-	-	-	-

[a]Domestic fuel prices minus Canadian federal sales tax, provincial/state fuel taxes and fuel-related airport fees.

[b]Air Canada relative to Trans World, CP Air relative to Northwest and each Canadian regional carriers relative to the weighted average of the three northern U.S. local service carriers.

[c]Weighted average of the three northern U.S. local service carriers -- Allegheny, Frontier and North Central.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Appendix L and Table 27.

Canada's net prices ranged from -15.3 percent below Trans World's prices (in 1975) to 4.2 percent above (in 1978). Overall, except for 1975, it appears that the net prices of these two carriers were very similar. The differences between CP Air and Northwest for these years were also fairly small, ranging from -3.2 to 8.3 percent. Generally speaking, net fuel

prices paid by Canadian mainline carriers to their domestic suppliers were seldom more than five percent greater than the net prices paid by comparable U.S. trunk carriers, and they were sometimes less than the U.S. domestic trunk prices.

The pattern is appreciably differenct for the Canadian regional carriers. Table 8-5 shows that, with the exception of Transair, the net domestic fuel prices paid by these carriers generally exceeded the average for the three northern U.S. local service carriers by three percent or more, with Nordair being 17.1 to 24.2 percent higher than the three northern local service carriers. Given the similarities among the mainline and trunk carriers in the two countries, it seems likely that these larger percentage differences between the Canadian regional and the U.S. local service carriers reflect the higher prices paid for fuel in the Canadian north relative to the prices paid in the U.S. where the logistics of supply are much less difficult and costly. Unfortunately, detailed data are not available to allow this matter to pursued further.

Summary

Unlike the relationships that existed in employee payments, differences in fuel prices were small among the U.S. carriers. The trunk, local service and intrastate carriers generally paid systemwide prices for turbine fuel that were within two percent of each other, while the differences in domestic fuel prices were generally under five percent (see Table 8-2). In contrast to the employee payment rankings, the intrastate carriers consistently paid the highest fuel prices while the trunk carriers paid the lowest. In Canada, the two mainline carriers also paid similar systemwide fuel prices, but the regional carriers paid seven to ten percent more for their fuel than the mainline carriers, and between eight and 15 percent more for fuel purchased domestically.

There were significant intercountry differences in the systemwide fuel prices paid by the Canadian and U.S. carriers and, contrary to relative employee payments, Canadian prices were higher than U.S. prices. The two Canadian mainline carriers paid 15 to 20 percent more for fuel systemwide than comparable U.S. trunk carriers (after exchange rate adjustments), while the regional carriers usually paid from 20 to 35 percent higher system prices than the average of comparable U.S. local service carriers (see Table 8-4).

The differences in domestic fuel prices between the two countries do not appear to be the result of Canadian suppliers charging appreciably higher prices for fuel per se. Rather, they were largely due to the much higher taxes and fuel-related airport fees charged by the Canadian federal and provincial governments. Domestic prices net of taxes and fuel-related airport fees paid by the Canadian mainline carriers for fuel delivered primarily at major airports were generally within five percent of those paid by U.S. trunk carriers (see Table 8-5). Therefore, they were almost equal to the net prices paid by the U.S. intrastate carriers. The same was also true for Transair and, in 1975-76, for Pacific Western and Quebecair relative to the U.S. local service carriers. With regards to the higher net prices paid by the other regional carriers, an appreciable part of these differences may have been due to their paying very high prices to purchase fuel in remote regions of the country.

The policy implication regarding the effects of taxes and airport fees on airline costs is that it would have been relatively easy (but costly) for the federal and provincial governments to eliminate a large part of the fuel price disadvantage under which the Canadian carriers operated during 1975-78 relative to comparable U.S. carriers. All they would have had to do was to reduce their relatively high fuel taxes and airport fees down to U.S. levels.

Footnotes

1. Increases in fuel prices have been especially large in the U.S. since the termination of price controls (over turbine fuel) on February 25, 1979. Between December 1978 and June 1980, the average fuel price for the system operations of the U.S. trunk carriers increased 128.8 percent, from 10.514 to 24.053 cents per litre. During the same time period, the average fuel price for the system operations of the Canadian mainline carriers increased 55.9 percent, from 12.444 to 20.959 cents per litre. See CAB, "Fuel Cost and Consumption", (December 1978 and June 1980); PSA, Annual Report (1979), p. 7; SC(ASC), phone conversations with J. Bekooy (October 27, and 28, 1980).

2. There are limitations to comparing percentage shares of total operating expenses. First, such percentages do not indicate the relative sizes of operating expenses since the percentage distributions for low-cost carriers like Northwest and Southwest will have the same 100 percent total as high cost carriers such as Trans World and Eastern Provincial. Second, carriers having low percentage shares in one category must necessarily have high shares in one or more other categories in order to make up the 100 percent total (note Air Florida and Southwest's low labour shares and high petroleum shares compared with Air Canada's high labour share and low petroleum share). However, percentage shares do identify areas where carriers may be out of line with general performance and, therefore, may provide insights into why they are doing well or poorly relative to the overall norm.

3. Published fuel data for Canadian carriers include the federal sales tax, non-refundable provincial fuel taxes, and fuel concession payments at airports. CTC(A), Uniform System of Accounts and Reports for Commercial Air Carriers (Effective January 1, 1960, second printing October 1, 1960), pp. 58 and 61. There is no federal sales tax on turbine fuel in the U.S., and state fuel taxes are reported as part of taxes--other than payroll. 14 CFR (1978), pp. 313 and 316. The Canadian Ministry of Transport charges an airport fee (concession payment) of 1.5 cents per gallon (0.330 cents per litre) for all turbine fuel delivered to aircraft at the airports it operates. This includes virtually every major airport in Canada. Transport Canada, Air Services Fees Regulations, as amended. Similar fuel-related airport fees are assessed at some U.S. airports, but there is a wide diversity in charges since U.S. airports are generally owned and operated by local agencies.

4. The Imperial gallon is about 20 percent larger than the U.S. gallon. The conversion factors used in this study are: one Imperial gallon equals 4.546090 litres, while one U.S. gallon equals 3.7854118 litres.

5. Small quantities of gasoline were used in piston-powered aircraft by Eastern Provincial (1975-76), Nordair (1975-76), Quebecair (1975-78) and Southern (1975-78). Quebecair's peak use of gasoline during this period was 2.4 percent of total fuel (in 1976), while Southern's peak was 4.9 percent (in 1975). To the extent possible, all operating data for piston-powered aircraft and for gasoline have been excluded from this and subsequent analyses. CAB, Form 41, Schedule P-5.2 (Years ended December 31, 1975-78), as summarized in I.P. Sharp Associates, computer runs (October 17, 1980); and SC(ASC), Air Carrier Operations in Canada (October-December 1975-78), Table 4.

6. U.S. carriers generally used grade A-1 fuel during this entire period. As of late 1980, about ten percent of Air Canada's total fuel was still grade B. Telephone conversation with Mr. Edward Lloyd, Purchasing Agent, Air Canada (October 30, 1980). Grade A-1 fuel is priced about .418 cents per litre more than grade B fuel. Letter from Mr. R. Ward, Marketing Department, Imperial Oil Ltd. (December 1, 1980).

7. Department of Finance Canada, Economic Review (April 1980), p. 261.

8. The details of how these estimates were calculated are given in W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix K.

9. Ibid.

10. Letter from Mr. R. Ward, Marketing Department, Imperial Oil Ltd. (December 1, 1980).

11. CAB, Supplement to the Handbook of Airline Statistics (November 1979), p. 155.

12. Ward, supra note 10.

13. CAB, supra note 11.

14. Transport Canada, supra note 3,

15. PSA, "Petroleum Products," worksheet attached to a letter from Mr. L. A. Guske, Vice President and Controller (August 7, 1979). Southwest Airlines, "Operating Statement" (December 1976-78), Schedules E-1 and F.

9. Fuel Utilization and Expenses

In addition to differences between carriers in fuel prices and taxes, it is also possible for differences to exist in fuel utilization. Two measures of fuel utilization are available ton-miles (ATM) per litre and revenue ton-miles (RTM) per litre. The former measures aircraft output per unit of fuel input, the latter the combined output per litre of fuel of both aircraft and the carrier's traffic generating activities. RTM per litre is the more relevant measure of fuel utilization because flying empty aircraft over a route system has little economic value even though it produces the same ATM as flying aircraft full of revenue traffic. Therefore, RTM per litre will be used in this study as the measure of fuel utilization.[1]

Average aircraft stage length (aircraft miles flown divided by the number of departures performed) is a relevant factor affecting fuel utilization. The quantity of fuel consumed while taxiing is little affected by distance flown, and fuel consumption is greater during take-off and climb than during enroute cruising. Thus, airlines with long average stage lengths should have greater RTM per litre than carriers with shorter average stage lengths which must spend relatively more fuel taxiing, taking off and climbing. Since carriers differ with regards to average stage length and since this factor may be largely beyond their control (often due to regulatory constraints), it is desirable to remove the effects of distance when comparing the fuel utilization of the various carriers. This can be done through the use of regression analysis as in the previous chapters when dealing with operating expenses per RTM and with employee utilization and expenses per RTM.[2]

Output per Litre

Table 9-1 summarizes the average RTM per litre for the 18 carriers during the four-year period from 1975 through 1978. This measure of fuel utilization is then plotted on Figure 9-1 in relation to average system stage length (also given in Table 9-1). As expected, Figure 9-1 shows a significant positive relationship between distance and RTM per litre, with the R^2 for the straight-line regression of the logarithms of the federally-regulated airlines' variables being .615.[3]

There appear to be some country-related differences in RTM per litre among the regulated airlines of Canada and the U.S. Figure 9-1 shows that five out of the seven Canadian carriers lie well above the trend line for this measure, with only Eastern Provincial and Transair being somewhat below the line. In contrast, during 1975-78, six out of the seven U.S. regulated airlines were located below the trend line. Frontier was the only CAB-regulated carrier with above average performance, even though Northwest and North Central were fairly close to the trend line.

The dichotomy in RTM per litre between the regulated airlines of the two countries appears to be due to the Canadian carriers having higher load factors than the U.S. carriers. As can be seen in Table 9-2, their all-services RTM load factors are equal to or higher than those of comparable U.S. trunk and local service carriers. Furthermore, the revenue passenger-mile load factors in Table 9-2 indicate that the higher RTM load factors of the Canadian mainline carriers over the U.S. trunk carriers during these years were due to higher scheduled passenger load factors. In contrast, the Canadian regional carriers' superior performance in system RTM load factors was due to their high load factors in passenger charters which, of course, accounted for very large shares of their total traffic (over 60 percent for Nordair and Quebecair -- see Table 5-2).[4]

Table 9-1

Fuel Utilization and Average System Stage Length
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	Avg. Sys. Stage Length[a]	RTM per Litre		
		Actual	Trend[b]	% Deviation[c]
Mainline				
Air Canada	633	.819	.733	11.7%
CP Air	960	.879	.833	5.5
Trunk				
Trans World	921	.698	.823	-15.2
Northwest	654	.712	.740	-3.8
Delta	447	.601	.658	-8.7
Intrastate				
Air Calif.	235[d]	.711[d]	.539	31.9
Air Florida	221[e]	.410[d]	.529	-22.5
PSA	271	.591	.564	4.8
Southwest	252	.637	.551	15.6
Regional				
East. Prov.	244	.530	.546	-2.9
Nordair	478	.751	.672	11.8
Pac. Western	272	.703	.564	18.5
Quebecair	320	.709	.593	19.6
Transair	425	.593	.648	-8.5
Local Service				
Allegheny	238	.472	.542	-12.9
Frontier	211	.618	.522	18.4
N. Central	144	.447	.464	-3.7
Southern	211	.404	.522	-22.6

[a]Total system revenue aircraft miles flown divided by number of revenue departures performed yields average aircraft stage length in statute miles.

[b]Calculated from data for the federally-regulated airlines using the equation: $\text{Log } Y = .100 + .309 \text{ Log } X$, $R^2 = .615$.

[c]Actual percent of trend value.

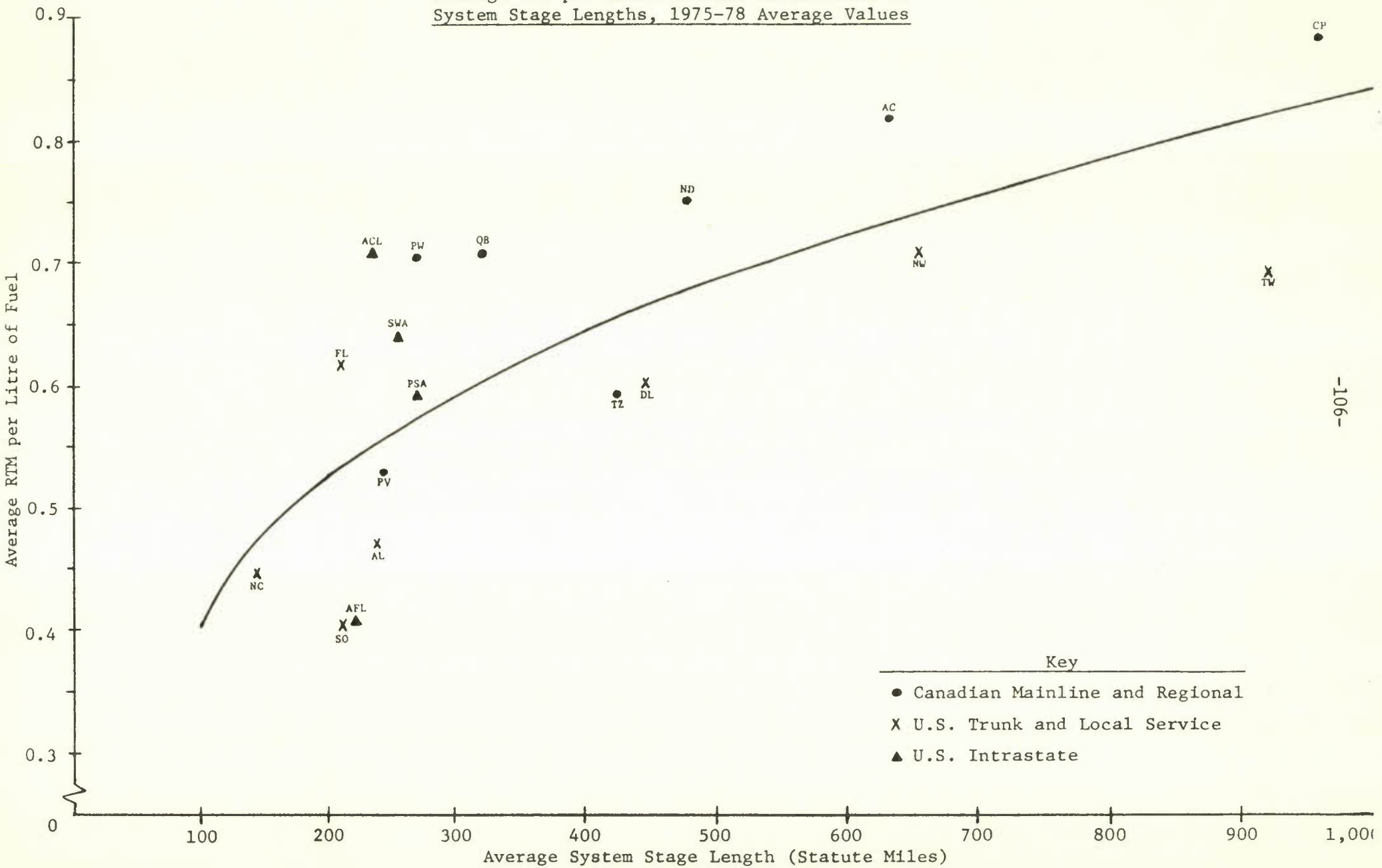
[d]Year ended December 31, 1978.

[e]Year ended September 30, 1978.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 28.

Figure 9-1

Average RTM per Litre of Fuel in Relation to
System Stage Lengths, 1975-78 Average Values



Source: Table 9-1.

Table 9-2

System Revenue Ton-Mile and Revenue Passenger-Mile Load Factors
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	1975-78 Load Factors			
	Revenue Ton-Mile	Revenue Passenger-Mile		
	All Services	Scheduled	Charter	All Services
Mainline				
Air Canada	48.3%	61.1%	85.9%[b]	62.0%
CP Air	52.5	63.2	83.0[b]	64.6
Trunk				
Trans World	48.3	57.8	87.1	59.1
Northwest	42.1	47.7	95.1	48.8
Delta	49.2	57.8	79.9	58.1
Intrastate				
Air Calif.	61.3[a]	71.3[a]	n.a.	n.a.
Air Florida	n.a.	53.4[a]	n.a.	n.a.
PSA	48.8	62.2	n.a.	n.a.
Southwest	47.7	66.3	n.a.	n.a.
Regional				
East. Prov.	60.9	53.5	88.4[b]	63.6
Nordair	n.a.	39.4	83.4[b]	74.5
Pac. Western	63.7	51.9	85.5[b]	62.7
Quebecair	n.a.	60.0	83.7[b]	75.6
Transair	n.a.	53.6	82.3[b]	64.1
Local Service				
Allegheny	50.5	56.0	70.7	56.4
Frontier	50.7	58.9	88.6	58.9
N. Central	43.7	50.1	63.9	51.0
Southern	44.8	51.9	59.7	52.7

n.a. -- not available.

[a]Year ended December 31, 1978.

[b]International charters for 1975-78 plus domestic charters for 1978.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 29.

The more productive fuel utilization of the Canadian carriers in terms of RTM per litre would provide an argument in favour of their relatively limited competitive operations were it not for the generally comparable performances of the U.S. intrastate carriers under their more competitive circumstances.[5] With the exception of Air Florida, the intrastate carriers' scheduled passenger load factors generally exceeded those of Air Canada and CP Air, with Air California being truly outstanding in this regard with a 71.3 percent load factor in 1978 (and a 71.8 percent average for the full four-year period).[6] Furthermore, despite the very limited cargo services of the intrastate carriers (which served to reduce their RTM load factors), they were also similar to the Canadian carriers in terms of RTM load factors. As a result, the three largest U.S. intrastate carriers also lie above the RTM per litre trend line, with Air California now having the best performance of these three carriers, and with PSA's lower load factor placing it close to, but still above, the trend line.

An airline's economic efficiency in utilizing fuel obviously increases as load factor increases. Therefore, environments and actions that increase the average load of an aircraft also increase fuel utilization in an economically meaningful sense. During 1975-78, the Canadian carriers were able to achieve high average loads under limited competition and relatively high fares per mile. At the same time, the U.S. intrastate carriers were also able to achieve high average loads and fuel utilization under intensive competition and relatively low fares per mile. Thus, efficient performance in terms of load factors and fuel utilization was achieved in both environments. However, there were important differences in terms of who benefited from this performance. In Canada the existing airlines and their suppliers (employees, etc.) were benefited relatively more than others, while

in California, Florida and Texas the prime beneficiaries were the new intrastate carriers and consumers.

Fuel Expenses

The combined effects of differences in fuel prices and fuel utilization can be measured by fuel expenses per RTM. Table 9-3 presents these data for the carriers averaged over the four-year period from 1975 to 1978. The fuel expenses per RTM are plotted against average stage lengths in Figure 9-2, and it can be seen that there is a negative relationship between the two variables (which is consistent with the positive relationship between RTM per litre and distance), with the R^2 for the federally-regulated airlines' best-fit trend line being .693.[7]

Table 9-3 also gives the deviations of actual fuel expenses per RTM from the trend-line values depicted in Figure 9-2. The percentage deviations from the trend line range from Frontier's -21.4 percent to the positive deviations of 17.7 and 17.0 percent for Eastern Provincial and Transair. Contrary to the finding for RTM per litre, no consistent differences were found between the federally-regulated airlines of Canada and those of the U.S. In Canada, three of the seven airlines had above average fuel expenses per RTM while four had below average expenses per RTM. Similarly, three of the CAB-regulated U.S. airlines had above average fuel expenses per RTM while four were below average.

Among the intrastate carriers, fuel expense data for the full four-year period are available for just PSA and Southwest. Both of these carriers achieved fuel expenses per RTM that were well below the federally-regulated airlines' trend line (-11.5 and -20.0 percent respectively), and Air California's very high load factors mean that it too had a negative

Table 9-3

Fuel Prices, Utilization and the Resulting Fuel Expenses per RTM
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	Fuel Prices ¢/Litre	Fuel Utilization RTM/Litre	Fuel Expenses per RTM ¢ per RTM Actual	Trend[a]	Deviation[b] ¢/RTM	Percent
Mainline						
Air Canada	10.762[c]	.819	13.145	14.441	-1.296	-9.0%
CP Air	11.175[c]	.879	12.713	12.849	-0.136	-1.0
Trunk						
Trans World	9.512	.698	13.770	12.999	0.771	5.9
Northwest	9.395	.712	13.195	14.310	-1.115	-7.8
Delta	9.058	.601	15.071	15.922	-0.851	-5.3
Intrastate						
Air Calif.	11.719[d]	.711[d]	16.482[d]	19.069	-[e]	-[e]
Air Florida	10.750[f]	.410[d]	26.220[g]	19.401	-[e]	-[e]
PSA	9.590	.591	16.221	18.322	-2.101	-11.5
Southwest	9.535	.637	14.958	18.699	-3.741	-20.0
Regional						
East. Prov.	11.775[c]	.530	22.207	18.869	3.338	17.7
Nordair	12.600[c]	.751	16.771	15.625	1.446	7.3
Pac. Western	12.107[c]	.703	17.216	18.303	-1.087	-5.9
Quebecair	11.915[c]	.709	16.812	17.487	-0.675	-3.9
Transair	11.211[c]	.593	18.896	16.149	2.747	17.0
Local Service						
Allegheny	9.224	.472	19.551	19.001	0.550	2.9
Frontier	9.543	.618	15.454	19.654	-4.200	-21.4
N. Central	9.660	.447	21.619	21.878	-0.259	-1.2
Southern	9.110	.404	22.089	19.654	2.435	12.4

[a]Calculated from data for the federally-regulated airlines using the equation: Log Y = Log 88.206 - .281 Log X, R^2 = .693.

[b]Actual fuel expenses per RTM minus trend values.

[c]After exchange rate adjustments pertaining to fuel purchased in other countries for transborder and international flights.

[d]Year ended December 31, 1978. Fuel price is partially estimated.

[e]Calculation inappropriate due to the use of different time periods.

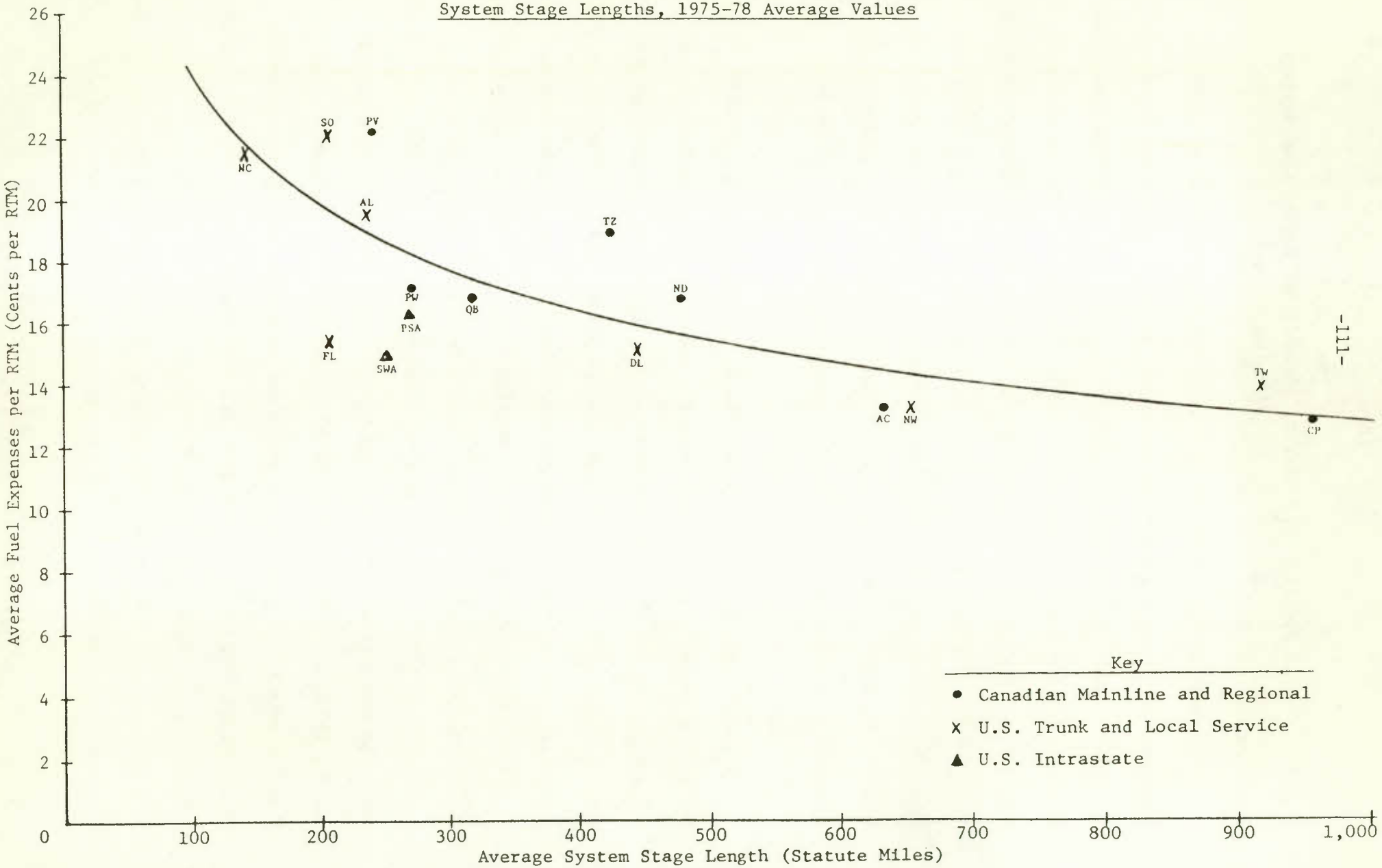
[f]Year ended July 31, 1978.

[g]Assuming fuel utilization was the same for the years ended July 31, 1978 and December 31, 1978.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 31.

