FLIGHT TRANSPORTATION LABORATORY REPORT R 91-2

CONCENTRATION IN U.S. AIR TRANSPORTATION:

AN ANALYSIS OF ORIGIN-DESTINATION MARKETS SINCE DEREGULATION

Jan Van Acker

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by

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ABSTRACT

The thesis examined the effects on competition of deregulation in the airline industry by analyzing changes in concentration over the ten-year period 1979-1989 in two sets of origin-destination city-pair markets: the top 100 markets in which the most passengers traveled in 1989, and the top ten markets to and from each of fifteen dominated cities. Concentration levels were significantly lower in the top 100 markets in 1979 than in 1989. Average concentration levels in the 150 markets out of the dominated cities were only slightly lower in 1989 than in 1979. In both sets of markets average concentration decreased from 1979 to 1985. From 1985 to 1989, it increased slightly in the top 100 markets, and it increased significantly in the 150 markets out of the dominated cities.

The hub-and-spoke route structure developed by all major airlines was the primary cause for the decrease in concentration levels in most of the markets. In the markets out of the hub airports, the development of the hub by a single airline led to an increase in competition in the period 1979-1985, as this airline began to compete against incumbent carriers in those markets. After 1985, however, the hub airlines became gradually dominant in the markets out of their hub airports, prompting many to ask for reregulation of some kind. This would probably not increase competition in the dominated cities' markets, however, and would very likely adversely affect competition in the overall air transportation system.

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Contents

List of Tables

List of Figures

Chapter 1

Introduction

1.1 U.S. Airline Deregulation

Since its early existence, air transportation has drawn much government attention for reasons of public utility and national defense. From the emergence of the first airlines, federal government was heavily involved in air transportation through various Acts such as the 1934 Airmail Act. The industry was comprehensively regulated in the Civil Aeronautics Act of 1938, which established an independent Civil Aeronautics Board (CAB). The CAB was given the exclusive authority to issue a "certificate of public convenience and necessity" to allow airlines to provide public air transportation, to decide on which markets these airlines would be allowed to enter and exit, and to regulate fares filed by airlines.

Although air transportation and airline revenues grew at a high rate from 1938 on, the

airlines were never very profitable. The airline industry is very cyclical in nature and airlines have high fixed capital costs. As a result, downturns in the economy tend to cause big losses in the industry. This became especially clear in the beginning of the seventies when the economic recession, along with the advent of wide-body aircraft and increased fuel costs caused by the oil shocks, led to excess capacity and severe losses.

The experiences of lower fares and less excess capacity in the deregulated intrastate environments of California and Texas advocated the belief that the regulated air transportation system supervised by the CAB fostered inefficiency, higher costs and higher prices. Academic economists believed that the airline industry was naturally competitive because of the absence of natural exit and entry barriers in serving markets (high mobility of airline assets), the equal access of the airlines to technology, and the overall absence of economies of scale. Perfect competition in a deregulated environment would lead to an equilibrium of fares and service at which the aggregate economic welfare of passengers and airlines would be at its maximum level.

In 1978 Congress passed the Airline Deregulation Act ending, for domestic services, 40 years of air transportation regulation. The Act freed competition by allowing any carrier "fit, willing and able" to serve any and all domestic routes and cities and to set fares without government approval. Free competition would bring about lower fares for the traveling public as well as higher earnings for the airlines because of increases in efficiency levels in the industry. In addition, a deregulated industry would still provide the needed level of air

transportation service. [1] [2]

Since 1978, the effects of deregulation have been researched by many. Overall, deregulation has been a very positive experience. The average fares paid by consumers have declined since deregulation, both compared to consumer prices in general and compared to the fares that would likely have prevailed had regulation continued. The availability of many discounted fares has democratized air transportation by making air travel affordable for many more Americans. Finally, the public has also benefitted from an increase in frequency of service and in competitive service to choose from. [3] [4] [5] [6] [7] [8] [9]

However, beginning in 1985, a shake-out of the industry caused by mergers and bankruptcies has turned it more and more into an oligopoly. Critics of airline deregulation have accused the airlines of misusing oligopoly power in some areas of the marketplace, such as at the different hub cities. One of the ways in which airlines have tried to make their operations more efficient since deregulation has been the development and strengthening of hub-and-spoke systems. As a consequence, several of the nation's major airports have become dominated by one or two carriers. Carrier domination of a hub could become a barrier to entry in serving markets to and from the hub, because of the size of the dominant airline's operations and the subsequent economies of scale and scope. From 1985 on industry fares began to rise again, and it has been alleged that fares on routes to and from some of the hub cities have risen above the industry average. [10] [11] [12]

All of this has fueled questions whether only a few carriers will be able to survive a deregulated environment in the long run, and whether the end result of deregulation will be an industry with highly concentrated subsystems, which would require government intervention to preserve public welfare. The airline industry's sensitivity to economic conditions suggests, though, that average fares are likely to decrease whenever excess capacity emerges from declines in traffic volume. The present situation in the airline industry is the best proof of this argument.

1.2 Objective of the Thesis

Concentration, or the number of competitors in an industry or market and the distribution of their size, is an important issue in any industry of major public interest such as air transportation, because it is thought to determine market power and hence business behavior and performance. In particular, high levels of concentration are likely to correspond to an industry performance that does not yield the optimal aggregate economic welfare of consumers and producers produced by perfect competition. In highly concentrated industries an optimum allocation of resources is unlikely to be realized, the lack of competition is likely to affect the internal efficiency of firms, and an unequal distribution of income might occur.

The objective of airline deregulation was to enhance efficiency and increase public

welfare through increases in competition in a deregulated environment. The shake-out that occurred in the industry since 1985 has fueled questions about the desirability and the benefits of deregulation, though. A first objective of this thesis is therefore to look at changes in concentration in certain markets since deregulation in order to provide empirical evidence on the benefits and drawbacks of deregulation for the entire U.S. air transportation system.

To defend the alternative of reregulation, critics of airline deregulation most often point to hub cities across the country and the high levels of concentration and higher fares at these cities. A second objective of this thesis is to study the effects of deregulation on competition in various origin-destination markets to and from several dominated cities. A comparison of concentration levels in these markets before and after deregulation should illuminate any negative aspects of deregulation and help decide on the desirability of public intervention in some of the deregulated markets.

Important to mention is that the analysis looks at competition and concentration in origin-destination markets and does not study aggregate airport concentration levels. The real markets in air transportation are the origin-destination city-pairs between which a passenger travels. Any study that takes an aggregate look at the whole system, or at subsystems such as airports or cities, gathers different city-pair markets that correspond to different consumer demands. Such an aggregate study may hide differences in concentration among the different markets and lead to inaccurate conclusions.

1.3 Structure of the Thesis

The remainder of this thesis is divided into six chapters.

Chapter 2 contains a literature review. In order to keep the research manageable, the scope of the thesis has been limited to the study of the effects of deregulation on concentration and not on fares. The relationship between concentration and fares and the effects of deregulation on fares has been studied fairly extensively and Chapter 2 also provides an overview of some of those studies.

Chapter 3 addresses the methodology used in the analysis. It explains the rationale for using the origin-destination city-pair approach in studying concentration, and gives an overview of the different concentration measures used in the thesis.

Chapter 4 analyzes the changes in concentration in the origin-destination city-pair markets that were ranked one through 100 in terms of local passengers enplaned in 1989. It looks at changes in concentration in the 100 markets throughout the ten year period studied, compares concentration and changes in concentration in the top 100 markets to the top 10 markets and top 50 markets, and studies a breakdown of the top 100 markets into non-hub markets and hub markets.

Chapter 5 gives the concentration analysis for fifteen different cities dominated by one

or two carriers. It looks at the changes in concentration throughout the ten year period studied, and compares the different cities with one another.

Chapter 6 provides policy conclusions based on the analysis of Chapter 4 and Chapter 5. It looks at the benefits and drawbacks of deregulation on an system-wide level and on a city specific level, and discusses the desirability of reregulation.

Notes

[1] Melvin A. Brenner, James O. Leet, Elihu Schott, Airline Deregulation, ENO Foundation for Transportation, Westport, Connecticut, 1985.

[2] Michael Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy, and Public Policy", Yale Journal on Regulation, vol. 4, 1987.

[3] Michael E. Levine, op. cit.

[4] Steven A. Morrison and Clifford Winston, "The Dynamics of Airline Pricing and Competition", The Brookings Institution: AEA Papers and Proceedings, vol. 80 no. 2, 1990.

[5] Steven A. Morrison and Clifford Winston, The Economic Effects of Airline Deregulation, The Brookings Institution, Washington, D.C., 1987.

[6] Kenneth Labich, "Should Airlines be Reregulated?", Fortune, June 19, 1989.

[7] Steve Lohr, "War and Recession Speed Up the Airlines' Flights to Oblivion", The New York Times, February 17, 1991.

[8] Peter Passell, "Why Only a Few Big Airlines Prosper in a Deregulated Sky", The New York Times, January 2, 1991.

[9] The Economist, "Flying Against the Rules", The Economist, June 24, 1989.

[10] GAO, Airline Competition: Higher Fares and Reduced Competition at Concentrated Airports, United States General Accounting Office, Washington, D.C., 1990.

[11] Kenneth Labich, op. cit.

[12] Peter Passell, op. cit.

Chapter 2

Literature Review

2.1 Introduction

In this chapter we take a look at different studies that have investigated competition in the air transportation industry since deregulation. The first section of this chapter gives an overview of studies on the relationship between market concentration and fares. In the second section we review the literature on the relationship between fares charged in a market and the degree of domination by one or two carriers at the endpoint cities of that market. Finally, in the third section we examine the results of some studies that have researched changes in concentration in the U.S. air transportation system since deregulation.

2.2 The Relationship between Concentration and Fares

The 1978 Airline Deregulation Act was based on the belief that the air transportation industry was naturally competitive. In a competitive deregulated environment fares would be set based on the average costs of providing transportation. Since exit of and entry in serving markets would be unrestricted and easy because of the high mobility of airlines' assets, airlines would exit those markets where competitive pricing was below their average cost and deploy their aircraft in those markets where pricing was above average cost. The equilibrium fare would be at average cost, and pricing would thus be unrelated to market concentration and to the number of carriers serving a market. [1]

In the early eighties, researchers began to realize that the airline industry would not be perfectly competitive because of the limited number of airlines competing and the limitations of these airlines in terms of deployable aircraft. Bailey and Baumol [2] applied the theory of contestability to airline markets and concluded that the number of carriers serving a market was not crucial to the achievement of perfect competition and the resulting optimal economic welfare. The perfect contestability theory assumed that carriers which did not serve a certain market could be potential entrants, and that the mere threat of their entry would prevent the airlines serving that market from setting fares above average cost. The number of competitors serving a market and the market concentration would therefore not affect pricing either.

Different studies published since 1985 have found that empirical evidence is inconsistent with the theory of perfect contestability. Bailey, Graham, and Kaplan [3] concluded that fares were related to the number of actual competitors in a market and that fares increased when concentration increased. They assumed that these effects were due to the transition from regulation to deregulation, however, and that in the long run the contestability theory would hold. Morrison and Winston [4] used a model that measured welfare [5] to determine that the airline industry was not perfectly contestable. They found that an increase in the number of potential entrants [6] in a certain market led to an increase in welfare, which was consistent with contestability, but that actual welfare was different from the optimal welfare yielded by a perfectly competitive environment, which meant that the airline industry was not perfectly contestable.

In another study, Morrison and Winston [7] concluded that fares were negatively related to the number of effective competitors in the market. Hurdle, Johnson, Joskow, Werden, and Williams [8] determined that fares were related to the number and size distribution of incumbents. The number of potential entrants [6] in a market had an influence on fares as long as the incumbent airlines did not enjoy a significant advantage due to economies of scale and scope. Since this constituted a barrier to entry to serving the market, contestability would not hold in these markets. Meyer and Oster [9] found that markets served by more than two carriers often offered a greater variety of discount fares than markets dominated by one or two carriers. All of these latter studies suggest a positive correlation between fares and market concentration, i.e. an increase in concentration would

lead to an increase in fares.

2.3 Market Concentration, Airport Domination and Fares

Allegations of higher than average fares in markets to and from major cities with airports dominated by one or two airlines have aroused interest in the relationship between airport or city concentration and fares. Upon Congressional request the General Accounting Office [10] examined trends in yields and service at 15 concentrated airports and compared them with trends at 38 other less concentrated airports. The GAO concluded that yields, on average, increased more at the concentrated airports and that fares charged by the dominant carriers tended to rise as their aggregate airport enplanement shares increased. GAO limited its study to aggregate airport concentration, however, and it thereby failed to capture the differences in characteristics of different markets. These differences in characteristics may give rise to differences in concentration and hence differences in fares in different markets. The conclusions drawn in the GAO's report may not be fully representative of the different markets.

Several other studies have attempted to construct models to explain changes in fares, with market concentration as well as airport concentration as explanatory variables. A study conducted by Simat, Helliesen & Eichner [11] for the Air Transportation Association found

that fares at some concentrated airports were slightly higher than at other airports, but that no correlation could be established with airport concentration. Instead, the study argued that higher fares at some of the concentrated airports were mainly related to higher levels of service and to the greater number of high cost short-haul markets served from hub cities. Morrison and Winston [12] found that fares were related to market concentration as measured by the number of airlines competing in a market, but not to aggregate concentration levels at the endpoint airports of the market. The impact of a change in the number of airlines competing in a market on changes in fares was smaller, however, if one of the endpoints of the market was a slot-controlled airport. This was due to the fact that fares in slot-controlled markets reflected the opportunity cost of the slot and therefore did not just depend on market competition.

Borenstein [13] argued that a source of market power in city-pair markets was the size of a carrier's operations at the endpoints of the market. When a carrier was able to provide a higher level of service (higher frequency, non-stop service, etc.) it became more attractive to passengers. This superior service tended to increase the airline's share of the market and its average price. He found, however, that this did not permit other airlines serving the same market to charge similar prices, which meant that price sensitive passengers traveling to or from dominated airports would still be able to find competitive fares.

Levine [14] referred to higher fares in markets to and from hub airports as "rents" charged by the hub carrier for the investments it had made in constructing the hub, and in

subsequently making much more non-stop service available than the city would otherwise receive. Travelers at non-hub cities had less non-stop service than they might have in an environment without hubbing. On the other hand, these travelers benefitted from a higher frequency of service and from far more competition and lower fares than would be available in a regulated non-hub environment, though.

2.4 Changes in Concentration since Deregulation

Most of the studies that have examined changes in concentration since deregulation have found that overall concentration levels have decreased in the U.S. air transportation system. Morrison and Winston [15] found that the average number of "effective competitors" [16] in U.S. domestic origin-destination markets had risen from 1.52 in 1978 to 1.90 in 1988, although the number of effective competitors in the total U.S. air transportation system had fallen from 8.7 in 1978 to 7.7 in 1988. Morrison and Winston also noted that the percentage of travelers who were flying on carriers with a share of more than 90% of the passengers transported in a city-pair market had decreased from 28% of the total number of passengers in 1978 to 17% in 1988; the percentage of travelers flying on airlines with 20% or less market share had risen from 7% to 17% during the same period.

A study performed by the Department of Transportation [17] provided similar results:

the passenger enplanements in markets where a single carrier controlled 90% or more of the market had declined from 22% of all passenger enplanements in 1979 to 11% in 1989. In 1979 only 4% of all passengers traveled in markets where at least four airlines carried 10% or more of the passengers, whereas in 1989 that number had increased to 20%. In a study on the early results of deregulation, Meyer and Oster [18] found that the average number of carriers serving each airport had increased by 31% from 1978 to 1983 at large hubs [19], by 51% at medium hubs, by 42% at small hubs, and by 15% at non-hubs.

2.5 Conclusion

Most of the studies reviewed in this chapter have looked at changes in concentration in the U.S. air transportation system since deregulation in the context of fare changes. The studies reviewed in the first and second section of this chapter used concentration levels in markets and/or at airports to find a relationship between market concentration and/or airport domination, and fares charged in the market. Studies such as the ones mentioned in the previous section have taken an aggregate look at changes in concentration and changes in fares to judge on the merits of deregulation.

None of these studies have taken a detailed look at changes in concentration on an origin-destination market level, however. An analysis of trends in concentration in different

origin-destination markets could provide some insight into the relationship between market concentration and market characteristics. A detailed study of which markets have benefitted from deregulation and those which have not and for what reasons should provide valuable guidance to any discussion on the desirability of public intervention in markets and in which kind of markets.

Notes

[1] Michael E. Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy, and Public Policy", Yale Journal on Regulation, vol. 4, 1987.

[2] Elizabeth E. Bailey and William Baumol, "Deregulation and the Theory of Contestable Markets", Yale Journal on Regulation, vol. 1 no. 2, 1984.

[3] Elizabeth E. Bailey, David R. Graham, David P. Kaplan, Deregulating the Airlines: An Economic Analysis, The MIT Press, Cambridge, Massachusetts, 1985.

[4] Steven A. Morrison and Clifford Winston, "Empirical Implications and Tests of the Contestability Hypothesis", Journal of Law and Economics, vol. 30, 1987.

[5] Welfare in this model is a dollar value which includes the benefits of lower fares to the traveling public as well as the benefits of increased frequency of service to time-sensitive business travelers.

[6] A potential carrier is defined as a carrier that serves at least one of the two airports involved in a market, but that does not serve the market itself.

[7] Steven A. Morrison and Clifford Winston, "The Dynamics of Airline Pricing and Competition", The Brookings Institution: AEA Papers and Proceedings, vol. 80 no. 2, 1990, p. 390-391.

[8] Gloria J. Hurdle, Richard L. Johnson, Andrew S. Joskow, Gregory J. Werden, and Michael A. Williams, "Concentration, Potential Entry, and Performance in the Airline Industry", The Journal of Industrial Economics, vol. 38 no. 2, 1989.

[9] John R. Meyer and Clinton V. Oster, Deregulation and the Future of Intercity Passenger Travel, The MIT Press, Cambridge, Massachusetts, 1987.

[10] GAO, Airline Competition: Higher Fares and Reduced Competition at Concentrated Airports, United States General Accounting Office, Washington, D.C., 1990.

[11] Simat, Helliesen & Eichner, Hub Operations: An Analysis of Airline Hub-and-Spoke Systems Since Deregulation, Simat, Helliesen & Eichner, Inc., New York, New York, 1989.

[12] Steven A. Morrison and Clifford Winston, "The Dynamics of Airline Pricing and Competition", op. cit.

[13] Severin Borenstein, "Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry", RAND Journal of Economics, vol. 20 no. 3, 1989.

[14] Michael E. Levine, op. cit.

[15] Steven A. Morrison and Clifford Winston, "The Dynamics of Airline Pricing and Competition", op. cit., p. 390.

[16] The term "effective competitors" used in the Morrison and Winston study refers to "the number of equivalent equal size competitors calculated by inverting the appropriate Herfindahl index".

[17] Kenneth Labich, "Should Airlines be Reregulated?", Fortune, June 1989, 1989, p. 84.

[18] John R. Meyer and Clinton V. Oster, op. cit., p. 109-121.

[19] The term hub has been taken from FAA area classifications: an area is considered a large hub if the area's share of all U.S. enplanements is greater than 1%, a medium hub if the share is between 0.999% and 0.250%, a small hub if the share is between 0.100% and 0.249%, and a non-hub if the share is smaller than 0.099%.

Chapter 3

Analysis Methodology

3.1 Introduction

This chapter explains the methodology used in the thesis. It includes the definition of the origin-destination city-pair market concept in the first section, the definition of different concentration measures used in the analysis in the second section, and a list of the collected data as well as the methodology of the data analysis in the third section.

3.2 Origin-Destination City-Pair Markets

Of crucial importance in analyzing competition and concentration in an industry

market is defining the market in the right way. The theoretical definition of a market is the collection of all the customers sharing a particular need or want and all the producers of that need or want, who might be willing an able to engage in exchange to satisfy that need or want. [1] [2] In purchasing a ticket from an airline, a customer is buying transportation from his/her origin area to his/her destination area. A market in air transportation is therefore made up of all the customers who want to travel from a specific origin area to a destination area, and of all the airlines that provide transportation from that origin area to that destination area.

Consider a simplified air transportation system in which a person can only travel between three different points A, B, C. A traveler's demand for transportation from origin A to destination B is not affected by improvements in service or changes in price of the air services from A to C. The market for air transportation from A to B is therefore distinct from the market for air services from A to C. Put in the context of the U.S. air transportation system, the market for air services from Boston to Chicago is distinct from the market for air transportation from Boston to Washington. In buying transportation from Boston to Chicago, a traveler has a choice among different Chicago airports as a destination. The markets involving these different airports are not independent from one another: changes in service or price in markets to one of the airports will affect demand in markets to the other airports. Although there is probably a minimum difference in service or price below which travelers will not switch from one airport to another, we can assume that this threshold is not high and that the different airports are therefore fairly good substitutes for one another. Since

a passenger is ultimately buying transportation from the Boston area to the Chicago area, we can aggregate the markets from Boston to the different airports in metropolitan Chicago into one Boston-Chicago market. The markets defined above are called "origin-destination city-pair markets". [3]

It is important to note the difference between the concepts of route and city-pair market. A route is the physical path followed by an airplane between take-off at an airport and landing at the next airport. In the present hub-and-spoke air transportation system many passengers travel one-stop through hubs from their origin to their destination. In doing so, they travel on several different routes, but only in one market. For instance, a passenger who travels from Boston to Seattle through Chicago can fly on two different routes, the Boston-Chicago route and the Chicago-Seattle route, but only in one city-pair market, the Boston-Seattle market. Moreover, the same traveler could also fly on another airline through another hub, for instance Atlanta, in which case she would travel on the Boston-Atlanta and Atlanta-Seattle routes. Passengers traveling in the same market can therefore fly via completely different routes. Vice versa, the passengers that are transported on the same route often travel in many different markets, especially if the route is to or from a hub airport. For instance, passengers that fly from Boston to Los Angeles through Atlanta and passengers that fly from Boston to Atlanta, two different city-pair markets, travel on the same Boston-Atlanta route.

In order to study changes in concentration in the air transportation system correctly, one has to look at origin-destination city-pair markets. Any study that takes an aggregate

look at the whole system or at subsystems such as airports, or that analyzes changes in concentration in certain routes, gathers city-pair markets that correspond to different consumer demands. Such an aggregate study may hide differences in concentration and fare changes among the different city-pairs and therefore lead to inaccurate conclusions.

3.3 Concentration Indices

Market concentration refers to the number of firms that sell a particular product or collection of products in a market and to the distribution of the firms' sizes. Concentration is considered to be a significant dimension of market structure because it is thought to play an important role in determining market power and hence business behavior and performance. Since it is easier to measure, concentration can be used as a proxy for market power. Market power and the efficiency and public welfare issues related to it are sensitive public policy issues, making it very important to measure concentration correctly. Unfortunately, no universally correct way of measuring concentration seems to exist. Economists, governments, researchers and industry officials have developed a variety of indices to compute a numerical value showing a level of industrial or market concentration that supports their case.

A first problem that arises in the process of measuring concentration is the choice of the variable to describe size with: revenues, total passenger enplanements, local passenger

enplanements, number of employees, and assets are all valid alternatives. For our purposes, the best variable to use is local passenger enplanements: in studying the effects of deregulation on competition, we are ultimately interested in the effects on aggregate economic welfare of public and airlines. Variables such as the number of employees, the number of aircraft deployed or seats supplied, and revenues give only the airline side of the equation. Changes in the number of passengers transported provide information on both consumer preferences and airline performance. Since we study concentration on an origin-destination city-pair level, we are only interested in local passengers. Total passenger enplanements include passengers which travel in other origin-destination markets. Local passengers are the passengers originating at one of the cities of the pair and traveling to the other one, and therefore make up the demand for air transportation in that specific origin-destination market. Market share in this thesis therefore corresponds to the relative share of local passenger enplanements in an origin-destination market.

The second problem in determining concentration is making a choice of a concentration index. The oldest and most commonly used index is the K-firm concentration ratio. This ratio is defined as the cumulative market share of the K firms with the largest market shares in that market. The major drawback of this index is that it does not show the size distribution of the firms in the market. It does not even provide any information on the firms not included in the group of the K largest firms at all. Another drawback of this index is that the number K is chosen arbitrarily. This can be overcome by computing different concentration ratios, e.g. a two-firm as well as a four-firm concentration ratio. On its own,

the concentration ratio does not explain concentration and market power well. It can be useful in combination with other concentration measures, though, and in comparisons of concentration levels for different markets or for different years.

Another frequently used index, among others used by the Department of Justice, is the Hirschman-Herfindahl Index (HHI). The HHI is the sum of the squared values of all firms' market shares. The advantage of the HHI is that it incorporates information about the size distribution of the firms in the market. The squaring of the shares increases the contribution of the bigger firms to the HHI more than proportionately, which may correspond to the fact that big firms have more than proportionate market power. A drawback of the HHI is that a given numerical value of the HHI could correspond to different size distributions. The HHI therefore does not fully explain concentration and market power on its own either. It may be most useful in combination with other measures, and in comparisons of concentration levels for different markets or different years. [4] [5] [6]

Another way to measure concentration is by examining the number of competitors in the market. The total number of firms active in a market is not really a useful measure because some of the firms may have too small a share of the market to influence the level of competition. In order to overcome this drawback, one could compute the smallest number of competitors whose cumulative market share is greater than 90%, in the assumption that this excludes the non-significant competitors. The drawbacks of this index are similar to the ones for the K-firm concentration ratio: it does not incorporate the distribution of any of the

firms in the market, and the cumulative market share value of 90% is as arbitrary as the number K for the concentration ratio.

A more useful number could be the total number of "effective" competitors in the market, where effective competitors are defined as those competitors that can influence the characteristics of competition in the market. In air transportation markets, one can assume that airlines with a market share greater than 5% share would be able to play a role in determining the level of competition. The drawbacks of this index are also that the 5% barrier has been chosen arbitrarily and that the "number of effective competitors" index does not really incorporate the distribution of the size of these effective competitors either.

None of the discussed indices can fully describe concentration on its own. A combination of several of these indices can give a reasonable measure of the levels of concentration in a market, however. The different measures can also be used on their own in comparisons of concentration levels between different markets or across different years. Since the different indices give similar results, we decided to limit the number of indices used in our analysis. We selected the Hirschman-Herfindahl Index and one of the K-firm concentration ratios, since these are the most familiar concentration indices, and decided also to use one of the indices of the third category discussed above.

The two-firm (C2) and four-firm (C4) concentration ratio are the most useful among the K-firm concentration ratios in air transportation markets because of the limited number

of airlines competing in the different markets. Any higher number, such as an eight-firm concentration ratio, would almost always be at 100%. In order to choose between these two concentration ratios, we ran a correlation analysis of each of these ratios with the HHI for the top 100 markets for the years 1979, 1983 and 1989. The lower the correlation with the HHI, the more preferable the index would be, in order to differentiate the results obtained with the two concentration indices. Although the average correlation coefficient over the three years for the HHI-C2 correlation analysis was greater than that for the HHI-C4 correlation analysis (0.84 as compared to 0.62) we decided to use the two-firm concentration ratio because of its higher variance. Because of the limited number of competitors in air transportation markets, and especially in the markets to and from dominated cities, the four-firm concentration ratio's value will always be very high (close to 100%) and its variance relatively low.

The indices of the third category discussed above give a measure of the number of firms competing in the market instead of their cumulative market shares. We selected the "number of competitors with a market share greater than 5%" index (MS5% index), or shorter the "number of effective competitors" index from among these indices, based on a correlation analysis of the different indices discussed with the HHI and the C2 index for the year 1979, 1983 and 1989. The average correlation coefficients of the "number of airlines with cumulative market share greater than 90%" index' correlation analyses with the HHI and the C2 index were respectively 0.79 and 0.87. The correlation coefficients of the MS5%-HHI and the MS5%-C2 correlation analyses were 0.79 and 0.70 respectively. Since we preferred

to have as low a correlation with the other indices as possible, we selected the number of effective competitors index (MS5% index).

3.4 Analysis Methodology

The purpose of this thesis is to study the effects of deregulation on competition in air transportation by looking at changes in concentration in city-pair markets. Since the entire U.S. air transportation system contains tens of thousands of origin-destination city-pair markets, we decided to focus on a subset of markets. In order to capture as much of the positive as well as the negative effects of deregulation, we decided to look at the top 100 city-pair markets and at the top ten markets to and from each of fifteen dominated cities.

The first set of origin-destination city-pair markets examined in this study therefore consists of those markets that were ranked one through 100 in terms of local passengers transported in both directions in 1989. Appendix A lists the 100 city-pair markets ranked in order of number of local passengers transported in the markets in 1989. The passengers that traveled in between those cities made up 31.1% [7] of all passengers transported domestically in the U.S. in 1989. This set of markets will therefore give a good picture of the changes in competition actually experienced by a fair number of travelers.

The second set of origin-destination city-pair markets to be examined in this thesis consists of all the markets to and from each of fifteen dominated cities that were ranked one through ten in terms of local passengers transported in both directions in 1989. The markets to and from these cities are alleged to be the ones that suffered most from the airline deregulation through decreases in competition and higher fares.

We defined the selection criteria for the dominated cities on the same basis as the GAO study mentioned in Chapter 2 [8]. The airports were selected from among the 75 airports with the highest number of local passenger enplanements in the U.S. An airport was considered to be concentrated when one airline carried at least 60% or two airlines at least 85% of all the passengers (both local and connecting) that enplaned at that airport in 1985. Six of the airports that met the selection criteria were excluded because they were located in metropolitan areas served by more than one major commercial airport. Appendix B lists the city-pair markets used in this analysis. Table 3.1 lists the fifteen cities.

Atlanta	Minneapolis/St.Paul
Charlotte	Nashville
Cincinnati	Pittsburgh
Dayton	Raleigh-Durham
Denver	St.Louis
Detroit	Salt Lake City
Greensboro/High Point	Syracuse
Memphis	

Table 3.1 List of the Dominated Cities Studied

The data sample used in this study contained the numbers of local passengers transported in both directions in each of the markets, by airline and by quarter for all the quarters of the period 1979-1989. We collected the data for all the origin-destination markets specified above for six different years (1979, 1981, 1983, 1985, 1987, and 1989) and aggregated the quarterly data per year.

From these aggregated data, we computed for each market and for each year the values of the Hirschman Herfindahl Index, the two-firm concentration ratio, and the number of effective competitors. These values were then used for the analysis of the changes in concentration in and across the different markets throughout the ten years. In our analysis of concentration levels and of changes in concentration we specifically focused on the year 1979, the first full year of deregulation; 1985, the year with the highest level of competition according to previous studies and to our preliminary findings; and 1989, the most recent complete year of data available.

3.5 Conclusion

The purpose of this thesis is to study the effects of deregulation on competition in air transportation by looking at changes in concentration over the ten-year period 1979-1989. Since a measurement of concentration is useful as an index of market power, one has to study

changes in concentration on a market level. The markets of relevance in air transportation are origin-destination city-pair markets.

Concentration in the origin-destination markets is related to the number of competitors in the market, and to the distribution of their market shares. The market share of a firm is defined as the firm's relative share of the local passenger enplanements in an origin-destination market. In this thesis we use three different concentration indices to measure concentration in these markets: the Hirschman-Herfindahl Index (HHI), the two-firm concentration ratio (C2), and the "number of competitors with a market share greater than 5%" index or, in short, the "number of effective competitors" index (MS5%).

In order to capture as much of the positive as well as negative effects of deregulation on concentration in the entire U.S. air transportation system, we decided to look at two subsets of markets. The first set of origin-destination city-pair markets examined in this study consists of those markets that were ranked one through 100 in terms of local passengers transported in both directions in 1989. The second set consists of the markets to and from each of fifteen dominated cities that were ranked one through ten in terms of local passengers transported in both directions in 1989. For each of these markets, we computed and analyzed concentration levels for the years 1979, 1981, 1983, 1985, 1987, and 1989.

Notes

[1] Robert S. Pindyck and Daniel L. Rubinfeld, Microeconomics, Macmillan Publishing Company, New York, New York, 1989, p. 11.

[2] Philip Kotler, Marketing Management, Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1991, p. 8.

[3] Robert W. Simpson, Notes for Air Transportation Economics, MIT, Cambridge, Massachusetts, 1982, Chapter 2 p. 1-17.

[4] B. Curry and K. D. George, "Industrial Concentration: A Survey", The Journal of Industrial Economics, vol. 31 no. 3, 1983.

[5] M. A. Utton, Industrial Concentration, Penguin Books, Ltd., Harmondsworth, Middlesex, U.K., 1970.

[6] Eduardo R. Sevilla, The Influence Factor: A Measure of the Dominance of Airports by the Airlines, Master's Thesis, MIT, Cambridge, Massachusetts, 1990.

[7] Data Base Products, Inc., O&D Plus Database, Data Base Products, Inc., Dallas, Texas.

[8] General Accounting Office, Airline Competition: Higher Fares and Reduced Competition at Concentrated Airports, United States General Accounting Office, Washington, D.C., 1990, p. 14-15.

Chapter 4

Analysis of the Top 100 Origin-Destination City-Pairs

4.1 Introduction

This chapter examines the changes in concentration over the ten year period 1979-1989 in the 100 origin-destination city-pair markets in which the most passengers traveled in 1989. In the first section of the chapter, we analyze the concentration levels for different years. In the second section we look at the distributions of changes in concentration over different periods, namely the 1979-1985, 1985-1989, and 1979-1989 periods. In the third section, we study the effect of market size on competition by comparing the analysis of the top ten markets, the top 50 markets, and the top 100 markets. Finally, in the fourth section, we compare the concentration levels of two subgroups, hub markets and non-hub markets, with one another.

We use the results obtained for only one of the concentration indices for the analysis discussions in each of the sections, because of the similarity of the results for the three different indices. In order to have a common reference, we provide a brief comparison with the results obtained for the HHI at the end of each section.

4.2 Comparison of Concentration Levels for Different Years

Competition, as measured by market concentration [1], has increased over the ten year period from 1979 to 1989 in the top 100 origin-destination (O-D) city-pair markets. In most of these markets, concentration decreased substantially from 1979 until 1985. After 1985, the results were mixed for different markets: concentration decreased further in some of them, whereas it increased in others. The strengthening of all airlines' hub-and-spoke systems leading to increased hub dominance and the many airline mergers and acquisitions during the 1985-1989 period probably contributed to an increase in concentration in some of these markets. As a result, the average concentration level for the top 100 markets was higher in 1989 than in 1985. This 1989 level was still substantially lower than in 1979, however.

This picture is shown by a comparison across the ten year period of the average values of the concentration indices for the 100 markets. Table 4.1 and Figure 4.1 show the average number of competitors that carried more than 5% of the market ("effective"

Year	Average Number of Effective Competitors
1979	2.7
1981	3.3
1983	3.5
1985	3.8
1987	3.6
1989	3.7

Table 4.1 Average Number of Effective Competitors for the Top 100 Markets

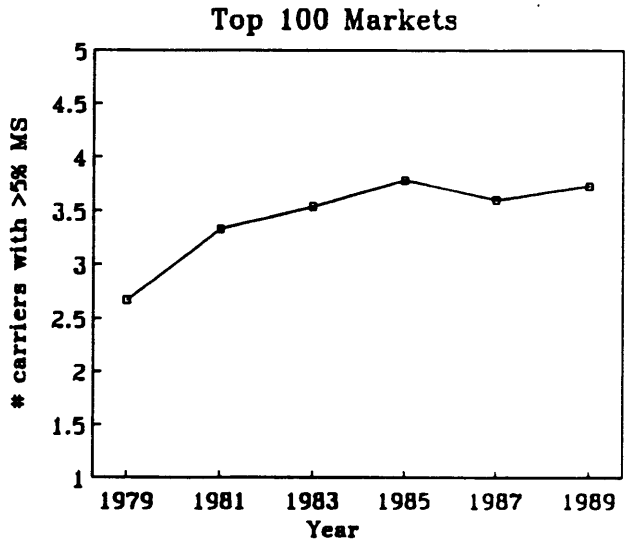


Figure 4.1 Average Number of Effective Competitors for the Top 100 Markets

competitors). This average number of effective competitors increased from 2.7 in 1979 to 3.7 in 1989. In 1989, therefore, on average one more airline was carrying more than 5% of the market in each of the 100 markets than in 1979. The average number of effective competitors increased steadily from 2.7 in 1979 to 3.8 in 1985, but decreased subsequently

to 3.6 in 1987. By 1989, it had recovered to 3.7.

The 1979, 1985, and 1989 distributions of the number of effective competitors for the 100 markets show a more detailed picture of the different concentration levels. The 1979 distribution was quite high and located around two to three effective competitors. By 1985, the distribution had become wider, and its peak had shifted close to four effective competitors. The distribution did not change much from 1985 to 1989. Table 4.2 and Figure 4.2 show these distributions. Table 4.3 provides the percentages of passengers, relative to the total number of passengers carried in the top 100 markets, that traveled in markets served by one, two, three, etc. effective competitors. Figure 4.3 shows these numbers in a histogram.

In 1979 there were eight markets out of the top 100 studied in which only one airline carried more than 5% of the market. 5.5% of all passengers that traveled in 1979 in the top 100 markets were transported in these eight markets. In another 38 markets only two effective competitors offered air transportation service, corresponding to 30.9% of all passengers. Conversely, only 17.8% of all 1979 top 100 market travelers could choose from among four or more carriers for transportation in their origin-destination market (16 out of 100 markets).

There were no markets remaining with only one effective competitor in 1985. In only 17 of the 100 markets were two airlines carrying more than 5% of the market, down from

38. The percentage of passengers transported in these markets was only 12.6%, down from 30.9%. In 53 (more than half!) of the 100 markets 58.2% of all travelers could choose from among four or more effective competitors, up from only 16 in 1979.

# Carriers With >5% MS	1979	1985	1989
1	8	0	1
2	38	17	19
3	38	30	24
4	11	24	29
5 to 6	5	28	24
7 to 8	0	1	3

Table 4.2 Market Frequencies of Numbers of Effective Competitors for the Top 100 Markets

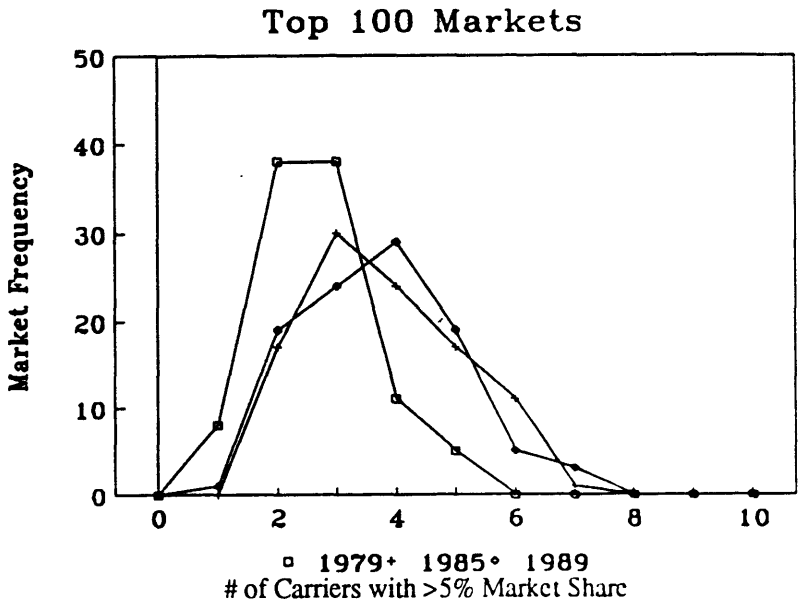


Figure 4.2 Market Frequencies of Numbers of Effective Competitors for the Top 100 Markets

# Carriers With >5% MS	1979	1985	1989
1	5.5%	0.0%	0.7%
2	30.9%	12.6%	16.5%
3	45.8%	29.1%	20.5%
4	11.3%	26.3%	28.9%
5 to 6	6.5%	30.7%	30.2%
7 to 8	0.0%	1.2%	3.3%

Table 4.3 Passenger Traffic by Number of Effective Competitors as a Percentage of Total Top 100 Market Passengers

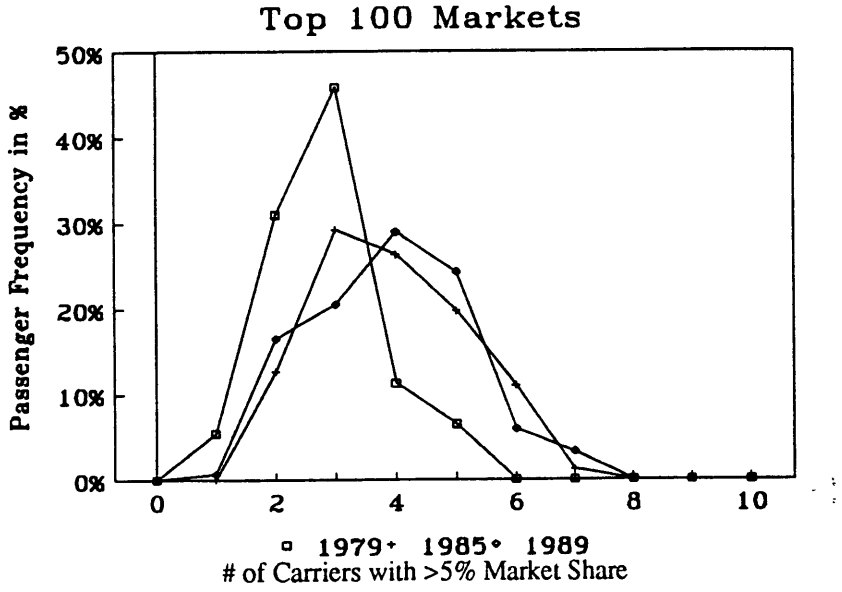


Figure 4.3 Passenger Traffic by Number of Effective Competitors as a Percentage of Total Top 100 Market Passengers

The distribution of the number of effective competitors did not change as much from 1985 to 1989. One important change was the reduction in competition to only one effective carrier in one of the 100 markets, namely St. Louis - New York. The number of markets where only two effective competitors offered air transportation service was also slightly

higher, 19 as compared to 17 in 1985. The percentage of passengers transported in these markets was 16.5% in 1989 as compared to 12.6% in 1985. The total number of markets with more than four effective competitors increased from 53 in 1985 to 56 in 1989, and the corresponding percentage of passengers from 58.2% to 62.4%.

A comparison of the 1989 and 1979 distributions shows that 62.4% of all passengers traveling in the top 100 markets in 1989 could choose from among four or more effective competitors, up from only 17.8% of all passengers traveling in the same 100 markets in 1979. This is a clear indication that competition on aggregate increased from 1979 to 1989 in the top 100 markets, to the benefit of the people who traveled in those markets. Table 4.4 displays the 100 markets ranked in order of number of effective competitors in the market in 1989, with the corresponding numbers of effective competitors for 1979 and 1985.

An analysis of the concentration levels as measured by the HHI gives very similar results. As a comparison, Table 4.5 and Figure 4.4 show the average HHI across the top 100 markets throughout the ten-year period. The average HHI decreased from a level of 4920 points in 1979 to 3360 points in 1985. Although it increased subsequently to reach a level of 3590 points by 1989, this level was still substantially lower than the concentration level in 1979.

Origin-Destination City-Pair Markets		# of Effective Competitors		
		1979	1985	1989
New York	St. Louis	2	3	1
Albuquerque	Phoenix	2	2	2
Atlanta	Dallas/Fort Worth	2	3	2
Boston	Philadelphia	2	3	2
Burbank	San Francisco	1	2	2
Chicago	San Francisco	3	3	2
Dallas/Fort Worth	Los Angeles	3	3	2
Hilo, Hawaii	Honolulu	1	2	2
Honolulu	Kona, Hawaii	1	2	2
Honolulu	Kahului, Hawaii	1	2	2
Honolulu	Lihue, Hawaii	1	2	2
Houston	Los Angeles	2	4	2
Houston	New Orleans	5	4	2
Houston	San Antonio	4	2	2
Las Vegas	Phoenix	4	3	2
Los Angeles	Oakland	1	2	2
Los Angeles	San Jose	2	4	2
Orange County, Cal.	San Jose	1	2	2
Orange County, Cal.	San Francisco	1	2	2
Phoenix	San Diego	3	5	2
Atlanta	Washington	3	2	3
Atlanta	Miami	2	3	3
Atlanta	New York	2	3	3
Austin	Dallas/Fort Worth	2	4	3
Buffalo	New York	2	3	3
Chicago	Los Angeles	4	4	3
Chicago	Washington	3	3	3
Dallas/Fort Worth	Tulsa, Oklahoma	3	4	3
Dallas/Fort Worth	San Antonio	2	3	3
Dallas/Fort Worth	Washington	2	3	3
Denver	Phoenix	3	4	3
Denver	Los Angeles	2	3	3
Houston	New York	4	4	3
Las Vegas	Los Angeles	3	2	3
Las Vegas	San Diego	2	3	3
Los Angeles	Phoenix	5	4	3
Miami	San Juan	3	2	3
Minneapolis/St. Paul	New York	3	3	3
New York	Norfolk, Virginia	2	2	3
Ontario, Cal.	Phoenix	4	3	3
Orlando	Philadelphia	4	3	3
Phoenix	San Francisco	4	4	3
San Diego	San Francisco	3	3	3

San Juan	New York	2	3	3
Boston	Chicago	3	5	4
Boston	New York	2	4	4
Chicago	Houston	3	5	4
Chicago	St. Louis	2	5	4
Chicago	Dallas/Fort Worth	2	5	4
Chicago	New York	3	5	4
Chicago	Philadelphia	2	3	4
Chicago	Cleveland	3	4	4
Chicago	Tampa	3	4	4
Chicago	Denver	3	4	4
Chicago	Minneapolis/St. Paul	4	5	4
Chicago	Las Vegas	2	3	4
Cleveland	New York	3	3	4
Dallas/Fort Worth	New York	2	5	4
Dallas/Fort Worth	Houston	2	5	4
Dallas/Fort Worth	Denver	2	5	4
Denver	New York	2	4	4
Detroit	Los Angeles	2	4	4
Detroit	New York	3	5	4
Fort Lauderdale	New York	3	3	4
Los Angeles	Seattle/Tacoma	3	5	4
Miami	Tampa	4	4	4
Miami	Washington	2	2	4
New York	Rochester, NY	2	4	4
New York	New Orleans	2	5	4
New York	Seattle/Tacoma	2	6	4
Pittsburgh	New York	3	2	4
San Francisco	Seattle/Tacoma	3	6	4
West Palm Beach	New York	2	3	4
Boston	Los Angeles	3	6	5
Boston	Washington	3	4	5
Boston	San Francisco	3	6	5
Boston	Orlando	3	3	5
Chicago	Kansas City	2	6	5
Chicago	Miami	3	5	5
Chicago	Phoenix	2	4	5
Chicago	Detroit	3	6	5
Chicago	Atlanta	2	4	5
Chicago	Orlando	2	3	5
Los Angeles	San Francisco	5	3	5
Los Angeles	New York	4	6	5
Los Angeles	Miami	2	2	5
Los Angeles	San Diego	5	4	5
Miami	New York	3	3	5
Orlando	New York	3	5	5
San Francisco	Washington	3	6	5
San Francisco	New York	3	6	5

Tampa	New York	3	3	5
Los Angeles	Washington	3	4	6
Miami	Orlando	3	3	6
New York	San Diego	2	5	6
New York	Las Vegas	3	6	6
Washington	New York	3	4	6
Honolulu	San Francisco	4	6	7
Honolulu	Los Angeles	5	7	7
New York	Phoenix	2	5	7

Table 4.4 Numbers of Effective Competitors for the Top 100 Markets

Year	Average HHI
1979	4917
1981	4077
1983	3913
1985	3361
1987	3705
1989	3586

Table 4.5 Average HHI for the Top 100 Markets

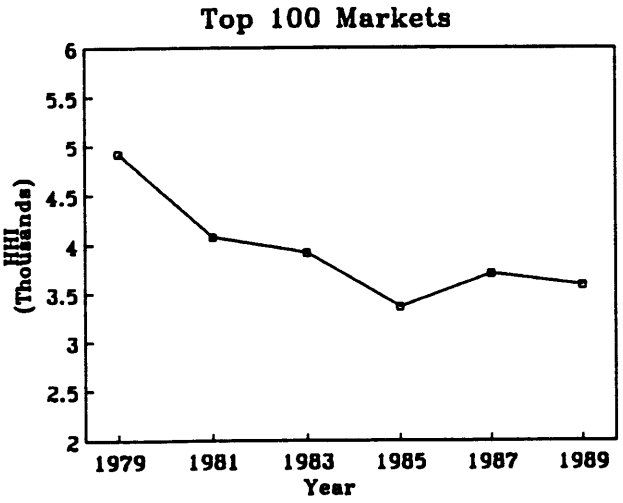


Figure 4.4 Average HHI for the Top 100 Markets

4.3 Analysis of Changes in Concentration

The previous section's comparison of the number of effective competitors for the different years does not really tell us much about the changes in concentration in different markets. A more detailed analysis of these changes provides more insight in the changes in competition actually experienced by the travelers. An example can illustrate the importance of this distinction: let us assume that in a certain year 40 out of the 100 markets are served by two airlines, and the other 60 markets by three airlines. If over the course of the year the number of airlines serving each of the former 40 markets does not change, whereas in ten out of the latter 60 markets one airline withdraws its service, we end up with 50 markets served by two airlines and 50 markets served by three airlines. If, in another scenario, in each of 30 out of the former 40 markets one new airline begins to offer competitive service, whereas in 50 out of the latter 60 markets one airline withdraws its service, we also end up with 50 markets served by two and 50 markets served by three airlines. In the first scenario only 10% of all markets experience a change in competition, whereas in the second scenario this percentage is 70%!