Figure 9-2

Average Fuel Expenses per RTM in Relation to System Stage Lengths, 1975-78 Average Values



Source: Table 9-3.

deviation.[8] Air Florida, in contrast, probably had higher than average fuel expenses per RTM.[9]

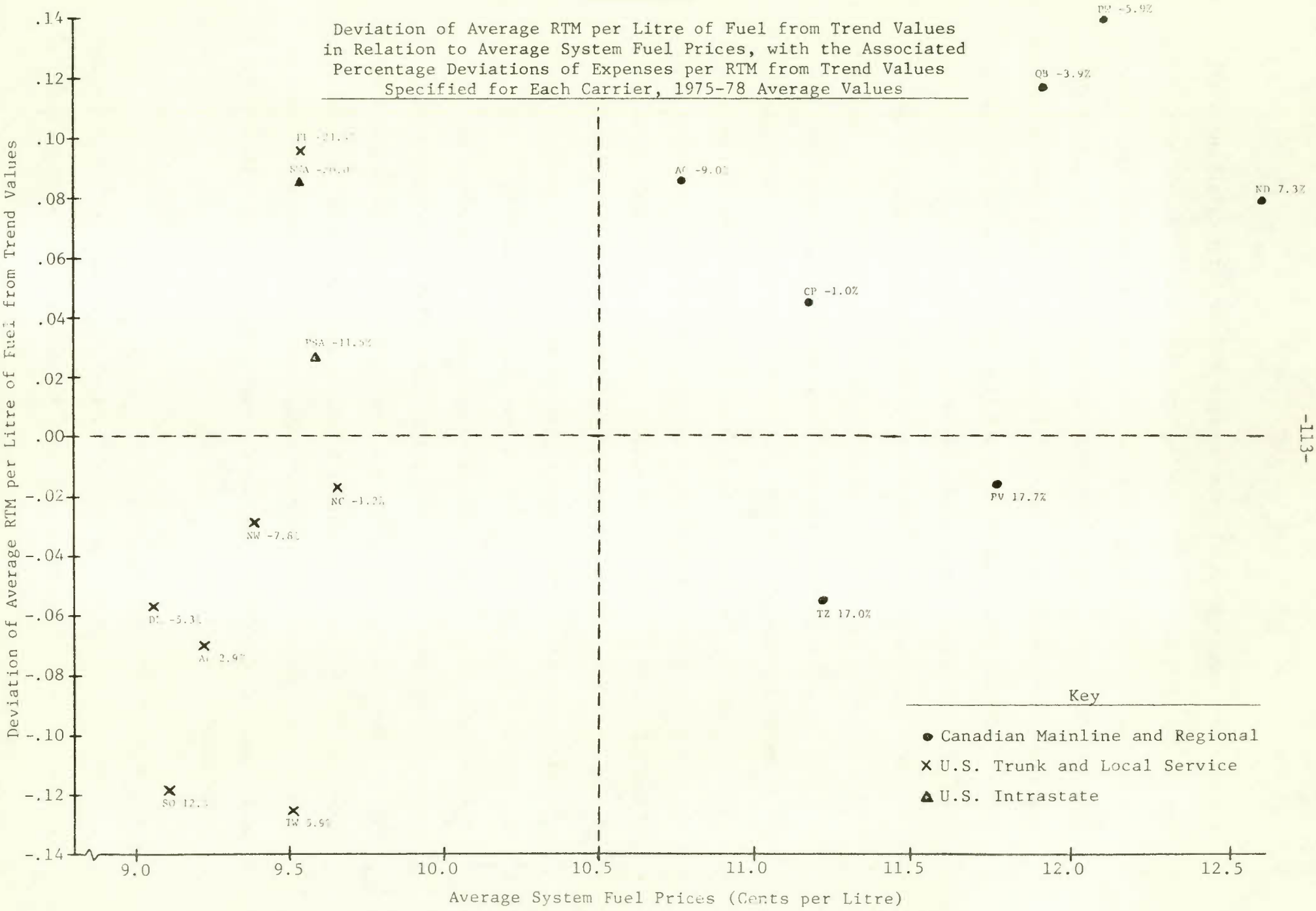
The joint effects of prices and utilization on expenses per RTM are indicated in Figure 9-3 which is a scatter diagram on which the deviation of each carrier's actual RTM per litre from the distance-related trend line is plotted against its average fuel price. In addition, the percentage deviation of each carrier's fuel expenses per RTM from the distance-related trend line in Figure 9-2 is specified next to its plot. The diagram is divided into four quadrants by a horizontal line depicting zero deviation from the federally-regulated airlines' fuel utilization trend line and by a vertical line depicting the simple average of their fuel prices (see Table 9-3).

Frontier, Southwest and PSA had the lowest fuel expenses per RTM (-21.4, -20.0 and -11.5 percent below the trend line, respectively), and all are located in the northwest quadrant of Figure 9-3, which means that they had both below average fuel prices and above average deviations in RTM per litre. At the other extreme, Eastern Provincial and Transair were located in the southeast quadrant, meaning that they had above average fuel prices and below average deviations in RTM per litre. Thus, it is not surprising to find they had high fuel expenses per RTM (17.7 and 17.0 percent above the trend line). Southern and Nordair also had high fuel expenses per RTM (12.4 and 7.3 percent above the trend line). Figure 9-3 implies that Southern's low average fuel price was more than outweighed by its low fuel utilization, while Nordair's relatively high RTM per litre was counterbalanced by its very high average fuel price.

There was no obvious pattern among the remaining nine carriers. In the southwest quadrant, the relatively low prices of the five remaining U.S.

Figure 9-3

Deviation of Average RTM per Litre of Fuel from Trend Values in Relation to Average System Fuel Prices, with the Associated Percentage Deviations of Expenses per RTM from Trend Values Specified for Each Carrier, 1975-78 Average Values



Sources: Tables 9-1 and 9-3.

carriers were associated with below average RTM per litre, yielding roughly average fuel expenses per RTM (ranging from -7.8 percent below the trend line for Northwest to 5.9 percent above the line for Trans World). The remaining four Canadian carriers were all in the northeast quadrant, reflecting their high prices and above average fuel utilization. Their fuel expenses per RTM were all somewhat below average (ranging from -9.0 percent below the trend line for Air Canada to -1.0 percent below the line for CP Air.

Production theory (and common sense) implies that carriers paying higher fuel prices will seek to obtain greater output per litre of fuel. Figure 9-3 indicates that this has been the case among North American carriers. All seven Canadian carriers had higher average fuel prices in 1975-78 than the nine U.S. carriers for which price data are available. Five of the Canadian carriers (71 percent) produced above average RTM per litre while only three of the U.S. carriers (33 percent) managed to do so. Furthermore, two of the three above average U.S. carriers were intrastate carriers, leaving Frontier as the sole CAB-regulated airline to achieve above average fuel utilization.[10] It appears that it is possible for the airlines of both countries to achieve above average fuel utilization (after adjusting for the effects of distance). Higher fuel prices may have been the motivation for most Canadian carriers, while the largest U.S. intrastate carriers were motivated by other factors, perhaps by the need to lower costs in order to survive while offering low fares per mile. Another possibility is that the intrastate carriers' small, homogeneous route systems also facilitated fuel conservation.

Effects on Total Operating Expenses

An indication of the combined effects of differences in fuel prices and utilization on total operating expenses is given in Table 9-4 where each

Table 9-4

Effects of Deviations in Fuel Expenses per RTM on Total System Operating Expenses
Canadian Mainline, Regional and Selected U.S. Carriers, 1975-78 Average Values

Carrier	1975-78 Total System RTM (000)	Fuel Exp. Deviation ¢/RTM	Total Fuel Saving (-) or Increase[a]	1975-78 Total System Operating Expenses CDN. or U.S. Dollars (000) Actual	Hypothetical[b]	Percent Difference
Mainline						
Air Canada	5,971,529	-1.296¢	$-77,391,000	$4,272,221	$4,349,612	-1.8%
CP Air	2,387,679	-0.136	-3,247,000	1,477,070	1,480,317	-0.2
Trunk						
Trans World	12,491,772	0.771	96,312,000	8,567,974	8,471,662	1.1
Northwest	6,032,110	-1.115	-67,258,000	3,304,273	3,371,531	-2.0
Delta	8,863,049	-0.851	-75,425,000	6,581,933	6,657,358	-1.1
Intrastate						
Air Calif.	n.a.	n.a.	n.a.	-	-	-
Air Florida	n.a.	n.a.	n.a.	-	-	-
PSA	908,126	-2.101	-19,080,000	701,253	720,333	-2.6
Southwest	245,302	-3.741	-9,177,000	139,824	149,001	-6.2
Regional						
East. Prov.	153,835	3.338	5,135,000	169,293	164,158	3.1
Nordair	299,475	1.446	4,330,000	211,167	206,837	2.1
Pac. Western	540,753	-1.087	-5,878,000	449,300	455,178	-1.3
Quebecair	291,948	-0.675	-1,971,000	223,922	225,892	-0.9
Transair	164,497	2.747	4,519,000	139,864	135,345	3.3
Local Service						
Allegheny	1,630,916	0.550	8,970,000	1,801,463	1,792,493	0.5
Frontier	812,399	-4.200	-34,121,000	823,633	857,754	-4.0
N. Central	612,194	-0.259	-1,586,000	807,180	808,766	-0.2
Southern	509,398	2.435	12,404,000	585,135	572,731	2.2

n.a. -- not available.

[a] Total system RTM times fuel expenses deviation from the distance-related trend line.

[b] Actual system operating expenses plus total fuel saving or minus total fuel increase.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 32.

carrier's total system RTM for 1975-78 is multiplied by the deviation of its fuel expenses per RTM from the distance-related trend line given in Table 9-3. Adding or subtracting the resulting value to or from actual total operating expenses (for carriers with below or above average fuel expenses per RTM) yields the carrier's hypothetical total operating expenses had it achieved average (trend line) values for its fuel expenses per RTM. The percentage differences between the actual and hypothetical figures indicates the extent to which variations in fuel prices and utilization caused total operating expenses to deviate from the norm.

The percentage differences for PSA, Frontier and Southwest imply that fairly low fuel prices and high utilization can yield reductions in total operating expenses of 2.6 to 6.2 percent from the norm. In contrast, Eastern Provincial and Transair's high prices and low utilizations resulted in increases in actual over hypothetical operating expenses of 3.1 to 3.3 percent. Since the relatively high fuel prices paid by the Canadian regional carriers were due largely to factors beyond their direct control (higher taxes and airport fees plus, probably, the high costs of supplying fuel in remote locations), it would not have been feasible for Eastern Provincial and Transair to reduce their total operating expenses to match the -6.2 percent difference achieved by Southwest (a gross change of over nine percent). However, if Quebecair and Pacific Western were able to achieve actual operating expenses 0.9 to 1.3 percent lower than their hypothetical levels by producing relatively high RTM per litre (while paying high fuel prices), it appears that reductions in total operating expenses in the order of four percent were possible for Eastern Provincial and Transair. Smaller reductions might have been possible for Air Canada, CP Air and Nordair, but significant reductions for these carriers would have required decreases in fuel prices (including taxes and airport fees).

A similar conclusion regarding fuel utilization applies to the U.S. carriers. Given the consistency in their fuel prices, it follows that carriers with high fuel expenses per RTM (Trans World, Allegheny and Southern) could have reduced their total operating expenses by five to six percent during 1975-78 had they achieved fuel utilization relative to the trend line comparable to that achieved by Frontier, PSA and Southern. Northwest, Delta and North Central could also have lowered their operating expenses somewhat, but only by two or three percent.

Summary

Even though the differences in fuel prices (including taxes and fuel-related airport fees) between the two countries were relatively large, equal or greater differences existed in terms of fuel utilization. As calculated in Table 9-1, the federally-regulated airlines had deviations in RTM per litre around a distance-related trend line ranging from -22.6 to 19.6 percent (an interval of 42.2 percentage points); and it happens that all but two of the Canadian carriers were above average in RTM per litre, while all but one of the CAB-regulated airlines were below average. At the same time, the U.S. intrastate carriers (except Air Florida) also had above average performance similar to that of the superior Canadian carriers (see Table 9-1 and Figure 9-1).

The high system fuel utilization of the Canadian carriers (except Eastern Provincial and Transair) relative to the lower utilization of the CAB-regulated airlines (except Frontier) tended to balance out the effects of the higher Canadian system fuel prices and, as a result, during 1975-78 similar fuel expenses per RTM existed among the federally-regulated airlines in the two countries. About half of these carriers in each country had higher than average fuel expenses per RTM (relative to a distance-

related trend line) while the other half had lower than average expenses per RTM. At the same time, however, the three largest U.S. intrastate carriers (plus Frontier) had the lowest expenses per RTM (relative to the trend line) because they enjoyed both the low U.S. fuel prices and high fuel utilization (see Table 9-3, Figures 9-2 and 9-3, and footnote 8).

Calculations given in Table 9-4 indicate that improved fuel utilization would have reduced the total operating expenses of Eastern Provincial and Transair by around four percent, while lower fuel prices (achieved mainly by reducing taxes and fuel-related airport fees to U.S. levels) would have yielded additional decreases for these and other Canadian carriers. Similarly, increased fuel utilization would have reduced total operating expenses of Trans World, Allegheny and Southern by five to six percent, and those of Northwest, Delta and North Central by two or three percent.[11]

Here again the by now familiar pattern has been found. All the federally-regulated airlines in Canada and all those studied in the U.S. (except Frontier) had similar fuel expenses per RTM, while the U.S. intrastate carriers (except Air Florida) had lower fuel expenses per RTM. Once more the largest intrastate carriers' low fuel expenses per RTM were consistent with their low fares per mile. Furthermore, they achieved their low fuel expenses per RTM through high fuel utilization, not by having lower fuel prices relative the other U.S. carriers. Since all carriers have significant influence over the generation of RTM (through scheduling practices, fare policies, sales activities, etc.), it is clear that the intrastate carriers played an important role in reducing their fuel expenses, and they did so in relatively competitive environments.

Footnotes

1. RTM per litre is also preferable to the more direct measure of aircraft miles per litre because fuel consumption is heavily influenced by aircraft size. Obviously, large aircraft (such as the B-747) have higher fuel consumptions per mile flown than smaller aircraft (such as the B-737 or DC-9). Therefore, using aircraft miles per litre as a measure of fuel utilization would result in the Canadian regional and the U.S. intrastate and local service carriers (with their fleets of small aircraft) having better fuel utilization that the Canadian mainline and U.S. trunk carriers with their mixed fleets of large and small aircraft. This bias against large aircraft is partially (or entirely) offset by the use of RTM per litre because these aircraft have greater capacities as well as higher fuel consumptions per aircraft mile. Of course, a direct measure of relative fuel utilization could be achieved by comparing each carrier's fuel consumption per aircraft mile for each aircraft type. Unfortunately this cannot be done in this study because only total system fuel consumption is reported to Statistics Canada by Canadian carriers in contrast to the detailed data for individual aircraft type that are reported to the CAB by U.S. carriers.

2. Average passenger trip length was used as the measure of distance in the regression analyses undertaken in the previous chapters, while average aircraft stage length is used in this chapter because fuel consumption is directly related to aircraft movements. It happens, however, that there is a close positive relationship between average passenger trip lengths and aircraft stage lengths so that regression RTM per litre against either one results in very similar R^2. Thus, the findings regarding fuel utilization are not affected by using one or the other of these distance measures.

3. Based on the lowest mean squared error, the best fit for RTM per litre was obtained from the equation $Y = X/(183.400 + 1.077X)$, $R^2 = .619$. However, in order to be consistent with an analysis using ATM per litre presented in the technical study, and because the differences in R^2 were small, it was decided to use the following equation for RTM per litre: $\text{Log } Y = \text{Log } .100 + .309 \text{ Log } X$. The associated R^2 of .615 is significant at the one percent level (see footnote 3, Chapter 4).

4. W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Table 7.

5. During 1975-78, domestic rivalry among the Canadian carriers was largely limited to the transcontinental service of Air Canada and CP Air where CP Air was restricted to around 25 percent of scheduled ASM. This was in sharp contrast to the U.S. regulated airlines where essentially all major domestic city pairs had from two to ten generally unrestricted carriers authorized to provide service. Internationally, Canadian carriers participated in a number of pooling operations with their foreign counter-parts while such pools were rare exceptions among U.S. carriers (the Pan American/Aeroflot pool being one of those exceptions). Only in transborder operations did the carriers of the two countries face similar degrees of rivalry. The rivalry faced by the U.S. intrastate carriers was much greater during these years since the regulatory duopoly in each state allowed price, as well as service-quality, rivalry among carriers. Only Air California enjoyed a monopoly in several of its major city pairs (those originating/terminating at Santa Ana/Orange Country airport).

6. Air California, Annual Report (1976), plus information supplied by Mr. F. R. Davis, Vice President-Marketing (Oct. 12, 1978), and Mr. M. P. Van Dordrecht, Vice President & Treasurer (July 18, 1979)..

7. Based on the lowest mean squared error, the equation for the best-fit trend line for the federally-regulated airlines is Log Y = Log 88.206 - .281 Log X. The Associated R^2 of .693 is significant at the one percent level (see footnote 3, Chapter 4).

8. In "PUC Application No. 58126" (December 28, 1978), Appendix A, Air California estimated its 1978 fuel costs at $13,898,000 based on actual experience for the first ten months of that year (see Table 8-1). Its actual 1978 fuel consumption was 118,592,810 litres. These data imply an average price (probably including oil expenses, taxes and airport fees) of 11.719 cents per litre. Table 8-2 shows that this is approximately one cent per litre (ten percent) higher than the simple average of the prices paid by all the other U.S. carriers in 1978. Therefore, it seems likely that Air California's fuel cost estimate for the PUC was somewhat exaggerated. This should not be surprising given its objective of obtaining an increase in fares. However, even using the estimated fuel cost associated with this high fuel price, Air California's average fuel expense was 16.482 cents per RTM, which is still 10.5 percent below the 1975-78 trend line for a 235 mile stage length. Clearly, the difference would be even greater for Air California's average 1975-78 fuel expense.

9. Air Florida's estimated fuel expense was 26.220 cents per RTM during the year ended July 31, 1978. This was almost 60 percent higher than Air California for roughly the same time period.

10. Air California would doubtless also be in this group if its data were available, while Air Florida would be among the remaining U.S. carriers in the southwest quadrant.

11. The very large increases in fuel prices in the U.S. following the decontrol of turbine fuel prices in February 1979 has resulted in U.S. fuel prices rising above Canadian fuel prices (see footnote 1, Chapter 8). Therefore, if there has been little relative change in fuel utilization, it follows that most of the Canadian carriers should now be enjoying fuel expenses per RTM below those of most of the CAB-regulated airlines. Whether or not this situation will continue depends on federal government policies regarding fuel prices, taxes and airport fees.

10. Weather and Airline Costs

Canadian airline executives frequently state that Canada's adverse weather and small population are important reasons for differences in airline costs and employee productivity between Canadian and U.S. carriers. The argument is that Canadian carriers operating under relatively adverse weather and serving sparsely populated geographic areas (having low traffic densities) are unable to utilize employees, aircraft and other inputs as productively as U.S. carriers operating under more favourable conditions. The following quotation from Mr. G. B. Hunnings of CP Air summarizes this position:

> There are some who will claim that the wide differences between fares in Canada and the "efficient" cost of production of United States carriers is not explainable by the fact that factor input prices are higher in Canada, that Canada has a Federal Sales Tax; more severe, generally speaking, weather conditions, and that the Canadian market is about a tenth the size and much more randomly distributed than U.S. markets.[1]

It happens that the evidence presented in this study challenge several aspects of this statement. First, Chapter 2 and previous research demonstrated that through 1978 wide differences did not exist between the domestic and transborder coach/economy fares of the federally-regulated airlines in Canada and the U.S. Second, similarities, rather than differences, were also found to exist among the federally-regulated airlines of the two countries in terms of total operating expenses per RTM (Figure 4-1), RTM per employee (Figure 6-1) and revenues per employee (Figure 6-2). Third, it was shown that average system payments for labour were lower (not higher) among the Canadian carriers than their U.S. counterparts (Table 7-1), and that these lower payments, when combined with similar employee productivity, tended to provide Canadian carriers with somewhat lower average employee payments per RTM than the CAB-regulated U.S. carriers (Figure 7-1). Thus, Mr. Hunnings' statement appears

to be incorrect in several important respects. He is correct, however, regarding the federal sales tax which did contribute to making fuel prices higher in Canada than in the U.S. But because of the Canadian carriers' higher RTM per litre of fuel (Figure 9-1), the higher fuel prices did not carry over into higher fuel expenses per RTM in Canada than in the U.S. (Figure 9-2).

Overall, Mr. Hunnings' implication of U.S. superiority appears not to apply to the federally-regulated airlines of the two countries. To the contrary, the similarities among these carriers were more prevalent than their differences. At the same time, however, lower fares and more efficient production did characterize the U.S. intrastate carriers compared with the federally-regulated airlines of both countries. This finding is consistent with the hypothesis that the major source of performance differences is the regulatory monopoly within which the federally-regulated airlines operated as opposed to the regulatory duopolies of the intrastate carriers. But Mr. Hunnings might extend his argument regarding weather and population to the intrastate carriers and say that their performances differed from that of the federally-regulated airlines mainly because of favourable weather and population characteristics rather than regulatory differences. Therefore, this chapter will be devoted to presenting both direct and indirect evidence regarding the effects of weather on airline performance, while the possible effects of population differences will be investigated in Chapter 11.

Transportation and Weather

Weather affects productivity, and therefore costs, in all industries where significant proportions of total production must be undertaken in the out-of-doors. Examples include agriculture, construction, and all transport modes. It happens that airlines have an advantage over surface modes in

being less affected by snow, ice, rain and fog during enroute operations. Expecially adverse weather can often be avoided by flying over or around it at relatively low additional cost, while surface carriers generally have to plough through adverse conditions.[2] Airlines are, however, disadvantaged relative to surface carriers in terms of weather in and around terminals. If the weather gets too bad, a truck, bus or train can stop where it is (or pull off onto a shoulder or siding) and a ship can heave to until the weather improves. The airplane does not have this convenient response to adverse weather. It can only land (stop) at airports, and this can be done only if local weather conditions are not too severe. Also, a commercial airliner cannot depart from an airport if it is closed by weather or, unlike surface vehicles, if the destination and alternate airports are forecast to be closed at the estimated time of arrival. Clearly, the critical weather conditions of airline operations are those experienced at airports rather than enroute. Thus, a comparison of the effects of weather on airline performance can concentrate on the relative weather conditions at the airports served by each carrier.

Finally, it should be recognized that all airlines experience adverse weather conditions. Therefore, the question is the degree to which some airlines experience relatively more adverse weather than other airlines, not whether some airlines enjoy good weather conditions while others have bad conditions.

Direct Evidence Regarding Weather

Historical weather data for many (but not all) airports served by the airlines have been published by Environment Canada and the U.S. Department of Commerce.[3] The data for every available North American airport served in 1978 by each of the 18 Canadian and U.S. carriers included in this study were

recorded from these sources. The resulting "sample" ranged from a 93 percent coverage for Air Canada (39 out of 42 airports), down to 45 percent for Air California (five out of 11 airports). The simple average for each of four weather factors was then calculated for each carrier, and the carriers were compared on the basis of these averages.[4]

The first factor to be considered was the mean annual snowfall. This indicates the relative amounts of time airports may be closed due to runways and taxiways being blocked by snow, the extent to which it is more difficult to operate ground handling equipment, and the higher fees paid by airlines to airport operators to cover the costs of snow removal. The second factor was the percentage of times during regularly scheduled weather observations (taken throughout each day) that the ceiling and/or visibility fell below the Category I minimums of 200 foot ceiling and/or one-half mile visibility, thereby preventing landings and takeoffs at most major airports.[5] The third was the mean minimum temperatures during December through March which indicates the extent to which extra ground facilities, heating systems and fuel, heavy clothing, etc., are required to protect employees, traffic and equipment. Finally, the mean maximum temperatures during June through August were also recorded. The effects of hot weather may be less obvious than cold weather, but they exist nonetheless. They include additional fuel required for takeoffs due to air density decreasing as temperatures rise (this may also reduce payloads on long-haul flights), costs of air conditioning, and the possibility that employees become less productive when working in very hot weather.[6]

The simple averages for the four weather factors are presented in Table 10-1 for each carrier. A review of this information (and looking at Figures 10-1 to 10-4 below) point out several general facts regarding weather. For one thing, on average, Canadian carriers face heavier snowfalls within North

Table 10-1

Mean Snowfall, Percentage of Observations Below Category I Minimums and Mean Temperatures at North American Airports[a] Served by Canadian Mainline, Regional and Selected U.S. Carriers

Carrier	Number of Airports	Mean Annual Snowfall (inches)	Percentage of Observations Below Category I Minimums[b]	Mean Temp. (°F) Dec-Mar Minimum	Mean Temp. (°F) Jun-Aug Maximum
Mainline					
Air Canada	39	75.2	2.2	17.7	74.5
CP Air	16	59.2	1.1	17.9	72.2
Trunk					
Trans World	35	22.4	0.8	29.9	84.5
Northwest	34	31.7	1.0	25.6	80.4
Delta	63	18.5	1.1	32.7	85.3
Intrastate					
Air Calif.	5	0.02	1.3	45.1	80.4
Air Florida	6	0.0	1.1	51.4	89.2
PSA	7	0.01	1.6	44.8	81.2
Southwest	6	3.1	1.0	39.5	92.2
Regional					
East. Prov.	15	136.1	3.0	10.0	69.3
Nordair	12	84.3	1.9	0.5	66.7
Pac. Western	31	54.8	1.2	5.6	69.2
Quebecair	8	129.8	1.5	2.4	69.8
Transair	13	69.2	2.1	-10.4	63.1
Local Service					
Allegheny	42	41.9	1.1	24.0	82.0
Frontier	32	28.8	0.8	23.8	86.8
N. Central	33	47.3	1.1	16.7	80.5
Southern	28	13.3	1.2	34.4	86.8

[a]Including Honolulu.

[b]Less than 200 ft. ceiling and/or $\frac{1}{2}$ mile visibility.

Sources: Atmospheric Environment Service, Airport Handbook (1975). National Oceanic and Atmospheric Administration, Airport Climatological Summary (various dates).

America than do the federally-regulated U.S. carriers, and the U.S. intrastate carriers experience very little snow. Associated with this is the expected finding that Canadian carriers have lower average minimum winter temperatures than U.S. carriers (except for North Central), and they also experience lower summer temperatures. Again, the intrastate carriers are well off in having the highest minimum winter temperatures, but Air Florida and Southwest have also had the hottest summer temperatures (with Air California and PSA being average in this factor). All this, of course, simply verifies the obvious -- winters are more severe and summers are cooler in Canada than in the U.S.; and the Canadian carriers with transborder routes do not serve enough U.S. airports to offset the effects of Canadian weather when calculating simple weather averages for North American operations.

The clear dichotomy between the carriers of the two countries does not extend to Category I ceiling/visibility minimums. Table 10-1 shows that below minimum conditions exist for the Canadian carriers from 1.1 to 3.0 percent of the time, compared with 0.8 to 1.6 percent of the time for the U.S. carriers. CP Air, Pacific Western and Quebecair all fall within the U.S. range, and Air California, PSA and Southern lie above the lower boundary of the Canadian range. Furthermore, it is obvious that the U.S. intrastate carriers are not favoured by this weather factor. Indeed, Air California and PSA have the highest percentages of the U.S. carriers.[7]

Given that the Canadian carriers generally face more adverse weather than U.S. carriers, the next question is whether or not this makes an appreciable difference in their operating expenses per unit of output. Regressing actual operating expenses per RTM for the federally-regulated airlines (from Table 4-1) against each of the four weather factors yields statistically insignificant R^2 for the best-fit regressions ranging from .006 (Category I minimums) to .065 (maximum temperatures).[8] Furthermore,

comparisons of individual carriers also indicate no relationship exists between weather and operating expenses per RTM. For example, Table 4-1 shows that Allegheny and Eastern Provincial both had 1975-78 average operating expenses of about $1.10 per RTM (in their respective currencies), yet, as can be seen in Table 10-1, Eastern Provincial operated with 3¼ times more snow, below Category I minimums 2.7 times more frequently, and average winter temperatures 14 degrees Fahrenheit colder than Allegheny. Only in summer temperatures did it have an advantage over Allegheny.