Table 4.6 gives the distribution of the changes in the Hirschman-Herfindahl Index (HHI) for the top 100 markets for the periods 1979 to 1989, 1979 to 1985 and 1985 to 1989. Figure 4.5 displays these distributions in a graph. Table 4.7 lists the different city-pair markets ranked in order of the change in HHI from 1979 to 1989, with the HHI value in 1989 and the corresponding changes in HHI for each of the three periods 1979-1989, 1979-

1985, and 1985-1989.

Change in HHI	1979-1989	1979-1985	1985-1989
-8000 to -6000	1	0	0
-6000 to -4000	9	7	0
-4000 to -2000	19	29	4
-2000 to 0	47	49	37
0 to 2000	20	13	54
2000 to 4000	4	2	4
4000 to 6000	0	0	1
Total Decreased	76	85	41
Total Increased	24	15	59
Average Change	-1330	-1555	225

Table 4.6 Market Frequencies of Changes in HHI for the Top 100 Markets

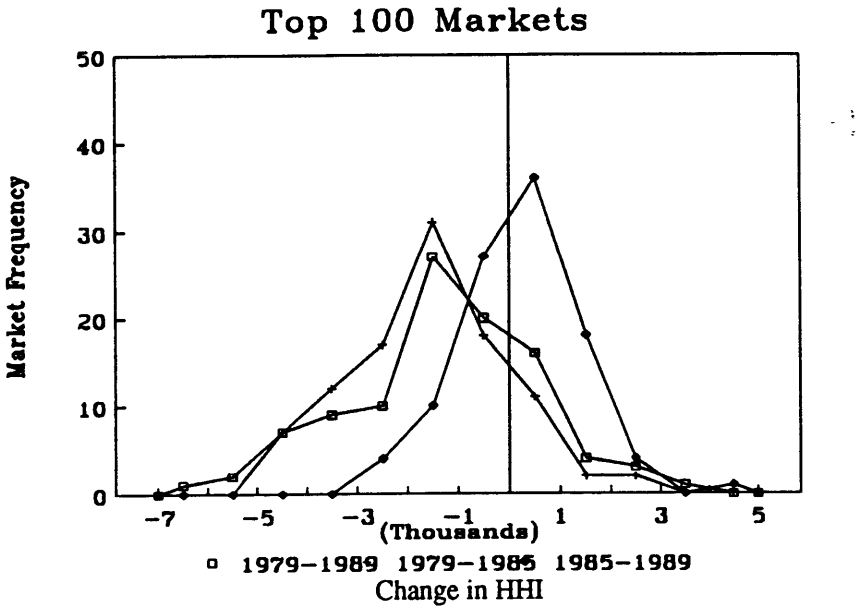


Figure 4.5 Market Frequencies of Changes in HHI for the Top 100 Markets

Origin-Destination City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-89
Chicago	Las Vegas	1796	-6321	-3795	-2526
Honolulu	Kahului, Hawaii	4843	-5144	-4855	-288
Honolulu	Kona, Hawaii	4957	-5030	-4521	-509
Orange County, Cal.	San Francisco	4961	-4991	-4920	-72
Honolulu	Lihue, Hawaii	5069	-4927	-4686	-242
Hilo, Hawaii	Honolulu	5149	-4825	-4846	21
New York	San Diego	1744	-4695	-3994	-702
Los Angeles	Oakland	5292	-4588	-4646	58
Burbank	San Francisco	5622	-4373	-3337	-1037
Orange County, Cal.	San Jose	5895	-4092	-4785	693
Chicago	Phoenix	1802	-3677	-3109	-569
Las Vegas	Los Angeles	3461	-3637	-2544	-1093
Chicago	Kansas City	2116	-3603	-3850	247
Boston	New York	2802	-3566	-3485	-81
Las Vegas	San Diego	3375	-3521	-3219	-301
New York	Phoenix	1629	-3506	-2592	-914
New York	Norfolk, Virginia	3985	-3296	-1424	-1873
Washington	New York	2708	-3293	-3109	-184
Orlando	New York	1905	-3100	-2281	-819
Dallas/Fort Worth	Denver	2701	-2813	-3512	700
New York	Las Vegas	1813	-2757	-2824	68
New York	Seattle/Tacoma	2149	-2735	-2582	-152
Chicago	Orlando	2232	-2647	-2336	-311
Chicago	Atlanta	2949	-2538	-2031	-508
Miami	Washington	2015	-2514	-209	-2305
Boston	Los Angeles	1952	-2440	-2701	261
Orlando	Philadelphia	3459	-2274	-1690	-585
Chicago	St. Louis	3347	-2161	-3019	858
Los Angeles	San Jose	5347	-2141	-3991	1850
West Palm Beach	New York	2413	-1980	-1025	-955
Tampa	New York	2056	-1952	-1285	-667
Los Angeles	Miami	2044	-1922	746	-2668
New York	New Orleans	2217	-1912	-2127	215
Boston	Orlando	3198	-1886	-2003	117
Chicago	Minneapolis/St. Paul	3336	-1807	-2598	791
Miami	Orlando	1744	-1807	115	-1921
Miami	New York	2367	-1771	512	-2283
Chicago	Philadelphia	3017	-1674	-1461	-213
Chicago	Cleveland	3017	-1673	-1761	88
Chicago	Miami	2066	-1649	-1718	69
Los Angeles	Seattle/Tacoma	2148	-1614	-1593	-21

Cleveland	New York	3315	-1553	-1110	-443
Chicago	Dallas/Fort Worth	3463	-1493	-2265	772
New York	Rochester, NY	4420	-1471	-2826	1355
Honolulu	San Francisco	1829	-1412	-941	-470
Denver	New York	3253	-1406	-2032	627
Dallas/Fort Worth	Washington	3482	-1275	-1501	226
San Francisco	Seattle/Tacoma	3269	-1212	-2160	949
Los Angeles	New York	1723	-1160	-1012	-148
Chicago	Detroit	2152	-1143	-1130	-13
Chicago	Houston	2353	-1105	-1418	313
Dallas/Fort Worth	Tulsa, Oklahoma	3963	-1082	-1788	707
Miami	San Juan	4339	-1047	416	-1463
Los Angeles	Washington	2093	-1045	-1300	255
Denver	Phoenix	3323	-1031	-1686	656
Atlanta	Miami	3737	-1004	-885	-119
Honolulu	Los Angeles	1597	-949	-500	-449
Atlanta	New York	3913	-935	-1294	359
Chicago	Tampa	2526	-895	-957	62
San Francisco	New York	2019	-858	-1116	258
Boston	San Francisco	2862	-803	-1657	854
Miami	Tampa	2257	-689	547	-1236
Chicago	New York	2763	-635	-1247	612
Detroit	New York	4258	-589	-3071	2482
Fort Lauderdale	New York	3033	-578	582	-1160
Dallas/Fort Worth	New York	4147	-521	-1665	1144
Boston	Washington	2339	-475	-74	-401
Dallas/Fort Worth	Houston	4599	-425	-1700	1275
Dallas/Fort Worth	San Antonio	4351	-405	598	-1004
Atlanta	Dallas/Fort Worth	5932	-350	-1968	1618
Austin	Dallas/Fort Worth	4685	-311	-696	384
Denver	Los Angeles	4548	-306	-1479	1172
Detroit	Los Angeles	4587	-263	-2208	1946
Houston	Los Angeles	5482	-206	-2948	2742
Atlanta	Washington	4701	-193	-721	528
Phoenix	San Francisco	3357	-135	-574	440
Los Angeles	San Diego	1986	57	1287	-1231
San Francisco	Washington	3617	100	-1047	1147
Boston	Chicago	3435	140	-1019	1160
Los Angeles	San Francisco	2142	171	822	-651
Minneapolis/St. Paul	New York	5929	198	-1308	1506
Phoenix	San Diego	4238	217	-1642	1858
Las Vegas	Phoenix	4251	327	-424	750
Albuquerque	Phoenix	5379	349	-32	382
Dallas/Fort Worth	Los Angeles	4403	413	-829	1243
Chicago	Los Angeles	3181	438	-305	744
San Juan	New York	5507	471	-1449	1920
Chicago	Denver	4304	579	-748	1327
Buffalo	New York	5684	606	-548	1153
San Diego	San Francisco	4403	716	614	102

Boston	Philadelphia	5429	879	-1197	2076
Chicago	Washington	4152	915	-481	1396
Ontario, Cal.	Phoenix	4124	1144	2634	-1490
Pittsburgh	New York	5071	1184	283	901
Chicago	San Francisco	4811	1285	-374	1659
Los Angeles	Phoenix	4255	1743	937	807
Houston	New York	5145	2193	-335	2528
New York	St. Louis	8860	2650	-1356	4006
Houston	San Antonio	5556	2710	2392	318
Houston	New Orleans	5387	3287	1454	1832

Table 4.7 Changes in HHI for the Top 100 Markets

The distribution of the changes in concentration from 1979 until 1989 shows that deregulation had a beneficial effect on competition in most of the top 100 origin-destination markets. In 76 of these markets, concentration as measured by the Hirschman-Herfindahl Index decreased. The largest decrease in HHI, 6300 points, occurred in the Chicago-Las Vegas market. This market was one of the most concentrated markets in 1979, and had become one of the least concentrated markets by 1989. Nine other markets experienced a decrease in HHI of between 4000 and 6000 points. These markets included four intra-Hawaii as well as four smaller intra-California markets which were served by only one airline in 1979. The other market was New York-San Diego which was too small a market to be served non-stop by many carriers during regulation prior to 1978. The growth of hub-and-spoke systems after deregulation made it possible for several more airlines to offer connecting service in markets such as the New York-San Diego market which led to a substantial decrease in concentration in these markets. Forty-seven out of the 100 markets saw a decrease in HHI of between 0 and 2000 points from 1979 to 1989. This decrease does not

seem to be very large. However, this is partly due to the nature of the Hirschman-Herfindahl Index. A market in which three airlines each carry 33.3% of the passengers has a HHI value of 3333 points, whereas a market in which five airlines each have a 20% market share has a HHI value of 2000 points. Although the latter market has two competitors more than the former, the difference in HHI is only 1333 points.

The HHI values increased from 1979 to 1989 in 24 of the top 100 origin-destination markets. The change in HHI was smaller than 500 points for 11 of these markets and smaller than 1000 points for 16, however. Four markets experienced an increase in HHI from 1979 to 1989 of between 1000 and 2000 points: two of these markets had Phoenix as endpoint, one Chicago and one Pittsburgh, all of them cities with hub airports. Four markets saw an increase in concentration of greater than 2000 points. Three of these markets had Houston as one of the endpoints, where both Continental Airlines and Southwest Airlines strongly increased their presence. Continental Airlines' increase in market share in some of the markets out of Houston negatively affected competition in the Houston-New York market and to a lesser extent the Houston-New Orleans market. Southwest Airlines similarly influenced concentration in the Houston-San Antonio and Houston-New Orleans markets. The other market, St. Louis-New York, had TWA's main hub as one of its endpoints.

The increase in competition was most apparent from 1979 until 1985: the HHI decreased in 85 of the 100 markets in this period. The largest number of markets, 49 out of the 100, experienced a decrease in concentration of between 0 and 2000 HHI points. Only

two markets saw an increase in HHI greater than 2000 for the 1979-1985 period: Houston-San Antonio and Ontario-Phoenix. Southwest Airlines experienced a strong growth in market share in the Houston-San Antonio market while increasing its presence at Houston. America West similarly increased its share of passenger enplanements in the Ontario-Phoenix market while building its presence at Phoenix.

After 1985, concentration increased in many of the top 100 origin-destination city-pair markets, which led to an increase in average HHI from 3400 to 3600. In 59 markets the HHI values were higher in 1989 than in 1985. Five of these markets experienced an increase greater than 2000 points: Houston-New York, Houston-Los Angeles, Detroit-New York, Boston-Philadelphia, and St. Louis-New York. The Houston and Detroit markets saw an increase in concentration because of the strengthening of Continental's and Northwest's hub presence at the respective airports. In the Boston-Philadelphia market US Air took over Eastern Airline's market share in 1989 when Eastern sold its gates and slots to Midway. In the St. Louis-New York market the HHI increased by 4000 points between 1985 and 1989, after an initial decrease from 1979 until 1985. Competition in this market apparently suffered from the merger between TWA and Ozark Airlines.

An interesting question is whether any relation exists between the changes in concentration in the period 1979-1985 and the changes in the period 1985-1989. A correlation analysis of the changes in HHI of the 100 markets from 1979 to 1985 and the changes in HHI from 1985 to 1989 showed almost no correlation, with a correlation

coefficient of -0.11. A t-test of the hypothesis that the correlation coefficient was zero found that this value was not significantly different from zero, with a statistical confidence of 95%.

Thirty-eight of the 59 markets in which concentration increased from 1985 to 1989 had experienced a decrease in concentration over the period 1979-1985 which was greater than the subsequent increase. The HHI value of these markets in 1989 was therefore smaller than the value in 1979. In 16 of the 59 markets the HHI decreased in the period 1979-1985, followed by a greater increase in the period 1985-1989.

In seven of the 15 markets in which the HHI had increased from 1979 to 1985, it subsequently decreased by a larger amount in the period 1985-1989. This resulted in a lower HHI value for these markets in 1989 than in 1979. In three of these 15 markets, the HHI increased from 1979 to 1985, followed by a smaller decrease in the period 1985-1989.

In five of the markets, concentration increased both from 1979 to 1985 and from 1985 to 1989: Houston-New Orleans, Houston-San Antonio, Los Angeles-Phoenix, Pittsburgh-New York, and San Diego-San Francisco.

4.4 Comparison of Concentration Levels in the Top Ten, the Top 50, and the Top 100 O-D Markets

One could imagine that the markets with the largest passenger demand are the most attractive markets to the different airlines. An airline which has the opportunity to enter two new markets with different passenger demands but all other characteristics the exact same, will probably prefer to enter the larger market of the two. In this section we assess this argument and ask the question whether the size of the market had an impact on changes in competition in the market, i.e whether more airlines actually entered the larger markets. We do this by comparing the concentration levels in the top 100 markets with those in the top ten markets and the top 50 markets over the ten year period 1979-1989.

Table 4.8 and Figure 4.6 show the average C2 concentration index of the top 100, top 50 and top ten origin-destination city-pair markets throughout the period 1979-1989. The concentration was on average lower in the top ten than in the top 50 markets, and lower in

Year	Top 100 Markets	Top 10 Markets	Top 50 Markets
1979	86.6%	79.5%	83.9%
1981	79.2%	74.8%	77.7%
1983	78.4%	75.0%	77.0%
1985	73.3%	70.6%	71.8%
1987	74.7%	72.2%	74.3%
1989	73.6%	66.2%	73.3%

Table 4.8 Average C2 for the Top 100, Top 10, and Top 50 Markets

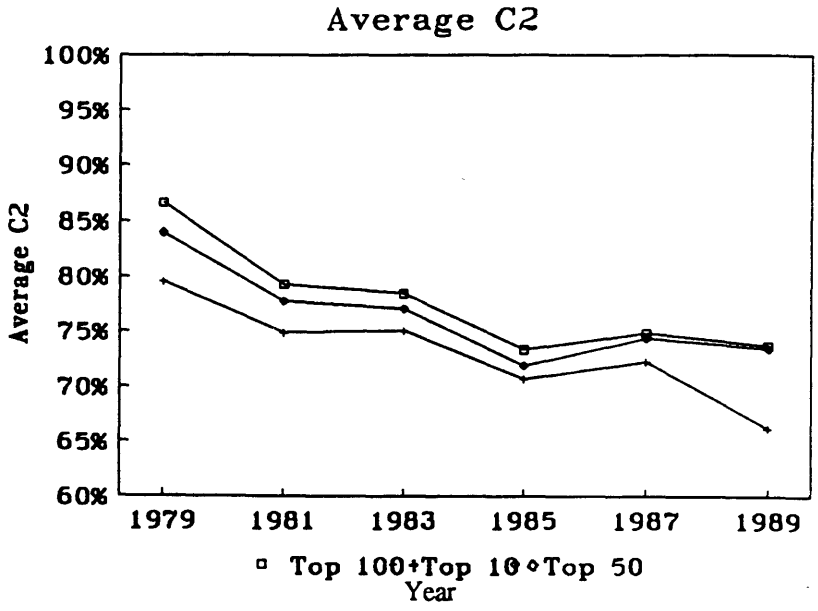


Figure 4.6 Average C2 for the Top 100, Top 10, and Top 50 Markets

the top 50 than in the top 100 markets. The difference between the average C2 value of the top ten markets and the average C2 value of the top 50 or top 100 markets increased from 1979 to 1989 and was about 7% in 1989. On the other hand, the difference in average C2 between the top 50 and the top 100 markets became smaller throughout the ten year period, and decreased mainly in the period 1985-1989.

The fact that the average C2 values for the top 50 and top 100 markets were converging is probably due to the existence of barriers to entry in some of the markets. The top 100 markets include many markets with hub airports as endpoints. The hub carrier offers a higher frequency of service and much more non-stop service in most of the markets than the other carriers in those markets, which makes it more attractive to passengers. The hub airline therefore carries a major share of the passengers in these markets, and market

concentration is higher than in markets without hub airports at one of the endpoints. The presence of a hub at one of the endpoints thus tends to strongly reduce the impact of the size of the market on concentration, which means that the concentration levels of hub markets ranked 20 or 80 may be very similar. Since both the top 50 and the top 51-100 markets include many markets with hub airports at the endpoints in which the impact of the market size on concentration is greatly reduced and since many airlines strengthened their hubs in a major way in the period 1985-1989, the average concentration levels of these groups of markets converged in that period.

In the top ten (or perhaps top 20) markets, however, market demand is so large that several airlines can profitably serve the market and attain a large enough scale of operations to offer the frequency of service needed to be attractive to travelers. The passengers traveling in these markets are carried by several airlines and average concentration is therefore lower than in the top 100 markets. Among the top ten markets, only two markets had a C2 value greater than 70% in 1989: Dallas-Houston, which had a hub at each of its endpoints and was served mainly by the hub carriers American Airlines and Southwest Airlines, and Honolulu-Kahului, which as an intra-Hawaii market was too far away from the continental US for the different airlines to easily integrate it into their networks, and which was served by two Hawaiian carriers, Aloha Airlines and Hawaiian Airlines. The existence of slot controls at some of the airports of cities in the top ten markets apparently did not constitute much of a barrier. All of these cities, New York, Chicago, and Washington, had more than one airport, though, which counteracts the effect of the slot controls. Moreover, if an airline acquires

slots at such a slot controlled airport, it is more appealing to the airline to use those slots for the markets in which it carries the most passengers.

It would be interesting to compare the concentration levels of a random set of domestic origin-destination city-pair markets with those for the top 100 markets, in order to further investigate the effects of size of market demand on competition. Such a study is left for further research.

The comparison of the concentration levels as measured by the HHI of the top ten, top 50 and top 100 markets gives similar results. Table 4.9 and Figure 4.7 show the average HHI values of the top ten, top 50 and top 100 markets throughout the period 1979-1989. Concentration as measured by the HHI was on average lower in the top ten than in the top 50 markets, and it was lower in the top 50 than in the top 100 markets. The difference between the average HHI of the top ten and the top 100 markets increased from 1979 to 1989 and was about 700 points in 1989. From 1985 on the average HHI value of the top 50

Year	Top 100 Markets	Top 10 Markets	Top 50 Markets
1979	4917	4626	4716
1981	4077	3877	3860
1983	3913	3369	3595
1985	3361	3165	3188
1987	3705	3327	3602
1989	3586	2900	3498

Table 4.9 Average HHI for the Top 100, Top 10, and Top 50 Markets

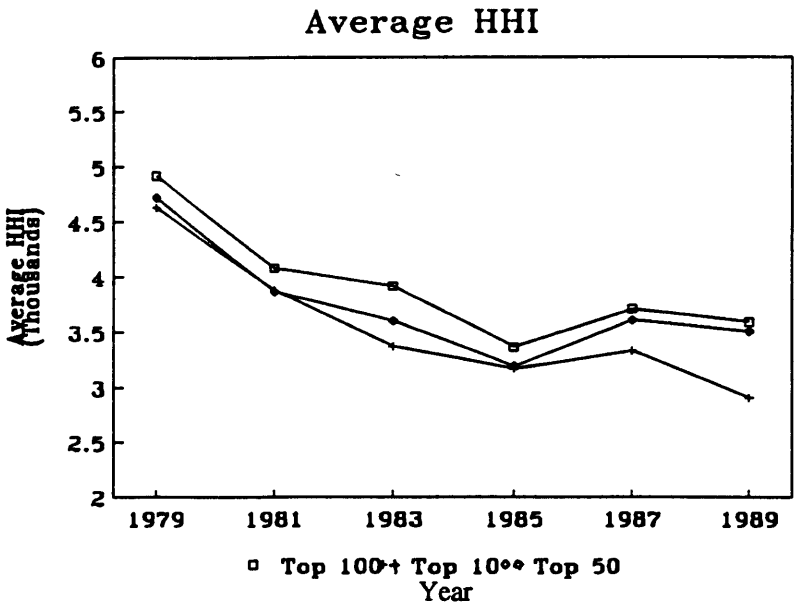


Figure 4.7 Average HHI for the Top 100, Top 10, and Top 50 Markets

markets seemed to converge to the average HHI value of the top 100 markets. Unlike the results obtained for the C2 index, the HHI values of the top ten and top 50 markets were very similar in the period 1979-1985. These differences in trends are in part a result of the fact that the HHI incorporates the distribution of the market shares of all carriers in the market, whereas the C2 only gives the sum of the market shares of the two largest carriers in the market. The difference in the HHI and C2 results suggests that the distributions of the passenger shares of the two carriers that make up the C2 values were very similar on average for the top ten markets and the top 50 markets. In that case the HHI values would be very similar, even when the C2 values differed slightly.

4.5 Comparison of Concentration in Hub and Non-Hub Markets

Some of the studies reviewed in Chapter 2 found that a source of market power in city-pair markets was the size of a carrier's operations at the endpoints of the market. When a carrier developed a hub at an airport and consequently became dominant at the airport, this carrier would possess market power in markets to and from that airport. According to these studies, concentration was therefore higher in such markets than in markets without hub endpoints. In this section, we take a look at the effect of the presence of a hub as one of the endpoints of a top 100 market on concentration in that market, in order to assess the findings of these previous studies.

We divided the 100 markets into two groups: those origin-destination markets that did not have a hub airport at one of their endpoints in 1989, and those markets that did. Table 4.10 provides a list of the cities with hub airports as endpoints in the top 100 markets. New York is not included in this list because we do not consider the city, served by three major airports, to be dominated by one or two airlines. Chicago, on the other hand, has been included because the Chicago markets are mainly served by one airport (O'Hare), which is dominated by two airlines. In addition, Midway is a hub airport of Midway airlines.

Atlanta	Houston
Chicago	Minneapolis/St. Paul
Dallas/Fort Worth	Phoenix
Denver	Pittsburgh
Detroit	St. Louis

Table 4.10 U.S. Cities with Hub Airport(s)

Forty-nine of the top 100 origin-destination city-pair markets are non-hub markets according to this categorization, and 51 markets are hub markets. Table 4.11 and Table 4.12 list the non-hub and the hub markets, respectively, in order of number of effective competitors in the markets in 1989, and also give the changes in number of effective competitors for the periods 1979-1989, 1979-1985, and 1985-1989 for each of the markets.

Origin-Destination City-Pair Markets with Non-Hub Airports		MS5%	Change in Number of Effective Competitors		
		1989	'79-'89	'79-'85	'85-'89
Boston	Philadelphia	2	0	1	-1
Burbank	San Francisco	2	1	1	0
Hilo, Hawaii	Honolulu	2	1	1	0
Honolulu	Kahului, Hawaii	2	1	1	0
Honolulu	Lihue, Hawaii	2	1	1	0
Honolulu	Kona, Hawaii	2	1	1	0
Los Angeles	San Jose	2	0	2	-2
Los Angeles	Oakland	2	1	1	0
Orange County, Cal.	San Francisco	2	1	1	0
Orange County, Cal.	San Jose	2	1	1	0
Buffalo	New York	3	1	1	0
Las Vegas	Los Angeles	3	0	-1	1
Las Vegas	San Diego	3	1	1	0
Miami	San Juan	3	0	-1	1
New York	Norfolk, Virginia	3	1	0	1
Orlando	Philadelphia	3	-1	-1	0
San Diego	San Francisco	3	0	0	0
San Juan	New York	3	1	1	0
Boston	New York	4	2	2	0
Cleveland	New York	4	1	0	1
Fort Lauderdale	New York	4	1	0	1
Los Angeles	Seattle/Tacoma	4	1	2	-1
Miami	Tampa	4	0	0	0
Miami	Washington	4	2	0	2
New York	Seattle/Tacoma	4	2	4	-2
New York	Rochester, NY	4	2	2	0
New York	New Orleans	4	2	3	-1
San Francisco	Seattle/Tacoma	4	1	3	-2
West Palm Beach	New York	4	2	1	1

Boston	Los Angeles	5	2	3	-1
Boston	San Francisco	5	2	3	-1
Boston	Orlando	5	2	0	2
Boston	Washington	5	2	1	1
Los Angeles	Miami	5	3	0	3
Los Angeles	New York	5	1	2	-1
Los Angeles	San Francisco	5	0	-2	2
Los Angeles	San Diego	5	0	-1	1
Miami	New York	5	2	0	2
Orlando	New York	5	2	2	0
San Francisco	New York	5	2	3	-1
San Francisco	Washington	5	2	3	-1
Tampa	New York	5	2	0	2
Los Angeles	Washington	6	3	1	2
Miami	Orlando	6	3	0	3
New York	San Diego	6	4	3	1
New York	Las Vegas	6	3	3	0
Washington	New York	6	3	1	2
Honolulu	Los Angeles	7	2	2	0
Honolulu	San Francisco	7	3	2	1

Table 4.11 Change in Number of Effective Competitors for the Non-Hub Markets of the Top 100 Markets

Origin-Destination City-Pair Markets with Hub Airport		MS5%	Change in Number of Effective Competitors		
		1989	'79-'89	'79-'85	'85-'89
New York	St. Louis	1	-1	1	-2
Albuquerque	Phoenix	2	0	0	0
Atlanta	Dallas/Fort Worth	2	0	1	-1
Chicago	San Francisco	2	-1	0	-1
Dallas/Fort Worth	Los Angeles	2	-1	0	-1
Houston	New Orleans	2	-3	-1	-2
Houston	San Antonio	2	-2	-2	0
Houston	Los Angeles	2	0	2	-2
Las Vegas	Phoenix	2	-2	-1	-1
Phoenix	San Diego	2	-1	2	-3

Atlanta	New York	3	1	1	0
Atlanta	Washington	3	0	-1	1
Atlanta	Miami	3	1	1	0
Austin	Dallas/Fort Worth	3	1	2	-1
Chicago	Washington	3	0	0	0
Chicago	Los Angeles	3	-1	0	-1
Dallas/Fort Worth	Washington	3	1	1	0
Dallas/Fort Worth	San Antonio	3	1	1	0
Dallas/Fort Worth	Tulsa, Oklahoma	3	0	1	-1
Denver	Los Angeles	3	1	1	0
Denver	Phoenix	3	0	1	-1
Houston	New York	3	-1	0	-1
Los Angeles	Phoenix	3	-2	-1	-1
Minneapolis/St. Paul	New York	3	0	0	0
Ontario, Cal.	Phoenix	3	-1	-1	0
Phoenix	San Francisco	3	-1	0	-1
Boston	Chicago	4	1	2	-1
Chicago	New York	4	1	2	-1
Chicago	Philadelphia	4	2	1	1
Chicago	Houston	4	1	2	-1
Chicago	Tampa	4	1	1	0
Chicago	Denver	4	1	1	0
Chicago	Cleveland	4	1	1	0
Chicago	Minneapolis/St. Paul	4	0	1	-1
Chicago	St. Louis	4	2	3	-1
Chicago	Las Vegas	4	2	1	1
Chicago	Dallas/Fort Worth	4	2	3	-1
Dallas/Fort Worth	Houston	4	2	3	-1
Dallas/Fort Worth	New York	4	2	3	-1
Dallas/Fort Worth	Denver	4	2	3	-1
Denver	New York	4	2	2	0
Detroit	Los Angeles	4	2	2	0
Detroit	New York	4	1	2	-1
Pittsburgh	New York	4	1	-1	2
Chicago	Atlanta	5	3	2	1
Chicago	Orlando	5	3	1	2
Chicago	Detroit	5	2	3	-1
Chicago	Miami	5	2	2	0
Chicago	Phoenix	5	3	2	1
Chicago	Kansas City	5	3	4	-1
New York	Phoenix	7	5	3	2

Table 4.12 Change in Number of Effective Competitors for the Hub Markets of the Top 100 Markets

Table 4.13 and Figure 4.8 show for both groups the average number of carriers that carried more than 5% of the market, for six years of the ten year period studied. Although these averages were slightly different in the period 1979-1985, the trends of a decrease in

Year	Hub Markets	Non-Hub Markets
1979	2.7	2.6
1981	3.3	3.4
1983	3.7	3.4
1985	3.9	3.7
1987	3.5	3.7
1989	3.5	4.0

Table 4.13 Average Number of Effective Competitors for the Non-Hub Markets and the Hub Markets

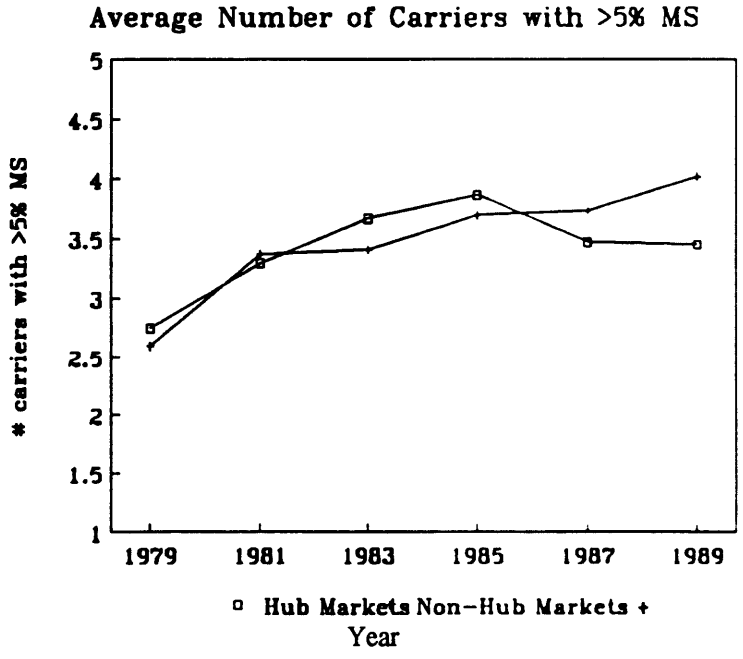


Figure 4.8 Average Number of Effective Competitors for the Non-Hub Markets and the Hub Markets

concentration were similar in both groups of markets. The average number of effective competitors increased for the hub markets from 2.7 in 1979 to 3.9 in 1985, and for the non-hub markets from 2.6 to 3.7.

After 1985, a marked difference in the average change in concentration occurred between the hub markets group and the non-hub markets group. The average number of effective competitors increased further in the non-hub market group, from 3.7 to 4.0, whereas it decreased in the hub market group, from 3.9 to 3.5. The increase in concentration in the hub market group took place mainly in the period from 1985 to 1987. By 1985, the airlines had gained experience in competing in a deregulated environment and began to expand their hub-and-spoke networks aggressively in order to reap more economies of scale and scope. Some of the airlines merged in order to expand their networks. The problems and bankruptcies that occurred at several airlines in the period 1985-1987 also helped many of the remaining carriers strengthen their positions at their hub airports. By 1987 many of the airlines dominated their hub airports and most markets to and from those airports. Average concentration levels in the hub market group did therefore not change significantly from 1987 to 1989.

As a result of the difference in changes in concentration from 1985 until 1989, the non-hub markets therefore had on average 0.5 effective competitors more offering service in 1989 than the hub markets. In 1989, each of the 49 non-hub markets had on average 1.4 effective competitors more than in 1979. For the hub markets this increase was limited to

0.8 effective competitors more on average in each of the markets.

The picture shown above is illustrated even better by the comparison of the distributions of the 1979-1985 and 1985-1989 changes in concentration for the different markets of the two groups. Table 4.14 and Table 4.15 provide the distribution of changes in the number of effective competitors in the periods 1979-1989, 1979-1985, and 1985-1989 for the non-hub markets and the hub markets respectively. The distributions were similar for both groups in the period 1979-1985. Almost 70% of the markets in both groups experienced an increase in the number of effective competitors, about 10% a decrease, and about 20% saw no change. After 1985, however, 27 out of 51 hub markets saw a decrease in the number of effective competitors, whereas this was the case for only 11 out of 49 non-hub markets. Only eight of the hub markets experienced an increase in the number of effective competitors, as

Change in # Carriers With >5% MS	'79-'89	'79-'85	'85-'89
-4 to -3	0	0	0
-2 to -1	1	5	11
0	8	11	19
1 to 2	33	24	17
3 to 4	7	9	2
5 to 6	0	0	0
Total Decreased	1	5	11
Total Increased	40	33	19
Average Change	1.10	0.33	1.43

Table 4.14 Market Frequencies of Changes in Number of Effective Competitors for the Non-Hub Markets

Change in # Carriers With >5% MS	'79-'89	'79-'85	'85-'89
-4 to -3	1	0	1
-2 to -1	11	7	26
0	9	8	16
1 to 2	25	28	8
3 to 4	4	8	0
5 to 6	1	0	0
Total Decreased	12	7	27
Total Increased	30	36	8
Average Change	1.12	-0.41	0.71

Table 4.15 Market Frequencies of Changes in Number of Effective Competitors for the Hub Markets

compared to 19 non-hub markets. These eight markets were Atlanta-Washington, Chicago-Atlanta, Chicago-Las Vegas, Chicago-Philadelphia, Chicago-Orlando, Chicago-Phoenix, New York-Phoenix, and New York-Pittsburgh.

This analysis shows somewhat different results of deregulation for the non-hub market group than for the hub market group. Most of the non-hub markets were better off in terms of competition in 1989 than in 1979. Only one out of 49 non-hub markets, Orlando-Philadelphia, was served by one effective competitor less in 1989 than in 1979. Forty of the non-hub markets were served by more airlines with a market share greater than 5% by 1989.

The hub market group was worse off than the non-hub market group in 1989. As compared to 1979, though, most of the markets were still better off in the deregulated

environment. From 1979 until 1989, only 12 out of 51 markets, or about 20% of the hub markets in the top 100 O-D market group, saw a decrease in the number of effective competitors. Thirty of the 51 hub markets, or about 60%, were served by a greater number of effective competitors in 1989 than in 1979, though. Many of these markets were markets to and from Chicago, however, which may skew the picture. Since both United and American, two of the strongest U.S. airlines, have a hub at Chicago one can expect competition in markets to and from Chicago to be higher than in markets to and from other hub airports.

The comparison of the concentration levels as measured by the HHI of the non-hub markets group and the hub markets group of the top 100 markets gives results similar to the ones explained above. Table 4.16 and Figure 4.9 show the average HHI values of the non-hub markets and the hub markets. In the period 1979-1985 the average HHI of the hub markets was smaller than the average HHI of the non-hub markets. Both averages declined

Year	Hub Markets	Non-Hub Markets
1979	4472	5379
1981	3886	4275
1983	3881	3946
1985	3186	3543
1987	3822	3583
1989	3884	3277

Table 4.16 Average HHI for the Non-Hub and the Hub Markets

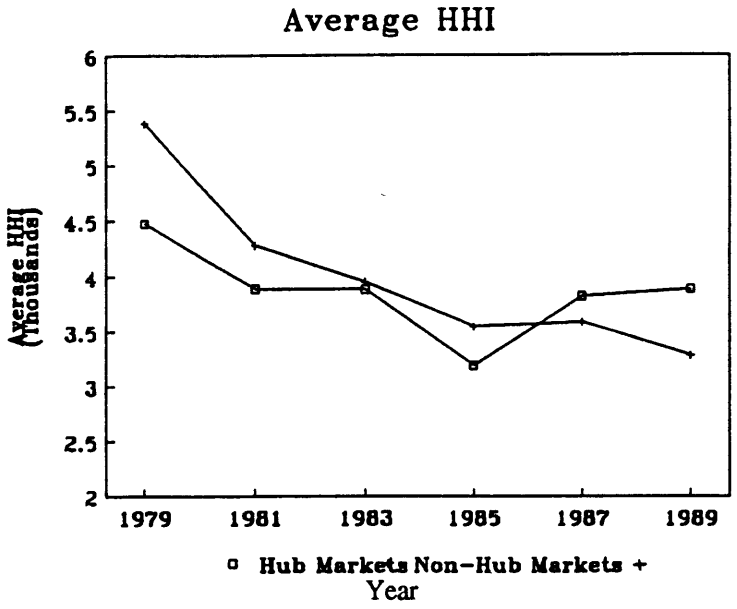


Figure 4.9 Average HHI for the Non-Hub and the Hub Markets

in that period. After 1985, the average HHI of the non-hub markets group remained the same from 1985 to 1987 and decreased further from 1987 to 1989. The average HHI of the hub markets group increased from 1985 to 1989, however.

The difference in the trends from one year to the next of the average HHI values and the average number of effective competitors is due to the fact that the HHI incorporates the distribution of the market shares of all carriers in the market, whereas the number of effective competitors index only gives the number of carriers with a market share greater than 5%. Any changes in the distribution of market shares above 5% among carriers will therefore not be shown by the number of effective competitors index.

4.6 Conclusion

Deregulation had a positive effect on aggregate competition in the top 100 markets. Average concentration levels were the lowest in 1985, and increased from 1985 to 1987. In 1989, concentration was still much lower than in 1979, however. About 70% of the 100 markets experienced a decrease in concentration from 1979 to 1989.

The 1979-1989 changes in concentration across the 100 markets were different depending on market characteristics. About 60% of the markets that had a hub airport at one (or both) of their endpoints had lower levels of concentration in 1989 than in 1979, whereas this percentage was about 80% for the markets that had no hub airport at an endpoint. As a result, in 1989, the non-hub markets of the top 100 market group on average offered more competitive service than the hub markets.

The size of a market's demand seemed also to have an influence on concentration. Concentration levels were lower on average in the ten markets in which the most passengers traveled in 1989 than in the top 100 markets. This difference existed already in 1979, but had become larger by 1989. This may be due to the fact that entry barriers emerged in the hub markets over the period 1979-1989, which limited the average decrease in concentration for the top 100 markets. In the top ten markets, it was much harder to create such entry barriers because of the size of the markets. This widened the difference in average concentration levels between the top ten and the top 100 markets.

Notes

[1] In this thesis we sometimes use the concepts increase (respectively decrease) in competition and decrease (respectively increase) in concentration interchangeably. Although we only analyze concentration, a decrease in concentration is caused by a decrease in market share of the dominant carriers in a market or an increase in the number of competitors in a market. Both of these are commonly assumed to lead to increased competition, provided that the competing firms not collude. We therefore assume that a decrease in concentration corresponds to an increase in competition.

Chapter 5

Analysis of the Top O-D Markets at Fifteen Dominated Cities

5.1 Introduction

This chapter studies the changes in concentration over the ten year period 1979-1989 in the top ten origin-destination city-pair markets in 1989 to and from each of fifteen dominated cities. Chapter 3 explains the selection of the fifteen cities. Table 5.1 lists the different cities and gives the ten percent sample numbers [1] of the local passengers transported in the top ten markets of each of these cities. The same table also shows the ten percent sample numbers of total local passengers carried in the top 100 markets studied in Chapter 4. The total number of local passengers carried in the set of 150 markets analyzed in this chapter is about 40% of the total number of local passengers carried in the top 100 markets. The majority of the passengers that are transported in the 150 markets selected,

Dominated City	Local Passengers Transported (Ten Percent Sample)		
	1979	1985	1989
Atlanta	333606	435150	518239
Charlotte	89201	136903	141155
Cincinnati	119054	154944	151364
Dayton	71221	79454	80707
Denver	338990	490627	437764
Detroit	304785	409509	545043
Greensboro/High Point	64058	115979	77785
Memphis	101870	102382	113631
Minneapolis/St. Paul	240305	363203	377348
Nashville	69577	79824	151152
Pittsburgh	245816	271572	271589
Raleigh/Durham	83845	127520	133655
Salt Lake City	126152	159700	164857
St. Louis	222259	254029	371983
Syracuse	82334	119419	97357
Total	2493073	3300215	3633629
Top 100 Markets' Total	5497820	8168173	8965216
Total as % of Top 100 Markets' Total	45.3%	40.4%	40.5%

Table 5.1 Local Passengers Transported in the Top Ten Markets to and from the Dominated Cities

travel in the top ten markets to and from only five of the cities: Atlanta, Denver, Detroit, Minneapolis/St. Paul, and St. Louis.

In the first section of this chapter, we analyze the top ten markets' average concentration levels for the different concentrated cities. In the second section we study and compare concentration levels across the total set of 150 markets in aggregate terms. In the

third section, we take a more detailed look at the different dominated cities and examine the changes in concentration in the different markets to and from these cities throughout different periods, namely the 1979-1985, 1985-1989, and 1979-1989 periods.

Similar to Chapter 4, we discuss the analyses in the different sections by looking at the results obtained for only one of the concentration indices. In order to have a common reference, we provide a brief comparison with the results obtained for the Hirschman-Herfindahl-Index at the end of each section.

5.2 Changes in the Average Concentration Levels of the Top O-D Markets of the Dominated Cities

The majority of the markets studied in this chapter were served by only one or two carriers in 1979. During the period 1979-1985 many changes occurred, as airlines withdrew from markets and entered others, and as competition from new carriers emerged. As a result, most markets experienced a decrease in concentration from 1979 to 1985. At the dominated cities that we examined, certain carriers began to increase their presence by 1985 in a drive to reap economies of scale and scope from hub-and-spoke networks and the scale of their operations. This trend intensified in the period 1985-1989 as most of these carriers strengthened their hub operations in a major way, either by further increasing the scale of

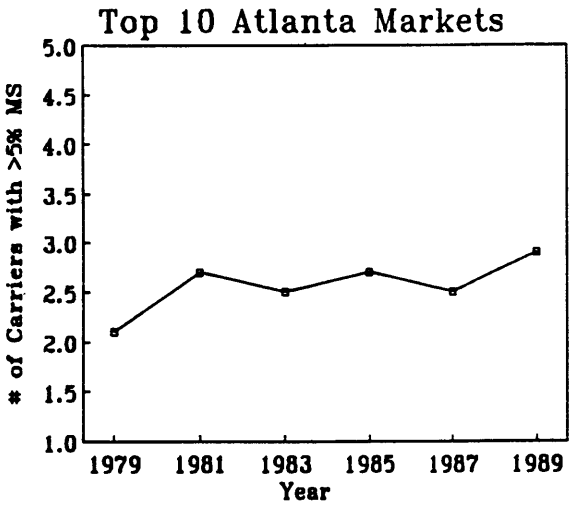
their own operations, or by merging with another carrier that also had substantial operations at the same city airport. As a result, the average concentration level of the top ten markets of most of the dominated cities increased from 1985 to 1989, although it remained lower than the 1979 level at many of the cities.