All of the operating expense and productivity analyses in Chapters 4, 6 and 9 demonstrated clear associations between these performance factors and distance for the federally-regulated airlines. Therefore, the possible effects of weather on operating expenses per RTM may have been obscured by the important inverse relationship between operating expenses and distance. To determine if this was the case, the deviations of operating expenses per RTM from the distance-related trend lines (Table 4-1) were regressed against each of the four weather factors given in Table 10-1. If adverse weather appreciably affects operating expenses, it follows that federally-regulated airlines operating under more adverse weather conditions should have their actual operating expenses per RTM above the trend line in Figure 4-1 (positive deviations), while those enjoying less adverse weather should have actual values below the trend line (negative deviations).

The scatter diagrams for the deviations in operating expenses per RTM (in cents per RTM) and each of the weather factors are plotted in Figures 10-1 to 10-4. In addition, the best-fit trend lines for the federally-regulated airlines is drawn in each figure. It can be seen that the slopes of the regression lines in these figures have the predicted signs except for the maximum temperature regression. However, the slopes are very flat and the

Figure 10-1

Deviations of 1975-78 Average Operating Expenses per RTM
in Relation to Mean Annual Snowfall

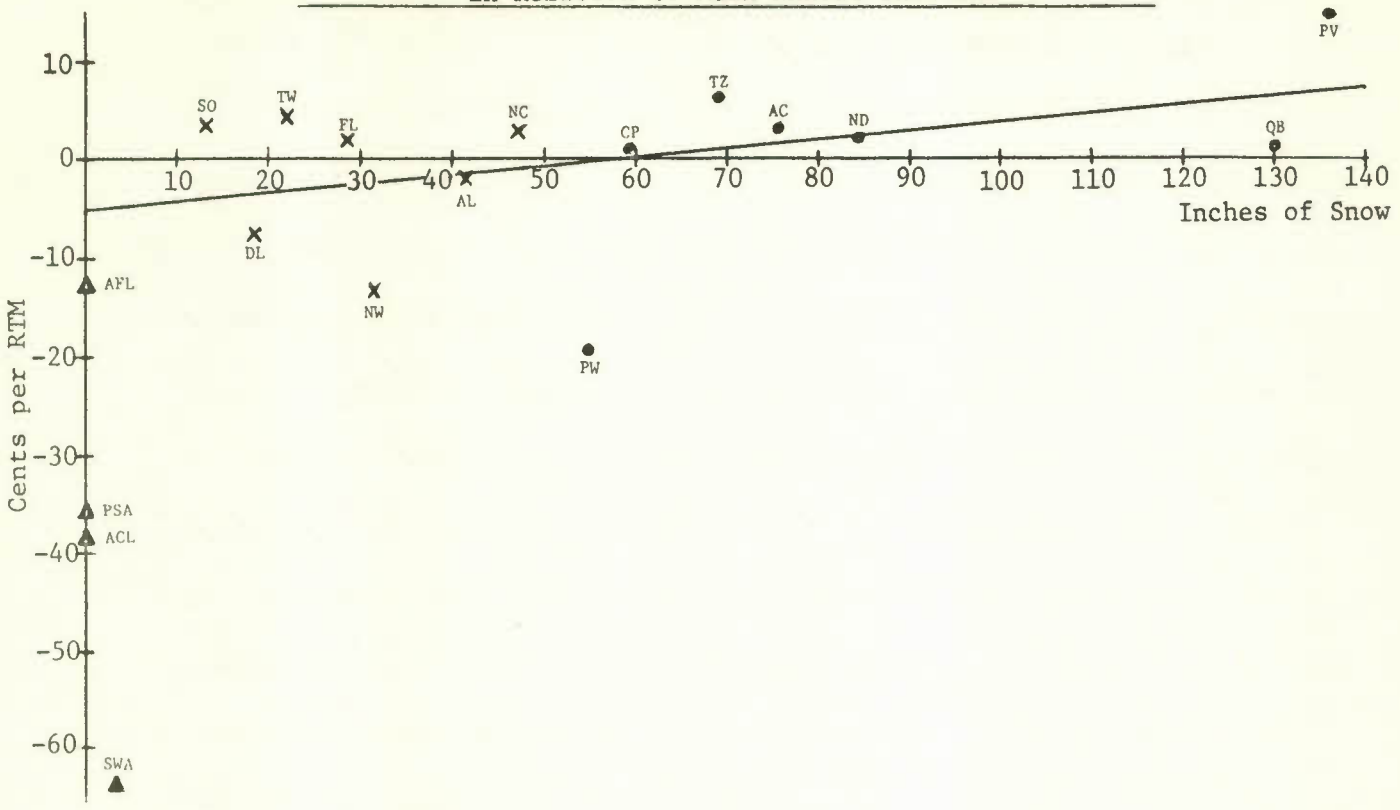
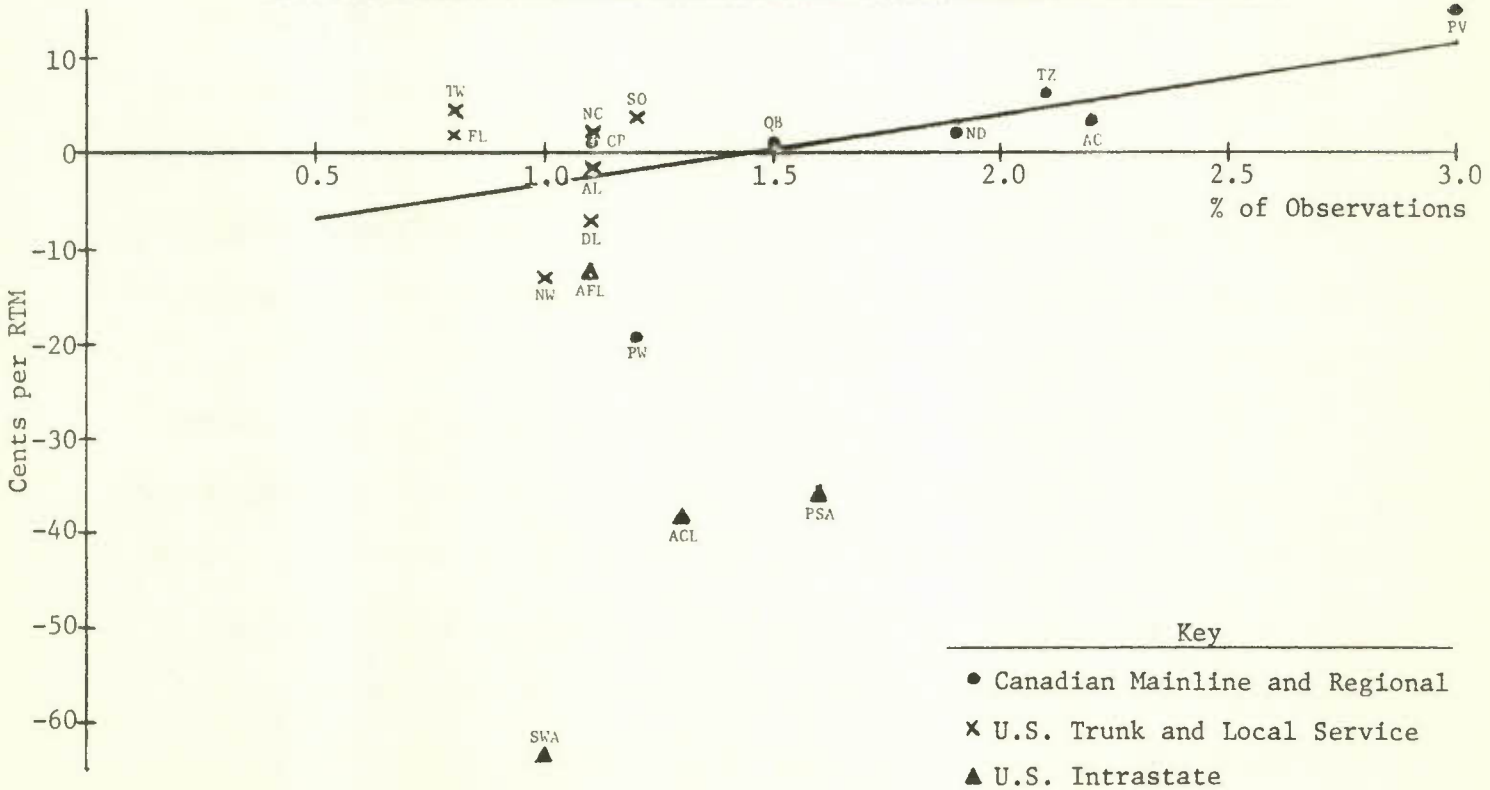


Figure 10-2

Deviations of 1975-78 Average Operating Expenses per RTM
in Relation to Percentage of Observations Below Category I Minimums



Sources: Tables 4-1 and 10-1.

Figure 10-3

Deviations of 1975-78 Average Operating Expenses per RTM
in Relation to December-March Mean Minimum Temperatures

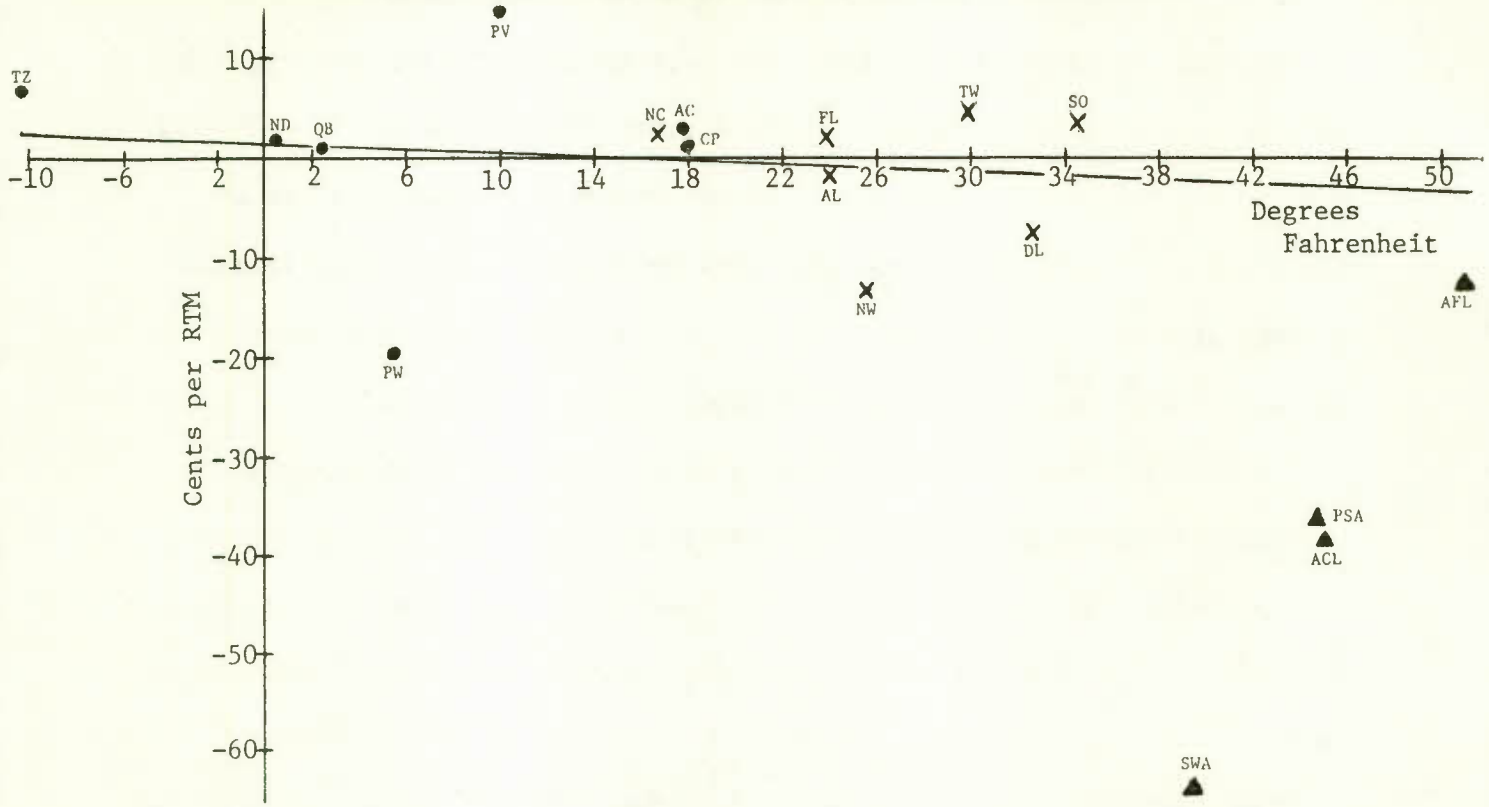
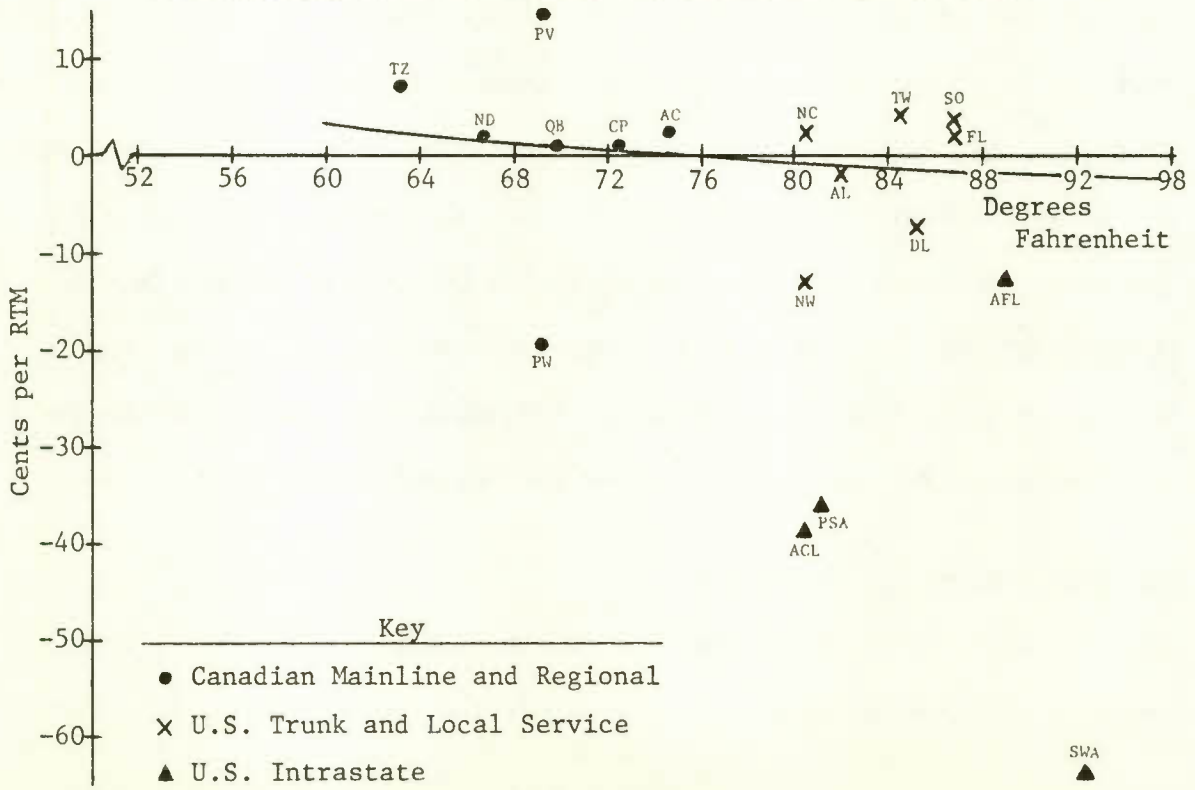


Figure 10-4

Deviations of 1975-78 Average Operating Expenses per RTM
in Relation to June-August Mean Maximum Temperatures



Sources: Tables 4-1 and 10-1.

only relationship that is statistically significant at the five percent level is for Category I minimums, with an R^2 of .299.[9]

Similar results were obtained when regressing deviations of actual RTM per employee from their distance-related trend line values (Table 6-2) with the weather factors in Table 10-1. After deleting the unusually large deviation for Northwest (as was also done in Chapter 6), the only statistically significant association (at the five percent level) was between Category I minimums and RTM per employee, with an R^2 of .298.[10]

In summary, then, no statistically significant correlation exists for the federally-regulated airlines between each of the four weather factors and operating expenses per RTM. At the same time, only Category I minimums were found to have a statistically significant relationship with deviations in actual operating expenses per RTM and deviations in actual RTM per employee from their respective best fit distance-related trend lines. These latter findings would indicate that the lower operating expenses per RTM of the three largest intrastate carriers could be due in part to less adverse weather were it not for the fact that these carriers did not operate under appreciably favourable Category I conditions. Indeed, Table 10-1 and Figure 10-2 show that these carriers' experienced below Category I minimums from 1.0 to 1.6 percent of the time, which is quite similar to the experience of the trunk and local service carriers in the U.S., plus CP Air, Pacific Western and Quebecair in Canada. Therefore, with regards to all four weather factors, this direct evidence indicates that the intrastate carriers' very low operating costs were not due to favourable weather conditions.

Indirect Evidence -- Employment

Indirect evidence can also be used to investigate whether or not Canada's more severe weather increases airline costs appreciably. For

example, if Canadian carriers are more affected by adverse weather than U.S. carriers, one would expect this to be reflected in their employment practices. Specifically, Canadian carriers should have to hire more employees in order to produce a given amount of output, and most of these added employees should be assigned to jobs that are exposed to weather. Thus, in relation to U.S. airlines, Canadian carriers should have lower employee productivity and should employ proportionally more pilots and copilots, other flight personnel (cabin attendants) and terminal/ramp personnel, while having proportionally fewer employees working indoors in positions that are not directly affected by weather (such as general management, accounting, purchasing and sales personnel.

Employee productivity was analyzed in Chapter 6, and Table 6-2 shows that during 1975-78 there was no systematic difference between the federally-regulated airlines of Canada and the U.S. in terms of RTM per employee, after adjusting for the effects of distance. Four of the Canadian carriers had negative deviations (relatively low employee productivity) and three had positive deviations, while the U.S. carriers were also divided almost equally with three negative and four positive deviations. It is relevant to note that Southern was one of the U.S. carriers with negative deviations despite its favourable location in the south, while Northwest had a large positive deviation even though it operated primarily along the Canadian/U.S. border. All of this, of course, is inconsistent with the argument that Canadian weather has significantly adverse effects on Canadian airline performance.

Even though Canadian employee data are available only for the six major categories listed in Table 10-2, it is still possible to use these rather aggregated data to investigate whether or not adverse weather results

Table 10-2

Percentage Distribution of Number of Employees by Category
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	Percentage of Total System Employees (1975-78 Average)					
	Pilots & Copilots	Other Flt. Personnel	Maint. Labour	Aircraft & Traffic Servicing	General Mgt.	Other Employees
Mainline						
Air Canada	7.2%	13.4%	15.2%	36.4%	0.6%	27.2%
CP Air	7.6	11.9	15.9	26.2	1.1	37.3
Trunk						
Trans World	10.0	14.5	17.4	33.8	0.1	24.2
Northwest	12.6	18.4	10.9	40.9	0.4	16.8
Delta	10.3	15.0	12.1	51.1	0.2	11.2
Intrastate						
Air Calif.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Air Florida	11.0	16.5	10.0	41.5	9.0	12.0
PSA	13.0	17.0	15.0	39.9	3.0	12.1
Southwest	10.5	16.6	9.4	51.3	4.5	7.7
Regional						
East. Prov.	10.5	15.5	29.8	29.5	3.3	11.4
Nordair	14.7	14.8	19.6	25.3	2.9	22.7
Pac. Western	12.0	11.9	21.2	36.8	17.3	0.8
Quebecair	15.0	16.4	16.7	27.9	17.2	6.8
Transair	13.1	13.2	22.2	20.1	14.2	17.2
Local Service						
Allegheny	11.8	11.2	14.3	46.9	0.5	15.3
Frontier	13.7	10.4	17.1	39.8	1.1	17.9
N. Central	13.6	11.4	14.4	43.5	0.4	16.7
Southern	12.6	10.7	9.3	44.4	0.9	22.1

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 34.

in Canadian carriers utilizing proportionally more employees in jobs exposed to the weather. One of these six categories covers pilots and copilots and a second covers other flight personnel.[11] Under the adverse weather explanation of higher Canadian airline operating expenses, the Canadian mainline and regional carriers should hire relatively more of these types of employees than U.S. carriers since the work of such employees is directly affected by weather conditions. It happens, however, that the opposite relationships actually proves to be the case for the Canadian mainline carriers. Table 10-2 shows that Air Canada and CP Air had pilot and copilot shares of 7.2 and 7.6 percent which are less than the 10.0 to 13.0 percent shares for the U.S. trunk and intrastate carriers.[12] Similarly, for the other flight personnel category, the Canadian mainline carriers' shares were 13.4 and 11.9 percent compared with 14.5 to 18.4 percent for the U.S. trunk and intrastate carriers.

The differences in pilot and copilot shares proved to be negligible for the Canadian regional and the U.S. local service carriers. The five regional carriers' shares ranged from 10.5 to 15.0 percent, compared with 11.8 to 13.7 percent for the four local service carriers (and 10.5 to 13.0 percent for the intrastate carriers). Even these similarities, however, are inconsistent with the reasoning that weather adversely affects Canadian employee productivity more than U.S. employee productivity. It is relevant that Eastern Provincial, Pacific Western and Transair had the lowest pilot and copilot percentages (10.5, 12.0 and 13.1) even though they were the regional carriers that carried the majority of their traffic within Canada and, thus, operated primarily in the Canadian weather environment.

The percentages for other flight personnel for the five regional carriers provide the only case that is partially consistent with the weather

explanation regarding lower Canadian labour productivity. These percentages ranged from 11.9 to 15.5 for the regional carriers in comparison with only 10.4 to 11.4 percent for the local service carriers. However, the intrastate carriers' range was from 16.5 to 17.0 percent, which is not consistent with the weather explanation. One possible reason for the regional carriers' larger percentages over the local service carriers is their large charter operations. The cabin attendant requirements for long-haul charter services may be greater than the requirements for short-haul local service operations.[13]

The obverse comparison, utilizing the general management and other employee categories that generally work indoors, is consistent with the conclusion derived from the comparisons of flight personnel. Since there appears to be some difference of opinion among the Canadian carriers on how to allocate personnel among the general management and other employees categories, it seems desirable to aggregate these two categories and analyze the resulting combined percentages.[14] Instead of Air Canada and CP Air having relatively small percentages for these combined categories, their 27.8 and 38.4 percent shares were both larger than the 11.4 to 24.3 percent shares for the trunk carriers and the 12.2 to 21.0 percent shares for the intrastate carriers. Similarly, the five regional carriers' combined shares ranged from 14.7 to 31.4 percent, with three of these carriers exceeding the local service carriers' range of 15.8 to 23 percent.

Overall, the indirect evidence from the employment data does not support the explanation that adverse weather is an important reason for the lower output per employee of the majority of Canadian carriers. This, of course, is consistent with the conclusion of the previous section that was based on direct evidence regarding the effects of weather.

Indirect Evidence -- Profits

If relatively adverse weather serves to increase costs appreciably, and if airlines charge the same fares, one would expect carriers operating mainly in the north to have lower profits than those operating primarily in the south where the weather was less severe. This would be especially true for the CAB-regulated airlines since they calculated their fares from the same distance-related fare formulas thoughout this period.

Table 3-1 shows that Delta (a predominantly southern airline) did indeed have relatively low operating ratios (high profits); but so did Northwest despite the fact its primary routes extended along the northern most edge of the U.S. and on to Alaska and across the North Pacific. At the same time, even though it mainly served the U.S. south, Southern was a relatively low-profit airline compared with Allegheny, Frontier and North Central whose routes were mostly in the northern U.S. with extensions on into Canada. Clearly, these profit performances are also inconsistent with the hypothesis that northern climates serve to increase the operating expenses of airlines over those operating in more temperate climes.

Summary

Both the direct and the indirect evidence presented in this chapter challenge the statement that weather is an important reason for Canadian carriers to have higher operating costs than U.S. carriers in general and the intrastate carriers in particular. Actually, similarities, rather than differences, characterized the cost performances of the federally-regulated airlines of the two countries during the period studied. Furthermore, the only weather factor that had a small, but statistically significant, relationship with operating expenses per RTM as well as with RTM per employee (after adjusting for the effects of distance) was the percentage

of time carriers experienced below Category I minimums. With regard to this factor, however, the U.S. intrastate carriers experienced about the same conditions as the CAB-regulated airlines plus three of the seven Canadian carriers.

The indirect evidence concerning employment is particularly persuasive. Labour is the input accounting for the largest portion of airline costs and it plays a crucial role in airline operations. Surely, if adverse weather serves to increase airline costs it should be evident in employee productivity and in the distribution of employees between outdoor and indoor jobs. Yet, no indication of such effects could be found. To the contrary, despite differences in weather, employee productivity among the federally-regulated Canadian and U.S. airlines was similar. Furthermore, the distribution of employees between outdoor and indoor jobs for Air Canada and CP Air relative to the U.S. trunk carriers was just opposite to the expected distribution, and the distribution for the regional carriers did not differ appreciably from that of their local service counterparts. Clearly, one must look for reasons other than weather to explain why the performance of the Canadian carriers differed so markedly from that of the low-cost U.S. intrastate carriers.

Footnotes

1. G. B. Hunnings, Assistant Vice-President, Public Affairs, CP Air, "Regulating Canada's Airlines: Where Do We Go From Here?" paper presented at the National Conference on Airline Regulation, sponsored by the American Enterprise Institute and the Institute for Research on Public Policy, Ottawa (June 27, 1979), pp. 4-5.

2. Headwinds may be an unavoidable enroute weather condition for airlines that prolong flights and increase costs. But a headwind for one flight is a tailwind for another flight traveling in the opposite direction. Thus, the net effects of wind on carrier costs are probably small.

3. Atmospheric Environment Service, Airport Handbook (Toronto: Environment Canada, 1975). Also, National Oceanic and Atmospheric Administration, Airport Climatological Summary, Climatography of the United States No. 90 (1965-1974) [Asheville, N.C.: U.S. Department of Commerce, various dates].

4. A more accurate average measure of weather effects would be obtained by weighting the observations at each airport by the number of aircraft movements for each carrier. However, aircraft movement information is not published for Canadian carriers by airport and, therefore, it is not possible to calculate weighted averages at this time. Also, it is emphasized that these averages exclude airports served by the various carriers in countries other than Canada and the U.S. If a majority of these international destinations are located in milder climates than North America, the system simple averages would be somewhat lower than the North American averages given in Table 10-1.