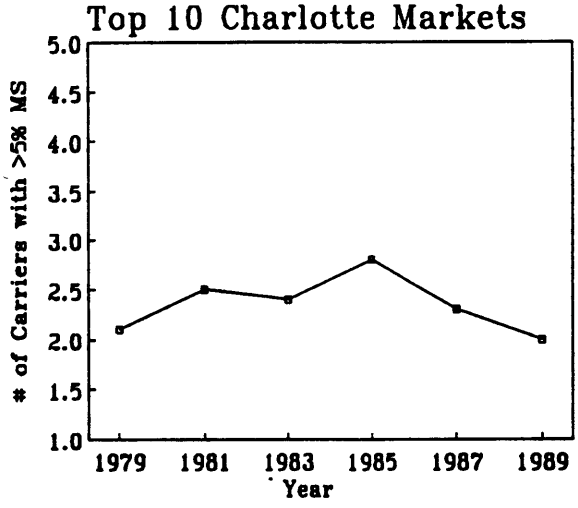
Top 10 Markets to and from	1979	1981	1983	1985	1987	1989
Atlanta	2.1	2.7	2.5	2.7	2.5	2.9
Charlotte	2.1	2.5	2.4	2.8	2.3	2.0
Cincinnati	2.1	2.6	2.5	2.9	2.5	2.1
Dayton	2.1	2.2	2.1	2.4	2.6	2.2
Denver	2.6	3.7	4.2	3.6	2.8	3.0
Detroit	2.4	2.8	3.1	3.8	4.1	3.1
Greensboro	2	2.5	2.3	2.2	1.9	1.9
Memphis	2.5	2.8	3.1	3.2	2.9	2.6
Minneapolis	2.6	3.4	3.2	3.2	2.3	2.4
Nashville	2.4	3.2	3.2	3.5	3.4	2.8
Pittsburgh	2.4	2.4	2.4	3.1	2.8	2.4
Raleigh/Durham	2.3	2.6	3.1	2.6	3.3	2.9
Salt Lake City	2.1	3.2	3.2	3.4	4.0	2.6
St. Louis	2.1	2.7	2.6	3.5	2.5	2.3
Syracuse	1.6	2.0	2.3	3.0	3.2	2.9

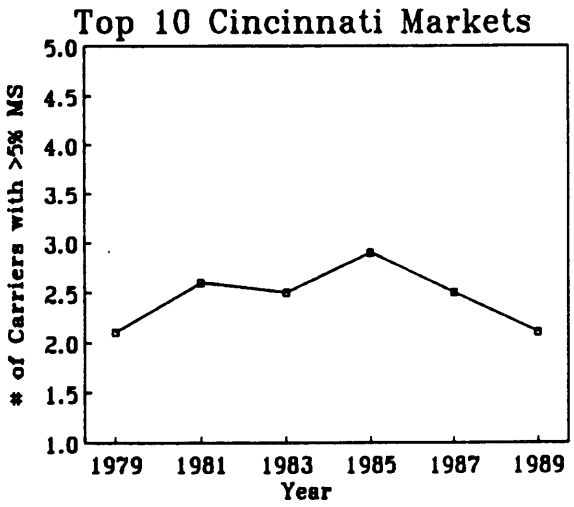
Table 5.2 Average Number of Effective Competitors of the Top Ten Markets for Fifteen Dominated Cities

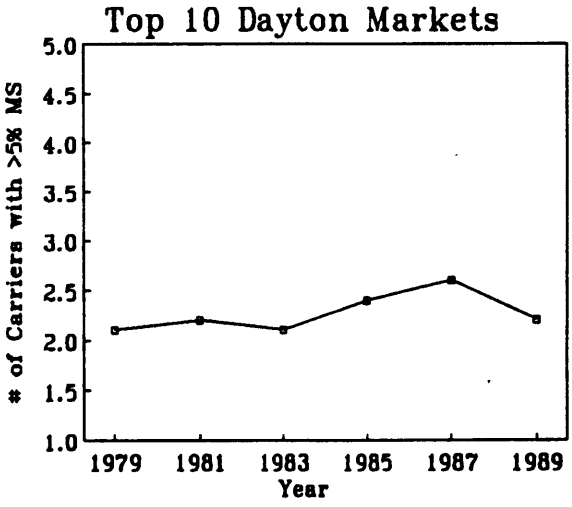
Table 5.2 gives the average number of effective competitors in the top ten markets to and from each dominated city, and Figure 5.1 plots these averages for the different cities in graphs. All of the cities experienced an increase in the average number of effective competitors serving their top ten markets from 1979 to 1985, although this increase was minimal for Dayton, Greensboro/High Point and Raleigh/Durham. Only two cities, Atlanta and Raleigh/Durham, experienced a further increase in the average number of effective competitors from 1985 to 1989. At Atlanta this trend was probably reversed when Eastern began to reduce its operations in 1989 because of labor problems accompanied by a strike.

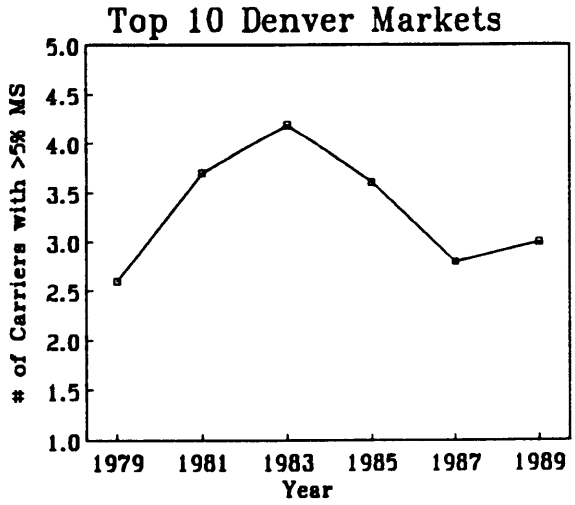
Although the average number of effective competitors declined in thirteen of the fifteen sets of markets from 1985 to 1989, only three of the cities were served on average by fewer airlines with a market share greater than 5% in 1989 than in 1979: Charlotte and Greensboro/High Point had become strongholds for Piedmont Aviation (US Air after their merger in 1989); Northwest had constructed its main hub at Minneapolis/St. Paul and dominated most of the Minneapolis markets, especially after its merger with Republic Airlines in 1986. At Cincinnati and Pittsburgh, the average number of effective competitors in the top ten O-D markets was the same in 1989 as in 1979, while at the remaining ten cities this average increased. For Dayton, Memphis and St. Louis the increase in the number of effective competitors from 1979 to 1989 was minimal, though. The cities that saw substantial increases in the average number of effective competitors in their top ten markets from 1979 to 1989 were Syracuse and Atlanta, although Denver, Detroit, Nashville, Raleigh/Durham, and Salt Lake City also enjoyed a higher average number of effective competitors serving their

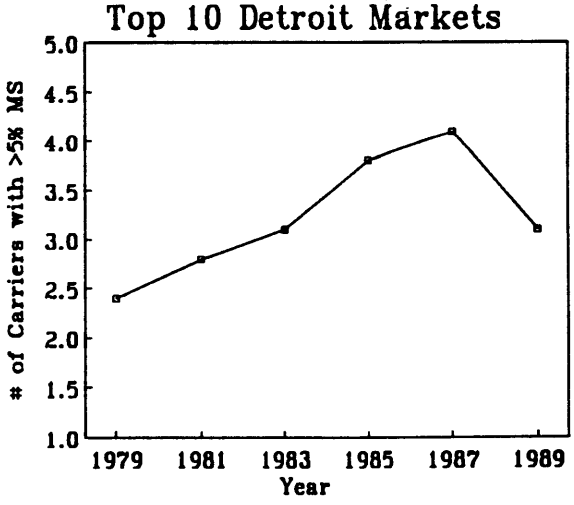

Top 10 Atlanta Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

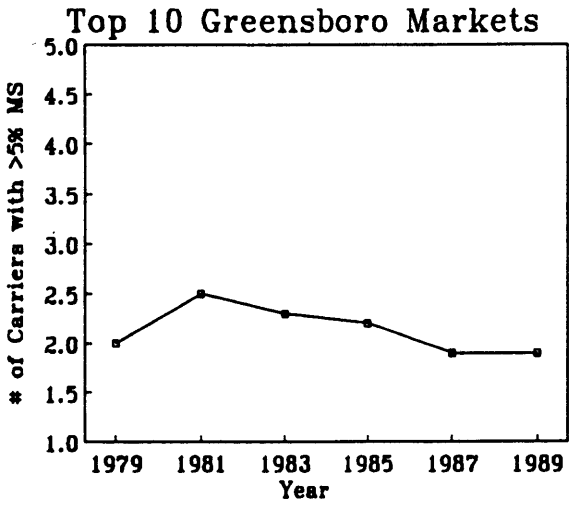

Top 10 Charlotte Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

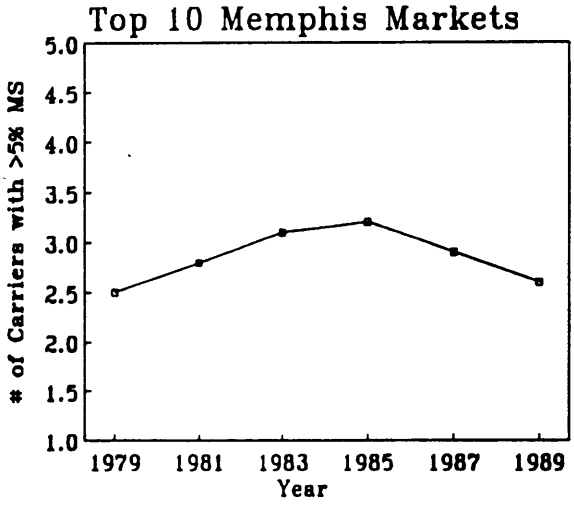

Top 10 Cincinnati Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

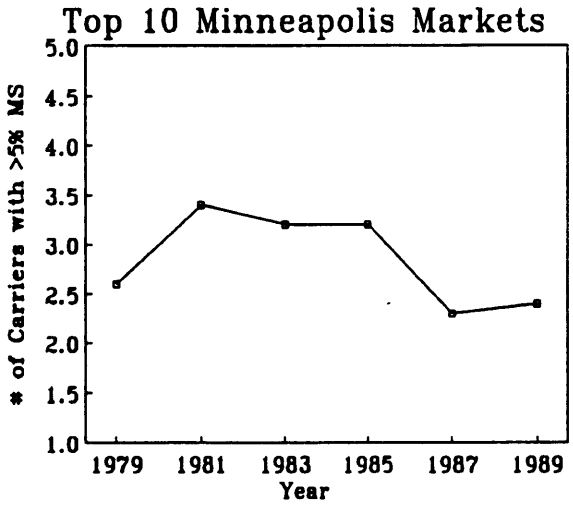

Top 10 Dayton Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

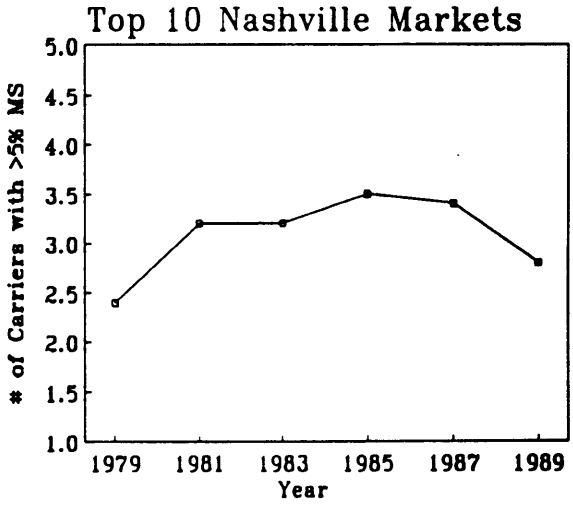

Top 10 Denver Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

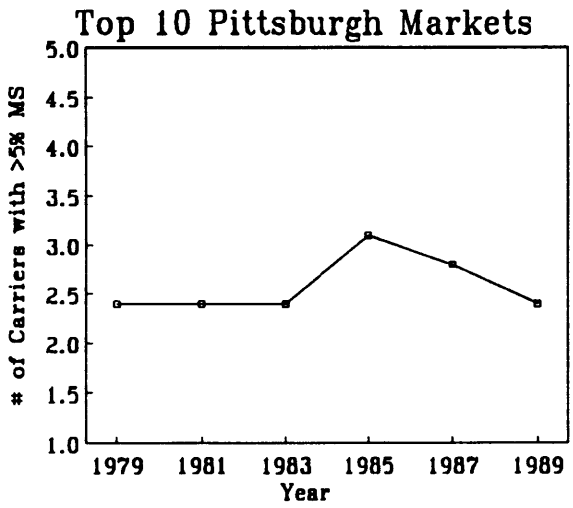

Top 10 Detroit Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

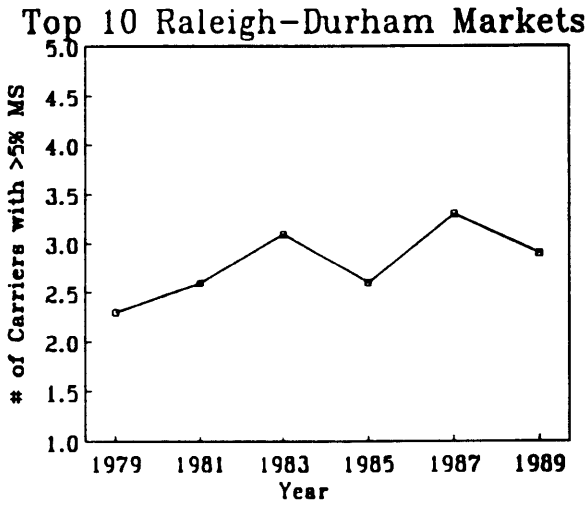

Top 10 Greensboro Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year


Top 10 Memphis Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year


Top 10 Minneapolis Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year


Top 10 Nashville Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year


Top 10 Pittsburgh Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year


Top 10 Raleigh-Durham Markets
# of Carriers with >5% MS
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
1979 1981 1983 1985 1987 1989
Year

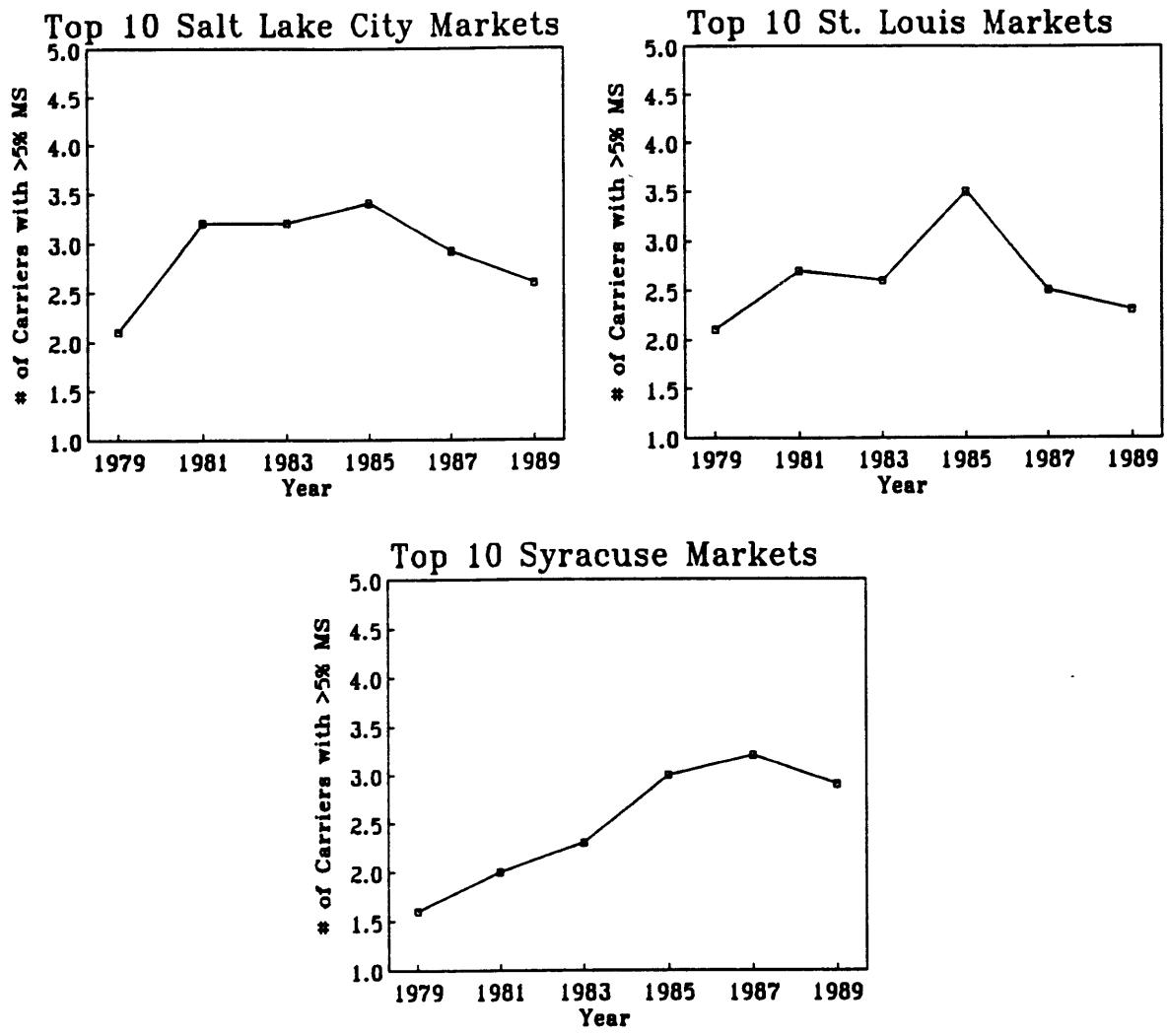


Figure 5.1 Average Number of Effective Competitors of the Top Ten Markets for Fifteen Dominated Cities

top ten markets.

Table 5.3 provides the distribution of the average number of effective competitors in the top ten markets of each of the cities for the years 1979, 1985, and 1989. In 1979, there was one city served on average by fewer than two effective competitors in its top ten

Average Number of Effective Competitors	1979	1985	1989
1.5 to 2	1	0	1
2 to 2.5	11	2	6
2.5 to 3	3	4	6
3 to 3.5	0	5	2
3.5 to 4	0	4	0
Minimum	1.6	2.2	1.9
Maximum	2.6	3.8	3.1

Table 5.3 City Frequencies of Average Numbers of Effective Competitors of the Top Ten Markets for Fifteen Dominated Cities

markets, and 12 cities with averages of less than 2.5. At none of the cities did more than three airlines carry more than 5% of the market on average in the top ten O-D markets. Syracuse markets were served by only 1.6 effective competitors and Denver and Minneapolis markets by 2.6, the minimum and maximum average numbers respectively.

By 1985 concentration had decreased across the different markets, and no dominated city had fewer than two effective competitors on average in their top ten markets. Only two cities were served by fewer than 2.5 effective competitors, and nine cities were served by more than 3 airlines with an average market share greater than 5% in the top ten markets. The minimum average number of effective competitors was 2.2, at Greensboro/High Point, and the maximum was 3.8, at Detroit.

As mentioned above, from 1985 to 1989 the average number of effective competitors

in the top ten markets decreased at most of the cities. As a result, in 1989 there was again one city which was served by fewer than two effective competitors on average in its top ten markets, namely Greensboro/High Point with an average of 1.9. At seven of the cities fewer than 2.5 effective competitors on average carried travelers in the top ten markets, and only two of the cities were served by more than three effective competitors on average. The maximum average number was 3.1, again at Detroit.

5.3 Changes in Concentration Levels in the 150 Markets

In order to further examine the trends in concentration in the markets to and from cities dominated by one or two airlines, we gathered the 150 different markets into one group, and looked at the average change in concentration for the whole group as well as at changes in the distributions of concentration levels for different years. Similar to the previous section, this analysis shows that concentration decreased in many of the markets from 1979 to 1985, but increased again from 1985 to 1989.

Table 5.4 and Figure 5.2 show the average number of competitors that carried more than 5% of the market for the complete set of 150 markets studied. This average number of effective competitors increased from 2.2 in 1979 to 3.1 in 1985, but decreased subsequently to 2.5 in 1989. In 1985, therefore, on average one airline more than in 1979 was carrying

Year	Dominated Airport Markets
1979	2.2
1981	2.8
1983	2.8
1985	3.1
1987	2.9
1989	2.5

Table 5.4 Average Number of Effective Competitors for the 150 Markets

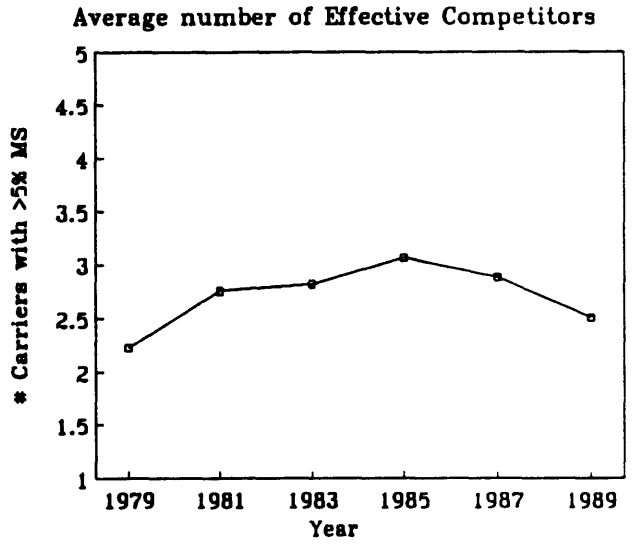


Figure 5.2 Average Number of Effective Competitors for the 150 Markets

more than 5% of the travelers in each of the 150 markets, but by 1989 this difference had dropped to an average of 0.3 effective competitors more.

Table 5.5 and Figure 5.3 show the distributions of the number of effective carriers for the 150 markets for the years 1979, 1985, and 1989. Table 5.6 and Figure 5.4 provide

# Carriers With >5% MS	1979	1985	1989
1	11.3%	7.3%	17.3%
2	59.3%	28.0%	34.0%
3	24.7%	30.0%	32.0%
4	4.7%	22.7%	13.3%
5 to 6	0.0%	12.0%	2.7%
7 to 8	0.0%	0.0%	0.7%

Table 5.5 Market Frequencies of Numbers of Effective Competitors for the 150 Markets

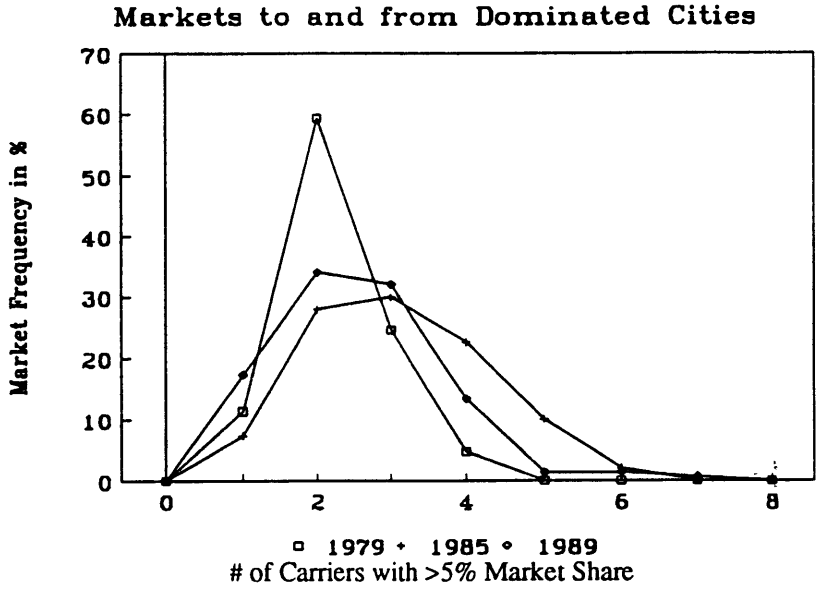


Figure 5.3 Market Frequencies of Numbers of Effective Competitors for the 150 Markets

the percentage of passengers, relative to the total number of passengers carried in the total set of 150 markets, that traveled in markets served by one, two, three, etc. effective competitors.

# Carriers With >5% MS	1979	1985	1989
1	5.4%	2.3%	11.9%
2	59.9%	21.4%	24.3%
3	28.7%	36.0%	28.3%
4	6.0%	21.6%	22.8%
5 to 6	0.0%	18.7%	14.2%
7 to 8	0.0%	0.0%	0.7%

Table 5.6 Passenger Traffic by Number of Effective Competitors as a Percentage of Total 150 Markets' Passengers

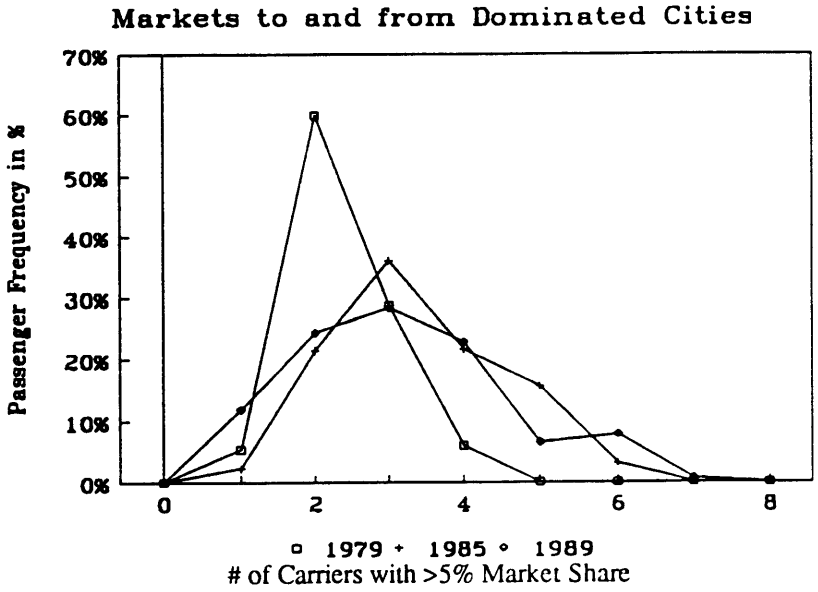


Figure 5.4 Passenger Traffic by Number of Effective Competitors as a Percentage of Total 150 Markets' Passengers

The 1979 distribution was very peaked and centered around two effective competitors. By 1985, the distribution had become wider, and its mode had shifted closer to three effective competitors. From 1985 to 1989, the distribution's mode shifted back towards two effective competitors. The 1989 distribution was much flatter than the 1979 distribution, though, and

also located slightly more to the right, i.e. towards a higher number of effective competitors.

In 1979, 11.3% of the 150 markets were served by only one effective competitor. Only 5.4% of all passengers carried in the 150 markets in 1979 traveled in these markets, though. In another 59.3% of the 150 markets only two airlines carried more than 5% of the market, corresponding to 59.9% of all travelers. Six percent of all travelers in 4.7% of the markets could choose from among four or more effective competitors for transportation in their origin-destination markets.

In 1985, 7.3% of the markets and 2.3% of the travelers were served by only one effective competitor, and 28% of the markets and 21.4% of the passengers by only two. 40.3% of all the persons that traveled in the 150 markets in 1985 could choose from among four or more airlines that carried more than 5% of the market, in 34.7% of the 150 markets.

By 1989, the percentage of markets with only one effective competitor had risen to 17.3%, as compared to only 11.3% in 1979. 11.9% of all passengers carried in the 150 markets in 1989 traveled in a market served by only one effective competitor, as compared to only 5.4% in 1979. The percentage of markets served by only two effective competitors was at 34.0% slightly higher than in 1989, but it was still much lower than the 59.3% of the travelers in 1979, and the percentage of passengers carried in these markets was at 24.3% also much lower than the 59.9% of the travelers in 1979. A total of 30.2% of all passengers transported in 16.6% of the 150 markets could choose from among four or more effective

competitors, down from the 1985 40.3% but still much higher than the 1979 value of 6% of the travelers in 4.7% of the 150 markets.

In order to get more insight in the changes in competition actually experienced by travelers in the 150 markets, we also studied the distributions of the changes in concentration in the periods 1979-1985, 1985-1989, and 1979-1989. Table 5.7 and Figure 5.5 show the distributions of the changes in the number of effective competitors for the 150 markets for these periods.

These distributions show the mixed results of deregulation experienced across the 150 markets. Although the number of effective competitors increased in 57% of the 150 markets and decreased in only 10% of the markets in the period 1979-1985, this number declined

Change in # Carriers With >5% MS	1979-1989	1979-1985	1985-1989
-4 to -3	1.3%	0.0%	4.0%
-2 to -1	22.0%	10.0%	45.3%
0	36.7%	33.3%	32.7%
1 to 2	36.0%	46.7%	18.0%
3 to 4	3.3%	10.0%	0.0%
5 to 6	0.7%	0.0%	0.0%
Total Decreased	23.3%	10.0%	49.3%
Total Increased	40.0%	56.7%	18.0%
Average Change	0.52	0.83	-0.31

Table 5.7 Market Frequencies of Changes in the Number of Effective Competitors for the 150 Markets

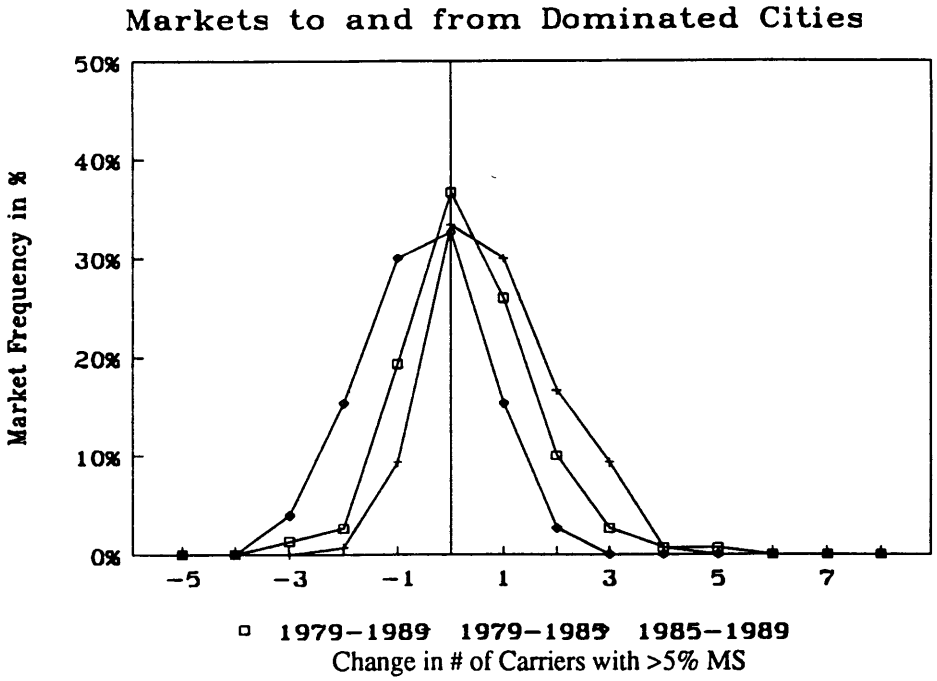


Figure 5.5 Market Frequencies of Changes in the Number of Effective Competitors for the 150 Markets

subsequently in 49% of the markets during the period 1985-1989 and rose in only 18% of the markets in the same period. Overall, from 1979 to 1989 the number of airlines carrying more than 5% of the market increased in 40% of the markets and decreased in 23% of the markets. The number of effective competitors was the same in 37% of the markets.

In 4% of the markets, travelers could choose from among three or more effective competitors more in 1979 than in 1989. These markets were Syracuse-Los Angeles, Syracuse-Atlanta, Salt Lake City-New York, Raleigh/Durham-San Francisco, Nashville-Los Angeles, and Atlanta-Chicago. In 1% of the 150 markets the number of effective competitors was three fewer in 1989 than in 1979. These markets were Detroit-Boston and

Minneapolis/St. Paul-Washington, which were both dominated almost entirely by Northwest Airlines in 1989. Both markets were affected by the merger of Northwest and Republic, and the Detroit-Boston market also suffered from Braniff's bankruptcy.

An analysis of the concentration levels as measured by the HHI in the total set of 150 markets gives very similar results. In comparison with the results of the above analysis of the average number of effective competitors, Table 5.8 and Figure 5.6 show the average HHI

Year	Average HHI
1979	5949
1981	5015
1983	4972
1985	4402
1987	5000
1989	5633

Table 5.8 Average HHI for the 150 Markets

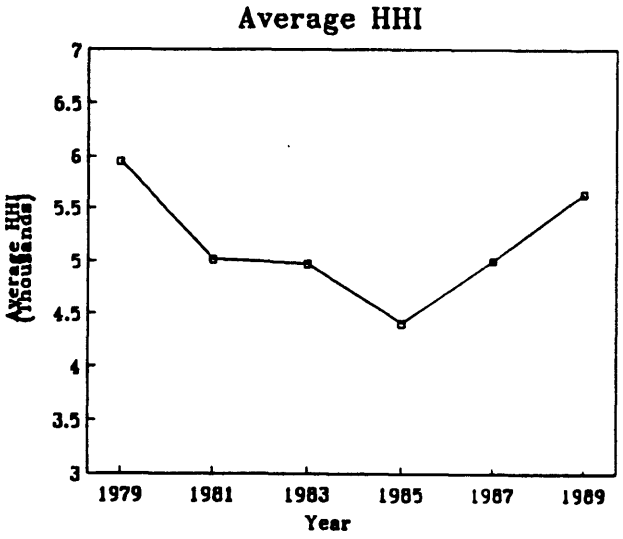


Figure 5.6 Average HHI for the 150 Markets

for the 150 markets throughout the ten-year period. The average HHI decreased from a level of 5950 points in 1979 to 4400 points in 1985. From 1985 to 1989 the average HHI increased again significantly to reach a level of 5630 points by 1989, which was only 320 points fewer than the average HHI level in 1979.

5.4 Detailed Analysis of the Dominated Cities

In this section we study the changes in competition and concentration in the top ten markets of each of the dominated cities in more detail. At most of these cities, competition in the top ten markets followed a similar pattern: different carriers served the different markets in 1979, although a few carriers were usually major competitors in several of the top ten markets. In order to build a hub operation, one of those carriers increased its presence at the city from 1979 to 1985 by entering markets it did not serve in 1979. Since it began to compete in those markets against incumbent carriers and since new competition also emerged in markets that the carrier served in 1979, concentration usually decreased in the majority of the markets from 1979 to 1985. After 1985, the hub airline further strengthened its position and it was usually able to become the dominant carrier in several of the markets, with the exception of those markets that had a hub of another carrier at the other endpoint. The markets with a multiple-carrier hub at one of the endpoints were usually best off in terms of competition in 1989, as long as the endpoints were not both hubs of one of the carriers.

Examples of such markets were mainly the Chicago markets, but also many of the Denver and Dallas markets, and the Atlanta markets prior to Eastern's problems.

In the following paragraphs we examine the trends at the different cities by analyzing the average HHI levels of the top ten O-D markets of each of the cities throughout the ten year period, as well as the changes in HHI in the different markets over the periods 1979-1985, 1985-1989, and 1979-1989. Table 5.9 gives the average HHI levels of the top ten markets for each of the dominated cities and Table 5.10 provides the changes in HHI values for the different periods for each of the cities. Tables 5.11 to 5.25 give the changes in HHI of the different city markets for each of the dominated cities.

Atlanta was served mainly by Delta Airlines and Eastern Airlines during the period 1979-1989. The airport was already a hub for both airlines before the advent of deregulation. From 1979 to 1985, some new competition emerged in the top ten Atlanta markets, which led to a decrease in concentration, but Delta and Eastern remained the primary carriers in virtually all of the markets. Concentration levels therefore did not change very much in the top ten Atlanta markets from 1979 to 1985. The HHI increased in seven of the markets from 1985 to 1989, mainly due to the strike at Eastern in 1989, which strengthened Delta's position in all the markets where it competed against Eastern only. Despite this increase, the HHI was lower in seven of the ten markets in 1989 than in 1979, and averaged out over the ten markets the HHI was slightly lower in 1989 than in 1979. The Atlanta-Boston, Atlanta-Orlando, and Atlanta-Tampa markets were the ones that suffered most from Eastern Airlines'

Top 10 Markets to and from	1979	1981	1983	1985	1987	1989
Atlanta	5181	4577	4899	4179	4736	4747
Charlotte	6703	5000	4961	4438	6144	7028
Cincinnati	5856	5094	6139	4659	5340	6448
Dayton	6586	6389	6077	5922	5944	6626
Denver	4777	3383	3191	3141	4643	4335
Detroit	5283	4865	4325	3383	3701	4434
Greensboro	6431	5547	5683	6138	6633	7516
Memphis	5394	5216	4454	4022	5074	5548
Minneapolis	5944	4288	4350	3639	6038	5741
Nashville	5907	4951	4653	4020	3967	4540
Pittsburgh	5141	4848	5842	4919	5841	6493
Raleigh/Durham	6130	5355	4532	5118	4112	4570
Salt Lake City	6067	4107	4478	4168	3552	5360
St. Louis	5662	4734	4823	3769	4810	5336
Syracuse	8167	6871	6171	4513	4467	5770

Table 5.9 Average HHI of the Top Ten Markets for fifteen Dominated Cities

Top 10 Markets to and from		'79-'89	'79-'85	'85-'89
Atlanta	# of Markets Decreased	7	10	3
	# of Markets Increased	3	0	7
	Average Change	-434	-1003	569
Charlotte	# of Markets Decreased	4	8	2
	# of Markets Increased	6	2	8
	Average Change	325	-2265	2591
Cincinnati	# of Markets Decreased	3	5	0
	# of Markets Increased	7	5	10
	Average Change	591	-1197	1789
Dayton	# of Markets Decreased	7	7	4
	# of Markets Increased	3	3	6
	Average Change	41	-663	704
Denver	# of Markets Decreased	7	9	0
	# of Markets Increased	3	1	10
	Average Change	-442	-1636	1194
Detroit	# of Markets Decreased	7	9	2
	# of Markets Increased	3	1	8
	Average Change	-849	-1900	1051
Greensboro/ High Point	# of Markets Decreased	3	7	1
	# of Markets Increased	7	3	9
	Average Change	1085	-293	1378
Memphis	# of Markets Decreased	4	8	2
	# of Markets Increased	6	2	8
	Average Change	154	-1371	1525
Minneapolis/ St. Paul	# of Markets Decreased	4	10	0
	# of Markets Increased	6	0	10
	Average Change	-203	-2305	2102
Nashville	# of Markets Decreased	6	7	3
	# of Markets Increased	4	3	7
	Average Change	-1367	-1887	520

Pittsburgh	# of Markets Decreased	2	5	3
	# of Markets Increased	8	5	7
	Average Change	1353	-221	1574
Raleigh/ Durham	# of Markets Decreased	7	7	6
	# of Markets Increased	3	3	4
	Average Change	-1559	-1012	-547
Salt Lake City	# of Markets Decreased	6	9	2
	# of Markets Increased	4	1	8
	Average Change	-707	-1899	1192
St. Louis	# of Markets Decreased	7	10	0
	# of Markets Increased	3		10
	Average Change	-326	-1893	1567
Syracuse	# of Markets Decreased	6	9	4
	# of Markets Increased	4	1	6
	Average Change	-2397	-3653	1257

Table 5.10 Changes in HHI in the Top Ten Markets for the Dominated Cities

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Atlanta	Boston	5446	455	-547	1002
Atlanta	Chicago	2949	-2538	-2031	-508
Atlanta	Dallas/Fort Worth	5932	-350	-1968	1618
Atlanta	Los Angeles	5089	-219	-656	437
Atlanta	Miami	3737	-1004	-885	-119
Atlanta	New York	3913	-935	-1294	359
Atlanta	Orlando	5608	482	-880	1362
Atlanta	Philadelphia	4097	-995	-410	-585
Atlanta	Tampa	6002	955	-637	1593
Atlanta	Washington	4701	-193	-721	528
Total Decreased			7	10	3
Total Increased			3	0	7
Average		4747	-434	-1003	569

Table 5.11 Changes in HHI for the Top Ten Atlanta Markets

strike, since an initial decrease in HHI from 1979 to 1985 in these markets was followed by a greater increase from 1985 to 1989. Eastern's labor and interrelated operational problems continued throughout 1990 and finally led to its demise in January 1991, which probably substantially increased the concentration levels in many of the other markets to and from Atlanta in 1990 and 1991.

In 1989, Delta Airlines was also the major carrier at two other cities, Cincinnati and Salt Lake City. At Cincinnati Delta had developed a hub itself, and at Salt Lake City it became the major hub carrier after merging with Western Airlines in 1987.

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Cincinnati	Atlanta	9710	566	278	288
Cincinnati	Boston	7651	3973	990	2983
Cincinnati	Chicago	3618	-2053	-3061	1008
Cincinnati	Dallas/Fort Worth	4889	-3967	-4772	805
Cincinnati	Detroit	5333	-1775	-2223	449
Cincinnati	Los Angeles	7231	2606	171	2435
Cincinnati	New York	5369	673	-1877	2550
Cincinnati	Orlando	7505	2530	-1922	4452
Cincinnati	Philadelphia	5034	1184	194	991
Cincinnati	Washington	8135	2176	250	1926
Total Decreased			3	5	0
Total Increased			7	5	10
Average		6448	591	-1197	1789

Table 5.12 Changes in HHI for the Top Ten Cincinnati Markets

Cincinnati was one of the six cities for which the average HHI of the top ten markets was higher in 1989 than in 1979. In the early years of deregulation different Cincinnati markets were dominated by different carriers, such as American, Delta and US Air. By 1985, Delta carried a substantial share of the passengers transported in the top ten Cincinnati markets. In some of the markets Delta displaced other carriers in the period 1979-1985 and became the dominant carrier. In the markets where the incumbent carrier had a stronghold at the other endpoint, Delta began to compete against this carrier and as a result, the HHI declined in these markets from 1979 to 1985. After 1985, Delta further strengthened its position in all of the top ten markets and became the dominant carrier in six of the markets by 1989. The HHI increased in all ten markets from 1985 to 1989. In 1989, the average reached a high of 6450 points in 1989, almost 600 points higher than in 1979. The HHI decreased in only three of the ten markets from 1979 to 1989: in the Chicago market Delta competed against United and American in 1989, in the Dallas market against American, and in the Detroit market against Northwest.

Different Salt Lake City markets were dominated by American, United, and Western Airlines in 1979. Although Western Airlines increased its presence by 1985 in all of the markets it did not serve in 1979, in most of these markets it joined incumbent competitors and took market share from these carriers, similar to Delta at Cincinnati. This was mainly the case in the Chicago, Dallas, New York and Washington markets. In some of the markets where it was the dominant carrier, such as Salt Lake City-Phoenix, competition emerged from carriers that were strong at the other endpoint of the market. As a result, the HHI decreased

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Salt Lake City	Atlanta	8825	1956	-3297	5254
Salt Lake City	Chicago	3262	-1656	-2336	680
Salt Lake City	Dallas/Fort Worth	5179	853	-1343	2196
Salt Lake City	Denver	2968	-844	-1353	509
Salt Lake City	Los Angeles	7588	-933	-894	-39
Salt Lake City	New York	2800	-2483	-3313	830
Salt Lake City	Phoenix	4883	-4796	-4758	-38
Salt Lake City	San Francisco	4974	-17	-100	83
Salt Lake City	Seattle	8128	625	501	124
Salt Lake City	Washington	4997	229	-2092	2321
Total Decreased			6	9	2
Total Increased			4	1	8
Average		5360	-707	-1899	1192

Table 5.13 Changes in HHI for the Top Ten Salt Lake City Markets

in nine of the markets from 1979 to 1985. After 1985, Western further strengthened its operations at Salt Lake City, and in 1987 the airline merged with Delta. The HHI increased in eight of the top ten markets from 1985 to 1989, mostly in the Salt Lake City-Atlanta market which had two Delta hubs as endpoints after 1987. In 1989, Delta was the dominant carrier in all but the Chicago, Dallas, Phoenix, and San Francisco markets, in which it competed with United and American, American, America West, and United respectively. The average HHI in the top ten Salt Lake City markets was still 700 points lower than in 1979, and the HHI was lower in six of the ten markets in 1989 than in 1979, mainly due to the decrease in HHI that took place from 1979 to 1985.

US Air (formerly Allegheny Airlines) was in 1989 the dominant carrier at five of the cities: Charlotte, Dayton, Greensboro/High Point, Pittsburgh, and Syracuse. Three of these cities, Charlotte, Dayton, and Greensboro/High Point, were strongholds of Piedmont Aviation before the merger of both airlines. This merger was very similar to the Delta-Western merger in that in both instances the carriers were not major competitors at the same cities. This is different from some of the other mergers discussed below, where one of the carriers eliminated the competition through a merger or acquisition when both carriers had substantial operations at the same city.

In 1979, all ten Charlotte markets were served by Eastern, and four of them, the Chicago, New York, Philadelphia and Washington markets, were dominated by the carrier. In the other six markets, Eastern competed against either Piedmont, or Delta, or both. By 1985, Piedmont had become a major competitor in most of the Charlotte markets. The HHI declined in eight of the markets from 1979 to 1985. Only the Charlotte-Raleigh/Durham market, where Piedmont had completely displaced Eastern by 1985, and the Charlotte-Dallas market, served by American and Eastern, experienced an increase in HHI in that period. From 1985 to 1989, Piedmont strengthened its operations at Charlotte substantially, mainly to the detriment of Eastern Airlines. In 1989, Piedmont was also helped by Eastern's strike, which left most of the markets to be served by Piedmont only (US Air after their merger). From 1985 to 1989, the HHI decreased only in the Charlotte-Raleigh/Durham market, due to American's construction of a hub at Raleigh/Durham, and in the Charlotte-Atlanta market, where Delta remained a strong competitor. The average HHI in the top ten Charlotte markets

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Charlotte	Atlanta	4160	-707	-545	-163
Charlotte	Boston	9065	2801	-1456	4257
Charlotte	Chicago	5470	-2944	-5169	2225
Charlotte	Dallas/Fort Worth	4629	1348	510	837
Charlotte	Los Angeles	5934	2365	-537	2903
Charlotte	Miami	6642	413	-2561	2974
Charlotte	New York	8469	-964	-5835	4871
Charlotte	Philadelphia	9606	-352	-5022	4670
Charlotte	Raleigh/Durham	7206	477	1464	-987
Charlotte	Washington	9100	817	-3501	4318
Total Decreased			4	8	2
Total Increased			6	2	8
Average		7028	325	-2265	2591

Table 5.14 Changes in HHI for the Top Ten Charlotte Markets

had decreased by 2000 points from 1979 until 1985, but it increased by more in the following years to reach a level of 7000 points in 1989. Only four of the markets experienced an overall decrease in concentration from 1979 to 1989: the markets to and from Atlanta, Chicago, New York and Philadelphia, the latter three mainly because they were served by Eastern only in 1979.

The top ten markets to and from Dayton were served by different carriers in 1979, although TWA was a major player in seven of the markets. By 1985, Piedmont had displaced TWA at Dayton and was the dominant carrier or one of the major competitors in eight of the markets. Dayton-Atlanta was served almost entirely by Delta, and Dayton-

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Dayton	Atlanta	9329	-383	-46	-337
Dayton	Boston	4775	-469	1090	-1559
Dayton	Chicago	5301	-405	2134	-2540
Dayton	Dallas/Fort Worth	6878	-1105	-604	-502
Dayton	Los Angeles	4900	-1096	-2871	1775
Dayton	New York	8417	1385	-2414	3798
Dayton	Orlando	6940	-2817	-4131	1314
Dayton	Philadelphia	8007	2883	-193	3076
Dayton	San Francisco	3875	-508	-642	134
Dayton	Washington	7842	2921	1043	1878
Total Decreased			7	7	4
Total Increased			3	3	6
Average		6626	41	-663	704

Table 5.15 Changes in HHI for the Top Ten Dayton Markets

Chicago by United. The average concentration decreased slightly from 1979 to 1985, mainly due to increased competition from Piedmont against the incumbents in some of the markets. Piedmont (and after the merger in 1989 US Air) fortified its position from 1985 to 1989. The HHI declined in that period only in the Boston market in which Piedmont encountered competition from different carriers with small market shares, and in the Chicago market in which American began to compete against United. In 1989, the average HHI was slightly higher than in 1979, but the HHI was only higher in three of the ten markets: in the New York market mainly due to the exit of TWA and later the disappearance of People Express, in the Philadelphia market where US Air and Piedmont combined their operations, and in the Washington market. The HHI decreased substantially in the Dayton-Orlando market, served

mainly by Delta in 1979, and by both Delta and Piedmont (US Air) in 1989.

The changes in concentration in the top ten Greensboro/High Point markets throughout the period 1979-1989 were very similar to those in the top ten Charlotte markets. In 1979, Eastern was also the major carrier in most of the Greensboro markets and competed mainly against Piedmont, or Delta, or both. In the Greensboro markets, Piedmont became the dominant carrier early on by completely displacing Eastern in some of the markets. After an initial decrease in average HHI in the period 1979-1981, the HHI therefore increased again to return almost to its 1979 level by 1985. The HHI decreased in that period mainly in the New York and Orlando markets where Piedmont began to compete against Eastern and Delta,

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Greensboro	Atlanta	7261	1685	-731	2416
Greensboro	Baltimore	9983	516	203	313
Greensboro	Boston	9561	4172	2266	1906
Greensboro	Chicago	4550	-890	-760	-130
Greensboro	Dallas/Fort Worth	4313	336	-724	1060
Greensboro	Miami	5171	17	-1066	1083
Greensboro	New York	9773	2903	-2403	5306
Greensboro	Orlando	5358	-1358	-2591	1233
Greensboro	Philadelphia	9649	-304	-713	409
Greensboro	Washington	9537	3769	3585	184
Total Decreased			3	7	1
Total Increased			7	3	9
Average		7516	1085	-293	1378

Table 5.16 Changes in HHI for the Top Ten Greensboro/High Point Markets

respectively. After 1985, Piedmont (and in 1989 US Air) further strengthened its position which made the average HHI increase even further. From 1985 to 1989 the HHI increased in nine of the Greensboro markets. In 1989 the average HHI was 7500 points, 1000 points higher than in 1979, and the highest level of any of the cities studied. Only in the Chicago and Orlando markets was the HHI lower in 1989 than in 1979. Piedmont completely dominated seven of the markets in 1989. Only Delta and Eastern in the Atlanta market, United in the Chicago market, and American in the Dallas market carried a substantial share of the passengers along with Piedmont.