5. Some airports and carriers have instrumentation that allows Category II operations (minimums at or above 100 foot ceiling and one-quarter mile visibility), while other airports require minimums higher than those for Category I. However, Category I minimums are those in effect at most major North American airports (telephone conversation with Mr. Donald Sinclair, Superintendent of Air Carrier Operations, Transport Canada, Toronto, June 19, 1980).

6. Mean annual precipitation (rain plus snow) was also investigated, but little difference existed in this factor between the federally-regulated Canadian and U.S. airlines (a simple average of 31.4 inches per year for Canadian carriers, versus 35.1 inches for U.S. carriers, with very similar overall ranges). Also, there was essentially no correlation between this factor and RTM per employee adjusted for passenger trip length.

7. A review of the source material reveals that below minimum conditions generally vary in a consistent pattern throughout the day, with the below minimum percentages generally being higher from midnight to 7 a.m. than during the remainder of the day. Since the majority of takeoffs and landings occur during this latter period (from 7 a.m. to midnight), the percentages of below minimum conditions actually faced by the carriers are less than those specified. Furthermore, to the extent that aircraft operations in Canada are more frequent at major centers located in the southern part of the country having a less severe climate, calculating weighted averages for each carrier (using the number of its aircraft movements at each airport as weights) would further reduce the overall annual average. For example, weighting Air Canada's Canadian Category I minimum percentages by the total movements of all airlines at its airports (on the assumption that Air Canada is the major carrier at most of these airports), reduces its average Canadian percentage from 2.7 to 1.9 percent. Thus, it should be realized that the percentages in Table 10-1 indicate relative differences among the airlines rather than absolute differences. A similar bias exists with regard to temperatures. Obviously, the daytime minimum winter and maximum summer temperatures are higher than the overall averages listed in the table.

8. Based on the lowest mean squared error, the best fit regressions were obtained from the following equations:

Snowfall:	$Y = 82.371 + 165.093/X,$	$R^2 = .020$
Category I Minimums:	$Y = 82.659 + 2.879X,$	$R^2 = .006$
Minimum Temperatures:	$Y = 88.825 - 9.523/X,$	$R^2 = .047$
Maximum Temperatures:	$Y = 31.899 + 0.717X,$	$R^2 = .065$

None of the R^2 are significant at the five percent level (see footnote 3, Chapter 4).

9. Based on the lowest mean squared error, the best fit regressions were obtained from the following equations:

Snowfall:	$Y = -5.169 + .089X,$	$R^2 = .165$
Category I Minimums:	$Y = -10.388 + 7.240X,$	$R^2 = .299$
Minimum Temperatures:	$Y = 1.527 - .092X,$	$R^2 = .021$
Maximum Temperatures:	$Y = -11.003 + 833.311X,$	$R^2 = .020$

Only the R^2 for Category I minimums is significant at the five percent level (see footnote 3, Chapter 4).

10. Based on the lowest mean squared error, the best fit regressions were obtained from the following equations:

Snowfall:	$Y = 2,965.729 - 37.645X,$	$R^2 = .050$
Category I Minimums:	$Y = 8,850.579 - 5,544.321X,$	$R^2 = .298$
Minimum Temperatures:	$Y = -302.373 + 4,440.765X,$	$R^2 = .135$
Maximum Temperatures:	$Y = 14,581.717 - 1,045,575.938/X,$	$R^2 = .055$

Only the R^2 for Category I minimums is significant at the five percent level (see footnote 3, Chapter 4).

11. One advantage of using these two categories is that the definitions of the employees to be included are unambiguous and, therefore, less subject to errors of categorization or to differences in interpreting the instructions of Statistics Canada or the CAB.

12. Since these carriers all operate with the same size cockpit crews for any given aircraft type, these percentages are not influenced by that factor. For example, in each case two pilots (rather than three) are used to operate two-engine aircraft.

13. Collective agreements for Eastern Provincial and Pacific Western specify a complement of four, rather than three, flight attendants on charter flights operated with Boeing 727 and 737 aircraft. "Agreement No. 1 Between Eastern Provincial Airways (1963) Ltd. and the Canadian Air Line Employees' Association (Flight Attendants)," Effective: November 1, 1975, p. 6; and "Agreement No. 12 Between Pacific Western Airlines Ltd. and the Canadian Air Lines Flight Attendants Association," Effective October 1, 1978, p. 58.

14. The apparent differences of opinion can be seen by comparing the percentages for Eastern Provincial and Nordair with those for Pacific Western, Quebecair and Transair; and Air Canada with CP Air.

11. Population and Airline Costs

Population is a proxy for traffic demand. Airlines serving areas of low population are generally expected to have lower demand for their services than carriers serving heavily populated areas. Of course, population is just one factor affecting overall demand for airline services. Others include per capita income; the availability of alternative means of transportation (the highway system, railroads, and water transport); an area's isolation relative to other population centres, or its proximity to another city having superior/inferior airline service; and the economic characteristics of the area (institutional, marketing, balanced or industrial economies).[1]

In addition to demand factors, traffic is also influenced by prices. Given two cities with identical population and other demand factors, if the fares and rates per mile available at one are appreciably lower than at the other, it will have more traffic (the first law of demand in economics).

General Canada/U.S. Comparisons

An overall perspective regarding Canadian and U.S. population and traffic generation is provided in Table 11-1 which lists 1978 populations, scheduled revenue origin and destination (O&D) passengers in domestic and transborder operations, and the number of points and airports served by carriers operating large jet aircraft in the two countries.[2] The population data confirm the well-known fact mentioned by Mr. Hunnings (see page 116) that Canada's population is about a tenth the size of the U.S. -- actually, 10.7 percent in 1978. In addition, Canada's total domestic and transborder O&D passenger volume in 1978 was 10.9 percent as large as the U.S. volume. These two percentages imply a slightly greater generation of traffic in Canada than in the U.S., and Table 11-1 shows that 1,726 O&D passengers per 1,000 population

Table 11-1

Canadian and U.S. Population, Origin and Destination Passengers and Points/Airports Served by Canadian Mainline, Regional and U.S. Trunk, Local Service and Intrastate Carriers, 1978

Country and Area of Operation	1978 Population (000)	1978 O&D Passengers[a] Total (000)	1978 O&D Passengers[a] Per 1,000 Population	Number of Domestic Points	Number of Domestic Airports
Canada-Domestic	-	25,881[b]	1,102	104	106
Transborder	-	14,646[c]	624	-	-
N. American	23,483	40,527	1,726	-	-
U.S. - Domestic	-	357,949[b]	1,638	400[d]	412
Transborder	-	14,646[c]	67	-	-
N. American	218,548	372,595	1,705	-	-

[a]Obtained from a 10-percent sample of passenger flight coupons lifted by the Canadian mainline and regional carriers and by all U.S. certificated carriers except helicopter and intra-Alaska carriers. In addition, this includes O&D passengers for the four intrastate carriers based on their internal reports. The sample covers passengers from domestic plus domestic portions of international trips, and transborder plus transborder portions of international trips. O&D passengers are counted twice in the country totals. Therefore, the number of passengers actually traveling equals exactly half of the country totals.

[b]Domestic plus domestic portions of international trips.

[c]Transborder plus transborder portions of international trips.

[d]Excludes 16 points located in U.S. territories and 173 points served only by intra-Alaska carriers.

Sources: CAB/FAA, Airport Activity Statistics of Certificated Route Air Carriers (December 31, 1978), Table 6.
Consumer and Corporate Affairs Canada, "Entry and Exit in the Domestic Air Transport Industry," working paper (1980), pp. 27-40.
W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 35 and footnote 3, Chapter XI.
Official Airline Guide (July 1 and December 1, 1978).
SC(ASC), "Airport Activity Statistics - Enplaned Revenue Passengers, Unit Toll Services, Selected Airports, Annual 1978," special tabulation attached to a letter from Mr. E. Di Sanza (July 31, 1980).

were generated in Canada during 1978 compared with 1,705 in the U.S.

One significant difference between Canadian and U.S. airlines is the relative importance of transborder traffic to the two countries. For Canada, 1978 transborder O&D passengers accounted for 36.1 percent of its North American total while the same passengers comprised just 3.9 percent of the North American total for the U.S. This means that domestic traffic generation was appreciably lower in Canada than in the U.S. (1,102 O&D passengers per 1,000 population vs. 1,638 for the U.S.), while transborder traffic generation was 9.3 times higher (624 per 1,000 population vs. 67 for the U.S.). These rates, however, are consistent with what would be expected from the relative population sizes and traffic of the two countries. Indeed, the 9.3 larger transborder traffic generation for Canada corresponds to the United States' population and O&D traffic being over nine times larger than Canada's population and traffic.

Table 11-1 also shows that, during 1978, a total of 104 Canadian points were served by one or more of the larger Canadian carriers through 106 airports, while a total of 400 points were served by large U.S. carriers through 412 airports.[3] On a nationwide basis, this yields an average 1978 population per airport of only 222,000 for Canada compared with 530,000 for the U.S. Relative to population, therefore, the coverage of large Canadian carriers has been much more extensive than that of large U.S. carriers.

The story differs with respect to geographic coverage. The two countries are similar in overall size (3,851,809 square miles for Canada vs. 3,675,633 for the U.S.),[4] yet the U.S. has four times the number of airports served by large airlines. Thus, the geographic coverage of airlines in the U.S. is more extensive than in Canada. This merely reflects the fact that Canada's population, traffic and airline coverages are more concentrated than in the

U.S., with most of the smaller Canadian population being located in the more temperate regions along the Canada/U.S. border.

Total Population

The simplest approach to investigating whether or not differences in operating costs between Canadian and U.S. carriers are affected by differences in population is to compare these carriers in terms of the aggregate 1970/71 populations surrounding the airports served by each carrier, that is, the population pool from which most traffic originates.[5] These population totals for each carrier are given in Table 11-2, broken down between areas located in Canada and those in the U.S. It can be seen that the total populations of Air Canada and CP Air were heavily influenced by the populations of the metropolitan areas they served in the U.S. Even with the U.S. populations added to those in Canada, however, the 1970/71 population pool available to Air Canada (51,634,000) was just two-thirds of Trans World's pool (76,097,000), while CP Air's population pool (19,539,000) was only 30 percent of Northwest's (66,083,000). Similarly, the population pools of the Canadian regional carriers were all very much smaller than those of the U.S. local service carriers.

If the Canadian carriers had consistently higher operating expenses than comparable U.S. carriers (after adjusting for the effects of distance), these relative population data would support the assertion that small population pools are associated with high operating costs. However, Table 4-1 shows that the 4.2 and 1.6 percent positive deviations in operating expenses per RTM for Air Canada and CP Air lie within the -19.2 to 7.0 percent range determined by the U.S. trunk carriers, and the -18.8 to 15.7 percent range of the Canadian regional carriers encompasses the deviations of the U.S. local service carriers. Thus, there is no consistent pattern among the federally-regulated airlines.

Table 11-2

Population, Number of Airports, and Number of Carriers Serving All Airports on the North American Route Systems of the Canadian Mainline, Regional and Selected U.S. Carriers

Carrier	1970/71 Population (000)			Number of Airports in			Number of Carriers in		
	Canada	U.S.	Total	Canada[a]	U.S.[a]	Total	Canada[b]	U.S.[b]	Total
Mainline									
Air Canada	11,524	40,110	51,634	33/32	17/10	50	69/21	12/139	241
CP Air	8,610	10,929	19,539	17/15	6/ 3	23	38/22	4/ 39	103
Trunk									
Trans World	0	76,097	76,097	-	41/38	41	-	11/347	358
Northwest	1,046	65,037	66,083	3/ 2	40/36	43	7/ 6	12/280	305
Delta	2,729	87,483	90,212	2/ 1	78/73	80	6/ 4	12/451	473
Intrastate									
Air Calif.	0	9,603	9,603	-	11/11	11	-	2/ 70	72
Air Florida	0	4,905	4,905	-	11/11	11	-	2/ 63	65
PSA	0	15,523	15,523	-	13/13	13	-	4/ 85	89
Southwest	0	6,782	6,782	-	13/ 9	13	-	2/ 49	51
Regional									
East. Prov.	3,831	0	3,831	18/17	-	18	34/ 4	-	38
Nordair	4,641	2,401	7,042	16/15	1/ 1	17	32/ 5	1/ 6	44
Pac. Western	2,622	1,425	4,046	36/36	1/ 1	37	49/ 8	1/ 9	67
Quebecair	3,680	0	3,680	18/18	-	18	32/ 4	-	36
Transair	3,417	0	3,417	20/20	-	20	31/10	-	41
Local Service									
Allegheny	5,331	70,412	75,743	3/ 2	58/56	61	9/ 9	5/280	303
Frontier	550	23,652	24,202	1/ 1	87/85	88	3/ 3	2/228	236
N. Central	3,267	49,858	53,125	3/ 3	72/70	75	8/ 9	4/231	252
Southern	0	50,171	50,171	-	59/56	59	-	4/287	291

[a]The first number of each pair is the total number of airline airports located within the areas containing the specified population. The second is the number of those airports actually served by the carrier. Totals sum only the first of these numbers. Data are for 1978.

[b]The first number of each pair is the number of Canadian carriers serving the total number of airline airports. The second is the number of U.S. carriers serving these airports. Every carrier is counted once at each airport served, yielding "airport carriers." Totals sum all carriers operating at the airports in both countries. Data are for 1978.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 36.

Population data for the U.S. intrastate carriers provide an even more serious challenge to the assertion that small population pools are associated with high operating costs. The intrastate carriers' 1970 population pools ranged from 4,905,000 (Air Florida) to 15,523,000 (PSA). These totals were considerably smaller than the totals for Air Canada and CP Air, and they encompassed the mainline carriers' domestic (Canada only) population pools. Yet, as shown in Table 4-1, the intrastate carriers had much lower operating expenses per RTM than any of the other carriers in relation to the distance-related trend line. If total population were a major factor affecting airline operating costs, the intrastate carriers would not have been so superior in this measure.

There were similar anomalies within each carrier group. CP Air's population pool was only 38 percent as large as Air Canada's, but relative to the distance-related trend lines its operating expenses per RTM (Table 4-1) were slightly superior to Air Canada's. Northwest had the lowest operating expenses of the three U.S. trunk carriers, yet it also had the lowest population pool. Furthermore, the most efficient of the intrastate carriers, Southwest, had the second smallest population pool -- one that was only 44 percent as large as PSA's pool.

Finally, regression analysis provides useful evidence regarding the lack of relationship between measures of operating expenses and employee productivity (as dependent variables) and population pool data (as

independent variables). The regressions for the following six pairs of data were calculated for the federally-regulated airlines:

1. Total operating expenses per RTM and
   a. North American population pool
   b. Domestic population pool[6]
2. Deviations in total operating expenses per RTM from the distance-related trend line and
   a. North American population pool
   b. Domestic population pool[6]
3. Deviations in total RTM per employee from the distance-related trend line and
   a. North American population pool
   b. Domestic population pool[6]

The R^2 for these six regressions ranged from .000 to .169 and none were statistically significant.[7] Thus, all of the above evidence questions the importance of population as a significant factor influencing airline operating costs.

Population per Airport

It can be argued that population per airport, rather than the total population pool available to a carrier, is the relevant population factor affecting airline operating costs. One carrier having a relatively small population pool served through a few airports might have the same population per airport as another carrier serving a much larger population pool through proportionally more airpots. Were this the case, and if operating costs were closely related to population per airport, then both carriers' operating costs should be similar. Population per airport data for each carrier are given in Table 11-3, and were calculated by dividing the 1970/71 population pools for each carrier by the total number of airports located in the relevant areas during 1978.

Again, Air Canada and CP Air were appreciably below Trans World and Northwest in total population per North American airport, with each Canadian carrier now being about 55 percent of its comparable U.S. carriers. Also,

Table 11-3

Population per Airport on the North American Route Systems of the Canadian Mainline, Regional and Selected U.S. Carriers

Carrier	1970/71 Population per Airport[a]		
	Canada	U.S.	Total
Mainline			
Air Canada	349,000	2,359,000	1,033,000
CP Air	506,000	1,822,000	850,000
Trunk			
Trans World	0	1,856,000	1,856,000
Northwest	349,000	1,626,000	1,537,000
Delta	1,364,000	1,122,000	1,128,000
Intrastate			
Air Calif.	0	873,000	873,000
Air Florida	0	446,000	446,000
PSA	0	1,194,000	1,194,000
Southwest	0	522,000	522,000
Regional			
East. Prov.	213,000	0	213,000
Nordair	290,000	2,401,000	414,000
Pac. Western	73,000	1,425,000	109,000
Quebecair	204,000	0	204,000
Transair	171,000	0	171,000
Local Service			
Allegheny	1,777,000	1,214,000	1,242,000
Frontier	550,000	272,000	275,000
N. Central	1,089,000	692,000	708,000
Southern	0	850,000	850,000

[a]Number of airports served in 1978.

Source: Calculated from data in Table 11-2.

with one exception, the Canadian regional carriers had lower populations per airport than the U.S. local service population pool. Given these similar relationships, it follows that the inconsistencies between total population pool and operating expenses per RTM should also hold for population per airport among the federally-regulated carriers. At the same time, the outstanding performance of the U.S. intrastate carriers continues to challenge the assertion that population per airport affects operating costs. The total populations per airport of the intrastate carriers were roughly equal to, or less than, those of the Canadian mainline carriers and, in two cases, were similar to the mainline carriers' domestic populations per Canadian airport. Yet the intrastate carriers had much lower operating expenses per RTM after adjusting for distance.

Finally, the best-fit regressions relating the three dependent variables with each carrier's total North American and domestic populations per airport (as two separate independent variables), yield R^2 ranging from .128 to .035.[8] Again, none of the R^2 are significant at the five percent level. Thus, the evidence continues to question the importance of population as a factor influencing operating costs.

Population per Airport Carrier

A third possibility is that an inverse relationship between population and airline operating costs can be found by using average population per carrier for all large carriers serving all airports within the relevant population pool. For example, Table 11-2 shows that Air Canada's North American system covered approximately 11,524,000 people located in areas served by 33 Canadian airports, and 40,110,000 people served by 17 U.S. airports, for a total population of 51,634,000. Including Air Canada, 90

large carriers (69 Canadian and 21 U.S.) provided service in 1978 at the 33 Canadian airports, and 151 large carriers (12 Canadian and 139 U.S.) served the 17 U.S. airports, making a total of 241 airport carriers serving all areas on Air Canada's North American system.[9] In essence, population per airport carrier indicates the average distribution of population over a carrier's system adjusted by the degree of competition/rivalry the carrier faces from other airlines. It is a rough indicator of the traffic available to a carrier at each airport on its system.

Table 11-4 gives both the population per airport carrier and the average number of carriers serving each airport located within the geographic areas associated with the indicated carrier's population pool. It can be seen that in 1978 the average numbers of carriers were generally two to three times higher at U.S. airports than at Canadian. Since each carrier served many more airports in its own country than in the other, it follows that the population pool available to each U.S. carrier is divided into more parts than is the case for Canadian carriers. This tends to counteract the larger populations in the U.S. Therefore, it is not surprising to find the total 1970/71 populations per airport carrier were almost the same among the Canadian mainline and U.S. trunk carriers, ranging from populations of 190,000 to 217,000 per airport carrier, and with Air Canada and Trans World being almost identical. The U.S. intrastate carriers were all lower than the mainline and trunk carriers, ranging from populations of 75,000 per airport carrier (Air Florida) to 174,000 (PSA). The Canadian regional carriers tended to be somewhat lower than the intrastate carriers in this measure, with populations per airport carrier ranging from 60,000 (Pacific Western) to 160,000 (Nordair). Finally, the U.S. local service carriers were divided into two subgroups. Allegheny (250,000) and North Central

Table 11-4

Population per Airport Carrier and Average Number of Carriers per Airport on the North American Route Systems of the Canadian Mainline, Regional and Selected U.S. Carriers

Carrier	1970/71 Population per Airport Carrier[a]			Average Number of Carriers per Airport		
	Canada	U.S.	Total	Canada	U.S.	Total
Mainline						
Air Canada	128,000	265,000	214,000	2.7	8.9	4.8
CP Air	144,000	254,000	190,000	3.5	7.2	4.5
Trunk						
Trans World	0	213,000	213,000	-	8.7	8.7
Northwest	80,000	223,000	217,000	4.3	7.3	7.1
Delta	273,000	189,000	191,000	5.0	5.9	5.9
Intrastate						
Air Calif.	0	133,000	133,000	-	6.5	6.5
Air Florida	0	75,000	75,000	-	5.9	5.9
PSA	0	174,000	174,000	-	6.8	6.8
Southwest	0	133,000	133,000	-	3.9	3.9
Regional						
East. Prov.	101,000	0	101,000	2.1	-	2.1
Nordair	125,000	343,000	160,000	2.3	7.0	2.6
Pac. Western	46,000	142,000	60,000	1.6	10.0	1.8
Quebecair	102,000	0	102,000	2.0	-	2.0
Transair	83,000	0	83,000	2.0	-	2.0
Local Service						
Allegheny	296,000	247,000	250,000	6.0	4.9	5.0
Frontier	92,000	103,000	103,000	6.0	2.6	2.7
N. Central	192,000	212,000	211,000	5.7	3.3	3.4
Southern	0	172,000	172,000	-	4.9	4.9

[a]Total population pool for each carrier divided by the sum of all the large carriers serving each airport within the relevant areas during 1978.

Source: Calculated from data in Table 11-2.

(211,000) were similar to the mainline and trunk carriers, while Frontier (102,000) and Southern (172,000) were more like the U.S. intrastate and Canadian regional carriers.

If population per airport carrier were a major determinant of airline operating costs, one would expect the similarities in this measure among the Canadian mainline and U.S. trunk carriers to yield similar operating expenses per RTM. However, after adjusting for distance, Table 4-1 shows that Northwest had appreciably lower operating expenses than its fellow carriers, and even more inconsistent differences are found when comparing the mainline and trunk carriers with the U.S. intrastate carriers. The latter carriers all have much lower operating expenses per RTM even though their populations per airport carrier were also much smaller.

Turning again to statistical inference, the best-fit regressions relating the three dependent variables with each carrier's total North American and domestic populations per airport carrier, yield statistically insignificant R^2 ranging from .107 to .004.[10] So once more the evidence fails to support the argument that there is an important inverse relationship between population and airline operating costs.

Other Factors and Conclusion

It is important to recognize that all the carriers in this analysis operate jet aircraft that are large relative to the aircraft commonly operated by Level III, IV and V carriers in Canada, and by commuter and air taxi carriers in the U.S. Therefore, implicit in the above comparisons is the fact that, regardless of local population, the traffic available at the various airports was sufficient to support the scheduled operation of jet aircraft. Thus, the costs of operating small aircraft at low-traffic generating airports are excluded and the conclusion of this section should

not be applied to them.

Another factor is that traffic generation from a given local population can be affected by operating restrictions imposed under regulation. CP Air's capacity and long-haul restrictions on the transcontinental route during and prior to 1978 are one example; the restrictions imposed on Canadian regional and U.S. local service carriers against operating nonstop flights between major cities are another. The fact that CP Air carried only 28 percent as many scheduled domestic RPM as Air Canada in 1978 while having a domestic populations pool 75 percent as large, is probably due in large part to such restrictions.[11] Despite its relatively low traffic generation, however, CP Air did as well or better than Air Canada in terms of operating expenses per RTM and employee productivity.

Not only have inconsistencies between population and operating costs within carrier groups failed to support the assertion of an important inverse relationship between these factors, but again and again the superior performance of the U.S. intrastate carriers have posed a fundamental challenge to the assertion. The small intrastate carriers served limited geographic areas where surface transportation has been much more competitive with air transportation than is the case for longer-haul routes. The total population pools available to Air California and PSA were much smaller than those available to Air Canada and CP Air, and were roughly comparable to the Canadian carriers' domestic pools. Yet these two intrastate carriers outperformed the Canadian carriers in terms of operating expenses per RTM. Similarly, Southwest's total population pool in Texas was smaller than even CP Air's domestic pool, its population per airport was about the same, and its population per "airport carrier" was again smaller. The metropolitan areas it served were even comparable in population to those in Canada.[12]

Yet, even with these population characteristics, Southwest achieved much lower operating expenses per RTM than CP Air.

Whether based on formal statistical inference or on individual comparisons between carriers, the evidence fails to support the assertion that there is an important inverse relationship between population and airline operating costs. Furthermore, there is no consistent indication that the operating costs of Canadian airlines differ from those of comparable U.S. carriers due to population differences. To the contrary, the evidence strongly indicates that population is not an important determinant of airline operating costs.

Summary

This chapter and the previous chapter have investigated the arguments proposed by Canadian airline representatives that adverse weather and smaller population are two reasons why Canadian mainline and regional carriers have higher operating costs than their U.S. counterparts. First of all, it was pointed out that the cost performances of the federally-regulated airlines in the two countries were characterized by substantial similarities rather than differences, but that important differences did exist between all the federally-regulated airlines and the U.S. intrastate carriers. Second, neither weather nor population was found to have an appreciable impact on airline performance. Chapter 10 demonstrated that, out of four measures of weather, only below Category I minimums proved to have a statistically significant relationship with distance-adjusted operating expenses per RTM and with distance-adjusted RTM per employee. However, since the U.S. intrastate carriers were about average with regard to this factor, their superior performance could not be attributed to especially favourable weather conditions. Then, as described in this

chapter, no statistically significant relationships were found between three measures of population and the operating expense and employee productivity measures. Furthermore, inconsistencies between population and operating costs existed within the various carrier groups.

This evidence casts serious doubt on the arguments that bad weather and low population impose higher operating costs on Canadian carriers. It now seems incumbent on any who continue to make these arguments to present comprehensive evidence supporting their assertions. Until such evidence is forthcoming the opposite conclusion stands -- adverse weather and low population do not significantly increase the operating costs of large Canadian carriers.

The policy implication of the above evidence is that there are no immutable demographic or climatic reasons why Canadian carriers cannot achieve operating performance similar to that of the U.S. intrastate carriers. Thus, one must look elsewhere for explanations of the large performance differences that have been found to exist between these two groups of carriers. The clear pattern of performance similarities among the federally-regulated Canadian and U.S. airlines in contrast to the large differences in their performance from that of the U.S. intrastate carriers is consistent with the hypothesis that regulatory monopolies have a major affect on airline performance. And, of course, regulation is an area that is clearly subject to policy change and direction.

Footnotes

1. For example, institutional cities such as Ottawa, Washington and Las Vegas generate more passengers per 1,000 population than do industrial cities such as Detroit and Montreal. Federal Aviation Agency, Air Traffic Patterns and Community Characteristics (1963), pp. 1-10.

2. The scheduled revenue O&D passenger data pertain only to the Canadian mainline and regional carriers, and to the U.S. trunk, local service and intrastate carriers. They exclude O&D passengers traveling only on Level III, IV and V Canadian carriers and on U.S. commuter carriers. Thus, the Canadian data pertain mainly to those points lying on the transcontinental routes along the border plus the north-south routes operated by CP Air and the five regional carriers. In addition, these O&D passenger data exclude all charter passengers. In 1978, however, charter passengers accounted for only about 0.8 percent of total domestic and transborder scheduled and charter O&D passengers for U.S. carriers, and 1.8 percent for Canadian carriers. Therefore, there were not enough of them to change the relationships indicated by scheduled O&D passengers. [Percentages calculated from data in Table 11-1, CAB, Supplement to the Handbook of Airlines Statistics (November 1979), pp. 8-9, and W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix H.]

3. Since some cities are served through more than one airport, the number of airports exceeds the number of points served.

4. Rand McNally, Cosmopolitan World Atlas (New York: 1962), p. 167.

5. The use of 1970 census data for the U.S. and 1971 census data for Canada was dictated by the need to have accurate figures for the various areas surrounding the airports served by each carrier. Such information is not available for 1978.

6. The use of domestic population pools as an independent variable responds to the possible argument that these data reflect more accurately the true demand for each carrier's services. After all, Canadian carriers in the U.S. (and U.S. carriers in Canada) are limited to only transborder operating rights in contrast to their more extensive domestic rights. Also, the transborder community of interest is probably less than the overall community of interest within each country. As can be seen in footnote 7, the use of domestic population pools did not yield appreciably higher R^2.

7. Based on the lowest mean squared error, the best fit regressions were obtained from the following equations:

$$
\begin{aligned}
&1.a.\ Y = 87.113 - 3{,}161.324/X, && R_2^2 = .000\\
&\quad b.\ Y = 89.512 - 21{,}609.266/X, && R_2^2 = .015\\
&2.a.\ Y = 2.188 - .000056X, && R_2^2 = .045\\
&\quad b.\ Y = 2.003 - .000061X, && R_2^2 = .053\\
&3.a.\ Y = -1{,}633.086 + .066X, && R_2^2 = .102\\
&\quad b.\ Y = -1{,}889.224 + .085X, && R^2 = .169
\end{aligned}
$$

None of the R^2 are significant at the five percent level (see footnote 3, Chapter 4).

8. Using population per airport in place of population pool, the best-fit regressions were obtained from the following equations based on the lowest mean squared error (see p. 147):

1.a. $Y = 96.110 - .012X$, $R^2 = .088$
b. $Y = 91.835 - .007X$, $R^2 = .035$
2.a. $Y = 1.679 - 611.178/X$, $R^2 = .035$
b. $Y = 2.812 - 842.663/X$, $R^2 = .120$
3.a. $Y = -1{,}423.954 + 3.057X$, $R^2 = .060$
b. $Y = -1{,}978.599 + 4.465X$, $R^2 = .128$

None of the R^2 are significant at the five percent level (see footnote 3, Chapter 4).

9. It should be clearly understood that each carrier is counted several times in this measure, once at every airport where it operates. Air Canada, for example, is counted 42 times because in 1978 it served 42 of the 50 airports within its population pool, leaving 199 airport carriers comprised of other large Canadian and U.S. airlines. The eight airports not served by Air Canada were: Edmonton Municipal, New York La Guardia, Chicago Midway, Dallas Love Field, Houston Hobby, Burbank, Long Beach and Oakland. It should also be understood that "large carriers" refers to the Canadian mainline and regional carriers, and to the U.S. trunk, local service and intrastate carriers.

10. Using population per airport carrier in place of population pool, the best fit regressions were obtained from the following equations based on the lowest mean squared error (see p. 147):

1.a. $Y = 90.481 - .023X$, $R^2 = .004$
b. $Y = 81.178 + .038X$, $R^2 = .010$
2.a. $Y = 3.417 - 461.624/X$, $R^2 = .041$
b. $Y = 4.905 - 596.231/X$, $R^2 = .107$
3.a. $Y = -2{,}002.236 + 17.166X$, $R^2 = .054$
b. $Y = -3{,}338.508 + 28.183X$, $R^2 = .064$

None of the R^2 are significant at the five percent level (see footnote 3, Chapter 4).

11. W. A. Jordan, supra note 2, Appendix G.

12. The 1970 populations of Dallas-Ft. Worth and Houston were 2,318,000 and 1,985,000, respectively, compared with 1971 populations for Montreal and Toronto of 2,729,000 and 2,602,000. Southwest's smallest area, Midland-Odessa, had a 1970 population of only 158,000. Ibid., Table 35.

12. Economies of Scale

Economies of scale are defined in economic theory as a situation where a firm's long-run average costs decrease as its rate of output increases. Since more inputs (labour, plant, equipment, supplies, etc.) are required to achieve higher rates of output, larger firm size is commonly associated with economies of scale. Therefore, cases where larger firms in an industry generally have lower average costs than do smaller firms constitute evidence that economies of scale exist in the industry.

The data presented in several of the previous chapters provide clear evidence that larger airlines in Canada and the U.S. do not generally have lower average costs than smaller airlines. Indeed, some of the larger airlines were found to have average costs that were above the norm. Thus, not only do these data challenge the existence of economies of scale, but they indicate that diseconomies of scale may actually exist among the larger airlines in the industry. This chapter will summarize this evidence and will outline its policy implications for the federal government.

Operating Expenses per RTM

The inverse relationship between distance and total operating expenses per RTM (a measure of average costs) was depicted in Figure 4-1. It can be seen from that figure that average costs decrease with distance, but data from Table 12-1 show that there is no statistically significant relationship between distance and airline size.[1] For example, during 1975-78 Air Canada and Nordair had almost identical system passenger trip lengths, but Air Canada was 20 times larger than Nordair in terms of total RTM carried. Similarly, even though Air Canada was 2½ times the size of CP Air, its average trip length was 1,064 compared with 1,789 for CP Air. Therefore, it cannot be

Table 12-1

Relative Sizes, Distances and Deviations of Operating Expenses per RTM
Canadian Mainline, Regional and Selected U.S. Carriers
1975-78 Average Values

Carrier	Relative Sizes Total System RTM Air Canada = 100	System Trip Length[a]	% Deviation of Total Operating Expenses per RTM[b]
Mainline & Trunk			
Trans World	209.2	1,390	7.0%
Delta	148.4	636	-8.7
Northwest	113.0[c]	1,110	-19.2
Air Canada	100.0	1,064	4.2
CP Air	40.0	1,789	1.6
Regional & Local Service			
Allegheny	27.3	323	-1.5
Frontier	13.6	406	2.0
North Central	10.3	253	1.9
Pacific Western	9.1	383	-18.8
Southern	8.5	329	3.4
Nordair	5.0	1,067	2.9
Quebecair	4.9	771	1.2
Transair	2.8	707	8.7
Eastern Provincial	2.6	444	15.7
Intrastate			
PSA	15.2	318	-31.8
Air California	5.2[d]	341	-38.0
Southwest	4.1	284	-52.8
Air Florida	1.2[e]	268	-9.9

[a]Total system scheduled plus charter RPM divided by total system passengers yields distance in statute miles.

[b]Deviation percent of trend value.

[c]1975-77. 1978 data are excluded due to Northwest's 108-day pilot strike.

[d]1977-78.

[e]1978 only.

Sources: Tables 4-1 and 5-1.

concluded that economies of scale are a factor that might account for part of the inverse relationship between total operating expenses per RTM and distance.[2]

Since distance is a relevant factor in relation to average costs, but is unrelated to firm size, it is necessary to remove its effects on total operating expenses per RTM in order to determine whether or not additional reductions in average costs are associated with increases in airline size. This can be done by comparing airline size with the deviation of each carrier's total operating expenses per RTM from the distance-related trend line. If economies of scale are a significant factor in the airline industry, the large carriers should tend to have negative deviations from the trend line while small carriers should have positive deviations.

Table 12-1 lists the 14 federally-regulated airlines in descending order of size (based on total system RTM) and gives their percentage deviations from the distance-related trend line for 1975-78. It is obvious from this table that a consistent inverse relationship does not exist between airline size and deviations in operating expenses per RTM. Some large airlines (Trans World, Air Canada and CP Air) had positive deviations while some small airlines (Allegheny and Pacific Western) had negative deviations. Both of these situations are contrary to what should be observed if substantial economies of scale exist in the airline industry. Furthermore, the straight-line regression between these two variables yields an R^2 of .036 which is not statistically significant at the five percent level.[3]

Figure 4-1 and Table 12-1 also show that all four of the relatively small U.S. intrastate carriers had negative deviations, with three of these carriers (Air California, PSA and Southwest) having negative deviations that far exceeded that of even Northwest, the lowest-cost of the 14 federally-regulated airlines. Clearly, if firm size were an important factor in

lowering average costs, the intrastate carriers would not have had such large negative deviations. In addition, among these four carriers, if economies of scale were important, PSA should have had a larger negative deviation than Air California or Southwest since it carried 2.9 and 3.7 times the RTM carried by these two carriers during the four-year period. But PSA actually had a smaller deviation than either Air California or Southwest, with Southwest's -52.8 percent deviation being two-thirds greater than PSA's -31.8 percent deviation. Again, the evidence is inconsistent with the existence of significant economies of scale in the airline industry.

Employee Productivity and Payments

As was pointed out in the summary of Chapter 6, the evidence regarding labour productivity is also inconsistent with the existence of economies of scale in the airline industry. Following the reasoning in the previous section regarding the elimination of the effects of distance, a straight-line regression between firm size and percentage deviations of RTM per employee from the distance-related trend line (Table 6-2) yields an R^2 of .080 for the federally-regulated airlines (excluding Northwest).[4] This finding questions the likelihood that labour productivity increases with airline size.

The straight-line regression between airline size and percentage deviations of grand total employee payments per RTM for the distance-related trend line (Table 7-2) yields an R^2 of .286 for the federally-regulated airlines (excluding Northwest) which is not quite significant at the five percent level.[5] Furthermore, the sign of the slope coefficient is positive, which means that had the relationship been significant it would have provided evidence of diseconomies of scale. It seems likely, however, that rather

than implying diseconomies of scale, this perverse relationship reflects the low payments per employee of the Canadian regional carriers, which comprised five out of the six smallest federally-regulated airlines (see Tables 7-1 and 12-1).

In addition to there being no evidence of economies of scale among the federally-regulated airlines from labour productivity and employee payment data, the small U.S. intrastate carriers continued to out perform the federally-regulated airlines in these labour measures. All four of the intrastate carriers had positive percentage deviations in RTM per employee (Table 6-2) that exceeded every federally-regulated airline but Northwest, and their negative percentage deviations in grand total employee payments per RTM (Table 7-2) were all much larger than even Northwest's percentage deviation. Again, this is inconsistent with what should occur if substantial economies of scale exist in the airline industry.

Fuel Utilization and Expenses

Evidence indicating the existence of possible economies of scale among the federally-regulated airlines is also missing from their fuel utilization and expense data. A straight-line regression between airline size (Table 12-1) and percentage deviations of RTM per litre from the distance-related trend line (Table 9-1) yields a statistically insignificant R^2 of .109.[6] Similarly, a straight-line regression between airline size and percentage deviations of fuel expenses per RTM (Table 9-3) yields another statistically insignificant R^2 of .038.[7] At the same time, the small U.S. intrastate carriers (except for Air Florida) had above average RTM per litre and below average fuel expenses per RTM, which are also inconsistent with the existence of economies of scale in the airline industry.

Charter Yields

A final test of the existence of economies of scale can be made by utilizing charter yield data. Since the Canadian mainline and regional carriers undertake charter operations voluntarily (in contrast to their regulatory obligations to operate scheduled service), it follows that their charter yields cover at least their average variable costs. Indeed, since charter service accounted for 20.4 to 75.7 percent of the regional carriers' total system RTM in 1978,[8] and since four out of five of these carriers were profitable in that year,[9] it seems likely that charter yields also covered a large portion of these carriers' fixed costs during 1978.

Most of the regional carriers' charter services were performed in transborder and international operations during the period under study. In fact, during 1978, between 64.9 and 94.3 percent of their total charter RTM were produced in those two areas.[10] Furthermore, it is in these two areas of charter operations that the greatest amount of competition is experienced since a number of foreign carriers are able to provide rival service in addition to the seven mainline and regional carriers. Therefore, the transborder and international charter yields should provide rough approximations of the long-run average costs of the regional carriers' charter services.

Table 12-2 shows that the Canadian regional carriers' transborder yields for 1978 were, on average, about 13 percent lower than those of Air Canada and CP Air (simple averages of 45.0 versus 52.2 cents per RTM), while the stage lengths of all seven carriers were very similar (all lying within a range of 1,129 to 1,299 miles). At the same time, the simple averages of the international charter yields for the regional and mainline carriers were almost identical (45.0 versus 44.1 cents per RTM), even though the two mainline carriers had longer average stage lengths of 2,051 and 2,645 compared with 1,371 to 1,776 for the regional carriers.

Table 12-2

Charter Yields per RTM and Average Stage Lengths
Canadian Mainline and Regional Carriers, 1978

Carrier	Yield per RTM				Average Flight Stage Length[a]			
	Dom.	Trans.	Int'l.	Sys.	Dom.	Trans.	Int'l.	Sys.
Mainline								
Air Canada	63.2¢	52.2¢	45.2¢	46.8¢	767	1,154	2,051	1,637
CP Air	44.0	52.1	43.0	43.4	1,535	1,281	2,645	2,432
Mean[b]	53.6	52.2	44.1	45.1				
Regional								
East. Prov.	56.4	49.1	-	50.1	712	1,289	-	1,142
Nordair	111.4	45.5	43.7	48.1	232	1,150	1,371	737
Pac. Western	57.5	43.0	47.2	49.7	333	1,299	1,715	640
Quebecair	126.8	41.9	43.8	60.5	226	1,170	1,776	457
Transair	42.9	45.7	45.3	44.9	739	1,129	1,580	1,075
Mean[b]	79.0	45.0	45.0	50.7				

[a]Charter aircraft revenue miles divided by aircraft revenue departures.

[b]Simple average.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 14.

It follows from the above comparisons that, after allowing for the effects of distance, either the regional carriers' costs were somewhat lower than those of the mainline carriers for very similar charter services, or the mainline carriers enjoyed above-normal profits on their charter operations. If the latter is correct, it implies that the operating costs of the two carrier groups were roughly equal and, therfore, that the relatively small regional carriers have achieved full economies of scale. If the former is correct, it implies that the mainline carriers are experiencing some diseconomies of scale. In either case, the evidence supports the conclusion that the small regional carriers are large enough to achieve the full economies of scale available from firm size in the Canadian airline industry.

Summary

Ever since Koontz's original study back in 1951,[11] researchers have investigated the possibility of economies of scale existing in the airline industry. Without exception, significant scale economies associated with firm size have not been found.[12] The evidence from this study is consistent with that long line of empirical research. In total, these findings mean that airline size is not an important factor affecting operating costs, either in Canada or in the U.S. Indeed, the U.S. intrastate experience demonstrates that very small airlines operating four or five aircraft of a suitable type are capable of achieving whatever scale economies exist in the airline industry.[13]

This should not be interpreted to mean that other factors, such as volume characteristics, variety of output, or aggregation of traffic flows (see Chapter 4) are irrelevant in achieving lower average costs. To the contrary, the evidence is clear that average costs do decrease with distance, and it seems likely that, up to some point, aircraft size also decrease operating costs (both of these factors being volume characteristics).[14] However, there is nothing inherent in airline operations that prevent small airlines from operating large aircraft over long distances. An airline operating, say, four Boeing 747s over appropriate stage lengths would still be a small carrier relative to most of the existing federally-regulated airlines in Canada and the U.S.

The policy implications stemming from the absence of scale economies are straight forward. First, there is no need for the federal government to restrict entry into the Canadian airline industry in order to ensure that existing airlines become large enough to achieve the lowest possible average costs. Actually, such a policy would be superfluous to the objective since, if scale economies did exist, smaller airlines would not be able to

survive in the face of the lower-cost operations of the larger airlines, which would grow ever larger until all scale economies had been achieved.

Second, there are no cost-based reasons to control entry in order to prevent the expansion of the largest airlines into the routes of the smaller airlines with the aim of establishing an airline monopoly. Smaller airlines can achieve at least equally low costs and, therefore, can match the fares of the larger carriers. Indeed, the experience of the U.S. intrastate carriers imply that, without a regulatory monopoly, the smaller carriers would be able to achieve substantially lower operating costs and fares than the larger carriers. Thus, if the objective is to prevent the growth of a monopoly (or a cartel), open entry would be the appropriate policy.

Third, if the objective is to protect the existing carriers (and their employees and suppliers), then entry control is the proper policy. However, the large differences in total operating expenses per RTM between the federally-regulated airlines and the U.S. intrastate carriers implies that one result of such a policy is much higher average costs of operation. As a result, as found in Chapter 2, fares must also be much higher in order for the protected carriers to survive without direct subsidies.

Finally, if the objective is to provide low-fare services to consumers, a policy of eliminating entry restrictions would be appropriate. Not only would this allow new, low-cost, low-fare carriers to enter the industry (therby benefiting their shareholders, employees and suppliers), but it would require the existing carriers to reduce their operating costs in order to survive the new competition. This means that the existing carriers would have to operate more efficiently at somewhat lower levels of service quality (but not safety), and probably pay lower salaries and beneifts to employees.

Footnotes

1. The federally-regulated airlines' straight-line regression equation between distance (Y) and airline size (X) is: $Y = 592.805 + 3.415X$. The associated R^2 of .239 is not significant at the five percent level (see footnote 3, Chapter 4). The R^2 for the log/log relationship is .204.

2. Since distance is a volume characteristic of airline operations, decreases in total operating expenses per RTM as distance increases are consistent with implications of the more recent cost theory which predicts reductions in average costs with increases in volume characteristics (see Chapter 4, p. 38).

3. The federally-regulated airlines' straight-line regression equation between percentage deviations of total operating expenses per RTM (Y) and airline size (X) is: $Y = 1.408 - .028X$. The associated R^2 of .036 is not significant at the five percent level (see footnote 3, Chapter 4).

4. The federally-regulated airlines' straight-line regression equation between percentage deviations of RTM per employee (Y) and airline size (X) is: $Y = -.926 + .044X$. The associated R^2 of .080 is well below the minimum of .306 required to achieve significance at the five percent level for a random sample of 13 pairs (see footnote 3, Chapter 4).

5. The federally-regulated airlines' straight-line regression equation between percentage deviations of grand total employee payments per employee (Y) and airline size (X) is: $Y = -3.984 + .094X$. The associated R^2 of .286 is not significant at the five percent level (Ibid.).

6. The federally-regulated airlines' straight-line regression equation between percentage deviations of RTM per litre (Y) and airline size (X) is: $Y = 3.920 - .069X$. The associated R^2 of .109 is not significant at the five percent level (see footnote 3, Chapter 4).

7. The federally-regulated airlines' straight-line regression equation between percentage deviations of fuel expenses per RTM (Y) and airline size (X) is: $Y = 2.134 - .032X$. The associated R^2 of .038 is not significant at the five percent level (see footnote 3, Chapter 4).

8. Calculated from data in W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix E.4.

9. Ibid., Appendix C. Also, see Table 3-1. Quebecair incurred a loss in 1978.

10. Calculated from data in Ibid, Appendix E.4.

11. H. D. Koontz, "Economic and Managerial Factors Underlying Subsidy Needs of Domestic Trunk Line Air Carriers," Journal of Air Law and Commerce, Vol. 18 (1951), pp. 127-67.

12. L. J. White, "Economics and the Question of 'Natural Monopoly' in the Airline Industry," Journal of Air Law and Commerce, Vol. 44 (1979), pp. 545-73.

13. W. A. Jordan, Airline Regulation in America (Baltimore: The Johns Hopkins Press, 1970), pp. 191-94. Also, during 1975-78, the intrastate carriers operated the following numbers of aircraft: Air California: 10 to 13, Air Florida: two to seven, PSA: 24 to 35, and Southwest: four to 13. See the internal records and SEC Forms 10-K of these companies for 1975-78.

14. Note that U.S. intrastate carriers operating Boeing 737s and 727s have achieved low average costs, so that the critical size for low-cost aircraft appears to be reached by aircraft smaller than B-737s and DC-9s (see pp. 61-62).

13. Cross-Subsidization

The cross-subsidization of service to communities that would not otherwise be served by a mainline or regional carrier is often said to be an important benefit of regulation. The argument is that service is provided on loss routes in return for regulatory protection from competition on profitable routes. Therefore, the argument goes, if regulation were to be terminated, the reduced profits resulting from increased competition over the previously protected routes would require the termination of service over the loss routes.

Two basic questions are relevant in the study of cross-subsidization in addition to the equity question of whether users of profitable services should be "taxed" through paying above-market prices for the benefit of the users of loss services. The first question concerns whether or not cross-subsidization actually occurs. That is, do Canadian carriers provide services to communities which, if terminated, would result in total costs decreasing more than total revenues, thereby yielding increased profits (or decreased losses)? If cross-subsidization actually occurs, the second question is whether the routes being subsidized are the ones the policy makers wish to benefit through regulation, or do they include routes that were not intended to be subsidized?

One of the difficulties in answering the first question stems from the fact that there is a great deal of joint production in airline operations whereby aircraft, personnel and other inputs are utilized to provide service over a variety of routes. The common costs associated with these inputs are generally allocated over the various routes in some arbitrary manner, and this allocation will obviously affect the accounting loss or profit attributed to that route. Furthermore, some traffic

origination/terminating on "loss" routes also utilize and provide revenues on "profitable" routes which might be lost to the carrier if service were terminated on the subsidized route. The allocation of a larger portion of these revenues to the "loss" route could well result in it being classified as profitable and, therefore, not subsidized.

Obviously, answers to these two questions require detailed cost and revenue data. A request was made to the Canadian Transport Commission [CTC(A)] for cost data that would assist in investigating this difficult question, but the CTC(A) and the airlines refused to allow such information to be presented in this study. Therefore, it has not been possible to investigate directly the assertion that cross-subsidization actually occurs in Canadian air transportation. However, some indirect evidence is available for major operating areas, and this evidence indicates that, if cross-subsidization is practiced by Canadian carriers, one area being so benefited is their international routes at the expense of their domestic routes.

RTM and Revenue Shares

The indirect evidence regarding cross-subsidization has to do with implications about what would be observed if cross-subsidization were indeed practiced. For example, under cross-subsidization, one would expect that operations over routes being subsidized would have smaller revenue shares relative to RTM (traffic) shares than would be the case over routes providing the subsidy. It can be seen from Table 13-1 that all the carriers which had significant international operations (the Canadian mainline and regional plus the U.S. trunk carriers) had smaller domestic RTM shares than revenue shares, but the absolute values of the Canadian carriers' negative differences (RTM shares minus revenue shares) were greater than those of

Table 13-1

Percentage Shares of Total System RTM and Revenues by Operating Area
Canadian Mainline, Regional and Selected U.S. Trunk Carriers
1975-78 Aggregate Values

Carrier	Percentage Shares								
	Domestic			Transborder			International		
	RTM	Rev.	Diff.	RTM	Rev.	Diff.	RTM	Rev.	Diff.
Mainline									
Air Canada	50.0	59.3	-9.3	15.1	16.1	-1.0	34.9	24.6	+10.3
CP Air	34.7	42.0	-7.3	14.5	12.5	+2.0	50.8	45.5	+5.3
Trunk									
Trans World	64.0	67.7	-3.7	0	0	0	36.0	32.3	+3.7
Northwest[a]	67.3[b]	72.9[b]	-5.6	n.a.	n.a.	-	32.7	27.1	+5.6
Delta	97.0[b]	97.5[b]	-0.5	n.a.	n.a.	-	3.0	2.5	+0.5
Regional									
East. Prov.	77.3	89.6	-12.3	22.7	10.3	+12.4	-[c]	0.1	-
Nordair	38.4	59.3	-20.9	19.1	14.5	+4.6	42.5	26.2	+16.3
Pac. Western	62.6	79.7	-17.1	14.5	9.9	+4.6	22.9	10.4	+12.5
Quebecair	39.3	67.4	-28.1	9.9	5.1	+4.8	50.8	27.5	+23.3
Transair	62.1	80.2	-18.1	15.9	8.5	+7.4	22.0	11.3	+10.7

n.a. -- not available.

[a]1975-77. 1978 data are excluded due to Northwest's 108-day pilot strike.

[b]Domestic plus transborder. During 1977-78, Canadian stations enplaned the following percentages of total system enplaned passengers: Delta = 0.70% and Northwest = 1.07%. These percentages are probably close approximations to these carriers' transborder RTM percentages since doubling them to account for U.S. enplaned passengers bound for Canada should be offset by the fact that the transborder operations of these carriers were primarily short-haul, stub-end extensions of domestic flights.

[c]Less than 0.1%.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 6 and 8.

the U.S. trunk carriers. At the same time, the Canadian carriers' international RTM shares were appreciably larger than their international revenue shares, and the resulting positive differences were larger than those of the U.S. carriers (except for CP Air relative to Northwest, due to CP Air's positive transborder difference).

The U.S. trunk carriers' data are important in this comparison because they demonstrate that domestic operations do not have to provide such large shares of system revenues relative to traffic as found among the Canadian mainline carriers, and it is this intercountry difference in relative shares that indicates the possible cross-subsidization of international operations by the mainline carriers. The even larger share differences for the Canadian regional carriers would also indicate cross-subsidization were it not for the fact that the regional carriers' international traffic is all charter which commonly has lower yields than scheduled traffic. Data from U.S. carriers with large international charter operations and relatively small domestic scheduled operations would be required to evaluate the regional carriers' share differences, but such carriers did not exist in the U.S. during 1975-78.

Passenger Yields

Additional evidence regarding cross-subsidization is available from scheduled passenger yields per RTM. The scheduled passenger yields per RTM for 1978 are presented in Table 13-2 for the Canadian mainline and the U.S. trunk carriers, together with the percentage changes in these yields between 1975 and 1978.[1] Looking at domestic passenger yields in relation to international yields, it can be seen that the Canadian mainline and the U.S. trunk carriers all had higher domestic yields than

Table 13-2

Scheduled Passenger Yields per RTM in 1978 and Percent Changes over 1975
Canadian Mainline and Selected U.S. Trunk Carriers

Carrier	Yield in Dollars per RTM[a]				Percent Change Over 1975			
	Dom.	Trans.	Int'l.	System	Dom.	Trans.	Int'l.	System
Mainline								
Air Canada	1.056	.918	.679	.921	25.0	10.2	10.6	17.9
CP Air	.930	.610	.701	.777	24.7	12.5	13.4	18.1
Trunk								
Trans World	.810	-	.685	.767	12.8	-	-1.4	7.9
Northwest	.830[b]	n.a.	.719	.796	14.5[b]	n.a.	16.9	14.5
Delta	.879[b]	n.a.	.673	.871	11.1[b]	n.a.	-9.3	10.3

n.a. -- not available.

[a]Total first-class, economy/coach and excess baggage revenues divided by total scheduled passenger RTM. Yields in Canadian and U.S. dollars for the respective countries.

[b]Domestic plus transborder. See note b in Table 13-1.

Source: W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 9.

international yields (as well as transborder yields for the mainline carriers). Air Canada and CP Air's domestic yields were 55.5 and 32.7 percent higher than their international yields, while Trans World's domestic yield was only 18.2 percent higher than its international yield. At the same time, the North American (primarily domestic) yields of Northwest and Delta were 15.4 and 30.6 percent higher than international.