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Pittsburgh	Atlanta	3658	-4458	-3623	-836
Pittsburgh	Boston	8973	3618	986	2632
Pittsburgh	Chicago	3086	-280	250	-530
Pittsburgh	Los Angeles	5781	541	-2417	2958
Pittsburgh	New York	5071	1184	283	901
Pittsburgh	Orlando	6091	1022	-1898	2920
Pittsburgh	Philadelphia	9972	3255	1135	2120
Pittsburgh	San Francisco	6418	1916	-1284	3200
Pittsburgh	Tampa	6126	1432	-1114	2546
Pittsburgh	Washington	9755	5297	5469	-172
Total Decreased			2	5	3
Total Increased			8	5	7
Average		6493	1353	-221	1574

Table 5.17 Changes in HHI for the Top Ten Pittsburgh Markets

The top ten Pittsburgh markets were served mainly by United, TWA and US Air in 1979. By 1985, US Air had strengthened its position in the different markets and had become one of the major carriers or the dominant carrier in all but the Atlanta market. The HHI decreased in only five markets from 1979 to 1985, mainly in the Pittsburgh-Atlanta market where Delta began to compete against Eastern. The HHI increased substantially in the Washington market, which was served by Northwest, United, and US Air in 1979, and by US Air only in 1985. From 1985 on, US Air increased its position at Pittsburgh and became the main carrier in some of the markets that were still served by other airlines in 1985. The HHI decreased only slightly in three of the ten markets from 1985 to 1989, and the average HHI was 1350 points higher in 1989 than in 1979. From 1979 to 1989 only two markets experienced a decrease in HHI: Pittsburgh-Chicago and especially Pittsburgh-Atlanta, which was served by US Air, Delta, and Eastern in 1989 as compared to primarily Eastern in 1979.

The top ten Syracuse markets were highly concentrated in 1979, with seven of the ten markets dominated by one carrier. These markets were served by Eastern, American, and US Air. By 1985 US Air began to compete in the some of the markets it did not serve in 1979 and competition emerged from a new entrant, Empire Airlines, both of which made concentration drop significantly. Only one of the ten markets experienced an increase in HHI from 1979 to 1985: Syracuse-Philadelphia, served almost exclusively by US Air in 1985. The consecutive mergers of Empire and Piedmont in 1985, and of Piedmont and US Air in 1989 eliminated one of US Air's competitors, which explains the rise in average HHI at Syracuse

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Syracuse	Atlanta	4418	-5552	-4065	-1487
Syracuse	Boston	9045	175	-4091	4266
Syracuse	Chicago	4119	-5473	-5889	417
Syracuse	Detroit	8942	3967	-740	4707
Syracuse	Los Angeles	1585	-5234	-4924	-310
Syracuse	New York	5820	653	-1756	2409
Syracuse	Orlando	3047	-6014	-5507	-507
Syracuse	Philadelphia	9741	790	493	296
Syracuse	Tampa	2695	-5875	-5178	-697
Syracuse	Washington	8289	-1406	-4879	3473
Total Decreased			6	9	4
Total Increased			4	1	6
Average		5770	-2397	-3653	1257

Table 5.18 Changes in HHI for the Top Ten Syracuse Markets

from 1985 to 1989, as well as the large increases in HHI in the Boston, New York, and Washington markets, which were served by both US Air and Empire Airlines in 1985. The increase in HHI in the Detroit market was due to Northwest's strengthening of its hub at Detroit after the merger with Republic Airlines. Over the ten-year period 1979-1989 the HHI increased only in those four markets, and especially in the Syracuse-Detroit market, whereas it dropped significantly in five other markets. The average HHI over the top ten markets was 2400 points lower in 1989 than in 1979.

Denver was a hub for both Continental Airlines and United Airlines in 1989. Both airlines already carried a substantial share of the passengers in many of the Denver markets

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Denver	Chicago	4304	579	-748	1327
Denver	Dallas/Fort Worth	2701	-2813	-3512	700
Denver	Houston	7292	-716	-3248	2532
Denver	Los Angeles	4548	-306	-1479	1172
Denver	New York	3253	-1406	-2032	627
Denver	Phoenix	3323	-1031	-1686	656
Denver	Salt Lake City	2968	-844	-1353	509
Denver	San Francisco	5900	1793	371	1422
Denver	Seattle	4999	-108	-1700	1592
Denver	Washington	4066	435	-972	1407
Total Decreased			7	9	0
Total Increased			3	1	10
Average		4335	-442	-1636	1194

Table 5.19 Changes in HHI for the Top Ten Denver Markets

in 1979, and they strengthened their positions by 1985 by entering the other top ten markets. By 1985, Continental had become a major player in nine of the markets, and United in all ten. Frontier Airlines was also serving five of the markets. Because of this competition among the three airlines, the HHI decreased in nine of the top ten markets from 1979 to 1989, and the average HHI declined substantially. Frontier Airlines was merged with People Express in 1985, but filed for bankruptcy in 1986 and its Denver operations were sold to United. This reduced competition in many of the Denver markets in the period 1985-1989. In addition, both United and Continental strengthened their position relative to each other in the markets to and from one of their other hubs, such as the Denver-Houston and Denver-New York markets for Continental, and the Denver-Chicago and Denver-Washington markets

for United. As a result, the HHI increased in all ten Denver markets from 1985 to 1989. Because of the fact that Denver was a hub for two airlines, however, the average HHI was still rather low in 1989, and lower than in 1979. Only three of the markets, Denver-Chicago, Denver-San Francisco, and Denver-Washington, were more concentrated in 1989 than in 1979, and all three of these markets had United hubs at both endpoints.

Northwest Airlines was the dominant carrier in 1989 at three of the fifteen cities: Detroit, Minneapolis/St. Paul, and Memphis. It had attained this position mainly through a merger with Republic Airlines. Memphis and Detroit were strongholds of Republic before the merger of both airlines, and Northwest and Republic were the main carriers serving Minneapolis.

In 1979, American Airlines had the largest presence in the top ten Detroit markets. It was a major competitor in seven of the markets, although other carriers such as Northwest, Republic, United and TWA were also carrying a substantial share of the passengers in different markets. By 1985, concentration decreased in nine of the markets, due to the entry of new carriers such as Midway, Ozark and People Express. Republic had displaced American as the carrier with the strongest position in the top ten markets. From 1985 to 1989 Republic, and after their merger Northwest, built Detroit into a stronger hub. The HHI increased in eight of the markets, with the largest increases in the Boston, Los Angeles, New York, and Washington markets which were all dominated by Northwest in 1989. The Detroit-Nashville market experienced a large decrease in concentration as American began

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Detroit	Boston	8530	4636	79	4557
Detroit	Chicago	2152	-1143	-1130	-13
Detroit	Los Angeles	4587	-263	-2208	1946
Detroit	Nashville	3419	-6352	-1448	-4905
Detroit	New York	4258	-589	-3071	2482
Detroit	Orlando	3445	-1710	-2791	1081
Detroit	Phoenix	3128	-3308	-3655	347
Detroit	San Francisco	4552	123	-1130	1253
Detroit	St. Louis	3306	-2180	-2200	20
Detroit	Washington	6962	2297	-1443	3740
Total Decreased			7	9	2
Total Increased			3	1	8
Average		4434	-849	-1900	1051

Table 5.20 Changes in HHI for the Top Ten Detroit Markets

to develop a new hub at Nashville and challenge Republic's (Northwest's) dominant position in that market. The average HHI for the top ten markets was lower in 1989 than in 1979, although it had increased from 1985 to 1989. In seven of the markets the HHI was lower in 1989 than in 1979, especially in the Nashville market. Two of the markets, Detroit-Boston and Detroit-Washington, experienced a substantial increase in HHI from 1979 to 1989, however, as Northwest became essentially the only carrier serving these markets by 1989.

In 1979, the top ten Memphis markets were served by different carriers such as Delta, American, Braniff, and Republic. By 1985, Republic and Delta had both strengthened their position at Memphis and they were each carrying a substantial share of the passengers in

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Memphis	Atlanta	7187	-928	-3031	2103
Memphis	Chicago	2954	-4556	-3987	-569
Memphis	Dallas/Fort Worth	3735	-1170	-770	-400
Memphis	Detroit	7718	-1118	-3851	2733
Memphis	Los Angeles	5742	352	-1412	1764
Memphis	Nashville	4824	1638	980	658
Memphis	New York	5961	1871	-1814	3685
Memphis	Orlando	5867	2048	828	1220
Memphis	Philadelphia	5573	1886	-331	2217
Memphis	Washington	5915	1516	-328	1844
Total Decreased			4	8	2
Total Increased			6	2	8
Average		5548	154	-1371	1525

Table 5.21 Changes in HHI for the Top Ten Memphis Markets

eight of the top ten markets. Throughout the 1979-1985 period, the HHI increased in only two of the markets. After 1985, Republic continued to strengthen its position, mainly by taking market share from Delta in different markets. After its merger with Northwest, the latter continued this policy, and as a result from 1985 to 1989 the HHI increased in eight markets. The main increases took place in the Atlanta market, the only market where Delta strengthened its position, in the Detroit market which had a Republic (after 1986 Northwest) hub at both of its endpoint cities, and in the New York market. In 1989, six of the markets had a HHI level that was higher than in 1979, most of them markets served by several carriers in 1979 and dominated by Northwest in 1989. The average HHI, which had declined from 1979 to 1985, was slightly higher in 1989 than in 1979.

The different markets to and from Minneapolis/St. Paul were served mainly by Northwest, Western, and Republic Airlines in 1979. From 1979 to 1985, both Northwest and Republic strengthened their position at Minneapolis and each served all of the top ten markets in 1985. Northwest was on average carrying a greater share of the passenger traffic than Republic, though, and was the dominant carrier in some of the markets. The only markets in which other airlines also carried a substantial number of passengers were the Chicago, Dallas, Denver and Phoenix markets. These were the markets with the largest decrease in HHI from 1979 to 1989, although all ten of the markets experienced a decrease in HHI in that period, mainly due to Republic's and Northwest's competition against one another.

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Minneapolis	Boston	7567	2018	-975	2993
Minneapolis	Chicago	3336	-1807	-2598	791
Minneapolis	Dallas/Fort Worth	3850	-5462	-6665	1203
Minneapolis	Denver	3383	-2225	-3518	1293
Minneapolis	Detroit	8753	2510	-1913	4423
Minneapolis	Los Angeles	6164	944	-1327	2272
Minneapolis	New York	5929	198	-1308	1506
Minneapolis	Phoenix	4337	-2207	-3481	1274
Minneapolis	San Francisco	6544	1476	-1068	2543
Minneapolis	Washington	7551	2524	-200	2724
Total Decreased			4	10	0
Total Increased			6		10
Average		5741	-203	-2305	2102

Table 5.22 Changes in HHI for the Top Ten Minneapolis/St. Paul Markets

After Northwest purchased Republic in 1986 this trend completely reversed. The merger essentially eliminated one competitor in each of the markets and the HHI was therefore higher in all ten of the markets in 1989 than in 1985. In 1989, Northwest completely dominated the Boston, Detroit, San Francisco, and Washington markets. Northwest only encountered significant competition in the Chicago market from United, Midway, and American, in the Dallas market from American, in the Denver market from Continental and United, and in the Phoenix market from America West. These were the only four markets with a lower HHI value in 1989 than in 1979. The average HHI for the top ten Minneapolis/St. Paul markets declined substantially from 1979 to 1985, but increased by almost the same amount afterwards and was hence about the same in 1989 as in 1979.

American Airlines was the dominant carrier at two of the cities studied, Nashville and Raleigh/Durham. At both cities, American began to develop a hub in the late eighties, although it did not really have a strong presence at either city earlier on.

In 1979, the top ten Nashville markets were served by American, Braniff, Eastern, Delta, and Republic. By 1985, only the Nashville-Memphis market had become more concentrated and dominated by one airline, Republic, while all the other markets were served by different carriers, mainly depending on the other endpoint of the market. Seven of the markets experienced a decrease in HHI from 1979 to 1985, some of them a substantial one. Although American served five of the markets in 1979, by 1985 it was a major player in only three of these markets. After 1985, American again strengthened its position in the top ten

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Nashville	Atlanta	4612	-594	30	-624
Nashville	Birmingham	4244	-2892	-4850	1958
Nashville	Boston	5217	1878	-184	2062
Nashville	Chicago	3690	-4488	-3750	-739
Nashville	Dallas/Fort Worth	6414	901	229	672
Nashville	Detroit	3419	-6352	-1448	-4905
Nashville	Houston	4726	-1218	-3749	2531
Nashville	Los Angeles	3728	-3860	-5320	1460
Nashville	Memphis	4824	1638	980	658
Nashville	Miami	4522	1319	-807	2126
Total Decreased			6	7	3
Total Increased			4	3	7
Average		4540	-1367	-1887	520

Table 5.23 Changes in HHI for the Top Ten Nashville Markets

markets in its move to develop a hub at Nashville. It still faced heavy competition in most of the markets in 1989, especially from Southwest Airlines, and dominated only three of the markets: Nashville-Boston, Nashville-Dallas and Nashville-Miami. These were three of the four markets in which the HHI was higher in 1989 than in 1979. The fourth one, Nashville-Memphis, was served by both Northwest and American, although Northwest had the larger share of the market. Due to the increase in competition from 1979 to 1985, the average HHI declined substantially in that period. After 1987, it began to creep back up, although it was still substantially lower in 1989 than in 1979.

The Raleigh/Durham markets were all served by Eastern Airlines in 1979, which

completely dominated some of them, such as the New York and Miami markets. By 1985 competition from other carriers had emerged in most of the markets, especially from Piedmont Aviation which had become a major competitor in eight markets. Eastern remained an important carrier in only four of the markets. As a result, the HHI was lower in seven markets in 1985 than in 1979, the main ones being the Miami and New York markets. The HHI increased in the Boston, Charlotte, and Philadelphia markets, which were all dominated by Piedmont Airlines in 1985. American Airlines had a strong presence only in the Raleigh/Durham-Dallas market. After 1987, American began to build a hub at Raleigh/Durham and by 1989 it was a major carrier in all of the top ten markets to and from this city. It still faced strong competition from other carriers in all but three of the markets:

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
Raleigh/Durham	Atlanta	4206	-1668	-899	-769
Raleigh/Durham	Boston	5623	934	1929	-995
Raleigh/Durham	Charlotte	7206	477	1464	-987
Raleigh/Durham	Chicago	4077	-1562	-1642	80
Raleigh/Durham	Dallas/Fort Worth	5146	1478	-374	1852
Raleigh/Durham	Miami	4981	-3831	-5204	1373
Raleigh/Durham	New York	3400	-4356	-4586	230
Raleigh/Durham	Philadelphia	4957	-1631	1080	-2711
Raleigh/Durham	San Francisco	1888	-1438	-827	-612
Raleigh/Durham	Washington	4220	-3998	-1063	-2934
Total Decreased			7	7	6
Total Increased			3	3	4
Average		4570	-1559	-1012	-547

Table 5.24 Changes in HHI for the Top Ten Raleigh/Durham Markets

the Boston, Dallas, and Miami markets. From 1985 to 1989, the HHI increased in the latter two markets only. In the Boston market it actually declined, because American's dominance in 1989 was not as complete as Piedmont's dominance of the market in 1985. In 1989, only three of the markets had a higher level of concentration than in 1979, the main one being the Raleigh/Durham-Dallas market. As a result the average level of concentration was much lower in 1989 than in 1979.

St. Louis was already a hub for TWA before deregulation. The airline was the dominant carrier in five of the top ten markets in 1979, and was a major competitor in two other markets. The other major competitors at St. Louis were American and Ozark Airlines.

O-D City-Pair Markets		HHI	Change in HHI		
		1989	'79-'89	'79-'85	'85-'89
St. Louis	Chicago	3347	-2161	-3019	858
St. Louis	Dallas/Fort Worth	4528	-506	-2037	1530
St. Louis	Denver	4671	-238	-2333	2095
St. Louis	Detroit	3306	-2180	-2200	20
St. Louis	Houston	3561	-916	-1626	710
St. Louis	Los Angeles	5486	-48	-654	606
St. Louis	New York	8860	2650	-1356	4006
St. Louis	Phoenix	4780	-320	-1360	1040
St. Louis	San Francisco	6567	155	-547	701
St. Louis	Washington	8252	302	-3798	4100
Total Decreased			7	10	0
Total Increased			3		10
Average		5336	-326	-1893	1567

Table 5.25 Changes in HHI for the Top Ten St. Louis Markets

By 1985, TWA had also become a major player in two more markets, but it had lost its dominant position in the other markets as new competition emerged. Ozark strengthened its presence at St. Louis in the period 1979-1985, and other airlines also entered some of the markets. All ten of the markets experienced a decrease in HHI from 1979 to 1985. After 1985, though, TWA eliminated its major competitor when it merged with Ozark Airlines. The HHI increased in all ten of the markets from 1985 to 1989, mostly so in the New York market where TWA competed against People Express in 1985, and in the Washington market which was served by TWA and Ozark only in 1985. However, in 1989 the HHI was significantly higher than in 1979 in the New York market only, and it was about the same in six of the other markets, since many of the markets were also dominated by TWA in 1979. The average HHI, after an initial drop from 1979 to 1985, had risen again to about the same level as in 1979.

5.5 Conclusion

Most of the top ten markets at the cities studied in this analysis were served by a limited number of airlines in 1979. During the period 1979-1985, concentration decreased in most of these markets as some competition emerged from new carriers, but mainly from a single carrier that was already serving some of the markets in 1979 and entered the others in a drive to increase the scale of its operations and develop a hub. After 1985, this airline

continued to strengthen its position at the city, either by further increasing the scale of its operations or by merging with one of its main competitors, which was the case at St. Louis and Minneapolis. At some of the cities, the dominant carrier was purchased by another airline without substantial operations at the city in the period 1985-1989. The concentration levels increased in most of the markets from 1985 to 1989 as the dominant airline strengthened its position. However, in about half of the 150 markets studied in this chapter, concentration was still lower in 1989 than in 1979.

The markets in which concentration levels did not increase from 1985 to 1989 were often those markets with a hub of another carrier at the other endpoint. In that case usually both airlines carried a substantial share of the passengers. The markets with a multiple-carrier hub at one of the endpoints and a hub of a different carrier at the other endpoint had the lowest concentration levels in 1989, since these markets were usually served by three airlines.

The cities that were better off in 1989 than in 1979 were Syracuse, Nashville, and Raleigh/Durham. Syracuse's top ten markets were highly concentrated in 1979, and at Nashville and Raleigh/Durham American began to develop a hub only in the late eighties, which shifts the time frame of the above explained trends. The cities that were definitely worse off in 1989 than in 1979 were Greensboro/High Point and Pittsburgh.

Atlanta, Denver, Detroit, Nashville and Raleigh/Durham still had rather low average

concentration levels in 1989: Atlanta and Denver were both hubs for two carriers, at least prior to Eastern' problems at Atlanta, which kept the top ten markets from being dominated by one airline. Only two of the Detroit markets had become completely dominated by Northwest by 1989, and many of the other top ten Detroit markets had a hub of another carrier at the other endpoint, which kept the markets competitive. Nashville and Raleigh/Durham were still served by several airlines in their top ten markets while American was developing its hubs at the cities. The average top ten market concentration levels were the highest at Charlotte, Dayton, and Greensboro/High Point, all of them US Air hubs in 1989 (Piedmont hubs prior to the US Air-Piedmont merger).

Notes

[1] Ten percent of all the ticket coupons has to be collected by the airlines and the data provided by these ticket coupons are reported on a monthly basis to the Department of Transportation. The data used in this study are from the Department of Transportation's statistics and represent therefore ten percent of all passengers transported.

Chapter 6

Policy Implications

6.1 Introduction

The Airline Deregulation Act was approved by Congress under the assumption that free competition would bring about many public benefits such as low fares that a regulated industry had not been able to provide. Any inquiry as to whether deregulation has been a good public policy should therefore focus on how well the deregulated airline industry has been able to provide those benefits as compared to the regulated industry.

This thesis has attempted to answer part of this question by analyzing concentration levels in the top 100 origin-destination markets in the United States and in the top ten markets to and from each of fifteen dominated cities throughout the ten-year period 1979-1989. The first section of this chapter discusses the policy implications of the results

obtained in the analysis of the top 100 markets. The second section looks at the positive and negative effects of deregulation in markets to and from dominated cities and analyzes the desirability and the possible impacts of public policy intervention.

6.2 The Effects of Deregulation on the Top 100 Markets

The analysis performed in Chapter 4 shows that, overall, U.S. deregulation has had a positive effect on competition in the top 100 domestic Origin-Destination markets as measured by changes in concentration levels throughout the ten-year period 1979-1989. Average concentration levels across the top 100 markets were lower in 1989 than in 1979 and about 70% of these markets were less concentrated.

Because our study focused on the 100 markets in which the most passengers traveled in 1989, it was not representative of the whole U.S. domestic air transportation system. However, our analysis leads to similar conclusions as other studies, which have found that the public has benefitted from a substantial increase in airline competition with an increase in frequency of service and an increase in competitive service. As a result, average fares paid by consumers have declined since deregulation, both compared to consumer prices in general and to the fares that would likely have prevailed had regulation continued. Moreover, the availability of many discounted fares has democratized air transportation by making air travel

affordable for many more Americans. [1] [2] [3]

The high merger and acquisition activity, along with the increase in fares in the period 1985-1989, have fueled popular and political concerns about the long-term effects of airline deregulation. Like the prices of many goods and services, air fares exhibit cyclical fluctuations, however. In most markets the rise in fares at the end of the eighties may at least have been partly due to booming economic conditions and the high demand for air travel that went along with them. The airline industry's sensitivity to national economic conditions suggests that discount fares are likely to expand whenever the economy slows down, driving down average fares in the industry. The price cutting in the beginning of 1991 was a good example of this. Air fares will continue to experience cyclical fluctuations and periodical upswings should not be considered to be a negative consequence of deregulation. [4] [5]

It is true, however, that the effects of deregulation have been more beneficial in some markets than in others. The average concentration in the non-hub markets among the top 100 markets decreased throughout the ten-year period 1979-1989 and was at its lowest level in 1989. On the other hand, in markets with hub cities at one of the endpoints, the average concentration decreased from 1979 to 1985, but increased subsequently. The implications of this increase in average concentration in hub markets are further explored in the next section.

The decrease in concentration in non-hub markets is in fact primarily due to the development of hub-and-spoke systems by all major airlines. This system allows the carriers

to serve many markets one-stop through their hubs which are not big enough to be served non-stop by several carriers on a financially viable basis. The more the different airlines expand their operations at one or more hubs and the larger their network becomes, the greater the incentive is to serve an additional city from the hub. Indeed, by adding one city the airline adds many new markets to its system and the additional service creates many benefits throughout the carrier's system. As a result of the hub-and-spoke networks, many deregulated city-pair markets with one-stop services over competing hubs were more competitive in 1989 when compared to 1979 and even when compared to 1985. The public policy objectives of the Airline Deregulation Act were therefore attained in these markets and their competitive performance is very unlikely to be improved by government intervention.