Of course, the above yields and percentage differences for 1978 were influenced by the higher costs associated with the relatively short average trip lengths for domestic passengers as compared with the longer average trips and lower costs for international passengers. Therefore, more useful comparisons could be made if each carriers' average costs per RTM were also availabe by major operating area. Unfortunately, since the

CTC(A) and the Canadian carriers refused to make such information available for presentation in this study, direct comparisons among carriers of net differences between yields and costs per RTM cannot be made. There is, however, another way to approximate the effects of distance-related costs on yield per RTM through the use of the domestic passenger fare formulas. Since these formulas are supposed to reflect the cost differences associated with distance, and since the systemwide relationships between distance and total operating expenses per RTM were essentially the same for the Canadian and U.S. federally-regulated airlines (see Figure 4-1), it follows that the formulas can be used to adjust for the effects of distance on costs in the following manner:

1. Calculate fares per mile for the mainline and trunk carriers from their respective formulas using both the average domestic and the average international scheduled passenger trip lengths for each carrier. The differences in these fares per mile approximate the cost differences for the two distances.

2. Compare the percentage differences in the calculated domestic and international fares per mile with the percentage differences between the actual domestic and international yields for each carriers (based on the same average mileages in each case).

3. If the percentage differences between the actual domestic and international yields of the Canadian carriers are <u>larger</u> than the differences between their calculated cost-based fares per mile, while the percentage differences for the U.S. carriers' actual yields are <u>smaller</u> than their calculated fare-per-mile differences, then it can be concluded that domestic Canadian yields in 1978 were indeed higher relative to costs than their international yields, while those of the U.S. carriers were lower.

This comparison is carried out in Table 13-3. It can be seen from the last two columns of this table that the percentage differences for the actual yields for both Air Canada and CP Air were indeed larger than the percentage differences for their calculated fares per mile, while the opposite was true for all three U.S. trunk carriers. Thus, it appears that domestic Canadian yields were significantly higher than their international yields,

Table 13-3

Differences in Average Passenger Trip Lengths, Fares per Mile, and Yields
Canadian Mainline and U.S. Trunk Carriers, 1978

Carrier	Average Scheduled Pax. Trip Length[a]		Calculated Domestic Formula Fare/Mile[b]		Domestic Percent Higher than Int'l.	
	Domestic	Int'l.	Domestic	Int'l.	Calculated Fare/Mile	Actual Yield
Mainline						
Air Canada	841	3,087	11.77¢	9.20¢	27.9%	55.5%
CP Air	980	4,256	11.22	8.94	25.5	32.7
Trunk						
Trans World	1,033	3,506	10.04	7.90	27.1	18.2
Northwest	835[c]	3,015	10.65[c]	8.05	32.3[c]	15.4
Delta	627[c]	1,694	11.81[c]	8.91	32.5[c]	30.6

[a]Scheduled RPM divided by scheduled passengers.

[b]Calculated from economy/coach passenger fare formulas for Canadian mainline carriers (effective April 1, 1978) and U.S. trunk carriers (effective May 1, 1978).

[c]Domestic plus transborder.

Source: W. A. Jordan, Performance of Regulate Canadian Airlines (1982), Table 10.

after adjusting for distance-related cost differences. This provides stronger, but still not conclusive, evidence consistent with the hypothesis that international passenger services were being cross-subsidized by the Canadian carriers' domestic passenger services. If cross-subsidization did occur, it was especially large for Air Canada whose 55.5 percent yield difference was almost twice its 27.9 percent fare-per-mile (estimated cost) difference.

The above evidence is based on data for 1978 only. Table 13-2 also shows the percentage increases in yields between 1975 and 1978. These data indicate that if cross-subsidization existed in 1978, it was greater than in 1975. The increases in domestic yields for both Canadian mainline

carriers over this period were about 25 percent, while their transborder yields increased only 10.2 and 12.5 percent, and their international yields just 10.6 and 13.4 percent. In contrast, the domestic yields for the three U.S. trunk carriers (including transborder for Northwest and Delta) increased between 11.1 and 14.5 percent, while the international yield for Trans World's Atlantic service decreased 1.4 percent and the yield for Northwest's Pacific service increased 16.9 percent.[2]

Cargo Yields

Table 13-4 give the 1978 yields per RTM for scheduled cargo service and, also the cargo yield percentages of passenger yield. These latter data show that, except for CP Air, the cargo yields for each mainline and trunk carrier comprised remarkably consistent percentages of the passenger yields for the various areas of operation. Therefore, for Air Canada, the evidence from passenger yields regarding the possible cross-subsidization of international operations by domestic is also supported by the evidence from cargo yields.

The same cannot be said for CP Air. During 1978 its cargo yield was 46.3 percent of passenger yield domestically, 53.6 percent for transborder service and 63.8 percent internationally. As a result, while its domestic passenger yield was 32.7 percent above its international passenger yield (which is consistent with cross-subsidization), its domestic cargo yield was 3.6 percent below its international cargo yield (which is inconsistent with cross-subsidization). Therefore, for CP Air, the yield evidence implies that if international operations were being cross-subsidized by domestic operations, the cross-subsidization was limited to passenger service.

An Alternative Viewpoint

In a critique of an earlier verison of the above analyses, Mr. J. J. Smith, currently Vice President, Economics and Airport Affairs, Air Transport

Table 13-4

Scheduled Cargo Yields per RTM and Cargo Percent of Passenger Yields
Canadian Mainline and Selected U.S. Trunk Carriers, 1978

Carrier	Yield in Dollars per RTM[a]				Cargo % of Passenger Yield			
	Dom.	Trans.	Int'l.	System	Dom.	Trans.	Int'l.	System
Mainline								
Air Canada	.532	.477	.337	.436	50.4%	52.0%	49.6%	47.3%[c]
CP Air	.431	.327	.447	.433	46.3	53.6	63.8	55.7
Trunk								
Trans World	.372	-	.314	.347	45.9	-	45.8	45.2[c]
Northwest	.304[b]	n.a.	.246	.277	36.6	-	34.2	34.8
Delta	.500[b]	n.a.	.371	.496	56.9	-	55.1	56.9

n.a. -- not available.

[a]Total mail, freight and express revenues divided by total scheduled mail, freight and express RTM.

[b]Domestic plus transborder. See note b in Table 13-1.

[c]It is surprising to find the system percentage being less than each of the percentages for all the various operating areas. These calculations have been checked, however, and are correct as shown.

Sources: Table 13-2.
W. A. Jordan, Performance of Regulated Canadian Airlines (1982), Table 12.

Association of Canada, described the development of cross-subsidization as follows:

> In 1947 the prevailing rate per mile was about 6¢ per passenger mile across Canada. The operating cost of a DC-3 was about 3¢ per seat mile on average stages of about 300 miles. In that year the four-engined North Star was introduced. With fare levels and construction unchanged, the North Star could fly 2000 mile stages at 2¢ per seat mile. Cross subsidy was born. The age of innocence ended. Informed observers settled down happily to the contemplation that, to the extent that cross subsidy existed, it was to the benefit of the Maritimes, Northern Quebec, Northern Ontario and the Prairies, and that the Universe was therefore unfolding as it ought.

> Much has happened since then
> (a) the coming of tapered fares in 1961
> (b) the development of average cost formula fares
> (c) the lessening of Atlantic profits due to increased foreign competition, the evolution of a discretionary spending market, and the strength of New York in Atlantic price-setting leadership.
> Of course, an average cost formula fare does not remove cross subsidy, but it greatly dampens it.[3]

In a more recent paper, Mr. Smith placed greater emphasis on Atlantic passengers, as follows:

> Cross-subsidy arrived with a new aircraft and not with a (government) policy. The age of innocence ended in 1948. The support of "small-town" Canada by Transcontinental and Atlantic passengers was substantial in those days. Its extent was known to the regulators and sensed with pleasure by many in public life. The great days of cross-subsidy lasted from 1948 to 1961.[4]

Following a description of the development of average cost formula fares, he concluded:

> So there is a kind of residual cross-subsidy, evolved by airline and not by government. A pale shadow. Not like the old days....5

The essence of Mr. Smith's description of cross-subsidization is that:

1. it does exist,
2. relatively remote areas of Canada have been the beneficiaries,
3. the subsidy is provided at the expenses of Transcontinental and Atlantic passengers,
4. cross-subsidization has been greatly reduced by the adoption of tapered, average cost formula fares.

Unfortunately, Mr. Smith fails to present cost and revenue data to support his assertion regarding the cross-subsidization of "small-town" Canada. At the same time, he appears to be in partial agreement with the above indirect evidence that it is possible international operations are being subsidized by domestic operations. In addition to item (c) in the first quotation, he wrote:

> Dr. Jordan notes that domestic yields appear higher than international yields. There are no short hauls on the Atlantic; Canada cannot be a price leader on the Atlantic. The Atlantic market out of Canada is about 70% discretionary spending, and prices must be set accordingly. The transcontinental market is about half discretionary spending. The Montreal-Toronto corridor, and the PWA, Nordair, Quebecair and EPA North-South routes are of course predominantly non-discretionary in nature.[6]

Apparently Mr. Smith believes there is an inverese relationship between discretionary spending and cross-subsidization. If so, then it would follow that Air Canada is subsidizing its Atlantic operations from its transcontinental route and the Montreal-Toronto corridor. Note that he makes no reference to CP Air's primarily Pacific and South American international operations, even though Tables 13-2 and 13-3 imply that they too may be subsidized by domestic operations. Also, despite his reliance on the Atlantic market and the strength of New York in Atlantic price-setting leadership, he does not explain why Trans World's yield data implies no cross-subsidization of that airline's Atlantic operations.

Mr. Smith states that "the great days of cross-subsidy lasted from 1948 to 1961." He attributes the decline in domestic cross-subsidization to the introduction of the tapered, average cost formula fares. Another possible cause of reduced cross-subsidization is given in Table 13-5. It shows that Air Canada and CP Air terminated service to 15 low-density communities between 1966 and 1978, thereby reducing the number of points potentially needing cross-subsidization. By 1978, 31 communities remained on Air Canada's domestic system and 15 points were served by CP Air, including seven that were served by both carriers.[7]

Summary

Better evidence on the existence of cross-subsidization between the major operating areas could be obtained by comparing revenue shares with

Table 13-5

Canadian Communities Where Air Canada and CP Air Terminated Service 1966-78

Community and Year of Termination			
Air Canada		CP Air	
Earlton, Ont.	1973	Castlegar, B.C.	1969
Goose Bay, Lab.	1971	Cranbrook, B.C.	1969
Lethbridge, Alta.	1970	Kamloops, B.C.	1969
Saguenay, P.Q.	1971	Kelowna, B.C.	1969
Trois Rivieres, P.Q.	1971	Penticton, B.C.	1969
		Quesnel, B.C.	1969
		Sandspit, B.C.	1969
		Smithers, B.C.	1969
		Williams Lake, B.C.	1969
		Windsor, Ont.	1970

Source: Consumer and Corporate Affairs Canada, Entry and Exit in the Domestic Air Transport Industry (1980), pp. 27-28.

appropriate shares of operating expenses for both Canadian and U.S. carriers. Since, however, the CTC(A) and the airlines have refused to allow available cost information by operating area to be presented in this study, it has not been possible to provide that evidence. Instead, reliance has had to be placed on indirect evidence and, therefore, the indication that the international operations of Canadian carriers have been cross-subsidized by their domestic services is necessarily tentative.

Given the importance of cross-subsidization as a rationale for regulation, those who wish to continue extensive regulation whould be asked to provide good evidence that cross-subsidization is indeed occurring and, furthermore, that any cross-subsidization is being applied to routes and communities in accordance with present-day policy objectives. One can well imagine policy makers being pleased with the thought of "small-town" Canada being subsidized by transcontinental and international passengers. This pleasure, however, might be reduced somewhat by the thought of international passengers being

subsidized by transcontinental and "small-town" Canada passengers. Of course, if some low-density domestic routes are being cross-subsidized, any cross-subsidization of international routes places an even greater burden on the passengers and shippers utilizing the remaining profitable domestic routes.

Finally, it should be recognized that cross-subsidization exists when operating expenses exceed operating revenues. Therefore, anything that can be done to reduce operating expenses significantly also reduces the potential need for cross-subsidization. It could well be that replacing a high-cost airline with a low-cost airline (such as an intrastate carrier) would eliminate the need for cross-subsidizing routes.

Footnotes

1. These average passenger yields are calculated from aggregated revenue data including first-class and economy/coach passengers, full and discount fares, and excess baggage. Therefore, they are not fares per mile actually paid by individual passengers. Also, changes in the mix of first-class and economy/coach service or in the number or terms of discount fares will change the average yield even though the basic fare formula is unchanged. In 1978, first-class passengers accounted for only 4.9 and 4.6 percent of Air Canada and CP Air's total system passenger revenues, while excess baggage accounted for 0.2 percent of both carriers' passenger revenues. For the three U.S. trunk carriers, the first-class share ranged from 9.8 (Northwest) to 11.6 (Trans World) percent of total system passenger revenues, with excess baggage accounting for between 0.1 and 0.3 percent. Thus, average yields are primarily determined by economy/coach service and revenues, with first-class playing a more important role in the U.S. than in Canada. (Percentages calculated from data in W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix F.

2. The extensive rivalry that has developed over the North Atlantic with the introduction of Laker's service in September 1977, and the associated increase in discount fares offered by the established carriers, appears to be relected in the change in Trans World's yields. Aviation Week and Space Technology (October 3, 1977) p. 28 and (October 17, 1977), p. 27. Delta's 9.3 percent decrease in yield over this period is excluded here because it reflects the inauguration of transatlantic service on April 30, 1978. Prior to that date, Delta's international service was limited to the Caribbean area.

3. J. J. Smith, "Comments on Initial Findings of Professor William A. Jordan," Economic Council of Canada, Professional Workshop on Regulation Research, McGill University (April 18, 1980), p. 4 (mimeographed).

4. J. J. Smith, "Regulatory Moves in Canadian Air Transport--Pragmatists at Work," in Transportation Research Forum, Proceedings--Twenty-Second Annual Meeting, Vol. XXII (1981), p. 543.

5. Ibid.

6. J. J. Smith, supra note 3, pp. 4-5.

7. Consumer and Corporate Affairs Canada, Entry and Exit in the Domestic Air Transport Industry (1980), pp. 27-28 (mimeographed).

14. Government Ownership

The previous chapters have demonstrated that very large differences in airline performance have been associated with regulatory monopolies in contrast to regulatory duopolies, and that these differences were not attributable to weather or population factors. Given the fact that the federal government owns all of Air Canada and most of Nordair (through Air Canada), and that Pacific Western is owned by the Alberta Government, it is desirable to investigate whether or not significant performance differences have been associated with government ownership within the environment provided by a regulatory monopoly.[1] Has government ownership been associated with higher or lower fares, productivity and operating expenses, or have there been little or no differences between government-owned and privately owned airlines in these factors?

In two articles, David G. Davies of Duke University compared the employee productivity of the two domestic Australian interstate carriers and attributed the observed differences to private versus government ownership.[2] Using data for the 16-year period from 1958-59 to 1973-74 he concluded:

> The evidence indicates that the private firm (Ansett Airlines) operating under the rules and customs associated with exchangeable private property rights, is more productive than the public enterprise (Trans-Australia).[3]

Let us see if Davies' conclusion is supported by performance differences between government-owned Air Canada in comparison with privately owned CP Air, Trans World, Northwest and Delta.[4]

North American Evidence

It has already been shown that there were no differences in the fares per mile offered by Air Canada and CP Air during 1978 and earlier years, and

that their economy fares per mile were very similar to the coach fares per mile of the U.S. trunk carriers. Thus, as in Davies' articles, the question of performance differences concerns productivity and related operating costs. It has also been demonstrated that distance plays an important role in airline operating expenses, employee productivity and fuel utilization. Therefore, intercarrier efficiency comparisons should continue to be undertaken using performance data that have been adjusted for the effects of distance, that is, by using the percentage deviations from the distance-related trend lines for the various measures. These percentage deviations for Air Canada, CP Air, Trans World, Northwest and Delta are summarized in Table 14-1, with the airlines listed in decreasing rank order of efficiency for each of six measures.

Table 14-1

Efficiency Rankings and Percentage Deviations from Distance-Related Trend Lines for Various Performance Measures Canadian Mainline and Selected U.S. Trunk Carriers

Efficiency Ranking	Carrier and its Percentage Deviation[a]--Average System Values					
	Employees			Fuel		Total Op.
	RTM per Employ. 1975-78	Op. Rev. per Emp. 1975-78	Total Payments per RTM, 1978	RTM per Litre 1975-78	Fuel Exp. per RTM 1975-78	Expenses per RTM 1975-78
1	NW 82.5	NW 55.6	NW -25.8	AC 11.7	AC -9.0	NW -19.2
2	DL 14.5	TW 9.0	DL -2.0	CP 5.5	NW -7.8	DL -8.7
3	TW 6.5	DL 8.5	CP 2.8	NW -3.8	DL -5.3	CP 1.6
4	CP -5.0	AC -2.1	TW 16.2	DL -8.7	CP -1.0	AC 4.2
5	AC -6.7	CP -5.2	AC 18.3	TW-15.2	TW 5.9	TW 7.0

[a]Percentage deviations from distance-related trend lines calculated for 14 Canadian and U.S. federally-regulated airlines.

Sources: Tables 4-1, 6-2, 6-3, 7-2, 9-1, and 9-3.

Table 14-1 shows that Air Canada ranked relatively low (fourth or fifth) among these five large carriers in terms of employee productivity (RTM and operating revenues per employee) and employee expenses (total employee payments per RTM). In contrast to is relatively poor performance with regards to employees, however, Air Canada was the best of the five carriers in terms of fuel utilization and expenses, consistently ranking first in these two measures while Trans World consistently ranked fifth. Thus, since labour and fuel together generally accounted for something over 60 percent of total operating expenses during 1978 (Table 6-1), it is not surprising to find Air Canada ranking fourth among the carriers in terms of total operating expenses per RTM, the most inclusive of airline cost measures.

Air Canada's 4.2 percent deviation above the distance-related trend line for operating expenses per RTM compares with 7.0 percent for fifth ranking Trans World and 1.6 percent for third ranking CP Air. Thus, since Air Canada lies midway between CP Air and Trans World and since both these latter carriers are privately owned, there seems to be little reason to attribute Air Canada's above-average operating expenses per RTM to government ownership. This conclusion is supported by the fact that the 5.4 percentage-point interval encompassing the positive deviations of these three carriers was small relative to the 10.3 percentage-point interval between CP Air's 1.6 and Delta's -8.7 percent deviation, and the 20.8 percentage-point interval between CP Air and Northwest's -19.2 percent deviation, with all of these carriers being privately owned. It appears that factors other than ownership account for the variations in operating expenses per RTM among the federally-regulated airlines.

If the comparison is limited to the two Canadian mainline carriers (similar to Davies' comparison of the two Australian carriers) it can be

said that Air Canada was inferior to CP Air in two of the three employee measures, and was superior to it in both of the fuel measures. Overall, Air Canada's operating expenses per RTM were somewhat poorer than CP Air's but, as indicated above, the deviation difference was just 2.6 percentage points, which is not large enough to conclude that important performance differences are associated with government ownership.

Table 14-2 provides additional information showing that Air Canada did not have unusually poor performance relative to privately owned airlines. To the contrary, it ranked third in RTM load factor (tied with Trans World) and second in RPM load factor (with CP Air ranking first in both measures).

Table 14-2

Rankings and Average System Values
for Load Factor and Input Price Measures
Canadian Mainline and Selected U.S. Trunk Carriers

Ranking	Carrier and its Average System Values			
	Load Factor		Payment	Fuel Price
	RTM 1975-78	RPM 1975-78	per Employee 1978	per Litre 1975-78[a]
1	CP 52.5%	CP 64.6%	CP $24,160	DL 8.984¢
2	DL 49.2	AC 62.0	AC 26,460	TW 9.455
3	AC 48.3	TW 59.1	DL 28,445	NW 9.502
4	TW 48.3	DL 58.1	NW 30,432	AC 10.797
5	NW 42.1	NW 48.8	TW 30,601	CP 11.193

[a]Canadian cents per litre for Air Canada and CP Air, U.S. cents per litre for the U.S. carriers. Estimated fuel purchased by Canadian carriers in foreign countries adjusted for the exchange rates between the Canadian and U.S. currencies. 1975-78 data calculated as the simple average of annual data for the four years.

Sources: Table 7-1, 8-2, 8-3 and 9-9.

The overall rankings of the prices paid for labour and fuel were clearly affected by intercountry differences (see Table 7-1 and 8-4). Within Canada, however, Air Canada paid about 9.5 percent higher prices for its labour and about 3.5 percent lower prices for its fuel than did CP Air. Again, these data do not provide a consistent pattern denoting inherent inefficiency on the part of government-owned airlines, even though the load factor data for just the two Canadian airlines might be considered weak evidence in support of this contention.[5]

Australian Evidence

The inconsistency between Davies' findings for the Australian airlines and the evidence from North American airlines naturally calls for further investigation. Is there a fundamental difference between airline operations in the two continents, or is there some simpler explanation for the inconsistency? The recent publication of more detailed information for the Australian airlines demonstrates that the latter is the case.

It happens that the privately owned firm in Australia (Ansett Transport Industries) operates through four airline subsidiaries and Davies' data were for the combined operations of all four rather than for each individual carrier. Of the four, only Ansett Airlines of Australia (then named Ansett ANA) was similar to the government-owned Trans-Australia Airlines (TAA) in providing interstate trunk operations throughout the country. Indeed, due to the detailed coordination and regulation of these two major airlines through the Rationalization Committee and the Minister for Transport, a majority of the physical attributes of these two carriers have been virtually identical over the years.[6] In contrast, the other three Ansett airlines were regional carriers operating smaller aircraft in largely intrastate service.[7] Therefore, a more appropriate comparison would have been between TAA and just

Ansett Airlines of Australia (AAA), rather than between TAA and the combined operations of all four Ansett subsidiaries as was done by Davies. Fortunately, annual traffic, personnel and aircraft data are now available for each Australian major and regional carrier, including the four Ansett airlines.[8] Thus, it is now possible to make the direct comparison between AAA and TAA.

In addition to using aggregated data for the four Ansett airlines, there are two other problems with Davies' evidence. The first of these is that the output measures he used were number of passengers, tons of mail and freight, and revenues.[9] It happens that an airline transporting its passengers and freight/mail an average of 500 miles is more productive in a physical sense than one that carries the same quantities of traffic only 250 miles. Unfortunately, this fact would not be reflected in Davies' first two output measures and would be somewhat obscured in the revenue measure if there were a significant distance taper in prices (see Figure 2-1).[10] Clearly, a better measure of passenger output would be revenue passenger-miles (RPM), while freight and mail output would be better represented by revenue ton-miles (RTM), both of which incorporate the important distance dimension of airline output.

The final problem with Davies' evidence is that it also ignores the differing relationships between distance and productivity measures for various inputs. Davies used employees as his input measure and compared the airlines' productivity in terms of number of passengers per employee, tons of freight and mail per employee, and revenue earned per employee. He failed to recognize, however, that there is a negative relationhip between distance and employee productivity measured in terms of passengers or tons of freight/mail per employee due to the fact that it requires less labour to carry 1,000 passengers (or 10 tons of freight/mail) an average of 250

miles than to carry them an average of 500 miles. In contrast, productivity measured in terms of RPM or RTM per employee yields a positive relationship between average trip length (distance) and employee productivity (see Figure 6-1). Finally, given a balancing fare taper, revenue per employee may vary very little with changes in distance (see Figure 6-2).

Differences Between the Major and Regional Carriers: The more detailed data now available for 1974-80 show that appreciable differences have existed between Ansett's smaller regional carriers and the two major carriers, AAA and TAA. First of all, during these years their fleets were largely comprised of different types of aircraft (see footnote 7).

Second, as shown in Table 14-3, there were also significant differences in average system scheduled trip lengths. Ansett Airlines of New South Whales (ANSW) and Ansett Airlines of South Australia (ASA) had average passenger and freight/mail trip lengths about one-half and one-third as long as AAA. In contrast, the average trip lengths of MacRobertson Miller Airlines (MMA) in sparsely settled Western Australia were over 25 percent longer than those of AAA. More importantly, it can be seen that the average passenger trip lengths for all four of the Ansett subsidiaries (the grouping used by Davies) were consistently shorter than those of TAA, while AAA alone had longer trip lengths than TAA. Given the inverse relationship between distance and passengers per employee, this reversal in relative distances could have had a significant impact on Davies' findings. The same reversal did not occur in freight/mail trip lengths. The regional carriers' small freight operations had little impact on total figures, so that both AAA and Ansett Total had somewhat longer average trip lengths than TAA.

Table 14-3

System Scheduled Passenger and Freight/Mail Trip Lengths
Ansett Airline Subsidiaries and Trans-Australia Airlines
1974-80

Cal. Year	Passenger Trip Length[a]						Freight/Mail Trip Length[b]					
	Ansett Subsidiaries					TAA	Ansett Subsidiaries					TAA
	AAA	ANSW	ASA	MMA	Total	Total	AAA	ANSW	ASA	MMA	Total	Total
1974	539	279	148	667	511	525	592	308	166	758	594	579
1975	548	273	152	693	519	536	613	298	169	777	614	604
1976	517	269	148	669	490	506	576	289	163	722	577	553
1977	514	272	152	669	489	510	559	296	161	690	559	544
1978	531	269	152	659	503	518	577	292	161	705	579	532
1979	540	269	150	681	512	528	551	288	151	736	556	522
1980	548	282	151	695	524	542	556[c]	290[c]	153[c]	747[c]	563[c]	520[c]
Mean[d]	534	273	151	676	507	524	575	295	161	733	577	547

[a]Statute miles. Total revenue passenger-kilometers divided by revenue passengers embarked, and multiplied by .62137.

[b]Statute miles. Total freight plus mail tonne-kilometers performed divided by tonnes embarked, and multiplied by .62137.

[c]Calculated from actual freight tons, freight RTM and mail RTM, plus estimated mail tons (see note d, Table 14-5).

[d]Weighted average.

Sources: Calculated from data in:
Australian Department of Transport, Australian Transport (1974-75 to 1979-80).
ICAO, Traffic, Commercial Air Carriers (1976-80).

Third, it happens that the three Ansett regional carriers did not report any maintenance and overhaul personnel in their employee counts. Apparently, AAA does the maintenance/overhaul work for these carriers, so it is necessary to increase the regional carriers' maintenance/overhaul and total employment figures by appropriate amounts and reduce AAA's figures

by equal amounts. Since maintenance/overhaul employees comprised at least 20 percent of total personnel reported for Ansett Total and TAA during 1974-80 (as well as for Connair and East-West Airlines, two independent regional carriers), the total reported employee figures for each of the Ansett regional carriers were increased by 25 percent (equivalent to 20 percent of total adjusted employees) with the added employees being assigned to their maintenance/overhaul employee category.[11] At the same time, AAA's figures were reduced by equal amounts. The adjusted total figures for the Ansett airlines are given in Table 14-4 (together with TAA's reported figures) and were utilized in all employee productivity

Table 14-4

Average Annual Number of Employees
Ansett Airline Subsidiaries and Trans-Australia Airlines
1974-80

Cal. Year	Average Number of Employees[a]					
	Ansett Subsidiaries[b]					TAA
	AAA	ANSW	ASA	MMA	Total	Total
1974	7,905.5	347.5	158.0	635.0	9,046.0	7,855.0
1975	8,149.0	369.5	172.5	640.0	9,331.0	7,904.5
1976	7,970.0	349.5	172.5	620.5	9,112.5	7,869.5
1977	8,036.5	334.5	176.0	631.0	9,178.0	8,001.5
1978	8,281.5	340.0	177.0	642.0	9,440.5	8,180.5
1979	8,340.0	337.0	166.0	657.0	9,500.0	8,226.5
1980	8,200.5	360.0	152.5	682.5	9,395.5	8,556.5

[a]Simple average of mid-year and year-end employment for 1974-80.

[b]The data for the individual Ansett subsidiaries are adjusted as described in the text. The Ansett and TAA totals are as reported.

Source: Calculated from data in:
ICAO, Fleet - Personnel, Commercial Air Carriers (1974-78 and 1976-80).

measures calculated below. This increased AAA's employee productivity measures by about 2.8 percent while decreasing those of the three Ansett regional carriers by 20 percent. Obviously, the resulting measures are partial estimates, but they are more accurate than productivity measures based on the reported employee data for the Ansett airlines.

Passenger and Freight/Mail Tons per Employee: The effect of Davies including Ansett's three intrastate carriers in his passengers per employee and freight/mail tons per employee measures is more clearly seen in Table 14-5. To provide perspective, Davies' employee productivity measures for fiscal years 1971-74 are given for Ansett Total and TAA, and then the more detailed information for each of the four Ansett subsidiaries, Ansett Total and TAA are given for calendar years 1974-80.

Looking first at scheduled passengers per employee, it can be seen that during 1974-80 ANSW and ASA were well over twice as high as AAA in this measure, while MMA was generally slightly lower than AAA (all of which is consistent with the differences among these carriers' average passenger trip lengths). On average, the net effect of combining the three regional carriers with AAA is to yield passenger per employee measures for Ansett Total that are over six percent higher than those of AAA for the seven years from 1974 through 1980. More significantly, it can be seen that, except for 1980, TAA's passengers per employee figures consistently fall between those of AAA and Ansett Total. On average, they are about 4.5 percent higher than AAA and about 1.5 percent lower than Ansett Total. Davies reported that "(t)he average number of passengers carried per employee over the 16 years under observation is consistently higher for Ansett Airlines, the private company."[12] This is quite true for the combined four Ansett subsidiaries due

Table 14-5

System Scheduled Passengers and Freight/Mail Tons per Employee[a]
Ansett Airline Subsidiaries and Trans-Australia Airlines
FY 1971-74 and CY 1974-80

Year	Scheduled Passengers per Employee[a]						Scheduled Freight/Mail Tons per Employee[a]					
	Ansett Subsidiaries					TAA	Ansett Subsidiaries					TAA
	AAA	ANSW	ASA	MMA	Total	Total	AAA	ANSW	ASA	MMA	Total	Total
FY 71	n.a.	n.a.	n.a.	n.a.	417[b]	399[b]	n.a.	n.a.	n.a.	n.a.	8.75[b]	5.70[b]
FY 72	n.a.	n.a.	n.a.	n.a.	437[b]	414[b]	n.a.	n.a.	n.a.	n.a.	8.82[b]	5.63[b]
FY 73	n.a.	n.a.	n.a.	n.a.	468[b]	449[b]	n.a.	n.a.	n.a.	n.a.	9.07[b]	5.62[b]
FY 74	n.a.	n.a.	n.a.	n.a.	532[b]	496[b]	n.a.	n.a.	n.a.	n.a.	10.02[b]	6.06[b]
Mean[c]	n.a.	n.a.	n.a.	n.a.	464[b]	440[b]	n.a.	n.a.	n.a.	n.a.	9.16[b]	5.75[b]
CY 74	485	1,054	1,238	500	521	515	9.17	6.91	4.80	10.54	9.10	6.65
CY 75	496	1,040	1,218	487	530	530	8.00	5.43	4.26	9.59	7.94	6.41
CY 76	487	1,067	1,233	470	522	512	8.21	5.59	4.16	10.04	8.16	6.55
CY 77	503	1,120	1,246	481	539	536	8.11	5.38	3.95	9.85	8.05	7.34
CY 78	533	1,232	1,291	535	573	552	8.45	5.55	3.65	11.12	8.44	8.14
CY 79	558	1,295	1,348	530	596	595	8.64	6.46	4.09	10.49	8.61	9.20
CY 80	607	1,218	1,399	554	620	600	8.53[d]	5.51[d]	3.95[d]	10.05[d]	8.45[d]	8.62[d]
Mean[c]	524	1,147	1,282	508	557	549	8.44	5.83	4.12	10.24	8.39	7.56

n.a. -- not available.

[a]The Australian Dept. of Transport implies that its data are for scheduled operations, but they may include nonscheduled operations as well. ICAO data indicate that nonscheduled service has been operated only by AAA and TAA, and comprises less than 0.2 percent of total traffic. Freight/Mail short tons equal metric tonnes times 1.10232.

[b]Davies does not state whether his data are for scheduled or for scheduled and nonscheduled service.

[c]Simple average of the values for FY 1971-74 or CY 1974-80.

[d]Actual freight tons plus estimated mail tons based on percentage increases in mail RTM over 1979.

Sources: Calculated from data in:
Australian Department of Transport, Australian Transport (1974-75 to 1979-80).
ICAO, Traffic, Commercial Air Carriers (1974-78 and 1976-80).
Table 14-4.
D. B. Davies, "Property Rights & Economic Efficiency," J. of Law & Economics (1977), p. 226.

to the very high figures for ANSW and ASA; but it is not true for AAA alone, and AAA is the carrier whose operations are most similar to those of TAA.

The pattern is somewhat different for freight/mail tons per employee. In this case ANSW and ASA had lower tons per employee than AAA while MMA had higher tons per employee, resulting in the figures for Ansett Total being almost identical to those of AAA. Comparing the CY 1974-80 figures with Davies' figures for FY 1971-74, however, shows that there was something of a decline in this measure for Ansett Total (and probably AAA) over the 1970 decade. In contrast, the data for TAA show steady improvements between FY 1971 and CY 1980 in its freight/mail tons per employee figures. As a result, in 1979 TAA's freight/mail tons per employee exceeded those of AAA and Ansett Total. This situation continued through 1980.

Overall, using Davies' own productivity measures, direct comparisons between TAA and AAA (rather than Ansett Total) indicate similar employee productivity despite differences in ownership. This, of course, is consistent with the North American experience and is quite inconsistent with Davies' findings.

RPM and RTM per Employee: The detailed data for 1974-80 also allow comparisons to be made between the Ansett subsidiaries and TAA using the RPM and RTM measures which incorporate the important distance dimension of airline output.[13] Table 14-6 presents scheduled RPM per employee, freight/mail RTM per employee and total RTM per employee. It shows that during these years TAA had higher RPM per employee than AAA except for 1980, and that TAA exceeded Ansett Total in this productivity measure for every year except 1978 and 1980. The opposite relationship applied to freight/mail RTM per employee -- both AAA and Ansett Total had higher RTM per employee than TAA for every year except 1979, when they were essentially equal in this measure.

Table 14-6

System Scheduled RPM, Freight/Mail RTM and Total RTM per Employee
Ansett Airline Subsidiaries and Trans-Australia Airlines, CY 1974-80

Cal. Year	Scheduled RPM per Employee[a]						Scheduled Freight/Mail RTM per Employee[b]					
	Ansett Subsidiaries					TAA	Ansett Subsidiaries					TAA
	AAA	ANSW	ASA	MMA	Total	Total	AAA	ANSW	ASA	MMA	Total	Total
1974	261,421	293,626	183,747	333,450	266,357	270,477	5,433	2,129	797	7,986	5,404	3,853
1975	271,572	284,422	185,264	337,305	274,994	284,491	4,905	1,618	719	7,450	4,872	3,870
1976	251,646	286,518	182,800	314,110	255,934	259,101	4,733	1,614	678	7,247	4,708	3,620
1977	258,902	305,160	188,954	321,597	263,557	273,810	4,528	1,590	636	6,789	4,502	3,991
1978	283,141	331,035	196,085	352,656	287,961	285,367	4,881	1,618	588	7,840	4,885	4,331
1979	300,820	348,516	202,614	360,843	304,947	313,937	4,757	1,860	619	7,725	4,787	4,800
1980	332,905	343,272	211,226	384,731	335,092	325,125	4,743	1,600	603	7,508	4,756	4,481
Mean[c]	280,058	313,221	192,956	343,527	284,120	287,473	4,854	1,718	663	7,506	4,845	4,135

Cal. Year	Scheduled Total RTM per Employee[d]					
	Ansett Subsidiaries					TAA
	AAA	ANSW	ASA	MMA	Total	Total
1974	31,368	31,260	19,025	41,066	31,829	30,687
1975	31,848	29,835	19,101	40,916	32,154	32,094
1976	29,699	30,040	18,812	38,411	30,099	29,325
1977	30,214	31,865	19,381	38,694	30,649	31,156
1978	32,972	34,459	20,040	42,827	33,453	32,642
1979	34,601	36,436	20,719	43,525	35,041	35,946
1980	37,770	35,656	21,561	45,676	38,000	36,737
Mean[c]	32,639	32,793	19,806	41,588	33,032	32,655

[a]RPM equals revenue passenger-kilometers times .62137.

[b]RTM equals metric tonne-kilometers times .68495.

[c]Simple average of the values for 1974-80.

[d]Passenger, freight and mail RTM.

Sources: Calculated from data in:
Australian Department of Transport, Australian Transport (1974-75 to 1979-80).
ICAO, Traffic, Commercial Air Carriers (1974-78 and 1976-80).
Table 14-4.

Combining these two major segments of traffic into total RTM per employee again indicates that there has been no consistent pattern of superiority between the two major carriers.[14] AAA alternated between being slightly higher and slightly lower than TAA from 1974 to 1980, with these two carriers' simple averages for the full seven-year period being essentially equal. At the same time, Ansett Total was higher than TAA for five out of the seven years, but only by small amounts. Ansett Total's simple average for all seven years is just 1.2 percent higher than that of TAA, and even this small performance superiority is due in large part to the high employee productivity of MMA in Western Australia. In general, then, the findings remain consistent with those for the North American carriers -- there appears to be no important differences in employee productivity attributable to differences in ownership.[15]

Summary

The finding that performance among the federally-regulated airlines is similar regardless of ownership should not be a complete surprise. Davies compared the airlines using the dichotomy of private ownership versus government ownership, but this dichotomy fails to recognize the existence of various types of private ownership and various degrees of government control. In his lectures at the University of California, Los Angeles, back in the 1960s, Professor Armen A. Alchian described a range of ownership types, each having the possibility of motivating different performance on the part of individuals and enterprises. The following is a list of some of these types of ownership:

1) Full private property with unconstrained profits.

2) Private property with profit sharing.

3) Private property with constrained profits.

4) Private property with regulated profits.

5) Nonprofit.

6) Government ownership.

7) Public/communal ownership.

This list in itself implies that the performance differences between government ownership, on the one hand, and private ownership with regulated profits, on the other hand, should not be as large as between government ownership and full private ownership with unconstrained profits. The performance data from both North America and Australia support this implication. Indeed, they indicate that, given a regulatory monopoly, airline performance under private ownership differs little from performance under government ownership.

It is important to emphasize that the above evidence applies primarily to relative performance under a regulatory monopoly -- it does not necessarily pertain to performance in a deregulated environment. Actually, it could well be that the performance similarities among federally-regulated airlines, regardless of ownership, are a common response to the protected environment established by a regulatory monopoly, and that performance differences would develop with the removal of such regulation. For example, in the absence of regulation, would a government-owned airline respond in the same ways as a privately owned airline if its existence were threatened by rival carriers? Might not the government-owned airline (supported by its employees and suppliers) turn to the government for subsidies (such as direct payments and low-cost loans) or for the allocation of an increased

share of government traffic, rather than make the painful adjustment that a privately owned airline would tend to make in similar circumstances? If so, the performance between government-owned and privately owned airlines would diverge.

The policy implication of this chapter is straightforward in circumstances where extensive federal regulation exists. In that situation, given the major performance effects associated with a regulatory monopoly, it appears to be inconsequential whether any of two or more rival airlines is privately owned or government-owned since essentially no additional performance effects can be attributed to either arrangement.

Unfortunately, the evidence presented in this chapter should be used with great caution, if at all, as a basis for predicting the results of different ownership arrangements should deregulation (or a regulatory duopoly) exist so that new airlines could enter the industry and compete on the basis of both price and service. The fact is that the performance evidence at hand reflects ownership differences given regulation, and it is not feasible to determine whether or not the performance effects of regulation serve to overwhelm those of ownership. It should be recognized, however, that good evidence regarding the possible impact of ownership on airline operations in the absence of regulation could be forthcoming from Canada should deregulation be adopted in this country and if there were no changes in the present types of ownership among the existing mainline and regional carriers.

Footnotes

1. Air Canada purchased 86.46 percent of Nordair's issued shares on January 26, 1979. Air Canada, Annual Report (1978), p. 11. Pacific Western was purchased by the Alberta Government in 1974. G. O'Lone, "Pacific Western Seeks Area Dominance," Aviation Week and Space Technology (August 8, 1977), pp. 33-35.

2. D. G. Davies, "The Efficiency of Public versus Private Firms: The Case of Australia's Two Airlines," Journal of Law and Economics (April 1971), pp. 149-65; and "Property Rights and Economic Efficiency--The Australian Airlines Revisited," Journal of Law and Economics (April 1977), pp. 223-26.

3. D. G. Davies, "Property Rights and Economic Efficiency," Ibid. p. 226.

4. The performance of Nordair and Pacific Western in relation to the other Canadian regional and U.S. local service carriers will not be analyzed because of the 1975-78 time period covered by this study. Controlling interest in Nordair was not purchased by Air Canada until January 1979, while Alberta's purchase of Pacific Western in 1974 was opposed by the federal government and the final ruling allowing the acquisition was not issued by the Supreme Court of Canada until February 1977 (see O'Lone, supra note 1). Therefore, it is doubtful that the full effects (if any) of government ownership would have had time to develop by 1978.

5. The input price differences, however, are consistent with the hypothesis that a government-owned airline is subject to paying higher prices for inputs supplied on a monopoly basis (unionized labour), but not for those supplied by an oligopolistic industry (fuel).

6. D. G. Davies, "The Efficiency of Public versus Private Firms," supra note 2, pp. 154-61. Also, Australian Department of Transport, Domestic Air Transport Policy Review, Vol. I (Canberra: Australian Government Publishing Service, 1979), pp. 33-41.

7. Between 1974 and 1979 the three Ansett regional carriers operated Fokker F-27s and F-28s, plus one or two de Havilland DHC-6s. In contrast, AAA and TAA operated mainly Boeing B-727-100/200s and DC-9-30s, plus some F-27s Lockheed L-188s and (for TAA) a few DHC-6s. International Civil Aviation Organization, Fleet - Personnel, Commercial Air Carriers (1974-80).

8. Individual carrier data for 1971 were published by the Australian Department of Civil Aviation in Civil Aviation, 1971-1972 (1972), and data for prior years may be available in earlier editions of that publication. Data for more recent years have been published by the Australian Department of Transport in Australian Transport. Mr. George Birch, Australian Representative to the Council of the International Civil Aviation Organization (ICAO), was most helpful in making copies of these publications available for use in this study. Data for the individual Australian carriers have also been published by ICAO starting with 1974. Reporting deadlines sometimes result in the ICAO data being preliminary while the Australian publications generally contain final figures. Telephone conversation with Mr. William Bekunda, Statistical Officer, ICAO, Montreal, August 10, 1981.

9. D. G. Davies, "The Efficiency of Public versus Private Firms," supra note 2, p. 161.

10. A fare taper has existed in Australia since at least 1969. C. A. Gannon, "Pricing of Domestic Airline Services: Selected Aspects of Fares on Australia's Competitive Routes," in Australian Department of Transport, Domestic Air Transport Policy Review, Vol. II (Canberra: Australian Government Publishing Service, 1979), pp. 121.

11. Employee percentages calculated from data in ICAO, Fleet - Personnel, Commercial Air Carriers (1974-78 and 1976-80), see W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix M, Exhibit 1. The use of AAA's maintenance/overhaul personnel by the Ansett regional carriers was supported by a letter from Mr. Peter J. Forsyth, Lecturer, The University of New South Whales (December 1, 1981), as follows: "As you rightly guess, there is an interchange of resources between the (Ansett) airlines. In particular, maintenance is undertaken by A.A.A. for some of the other airlines, and aircraft of one airline are sometimes used by another. Reservations and check in facilities at major airports are common (and Reservations facilities are provided to other commuter airlines)." This implies that the 25 percent upward adjustment of the regional carriers' employment totals somewhat understates the true allocation of employees to these Ansett subsidiaries.

12. D. G. Davies, "Property Rights and Economic Efficiency," supra note 2, p. 225.

13. Neither the Australian Department of Transport nor ICAO publishes revenue and expense data for domestic airlines. Therefore, it has not been possible to extend Davies' revenue per employee data for the Ansett subsidiaries.

14. ICAO calculates passenger RTM from RPM by assuming each passenger and his baggage weigh an average of 90 kilograms (198.4 pounds).

15. The RPM and RTM per employee data have one anomaly that deserves mentioning. Given the effects of distance on employee productivity (see Figure 6-1), Table 14-3 implies that these measures for short-haul ANSW and ASA should be lower than those for AAA and TAA, while long-haul MMA should be somewhat higher in these measures. This is the case in Table 14-6 except for ANSW in terms of RPM per employee and total RTM per employee. This carrier had higher RPM and total RTM per employee relative to AAA and TAA despite its shorter average trip lengths. This was probably due to AAA providing services such as ground handling and reservations to the regional subsidiaries in addition to the maintenance and overhaul services mentioned above (see footnote 11). If so, then AAA's total employment should be reduced somewhat more than was done in Table 14-4. This would further serve to yield small increases in AAA's employee output while causing larger decreases for ANSW (and probably ASA and MMA as well). Of course, any reallocation of personnel among the Ansett subsidiaries would have no impact on the measures for Ansett Total. It would be desirable to determine the extent that such adjustments should be made, but the similarities among AAA, Ansett Total and TAA for total RTM per employee make it unlikely that the conclusions of this analysis would be changed by any additional reallocations of personnel.

15. Conclusions and Policy Implications

The great majority of the evidence presented in this report indicates that economic regulation in the form of a regulatory monopoly does have major effects on airline performance. The generally similar performances of the federally-regulated airlines operating under different regulatory monopolies in Canada and the United States provides one test of this hypothesis.[1] A second test consists of the large performance differences that existed between the federally-regulated airlines of both countries, on the on hand, and the four U.S. intrastate carriers operating within regulatory duopolies in California, Florida and Texas, on the other hand.[2] Standing alone, each of these tests provides good evidence regarding the economic effects of regulatory monopolies. Together, they reinforce each other and provide very strong evidence indeed.

In addition to providing evidence regarding the effects of economic regulation, the performance similarities between the federally-regulated airlines of both countries, plus the evidence that weather and population do not affect airline performance, indicate that the relevant operating factors in the two countries are also quite comparable for airlines operating large aircraft. Thus, the experience of one country is applicable to the other. This means that U.S. experience under deregulation (including regulatory duopolies) can be useful to Canadian policy makers in deciding whether or not to adopt such a policy, while Canadian experience under continued regulation since 1978 can be useful to U.S. policy makers in evaluating the results of deregulation.

The data presented in this report also provide measures of the extent to which regulatory monopolies affect performance. Using the data for the U.S. intrastate carriers as a base to indicate performance without economic

regulation by a federal commission, and the data for the federally-regulated Canadian and U.S. airlines to reflect airline performance under federal regulation, it appears that a regulatory monopoly:

1. increases coach/economy fares between 50 to 100 percent, with night and weekend coach fares yielding differentials of 100 to 180 percent (Table 2-1);

2. increases total operating expenses per RTM by comparable percentages (Table 4-1);[3]

3. has little effect on profits as the offsetting fare and expense differences yield comparable profits for most carriers, with a few achieving high profits or incurring losses (Table 3-1);

4. reduces labour productivity by 40 to 54 percent, while increasing average employee payments by as much as one-third, resulting in increased employee payments per RTM of 60 to 180 percent;[4]

5. yields small reductions in fuel utilization in the U.S. (but not in Canada because of the higher load factors achieved by Canadian carriers), while having little impact on fuel prices so that, overall, small increases in fuel expenses per RTM occur (Table 8-2, 9-1, 9-2 and 9-3).[5]

However, when interpreting these quantitative estimates of the effects of regulation, it should be remembered that the service quality of the federally-regulated airlines was somewhat superior to that of the U.S. intrastate carriers. Specifically, the federally-regulated airlines have had greater carrier coordination which has facilitated intercarrier reservations, ticketing and transfers of traffic; and they have also had superior inflight service (meals and entertainment), lower seat densities and generally lower load factors; but they have not had better safety records.[6] Thus, some small portion of the above differences can be attributed to their superior service quality.

Even if there should be some remaining doubt about a causal relationship existing between regulatory monopolies and high-fare/high-cost airline operations, there is absolutely no question about the fact that had the CAB's jurisdiction extended to intrastate operations none of these low-fare/low-cost intrastate carriers would have been allowed to enter the industry. Between 1950 and 1974,

not one application by a new airline to perform trunk operations was approved by the CAB, and this included applications by the present California intrastate carriers.[7] Thus, while it might be argued that federal regulation need not necessarily cause airlines to be high-fare/high-cost operators, it is clear that had CAB regulation applied to intrastate operations the intrastate carriers would have been prevented from demonstrating that low-fare/low-cost scheduled operations are feasible in North America -- something that none of the federally-regulated airlines has yet to demonstrate. This is important because, when given a choice, the majority of passengers have shown a clear preference for low fares and somewhat lower service quality over high fares with a higher level of service quality (see p. 29n). Therefore, because of the gap in CAB jurisdiction, 46 million passengers were benefited in California, Florida and Texas during 1975-78, and millions more were benefited between 1949 and 1974.[8]

Other Cost Factors

Three other major sources of airline costs have not been analyzed in this study: aircraft costs, charges for the use of airport facilities, and the cost of capital. The first two are included in total operating expenses and comprise most of the roughly 40 percent of those expenses not accounted for by employee and fuel expenses. The third is classified as a non-operating expense, but it is largely influenced by expenditures on aircraft since aircraft commonly account for around 80 percent of an airline's total assets.[9]

There is little reason to expect that the prices paid for new aircraft by the various carriers should differ appreciably at any point in time after adjusting for the exchange rates required to convert prices into Canadian dollars for aircraft purchased in the U.S. by the Canadian carriers. However, there could be differences in prices to the extent used aircraft, rather than

new aircraft, were purchased or leased. It happens that only Air Florida operated primarily used aircraft during these years, including five DC-9-15s purchased from Air Canada.[10]

In contrast to the likely general similarities in aircraft prices, a prior study of aircraft utilization found that, as of 1975, the largest U.S. intrastate carriers (Air California, PSA and Southwest) utilized their aircraft appreciably more intensively than the federally-regulated airlines by generally installing 10 to 25 percent more seats in identical aircraft (due, in part, to operating only all-economy configurations while the federally-regulated airlines frequently provided both first-class and economy service in the same aircraft).[11] In addition, Table 9-2 (plus p. 108) shows that the scheduled passenger load factors of the three largest U.S. intrastate carriers averaged from 62.2 to 71.8 percent during 1975-78, compared with 61.1 to 63.2 percent for Air Canada and CP Air, and 47.7 to 57.8 percent for the three U.S. trunk carriers. Thus, not only did the intrastate carriers install more seats in their aircraft, but they generally filled a larger proportion of those seats. Overall, these two factors yielded increased aircraft utilization by the U.S. intrastate carriers that was 20 to 25 percent greater than the Canadian mainline carriers, and 30 to 35 percent greater than the U.S. trunk carriers. This indicates that the U.S. intrastate carriers probably also had lower aircraft operating expenses per RTM than the federally-regulated airlines.

Any differences in prices paid for airport facilities within each country should also be small since it is common for all carriers at each airport to be charged the same prices for comparable facilities and services. Fragmentary evidence, however, indicates that intercountry differences may have existed with prices charged by Transport Canada at Canadian airports being higher than

those charged by most locally-owned U.S. airports. The generally higher fuel-related airport fees are an example of this. Therefore, within each of the two countries most differences in the various airlines' airport expenses per RTM would probably be due to the relative sizes of facilities and the extent to which they are utilized. But, between the countries, there may be some additional differences in airport expenses per RTM due to price differences and, of course, it is also possible that airport utilization may also tend to differ between the two countries (as was the case for fuel utilization -- see Table 9-1). Unfortunately, a careful analysis of these matters has yet to be undertaken.

While detailed analyses of differences in aircraft and airport expenses per RTM are not presented in this report, it should be remembered that total operating expenses per RTM are analyzed in Chapter 4 and that Table 4-1 shows the federally-regulated airlines were quite homogeneous in this overall measure while differing substantially from the U.S. intrastate carriers (except Air Florida). It follows that the aircraft and airport cost factors are not large enough to change the basic differences between the federally-regulated airlines and the U.S. intrastate carriers identified from the analyses of the employee and fuel inputs.

Finally, with regard to the cost of capital, it seems likely that the smaller and younger U.S. intrastate carriers paid higher prices for capital during 1975-78 than the established federally-regulated airlines (especially Air Canada as a crown corporation and CP Air as a subsidiary of Canadian Pacific Ltd.). Therefore, in order to achieve roughly comparable capital costs per RTM it would have been necessary for them to extend their pattern of above average utilization of inputs into the area of aircraft, buildings and equipment. Their relatively high utilization of aircraft indicates that this was achieved.

Specialization

This study has provided considerable evidence that the Canadian and U.S. federally-regulated airlines have experienced roughly comparable total operating expenses per RTM (after adjusting for distance), with little of the relatively small differences that did exist among them being attributable to nationality or to whether an airline was privately owned or government owned. Furthermore, it has demonstrated that the operating expenses per RTM of these airlines have been much higher than those of the three largest U.S. intrastate carriers. The reasons for this latter difference have been sought primarily in the relative prices paid for inputs (labour and fuel) and in their utilization. The intrastate carriers did pay fairly low salaries to their employees, but the total employee payments for the three largest intrastate carriers were comparable to those paid by the Canadian regional carriers. At the same time, the U.S. intrastate carriers did not enjoy lower fuel prices. Therefore, while lower employee payments were helpful, lower input prices in general were not the major cause of their lower operating expenses per RTM. Instead, the high utilization of inputs appears to be the most important factor. It existed among labour, fuel and aircraft, and the differences were large relative to the federally-regulated airlines. Thus, the question becomes, how did the U.S. intrastate carriers manage to achieve generally high input utilization?