The only source of concern for the non-hub markets and the entire air transportation system would be that the industry might further consolidate, as more large carriers such as Eastern would cease operations or more mergers would occur. The best guarantee that the deregulated system will remain competitive is the presence of many financially healthy competitors. At present, many of the carriers are heavily leveraged due to their expansionary policies and acquisitions of the eighties, and the downturn in the economy at the end of 1990 and into 1991 has put many of them in a financially difficult situation. In order to retain the beneficial effects of competition from these airlines, lawmakers might have to change the current law on foreign ownership of U.S. airlines in order to allow foreign airlines to buy U.S. carriers. Foreign airlines might be the only ones willing to invest in some of the ailing U.S. airlines in order to be able to enter the U.S. market. [6]

Since deregulation has brought substantial benefits to the traveling public, we consider a relaxation of foreign ownership rules the only policy intervention in the air transportation system which could be desirable at present. Any other regulation or intervention is likely to negatively affect some of the benefits provided by deregulation, however.

6.3 The Effects of Deregulation on Dominated City Markets

Although deregulation has been beneficial for the overall air transportation system, certain subsystems such as markets to and from hub cities have become worse off than the average market in terms of competition and are sometimes even worse off in 1989 than they were in 1979. Both the analysis of the hub markets of the top 100 markets in Chapter 4 and the analysis of the top ten markets to and from fifteen dominated airports in Chapter 5 show that concentration decreased on average in those markets from 1979 to 1985, but increased subsequently from 1985 to 1989.

The detailed study of each of the dominated cities in Chapter 5 illuminates that these changes in concentration were usually the result of a single trend which extended throughout the whole period 1979-1989. This trend was the drive of an airline to increase the scale of its operations at the city and to develop a hub. During the period 1979-1985, concentration decreased in most markets to and from the hub city as this carrier entered new markets and

began to compete against the incumbent carriers in those markets. After 1985, the hub carrier continued to strengthen its position by further increasing the scale of its operations. Because the airline offered a higher frequency of service and more non-stop service in the markets to and from the hub than the other carriers, it became more attractive to travelers in these markets. As a result, the airline gradually took market share from the other carriers and became the dominant carrier in the market, which led to increases in concentration in most of these markets.

Many people have blamed the wave of mergers and acquisitions that took place from 1985 to 1989 for the increases in concentration in markets to and from dominated airports during that period. The general trend of hub development was just as important, if not more important, for this increase in concentration at most cities, however. Only at two of the cities studied in Chapter 5, Minneapolis/St. Paul and St. Louis, did a merger clearly lead to a substantial increase in concentration. At both cities two airlines, respectively Northwest Airlines and Republic Airlines, and TWA and Ozark Airlines, were simultaneously developing hubs which limited the ability of either one of them to dominate the city and the markets to and from that city. A merger of the carriers eventually led to complete domination of the city by one airline. One could question whether these mergers were intended to increase efficiency through economies of scale, or were fueled by a desire to gain control of a market in order to earn higher profits.

Even though other mergers, such as the Delta Airlines -Western Airlines merger and

the US Air - Piedmont Aviation merger, affected service at some of the fifteen cities, the mergers did not really change market concentrations at the city. Without the merger the different airlines, such as Western at Salt Lake City or Piedmont at Charlotte, would likely have gained full dominance of their respective hub cities as well.

Although average concentration levels increased from 1985 to 1989, they were still lower in 1989 than in 1979 in about half of the 150 markets studied in Chapter 5 and in about 60% of the hub markets in the top 100 markets studied in Chapter 4. Markets with hubs of different carriers at both endpoints or with multiple-carrier hubs at one of the endpoints were usually better off in 1989 than markets with only one hub at one of the endpoints, because of the presence of at least two carriers with strongholds in the market. The decrease in concentration in some of the hub markets is also due to the fact that these markets were highly concentrated in 1979. Before deregulation, the majority of the markets studied were served by only two carriers, or even only one. Concentration levels will not be very different when a market was served by only one airline in 1979 and dominated by one carrier in 1989. The key difference between those situations is that fares before 1978 were regulated, whereas in 1989 they were supposed to be disciplined by competition.

The absence of competition and the lack of a threat of competition because of the presence of barriers to entry in markets to and from hubs gives the appearance of a market system without control. The mere presence of regional monopolies or oligopolies has created public and political suspicions that the dominant carriers might charge monopolistic fares.

The same public and politicians seem to forget that the presence of a hub also offers many benefits such as much more non-stop service and higher frequencies of service than were available prior to deregulation or than are available at non-hub cities. These precise benefits made the hub carrier more attractive than other carriers in the markets to and from the hub city, which allowed the carrier to increase its share of the passengers transported in the first place.

Whether fares charged in markets to and from dominated cities are really higher than in other markets is beyond the scope of this thesis. Nevertheless, higher market concentration levels and allegations of higher fares have given rise to public and political desires to intervene at these cities to reinstate some kind of external controls or to inject more competition.

One policy intervention proposed sometimes is a form of control on fares, for instance a fare ceiling, in markets to and from hubs. A first problem in defining such a policy would be how to set such a fare ceiling. Since hub flights carry passengers that travel in many different markets, it is almost impossible to allocate costs of transportation to a passenger in a certain origin-destination market. Setting the fare ceiling on a cost basis would therefore be very difficult, although cost-based regulation would be the only fair and feasible alternative to free competition pricing. Aside from the problem of defining a fare ceiling for a specific O-D market, there is the much bigger issue of the desirability of such a policy. If fares were to be reregulated in certain markets, airlines would have little incentive to offer

discount fares in those markets, since they would be able to recover their costs through the regulated fares. Moreover, the effects of fare regulations in hub markets might spill over to other non-hub markets, since the costs of flying a route to a hub are incurred for carrying passengers in different markets. This might place airlines competing for through-hub traffic in very different competitive situations, necessitating complete regulation to compensate for the resulting distortions of competition. All of these implications of fare reregulation make it clear that intervention in this area is not a feasible policy option. [7] [8]

The other policy intervention considered would be to increase competition in markets to and from hubs. The only way in which regulators and lawmakers would be able to do that would be by decreasing the barriers to entry that exist in these markets.

One of the major barriers to increased competition is the scarcity of slots and gates at the dominated cities at the peak hours of the day. In order to increase competition, public officials could force the airlines that dominate the hub to give up some of these slots and gates. This would limit the airlines' ability to fully use the hub to reap economies of scale. Since the essence of a hub is to have large enough operations to be able to serve many markets through the hub simultaneously, this kind of intervention would adversely affect competition in many of the markets which have experienced a decrease in concentration since deregulation. One could question whether a policy that would decrease the benefits of the deregulated system is desirable.

An other alternative would be to increase capacity at the hub airports and offer that capacity to airlines other than the hub carrier. Constructing additional capacity would require funding, would take time, and would cause different kinds of environmental and noise problems, though. Aside from these airport related difficulties, there is the problem that many of the smaller markets do not have enough traffic to support non-stop competition on a financially viable basis, especially at the frequencies of service the new competitor would have to offer to make its service as attractive to travelers as the hub airline's service. This is especially true for the short-haul markets, which do not have the alternative to be served one-stop over a competing hub like the longer-haul markets. Additional capacity might allow carriers that are looking for opportunities to expand their networks to enter those longer-haul markets which provide above average profitability levels to a single carrier. Since these carriers will enter those markets from a position of strength in other markets, they will be less likely to be driven out of the markets by price cutting policies of the hub carriers as the start-up carriers of the beginning of the eighties.

The creation of additional capacity and the right allocation of this capacity might therefore increase competition in longer-haul markets to and from hub cities. It is questionable, however, whether it would increase competition in short-haul hub markets. This policy might also be attractive because a continued growth of traffic will eventually require the construction of additional capacity anyway.

Other barriers to entry which may limit competition are presented by computer

reservation systems, by hub carrier - travel agent relations at hub cities, and by frequent flyer programs. Policy interventions to decrease these barriers are beyond the scope of this thesis.

In addition to the above mentioned pro-active policies, public officials could use reactive policies to keep competition at current levels in the aggregate system and in different markets, which is very important to preserve the positive effects of deregulation. Such policies include closer investigations into mergers and into slot and gate allocation at airports. Such investigations should use the possible impacts on competition and concentration as the yardstick in allowing or prohibiting mergers and changes of gate/slot ownership. As shown in Chapter 5, not all of these activities affect competition adversely. At present, Department of Transportation officials seem to apply such a policy in general terms, as shown by the assignment of Eastern Airline's slots at Washington to Northwest Airlines in stead of United Airlines because the latter already has a hub at the city.

6.4 Conclusion

Airline deregulation has brought substantial public benefits. Levels of competition were higher in 1989 than in 1979, both on average across the markets researched and in most of the markets studied. This has resulted in increased frequency of service, more competitive services for consumers to choose from, and decreases in fares.

The hub-and-spoke route structure developed by all major airlines is the primary cause for the decrease in concentration levels. It allowed many airlines to serve markets one-stop through their hub, which could not be served non-stop by several carriers on a financially viable basis. Unfortunately, those same hubs that decreased concentration in the non-hub markets have led to increases in concentration in markets to and from the hubs.

The high visibility of these increased concentration levels in some of the hub markets has raised public and political concerns as to whether deregulation has been a good public policy and whether reregulation of some kind would be desirable. Many of the policy alternatives envisioned would hardly increase competition at the dominated cities, and would very likely adversely affect competition in the overall air transportation system.

The only active policy regulators and lawmakers could consider on a system-wide level would be a deregulation of the rules on foreign ownership of U.S. airlines. This would preserve or increase competition in the overall system, although it would probably not affect concentration in markets to and from dominated cities. At these dominated cities, the public officials could consider the construction of additional capacity. The other role that administrators should play is a reactive one, in which they should try to preserve the existing levels of competition and concentration by investigating mergers and slot and gate allocations more closely.

The primary goal of the regulators and lawmakers should be to preserve competition

levels in the overall air transportation system and in markets at current levels, and to let a deregulated industry take care of highly concentrated markets. Indeed, as carriers continue to expand their networks, they will eventually turn to those markets where profitability levels are above average and thereby increase competition in those markets.

Notes

[1] Steve Lohr, "War and Recession Speed Up the Airlines' Flights to Oblivion", The New York Times, New York, February 17, 1991.

[2] Kenneth Labich, "Should Airlines be Reregulated?", Fortune, June 19, 1989.

[3] The Economist, "Flying Against the Rules", The Economist, June 24, 1989.

[4] Steven A. Morrison and Clifford Winston, "The Dynamics of Airline Pricing and Competition", The Brookings Institution: AEA Papers and Proceedings, vol. 80 no. 2, 1990.

[5] John R. Meyer and Clinton V. Oster, Deregulation and the Future of Intercity Passenger Travel, The MIT Press, Cambridge, Massachusetts, 1987.

[6] Steve Lohr, op. cit.

[7] Michael E. Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy, and Public Policy", The Yale Journal on Regulation, vol. 4, 1987.

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Appendix A

List of the Top 100 Markets,

Ranked in Order of

Local Passengers Transported in 1989

Rank	Origin-Destination City-Pair Markets		# of Local Passengers (10% sample)	
			Absolute	% of Total
1	Boston	New York	317119	3.53%
2	Los Angeles	New York	311676	3.47%
3	Washington	New York	297162	3.31%
4	Chicago	New York	244608	2.73%
5	Miami	New York	220069	2.45%
6	Los Angeles	San Francisco	219839	2.45%
7	Dallas/Fort Worth	Houston	213913	2.38%
8	San Francisco	New York	206670	2.30%
9	Honolulu	Kahului, Hawaii	198688	2.21%
10	Fort Lauderdale	New York	175248	1.95%
11	Chicago	Detroit	174529	1.95%
12	Orlando	New York	170960	1.91%

13	Los Angeles	Phoenix	168462	1.88%
14	Honolulu	Lihue, Hawaii	166842	1.86%
15	San Juan	New York	158276	1.76%
16	Honolulu	Los Angeles	141717	1.58%
17	Atlanta	New York	126953	1.42%
18	West Palm Beach	New York	123164	1.37%
19	Chicago	Los Angeles	115903	1.29%
20	Honolulu	Kona, Hawaii	111014	1.24%
21	San Diego	San Francisco	110806	1.24%
22	Chicago	St. Louis	104979	1.17%
23	Tampa	New York	101992	1.14%
24	Dallas/Fort Worth	New York	101489	1.13%
25	Phoenix	San Diego	96762	1.08%
26	Boston	Washington	93206	1.04%
27	Hilo, Hawaii	Honolulu	92838	1.03%
28	Honolulu	San Francisco	90657	1.01%
29	Dallas/Fort Worth	San Antonio	88908	0.99%
30	Chicago	Minneapolis/St. Paul	87986	0.98%
31	Chicago	Kansas City	86723	0.97%
32	Houston	New York	86661	0.97%
33	Detroit	New York	85897	0.96%
34	Los Angeles	Washington	85754	0.96%
35	Chicago	Washington	82838	0.92%
36	Las Vegas	Phoenix	82580	0.92%
37	Denver	New York	81820	0.91%
38	Las Vegas	Los Angeles	80572	0.90%
39	Pittsburgh	New York	80546	0.90%
40	Buffalo	New York	75474	0.84%
41	Las Vegas	San Diego	75394	0.84%
42	Austin	Dallas/Fort Worth	73786	0.82%
43	Boston	Chicago	72400	0.81%
44	Chicago	San Francisco	71472	0.80%
45	Boston	Los Angeles	70854	0.79%
46	Los Angeles	Seattle/Tacoma	70067	0.78%
47	Houston	New Orleans	69864	0.78%
48	Chicago	Dallas/Fort Worth	69431	0.77%
49	Ontario, Cal.	Phoenix	69393	0.77%
50	Los Angeles	San Jose	68299	0.76%
51	San Francisco	Washington	67252	0.75%
52	Cleveland	New York	65030	0.72%
53	Chicago	Phoenix	64285	0.72%
54	Minneapolis/St. Paul	New York	64075	0.71%
55	Chicago	Philadelphia	63556	0.71%
56	New York	Phoenix	63285	0.71%
57	Chicago	Denver	62271	0.69%
58	Los Angeles	Oakland	61927	0.69%
59	Boston	San Francisco	61530	0.69%
60	Chicago	Atlanta	61423	0.68%
61	Houston	Los Angeles	60946	0.68%
62	Chicago	Orlando	58420	0.65%

63	New York	St. Louis	58314	0.65%
64	Orange County, Cal.	San Francisco	58066	0.65%
65	Atlanta	Washington	57767	0.64%
66	Miami	Orlando	57020	0.64%
67	Boston	Philadelphia	56897	0.63%
68	San Francisco	Seattle/Tacoma	56368	0.63%
69	Boston	Orlando	55438	0.62%
70	Chicago	Houston	54676	0.61%
71	Los Angeles	Miami	54155	0.60%
72	Chicago	Miami	51945	0.58%
73	Miami	Washington	50245	0.56%
74	Chicago	Cleveland	49764	0.55%
75	Miami	San Juan	49747	0.55%
76	New York	Seattle/Tacoma	49546	0.55%
77	Detroit	Los Angeles	48791	0.54%
78	Dallas/Fort Worth	Washington	48768	0.54%
79	Burbank	San Francisco	48601	0.54%
80	Chicago	Las Vegas	48074	0.54%
81	Denver	Los Angeles	47712	0.53%
82	New York	Las Vegas	47431	0.53%
83	Dallas/Fort Worth	Los Angeles	47425	0.53%
84	Orange County, Cal.	San Jose	47324	0.53%
85	Houston	San Antonio	47181	0.53%
86	New York	San Diego	46667	0.52%
87	Albuquerque	Phoenix	46628	0.52%
88	Dallas/Fort Worth	Tulsa, Oklahoma	46517	0.52%
89	New York	New Orleans	45340	0.51%
90	Chicago	Tampa	45192	0.50%
91	Atlanta	Dallas/Fort Worth	44954	0.50%
92	New York	Rochester, NY	44640	0.50%
93	Orlando	Philadelphia	43550	0.49%
94	Phoenix	San Francisco	43321	0.48%
95	Miami	Tampa	43213	0.48%
96	Atlanta	Miami	43107	0.48%
97	Los Angeles	San Diego	41660	0.46%
98	New York	Norfolk, Virginia	40837	0.46%
99	Dallas/Fort Worth	Denver	40263	0.45%
100	Denver	Phoenix	37812	0.42%
	Total		8971216	100.0%

Appendix B

List of the Top Ten Markets

out of Fifteen Dominated Cities

Origin-Destination City-Pair Markets		# of Local Passengers (10% Sample, 1989)	
		Absolute	% of Total
Atlanta	Boston	36553	1.01%
Atlanta	Chicago	61423	1.69%
Atlanta	Dallas/Fort Worth	44954	1.24%
Atlanta	Los Angeles	40981	1.13%
Atlanta	Miami	43107	1.19%
Atlanta	New York	126953	3.49%
Atlanta	Orlando	37464	1.03%
Atlanta	Philadelphia	35478	0.98%
Atlanta	Tampa	33559	0.92%
Atlanta	Washington	57767	1.59%
Charlotte	Atlanta	21423	0.59%
Charlotte	Boston	10524	0.29%
Charlotte	Chicago	14323	0.39%
Charlotte	Dallas/Fort Worth	9840	0.27%
Charlotte	Los Angeles	7479	0.21%
Charlotte	Miami	7368	0.20%
Charlotte	New York	39598	1.09%

Charlotte	Philadelphia	12024	0.33%
Charlotte	Raleigh/Durham	8310	0.23%
Charlotte	Washington	10266	0.28%
Cincinnati	Atlanta	12847	0.35%
Cincinnati	Boston	12694	0.35%
Cincinnati	Chicago	22810	0.63%
Cincinnati	Dallas/Fort Worth	9568	0.26%
Cincinnati	Detroit	10198	0.28%
Cincinnati	Los Angeles	12057	0.33%
Cincinnati	New York	37071	1.02%
Cincinnati	Orlando	9542	0.26%
Cincinnati	Philadelphia	11711	0.32%
Cincinnati	Washington	12866	0.35%
Dayton	Atlanta	6486	0.18%
Dayton	Boston	6647	0.18%
Dayton	Chicago	10622	0.29%
Dayton	Dallas/Fort Worth	6346	0.17%
Dayton	Los Angeles	9483	0.26%
Dayton	New York	15712	0.43%
Dayton	Orlando	5311	0.15%
Dayton	Philadelphia	5449	0.15%
Dayton	San Francisco	4296	0.12%
Dayton	Washington	10355	0.28%
Denver	Chicago	62271	1.71%
Denver	Dallas/Fort Worth	40263	1.11%
Denver	Houston	38270	1.05%
Denver	Los Angeles	47712	1.31%
Denver	New York	81820	2.25%
Denver	Phoenix	37812	1.04%
Denver	Salt Lake City	28004	0.77%
Denver	San Francisco	33048	0.91%
Denver	Seattle	27997	0.77%
Denver	Washington	40567	1.12%
Detroit	Boston	28120	0.77%
Detroit	Chicago	174529	4.80%
Detroit	Los Angeles	48791	1.34%
Detroit	Nashville	40963	1.13%
Detroit	New York	85897	2.36%
Detroit	Orlando	32165	0.89%
Detroit	Phoenix	27614	0.76%
Detroit	San Francisco	28850	0.79%
Detroit	St. Louis	45030	1.24%
Detroit	Washington	33084	0.91%
Greensboro/High Point	Atlanta	13560	0.37%
Greensboro/High Point	Baltimore	3541	0.10%

Greensboro/High Point	Boston	4122	0.11%
Greensboro/High Point	Chicago	8136	0.22%
Greensboro/High Point	Dallas/Fort Worth	4397	0.12%
Greensboro/High Point	Miami	3295	0.09%
Greensboro/High Point	New York	26010	0.72%
Greensboro/High Point	Orlando	3397	0.09%
Greensboro/High Point	Philadelphia	4713	0.13%
Greensboro/High Point	Washington	6614	0.18%
Memphis	Atlanta	18848	0.52%
Memphis	Chicago	16859	0.46%
Memphis	Dallas/Fort Worth	10637	0.29%
Memphis	Detroit	7286	0.20%
Memphis	Los Angeles	9447	0.26%
Memphis	Nashville	7431	0.20%
Memphis	New York	19089	0.53%
Memphis	Orlando	6766	0.19%
Memphis	Philadelphia	6389	0.18%
Memphis	Washington	10879	0.30%
Minneapolis/St. Paul	Boston	26905	0.74%
Minneapolis/St. Paul	Chicago	87986	2.42%
Minneapolis/St. Paul	Dallas/Fort Worth	20491	0.56%
Minneapolis/St. Paul	Denver	27119	0.75%
Minneapolis/St. Paul	Detroit	25603	0.70%
Minneapolis/St. Paul	Los Angeles	34070	0.94%
Minneapolis/St. Paul	New York	64075	1.76%
Minneapolis/St. Paul	Phoenix	30978	0.85%
Minneapolis/St. Paul	San Francisco	29536	0.81%
Minneapolis/St. Paul	Washington	30585	0.84%
Nashville	Atlanta	19116	0.53%
Nashville	Birmingham	6187	0.17%
Nashville	Boston	6992	0.19%
Nashville	Chicago	26379	0.73%
Nashville	Dallas/Fort Worth	11673	0.32%
Nashville	Detroit	40963	1.13%
Nashville	Houston	16601	0.46%
Nashville	Los Angeles	9701	0.27%
Nashville	Memphis	7431	0.20%
Nashville	Miami	6109	0.17%
Pittsburgh	Atlanta	16288	0.45%
Pittsburgh	Boston	20096	0.55%
Pittsburgh	Chicago	32777	0.90%
Pittsburgh	Los Angeles	18215	0.50%
Pittsburgh	New York	80546	2.22%
Pittsburgh	Orlando	20720	0.57%
Pittsburgh	Philadelphia	34330	0.94%
Pittsburgh	San Francisco	14772	0.41%

Pittsburgh	Tampa	14804	0.41%
Pittsburgh	Washington	19041	0.52%
Raleigh/Durham	Atlanta	21715	0.60%
Raleigh/Durham	Boston	9158	0.25%
Raleigh/Durham	Charlotte	8310	0.23%
Raleigh/Durham	Chicago	13578	0.37%
Raleigh/Durham	Dallas/Fort Worth	8984	0.25%
Raleigh/Durham	Miami	6282	0.17%
Raleigh/Durham	New York	36032	0.99%
Raleigh/Durham	Philadelphia	9788	0.27%
Raleigh/Durham	San Francisco	5472	0.15%
Raleigh/Durham	Washington	14336	0.39%
Salt Lake City	Atlanta	10342	0.28%
Salt Lake City	Chicago	14851	0.41%
Salt Lake City	Dallas/Fort Worth	12622	0.35%
Salt Lake City	Denver	28004	0.77%
Salt Lake City	Los Angeles	20219	0.56%
Salt Lake City	New York	22164	0.61%
Salt Lake City	Phoenix	17849	0.49%
Salt Lake City	San Francisco	13368	0.37%
Salt Lake City	Seattle	11703	0.32%
Salt Lake City	Washington	13735	0.38%
St. Louis	Chicago	104979	2.89%
St. Louis	Dallas/Fort Worth	26784	0.74%
St. Louis	Denver	17863	0.49%
St. Louis	Detroit	45030	1.24%
St. Louis	Houston	31360	0.86%
St. Louis	Los Angeles	23142	0.64%
St. Louis	New York	58314	1.60%
St. Louis	Phoenix	19282	0.53%
St. Louis	San Francisco	17985	0.49%
St. Louis	Washington	27244	0.75%
Syracuse	Atlanta	4751	0.13%
Syracuse	Boston	10577	0.29%
Syracuse	Chicago	7750	0.21%
Syracuse	Detroit	4436	0.12%
Syracuse	Los Angeles	4590	0.13%
Syracuse	New York	35260	0.97%
Syracuse	Orlando	6995	0.19%
Syracuse	Philadelphia	6946	0.19%
Syracuse	Tampa	5077	0.14%
Syracuse	Washington	10975	0.30%