The arguments that the intrastate carriers' outstanding performance was due to favorable weather conditions and to large population/traffic volumes were found to be unsupported by the evidence. Also, it was shown that economies of scale are not important in the airline industry. However, even though these negative findings have important policy implications, they do

not answer the affirmative question of how is high input utilization actually achieved. While a conclusive answer to this question is not available, it is desirable to propose the possibility that differences in carrier specialization may be an important source of differences in input utilization.

Throughout this study it has been noted that the U.S. intrastate carriers were much more specialized than the federally-regulated airlines. Individual intrastate carriers seldom operated more than two aircraft types at one time, and often operated one type.[12] They served relatively few cities and routes, and those served had traffic densities and distances compatible with their aircraft types. They never offered more than one class of service (always economy) and their fare structure was generally uncomplicated (with few promotional fares other than off-peak fares which applied to every seat on every specified flight). The implications of this simple type of operation apply to such things as employee training; aircraft maneuvering, maintenance and engineering; passenger reservations, ticketing and handling; schedule planning, tariffs and so on. It is significant that, with the possible exception of Northwest's employee productivity, none of the evidence presented in this report has been inconsistent with the hypothesis that specialization yields substantially higher input utilization and lower operating costs.

In the process of gathering data for this study, one piece of evidence surfaced that illustrates the effects of complicated operations on employee utilization and, therefore, on costs. In late 1977, P.L. 95-163 gave the U.S. intrastate carriers (except Southwest) permission to interline passengers with the CAB-regulated airlines. In response, PSA implemented a interline reservations system by obtaining access to American Airlines' SABRE system and assigning specially trained personnel to handle only interline transactions, while all other agents continued to handle only PSA online reservations.

PSA's records show the interesting fact that by mid-1979 (a year after interlining had been implemented), the monthly average transaction time on a interline telephone call was 345 seconds (almost six minutes), compared with just 135 seconds for a telephone call making a PSA online reservation.[13] Furthermore, PSA's Director of Reservations said that an appreciable part of the added 210 seconds (3½ minutes) per call was spent answering questions about the availability of promotional or other low fares, or explaining that economy seats were sold out but that first-class was still available, and would the caller like to be booked first-class and wait-listed on economy?[14] In other words, much of the extra time per call was spent handling the complications that have been associated mainly with federally-regulated airline operations.

At first glance, a difference of 210 seconds in average reservation time would not seem to have a major impact on overall operating expenses. However, PSA's Director of Reservations pointed out that during the first half of 1979 PSA reservations handled an average of 864,000 calls a month for its own services, and an additional 27,000 interline calls. Therefore, a reduction of just one second per phone call would yield a saving of 247.5 hours of agent time per month, or about 1½ agents, assuming a 7.5 hour work day. Of course, more agents also mean more space and equipment. During 1975, while handling an average of 685,000 monthly phone calls at an average transaction time of 110 seconds, PSA had 16,500 square feet of reservation office space, while in 1979, with about 30 percent more phone calls, they had 35,000 square feet of office space, a 112 percent increase. Also, they had more incoming phone lines, and so on.[15]

Obviously, simplifying operations of all airlines to the level of the intrastate carriers would not result in reducing reservations agents by 60 percent (going from 345 to 135 seconds per phone call), but it would certainly

increase RTM per reservation agent by an appreciable amount (perhaps as much as 100 percent). And, it should not be forgotten that PSA is a relatively small airline. The large federally-regulated airlines handle many more calls than PSA so that a one second reduction in time per call would save many more than 1½ agents per airline.

For those who believe PSA may be unusually efficient in handling its own reservation calls, consistent information is available from two other intrastate carriers. Air Florida reported an average talk time of 125.4 seconds on calls received on its Florida WATS line during mid-1979, compared with 189 seconds on calls received on its U.S. WATS line.[16] Similarly, Southwest (who does not interline with other carriers) reported an average talk time of 122.63 seconds in July 1979, which was an appreciable increase from the 87.58 seconds experienced during all of 1978.[17] The increase in talk time was attributed to the following factors:

1) Relatively more questions from novice travelers who tend to travel in the summer.

2) Serving more cities, especially New Orleans where a somewhat different fare structure was in effect.

3) An overburdened computer (due in part to item 2).

4) The operation of a single B-727-200 in addition to the basic fleet of B-737-200s. Experienced travelers inquired about, and tried to avoid flying on, the B-727-200 because its larger capacity required ground times in excess of Southwest's scheduled 10 minutes, thereby resulting in the B-727-200 falling behind schedule as the day progressed. (Note: Southwest terminated B-727-200 service in early 1980.)

5) More schedule changes than in 1978 so agents couldn't have the schedule memorized as much of the time. (Note that schedule memorization also becomes more difficult as the number of flights increase.)

6) A fare change on July 13, 1979, resulting in increased time to quote new fares.[18]

If these factors were important in increasing Southwest's talk time, the average talk times of the federally-regulated airlines must be affected to

a much greater extent by their larger and more complicated operations.

A final indication of the effects of complexity on reservation costs comes from the following quotation regarding Pan American's decision to sell formerly restricted discounted economy seats as low-fare tourist seats without restrictions:

> "Pan American wants simplification of fares. This is the route we will continue to follow and we hope that others join us," John B. Anderson, vice president-field sales and services said.
>
> "No one understands the current fares and, their varying constraints," he said. "It's impossible to sell them intelligently. On the other hand, unrestricted fares sell easily. We have found them generative. People understand them."
>
> Since its introduction of unrestricted fares, Pan American reservations agents, who normally had booked 50 seats for every 100 calls, are now booking 80 seats for every 100 calls, Anderson said.[19]

Pan American's experience does not apply to average talk time, but to an even more important factor -- the percentage of calls that result in a sale. Both factors, however, are important in terms of the productivity of reservation personnel, and they indicate how complexity influences airline operations and costs. They also point out the usefulness of Southwest's motto: "KISS -- Keep it Sweet and Simple," which is merely a more interesting way of expressing the basic idea of specialization.

Entry

An important implication flows from the findings that weather and population differences do not significantly affect airline operating costs, and that there are essentially no economies of scale due to airline size beyond those that can be achieved with four to five aircraft of a suitable type (see Chapters 10-12). This implication is that a substantial number of new airlines would enter the Canadian industry in the absence of regulation, resulting in a significant increase in the total number of viable Canadian

carriers operating scheduled service with large aircraft in domestic and (if allowed by the Canada/U.S. bilateral agreement) in transborder operations.[20]

It may be argued that Canada is different from the U.S. with regard to the entrance of new airlines because Air Canada's large size relative to other Canadian airlines will allow it to dominate Canadian air transportation in the absence of regulation, thereby effectively preventing new entry. One response to this argument is to point out that Air Canada's present relative size was achieved under regulation, so it does not indicate performance under deregulation. But, more important, there is evidence from the U.S. intrastate experience to indicate that large and supposedly dominant carriers are unable to prevent the entry of new airlines.

In the late 1940s, United Air Lines was the dominant carriers within California, with limited rivalry provided by Western Air Lines. Yet the intrastate carriers (especially PSA and California Central) were able to enter and survive the competition of these large CAB-regulated airlines despite the strong support enjoyed by United and Western from their interstate operations -- support that was foreclosed to the intrastate carriers by CAB regulation.

The major reason for the success of the intrastate carrieris in California appears to have been their very low operating costs which allowed them to survive while charging fares that were more than 50 percent below the CAB-authorized fares ($9.99 vs. $21.05 between Los Angeles and San Francisco). Not only did those low fares attract passengers to the intrastate carriers, but they resulted in large increases in total traffic as United and Western matched them over a year later. As a result, by 1952 total traffic in the three major California city pairs was 141 percent above the 1948 level, the CAB-regulated airlines carried 82 percent more passengers than they had

four years earlier, and the successful intrastate carriers were able to survive on their 26 percent share of total revenue passenger-miles.[21]

Southwest faced similar dominance by Braniff Airways within Texas back in the early 1970s (with additional rivalry from Texas International), while Air Florida had the same problem with Eastern Airlines within Florida in the mid 1970s (with National also providing rivalry in some city pairs). Each of these cases is similar to that currently existing within Canada, except that United and Eastern have always been much larger than Air Canada (in terms of RTM), while Braniff was about 70 percent as large during 1978.[22] The fundamental advantage enjoyed by the intrastate carriers has been their low operating costs -- a potent advantage indeed.

The Regulatory Hypothesis

Essentially all of the evidence presented in the previous chapters has been consistent with the hypothesis that a regulatory monopoly results in high operating costs and fares. However, there is the possibility that regulation need not necessarily result in high operating costs. Indeed, Northwest is an example of a federally-regulated airline having low operating expenses per RTM relative to other regulated airlines (but not relative to the three largest U.S. intrastate carriers). Conceivably, if regulatory commissions allowed all operationally qualified low-cost carriers to enter, the regulated airline industry would be characterized by low-cost operations. However, entry has not been determined on the basis of cost performance. In both Canada and the U.S. the entry of airlines operating large aircraft has been determined largely by grandfather provisions of some sort. The scheduled carriers in existence when regulation was instituted in 1938 were allowed to remain in the industry, while the regional and local service carriers were allowed to enter on a restricted basis during single time periods.[23] Carriers seeking to enter subsequently were not permitted to do so regardless of their potential cost performance.

At the same time, the demand for airline services has grown tremendously, and the refusal of the federal regulatory commissions to allow new airlines to enter as that growth occurred has resulted in the great expansion of the existing airlines in order to fulfill the increased demand. This, in turn, has meant that each existing carrier has had to provide an increasing quantity and range of service to many points with a variety of aircraft types. In addition, closed entry has made price discrimination a feasible pricing policy, thereby encouraging a complicated fare structure. Thus, the closed entry associated with regulation has encouraged diversity and has prevented a high degree of specialization in the industry. As a result, to the extent specialization facilitates low operating costs, closed entry makes it increasingly difficult for existing airlines to be low-cost carriers.

Overall, then, while regulation per se may not necessarily cause high operating costs, if it results in closed entry and the ignoring of low operating costs as a basic qualification for entry and survival (contrary to industries where entry is open), there is every reason to predict that high operating costs will result. The evidence provided in this report indicates that this has been the case in both Canada and the United States. Despite this, closure has been welcomed by the favoured carriers and their employees since it has decreased competition and has allowed the airlines to increase fares as costs (including employee costs) have increased.

Performance Under Alternative Regulatory Policies

The analyses presented in this report form the basis for predicting how airline performance will differ under alternative regulatory policies. Under a policy of retaining the regulatory status quo [with the entry of new mainline and regional airlines prohibited, using CTC(A) proceedings to allocate new routes among existing carriers, and the continuation of price and service-

quality regulation], there is every reason to expect that Canada will continue to experience the kind of airline performance by the mainline and regional carriers that it has experienced in the past, that is:

1. High fare levels;
2. A complicated fare structure yielding considerable price discrimination in the form of promotional fares;
3. High service quality with substantial carrier coordination facilitating intercarrier reservations, ticketing and transfers of traffic;
4. High operating costs;
5. Lower employee productivity while paying above-market salaries and benefits;
6. No increase in the number of carriers, with some possible decrease in the present six mainline and regional carriers through mergers; and
7. Normal profits on average (with year-to-year fluctuations).

In contrast, should a policy of deregulation be adopted (whereby new airlines could enter the industry so long as they met federal safety requirements, carriers could serve the routes of their choice without restrictions as to type of aircraft utilized, fare and rate decreases could be implemented without interference, and there would be no restrictions on the quality and quantity of service operated), the evidence leads to the prediction that, over time (ten years or so), airline performance would move from present levels to the following:

1. Fares would decrease by as much as 50 percent from regulated levels;
2. The fare structure would become simple with essentially no discriminatory fares;
3. Service quality would decline somewhat with less carrier coordination, the elimination of first-class service, increases in seat densities and increases in average load factors;
4. Operating costs of successful airlines would be substantially reduced;
5. Employee productivity would increase with salaries and benefits decreasing to market levels;

6. The number of airlines would increase, with each being more specialized than existing regulated airlines;

7. Service to small communities would become more viable because lower operating costs would decrease revenue requirements, including direct and cross subsidies;

8. Charter service would decline substantially and would be largely limited to single-entity services; and

9. Profits of successful airlines would be at normal levels on average (again, with year-to-year fluctuations).

The above alternatives approximate the extremes of full regulation and complete deregulation. Of course, there are a number of in-between possibilities containing characteristics of both. One key factor concerns the vital matter of entry. If low-cost performance is desired, then policies should be adopted that will allow new, specialized airlines to enter the mainline and regional carrier groups (probably from the ranks of the existing Level III-V carriers). Entry could be limited to domestic operations (leaving transborder and international carriers protected); to various regions within the country (thereby protecting the mainline carriers); to cargo operations (thereby protecting primarily passenger carriers); to propeller aircraft (thereby protecting operators of jet aircraft), and so on.

Entry into individual city pairs or routes could be freed by allowing each existing airline to enter one or two city pairs of its choice every year without restraint by the CTC(A); or by allowing any carrier to provide nonstop service in a city pair where an already authorized carrier has failed to provide such service during the prior 12 months (or some other time period). Fare regulation could be reduced by allowing the initial fares of new carriers in a city pair to be implemented without prior approval by the CTC(A); by allowing each existing carrier to lower any fare or rate at its discretion while requiring CTC(A) permission before any fare/rate could be increased; or by having the CTC(A) establish a "zone of reasonableness"

around formula fares with carriers being allowed to adopt any fare within that range. If low fares are desired, however, it should be remembered that major broadly-based fare reductions are possible only if carriers having much lower operating costs are allowed to provide service. Thus, it would be necessary to coordinate relaxations in fare regulation with more liberal entry policies.

Risks

The opponents of deregulation will be quick to point out that there are many risks in moving from the known status quo to a major change in the regulatory environment. While this is true, there are also risks involved in maintaining the status quo. One such risk concerns the high operating costs associated with extensive regulation. High operating costs require high fares, and high fares both decrease the amounts of airline services demanded and encourage the development of substitute services -- all to the long-run detriment of the industry.

Televised phone conversations comprise one example of a substitute service that poses a threat to the airline industry. This service is becoming available and it doesn't take many $200 roundtrip fares (the current price for a 300 mile trip) to make such telephone services attractive. Indeed, the CBC's TV programme, The Journal, is demonstrating how this service facilitates face-to-face conversations. If airline operating costs were substantially lower, so that air fares could be reduced by 30 to 50 percent, the airlines' long-run competitive position would be greatly strengthened in the business sector, while personal travel would also increase. Furthermore, reduced operating costs would promote the development of air freight, something that is much less subject to telecommunication competition.

A second risk in retaining a regulatory monopoly is the fact that the U.S. airline industry is currently progressing through the transition from regulation to deregulation. The fact is that there is considerable rivalry between Canadian and U.S. carriers, and if a deregulated environment makes successful U.S. carriers more effective lower-cost competitors, the Canadian airlines will be at a substantial disadvantage. Obviously, the roughly 15 percent of Canadian carriers' RTM moving over transborder routes will be directly exposed to the competition of the changed U.S. carriers. In addition, extensions of low-fare international service by U.S. (and other foreign) carriers will inpinge on the 38 percent or so of the Canadian carriers' total RTM moving internationally. This will become more prevalent with the expansion of international service at nearby U.S. cities such as Boston, Buffalo, Detroit, Minneapolis and Seattle. Furthermore, the widespread development of low-fare domestic service in the U.S. will be observed by Canadian travelers who will question why similar widely-available domestic fares and services are not offered by Canadian carriers. Responding to the resulting pressure for lower domestic fares could weaken Canadian carriers with their higher regulatory-related operating costs. Given all this, postponing deregulation in Canada could mean that when it is finally implemented, weakened Canadian carriers would have to undergo the necessary adjustments more rapidly and painfully than their U.S. counterparts which, by then, would be experienced in responding to the marketing and operating problems associated with deregulation (in contrast to the problems associated with regulation).

One cannot avoid the reality that deregulation is being implemented in the United States. Should it eventually result in the performance indicated by the experience of the U.S. intrastate carriers, it will be impossible for

Canada (and perhaps the rest of the world) to be immune from its effects. The above indicates that a "wait and see" policy for Canada will be very costly to the existing Canadian carriers if the U.S. experiment is a success.

Overall, the risks associated with maintaining an extensive regulatory monopoly in Canada concern basic threats to the industry in general. This should not be surprising since regulation causes the airlines to act in concert so that adverse effects will probably apply on an industry-wide basis.

In contrast, the risks of adopting deregulation in the near future, thereby paralleling developments in the U.S., mainly concern individual Canadian airlines. Those that could make the necessary adjustments quickly, in cooperation with their employees and suppliers, would survive and achieve normal profits once the adjustments were completed. However, those that resisted change, or were unable to gain employee and supplier cooperation, could well experience difficult times and could be forced out of business. Of course, the detrimental effects on such carriers would be partially or entirely counterbalanced by the benefits enjoyed by new low-cost carriers (and their employees and suppliers) which would enter either as replacements of failing carriers or as additional operators. The benefits accruing to consumers should also be recognized. As indicated above, low-cost/low-fare airline operations have much greater long-run potential than do high-cost/high-fare operations because they will discourage the inroads of substitute services and will thereby result in greater demand. While deregulation will doubtless pose many short-run problems, the fundamental long-run problems will be greater under continued regulation.

Intermediate Policies

Policy alternatives need not be limited to extensive regulation or complete deregulation. As outlined above, more moderate and reversible

policies could result in a move from a complete regulatory monopoly to some intermediate stage between regulation and deregulation pending the evaluation of U.S. airline performance over a longer time period. For example, existing mainline and regional carriers could be allowed greater discretion in entering new routes of their choice and offering lower fares. Wardair and various local carriers could be allowed to enter and operate unit-toll services within Canada, perhaps with the local carriers being allowed complete discretion regarding routes and fares within a general restriction that they operate propeller aircraft only. This would protect the jet operations of the mainline and regional carriers while allowing the local carriers to become better prepared to move into unrestricted operations should full deregulation be adopted in the future. The abolition of entry and rate controls over all-cargo airlines is another move that would limit diversion from the mainline and regional carriers while allowing new airlines to obtain useful experience and to provide consumers with more service.

The deregulation of transborder operations could be another intermediate move, providing the cooperation of the U.S. government could be obtained. Such deregulation would be characterized by open entry and unregulated fares for transborder service, but without extending domestic cabotage rights to the carriers of the other country. Thus, any Canadian carrier would be able to serve any U.S. point, but could not carry traffic between two or more U.S. cities, with the same provision applying to U.S. carriers serving Canada. In such a situation, it is predicted that Canadian carriers would tend to dominate long-haul service to cities on the eastern, southern and western periphery of the U.S. (building on backup traffic from Canadian points), while U.S. carriers would tend to be more successful in relatively short-haul transborder service to and from points located in the central and northern parts of the U.S. (building

on backup traffic from interior U.S. points). This policy would, of course, provide Canadian carriers with greater first-hand knowledge of U.S. deregulation.

Conclusion

The low-cost and low-fare performance of the U.S. intrastate carriers has demonstrated that deregulation is a viable policy alternative, and it proved instrumental in influencing U.S. policy makers to deregulate the U.S. interstate airlines.[24] Deregulation has not brought chaos to the U.S. industry. Indeed, the financial difficulties of the deregulated airline industry during 1980-82 merely replicate the financial difficulties experienced by the regulated airlines in 1947-49, 1958-60 and 1970-75.[25] In each case, carrier losses have been associated with a recession coinciding with the delivery of unusually large numbers of aircraft. Also, in each case a number of airlines have managed to be profitable while others were not, thereby indicating that losses were not completely beyond the control of management and employees.

Deregulation also did not bring immediate and radical changes in industry performance. The only discernible thing that happened following the enactment of the Airline Deregulation Act by Congress on October 15, 1978, was the line of lawyers that suddenly formed on the sidewalk outside the CAB's offices waiting for the President to sign the Act so that they could then be the first to submit applications to the Board under the new legislation (it turned out to be a nine-day wait, and law clerks and messengers soon replaced the high-priced lawyers in the queue). To date, the existing U.S. airlines have been slowly adjusting to deregulation while coping with other major changes such as the uniquely large increases in fuel prices, the DC-10 grounding in 1979, the air traffic controller strike/firing in 1981-82, high inflation and a recession. New airlines have begun to enter the industry while existing airlines have expanded into new routes, resulting in substantial increases in

competition in many city pairs and in substantial fare reductions in those pairs.[26]

Deregulation is not risk free, but neither is continued regulation nor any intermediate policy between these two extremes. However, there is one fundamental factor that should guide the development of policy regarding airline regulation. That is, the long-term economic strength of low-cost carriers is much greater than that of high-cost carriers. Therefore, policies designed to foster the operations of low-cost carriers will more likely be successful than policies that prevent such carriers from operating, thereby protecting (and promoting the expansion of) high-cost carriers. Given the difficulties of identifying such carriers in advance, this prescription argues for a policy in which entry is relatively easy. Open entry in California, Florida and Texas allowed the successful intrastate carriers to demonstrate just how much lower operating costs could be relative to the high and quite homogeneous costs of the federally-regulated airlines in Canada and the United States. Open entry under deregulation is now demonstrating that low-cost operations are feasible throughout the U.S. Given the similarities between regulated Canadian and U.S. airline performance, it follows that low-cost operations are also possible in Canada.

The history of Canada has many examples of large government subsidies being paid to companies to foster low-priced transportation in order to promote nationhood. Since low-cost airline operations allow carriers to offer low fares and rates, Canada is now in a position to promote low-priced air transportation and national cohesion without direct subsidies, but merely by making appropriate policy changes that will promote the operation of low-cost airlines.

Footnotes

1. The main exceptions to these similar performances were Northwest's very high labour productivity (RTM per employee) and the differences in prices paid for inputs, with the Canadian carriers paying lower salaries and wages and higher fuel prices (due in large part to differences in taxes and airport fees).

2. These differences were especially large for Air California, PSA and Southwest, with smaller differences existing for Air Florida.

3. The -31.8 to -52.8 percent deviations of PSA, Air California and Southwest from the federally-regulated airlines' trend line are equivalent to the federally-regulated airlines having operating expenses per RTM that were 47 to 112 percent above those of these intrastate carriers.

4. As in footnote 3, these percentages were calculated by reversing the positions of the carriers in the calculations. That is, the actual values for the intrastate carriers became the denominator and the trend values for the federally-regulated airlines the numerator.

5. The higher Canadian fuel prices (including taxes and airport fees) caused the higher fuel expenses per RTM for the federally-regulated Canadian airlines.

6. W. A. Jordan, Airline Regulation in America: Effects and Imperfections (Baltimore: The Johns Hopkins Press, 1970), pp. 49-53. This source contains the safety records of intrastate carriers from 1949 through 1969. Since then there have been two other fatal accidents involving former intrastate carriers. A PSA B-727-200 collided with a Cessna 172 on September 25, 1978, killing 137 people in the two aircraft and seven on the ground, while an Air Florida B-737-200 crashed on takeoff from Washington National Airport on January 13, 1982, killing 74 on board the aircraft and four on the ground. Aviation Week and Space Technology (June 4, 1979), pp. 70-75, and (January 25, 1982), pp. 30-31.

7. CAB, "Appendix to Question 19," submitted to the Subcommittee on Administrative Practice and Procedure of the Committee on the Judiciary of the United States Senate (1975), Pp. 13.

8. W. A. Jordan, Performance of Regulated Canadian Airlines in Domestic and Transborder Operations (Ottawa: Consumer and Corporate Affairs Canada, 1982), Appendix H.3.

9. CAB, Supplement to the Handbook of Airline Statistics (November 1979), pp. 77-78.

10. Air Florida, SEC Form 10-K (July 31, 1977), pp. 19-22.

11. W. A. Jordan, "Airline Performance Under Regulation: Canada vs. the United States," in R. O. Zerbe, Jr., ed., Research in Law and Economics, Vol. 1 (Greenwich, Conn.: JAI Press, Inc., 1979), pp. 55-56. More recent data indicate this general range of seating differences persisted through 1978.

12. The following aircraft types were operated by the U.S. intrastate carriers during 1975-78:

		Maximum Number Operated				
		1975	1976	1977	1978	
Air California:	L-188	2	2	3	3	
	B-737-100/200	7	8	9	10	
Air Florida:	L-188	2	3	2	0	
	B-727-100	0	0	1	0	
	DC-9-15	0	0	4	5	
	B-737-200	0	0	0	2	(Nov.-Dec.)
PSA:	L-188	2	2	3	4	
	B-737-200	3	2	0	0	
	B-727-100/200	24	26	29	31	
Southwest:	B-737-200	5	6	10	13	

Sources: Annual reports, SEC Forms 10-K and company records for these airlines.

13. Letter from Mr. J. G. Opp, Director of Reservations, PSA (July 13, 1979). Also, conversation with Mr. Opp (July 11, 1979).

14. Ibid. (July 11, 1979).

15. Ibid. The increase in floor space was due in part to moving to new quarters.

16. Letter from Mr. M. Creasser, Manager Telephone Sales, Air Florida (October 9, 1979).

17. Conversation with Mr. Lowell McCallister, Manager--Procedures & Publications, Southwest Airlines (August 17, 1979); also, telephone conversation with Cathy (last name unknown), Reservations Manager, Southwest Airlines (August 17, 1979).

18. Ibid.

19. James Ott, "Gains Forecast in U.S. Travel to Europe," Aviation Weeks and Space Technology (January 4, 1982), pp. 26-29 (esp. p. 28). It may be relevant that this new policy was adopted after Mr. C. E. Acker, former Chairman of Air Florida, became Chairman of Pan American in the summer of 1981.

20. W. A. Jordan, supra note 8, Chapter XIII (see subsection on Entry) provides a more detailed analysis of this implication.

21. W. A. Jordan, supra note 6, pp. 17-24, 78, 276-79, 284 and 305-18. In 1965, the intrastate carriers' share was 45.5 percent of total RPM.

22. Calculated from data in W. A. Jordan, supra note 8, Appendix E.1; and CAB, Air Carrier Traffic Statistics (December 1978).

23. W. A. Jordan, "Comparisons of American and Canadian airline Regulation," in G. B. Reschenthaler and B. Roberts, eds., Perspective on Canadian Airline Regulation (Montreal: Institute for Research on Public Policy, 1979), pp. 23-27.

24. U.S. Senate, Civil Aeronautics Board Practices and Procedures, Report of the Subcommittee of Administrative Practice and Procedure of the Committee on the Judiciary (1975), pp. 3-5 and 40-58.

25. CAB, Handbook of Airline Statistics (1973 ed.; Washington, D.C.: 1974). Also, CAB, Air Carrier Financial Statistics (December 1974, 1976, 1978, 1980 and 1981).

26. It has been said that deregulation has also resulted in the replacement of trunk and local service carriers at smaller cities by commuter carriers. These replacements, however, are largely the continuation of a long-established trend primarily reflecting changes in the sizes of aircraft operated by the various airline groups. Between 1946 and late 1978, the CAB authorized individual trunk carriers to suspend service at 345 points, while individual local service carriers were allowed to suspend service at 365 points. CAB, Bureau of Consumer Protection, North Central-Southern Merger Case, Direct Exhibits, Docket 33136 (October 13, 1978), Exhibits Nos. BCP-DE-5 and 6 (corrected).